DISTRIBUTION MAPS OF PACIFIC PLANTS

27. **Wahlenbergia marginata** (Thunb.) DC.

Name: Wahlenbergia marginata (Thunb.) DC. Monogr. Camp. (1830) 143.

Family: *Campanulaceae.*

Taxonomy: In the sense accepted here, this species shows a large range of variation over its extensive area of distribution and has been described under a number of names.

Habit: An erect or ascending herb with blue, star-shaped flowers which varies from a very delicate annual to a rather medium-sized (c. 60 cm) branched herb of which the taproot and its crown may become woody; the latter situation specially develops in pyrogenous savannahs. The flowers may vary in size and minute specimens on seepage talus have been encountered with only 3-lobed corollas.

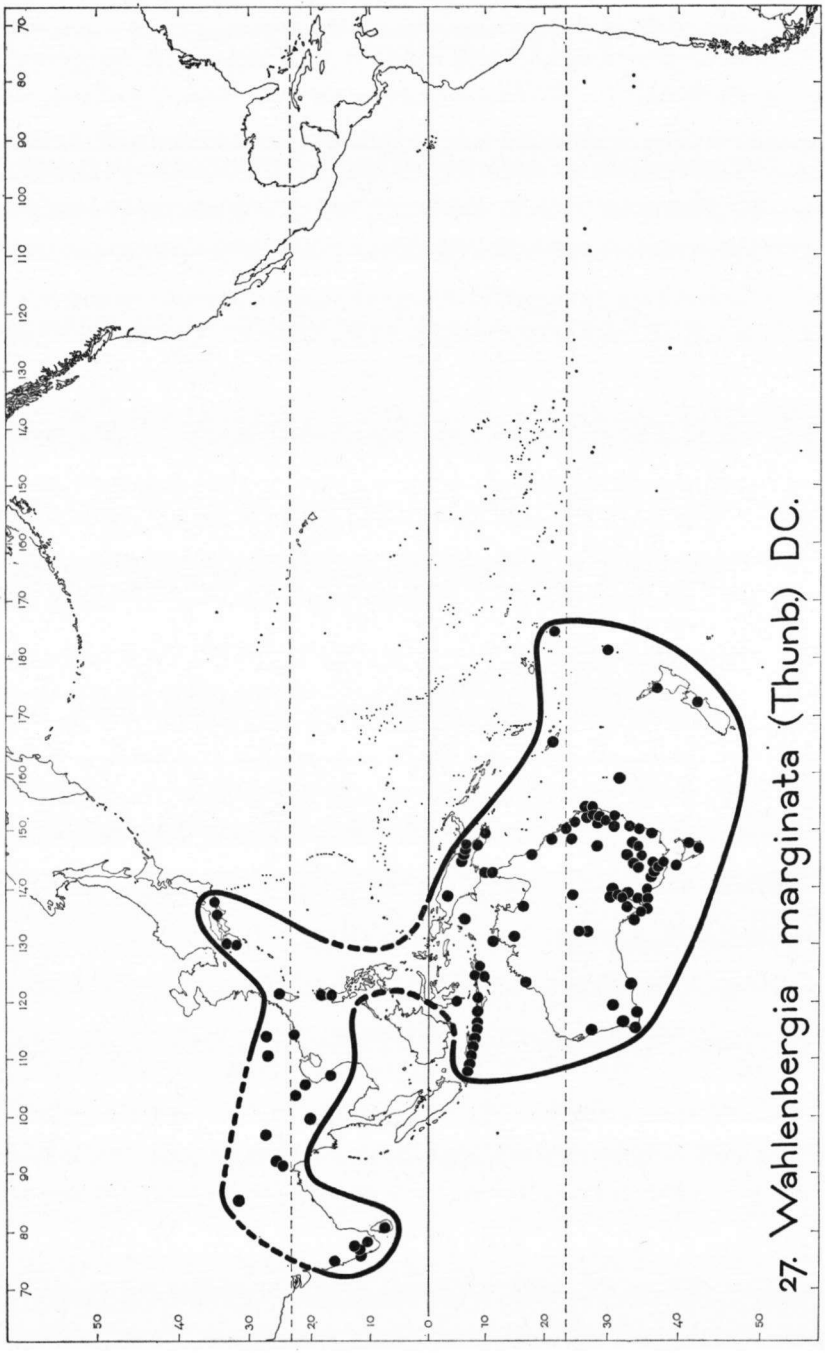
Habitat: In grassfields and light forests of *Eucalyptus* and *Casuarina*, along trails, among rocks, in Malesia only in the mountains between 800 and 3500 m (only once found in the lowland), at higher latitudes descending to sea-level.

Ecology: In the tropics it shows distinct preference for regions subject to a feeble to strong dry season, which may explain its absence from the Great Sunda Islands with their prevailing everwet rain-forest climate. The flowers are protandrous, but are not visited by insects and autogamy seems to be the rule.

Dispersal: The capsules contain a large amount of small seeds which have no special dispersal design. On open mountain slopes heavy winds will probably be instrumental in local dispersal.

Sources: B. Moeliono & P. Tuyn, Fl. Mal. I, *6* (1960) 115—118, fig. 4 (map). All material from the herbaria at Bogor, Harvard, Leyden, Singapore, Utrecht, etc. has been studied by the author.

P. TUYN.


27. Wahlenbergia marginata (Thunb.) DC.

28. **Sararanga philippinensis** Merr.

Name: Sararanga philippinensis Merr., Philip. Gov. Lab. Publ. *29* (1905) 5.

Family: *Pandanaceae.*

Taxonomy and distribution: *Sararanga* is one of the three genera of the family; amply distinct from both *Pandanus* (in fruit morphology, phyllotaxy, aerial root system) and *Freycinetia* (in habit, fruit morphology, phyllotaxy); apparently an ancient genus. There are 2 species: *S. philippinensis* Merr. of the Philippines and *S. sinuosa* Hemsl. of the Solomons and New Guinea (map 29).

Habit: Dioecious pandanoid trees finally considerably branched, often branching in di-, tri- or quadri-chotomies, up to nearly 20 m high. Proproots absent, instead the basal part of the trunk bulbous or expanded with a dense mesh of small interwoven fibrillose rootlets.

Habitat & Ecology: Riverbanks or open areas in rain-forest, sometimes in or near swamps, up to c. 400 m elevation, also on dry land, especially burned-over areas. Usually occurring as individual plants or in small groups, or sometimes in relatively pure stands in disturbed (usually burned-over) places, often accompanied by lowland forest tree species; in montane areas rather rare, scattered in rain-forest.

Dispersal: The fruits are fleshy polypyrenous berries which occur in profusion on elongate branched panicles pendent from the female trees, and are quite probably sought by birds, and perhaps distributed by them.

Sources: O. Warburg, Pfl. R. Heft *3* (1900) 25; U. Martelli in Elmer, Leafl. Philip. Bot. *3* (1911) 1110; B C. Stone, Brittonia *13* (1961) 222—224, fig. 9 (map). Herbaria: Kew, Leyden, New York, Bishop Mus., U.S. Nat. Herb.

29. **Sararanga sinuosa** Hemsl.

Name: Sararanga sinuosa Hemsl., J. Linn. Soc. Bot. *30* (1894) 216, t. 11; emend. in Stapf, ibid. *32* (1896) 488, t. 4—7.

Family: *Pandanaceae.*

Notes: Although the species is not uncommon in New Guinea and the Solomons it has so far not been collected from the Bismarcks.

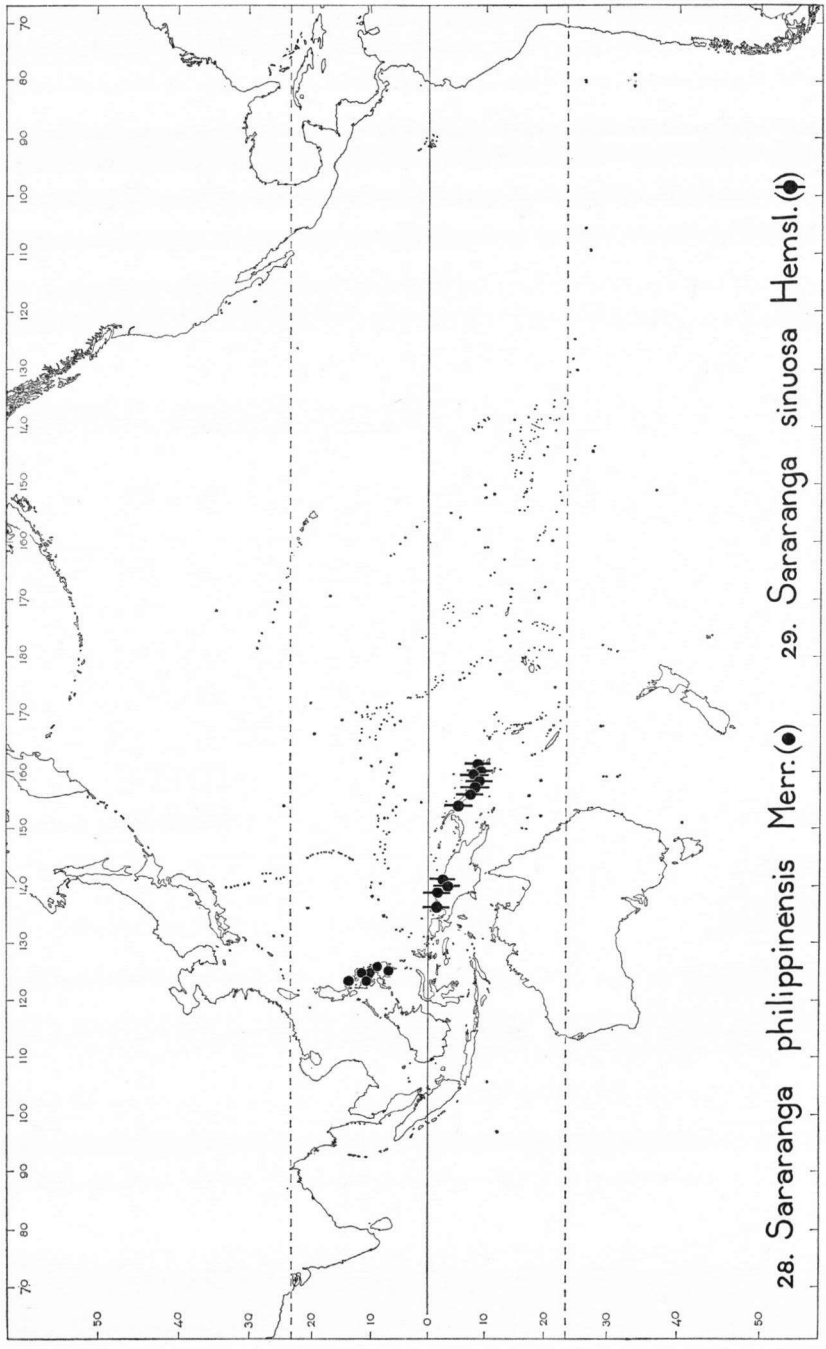
Habit: As the foregoing species.

Habitat & Ecology: As for *S. philippinensis* (map 28).

Dispersal: As for *S. philippinensis* (map 28).

Sources: B. C. Stone, Brittonia *13* (1961) 214—221, fig. 7 (map). Field observations (Solomons), and letters (J. S. Womersley, W. Vink).

B. C. Stone.


28. Sararanga philippinensis Merr.(●)
29. Sararanga sinuosa Hemsl.(●)

30. **Gelsemium** Juss.

Name: Gelsemium Jussieu, Gen. Pl. (1789) 150.

Family: *Loganiaceae.*

Taxonomy: There are three rather closely related species:
G. elegans (Gardn.) Benth. in Asia, *G. sempervirens* (L.) Pers., and *G. rankinii* Small in America.

Habit: Straggling shrubs.

Habitat: Shrubberies at low to medium altitudes.

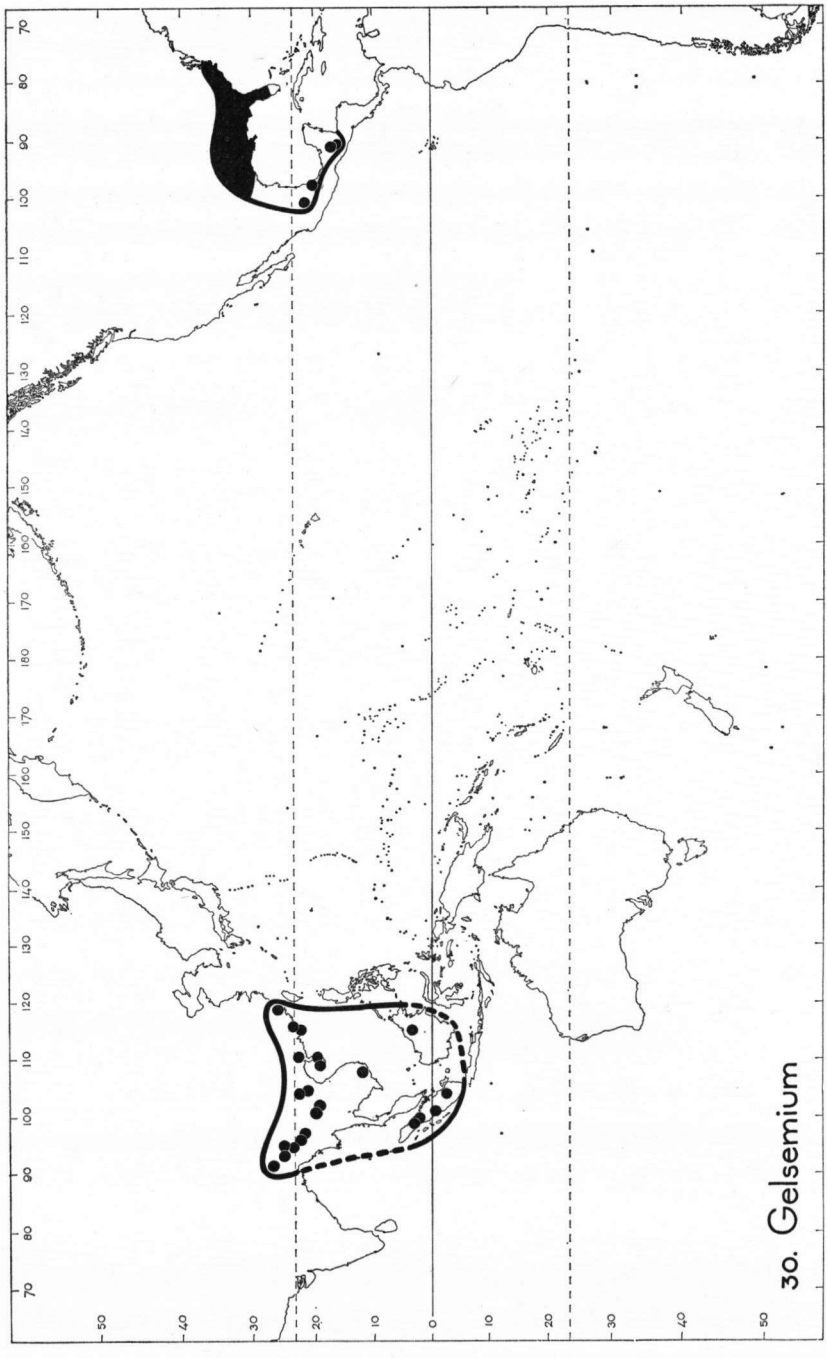
Ecology: In dry to wet forests and thickets, apparently nowhere common.

Dispersal: By the wind; the capsular fruits contain a number of small, winged seeds.

Note: The map published by Hui Lin Li in Trans. Am. Phil. Soc. n.s. *42* (1952) map 43, is incorrect in many points; as, however, this map is also not in accordance with accompanying text, apparently by mistake a wrong map has been printed.

Sources: Revisional studies of the American species by Prof. Dr. R. K. Godfrey, Florida State University, Tallahassee, Florida, U.S.A., who provided a map of the American distribution. P. W. Leenhouts, Fl. Mal. I, *6* (1962) 343.

P. W. LEENHOUTS.


30. Gelsemium

31. **Haloragis micrantha** (Thunb.) R. Br. ex Sieb. & Zucc.

Name: Haloragis micrantha (Thunb.) R. Br. ex Sieb. & Zucc., Abh. Bayer. Ak. Wiss. 4 (2) (1844) 133, repr. (1845) 25.

Family: *Haloragidaceae.*

Taxonomy: Nothwithstanding its enormous range the species is easily recognizable and well marked against other species of the genus; its characters are very constant and it has in the past not been confused with other species.

Habit: A small prostrate herb; stems rooting at the nodes, 5—30 cm long, with ascending tips.

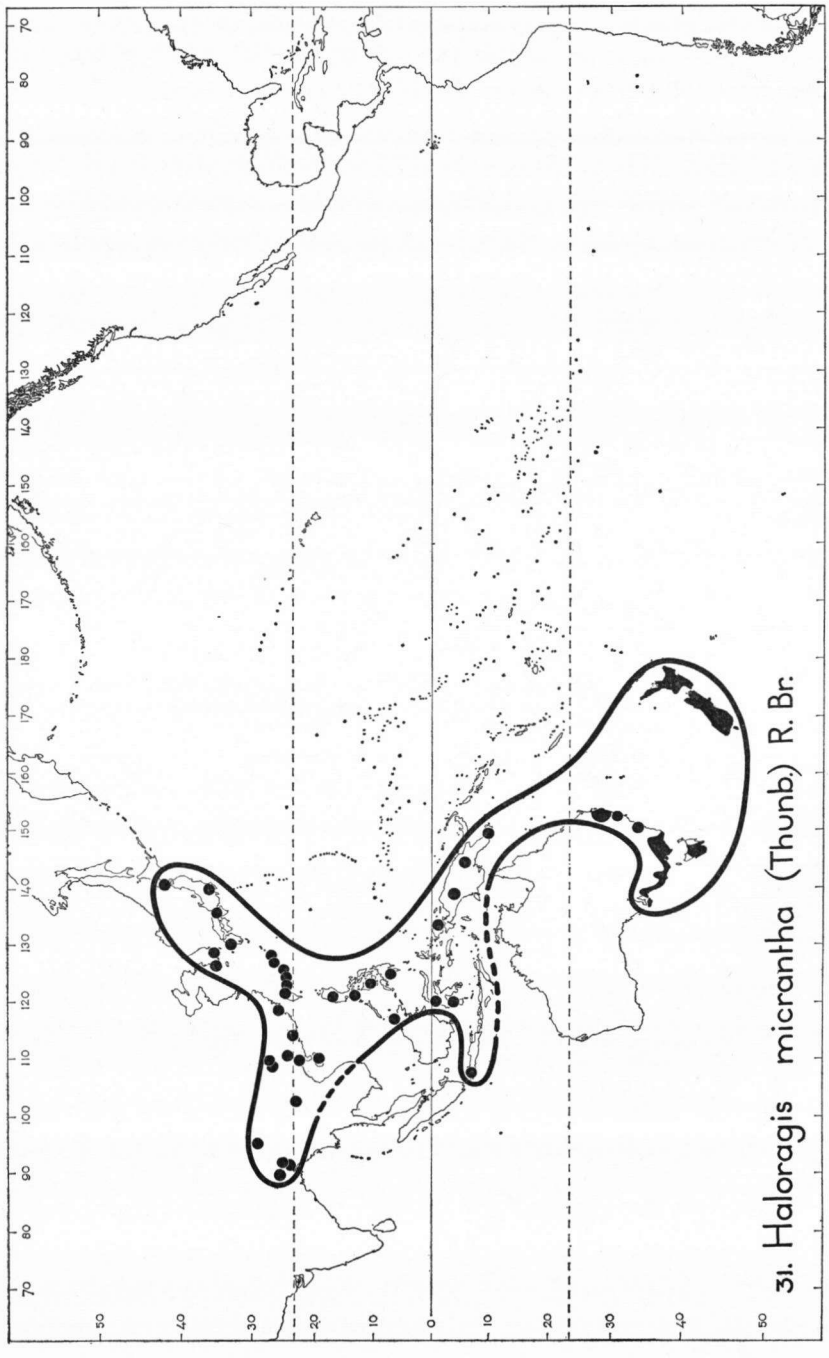
Habitat: In marshy mountain turf, moist places along mountain brooks, on wet ridges, summits, and plateaus, in the tropical zone between 1200 and 3500 m, descending to low altitudes at higher latitudes.

Ecology: Locally often very common, in sods.

Dispersal: The fruits are small, smooth, glabrous, almost globular nuts, about 1 mm diam., crowned by the minute calyx. Dispersal method unknown.

Sources: Literature and herbaria; MS of a revision. Mr. J. H. Willis, of the National Herbarium, Melbourne, is responsible for the localities in Australia and New Zealand.

N. CASPERS.


31. Haloragis micrantha (Thunb.) R. Br.

32. **Scleria polycarpa** Boeck.

Name: Scleria polycarpa Boeck., Linnaea *38* (1874) 509.

Family: *Cyperaceae.*

Synonym: *Scleria margaritifera* Willd. (1805), non Gaertn. (1788).

Taxonomy and distribution: The large genus *Scleria* is mainly distributed in the tropics. *S. polycarpa* is closely related to and often confused with *S. purpurascens* Steud. (= *S. multifoliata* Boeck.) of Western Malesia and the more widely distributed *S. scrobiculata* Nees. From both it can most easily be distinguished by the narrow inflorescence and the shape of nut and disk.

Habit: Tall, erect herb with triquetrous stems; leaves linear, 5—10 mm wide, those in the middle part of the stems in (false) whorls of 3—5; inflorescence narrow, consisting of a terminal panicle and some lateral ones, the latter subtended by leafy bracts.

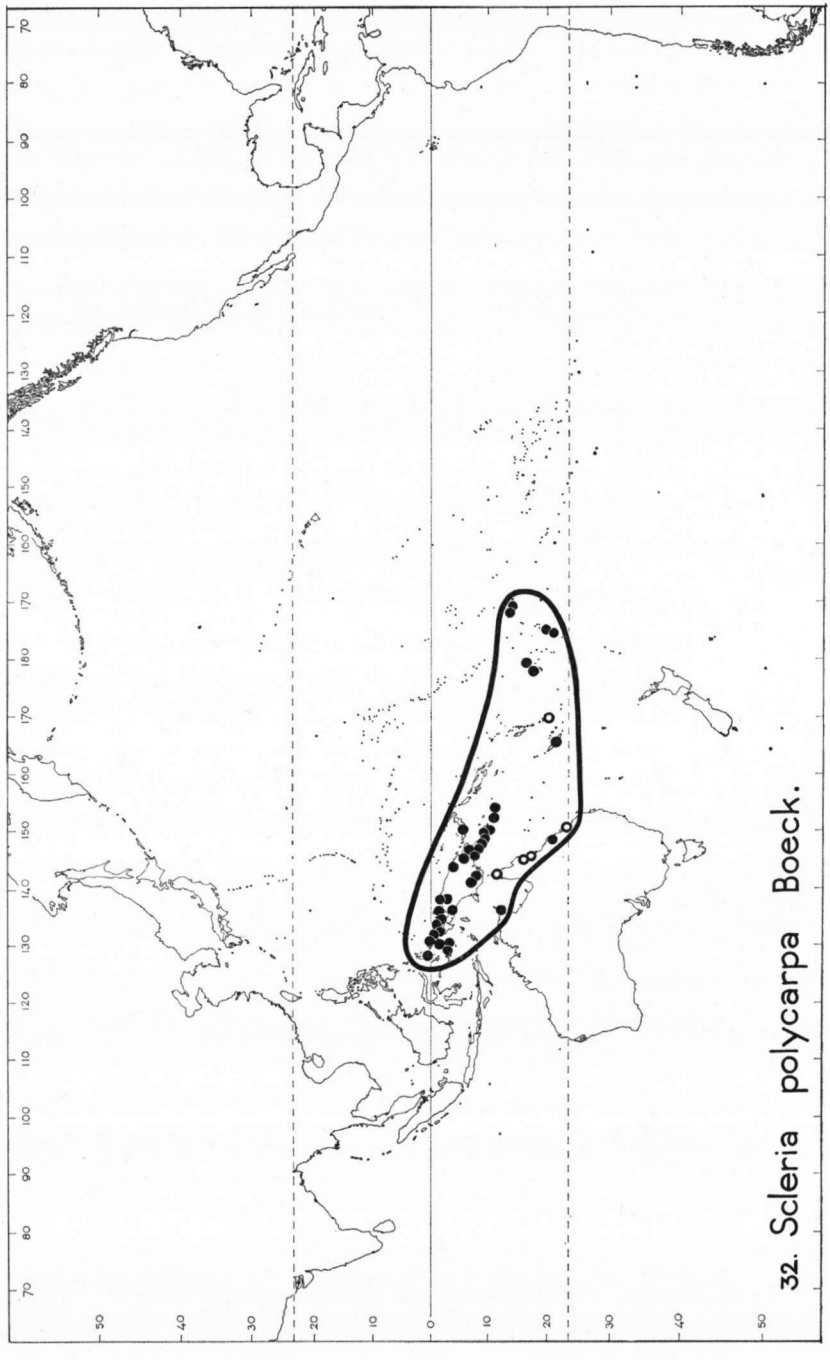
Habitat: Swampy rain-forests, shady banks of streams, also in coast-vegetation, at low altitudes, in New Guinea ascending to 1200 m.

Fruits: Globose nuts, hardly or not umbonulate, smooth or slightly rugulose, white or (frequently) more or less tinged with blue, 2—2½ mm across, inserted on a shallowly 3-lobed, bright yellow or reddish disk.

Dispersal: Little is known about the dispersal of *Scleria* nuts; they have been found in the stomach of various birds (Ridley, Dispersal of Plants (1930) 419, 491, 496).

Sources: S. T. Blake, J. Arn. Arb. *35* (1954) 230. Collections from several herbaria.

J. H. KERN.


32. Scleria polycarpa Boeck.

33. **Cynoctonum** Gmel.

Name: Cynoctonum Gmel., Syst. (1791) 443.

Family: *Loganiaceae.*

Synonym: *Mitreola* L.

Taxonomy and distribution: There are 6 species: *C. mitreola* (L.) Britt., widely dispersed throughout the American as well as the Australian and most of the Asiatic part of the area, moreover closely related to the two species described from Madagascar (*M. perrieri* Jovet and *M. turgida* Jovet); *C. sessilifolium* Gmel., restricted to the SE. part of the United States; *C. sphaerocarpum* Leenh., only known from the island of Borneo, and *C. pedicellatum* (Benth.) Rob., known from Sikkim and Central China.

Habit: Annual or perennial herbs.

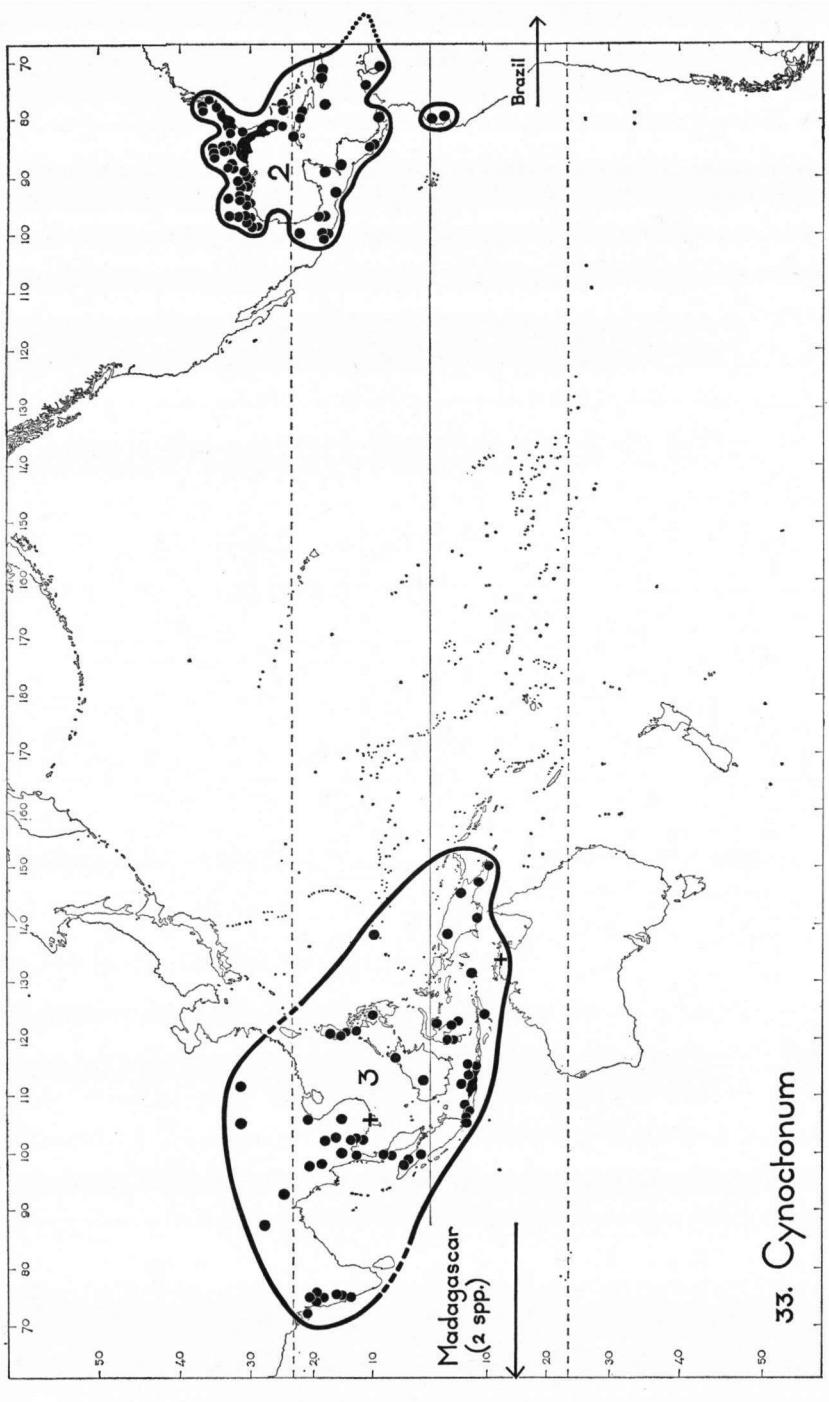
Habitat: Open lowland vegetation.

Ecology: Preferably in wet spots under seasonal conditions, on heavy clay soils or limestone.

Dispersal: Capsular fruits with small seeds, which might be dispersed by wind and water.

Sources: P. W. Leenhouts, Fl. Mal. I, *6* (1962) 375—377. The Indian localities were provided by Dr. H. Santapau (Bombay, India); Mr. L. S. Smith (Brisbane, Australia) gave information about the Australian locality; Dr. C. E. Wood and Dr. G. K. Brizicky (Arnold Arboretum) and Prof. Dr. R. K. Godfrey (Tallahassee, Florida) have provided the localities in America.

P. W. LEENHOUTS.


33. Cynochonum
Madagascar
(2 spp.)
Brazil
2
3

34. Soulamea Lamk

Name: **Soulamea** Lamk, Dict. Encycl. Méth. *1*(1783) 449.

Family: *Simaroubaceae*.

Synonym: *Amaroria* A. Gray.

Taxonomy and distribution: A genus which possesses 1 species endemic in the Seychelles (Mahé I.), 6 endemic species in New Caledonia, 1 species in Fiji, and 1 littoral species (*S. amara* Lamk) widely distributed from Borneo eastward to about 170° E.L.

Habit: Shrubs or small trees. The flower and fruit of the species are very uniform and the main specific differences lie in the leaf structure. It is remarkable that the widely distributed *S. amara* is the only species with bisexual flowers, all others have unisexual ones.

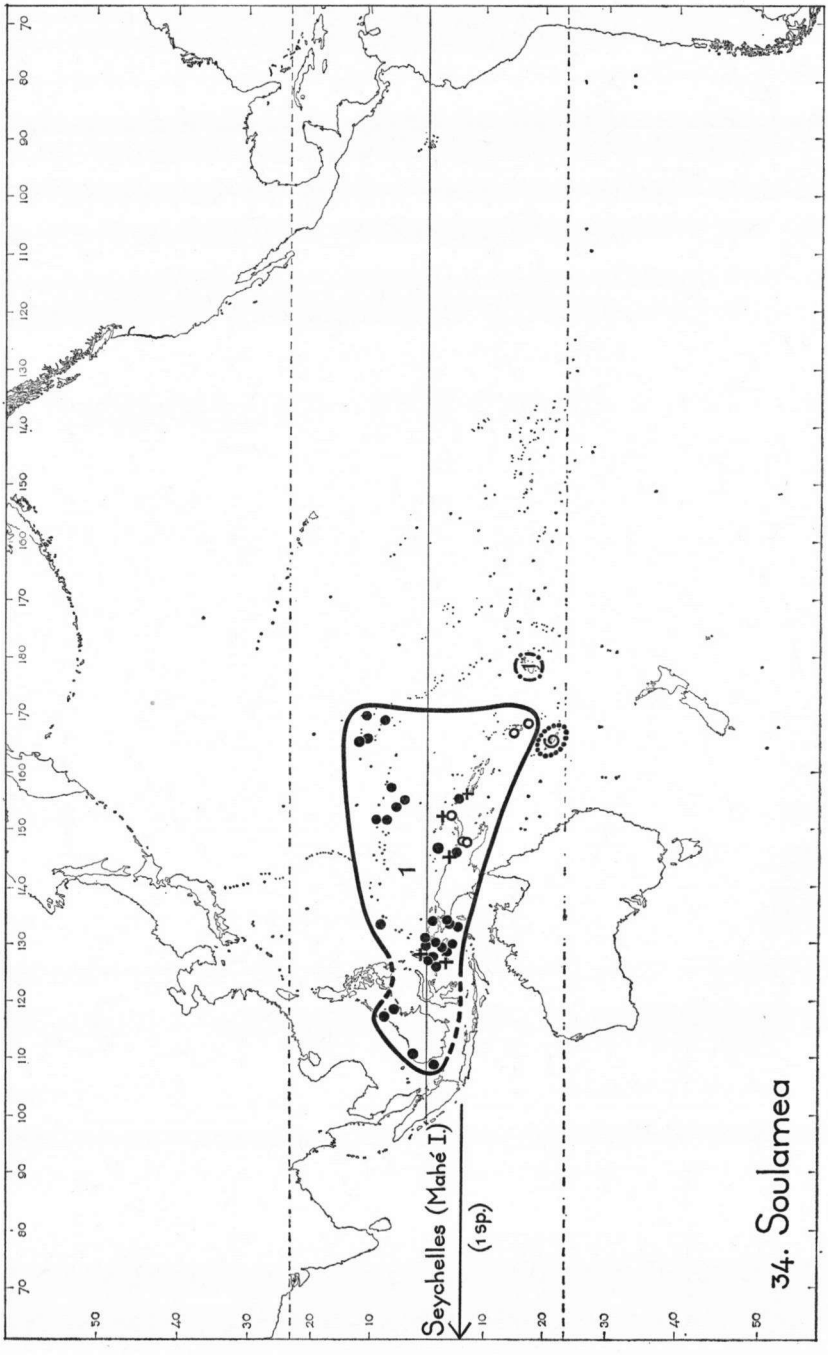
Habitat: Whereas the Seychelles, Fijian and New Caledonian species are all growing inland, *S. amara* is a typically littoral tree up to 5(—15?) m tall, and characteristic of the Barringtonia formation, exhibiting a rather closed area of distribution, there being two western outposts in Borneo, each known from a single collection only, viz in Banguey I. and Karimata I. It grows often associated with *Messerschmidia*, *Scaevola*, *Ochrosia*, etc. and is sometimes locally dominant.

Dispersal: The fruit in the genus is a dry (1—)2(—3)-celled, indehiscent, flattened, distinctly 2(—3)-winged, more or less emarginate roundish nut, c. 2—3 cm long, each cell containing one seed. The nuts certainly possess buoyancy power and seem adapted to dispersal by seawater. Hemsley recorded that seeds have been found in the crop of birds in Admiralty Is.

Notes: Observing the distribution of *S. amara* it is conspicuous that there are so few localities in Micronesia, the Solomon Is., and in Malesia west and south of the Moluccas, and its absence in the Marianas, Australia, and New Caledonia! Furthermore, it shares with *Suriana maritima* and *Pisonia grandis* an unusual preference for coral atolls and small islands and islets, which must be correlated with more or less exacting soil conditions. *Soulamea* shares with several genera the phenomenon that one (sometimes two) species of an inland genus is adapted to shore conditions and has gained an enormous distributional area reaching far beyond that of the inland species, as is the case in for example *Casuarina*, *Spinifex*, *Dodonaea*, *Tribulus*, *Vigna*, *Canavalia*, *Messerschmidia*, *Scaevola*, *Mucuna*, etc.

Source: H. P. Nooteboom, Fl. Mal. I, *6* (1962) 221—223, fig. 22 (map).

H. P. Nooteboom & C. G. G. J. van Steenis.


34. Soulamea
Seychelles (Mahé I.)
(1 sp.)
1

35. Suriana maritima L.

Name: Suriana maritima L., Sp. Pl. (1753) 284.

Family: *Simaroubaceae.*

Taxonomy and distribution: The genus *Suriana* is monotypic and is distributed through the tropics, from Mozambique through the Indian Ocean eastward in the Pacific to the Pacific west coast of America; beyond the isthmus of Panama it occurs in the Caribbean, finding its northernmost locality in the Bermudas, and eastwards to Brazil. It is absent from West Africa.

Habit: A shrub or small tree up to 3(—8?) m tall.

Habitat: A typical constituent of the Barringtonia formation and restricted to sandy and coral beaches, usually rare, but locally often very common and forming thickets, often associated with *Messerschmidia, Scaevola, Guettarda,* etc., from sea-level up to 10 m. In SE. Polynesia Brown found it a sand binder initiating the formation of small dunes; in Bikini especially common on the windward side of the islet; in the Tuamotus one of the most common littoral woody plants.

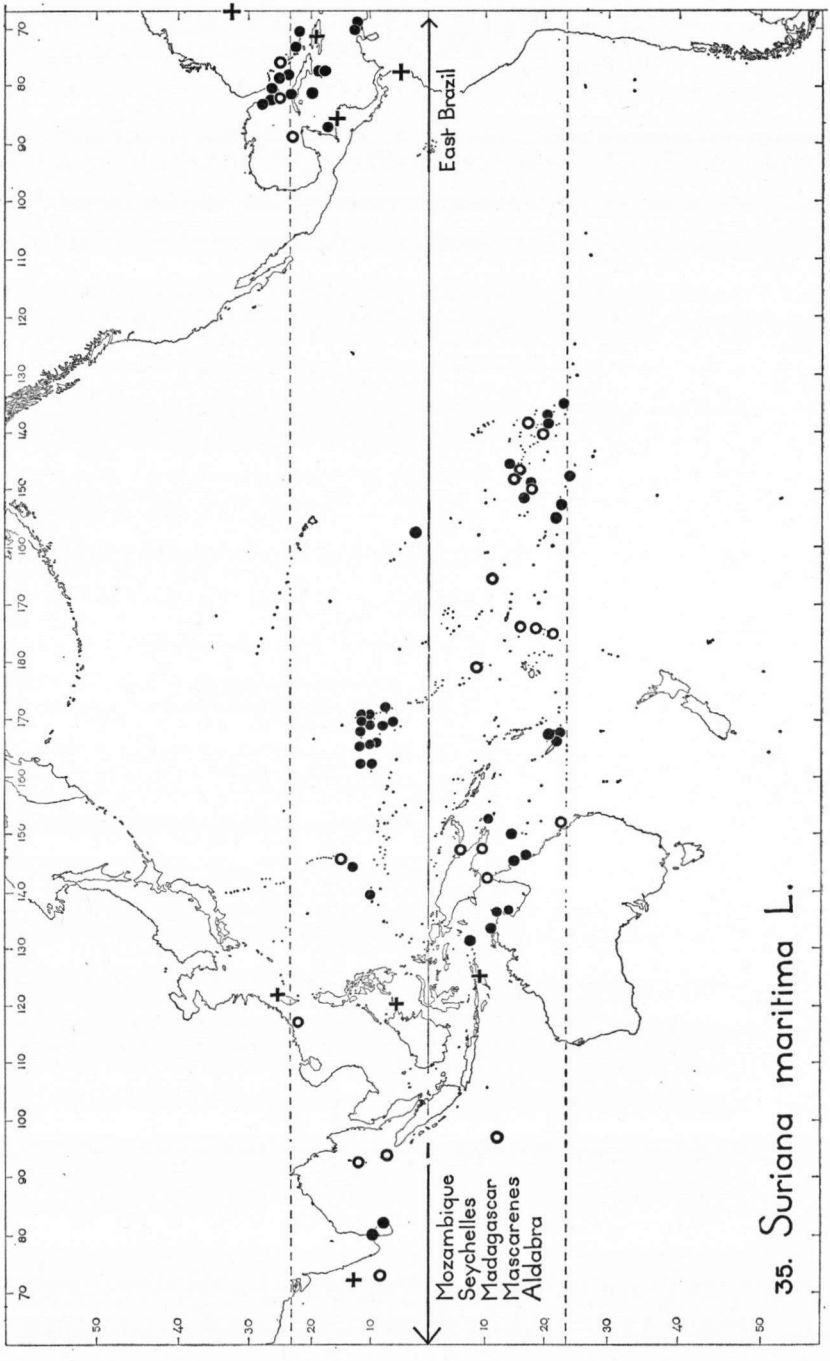
Dispersal: Fruits are slightly drupaceous, 3—5 together, enclosed by the calyx, subovoid, hairy, c. 3—4 mm long; one seed in each carpel which is finally nut-like. Schimper and Guppy have established the great buoyancy power of the nuts, up to at least 5 months, being due to an airfilled space in the nut.

Notes: Ridley (Disp. 264) dwelt at length on the remarkable distribution pattern, all localities in the Pacific (save two in Australia: Yirrkalla, Arnhem Land and Look out point, NE. Queensland) being restricted to small islands or islets, shunning the mainland of the continents; also in the Carribean confined to small islets, in Florida to the Keys. All other things being equal, it is of course clear that such peculiar distribution patterns cannot be correlated with macroclimate or the course of sea currents, but must depend on factors connected with the soil or the habitat, probably mainly the soil. Soil analysis of the beaches is, therefore, highly desirable towards a further explanation of this preference for small islets and atolls.

Mr. L. S. Smith (in litt.) suggested provisionally that *Suriana* and other littoral plants (*Messerschmidia, Soulamea*) sharing this distaste for continental shores might prefer highly calcareous beaches and coral shores which, of course, are much more prevalent on islands than on the mainland where rivers silt the coral by outflow of freshwater and sediments.

Sources: Mr L. S. Smith verified the Australian localities; H. P. Nooteboom, Fl. Mal. I, *6* (1962) 196—198, fig. 2 (map).

H. P. Nooteboom & C. G. G. J. van Steenis.


East Brazil
Mozambique
Seychelles
Madagascar
Mascarenes
Aldabra
35. Suriana maritima L.

36. **Spathiphyllum** Schott

Name: Spathiphyllum Schott, Melet. Bot. (1832) 22.

Family: *Araceae.*

Taxonomy and distribution: According to the recent monograph by Bunting the genus is composed of 36 species, all in the tropics between 15° N and 15° S, to wit: 34 species on the American mainland in Central and tropical South America, 1 in Cocos I., situated c. 450 km off the coast of Costa Rica halfway the Galapagos Is. (*Sp. laeve* Engl.), and 1 in East Malesia (Celebes, Philippines, Moluccas) and Micronesia (Palau) (*Sp. commutatum* Schott). Both disjunct species are closely allied to *Sp. cannaefolium* (Dryand.) Schott, which is widely distributed and common in South America. Together these three species form the sect. *Massowia* (K. Koch) Engl., the other three sections being truly American. According to Bunting sect. *Massowia* appears to represent a phylogenetic offshoot of great age and is monophyletic. Recently Mr. D. Nicolson (Smithsonian Inst. Washington D.C.) found species of *Spathiphyllum* in East New Guinea, and cultivated specimens at Lae (Papua, New Guinea) which had come from New Britain and Bougainville. According to him the specimens seen comprise at least two species. These finds extend the distribution of *Spathiphyllum* eastward to western Melanesia. There is, however, a considerable gap between the two partial areas, which is filled by the related *Holochlamys* (see map 37). Together these two genera constitute the tribe *Spathiphylleae* within the subfamily *Monsteroideae.*

Habit: Terrestrial, stemless herbs, 20—120 cm tall, the many leaves arising from an abbreviated rhizome, rooted on the lower side.

Ecology: Obviously a true rain-forest constituent, many species preferring moist places, swamps, and river valleys, and other damp, shaded or half-shaded places. Obviously most localities are in the lowland or low hills, the *Sp. commutatum* being noted to ascend to c. 1000 m altitude.

Dispersal: The peduncled spadix bears small berries which contain a few to many seeds.

Notes: The trans-Pacific distribution is very strikingly disjunct. In the *Araceae* a counterpart is found in the genus *Schismatoglottis* with 75 species confined to tropical Malesia (a few species extending to continental SE. Asia) and of which two species have been found in tropical S. America which, however, in contrast to the affinity in *Spathiphyllum*, are assumed to form a separate infrageneric taxon (sect. *Philonotion*); cf. Bunting, Ann. Mo. Bot. Gard. *47* (1960) 69—71. A similar case is that of the Indo-Malesian genus *Homalomena* with c. 60 species in the W. Pacific and 6 in the tropical Andes which form a separate section.

Sources: G. S. Bunting, A revision of Spathiphyllum. Mem. N.Y. Bot. Gard. 10, *3* (1960) 1—54, 3 fig., and the collections of the Rijksherbarium, Leyden.

C. G. G. J. VAN STEENIS.

37. **Holochlamys** Engl.

Name: Holochlamys Engler, Malesia *1* (1882) 265.

Family: *Araceae.*

Notes: A genus of two species confined to New Guinea and adjacent islands, closely allied to 36. *Spathiphyllum.* The area of the genus is situated between the disjunct areas of *Spathiphyllum* in Malesia (see notes of map 36).

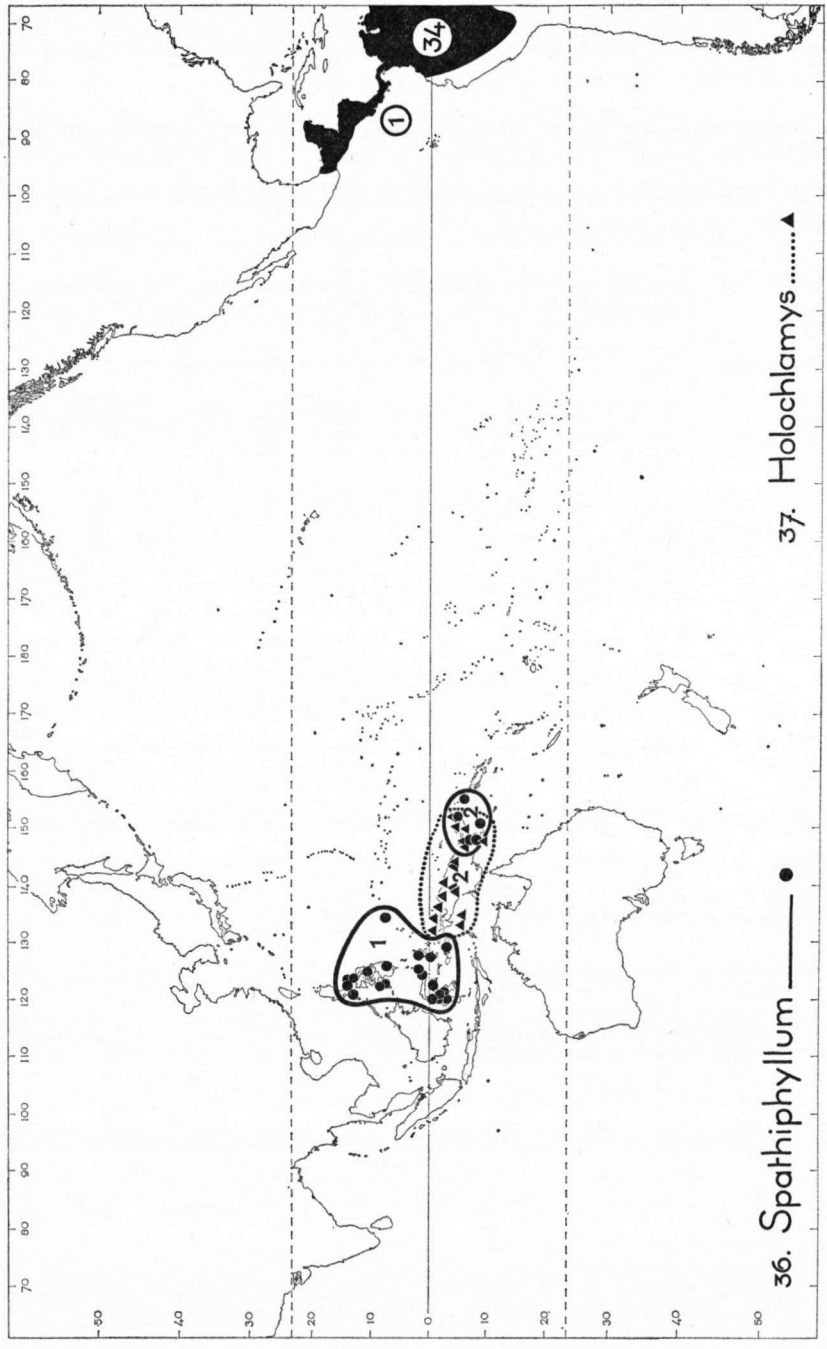
Habit: Short-stemmed herbs with erect, lanceolate leaves c. 1 m long.

Habitat & Ecology: Along rivers and other very humid places in dense lowland rain-forest.

Dispersal: Similar as in *Spathiphyllum.*

Sources: A. Engler & K. Krause, Nova Guinea *8* (1912) 806; Bot. Jahrb. *49* (1912) 96; ibid. *54* (1916) 83; collections in the Rijksherbarium Leyden. Mr. D. Nicolson has kindly supplied unpublished data on *Spathiphyllum* and *Holochlamys* in New Guinea, the Bismarcks and the Solomons.

M. M. J. VAN BALGOOY.


34
1
1
2
2
36. Spathiphyllum
37. Holochlamys

38. **Neuburgia** Bl.

Name: Neuburgia Blume, Mus. Bot. *1* (1850) 156.

Family: *Loganiaceae.*

Synonyms: *Couthovia* A. Gray; *Crateriphytum* Koorders.

Taxonomy and distribution: There are 10—12 species; New Guinea with 6 species is the main centre; one of these species extends to the west as far as Celebes and the Philippines and to the north to the Carolines (*N. celebica* (Koord.) Leenh.), and its localities are indicated by squares; one species is exclusively Moluccan (*N.moluccana* (Boerl.) Leenh.); *N. corynocarpa* (A. Gray) Leenh. is distributed from the Aru Is W of New Guinea to the Fiji Is. In the Fiji Is there is probably at least one more species, related to *N. corynocarpa*; other related species are known from New Caledonia and the New Hebrides (Aneityum) (1 species each). *Couthovia toua* Kaneh. from the Palau Is may also be a separate species; its relationship is with *N. celebica.*

Habit: Shrubs or (mostly small) trees.

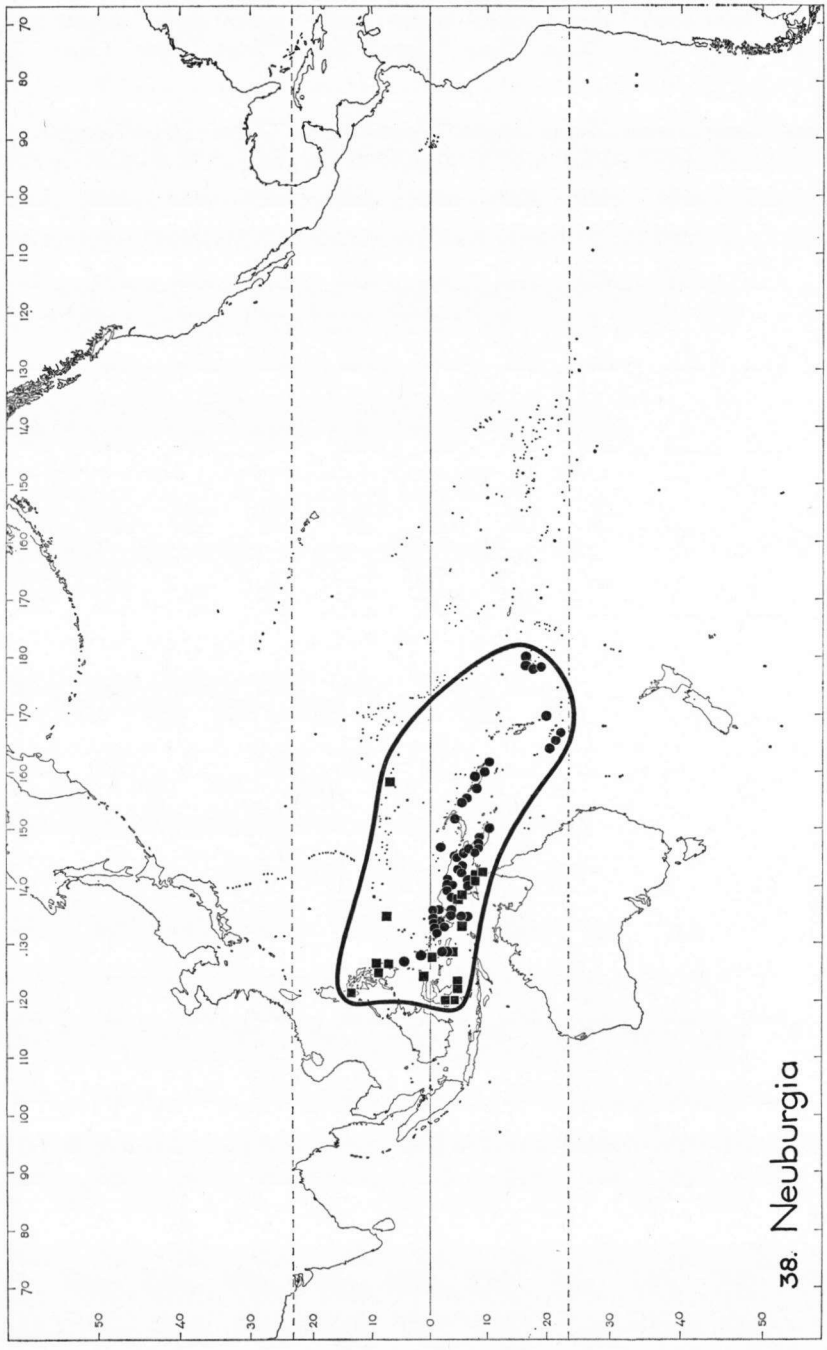
Habitat: Undergrowth and substage of primary, rarely secondary forests, along river-banks, sometimes in more open country, often on marshy or temporarily flooded localities; from the lowland up to c. 2000 m.

Ecology: Apparently preferably in marshy localities; usually scattered and often scarce.

Dispersal: The fibrous, corky drupes are probably as well dispersed by pigeons (as is reported) as by fresh water. Already Rumphius recorded the kernels as a regular constituent of the sea drift on the beaches of Ceram, in the Moluccas; presumably these have been carried by the rivers to the sea but are of no consequence to seaborne dispersal as the species have never been located in the proper beach forest.

Source: P. W. Leenhouts, Fl. Mal. I, *6* (1962) 363—369.

P. W. Leenhouts.


38. Neuburgia

39. **Geniostoma** Forst.

Name: Geniostoma Forst., Char. Gen. Pl. (1776) 12, t. 12.

Family: *Loganiaceae.*

Taxonomy and Distribution: At least about 20 spp., probably not more than c. 30; 2 in the Mascarenes, 1 in Japan, 4 in Malesia (among which 3 Papuan endemics), one of which also in the Marianas, locally in E. Queensland, and in the Pacific at least as far as Samoa (some other species from the Solomon Is, Fiji, Samoa, Niue I., Tahiti, Rapa, and Henderson I. are at least closely related), 1 species in Lord Howe I., 1 in New Zealand, and about a dozen in New Caledonia and neighbouring islands. The New Caledonian group of species shows the greatest diversity, all other species are more or less closely related to *Geniostoma rupestre* Forst., which is itself the most widespread species of the genus. Smith & Stone (1962), who revised the genus for the New Hebrides, Fiji, Samoa and Tonga, recognise 16 species, applying very narrow species limits.

Habit: Shrubs or small trees.

Habitat: Forests and more open places.

Ecology: As well in the rain-forest as in more open and sunny places, under everwet climatic conditions, from the lowlands to the mountains (up to c. 2800 m); most localities on hills or mountains.

Dispersal: Capsular fruits with seeds which are embedded in an orange-red pulp; the valves are caducous and the showy seedmass is exposed when the fruits are mature; dispersal thus probably by birds.

Sources: P. W. Leenhouts, Fl. Mal. I, *6* (1962) 369—373; A. C. Smith & B. C. Stone, Contr. U.S. Nat. Herb. *37* (1962) 1—41. Other Pacific localities are based upon herbarium specimens and literature.

40. **Labordia** Gaud.

Name: Labordia Gaud., in Freyc. Voy. Bot. (1829) 449, t. 60.

Family: *Loganiaceae.*

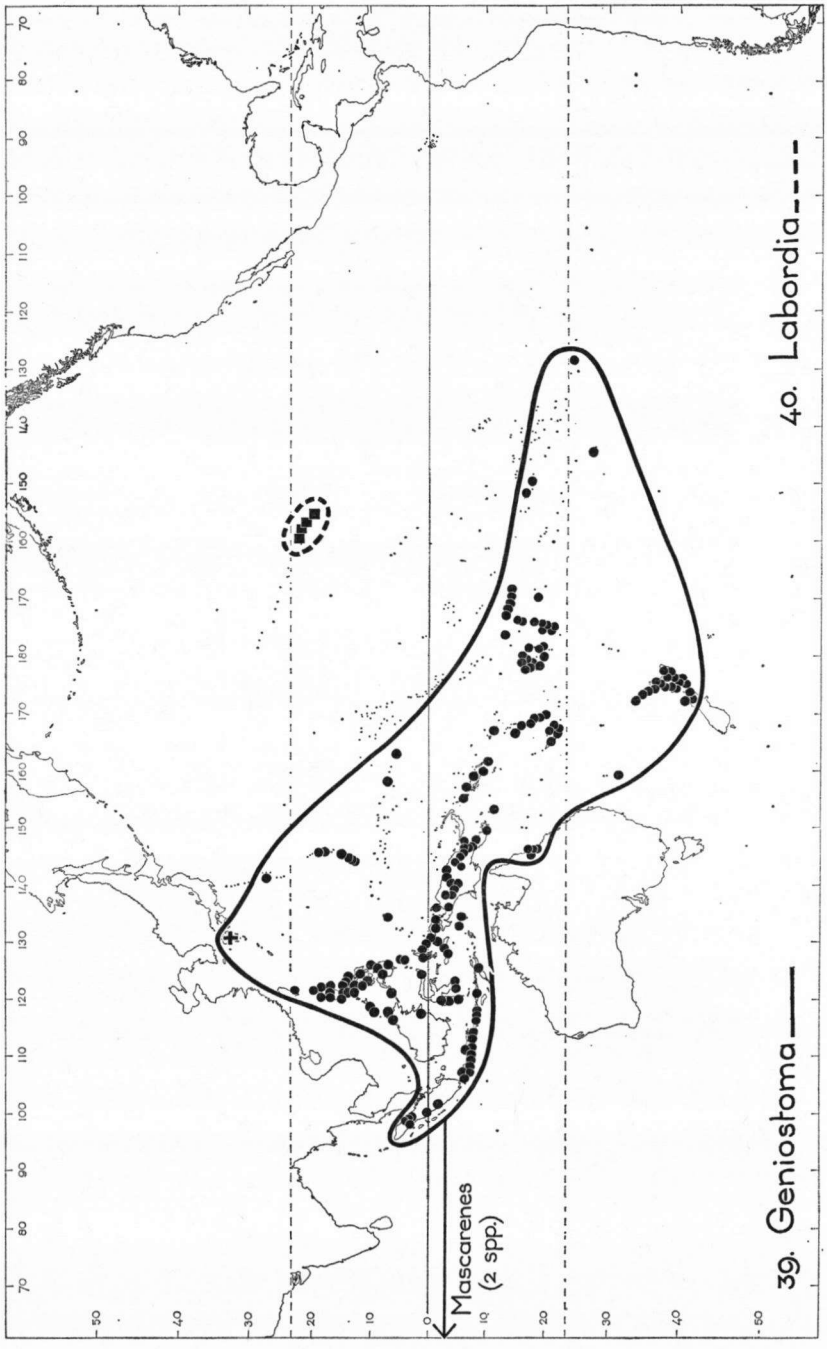
Taxonomy: Endemic in the Hawaiian Is, represented by 6—9 species, according to Hillebrand (1888), 23 according to Sherff (1939); present in all larger islands. This genus is the only close relative to *Geniostoma* and its area should be considered in conjunction.

Habit, Habitat & Ecology: As *Geniostoma* Forst.

Dispersal: Similar as in *Geniostoma*, according to Hillebrand, the marcescent valves caducous when fruits are quite ripe.

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 288—293; E. E. Sherff, Field Mus. Nat. Hist. Bot. Ser. *17* (1939) 445—546.

P. W. Leenhouts.


39. Geniostoma
40. Labordia
Mascarenes
(2 spp.)

41. **Coprosma** Forst.

Name: Coprosma Forst., Char. Gen. Pl. (1776) 137.

Family: *Rubiaceae.*

Taxonomy: A large genus of about 90 species, divided into 7 sections. A centre of species development is found in the New Zealand region and a secondary one in the Hawaiian Islands. It is most remarkable that no species has as yet been described from New Caledonia. Hybridization between species has frequently been noted in New Zealand.

According to Oliver closely related to the small, herbaceous genus *Nertera*, which has a similar but wider range.

Habit: Small prostrate or scrambling shrubs or small trees up to c. 8 m high.

Habitat: In the tropics on the hills or mountains; in Malesia not found below 2500 m but in a number of Pacific islands, sometimes only at a few hundreds of meters above sea-level; in temperate regions descending to sea-level.

The species occupy a large variety of habitats: exposed rocks and lava flows, sand dunes and dry shingle beds of rivers, bogs, scrub; some belong to the undergrowth of rain-forests.

Ecology: Species of *Coprosma* are sometimes important constituents of the vegetation in New Zealand, the Subantarctic and Hawaiian Islands. Some species growing in bogs or exposed rocks form dense mattings; these are often small-leaved and of ericaceous habit. Other tree-like species are found in rain-forests and thickets; these are often large-leaved. But small-leaved forms are sometimes also found in the forest.

The majority of species are dioecious, the flowers are mostly small and greenish. The filaments are long and the anthers pendulous in most cases, the styles usually long and filiform. Pollination is obviously mostly by wind.

Dispersal: The fruits are fleshy, mostly red, sometimes blue or black drupes, usually with two planoconvex pyrenes. They are eaten by various species of birds and the seeds germinate after passing their alimentary canal.

Note: Numerals above the hyphens indicate the number of sections, below the hyphen the number of species represented in each partial area or island group.

Sources: W. R. B. Oliver, B. P. Bish. Mus. Bull. *132* (1935); Rec. Dom. Mus. *1* (1942) 44—47; F. R. Fosberg, Occ. Pap. B. P. Bish. Mus. *13* (1937) 245—293; Brittonia *8* (1956) 178; J. W. Moore, Occ. Pap. B. P. Bish. Mus. *16* (1940) 19; collections in the Rijksherbarium, Leyden.

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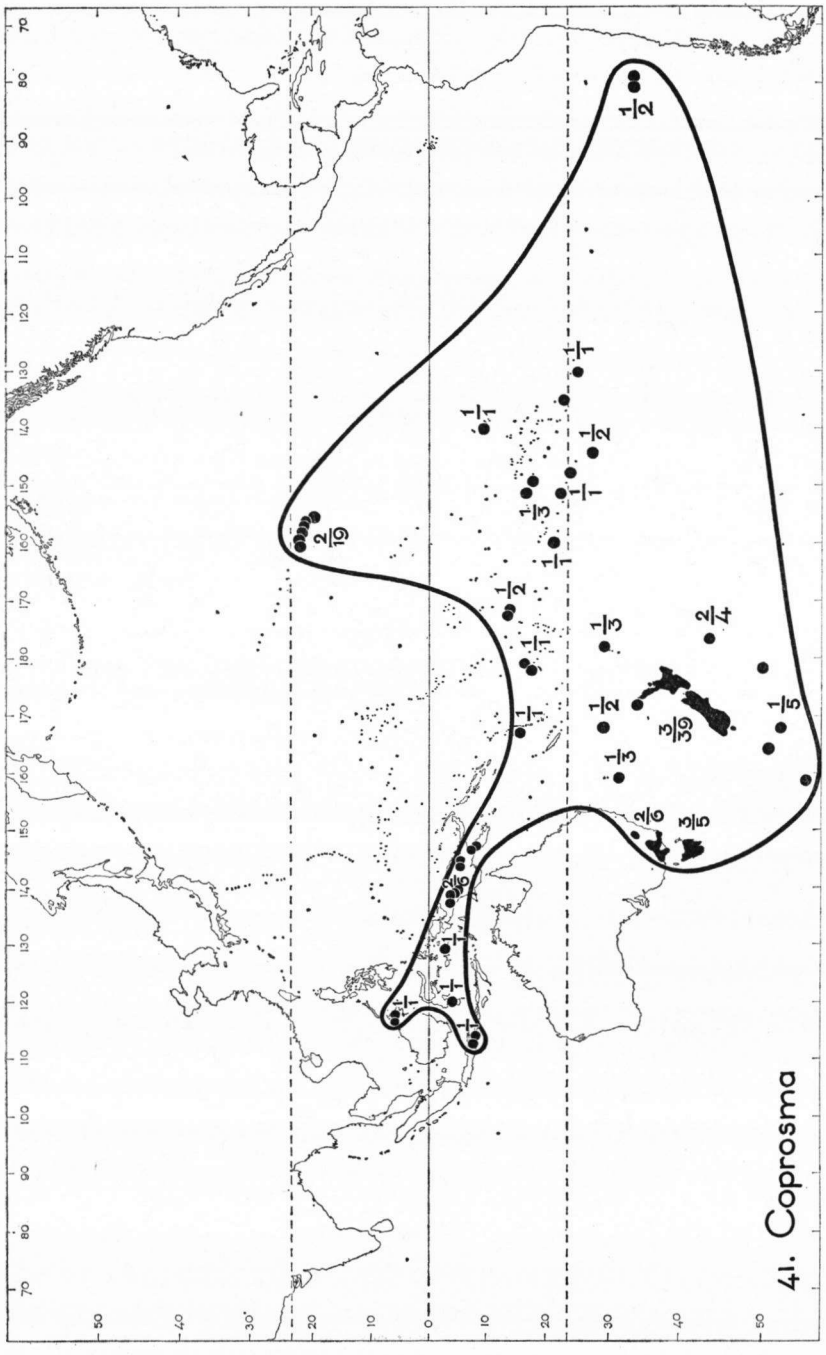
41. Coprosma

42. Nicotiana L.

Name: **Nicotiana** L., Gen. Pl. *84* (1754).

Family: *Solanaceae.*

Taxonomy and distribution: A genus comprising nearly 70 species, allied to *Cestrum* and *Petunia* both of which are confined to the New World.

Of the three subgenera of *Nicotiana* 2 are exclusively American. The third is also represented in Australia and some Pacific islands; all these species belong to one section.

Habit: Very small herbaceous annuals to tall soft-woody perennials.

Habitat: Semi-deserts, dry open country, screes, riverbanks or grassland. Many species increase considerably in number in disturbed areas (landslides, etc.). They shun the shaded forest.

Ecology: Well-drained soil and strong illumination appear to be essential to all species.

The majority of the species are confined to semi-arid stations under subtropical and temperate conditions, from sea-level up to 4000 m and more, only a few impinging on the edge of the tropics.

Dispersal: The fruit is a dehiscent capsule, containing a great number of small to minute seeds. These are globose, reniform or angular, as a rule provided with a rough reticulate seed-coat. According to Goodspeed the seeds of many species are disseminated epizoically.

Sources: T. H. Goodspeed, H. M. Wheeler & P. C. Hutchinson, The genus *Nicotiana* (1954); N. T. Burbidge, The Australian species of *Nicotiana.* Austr. J. Bot. *8* (1960) 342—381.

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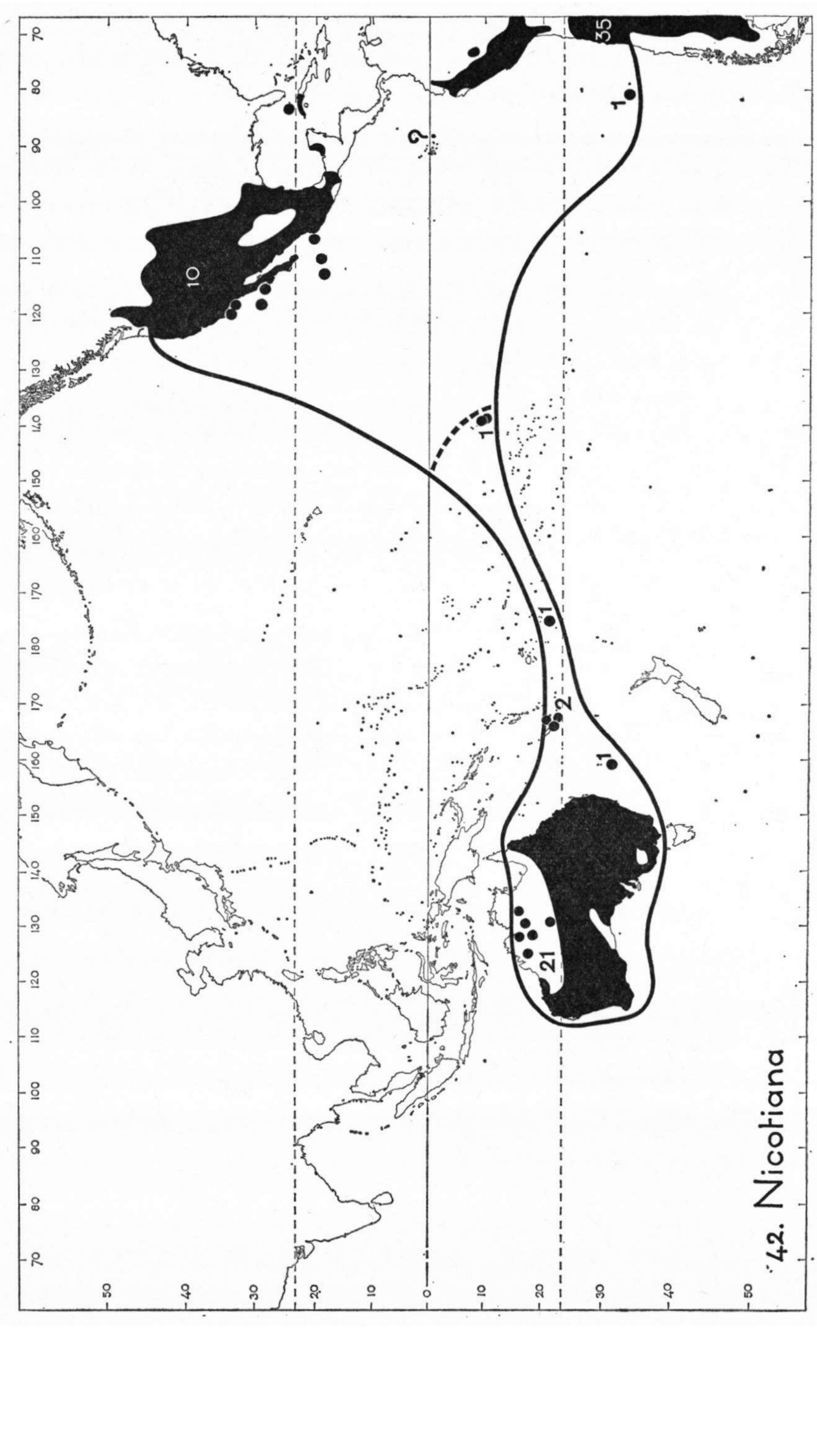

42. Nicotiana

43. **Dracophyllum** Labill.

Name: Dracophyllum Labill., Rel. Voy. Rech. Pér. (1799) 210.

Family: *Epacridaceae.*

Taxonomy: A genus of 49 species, divided into 3 subgenera. Subg. *Dracophyllum* covers the generic area except the subantarctic islands, subg. *Oreothamnus* has 27 species in New Zealand and some subantarctic islands and 1 in Tasmania, and subg. *Cordophyllum*, with 1 species, is confined to New Caledonia.

Dracophyllum is allied to the Australian genera *Richea* and *Sphenotoma.*

The majority of the species are peculiar to one island. Hybridization frequently occurs.

Habit: Ranging from small cushion-like plants to trees nearly 15 m high similar in habit to *Dracaena* or *Pandanus.*

Habitat: In scrub or swamps, some in the forest. Most species are confined to montane or subalpine stations in highlands.

Ecology: All species are found under temperate to subtropical climatic conditions. In New Zealand they form part of the scrub vegetation above the forest belt. Some are constituents of the rain-forest. In some of the subantarctic islands *Dracophyllum* is one of the most important constituents of the vegetation. The flowers are bisexual; no particulars are known to me about pollination which is probably by insects.

Dispersal: The fruit is a dry dehiscent capsule with numerous, very small seeds.

Sources: W. R. B. Oliver, A revision of the genus *Dracophyllum.* Trans. New Zeal. Inst. *59* (1929) 678—714; ditto, A revision of the genus *Dracophyllum.* Supplement. Ibid. *80* (1952) 1—17; H. H. Allan, Fl. New Zeal. *1* (1961) 521—539.

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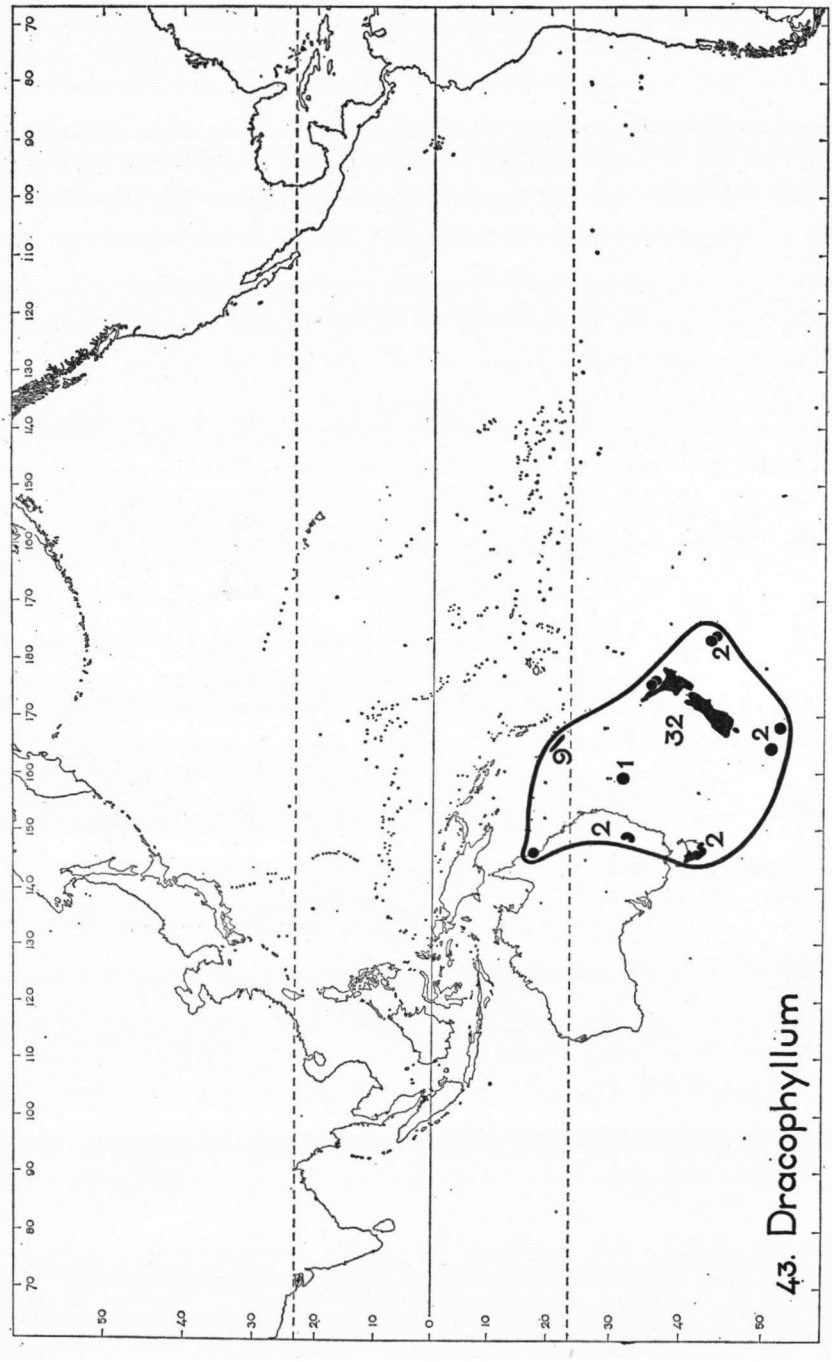
43. Dracophyllum
32
9
2
1
2
2
2
2

44. **Alphitonia** Reissek ex Endl.

Name: Alphitonia Reissek ex Endl., Gen. Pl. (1840) 1098.

Family: *Rhamnaceae*.

Taxonomy: A genus of c. 15 species, the delimitation of which is, according to Braid who revised the genus, not always easy. Sect. *Alphitonia* (*Tomentosae*) occupies the entire generic area, sect. *Glabratae* is confined to New Caledonia. Australia and New Caledonia each possess 5 species, Fiji has 3. *A. philippinensis* Braid has been recorded from Hainan by Hayata (1915) and by Merrill (1927, 1928); according to Merrill (1928) it has also been collected in Indo-China, near Tourane, by Mrs. Clemens. Recently the genus was reported from Sumatra by Hoogland (1960), but according to van Steenis this rests on erroneous identification (1961).

Habit: Trees or shrubs.

Habitat & Ecology: *Alphitonias* are eastwards of the Philippines and Moluccas a common constituent of the lowland rain-forest, secondary vegetation, coastal shrubs, and riverine forest. In the tall rain-forest they occupy a marginal position. In New Guinea ascending to 2500 m altitude.

Dispersal: The fruits are drupes which are produced in profusion on the terminal panicles; the exocarp becomes brittle at maturity and easily withers away. The hard endocarp forms 3, sometimes 2, cocci which dehisce lengthwise, each exposing a hard seed which is enveloped in a dark-red shining aril. Sometimes the seeds are still attached while pericarp and endocarp have decayed and fallen.

Sources: H. B. Guppy, Observations of a Naturalist in the Pacific (1906); Hayata, Ic. Pl. Form. *5* (1915) 28; Braid, Kew Bull. (1925) 168—186 (revision); Merrill, Lingn. Sc. Journ. *5* (1927) 120; ibid. *6* (1928) 282; Kanehira, En. Micr. Pl. (1935) 361; Suessenguth, in E. & P. Pfl. Fam. ed. 2, *20d* (1953) 91—95; Hoogland, Kew Bull. *14* (1960) 33; van Steenis, Blumea *11* (1961) 137.

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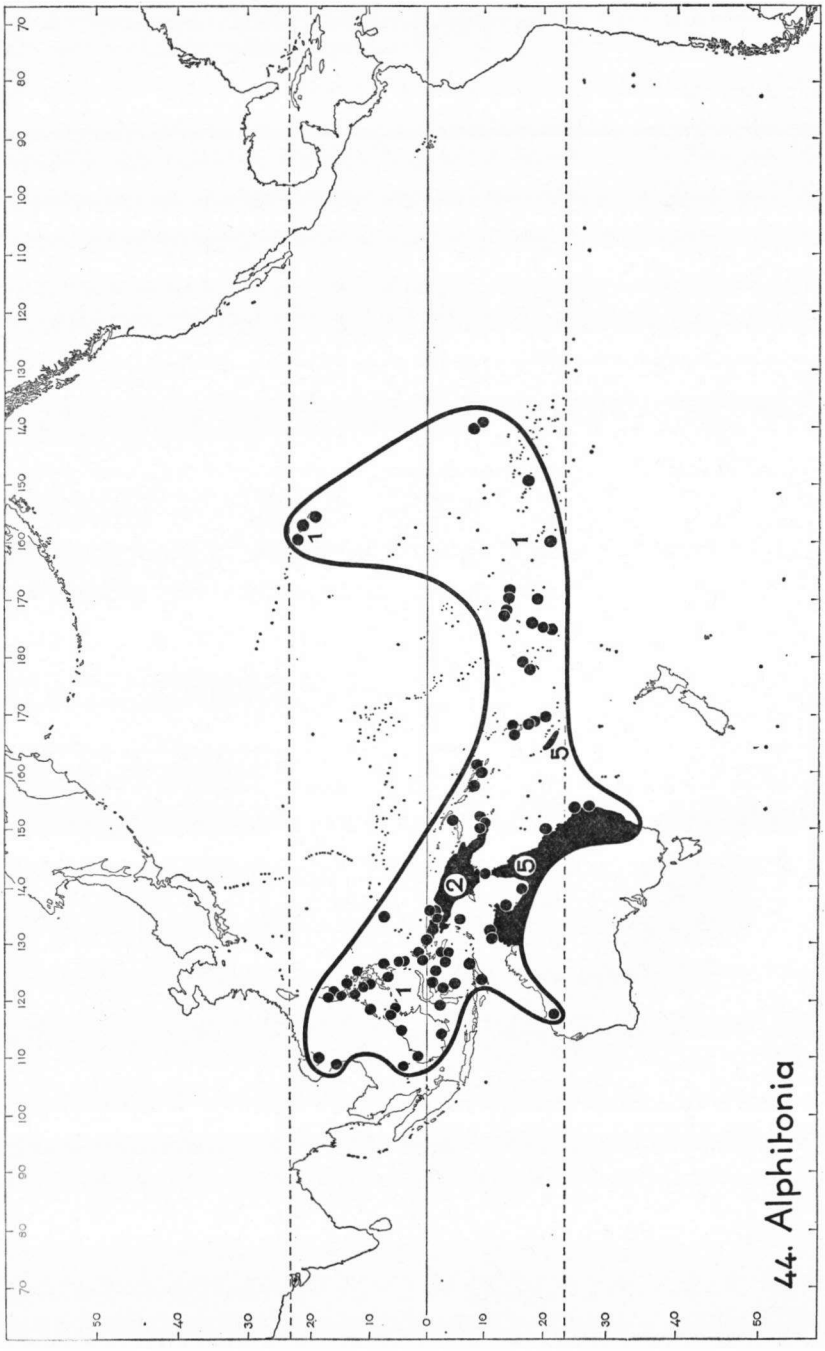
44. Alphitonia

45. **Argophyllum** Forst.

Name: Argophyllum Forst., Char. Gen. Pl. (1776) 29.

Family: *Escalloniaceae.*

Taxonomy: About 10 species, 7 in New Caledonia and 3 in Queensland. Considered by Engler to belong to the same tribe as *Corokia* A. Cunn. (treated below) and *Carpodetus* Forst. (New Zealand, New Guinea).

Habit: Shrubs or small trees. Flowers in panicles.

Habitat & Ecology: In forest at medium altitudes. In New Caledonia found from 20—1650 m. In Queensland principally in the highlands.

Fruit: The fruit is a small, 2—5-celled, loculicidal or septicidal capsule. The seeds are minute, globular, with a reticulate seed-coat.

Sources: F. M. Bailey, Fl. Queensl. *2* (1905) 532—533; A. Engler, Pfl. Fam. *18a* (1930) 214; C. T. White, Contr. Arn. Arb. *4* (1933) 37—38. Collections in the Rijksherbarium Leyden. Dr. R. H. Anderson (Sydney) and Messrs. S. L. Everist and L. S. Smith (Brisbane) have supplied the information on *Argophyllum* in Australia.

46. **Corokia** A. Cunn.

Name: Corokia A. Cunn., Ann. Mag. Nat. Hist. *3* (1839) 249.

Synonyms: *Colmeyroa* F. v. M.; *Lautea* F. Brown.

Family: *Escalloniaceae.*

Taxonomy: A small genus of 6 species, 2 in New Zealand and 1 in, respectively, New South Wales, Lord Howe I., Chatham I., and Rapa. Formerly sometimes classified with the *Cornaceae.* Allied to *Argophyllum*, a small genus confined to New Caledonia and East Australia.

Habit: Shrubs or small trees up to 6 m.

Habitat: Lowland and open forest shrubland and forest edges.

Ecology: In New Zealand a common component of coastal and lowland forest, sometimes associated with *Leptospermum.* In New South Wales at an altitude of some 700 m, together with *Ceratopetalum apetalum.*

Dispersal: The fruit is a drupe, c. ½—1½ cm diam., mostly red, sometimes yellow or blackish.

Sources: F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 213—214; L. S. Smith, Proc. R. Soc. Queensl. *69* (1957) 53—55; Allan, Fl. New Zeal. *1* (1961) 440—442.

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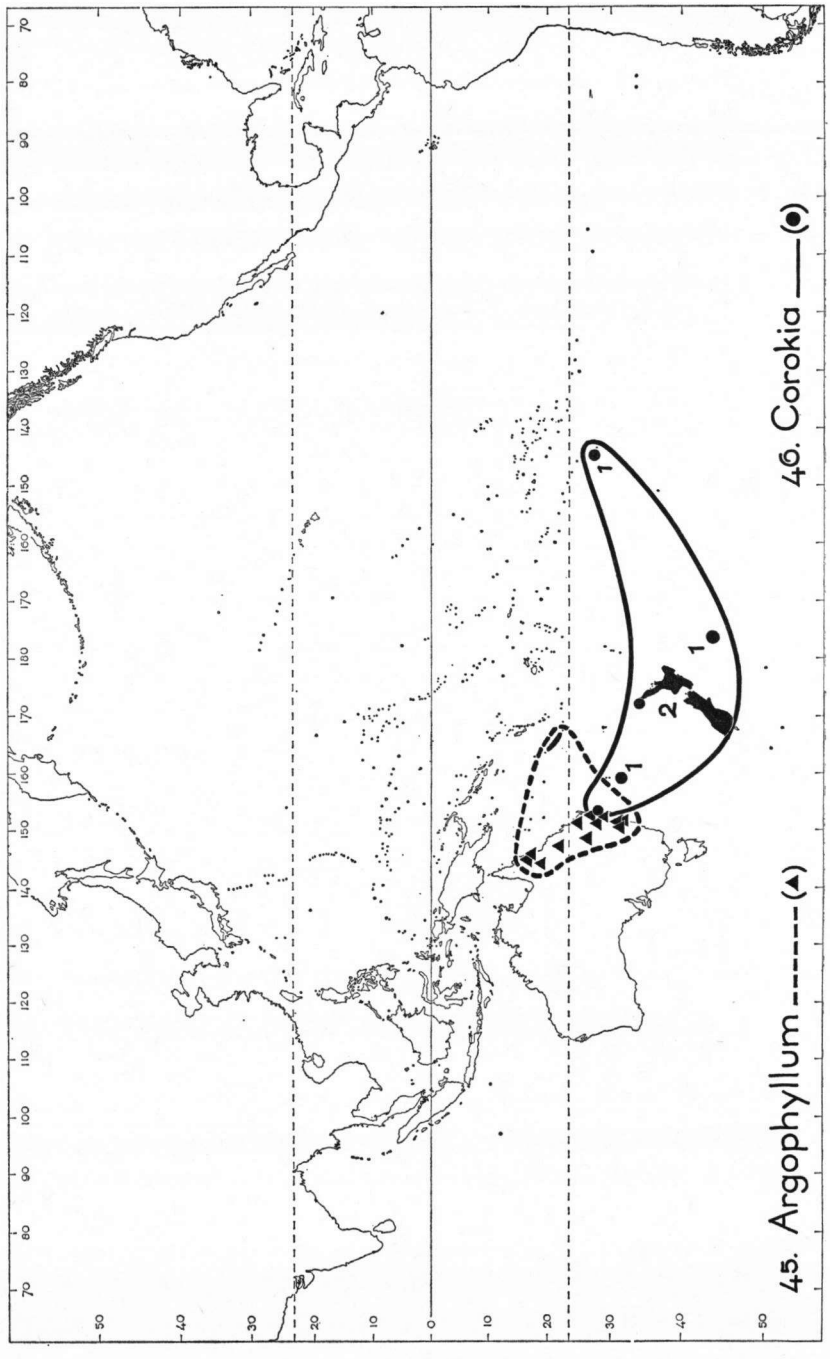
45. Argophyllum ------ (▲)
46. Corokia —— (●)
1
2
1
1
1

47. **Astelia** Banks & Sol. ex R. Br.

Name: Astelia Banks & Sol. ex R. Br., Prod. Fl. Nov. Holl. (1810) 291, nom. gen. cons.

Family: *Liliaceae.*

Synonym: *Funckia* Willd. (1808), nom. gen. rejic.

Taxonomy: A genus of 24 species, with specific centres in the New Zealand region (9 spp.) and the Hawaiian islands (6 spp.). Related genera are *Milligania* Hook. f. (endemic in Tasmania with 4 species) and *Collospermum* Skottsb. (see below). *Astelia novoguineensis* Krause, described from New Guinea at medium altitudes, belongs to the Philydraceous genus *Helmholtzia*, as pointed out by Skottsberg (1933).

Habit: Stemless perennial herbs, forming dense clumps or tufts.

Habitat: Epiphytic or terrestrial, in swamps or humid forest, also on lava fields.

Ecology: A strictly microtherm genus. All species dioecious. In the temperate zone from near sea-level to the summit of the mountains. In New Guinea *A. papuana* Skottsl. is not found below 2500 m, in the Pacific islands other species almost exclusively above 1000 m. Sometimes descending to as low as 450 m.

Dispersal: The berries which are borne in great profusion in terminal racemes are small and scarlet or orange and contain about 4—20 seeds, 1—4 mm long, with a hard but often brittle testa; they are eaten by birds.

Sources: C. Skottsberg, Bull. Jard. Bot. Btzg III, *13* (1933) 110; Kungl. Svensk. Vet. Ak. Handl. III, *14* (1934) no 2, 1—106, 272 fig. & maps, 24 pl.; Proc. 5th Pac. Sc. Congr. 1933 *4* (1935) 3318; Occ. Pap. B. P. Bish. Mus. *8* (1937) 240; Svensk Bot. Tidskr. *54* (1960) 477.

48. **Collospermum** Skottsb.

Name: Collospermum Skottsb., Kungl. Svensk. Vet. Ak. Handl. III, *14* (1934) 72.

Family: *Liliaceae.*

Taxonomy: A small genus of 5 species, closely allied to *Astelia*, but differing in the pronounced dimorphism of the flowers and the sticky nature of its seeds.

Habit, Habitat & Ecology: As *Astelia.* On mountain peaks in Fiji and Samoa. From sea-level up to the high mountains in New Zealand.

Dispersal: See *Astelia.* The seeds are enclosed in a gelatinous cup, formed by mucilaginous tube-like hairs. This swells and becomes sticky in water.

Sources: C. Skottsberg, Kungl. Svensk. Vet. Ak. Handl. III, *14* (1934) 72.

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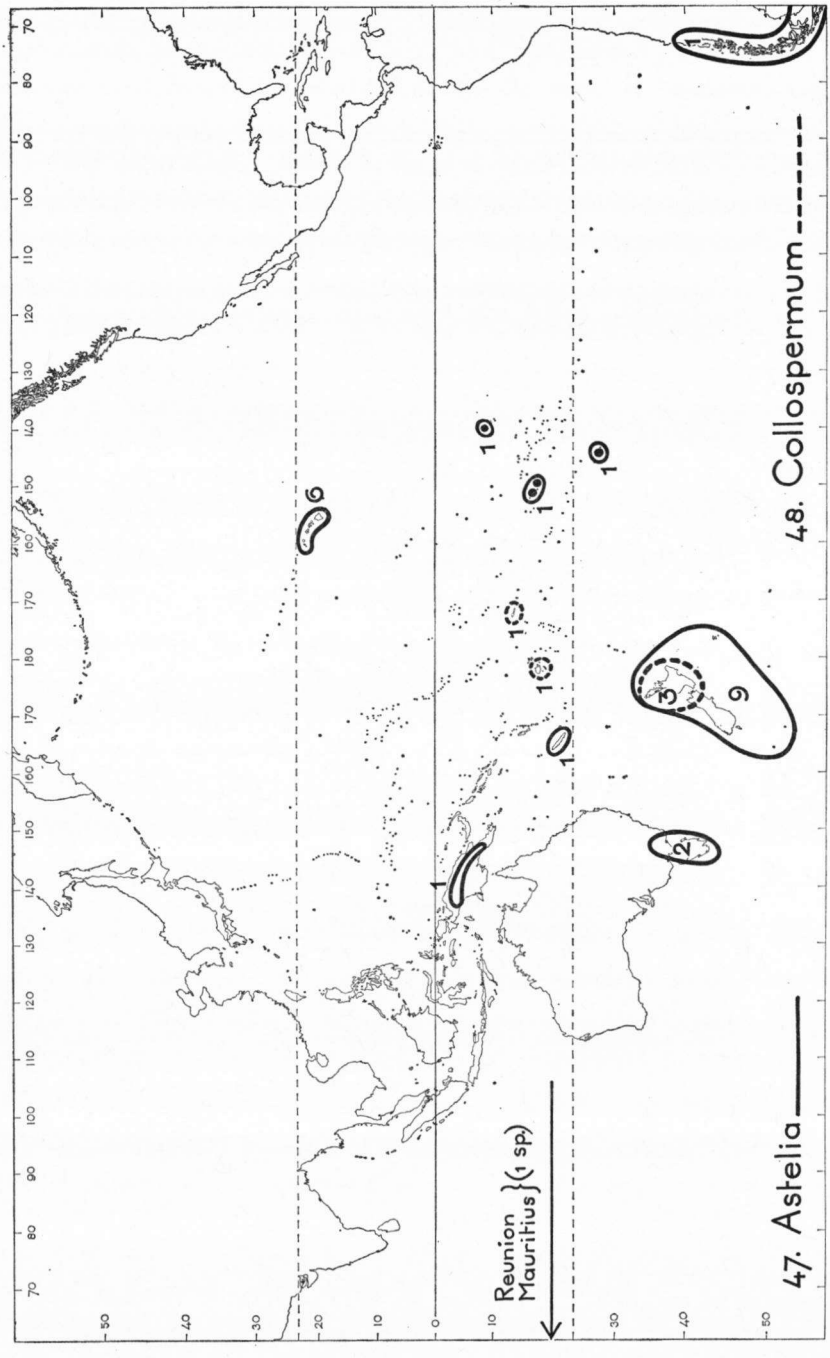
47. Astelia
48. Collospermum
Reunion
Mauritius
(1 sp.)

49. Celastrus L.

Name: Celastrus L.; Gen. Pl. ed. 5 (1754) 91.

Family: *Celastraceae.*

Taxonomy: A genus of 31 species. The present centre of specific development is found in East Asia; the fossil record points to a cosmopolitan distribution in Tertiary times. The Madagascar species is allied to those of Asia. All American species, except the North American *C. scandens* L. which is allied to Old World species, belong to a separate subgenus not represented in the Old World. Generic relationship is closest with the genus *Maytenus* Molina (incl. *Gymnosporia* Bth. & Hook. f.) with which it is often confounded.

Habit: Scandent or twining shrubs. Flowers in dichasia.

Habitat & Ecology: In thickets and forests from the lowland to c. 3000 m; in the tropics and subtropics. Plants dioecious or flowers bisexual; all Pacific species dioecious.

Dispersal: The fruit is a 3-celled, loculicidal capsule containing 1—6 ellipsoid seeds, 0.2—1.5 cm long, which are provided with a fleshy, crimson aril and become exposed after dehiscence. In some species it has been observed that they are eaten by birds.

Sources: Ding Hou, Ann. Mo. Bot. Gard. *42* (1955) 215—302 (monograph); Fl. Mal. I, *6* (1962) 233—238.

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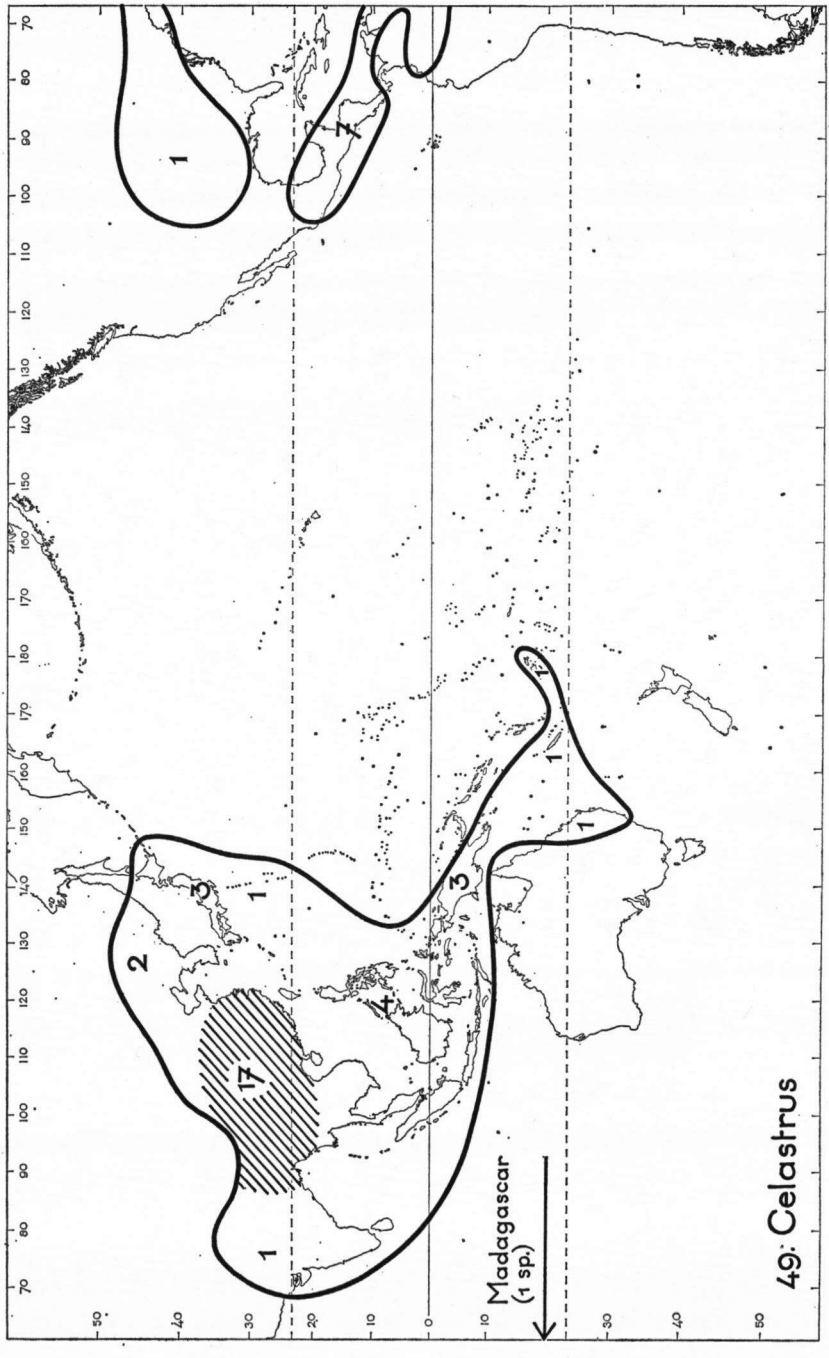

49: Celastrus
Madagascar
(1 sp.)
1
2
3
4
17

50. **Pometia** J. R. & G. Forst.

Name: Pometia J. R. & G. Forst., Char. Gen. Pl. (1776) 109, t. 85.

Family: *Sapindaceae.*

Synonyms: No current synonyms in use; see Radlkofer, Pflanzenreich Heft *98* (1933) 924.

Taxonomy: Two species, of which *P. ridleyi* King emend. Radlk. locally in N. Sumatra and Malaya (dotted on the map): glabrous, all nerves equally bending towards the top without reaching the margin, and *P. pinnata* Forst. occupying the delineated area: glabrescent or hairy, nerves alternating, one ending in a marginal tooth, the other bending towards the top without reaching the margin. *Pometia pinnata* is very variable and several formae can be distinguished. The population on the ancient Sunda Shelf seems taxonomically more or less segregated from the one in the Philippines, New Guinea, and further East: New Britain, Solomons, New Hebrides, Fiji, Tonga, and Samoa.

Habit: Medium-sized to large trees, often buttressed to c. 1½ m height, leaves paripinnate sometimes to 1 m long, inflorescence a terminal thyrse. Often recognizable from far by the occurrence of witches'-brooms.

Habitat: Rain-forest.

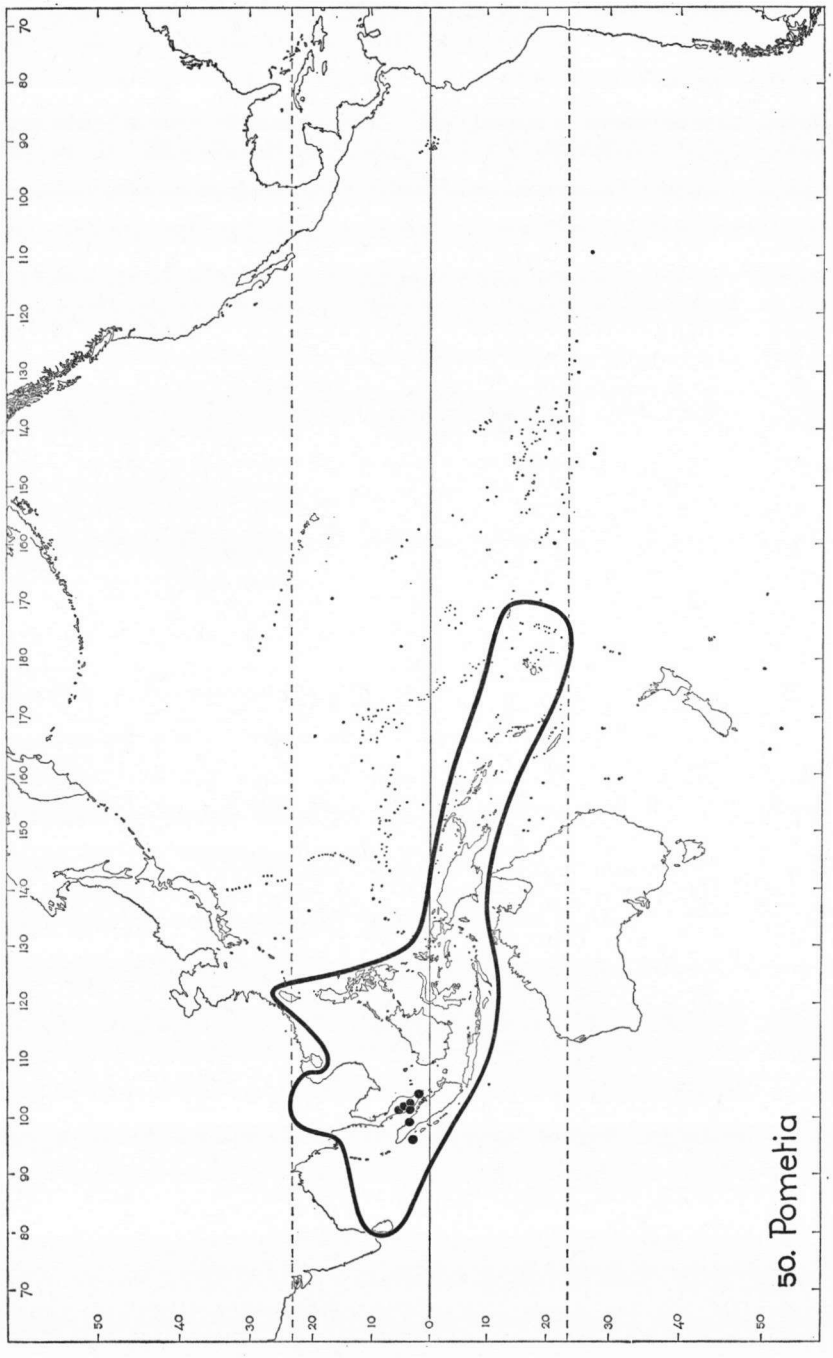
Ecology: In West Malesia mainly along rivers (Saraca-streams), and occasionally in swamp forest, in East Malesia mainly in dryland forest. Occurs on sandy, clayey, loamy soil, but also on limestone. In New Guinea very abundant, also in secondary forest and probably favoured by depletion of primary forest. In the areas with a severe dry season confined to a few moister stations. Generally in the lowlands, rarely up to 1000 m, exceptionally up to 1400 m (in Atjeh).

Dispersal: Most probably by bats, to which the fruits are clearly adapted. The area coincides largely with that of the fruit-eating *Pteropinae* as mapped by Van der Pijl, Acta Bot. Neerl. *6* (1957) 292.

On the other hand the genus is absent from all islands adjacent to Java, even those where rain-forest prevails (Meeuwen I., Prinsen I.) and where flying fox has often resting trees. This would not point to capacity for long-distance dispersal. Ridley (Disp. 268) mentions occurrence of fruits in sea-drift in Java, but there is no reason to assume that it is sea-dispersed; such fruits will have been brought to the shore by streams. It seems almost certain that fruits are dispersed by freshwater in the alluvial forests along streams.

Source: M. Jacobs, Reinwardtia *6* (1962) 109—144.

M. Jacobs.


50. Pometia

51. **Vavaea** Bth.

Name: **Vavaea** Bth., in Hook. Lond. J. Bot. *2* (1843) 212.

Family: *Meliaceae.*

Synonym: *Lamiofrutex* Laut.

Taxonomy and distribution: The genus was formerly considered to be a typical 'Pacific' genus, because the first representatives were described from the Pacific Islands. Later exploration yielded, however, many species from East Malesia which is now regarded as the largest centre of speciation; 7 species have been described from the Philippines, 7 from New Guinea, 2 from the Solomons, 1 from the New Hebrides, and 4 from Fiji and Tonga. It is much in need of a thorough revision. From Sumatra and Cape York there are single collections, made more than a century ago. Recently a new species was described from the Northern Territory (Blake 1954).

Habit: Mostly trees, up to 30 m tall, sometimes shrubs.

Habitat: Rain-forests, from the lowland up to about 1500 m.

Ecology: Locally *Vavaea* species are a common constituent of the rain-forest, for example in the Fiji and Tonga Is., the Philippines and New Guinea. The fragrant whitish or greenish flowers are borne on axillary or terminal clusters, but are neither showy nor large and are frequently concealed between the foliage.

Dispersal: The fruits are subglobose or globose, non-dehiscent, hard berries with a rather leathery exocarp and evidently not juicy but pulpy; when mature they are mostly black. They measure averagely 1—2 cm in diameter. The smooth seeds, 2—8 per fruit, measure a few mm in diameter and are provided with a hard seed-coat.

Sources: A. C. Smith, Contr. U.S. Nat. Herb. *30* (1952) 470—476; C. G. G. J. van Steenis, Acta Bot. Neerl. *1* (1952) 93—94, fig. 1; S. T. Blake, Austr. J. Bot. *2* (1954) 122, 1 pl. Collections of the Rijksherbarium, Leyden.

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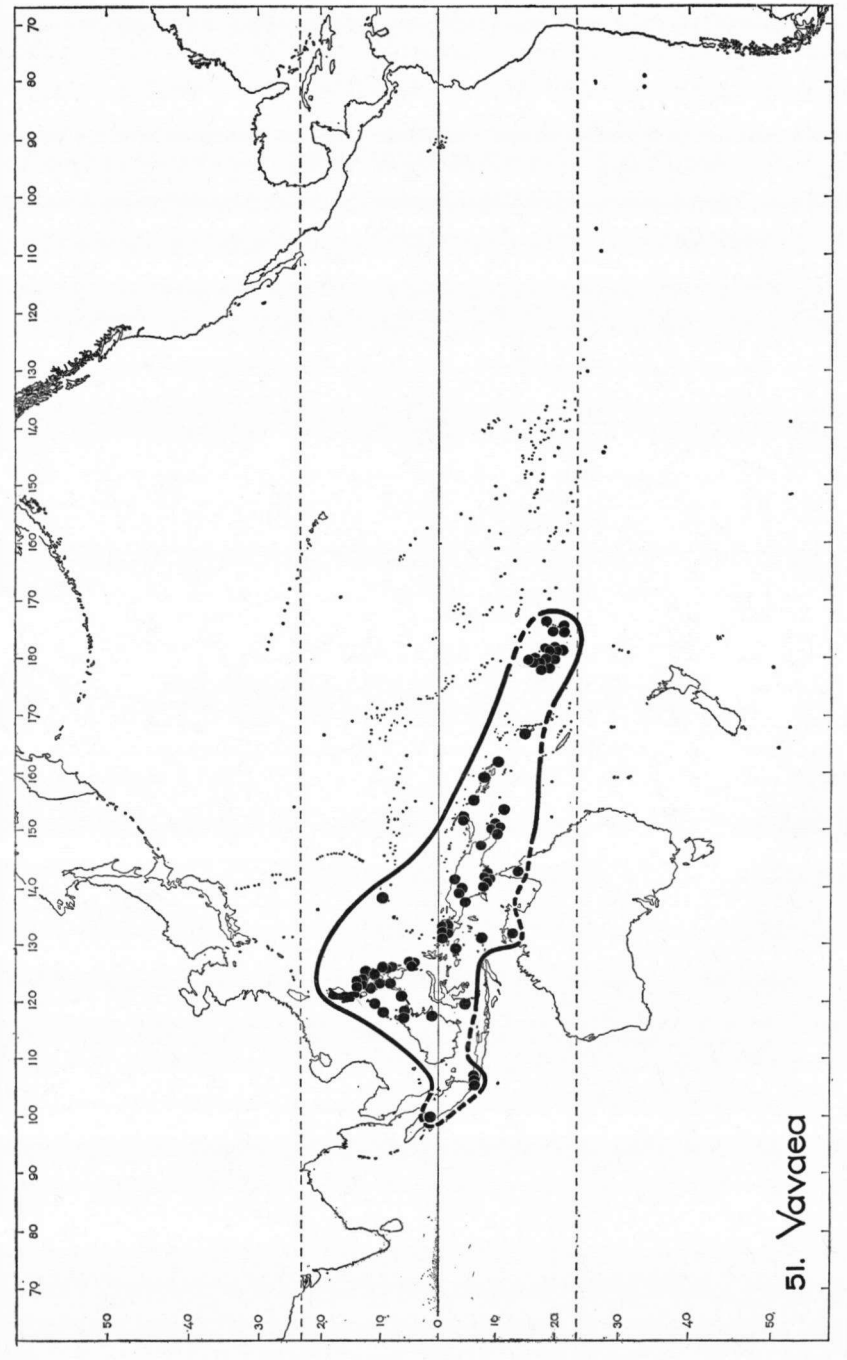

51. Vavaea

52. **Perrottetia** H. B. K.

Name: Perrottetia H. B. K., Nov. Gen. Sp. 7 (1825) 73, t. 622.

Family: *Celastraceae.*

Taxonomy and distribution: A small genus of about 10 closely allied species. In the Old World one species, *P. alpestris* (Bl.) Loes., comprising 3 subspecies, throughout Malesia to the Solomons and North Queensland, one species confined to Formosa, and one in Central China (Hupeh & Szechuan, only 2 localities), as yet unknown from the Indo-Chinese Peninsula. In the Hawaiian Islands one species, *P. sandwicensis* A. Gray. Some 7 species are recorded from S. Mexico to Columbia.

Habit: Shrubs or small trees.

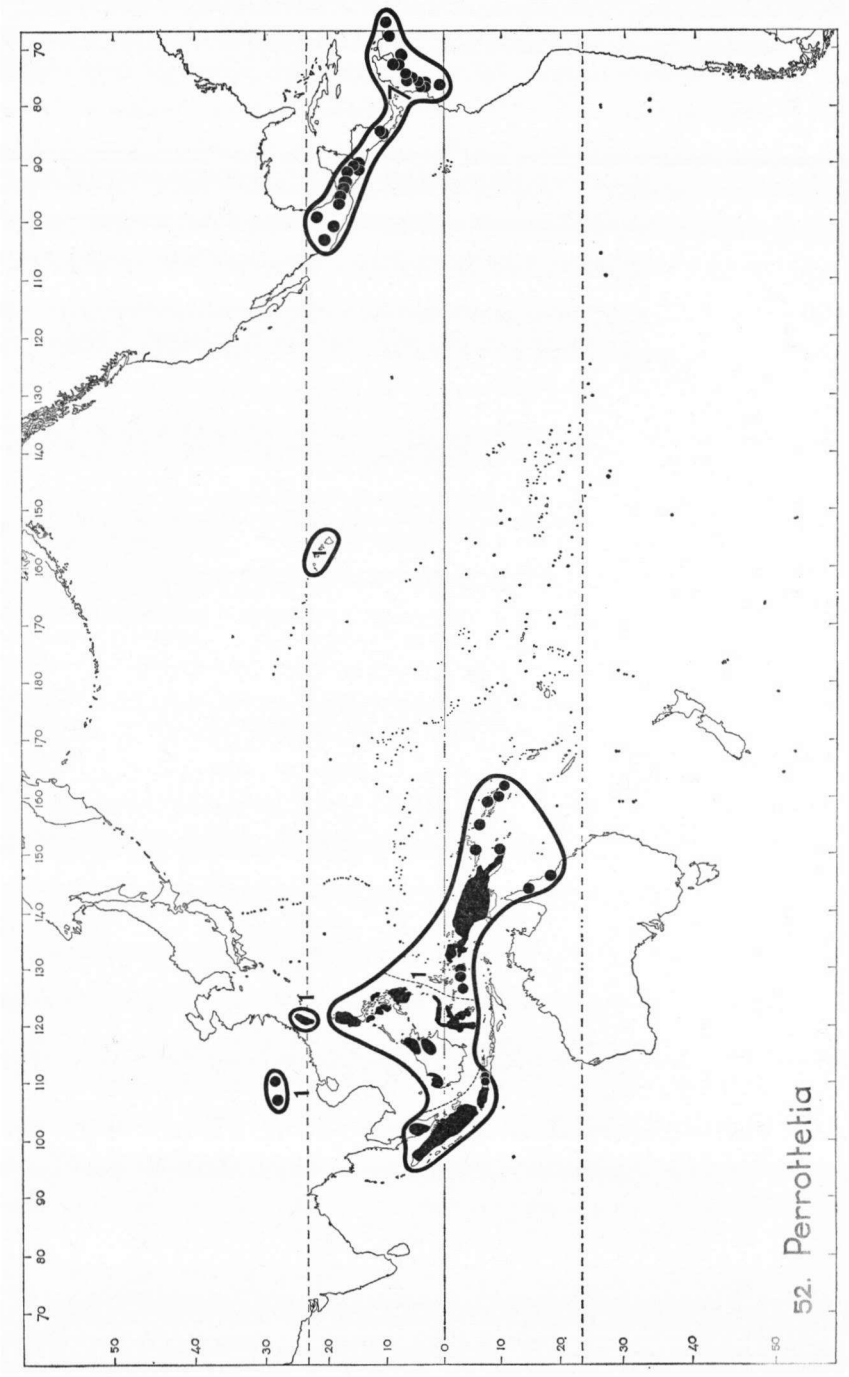
Habitat & Ecology: In rain-forests, primary and secondary, sometimes common in thickets on mountain ridges, preferring open places, in Malesia from sea-level up to c. 3000 m.

According to W. M. Docters van Leeuwen the flowers of *P. alpestris* close in the evening, the anthers joining above the stigma upon which they shed their pollen; he did not observe any insects visiting the flowers.

Dispersal: Fruit is produced in abundance, even by young specimens. It is a small berry (½—1 cm in diam.) containing 2—4 seeds provided with a thick crustaceous seed coat and an aril. They are probably eaten by birds.

Sources: Docters van Leeuwen, Verh. Kon. Akad. Wet. A'dam *31* (1933) 179; Ding Hou, Fl. Mal. I, *6* (1962) 288—291, map. The American localities were provided by Dr. A. Cronquist (New York) and Dr. J. J. Wurdack (Washington, D.C.).

M. M. J. VAN BALGOOY & DING HOU.


52. Perrottetia

53. Euphrasia L.

Name: Euphrasia (Tourn.) L., Gen. Pl. ed. 5 (1753) 263.

Family: *Scrophulariaceae.*

Synonyms: *Anagosperma* (Hook.f.) Wettst., *Siphonidium* J. B. Armst.

Taxonomy: A genus of 50—100 species (after thorough revision possibly much less), in temperate regions of both hemispheres. Especially well developed in Eurasia. Not in Central America or the northern part of the Andean chain. Some species on mountains in Malesia.

According to Du Rietz (1931, 1960) there is no direct relationship between the *Euphrasias* of South and those of North America, whereas there is a close relationship between the *Euphrasia* population of South America and the Austalian/New Zealandic one. The Malesian species are intermediate between these latter populations and the boreal population. The relationship of the Juan Fernandez species is with New Guinean *Euphrasias.*

Habit: Erect or prostrate herbs or subshrubs.

Habitat: In open places, bogs and grassland, mountain forest. In temperate zones from sea-level to the subalpine region. In Malesia exclusively above 2000 m.

Ecology: Annuals or perennials, semi-parasitic on the roots of other herbs.

Dispersal: The fruit is a loculicidally dehiscent capsule (rarely indehiscent). Seeds usually many (1—2 mm diam.) with a furrowed seed-coat. In some species seeds are dispersed by cattle (Ridley, 1930).

Sources: Various floras. H. N. Ridley, Dispersal of Plants (1930) 360, 373; G. E. Du Rietz, Svensk Bot. Tidskr. *25* (1931) 500—539; Acta Phytog. Suec. *13* (1940) 215—282, fig. 9; F. W. Pennell, J. Arn. Arb. *24* (1943) 267—274.

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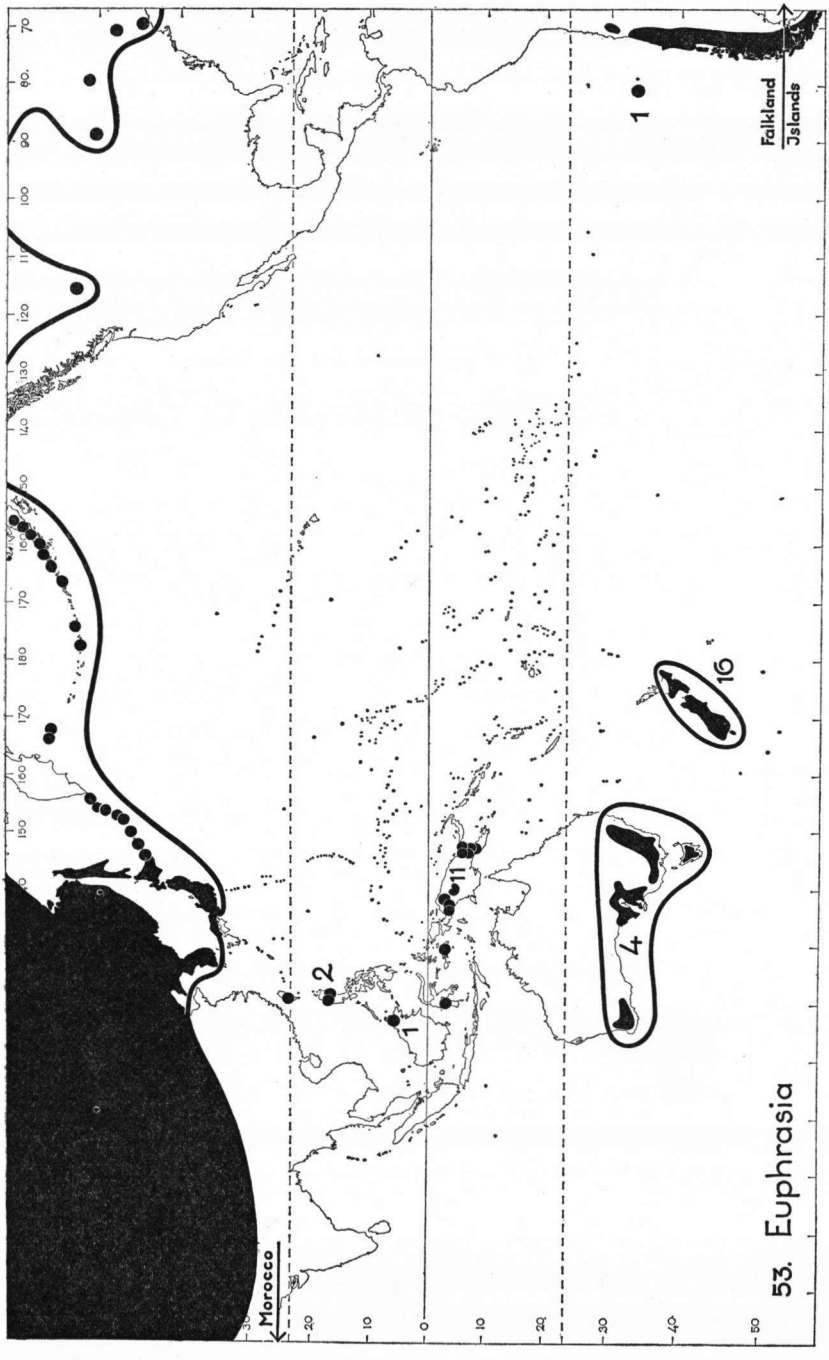
Morocco
Falkland Islands
1
2
1
11
4
16
1
53. Euphrasia

54. **Nertera** Banks & Sol. ex Gaertn.

Name: **Nertera** Banks & Sol. ex Gaertn., Fruct. *1* (1788) 124, t. 28, nom. gen. cons.

Family: *Rubiaceae.*

Synonym: *Gomozia* Mutis (1781), nom. gen. rejic.

Taxonomy: A small genus of some 10 species. *Nertera granadensis* (Mutis ex L. f.) Druce (syn. *N. depressa* Banks & Sol. ex Gaertn.) is widespread from Central and Andean South America to Australasia, and is further found in Madagascar and in the Atlantic Ocean (Tristan, Inaccessible and Gough I.). New Zealand is the centre of specific development with 6 species, according to Allan (1961). Closely related to *Coprosma* Forst.

Habit: Small, perennial, creeping, delicate herbs, often forming cushions or mats.

Habitat & Ecology: In bogs, damp lowland to montane forest, and in the subalpine belt of New Zealand. In Malesia on the damp rain-forest floor, not below 1000 m. Recorded from Samoa at 900 m altitude (Cristophersen, 1935). In the Hawaiian islands between 800—2000 m. The flowers are proterogynous; pollination may be carried out by the wind but selfpollination seems to be the rule (Docters van Leeuwen, 1933).

Dispersal: The fruit is a small orange to dark red (black in *N. nigricarpa* Hayata) drupe (3—10 mm) containing 2 coriaceous pyrenes each enclosing one seed. Plants are often studded with fruits, which are eaten by birds according to Ridley (1930), but Docters van Leeuwen (1933) has never observed this, neither did he find any seeds of *Nertera* in the stomachs of birds.

Sources: Forbes & Hemsley, J. Linn. Soc. Bot. *23* (1888) 391; W. Hillebrand, Fl. Hawaii. Is. (1888) 183; R. N. Rudmose Brown, J. Linn. Soc. Bot. *37* (1905) 242; H. N. Ridley, Dispersal of Plants (1930) 395; A. J. Ewart, Flora of Victoria (1930) 1045; W. M. Docters van Leeuwen, Verh. Kon. Akad. Wet. A'dam *31* (1933) 233; E. D. Merrill, Lingn. Sc. J. *13* (1934) 50; E. Christophersen, B. P. Bish. Mus. Bull. *128* (1935) 205; H. H. Allan, Fl. New Zeal. *1* (1961) 588—591. Private information by Dr. R. C. Bakhuizen van den Brink. Asiatic localities were provided by Miss Dr. L. M. Perry (Harvard Herbarium), Dr. H. R. Fletcher (Edinburg) and Dr. N. Y. Sandwith (Kew) who also supplied information concerning *Nertera* in America.

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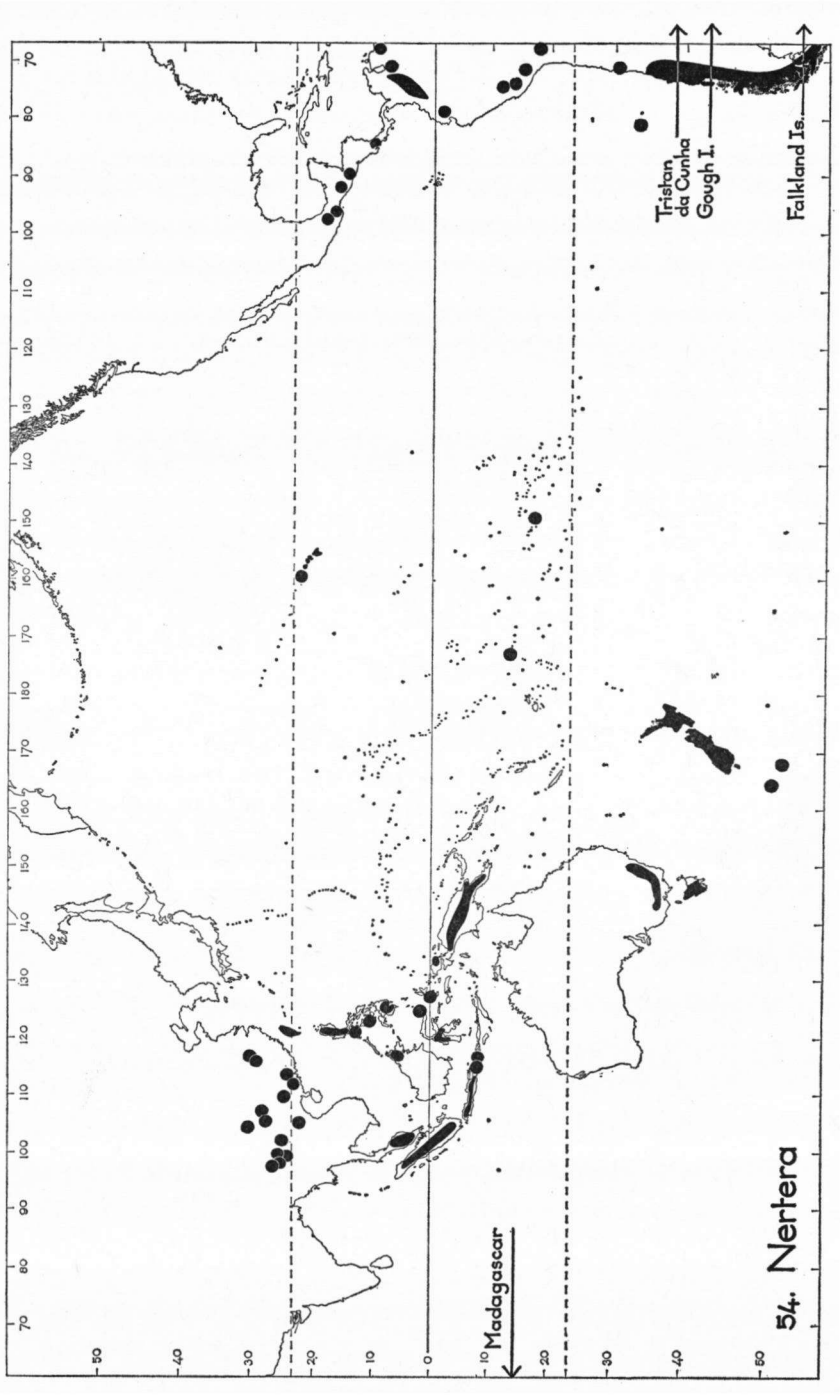
54. Nertera
Madagascar
Tristan da Cunha
Gough I.
Falkland Is.

55. **Hebe** Comm. ex Juss.

Name: Hebe Comm. ex Jussieu, Gen. Pl. (1789) 105.

Family: *Scrophulariaceae.*

Taxonomy: A genus comprising some 100 species according to Allan (1961). Closely allied to *Veronica* L., which is widespread throughout the temperate regions of both hemispheres and to the endemic New Zealandic genus *Pygmaea* Hook. f. (6 species). Hybridization is of common occurrence.

Habit: Shrubs or small trees usually ½—2 m high, but sometimes attaining a height of 6 m.

Habitat & Ecology: Along rivers and valleys, on rocky places, mountain ridges, also in forest and as a constituent of the subalpine vegetation. In New Guinea only on high mountains. The species from Rapa I. "not uncommon from 180—315 m altitude" (F. B. H. Brown, 1935).

Dispersal: The fruit borne on racemes or spikes is a septicidally dehiscing capsule (2—6 mm diam.). Seeds small and smooth (c. ½ mm), rather few to many.

Sources: F. W. Pennell, Rhodora *23* (1921) 38—40; J. Arn. Arb. *24* (1943) 255—260; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 266; H. H. Allan, Fl. New Zeal. *1* (1961) 885—952.

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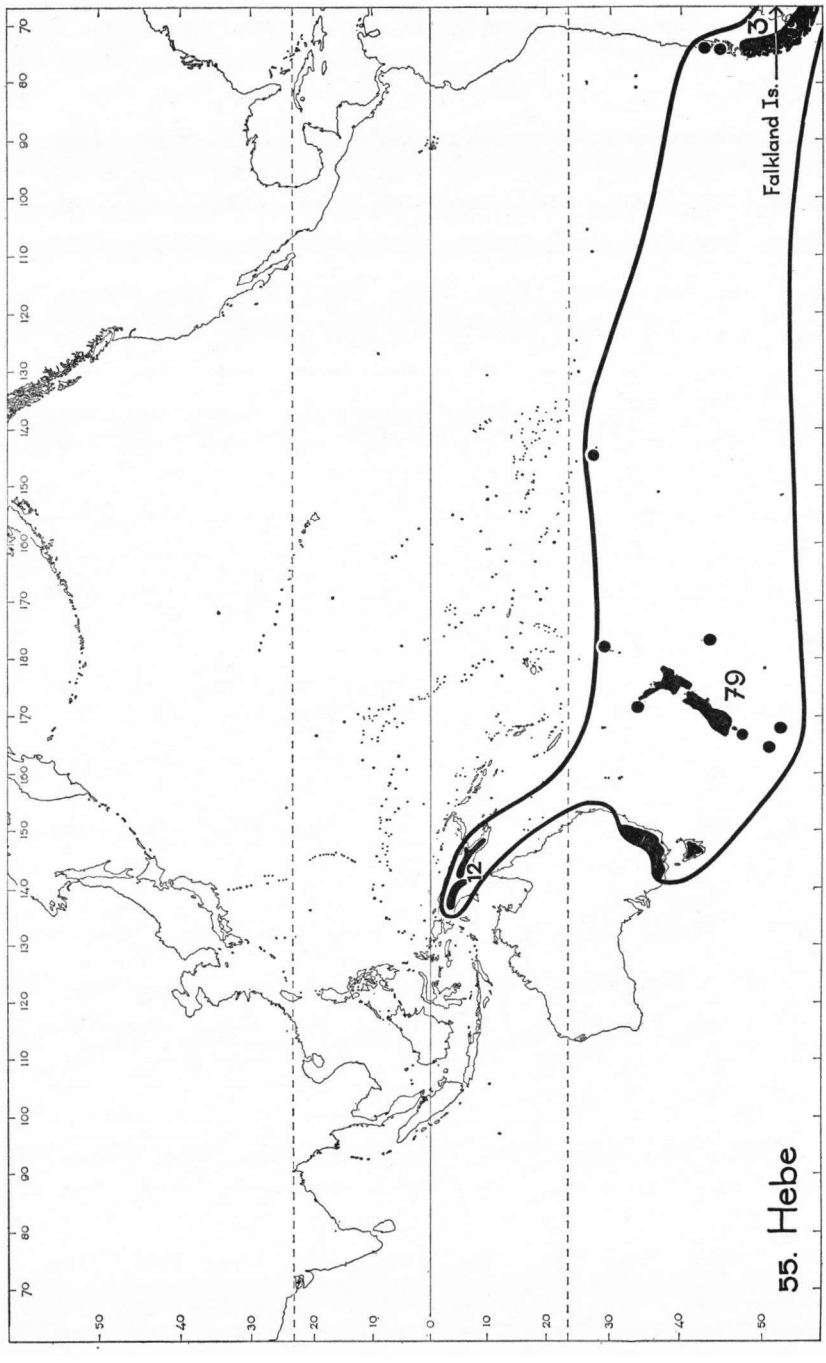
55. Hebe
Falkland Is.
79
12
70
80
90
100
110
120
130
140
150
160
170
180
170
160
150
140
130
120
110
100
90
80
70
50
40
30
20
10
0
10
20
30
40
50

56. **Gahnia** Forst.

Name: Gahnia J. R. & G. Forst., Char. Gen. Pl. (1776) 26, t. 26.

Family: *Cyperaceae.*

Taxonomy and distribution: A genus of 35 species, divided into 7 sections, centring in Australia (incl. also Tasmania). Three sections comprising 10 species limited to this region. The other sections distributed as follows:
Sect. *Gahnia* (*Conflexae*) (11 species): from North and East Australia and Tasmania to New Zealand, New Hebrides, Fiji, Marquesas, and Hawaiian Is.
Sect. *Agglutinatae* (6 species): from SE. Asia, throughout Malesia (except Java and the Philippines) to North, East, and South Australia and New Caledonia.
Sect. *Lampocarya* (*Inclusae*) (7 species): ranging throughout the area of the genus except in the Marquesas and West Australia.
Sect. *Divergentes*: one species limited to the Hawaiian Is.
The genus is related to *Machaerina.*

Habit: Perennial herbs with tall terete stems, forming large, dense tussocks; stolons absent; leaves mostly crowded at the base.

Habitat & Ecology: Preferably in open places on rocky, sandy soil, and mountain ridges, several species near craters or as pioneers on lava flows. Some in light forest.

Dispersal: The fruits are borne in profusion on the panicles. The nuts remain attached to the panicles by means of the persistent filaments which often strongly increase in length (for details of this mechanism see Benl, 1937). The smooth nuts are some mm in diam. and are protected by the hard pericarp. They are eaten by birds according to Benl (1937, 1940) and E. Jacobson (1919).

Sources: E. Jacobson, Trop. Natuur *8* (1919) 121; G. Benl, Flora *131* (1937) 369—386; Bot. Arch. *40* (1940) 151—257, 30 fig., 1 map; G. Kükenthal, in Fedde, Rep. *52* (1943) 52—111; J. H. Kern, Reinwardtia *6* (1961) 70—71; MS for the Flora Malesiana. Private information by Mr. J. H. Kern.

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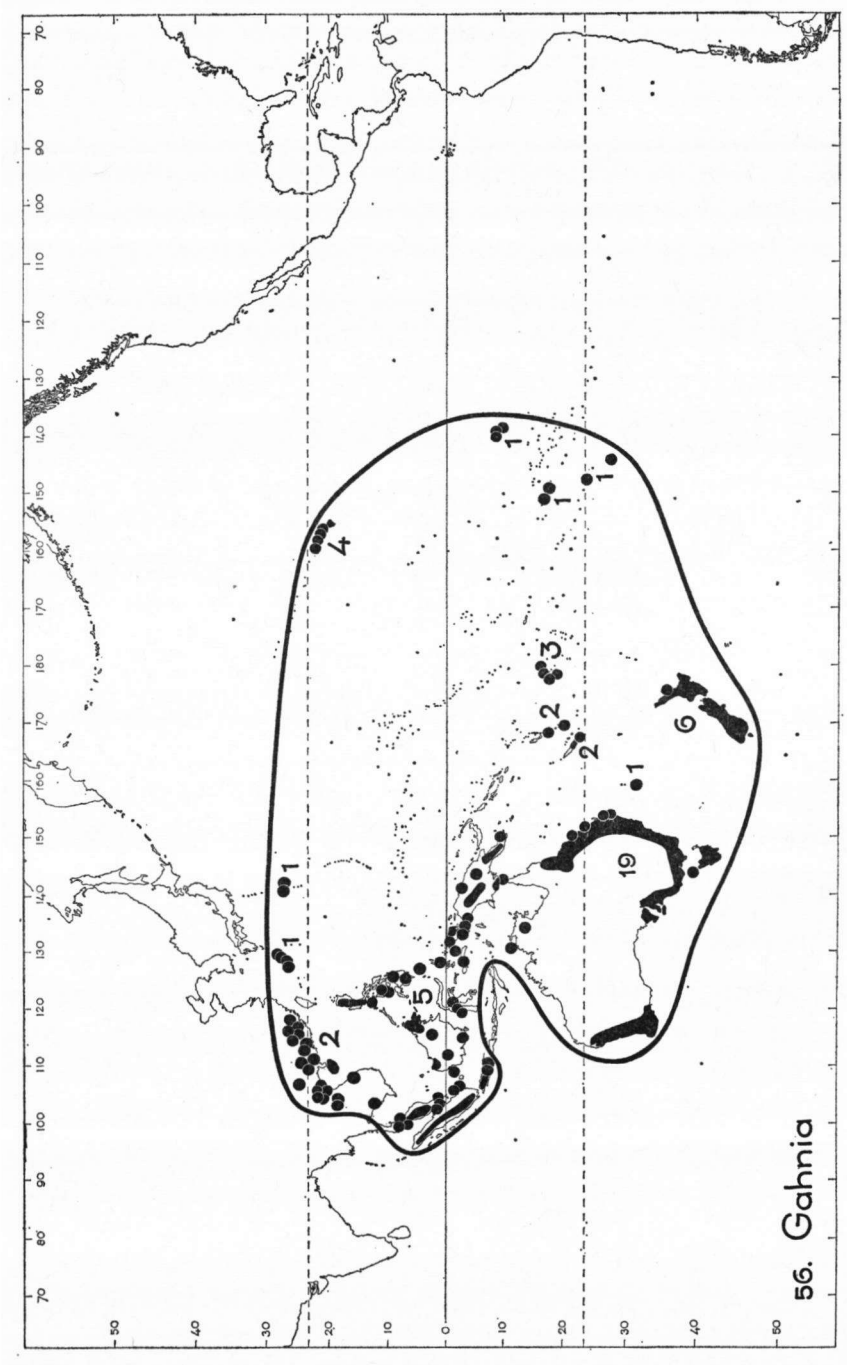
56. Gahnia

57. Flagellaria L.

Name: **Flagellaria** L., Gen. Pl. ed. 5 (1754) 156.

Family: *Flagellariaceae*.

Taxonomy: A genus of few species. *F. indica* L. widespread, covering nearly the whole range of the genus. *F. gigantea* Hook. f. known from Bismarck, Fiji, and Samoa Is. *F. neocaledonica* Schltr endemic in New Caledonia. A very large undescribed species from the Solomon Is (Backer, 1951, 246).

Habit: Robust, perennial herbs, climbing by means of leaf-tendrils. Flowers in terminal panicles.

Habitat & Ecology: Plants of humid tropical rain-forest and forest borders, from sea-level to c. 1500 m altitude. Frequently found on the inner edge of mangroves.

Dispersal: The fruit is a subglobose drupe (0.5—1.2 cm diam.), pink at maturity with a thin soft exocarp and a very hard endocarp, containing a single seed. Ridley (1930, in discussing *F. indica*) stated: "..... there are 2 very minute empty spaces in the hard shell, the remains of the other two cells of the ovary. The fruit floats at least in the dry state, though I doubt if these tiny spaces have any effect on its buoyancy". Ridley suggests sea-transport as means of dispersal rather than by birds.

Sources: H. N. Ridley, Dispersal of Plants (1930) 320; C. A. Backer, Fl. Mal. I, 4 (1951) 246—248; various other Floras. Collections in the Rijksherbarium Leyden. Drs. S. K. Mukherjee and H. Santapau (Calcutta) have provided distribution data of the genus in SE. Asia.

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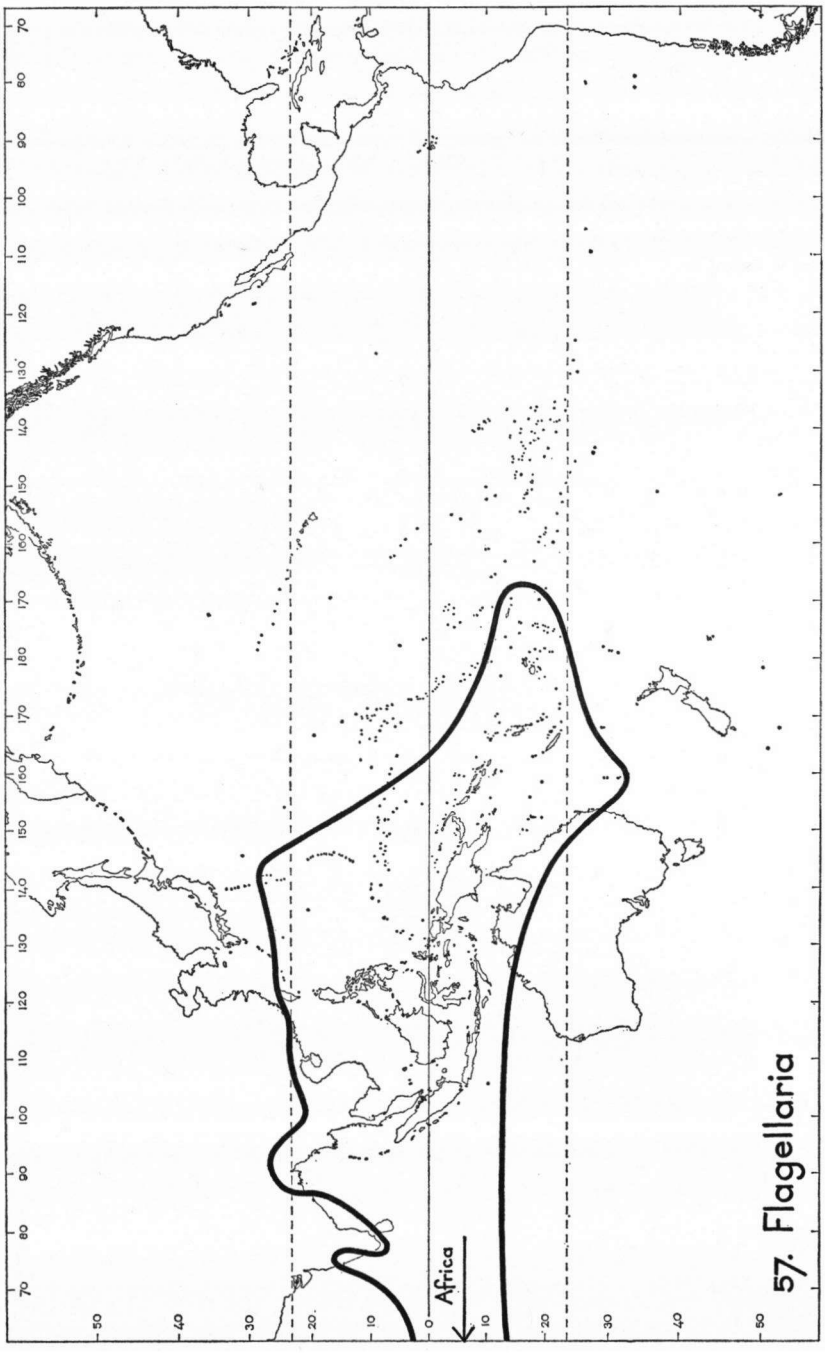
Africa
57. Flagellaria

58. **Joinvillea** Gaud.

Name: Joinvillea Gaud., Voy. Bonite (1846) 40, t. 39.

Family: *Flagellariaceae.*

Taxonomy: A small genus of 3—4 species, with a disjunct distribution pattern, at least according to our present knowledge. *J. borneensis* Becc. from Sumatra and Malaya to North Borneo, Palawan, and Sulu Is. from rather few restricted localities. A second one, *J. elegans* Gaud., in the Southwest Pacific (New Caledonia, New Hebrides, and Fiji). A third one, *J. gaudichaudiana* Brongn. & Gris, from the Hawaiian Is. This species is also recorded for Samoa by Christophersen (1938), who described a fourth species: *J. bryannii*, endemic in Samoa. Unidentified *Joinvilleas* were collected in the Solomons by L. J. Brass and T. C. Whitmore.

Habit: Robust, erect, reed-like perennial herbs, up to 6 m tall. Flowers in terminal panicles.

Habitat & Ecology: Plants of light dryland rain-forest at medium altitudes (up to 1700 m). Often on mountain ridges.

Dispersal: The fruit is a 2—3-seeded drupe less than 1 cm diam. with a thin-fleshy red exocarp. Seeds small (1—2 mm) enclosed in bony pyrenes. Dispersal is assigned to birds by Ridley (1930), but he provides no actual observations.

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 447—448; E. D. Merrill, R. As. Soc. J. spec. nr. (1921) 109; En. Philip. Fl. Pl. *1* (1923) 190; Contr. Arn. Arb. *8* (1934) 18; H. N. Ridley, Fl. Mal. Pen. *4* (1924) 368; Dispersal of Plants (1930) 320; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg *13* (1933) 25, 29; E. Christophersen, B. P. Bish. Mus. Bull. *128* (1935) 44—47; C. A. Backer, Fl. Mal. I, *4* (1951) 245—246. Collections in the Rijksherbarium, Leyden.

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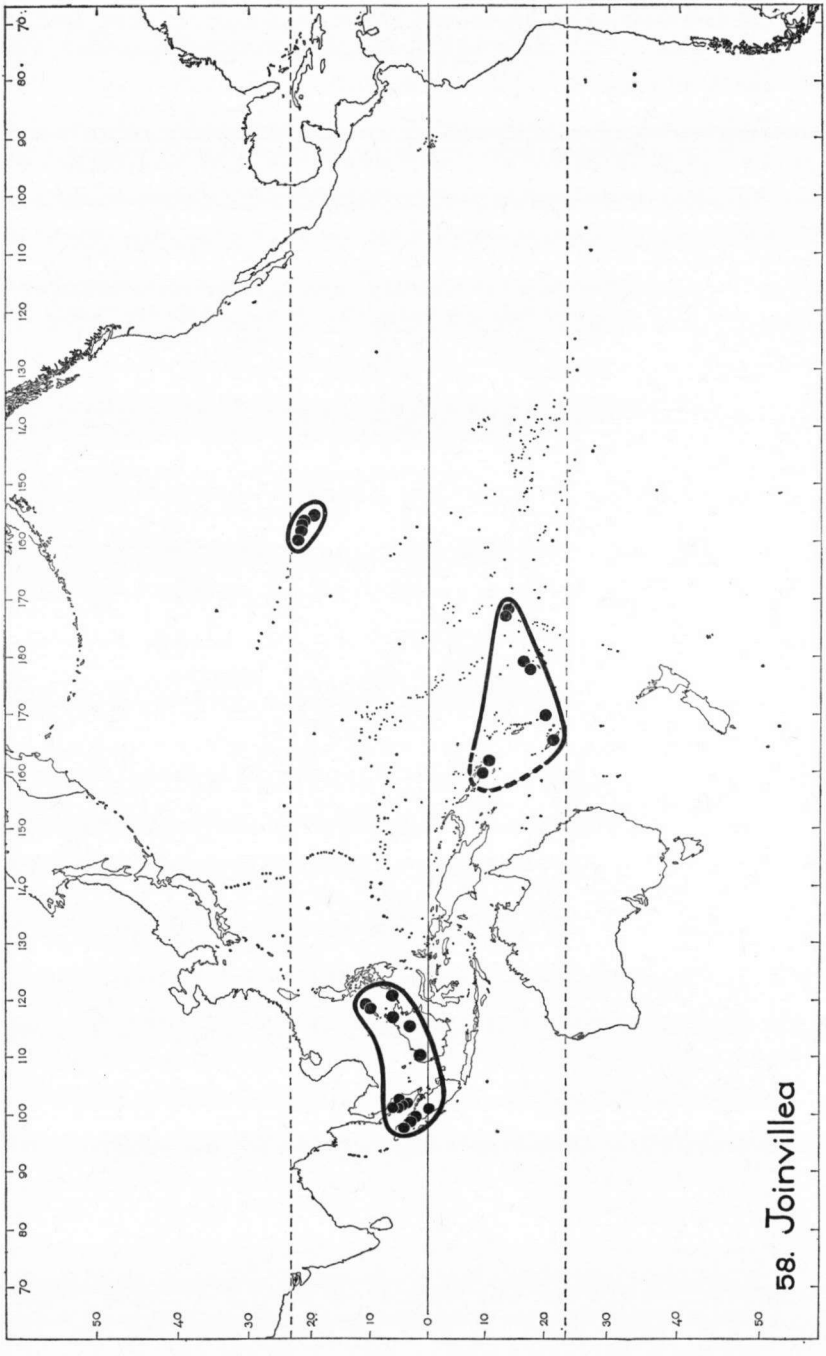
58. Joinvillea

59. **Myoporum** Banks & Sol. ex Forst.

Name: Myoporum Banks & Sol. ex Forst., Prodr. (1786) 44.

Family: *Myoporaceae.*

Taxonomy and distribution: A genus of c. 40 species, the bulk of which is found in Australia. All other genera of the *Myoporaceae*, except the monotypic genus *Bontia* L. of the Antilles, are confined to Australia. The distribution of the extra-Australian species is, according to the literature, as follows: One endemic species is found in the Sino-Japanese area, one is endemic in the Bonin Is. and Pagan I. (Marianas), the species from the S. Marianas is said to be the same as an Australian species (*M. tenuifolium* Forst.), the East Malesian species is endemic, the species from Hawaii is endemic in the Pacific: it is recorded also for the New Hebrides and Cook Is. According to Webster (1951) 3 endemic species occur in Tubuai Is. (incl. Rapa); New Zealand (incl. Kermadec and Chatham Is.) has two species, and New Caledonia eight of which one occurs also in Norfolk I.

Habit: Medium-sized trees to erect or prostrate shrubs. Even in one species the variability of both habit and leaf-form may be astonishing as e.g. in the Hawaiian *M. sandwicense* A. Gray (Webster, 1951).

Habitat & Ecology: Plants of dry, open, sunny country. Many species in deserts, savannahs and along the coast. Sometimes found on rocks and lava flows. Also in open forest, especially at forest edges.

Dispersal: The 2—10-celled fruit is a fleshy or dry, ovoid to globular drupe (5—10 mm). They are eaten by birds. In Hawaii it has been observed that the seeds are dispersed by goats (Ridley, 1930).

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 399; Forbes & Hemsley, J. Linn. Soc. Bot. *26* (1889) 250; F. Kraenzlin, in Fedde, Rep. Beih. *54* (1929) 14—41; H. N. Ridley, Dispersal of Plants (1930) 370, 464, 465, 469; G. P. Wilder, B. P. Bish. Mus. Bull. *86* (1931) 100; F. B. H. Brown, ibid. *130* (1935) 277—280; S. Bloembergen, Fl. Mal. I, *4* (1951) 265—266; G. L. Webster, Pac. Sc. *5* (1951) 52—77, 2 maps; F. R. Fosberg, Pac. Sc. *12* (1958) 17—20.

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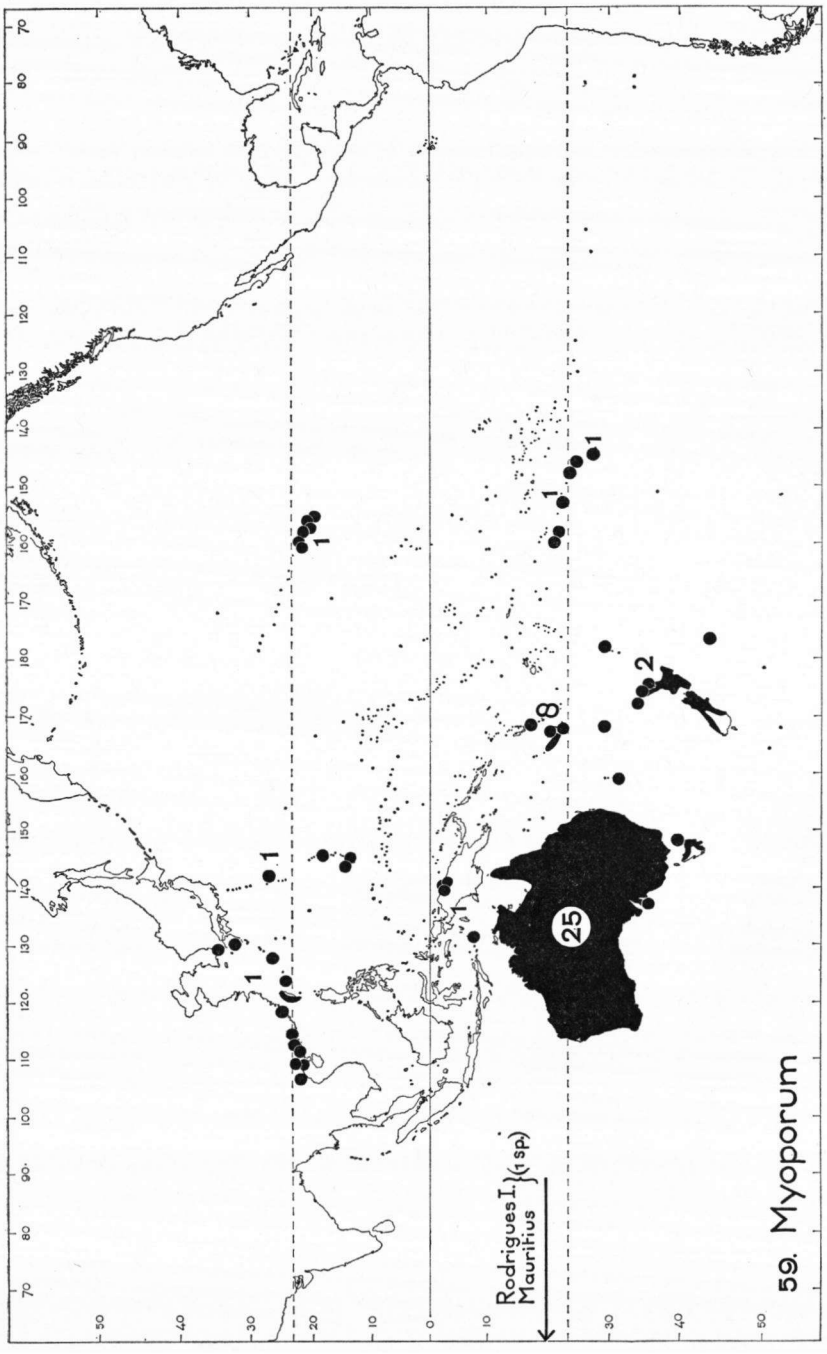
59. Myoporum
Rodrigues I.
Mauritius
(1 sp.)
25
8
2
1

60. **Corynocarpus** Forst.

Name: **Corynocarpus** J. R. & G. Forst., Char. Gen. Pl. (1776) 32, t. 16.

Family: *Corynocarpaceae.*

Synonyms: *Merrettia* Soland. ex Endl., *Cyanocarpus.* F. M. Bail.

Taxonomy and distribution: A small genus of which 4 species have been described. One in New Zealand, Kermadec and Chatham Is. One each in New Caledonia and New Hebrides and one in North Queensland, New Guinea and Aru Is. Recently also collected in the Solomons by Dr. T. C. Whitmore. It is the only genus in the *Corynocarpaceae.*

Habit: Small to medium-sized trees, up to 20 m tall, with terminal, many-flowered panicles.

Habitat & Ecology: *C. laevigata* Forst. is a very common component of the lowland forest in New Zealand, where it often dominates in the extensive "Karaka forests". *C. cribbianus* (F. M. Bail.) L. S. Smith is apparently not uncommon in the rain-forest of New Guinea to an altitude of c. 1800 m, but has never been reported to be a dominant of the undergrowth. The flowers are whitish and small (± 5 mm), odourless in *C. laevigata* (Krause, 1942), fragrant in *C. cribbianus* (van Steenis, 1951). According to Pigott (1927) *Corynocarpus* is anemophilous although he mentions visiting insects.

Dispersal: The fruit is a globular to elliptic drupe or nut, measuring 3—5 cm diam. The exocarp fleshy or hard with a fibrous or woody endocarp. They are eaten by birds such as fruitpigeons (*Carpophaga* or *Ducula* species) and honey-eaters (*Meliphagidae*) according to Ridley (1930) and others.

Sources: E. Pigott, Trans. New Zeal. Inst. *58* (1927) 57—71; H. N. Ridley, Dispersal of Plants (1930) 465, 501; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *13* (1933) 99; C. T. White, Contr. Arn. Arb. *4* (1933) 57; E. D. Merrill & L. M. Perry, J. Arn. Arb. *22* (1941) 541; J. Krause, in E. & P. Pfl. Fam. ed. 2, *20b* (1942) 22—35; C. G. G. J. van Steenis, J. Arn. Arb. *28* (1947) 421; Fl. Mal. I, *4* (1951) 262—264; ibid. I, 5 (1958) 557. Collections in the Rijksherbarium Leyden.

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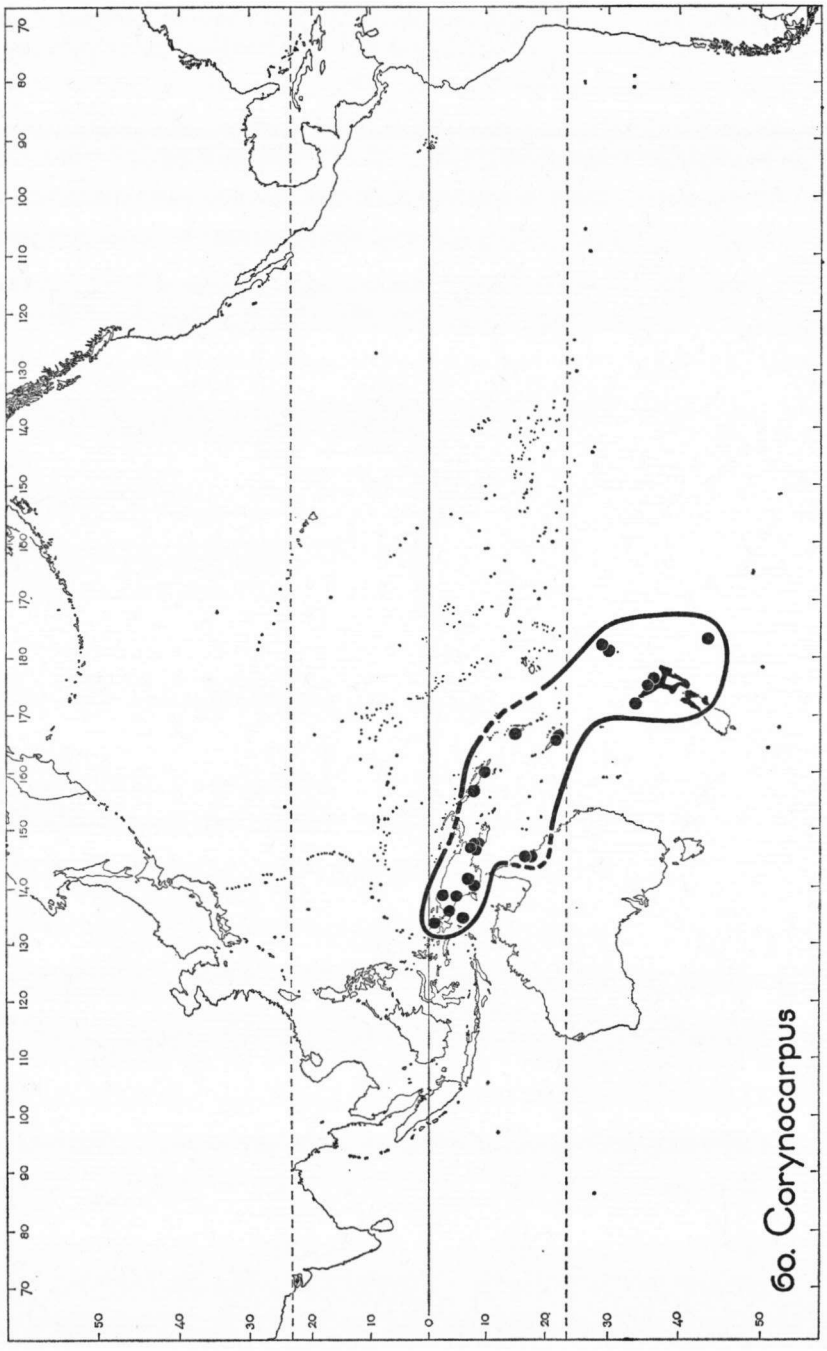

60. Corynocarpus

61. **Lepiniopsis** Val.

Name: Lepiniopsis Val., Ann. Jard. Bot. Btzg *12* (1895) 249—253.

Family: *Apocynaceae.*

Notes: A genus of 2 species. One (*L. ternatensis* Val., syn. *L. philippinensis* Elm.) is widely spread from the Philippines to the Moluccas and New Guinea. It has also been mentioned from the Bismarck Is. where Father Peekel found a fruit on the beach (Markgraf, 1930). Another species very closely allied, *L. trilocularis* Markgr., is described as an endemic in Palau.

Habit: A small tree.

Habitat & Ecology: Generally found at low altitudes as a component of the lowland rain-forest, sometimes ascending to a height of c. 800 m.

Dispersal: The fruit is a spindle-shaped drupe, 4—6 cm long and c. 1 cm broad (immature), with a rather thin, fleshy, very fibrous mesocarp and a membranous endocarp. The mature fruit is said to be red; its texture in the fully ripe state in nature is not exactly known. Containing 1—3 seeds. It seems to be buoyant, and is frequently found on the sandy beach.

Sources: E. D. Merrill, En. Philip. Fl. Pl. *3* (1923) 321; F. Markgraf, Bot. Jahrb. *63* (1930) 280; R. Kanehira, En. Micr. Pl. (1935) 395. Collections in the Rijksherbarium Leyden.

62. **Lepinia** Decne

Name: Lepinia Decne, Ann. Sc. Nat. III, *12*(1849) 194, t. 9.

Family: *Apocynaceae.*

Taxonomy: A genus of which 3 species have been described: one each in the Society Is. (Tahiti and Moorea), the Solomon Is. (San Cristobal and New Georgia group) and in the Carolines (Ponape). It is a rather isolated genus on account of its most remarkable fruit; allied to *Alyxia* and *Vallesia*, according to Decaisne (1849); to the African genus *Pleiocarpa* and the Australian *Notonerium* according to Hosokawa (1934). Pichon (1949) accommodated it in a separate group among the *Plumerioideae* together with the East Malesian genus *Lepiniopsis*.

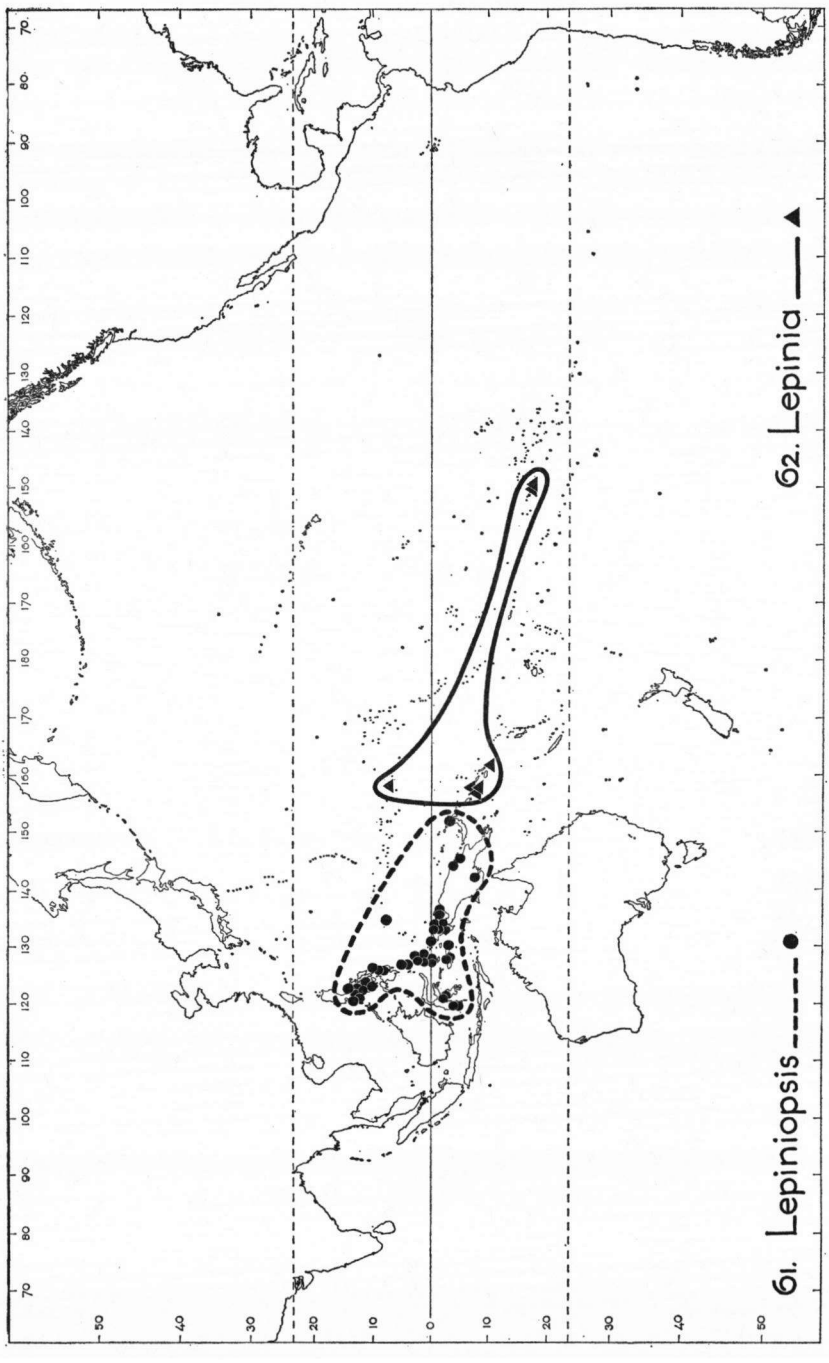
Habit: A medium-sized tree, 3—10 m tall.

Habitat & Ecology: The Tahiti species is mentioned from "high mountains"; that from Ponape occurs on the summit of a peak (800 m), and the Solomon Is. species is found in lowland rain-forest, of which it is a rather common component locally.

Fruit: The fruit consists of 4 carpels separate at the base but remaining attached at the apex, each carpel growing out into a slender, almost filiform stalk curved outwards. The apical thickened seed bearing parts of the carpels which are joined at right angles by their tips, are about 5 cm long and each contains one narrow-elliptic seed (c. 4 cm long and c. 1 cm broad); the whole fruit is an almost globose structure about 20 cm diameter.

Sources: E. Drake del Castillo, Fl. Polyn. Fr. (1893) 123; W. B. Hemsley, in Hook., Ic. Pl. (1905) pl. 2703; T. Hosokawa, Bot. Mag. Tokyo *48* (1934) 528—530; M. Pichon, Bull. Mus. Hist. Nat. Paris II, *21* (1949) 140.

M. M. J. VAN BALGOOY.


61. Lepiniopsis
62. Lepinia

63. **Mitrastemon** Makino

Name: Mitrastemon Makino, Bot. Mag. Tokyo *23* (1909) 326 ("*Mitrastemma*"); ibid. *25* (1911) 253.

Family: *Rafflesiaceae.*

Notes: Makino considered the genus to form a separate family (*Mitrastemonaceae*) and although subsequent authors (Hayata, Watanabe, etc.) have placed it in *Rafflesiaceae*, as is now generally accepted, several authors (e.g. Honda, Sakisaka, and Matuda) preferred to assign it family rank. There are about 5 species: c. 3 species from S. Japan throughout Ryu Kyu Islands to Formosa, 1 of these also in Sumatra. One species is known from Mexico and Guatemala. Recently new localities were added by Messrs Womersley (Lae) and Vink (Leyden) from E. New Guinea, and Corner (Cambridge, G.B.) from Mt Kinabalu in N. Borneo. According to Van Royen (1963) the Papuan specimens are conspecific with those of Formosa; he alluded to the possibility that after thorough revision there may be only one species in the Old World. The genus is unknown from the Pacific proper.

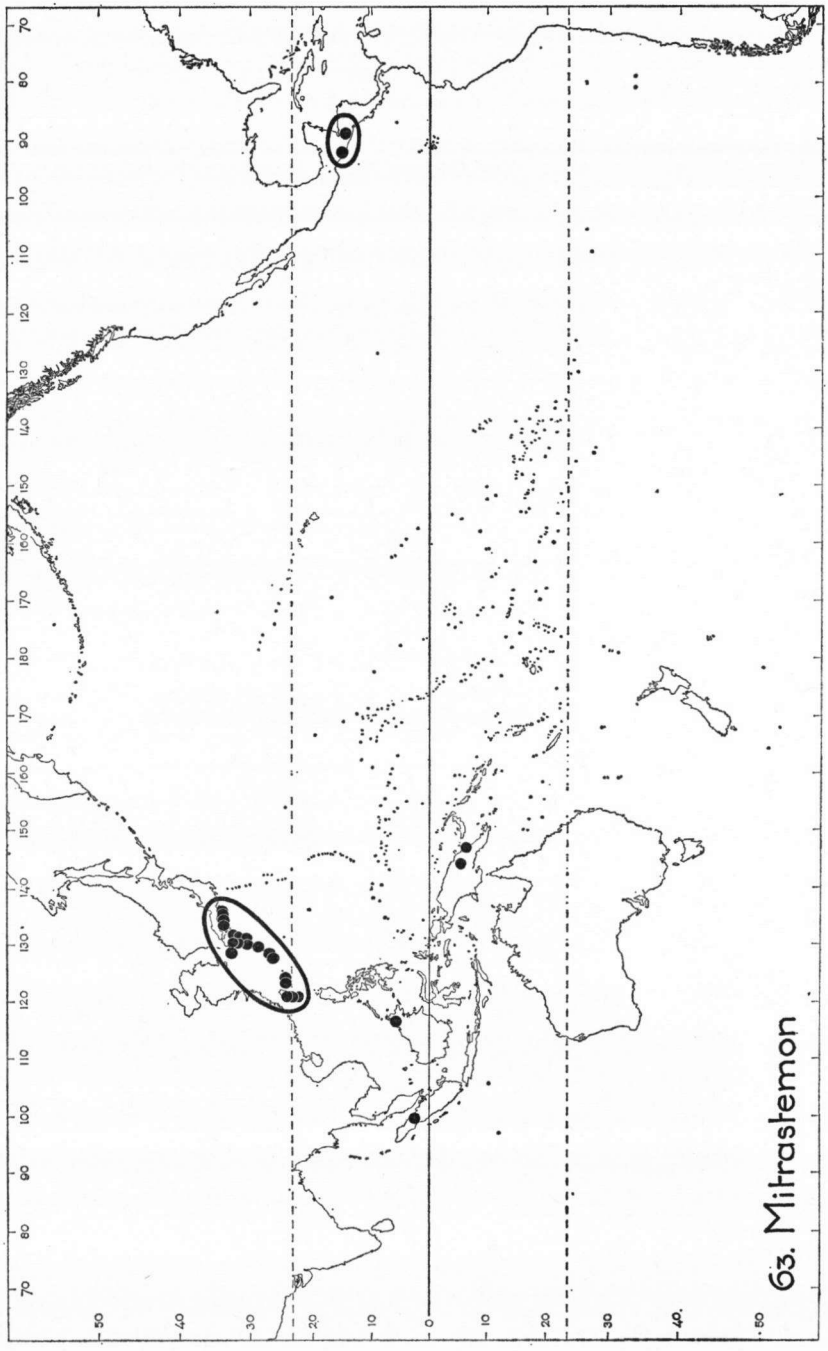
Habit: Small, leafless, echlorophyllose herbs, 3—15 cm high, parasitic on the roots of *Fagaceae.*

Habitat & Ecology: Species of *Mitrastemon* are almost invariably recorded from horizontal, exposed roots of *Fagaceae*: *Quercus*, *Lithocarpus*, and *Castanopsis*. The only exception was the specimen collected by Vink in the Kubor Range, which was parasitic on *Eugenia* (*Myrt.*). They are mostly found at medium altitudes (1500 m). According to Matuda (1947) flowers are developed during the dry season in months with mean temperatures of 10—20° C. The flowers produce copious amounts of nectar; Jochems (1928) found them to emit a "gingerlike" acid odour. They are visited by various insects and birds (e. g. *Zosterops*), which most likely accomplish pollination.

Dispersal: The berry is eaten by birds and various terrestrial animals. It contains numerous minute seeds, provided with a reticulated, hard testa.

Sources: B. Hayata, Ic. Pl. Form. *3* (1913) 199—213; S. C. J. Jochems, Rec. Trav. Bot Néerl. *25a* (1928) 203—207; Y. Yamamoto, Bot. Mag. Tokyo *50* (1936) 539—541; K. Watanabe, J. Jap. Bot. *12* (1936) 603—618; ibid. *13* (1937) 14—24 and 75—86, 1 map; P. C. Standley & J. Steyermark, Field Bot. *24* (1946) 103; E. Matuda, Bull. Torr. Bot. Cl. *74* (1947) 133—141, 1 map; P. van Royen, Nova Guinea, Bot. *14* (1963) 243—245.
Dr. J. J. Wurdack (Washington) and Dr. A. Cronquist (New York) have localized the the American records.

M. M. J. VAN BALGOOY.


63. Mitrastemon

64. **Ascarina** Forst.

Name: Ascarina J. R. & G. Forst., Char. Gen. Pl. (1776) 117, t. 59.

Family: *Chloranthaceae.*

Taxonomy: A genus of 7 species. Swamy (1953) distinguished two species groups: one represented with 3 species in East Malesia, the Solomon Islands, and New Caledonia, the other with 4 species from the Solomon Islands and New Caledonia to New Zealand in the south and the Marquesas Islands in the east. So the areas of the two sections overlap in the Solomon Islands and New Caledonia.

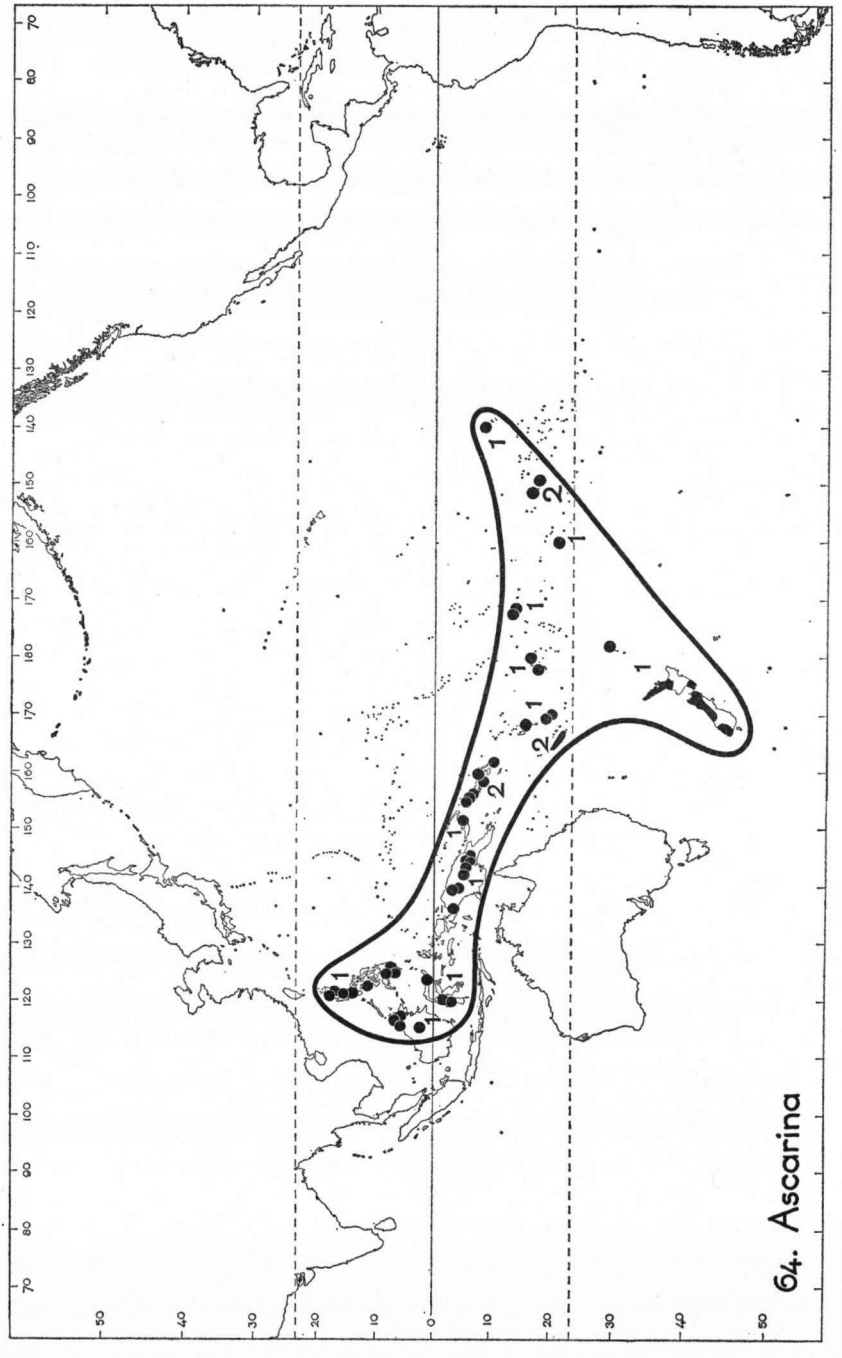
Habit: Shrubs or trees up to c. 25 m tall.

Habitat & Ecology: All species are dioecious. In Malesia they occur scattered in the montane rain-forest between 1000—3300 m altitude. In New Zealand *Ascarina* is locally common in lowland and montane rain-forest. In the other Pacific islands *Ascarina* is also locally rather common at medium altitudes (200—1600 m).

Dispersal: The fruit is a small, ovoid, green or whitish, inconspicuous drupe (1—3 mm in diam.) provided with a thin succulent exocarp. Often numerous fruits are borne on the branched spikes. According to Oliver, cited by Ridley (1930), they are eaten by birds.

Sources: B. Seemann, Fl. Vit. (1868) 258; E. D. Merrill, En. Philip. Fl. Pl. *2* (1923) 22; H. N. Ridley, Dispersal of Plants (1930) 465; G. P. Wilder, B. P. Bish. Mus. Bull. *86* (1931) 39; J. W. Moore, ibid. *102* (1933) 26; E. Christophersen, ibid. *128* (1935) 70; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 17; Fl. Nouv. Caléd. (1948) 91; B. G. L. Swamy, Proc. Nat. Inst. Sc. India *19* (1953) 371—388, 1 map; H. H. Allan, Fl. New Zeal. *1* (1961) 172—173. Dr. P. Wardle (Christchurch, New Zealand) has kindly mapped the genus for New Zealand. Collections in the Rijksherbarium Leyden.

M. M. J. VAN BALGOOY.


64. Ascarina

65. **Donatia** Forst.

Name: Donatia J. R. & G. Forst., Char. Gen. Pl. (1776) 9, t. 5.

Family: *Stylidiaceae.*

Taxonomy: Some authors exclude the genus from the *Stylidiaceae* and consider it to belong to a separate family: *Donatiaceae.* According to Hutchinson (1959) it is closer allied to *Saxifragaceae* than to *Stylidiaceae.* There are 2 species, one in Antarctic South America, the other in New Zealand and Tasmania.

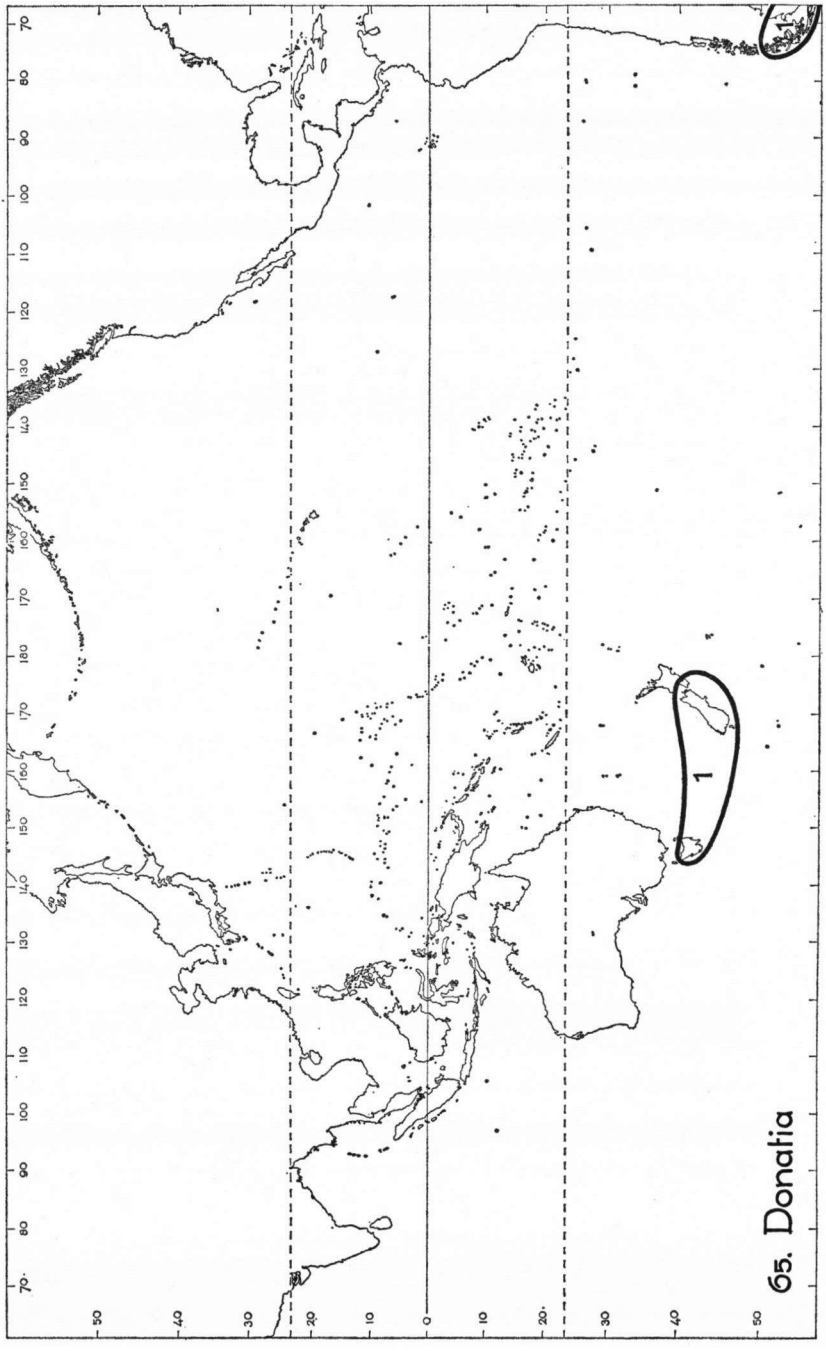
Habit: Small, densely tufted herbaceous perennials.

Habitat & Ecology: Small, moss-like plants of montane and subalpine sites, in bogs and low herbaceous vegetation. In the southernmost part of New Zealand descending to near sea-level.

Fruit: An indehiscent capsule c. 5 mm long, containing a few small seeds.

Sources: L. Rodway, Tasm. Fl. (1903) 100; J. Hutchinson, Fam. Fl. Pl. ed. 2, *1* (1959) 462—465, 1 map; H. H. Allan, Fl. New Zeal. *1* (1961) 794.

M. M. J. VAN BALGOOY.


65. Donatia
1
1

66. **Pisonia grandis** R. Br.

Name: Pisonia grandis R. Br., Prod. Fl. Nov. Holl. *1* (1810) 422.

Family: *Nyctaginaceae.*

Synonyms: *P. alba* Span., *P. sylvestris* Teysm. & Binn., *P. viscosa* Balf. f. For other synonyms see Airy Shaw (1952), and Stemmerik (1964, 464).

Taxonomy: *P. grandis* is readily distinguished in fruit (see description below), but male plants and sterile material are hard to identify. A white-leaved cultivar (described as *P. alba*) with edible leaves is cultivated in Malesia; the localities of this have not been indicated on the map. Two other species, *P. umbellifera* (J. R. & G. Forst.) Seem. and *P. brunoniana* Endl., are widespread in the Malesian and Pacific region. The genus is found throughout the tropics.

Habit: Soft-wooded dioecious (rarely monoecious) trees, often growing to considerable height, with large spreading crown.

Habitat & Ecology: This species is almost exclusively found on uninhabited coral islets or atolls, where it often grows gregariously and forms the bulk of the vegetation. These islands often serve as roosting places or nesting sites of large sea-birds, pigeons etc. Various authors, e.g. Christophersen (1927, 61) and Airy Shaw (1952, 92) have suggested that the trees require a coral or limestone soil associated with bird guano. Moreover, the birds are responsible for dispersal of the fruits (see below). If for some reason such bird-resorts are destroyed (e.g. by man), the plants are unable to maintain themselves in the long run. According to St.John (1951, 226) the species may grow well in upland stations and does not need a coral soil. But this appears to apply to the cultivated white form alluded to above, or to represent remnants of a formerly coastal vegetation. Airy Shaw (1952, 95) states: "it may be that there exist in some of the Pacific islands local races that do not require guano .... or that obtain their phosphates in other ways."

Dispersal: The fruits borne on cymes, are c. 1 cm long and a few mm broad and are provided with glandular pectinate ribs; at maturity they become very sticky. Sea-birds (herons, gannets, terns, and frigate birds) and pigeons carry the fruits from island to island. Dr. Fosberg observed a noddy (*Anous*) that was "literally plastered" with fruits of this species (Atoll Res. Bull. *23*, 1953, 4). Smaller birds are known to get killed occasionally if they become entangled in the viscid fruits.

Map: Dots indicate records verified by the authors mentioned below. Circles indicate literature records.

Sources: E. Christophersen, B. P. Bish. Mus. Bull. *44* (1927); H. St.John, Webbia *8* (1951) 225—228, map; H. K. Airy Shaw, Kew Bull. (1952) 87—97, map. J. F. Stemmerik, Fl. Mal. I, *6*, (1964) 450—468 map.

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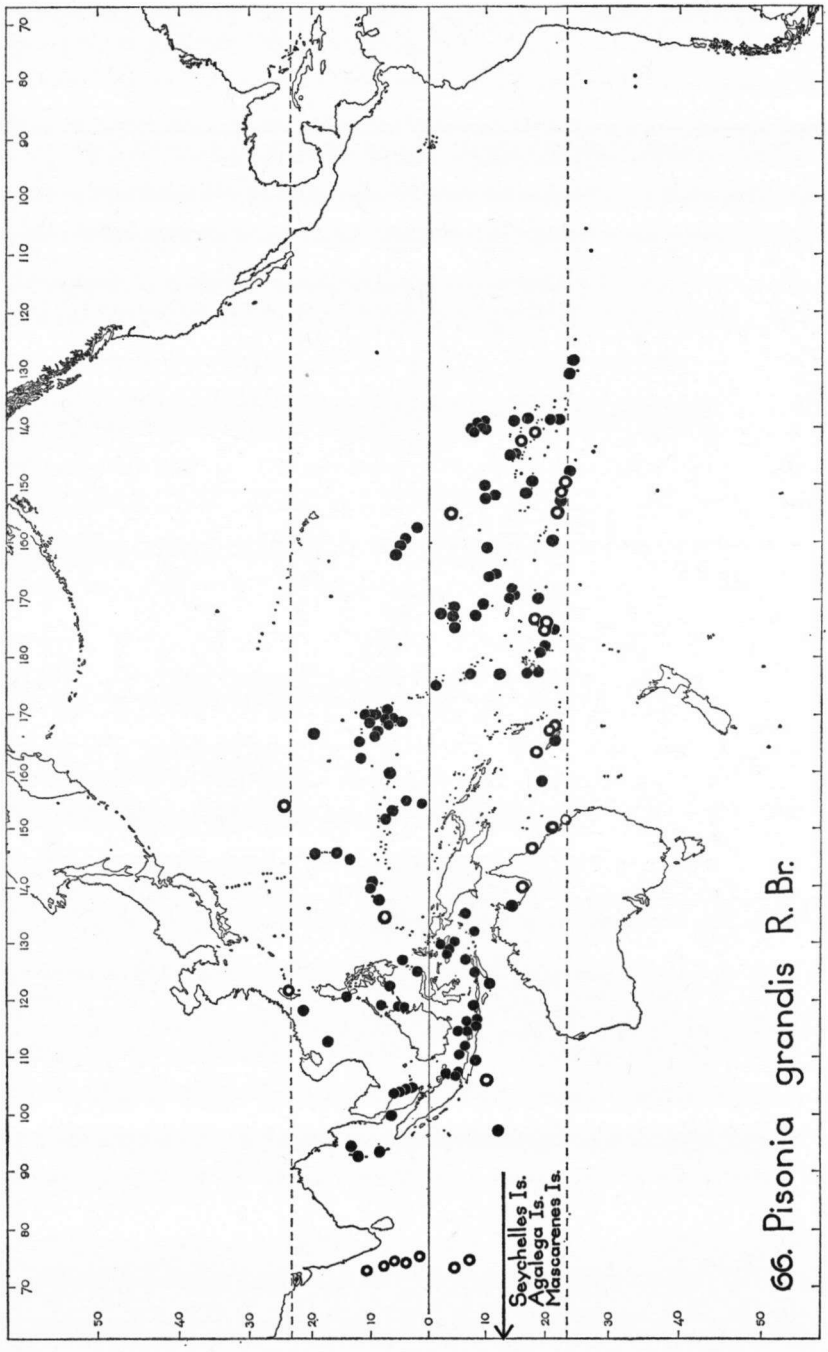
66. Pisonia grandis R. Br.
Seychelles Is.
Agalega Is.
Mascarenes Is.

67. Coriaria L.

Name: **Coriaria** L., Gen. Pl. ed. 5 (1754) 459.

Family: *Coriariaceae.*

Notes: This is the only genus of a taxonomically isolated family. Its remarkably disjunct distribution suggests a relict area. There is much uncertainty regarding the delimitation of the species due to the great variability and ease with which hybridization takes place. R.D'O. Good (1930) distinguishes three species groups, of which one is represented in the Mediterranean region and East Asia including also the Philippines, one is confined to continental SE. Asia, and the third occurs in New Guinea, several South Pacific islands including also New Zealand and in South and Central America.

Habit: Shrubs or small trees.

Habitat & Ecology: Plants of subtemperate to subtropical climatic conditions. In the tropical part of the range *Coriaria* is found in the rain-forest at medium to high altitudes: in the Philippines 1400—2000 m, in New Guinea 600—3000 m, in the Pacific islands above 400 m. In the Pacific islands *Coriaria* is rather rare except in New Zealand and surrounding islands (Kermadec and Chatham Islands) where they occur commonly in coastal and montane rain-forest and open shrubland.

Dispersal: The fruit is a capsule consisting of 5—8 cocci each containing one seed. The persisting petals cover the cocci and become fleshy, purple-blackish to red. Ridley (1930) stated that they are a favourite food of many species of birds.

Sources: R. D'O. Good, New Phytol. *29* (1930) 170—198, map; H. N. Ridley, Dispersal of Plants (1930) 423, 465, 476, 487, 501; W. R. B. Oliver, Rec. Dominion Mus. *1* (1942) 21—43; H. Hara & H. Kanai, Distribution Maps of Flow. Pl. in Japan *1* (1958) map 24; J. Hutchinson, Fam. Fl. Pl. ed. 2, *1* (1959) 147—148, 1 map. Personal information by Prof. Dr. C. G. G. J. van Steenis. Thanks are due to Dr. A. Cronquist (New York) and Dr. J. J. Wurdack (Washington, D.C.) for providing the American localities, and to Dr. F. M. Jarrett (Kew), Dr. S. K. Mukherjee (Calcutta) and Dr. H. Santapau (Calcutta) for the localities in continental Asia.

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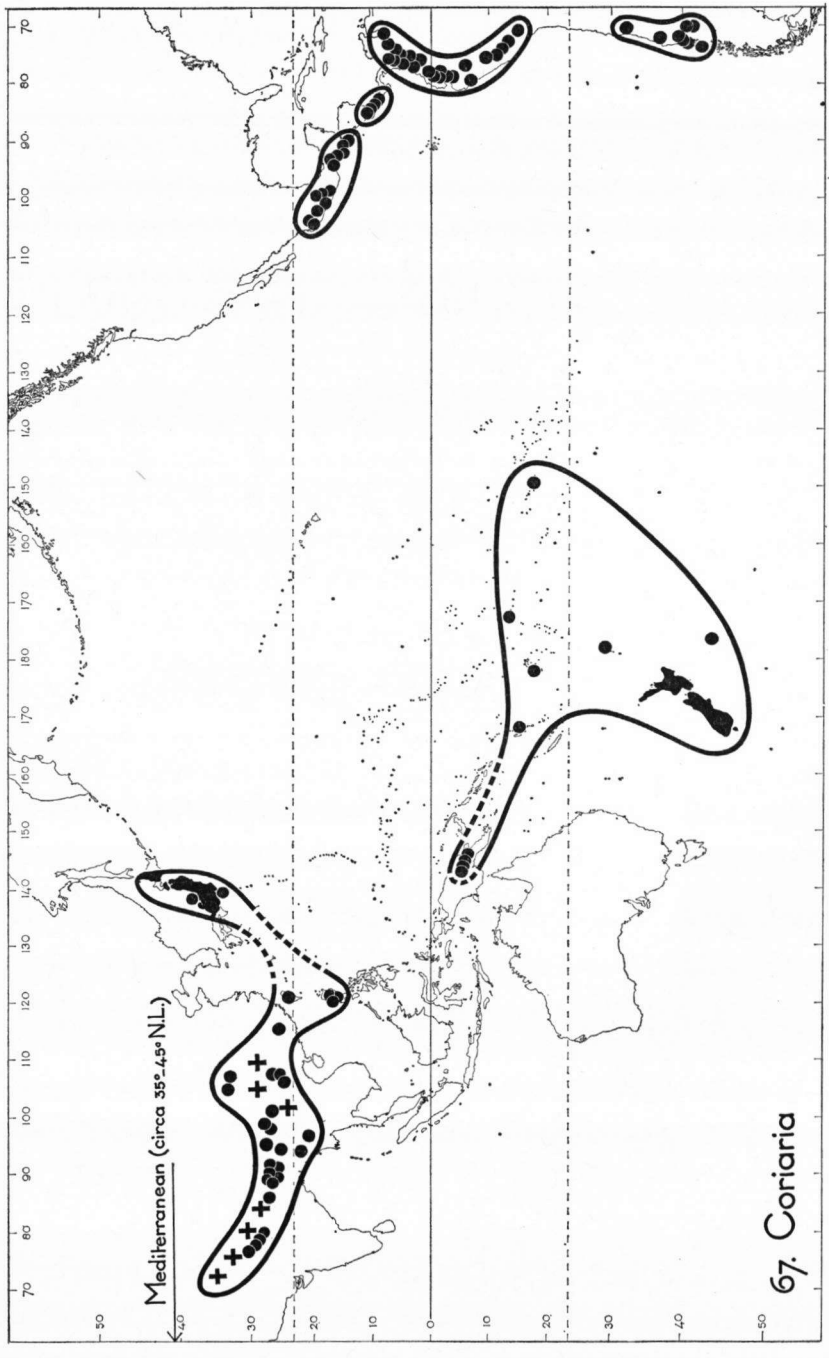
Mediterranean (circa 35°-45° N.L.)
67. Coriaria

68. **Picrasma** Bl.

Name: Picrasma Bl., Bijdr. 5 (1825) 247.

Family: *Simaroubaceae.*

Synonyms: *Nima* Ham. ex Juss., *Aeschrion* Vell.

Notes: In the New World the genus ranges from Mexico throughout the Greater and Lesser Antilles, Brazil (Rio de Janeiro), and Argentina (Misiones) to 20—30° SL. Six species are recognized in the Americas by Cronquist (1944), who mentions an undescribed species from Ecuador (1944, 141). In Asia and Malesia two species occur, of which one, *P. javanica* Bl., extends to the Solomons. The generic range is typically disjunct transpacific.

Habit: Shrubs or trees.

Habitat & Ecology: The species are monoecious or (incompletely) dioecious. They are of scattered occurrence in the rain-forest at low to medium altitudes. According to Prof. Hara (in litt.) *P. quassioides* (Don) Benn. is found in Japan "almost everywhere except on the high mountains"; in the Himalayas it is said to ascend to c. 2500 m.

Dispersal: The fruit consists of 1—5 globose or subglobose drupes (0.5—1 cm in diam.), with a thin succulent pericarp and a hard endocarp. The colour may be green, red, blue or black in the different species. No observations on dispersal agents are recorded in literature.

Map: Dots indicate localities verified by Mr. H. P. Nooteboom; circles are localities recorded in literature; crosses represent unlocalized records. The area of *P. quassioides* is indicated by q, the area of *P. javanica* by j.

Sources: A. Rehder, J. Arn. Arb. 7 (1926) 187; R. Kanehira, Formosan Trees ed. 2 (1936) 322; A. Cronquist, Brittonia 5 (1944) 139—143; H. P. Nooteboom, Fl. Mal. I, 6 (1962) 212—214, fig. 16 (map). Prof. H. Hara kindly provided data from Japan and Mr. Nooteboom located the Asiatic and Malesian records.

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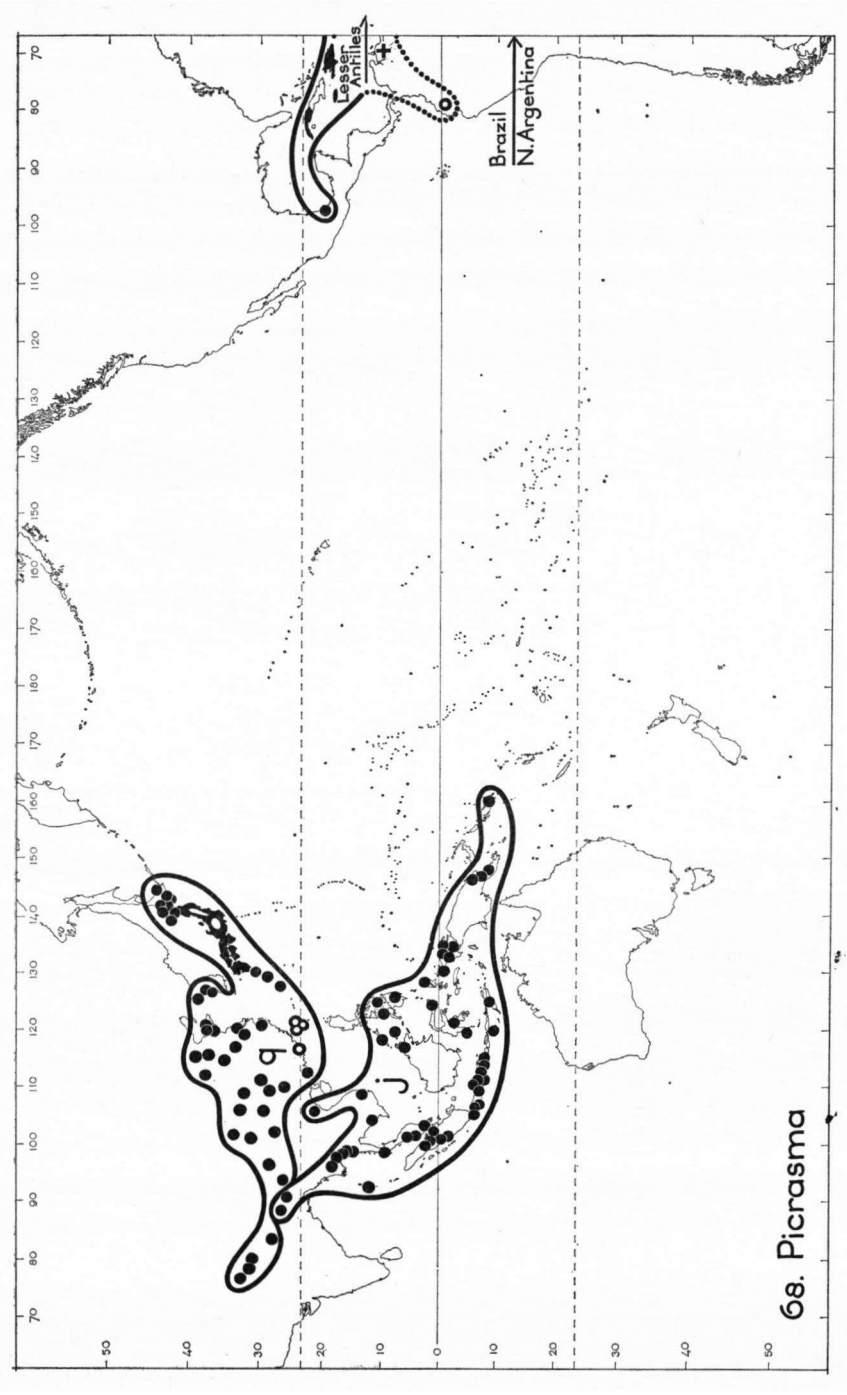
Lesser Antilles
Brazil
N.Argentina
b
j
68. Picrasma

69. **Eucryphia** Cav.

Name: Eucryphia Cav., Icon. *4* (1797) 48, t. 372.

Family: *Eucryphiaceae.*

Notes: A small genus with two species in Chile, one species in SE. Australia, and according to Bausch two species in Tasmania; other authors consider the latter two as conspecific.

Habit: Evergreen shrubs or trees. The Chilean *E. cordifolia* Cav. is said to attain a height of 50 m or more.

Habitat: Species of *Eucryphia* are limited to subtropical and temperate rain-forests, in coastal to montane sites in Tasmania and Australia, and from near sea-level up to c. 3500 m in Chile.

Ecology: According to Ewart (1930) the Australian *E. moorei* F. v. M. ".... prefers rich moist soils and does not thrive in very cold, dry or exposed localities." Skottsberg (1916) has found *E. cordifolia* as a characteristic element of the rain-forest in many parts of Chile between 36°—44° S. In Chiloë I. he found this species abundantly in the coastal districts where it forms the upper stage of the forest together with *Aextoxicum punctatum*, *Euph.*, *Drimys winteri*, etc. In the inland forests it dominates the upper stage together with *Nothofagus dombeyi* in the so-called *Eucryphia-Myrceugenia*-association. The species was also found as a rather rare element of the glacier vegetation, where it has a dwarf-shrubby habit. The large, white and fragrant flowers are produced in abundance.

Fruit: The fruit is a 4—14-locular, oblong, septicidally dehiscing, leathery or woody capsule, 1—2 by 0.5—1 cm. Each cell contains 1—5 ovate, winged seeds 3—8 mm long.

Sources: L. Rodway, Tasm. Fl. (1903) 45; C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. n.s. *56*, n. 5 (1916) 26, 27, 33—35, 260; A. J. Ewart, Fl. Vict. (1930) 770—771; J. Bausch, Kew Bull. *8* (1938) 317—349; J. Hutchinson, Fam. Fl. Pl. ed. 2, *1* (1959) 300—301, 1 map.

70. **Paracryphia** Baker

Name: Paracryphia Baker, J. Linn. Soc. Bot. *45* (1921) 306.

Family: *Eucryphiaceae.*

Notes: A genus of one or perhaps two species restricted to New Caledonia. Bausch (1938) and others excluded the genus from the *Eucryphiaceae* and tentatively referred it to *Winteraceae*, but it is maintained in the *Eucryphiaceae* by other authors. According to Mr. W. Vink who is engaged in a revision of the *Winteraceae* it certainly does not belong to this family. *Paracryphia* is one of a number of „relict" genera in New Caledonia. Other examples are *Canacomyrica*, *Myric.*, and *Oceanopapaver*, *Capparid.*

Habit: Shrubs or small trees up to 8 m tall.

Habitat: Known from few localities only, at altitudes between 500—1650 m, obviously in the rain-forest but judging from the few collections a scarce plant.

Fruit: The fruit is a 11—15-locular septicidally dehiscing capsule, 7—10 mm long, with 1—2 seeds in each cell. The winged seeds are elongate, flat, 1—1.5 mm long.

Sources: J. Bausch, Kew Bull. *8* (1938) 336—337; C. G. G. J. van Steenis, Bull. Bot. Gard. Btzg III, *18* (1950) 459—460. Collections in the Rijksherbarium Leyden.

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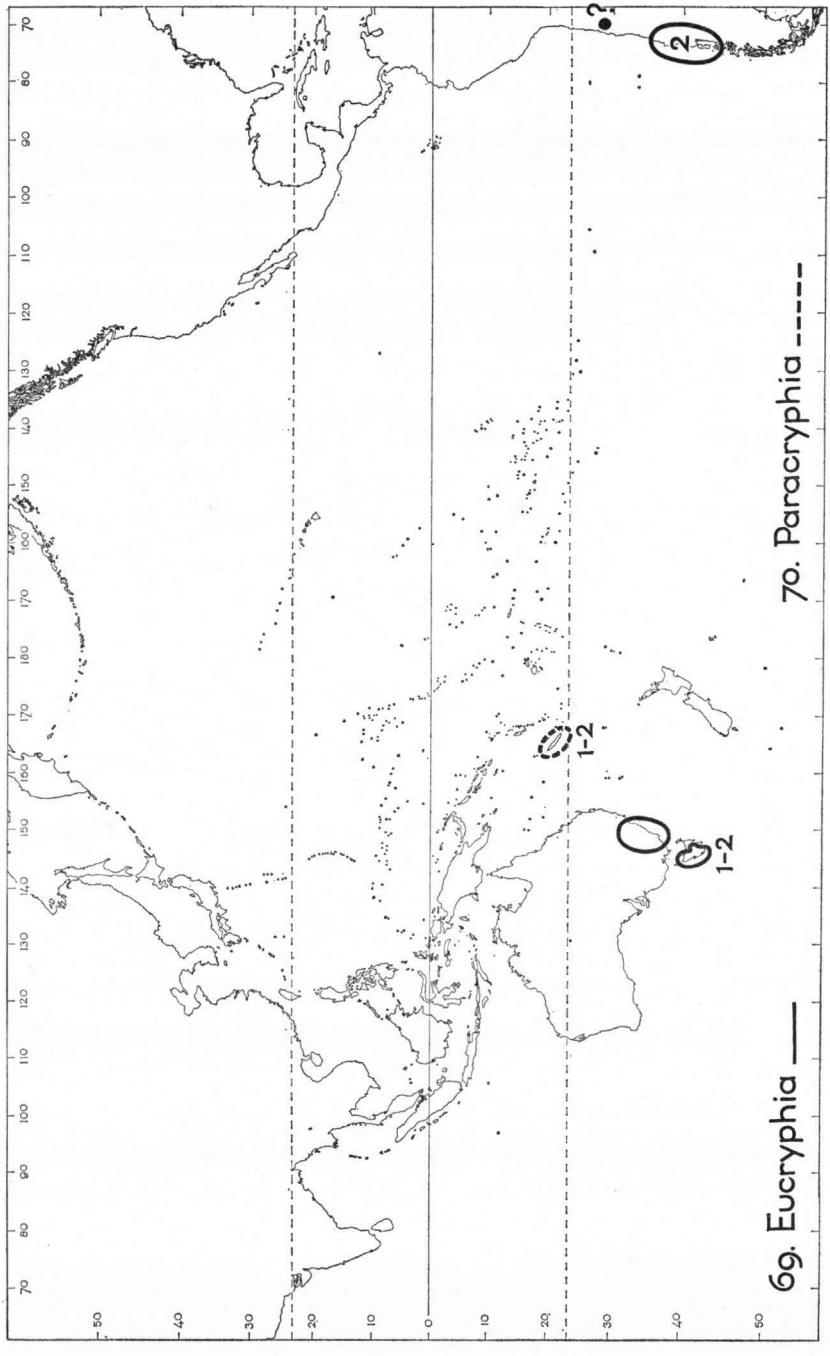
69. Eucryphia ——
70. Paracryphia - - - -
1-2
1-2
2-5
?

71. Cyrtandra Forst.

Name: **Cyrtandra** J. R. & G. Forst., Char. Gen. Pl. (1776) 5.

Family: *Gesneriaceae.*

Notes: A large genus of which c. 500 species have been described. The majority of the species is found in Malesia and the Pacific high tropical islands. Only one species each have been described from Siam, South China, Formosa (Botel Tobago I.), and Queensland. Remarkably few species have been described from the Bismarcks, Solomons, and New Hebrides, but this probably is partly due to lack of collecting and publication. Most of the species are restricted endemics. Only in the Pacific localities have been indicated on the map; the number of species of each island or island-group has been given, mainly after St. John (1957). But the genus is in need of an overall revision, so that the numbers of species may change considerably in future.

Habit: Perennial, terrestrial, rarely epiphytic herbs to soft-wooded shrubs or treelets up to c. 5 m tall.

Habitat & Ecology: Wherever wet rain-forest exists, within the range of the genus, *Cyrtandras* commonly occur and may form a substantial part of the undergrowth locally. They are found from the lowlands up to 3000 m and more.

Dispersal: The fruit is an ovoid, elliptic, oblong or spindle-shaped berry (0.5—5 cm long) containing numerous minute seeds, which have an indistinctly reticulated testa. Little is known about dispersal. Guppy stated that in Hawaii fruits of several *Cyrtandra* species may float for a few days (cf. Ridley, 1930). St. John (1957) suggests that they might be eaten by birds and mammals.

Sources: C. B. Clarke, in DC. Mon. Phan. 5 (1883) 201—287; T. Hosokawa, Trans. Nat. Hist. Soc. Form. *25* (1935) 410—413, 1 map; A. C. Smith, J. Arn. Arb. *34* (1953) 37—51; H. St. John, Occ. Pap. B. P. Bish. Mus. *21* (1955) 275—283; Proc. 8th Pac. Sc. Congr. *4* (1957) 217. Various Floras and collections in the Rijksherbarium Leyden.

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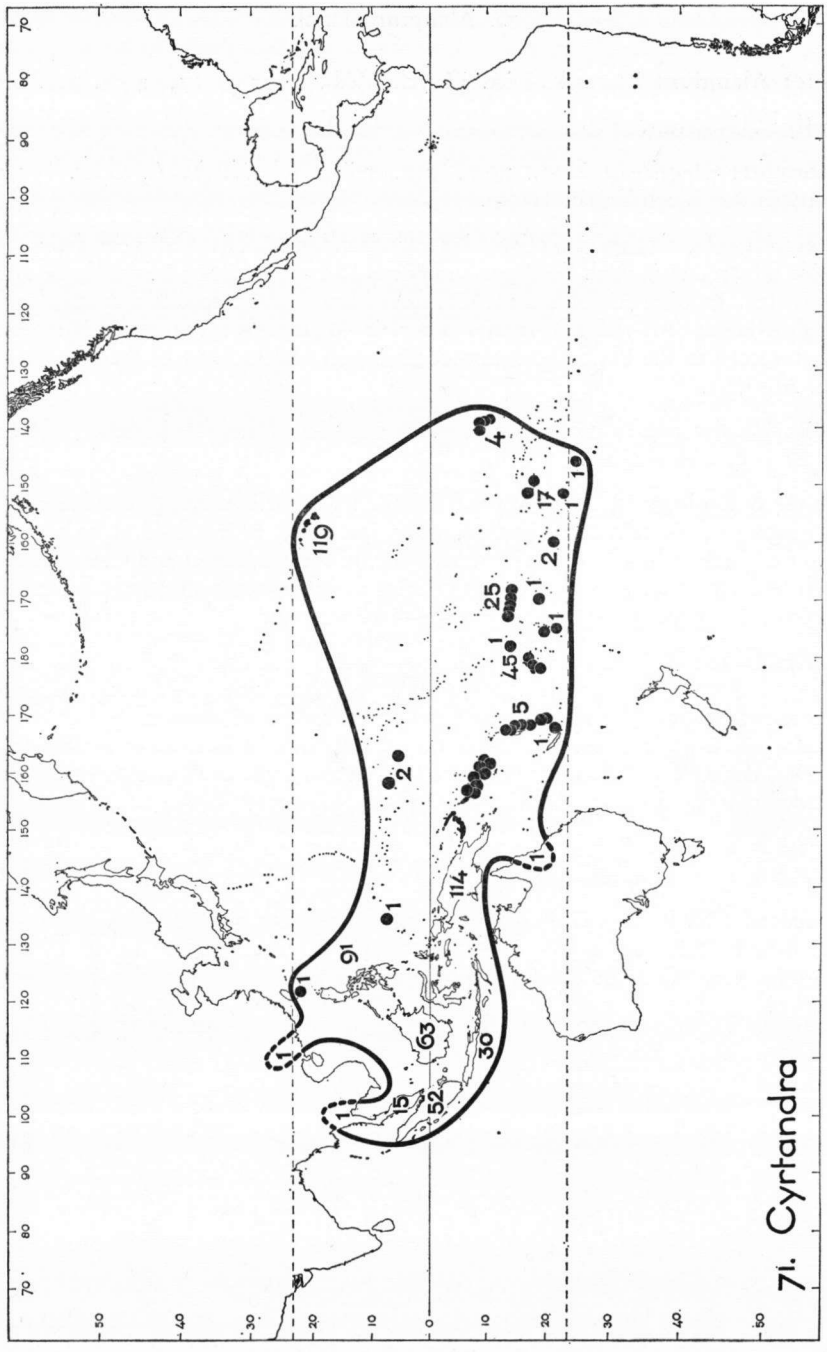
71. Cyrtandra

72. Alangium Lamk

Name: Alangium Lamarck, Dict. Encycl. Méth. *1* (1783) 174, nom. gen. cons.

Family: *Alangiaceae.*

Synonyms: *Angolamia* Scop., nom. gen. rejic., *Rhytidandra* A. Gray. For other synonyms see Bloembergen (1939).

Notes: A genus of 19 species, of which 14 are found in Malesia, 8 of these do not occur outside this area. Asia (incl. also Japan and Formosa) has 9 species, 3 of which are confined to this area. Tropical Africa and the Comores Islands have 2 species that are also found in Indo-Malesia. An endemic species occurs in Madagascar. The genus is represented with 2 species in the Pacific both also occurring in Malesia; one of these is also found in E. Australia.

Habit: Usually trees, sometimes shrubs. One species, *A. scandens* Bloemb., of Sumatra and Borneo, is a climber.

Habitat & Ecology: The majority of the species occur in the tropics and are common components of the rain-forest and secondary growths, from sea-level up to 2000 m, but some species extend to the temperate zone. In the Himalayas and China *A. alpinum* Smith & Cave and *A. chinense* (Lour.) Harms ascend to 3000 m altitude. The Pacific species occur in the rain-forest between 0—800 m altitude.

Dispersal: The fruit is a globose, ellipsoid or ovoid, often more or less flattened drupe (c. 0.5—3.5 cm long and c. 0.5—2 cm broad) containing 1 or 2 seeds; the mesocarp is succulent or spongy, the endocarp is woody. The colour is green, but according to the label on a sheet of *A. javanicum* (Bl.) Wang. from Rendova (Solomon Islands), coll. Walker & White B.S.I.P. no. 167, Oct. 1, 1945, the fruit is red. Ridley (1930) recorded that the fruits are eaten by squirrels and tree-shrews (*Tupaia*).

Map: For each island, island group, or partial area the number of species is given; localities are only indicated in the Pacific.

Sources: H. N. Ridley, Dispersal of Plants (1930) 350, 376; S. Bloembergen, Bull. Jard. Bot. Btzg III, *16* (1939) 139—235, 4 maps; R. Capuron, Adansonia II, *2* (1962) 283—284. Collections in the Rijksherbarium Leyden.

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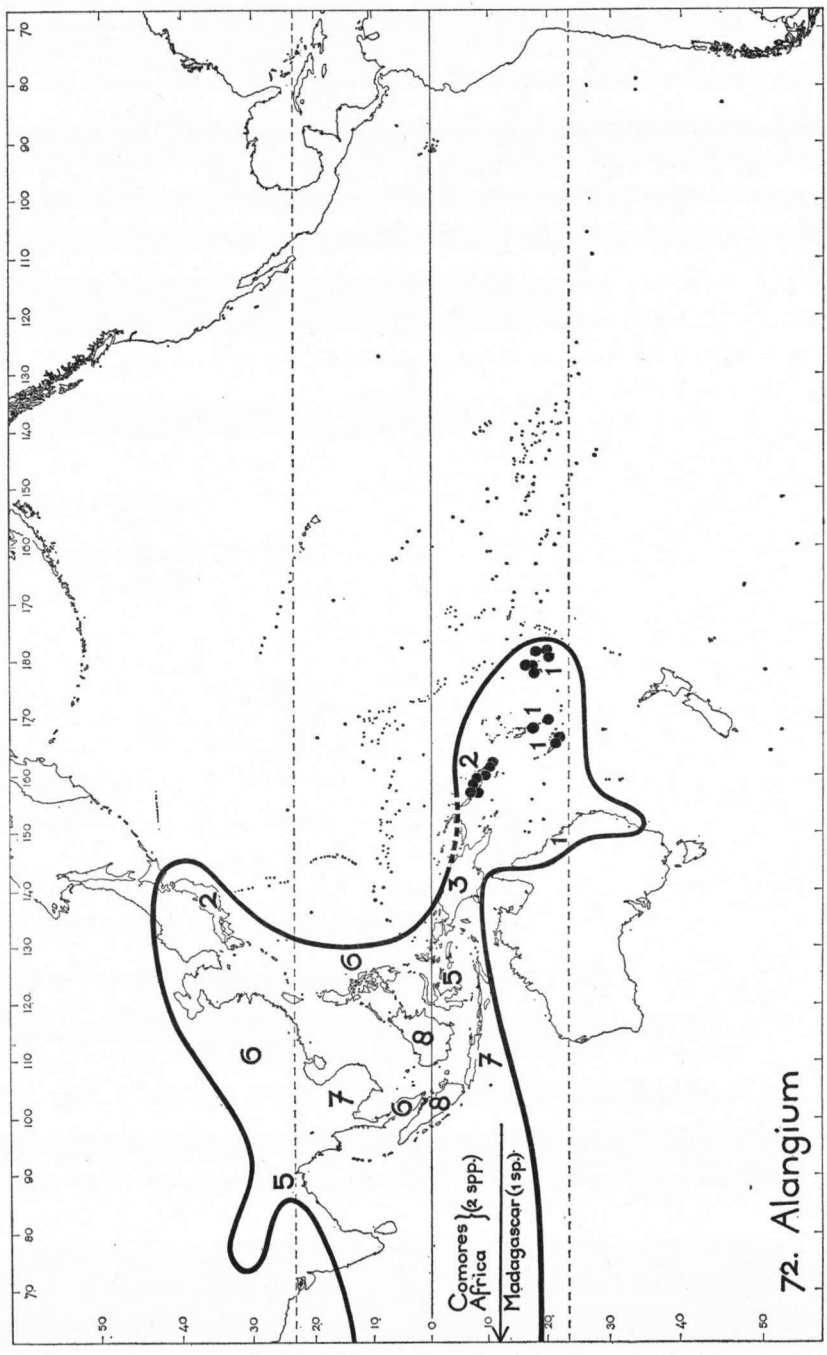
72. Alangium
Comores (2 spp.)
Africa
Madagascar (1 sp.)

73. **Distylium** Sieb. & Zucc.

Name: Distylium Sieb. & Zucc., Fl. Jap. *1* (1835) 178, t. 94.

Synonym: *Saxifragites* Gagnep.

Family: *Hamamelidaceae.*

Taxonomy and distribution: The area of this genus is one of the many examples of amphi-transpacific distribution. Walker (1944) distinguished 12 species; 9 species are found in East Asia, from the Khasya Hills in Assam (India) to Japan and the Bonin Islands, one species is found in montane-tropical Malesia, whereas there are 2 species in Central America (Guatemala and Honduras) in the mountains. The genus is allied to *Sycopsis* Oliv. (Indo-Malesia) and *Sinowilsonia* Hemsl. (China).

Habit: Usually shrubs to medium-sized trees, but trees of *D. stellare* Kuntze of Malesia are reported to attain a height of 45 m.

Habitat & Ecology: The species of this genus are polygamous-monoecious. Many of the East Asiatic species are of common occurrence in lowland forest and along streams. The Malesian species occurs more scattered in the mountains between 1000—2700 m. The two Central American species are known from very few localities, also only at montane altitude, 950—1350 m. The thermo-ecology of the genus is obviously subtropical to warm-temperate.

Dispersal: The fruit is an ovoid or subglobose to ellipsoid woody capsule (0.7—1.5 cm long) dehiscing with 2 or 4 valves. Each fruit contains 2 elongate to ovoid seeds (0.5—1 cm) with a hard shining testa.

Sources: E. H. Walker, J. Arn. Arb. *25* (1944) 322—335; W. Vink, Fl. Mal. I, 5 (1957) 369—370; H. K. Airy Shaw, Kew Bull. *17* (1963) 263—264. Collections in the Rijksherbarium Leyden.

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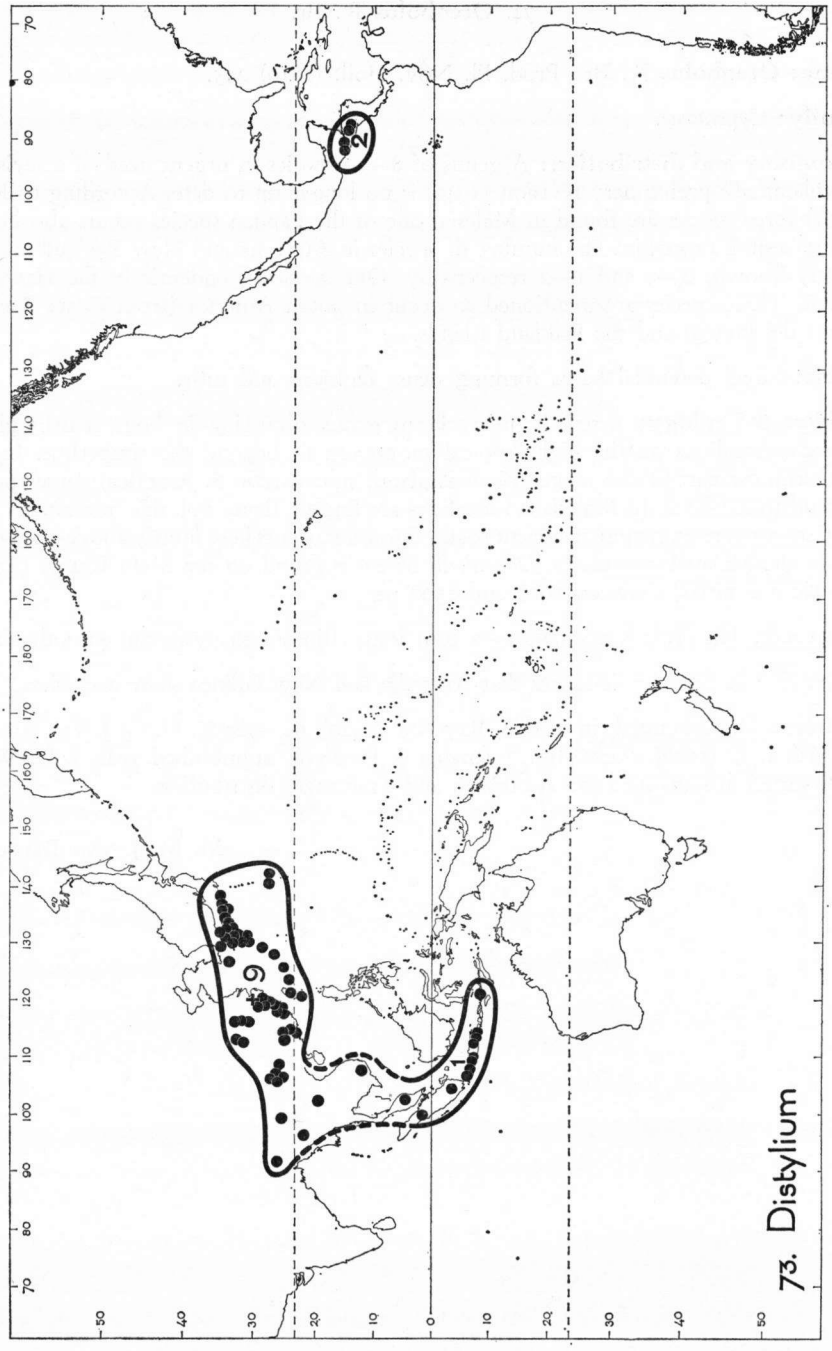
73. Distylium
1
2
6

74. **Oreobolus** R. Br.

Name: Oreobolus R. Br., Prod. Fl. Nov. Holl. (1810) 235.

Family: *Cyperaceae.*

Taxonomy and distribution: A genus of 8—10 species in urgent need of a revision, as Kükenthal's preliminary revision (1940) is no longer up to date. According to Kern (1961) three species are found in Malesia, one of the Papuan species occurs also in SE. Australia and Tasmania. The number of species in Australia and New Zealand are not exactiy known, 2—3 and 1—2 respectively. One species is endemic in the Hawaiian Islands. Three species are mentioned to occur in South America (from Costa Rica to Tierra del Fuego) and the Falkland Islands.

Habit: Small perennial herbs forming dense cushions and tufts.

Habitat & Ecology: A strictly microtherm genus, occurring in bogs, marshy places or rocky localities on the high tropical mountains to beyond the timberline. In the southernmost part of the range (New Zealand, subantarctic S. America) some species descend to sea-level. In Malesia no localities are known from volcanic mountains and most stations are on ranges of ancient rock; *Oreobolus* occurs here mostly above c. 2500 m, but in the Malay Peninsula *O. kükenthalii* Steen. is found on the Main Range (Tahan and Kerbau peaks) between 1600 and 2300 m.

Dispersal: The fruit is a small, 1—2 mm long ellipsoid to pyriform, smooth nut.

Map: The broken line indicates that Australia and New Guinea share a species.

Sources: G. Kükenthal, in Fedde, Rep. *48* (1940) 60—72; C. G. G. J. van Steenis, Fl. Mal. I, *5* (1957) cxciv, fig. 7 (map); J. H. Kern, unpublished. Mr. J. H. Willis Melbourne) has mapped the Australian and Tasmanian distribution.

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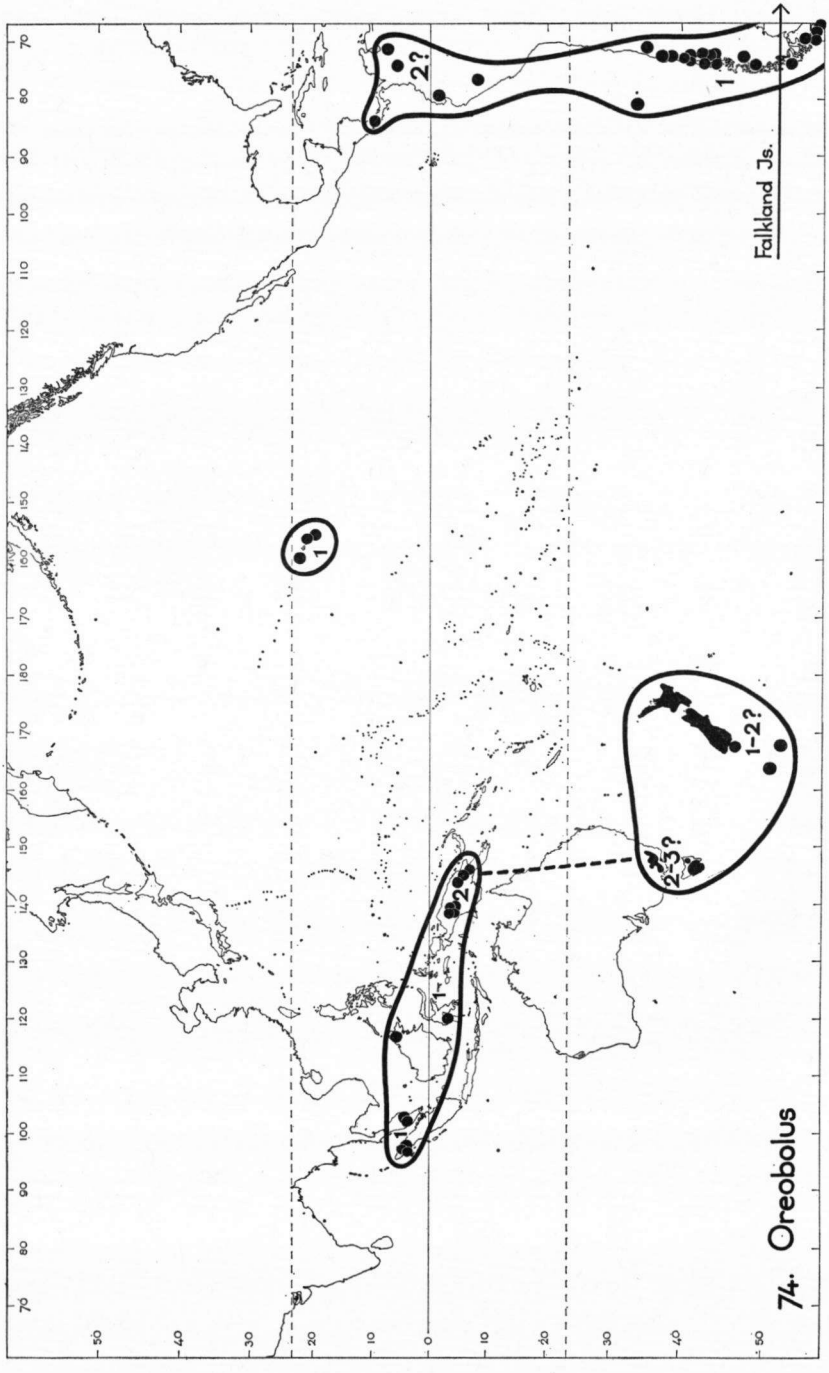
74. Oreobolus
Falkland Js.
1
2?
1
1-2?
2-3?
1-2
1

75. Santalum L.

Name: Santalum Linné, Gen. Pl. ed. 5 (1754) 165.

Family: *Santalaceae.*

Taxonomy and distribution: A genus of 19 species divided into the following sections: Sect. *Santalum*: 1 species in E. Java, Lesser Sunda Islands and Celebes (*S. album* L., introduced into many countries), 1 species in the Bonin Islands, 3 in Australia, 2 in New Guinea, 1 in New Caledonia, Loyalties and New Hebrides, and 1 in Fiji and Tonga. Sect. *Solenantha*: 4 species confined to the Hawaiian Islands (Kauai to Maui). Sect. *Hawaiiensia*: 3 Hawaiian species, from Laysan to Hawaii. Sect. *Polynesica*: 1 species in the Marquesas, Society and Tubuai Islands (incl. also Rapa), 1 peculiar to Henderson I. and 1 (now extinct) endemic in the Juan Fernandez Islands. The latter species was considered to belong to *Mida* (otherwise only known from New Zealand) by Sprague and Summerhayes (1927), but this is rejected by several authors, including Skottsberg (1929). According to Dr. H. U. Stauffer (personal information) cytological data support the distinction of *Mida* as a separate genus, and are in favour of uniting the extra-tropical Australian genus *Eucarya* (3—4 species) with *Santalum*, as suggested by other authors on morphological grounds. The genus was under revision by Dr. Stauffer, who expected that the number of species would undergo another reduction.

Habit: Shrubs or small trees. *S. album* is recorded to attain a height of c. 30 m occasionally.

Habitat & Ecology: *Santalums* are semiparasitic on the roots of other trees, in lowland to montane rain-forest, often in arid or even semidesert areas. Most species are confined to the tropics, but some penetrate into the subtropics and in Hawaii some species ascend to c. 3000 m.

Dispersal: The fruit is an ovoid, ellipsoid or turbinate drupe, red, purple or black when ripe, 0.5—2 cm long. The exocarp is thin fleshy, the endocarp hard. In some species the fruits are reported to be eaten by birds (Ridley, 1930).

Map: The 4 sections of *Santalum* are delineated on the map as follows: sect. *Santalum* ————, sect. *Solenantha* ....., sect. *Hawaiiensia* ~~~~~, sect. *Polynesica* —.—.—.—.

Sources: C. Skottsberg, Nat. Hist. Juan Fern. *2* (1922) 117; B. P. Bish. Mus. Bull. *43* (1927) 40—64; Proc. 4th Pac. Sc. Congr. *3* (1929) 435—442, 1 map; Act. Hort. Gothob. *5* (1929) 135—145; ibid. *9* (1934) 185—190; Occ. Pap. B. P. Bish. Mus. *14* (1938) 32—39; Proc. 6th Pac. Sc. Congr. *4* (1939) 692 (map); Act. Hort. Gothob. *15* (1944) 356—362; T. A. Sprague & V. S. Summerhayes, Kew Bull. *5* (1927) 193—199, 1 map; H. N. Ridley, Dispersal of Plants (1930) 459, 478, 501, 511; A. U. Däniker, Mitt. Bot. Mus. Univ. Zürich *142* (1932) 140—141; J. W. Moore, B. P. Bish. Mus. Bull. *102* (1933) 27—28; R. Pilger, in E. & P. Pfl. Fam. ed. 2, *16b* (1935) 81—82, 84; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 61—66; F. E. Egler, Occ. Pap. B. P. Bish. Mus. *14* (1939) 349—357; T. Tuyama, J. Jap. Bot. *15* (1939) 697—712, 1 map; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 20; T. G. Yuncker, B. P. Bish. Mus. Bull. *220* (1959) 104. Personal information by the late Dr. H. U. Stauffer (University of Zürich).

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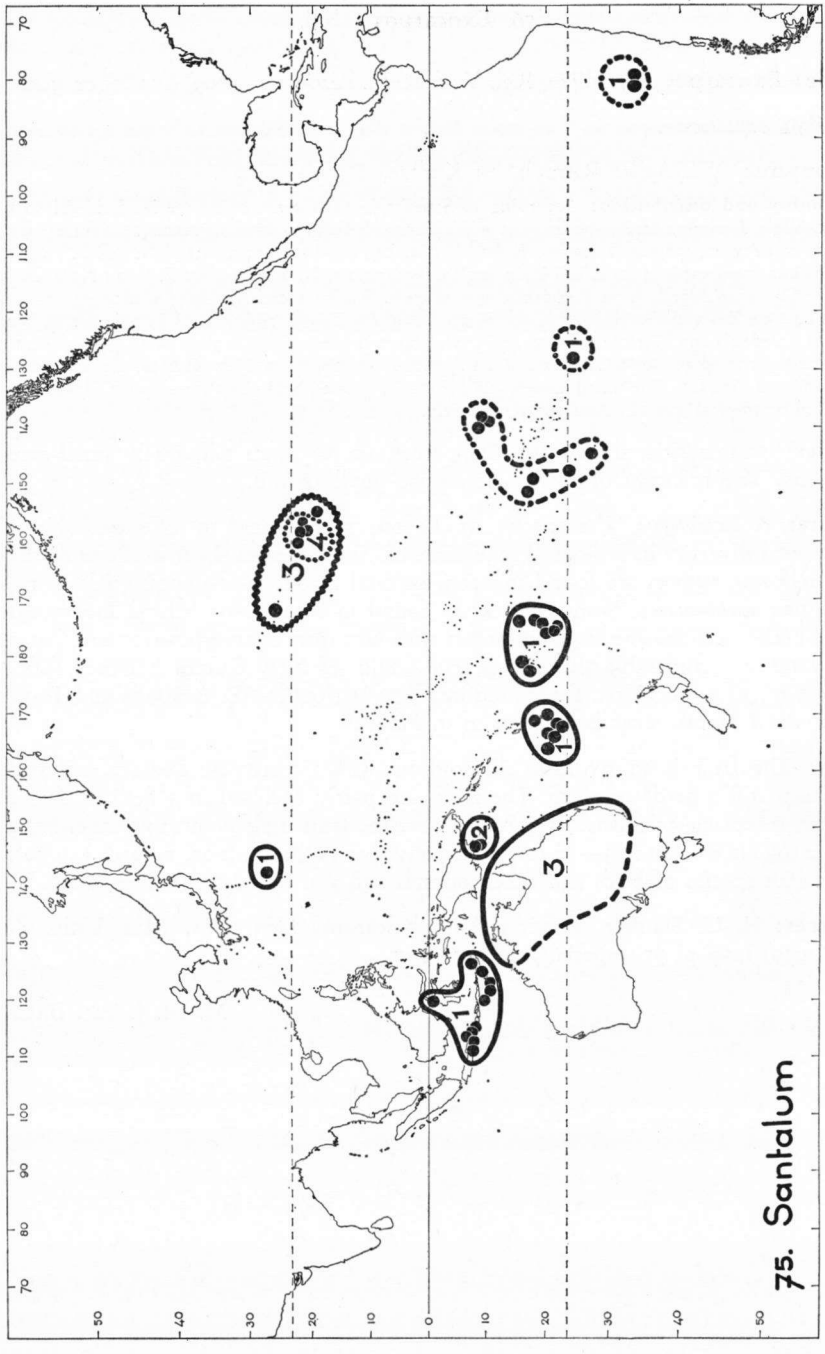
75. Santalum

76. **Exocarpos** Labill.

Name: Exocarpos Billardière, Rel. Voy. Rech. Pérouse *1* (1799) 155, nom. gen. cons.

Family: *Santalaceae.*

Synonyms: *Xylophyllos* Rumph. ex Kuntze, *Sarcopus* Gagn.

Taxonomy and distribution: According to Stauffer (1959) a genus of 26 species divided into 3 subgenera. Subg. *Exocarpos* has 19 species, 9 of which occur in Australia (and Tasmania). Of these 8 are confined to this region, whereas 1 species, *E. latifolius* R. Br., is widely spread from N. and E. Australia to East Malesia (westwards as far as and including the Philippines, N. Borneo, and E. Java). New Caledonia and the Hawaiian Islands have 3 endemic species each. Finally 1 endemic species each occurs in Lord Howe I., New Zealand (South I.), Fiji, and Rapa. Subg. *Phyllodanthos* consists of a single species confined to New Caledonia and Norfolk I. Subg. *Xylophyllos* has 6 species, of which 3 are New Guinean endemics, and 2 are restricted to New Caledonia. One species is known from New Guinea, Ceram, Sumbawa, Palawan, and Annam. The allied genera *Anthobolus* (3 species) and the monotypic *Omphacomeria* are restricted to tropical and SE. Australia respectively.

Habit: Semiparasitic, shrubs or small trees, up to 20 m tall, rarely small creeping shrublets. The branches of many species are phyllodinous.

Habitat & Ecology: The species of *Exocarpos* are found in different habitats and show great diversity in ecological requirements. Some species occur in the undergrowth of rain-forest. Others are found in open exposed places, sand-dunes, on lava streams, and along river-banks. Some species are found in marshes or behind the mangrove. Most species occur in the lowland tropics and subtropics between 0—1000 m, but a few are found at considerable altitude: *E. pullei* Pilg. of New Guinea has been found up to 3450 m, *E. nanus* Hook. f. is found in alpine stations in SE. Australia and Tasmania, *E. menziesii* Stauff. ascends to 2450 m in Hawaii.

Fruit: The fruit is an ovoid to ellipsoid nut with a coriaceous exocarp, a thin fleshy mesocarp and a hard endocarp. The fruits are partly enclosed in a fleshy soft cupular swollen receptacle which is often bright red; the fruit itself is mostly black. Fruit and cupule together measure 3—16 mm. Of many species the fruits are recorded to be eaten by various species of birds and other animals and also by man (Stauffer, 1959, 70).

Sources: H. U. Stauffer, Revisio Anthobolearum. Mitt. Bot. Mus. Univ. Zürich *213* (1959) map p. 77, especially p. 117—237.

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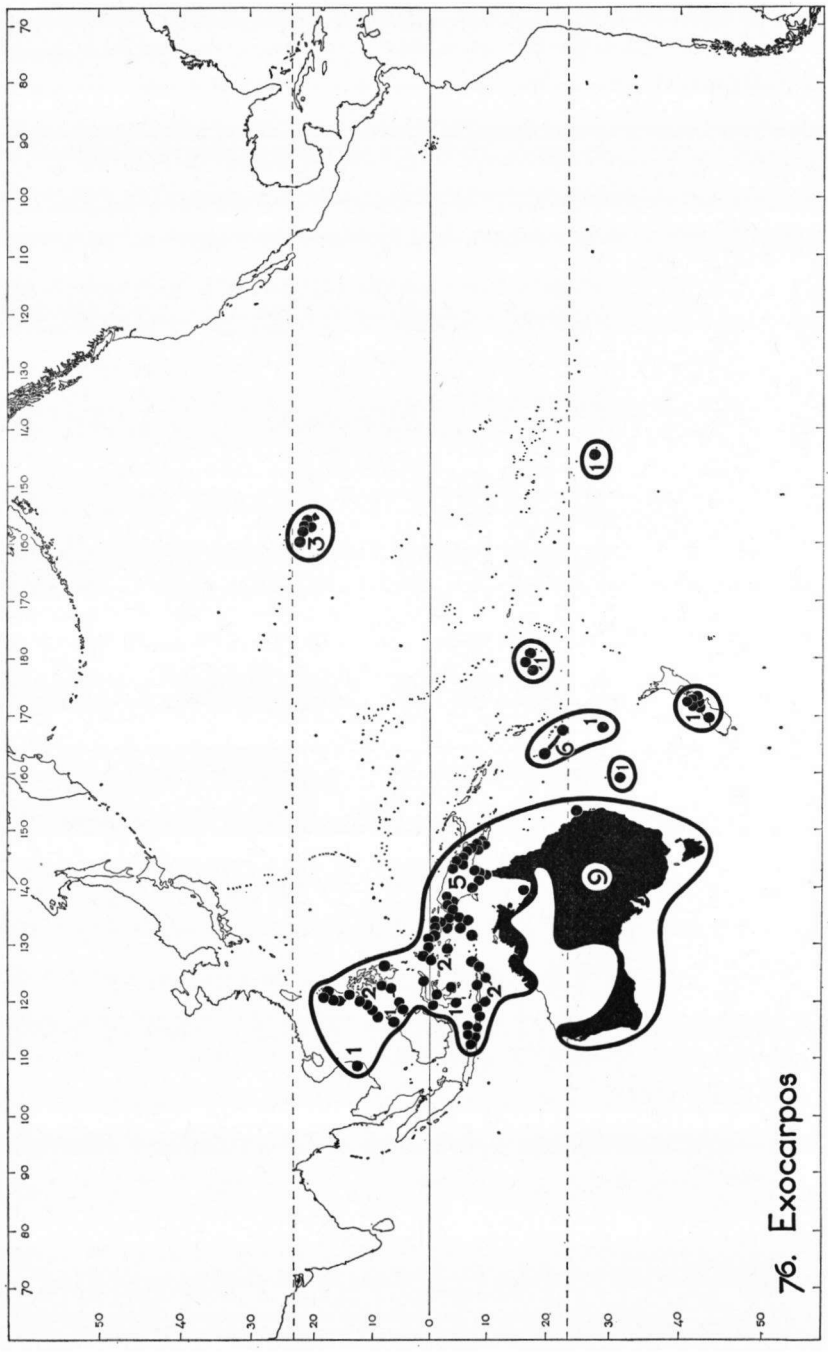
76. Exocarpos

77. **Schuurmansia** Bl.

Name: Schuurmansia Bl., Mus. Bot. Lugd. Bat. *1* (1850) 177, t. 32.

Family: *Ochnaceae.*

Taxonomy and distribution: A genus in which 3 species are distinguished by Kanis (1961). *S. elegans* Bl. occurs in Borneo, Celebes, Moluccas, and W. New Guinea and has been recorded for Mindanao (Philippines). *S. henningsii* Schum., a polymorphic species, is distributed from the Moluccas throughout New Guinea to the Bismarck and Solomon Islands. *S. vidalii* (F.-Vill.) Merr. is endemic in the Philippines (Luzon). The distribution of *Schuurmansia* is one of the many examples of generic areas terminating in the Solomons. The genus is closely allied to *Schuurmansiella* (Borneo), *Indovethia* (Borneo, Sumatra), and *Neckia* (Borneo, Malaya, Sumatra, and the Philippines). Other related genera occur in tropical America.

Habit: Slender trees or treelets up to 15(—30?) m tall.

Habitat & Ecology: The species of *Schuurmansia* are mostly found as a constituent of the understorey of the rain-forest at 0—3000 m. They grow on different types of soil: clay, sand, and rocks. *S. henningsii* often occurs as a pioneer on landslips and in secondary vegetation. The flowers are small, white, pink red or purple, borne on profusely branched terminal panicles. Observations on pollination are completely lacking.

Fruit: The fruits, produced in profusion, are non-dehiscent coriaceous ellipsoid capsules, 1—2.5 cm long, containing numerous propellor-like, winged, flat seeds. The seeds proper measure 0.7—1 by 0.2—0.3 mm, the wings 2—3 mm. The seeds are easily dispersed by wind.

Sources: A. Kanis, Nova Guinea, Bot. *6* (1961) 63—72, 1 map.

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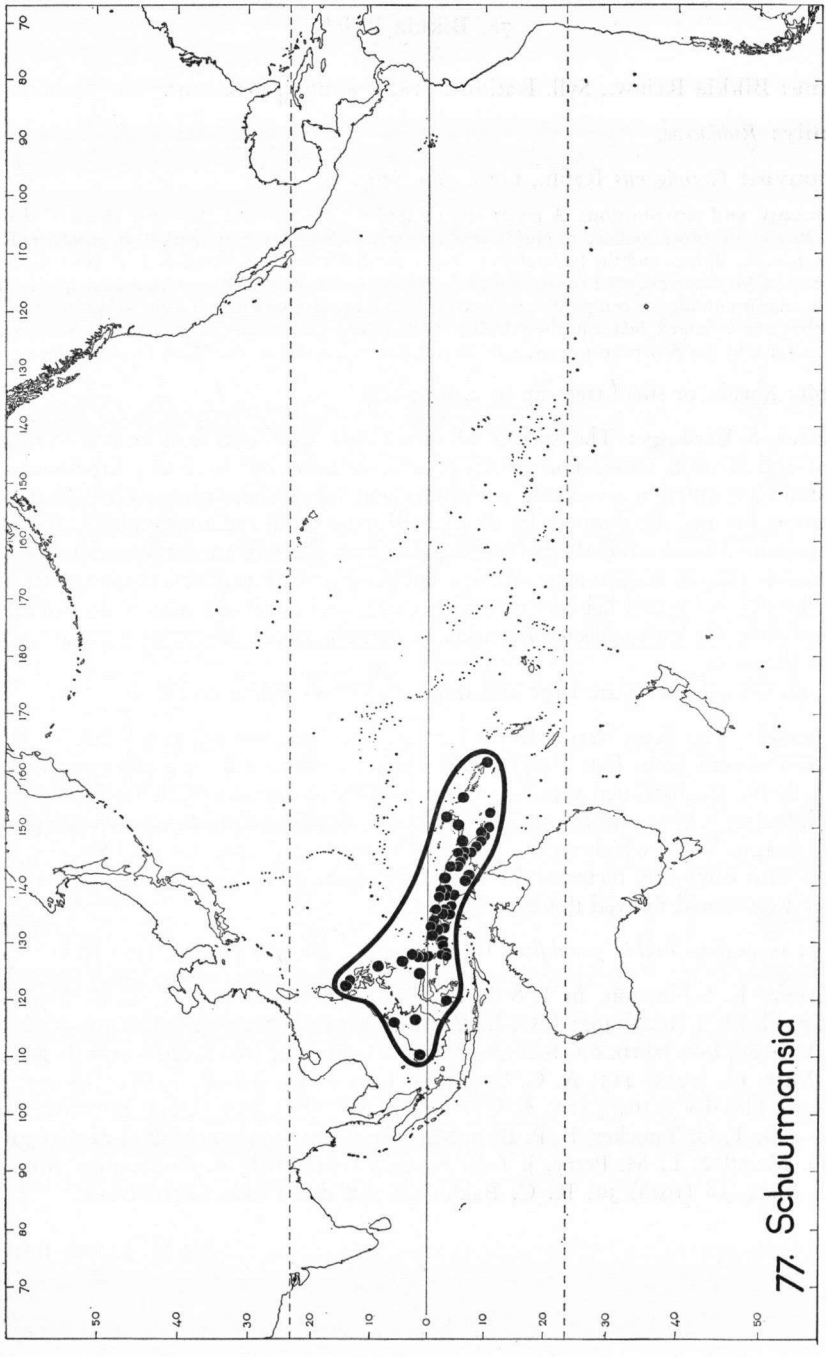
77. Schuurmansia

78. **Bikkia** Reinw.

Name: Bikkia Reinw., Syll. Ratisb. *2* (1825) 8, nom. gen. cons.

Family: *Rubiaceae.*

Synonym: *Cormigonus* Rafin., nom. gen. rejic.

Taxonomy and distribution: A genus of two sections, one covering the entire range of the genus (sect. *Bikkia*), the other confined to New Caledonia (sect. *Grisia*, with c. 10 species). *B. grandiflora* Reinw. occurs from E. Borneo and the Philippines to Palau and Solomon Is. *B. tetrandra* (L. f.) Rich. from New Guinea and Marianas eastward to the Tonga Is and Niue. Of the two New Caledonian species of sect. *Bikkia* one is considered conspecific with *B. tetrandra* by Bakhuizen van den Brink (unpublished). K. Schumann arranged *Bikkia* in the subtribe *Cinchonoideae-Cinchoneae-Condamineinae*, which comprises 10 genera: 8 in the American tropics, 1 in New Caledonia, and 1 in the West Pacific (*Bikkia*).

Habit: Shrubs or small trees up to c. 8 m tall.

Habitat & Ecology: The species of sect. *Grisia* are found from coastal to montane forest and in open scrub. The species of sect. *Bikkia* occur on rocky limestone shores or coral islets, often in association with other widespread shore plants. They are nowhere common, but may be frequent locally, which suggests an exacting ecology. *B. tetrandra* is represented in the Rijksherbarium Leyden by a sheet from the Wissel Lakes (New Guinea) at 1700 m (Eyma 4939). At first sight it appears improbable that a species otherwise limited to coastal habitats would occur so far inland and at such an altitude, but recently Mr. W. Vink collected *B. grandiflora* near Ajamaru Lake at 240 m and at c. 600 km from the coast.
The flowers of *Bikkia* are large and fragrant, and are white or red.

Dispersal: The fruit varies from campanulate and ellipsoid to oblong or clavate, and is 1—6 cm long. It is a septicidally dehiscent, coriaceous capsule, containing few (c. 5 in the small-fruited species) to many (some dozens in the large-fruited species) small, flat seeds 1—3 mm across. The seeds of *B. grandiflora* and *B. tetrandra* are provided with marginal cells which are vesicular in the former and form irregular fringes in the latter. This obviously increases the buoyancy of the seed. None of the species of sect. *Grisia* I examined showed this type of seed.

Map: triangles: *Bikkia grandiflora* Reinw.; dots: *Bikkia tetrandra* (L.f.) Rich.

Sources: K. Schumann, in E. & P. Pfl. Fam. 4, *4* (1897) 17—21; E. D. Merrill, En. Philip. Fl. Pl. *3* (1923) 492; J. G. B. Beumée, Trop. Natuur *15* (1926) 198—200, map; Th. Valeton, Bot. Jahrb. *60* (1926) 2—3; Nova Guinea *14* (1927) 229—232; R. Kanehira, En. Micr. Pl. (1935) 415; A. C. Smith, B. P. Bish. Mus. Bull. *141* (1936) 135; F. R. Fosberg, Lloydia *3* (1940) 122; A. U. Däniker, Mitt. Bot. Mus. Univ. Zürich *142* (1943) 439—440; T. G. Yuncker, B. P. Bish. Mus. Bull. *178* (1943) 110; ibid. *220* (1959) 245; E. D. Merrill & L. M. Perry, J. Arn. Arb. *25* (1944) 183; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 39; R. C. Bakhuizen van den Brink, unpublished.

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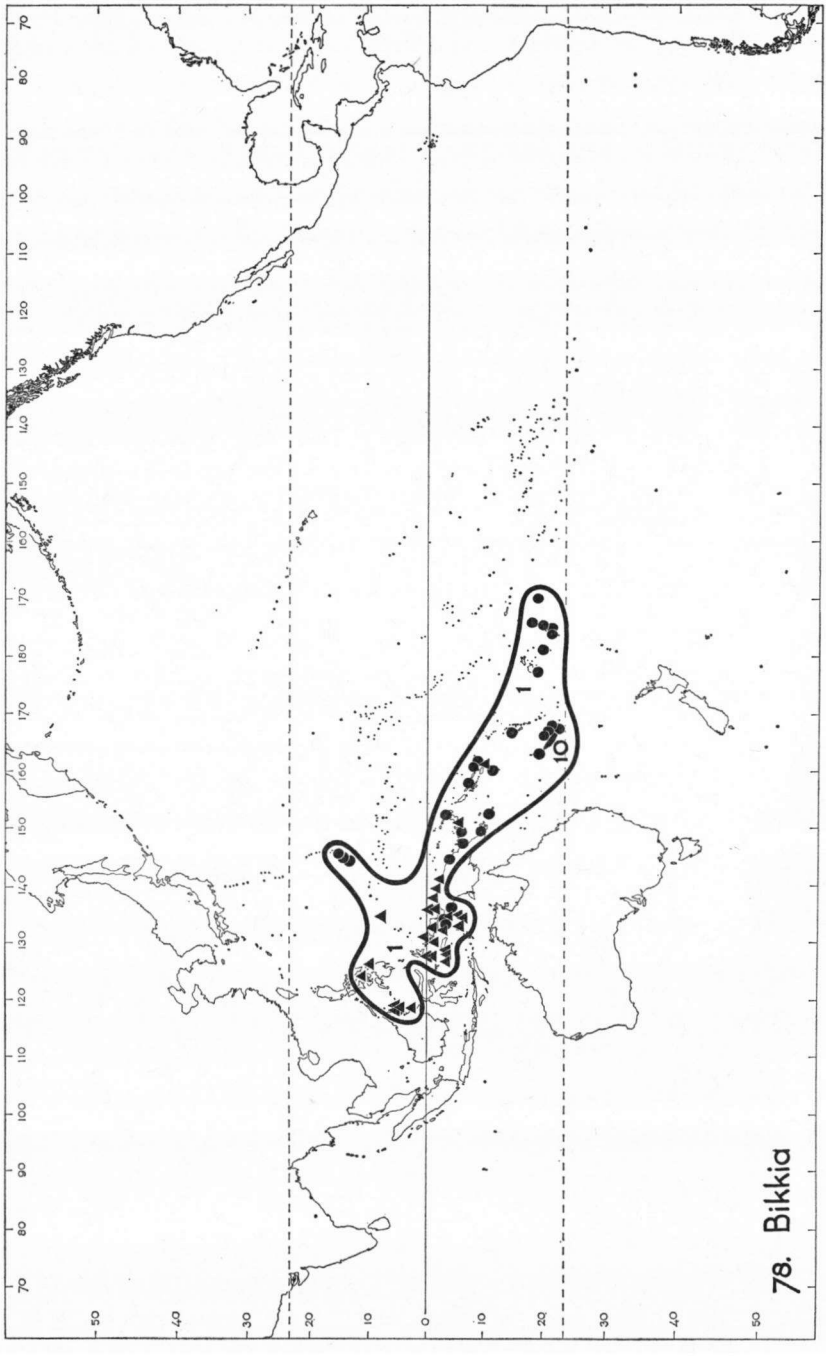
78. Bikkia
1
10
1

79. **Pritchardia** Seem. & Wendl.

Name: Pritchardia Seem. & Wendl., Bonplandia *9* (1861) 260.

Family: *Palmae.*

Synonym: *Colpothrinax* Griseb. & Wendl.

Notes: According to the latest conspectus of the genus there are c. 30 species, centring in the Hawaiian Islands with 24(—25?) species. A species of *Pritchardia* in Laysan I. (Leeward Is) has become extinct in the beginning of this century (Christophersen & Caum, 1931). In Fiji 2 species occur, one of which is also found in the Tonga Islands; it has also been reported from a number of other Pacific islands (Solomons, Samoa, Marquesas etc.) but it is very doubtful whether it is native there; these latter localities have been indicated on the map by question marks. Two species (one without exact locality) are recorded from the Tuamotu Islands. It is remarkable that one species is found in Cuba and Isla de Pinos in the Caribbean. The origin of one species is doubtfully given as „oriental Polynesia". *Pritchardia* is allied to both Asiatic and American genera.

Habit: Unarmed trees with erect, naked stems, and palmate leaves, usually attaining a height of 5—10 m. Some species occasionally reach a height of 25 m.

Habitat & Ecology: *Pritchardias* inhabit rain- and swamp forests, but they are also found on inaccessible mountain ridges, on lava streams and on rocky sea coasts, from sea-level up to c. 1300 m altitude. Most species are rare local endemics.

Fruit: The fruit of the majority of species is spherical, in some ellipsoid or pyriform, 1—5 cm long. The pericarp is more or less fleshy and is traversed by fibres, the endocarp is thin and hard. Some species are reported to have buoyant fruits. The possible role of ocean currents, birds and other dispersal methods is discussed by Beccari (1921, 4—8).

Sources: O. Beccari, Webbia *4* (1913) 202—240; O. Beccari & J. F. Rock, Mem. B. P. Bish. Mus. *8* (1921) no. 1; O. Beccari, Ann. Roy. Bot. Gard. Calc. *13* (1931) 308—316; E. Christophersen & E. L. Caum, B. P. Bish. Mus. Bull. *81* (1931) 12—13, 23.

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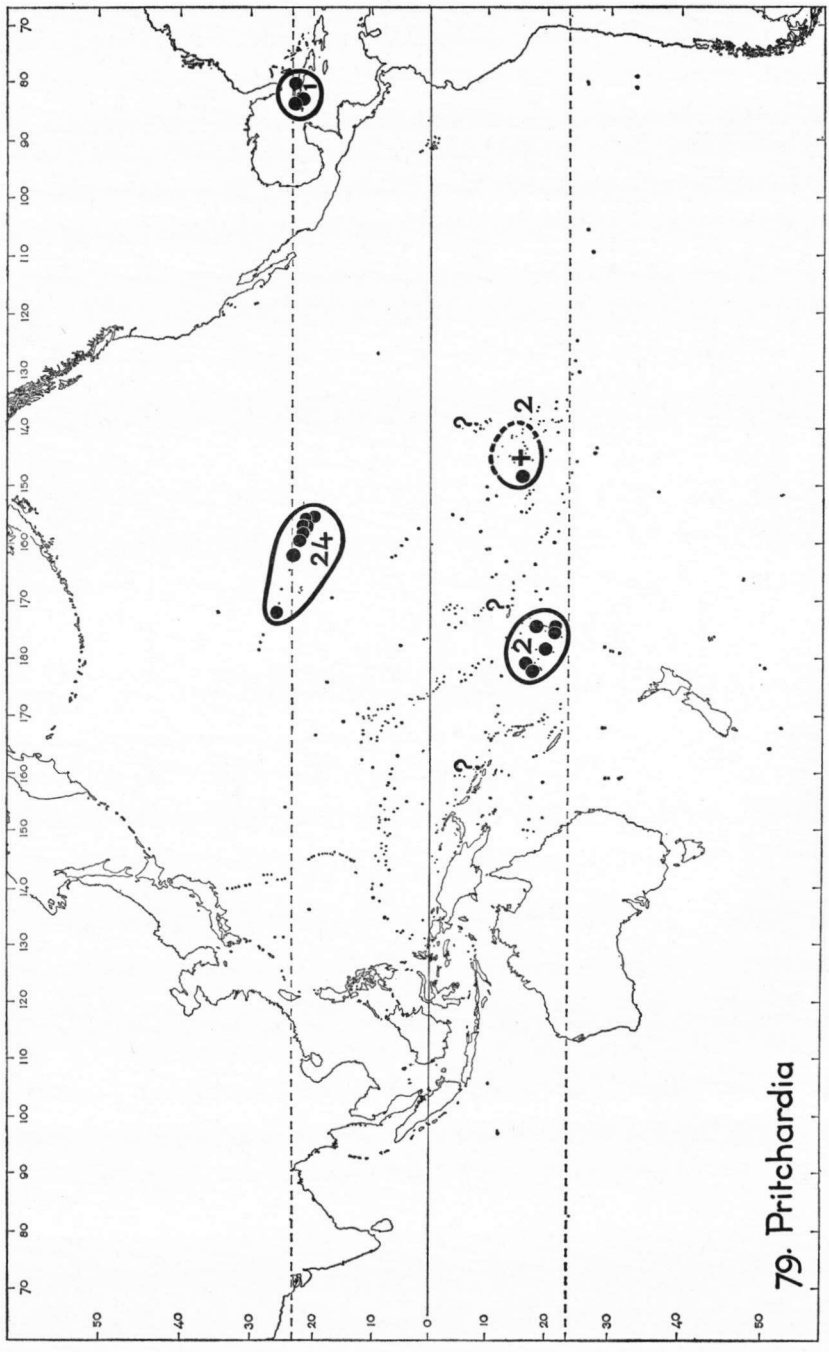
79. Pritchardia
24
2
2
?
?
?

80. **Clinostigma** Wendl.

Name: Clinostigma Wendl., Bonplandia *10* (1862) 196.

Family: *Palmae.*

Synonyms: *Bentinckiopsis* Becc., *Clinostigmopsis* Becc. ex Mart., *Exorrhiza* Becc.

Taxonomy and distribution: *Clinostigma* in the sense of Moore & Fosberg (1958) comprises 12 species of which 5 occur in Samoa, 3 in Fiji, and one endemic species each in the New Hebrides, Ponape I., Truk I. (both in the East Carolines) and the Bonin Islands. The genus belongs to a tribe which has its centre of generic development in the West Pacific (New Hebrides, New Caledonia, Fiji, and Samoa).

Habit: Unarmed trees with a single naked stem, up to c. 20 m tall.

Habitat & Ecology: The species are found in rain-forest, on open slopes, and on mountain ridges, from near sea-level up to c. 1500 m altitude.

Fruit: The fruit is globose to ellipsoid or oblong, sometimes asymmetrical, 1—2 cm long. The exocarp is smooth, the mesocarp is fleshy and fibrous, the endocarp thin and brittle. The seed is globose to oblong, covered by vascular strands, and has a hard endosperm.

Sources: O. Beccari, Webbia *4* (1913) 284—289; ibid. *5* (1921) 113; M. Burret, in Fedde, Rep. *24* (1928) 292—295; Notizbl. Berl.-Dahl. *12* (1935) 591—593; Occ. Pap. B. P. Bish. Mus. *11*, *4* (1935) 34; E. Christophersen, B. P. Bish. Mus. Bull. *128* (1935) 26—30; O. Beccari & R. E. G. Pichi-Sermolli, Webbia *11* (1956) 113—114, 118, 130—134, 137—138; E. H. Moore & F. R. Fosberg, Gentes Herb. *8* (1956) 458—466.

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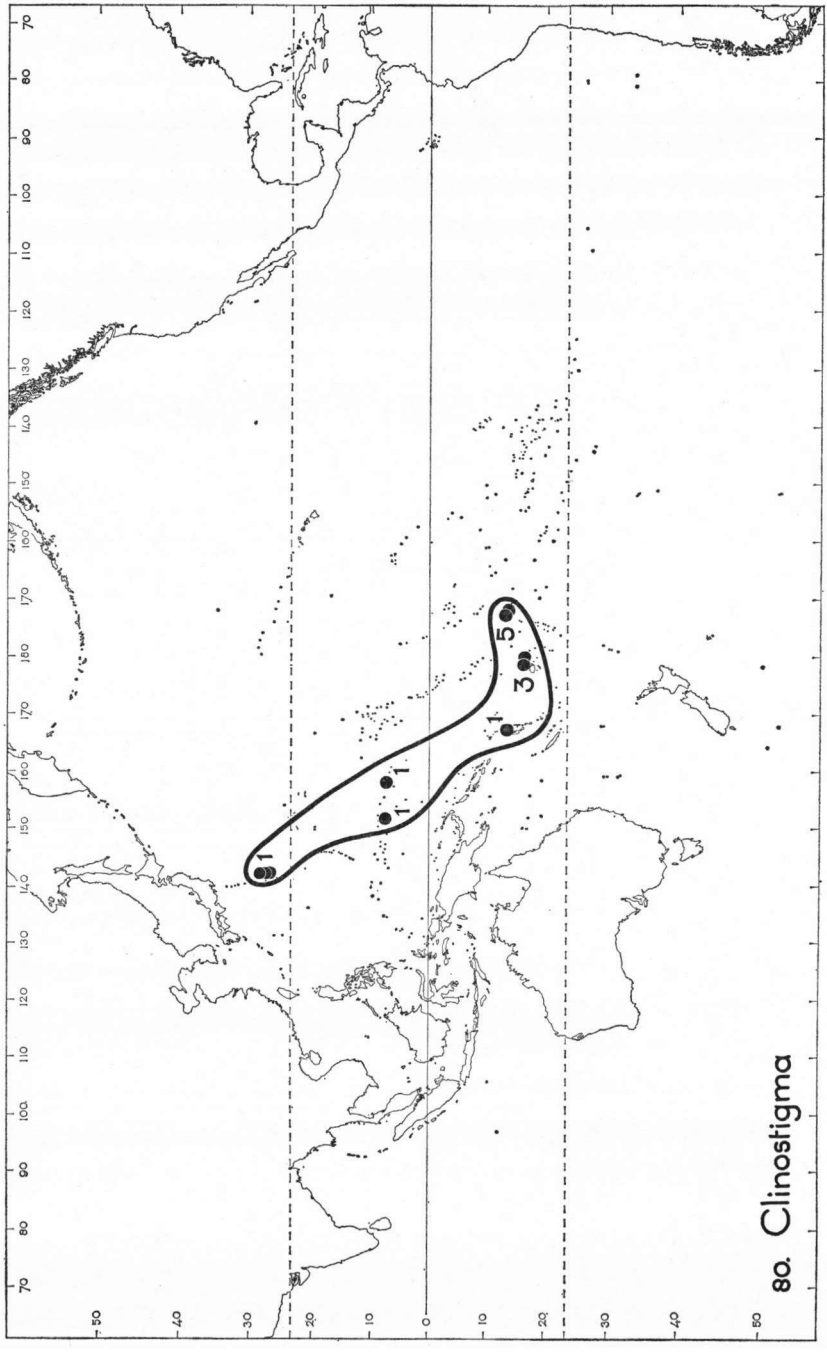
80. Clinostigma

81. Fuchsia L.

Name: Fuchsia Linné, Gen. Pl. ed. 5 (1754) 126.

Family: *Onagraceae.*

Taxonomy and distribution: A genus of c. 100 species divided into 7 sections, with a centre of specific development in the northwestern part of South America, from Venezuela to North Argentina (as far south as Tucuman Prov.), where 65 species occur. Of these 2 are also found in Central America. In Central America (from Mexico to Panama) 22 species occur, in Haiti (S. Domingo) there are two endemic species, in Jamaica one species which also occurs in South and Central America. In Southeast Brazil (Prov. Parana, S. Paolo, Rio de Janeiro, Espirito Santo, and Minas Geraes) there are 4 species. In Chile two species occur one of which, *F. magellanica* Lamk, extends throughout South Chile and West Argentina into Tierra del Fuego. The 4 New Zealandic species, together with the Tahitian species, form a separate section (*Skinnera*), which is not represented in America.

Habit: Shrubs or treelets up to 6 m tall, sometimes of liana-like habit.

Habitat & Ecology: Most species occur in temperate and montane rain-forests, especially along forest borders. In tropical and Central South America they often reach altitudes of 4000 m. In New Zealand and Chile the species occur in the coastal to lower montane forest. *F. cyrtandroides* J. W. Moore of Tahiti is reported from 1500—1600 m.

Fruit: The fruit is a black, purple or red, spherical to ellipsoid, or cylindrical to linear berry, 0.3—3.5 cm long, mostly containing many seeds.

Map: The broken line indicates that the Tahitian and New Zealandic species belong to one section.

Sources: C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. *56,5* (1916); J. W. Moore, Occ. Pap. B. P. Bish. Mus. *16,14* (1940); Ph. A. Munz, Proc. Cal. Acad. Sc. ser. 4, *25* (1943) 1—137; H. H. Allan, Fl. New Zeal. *1* (1961) 281—283.

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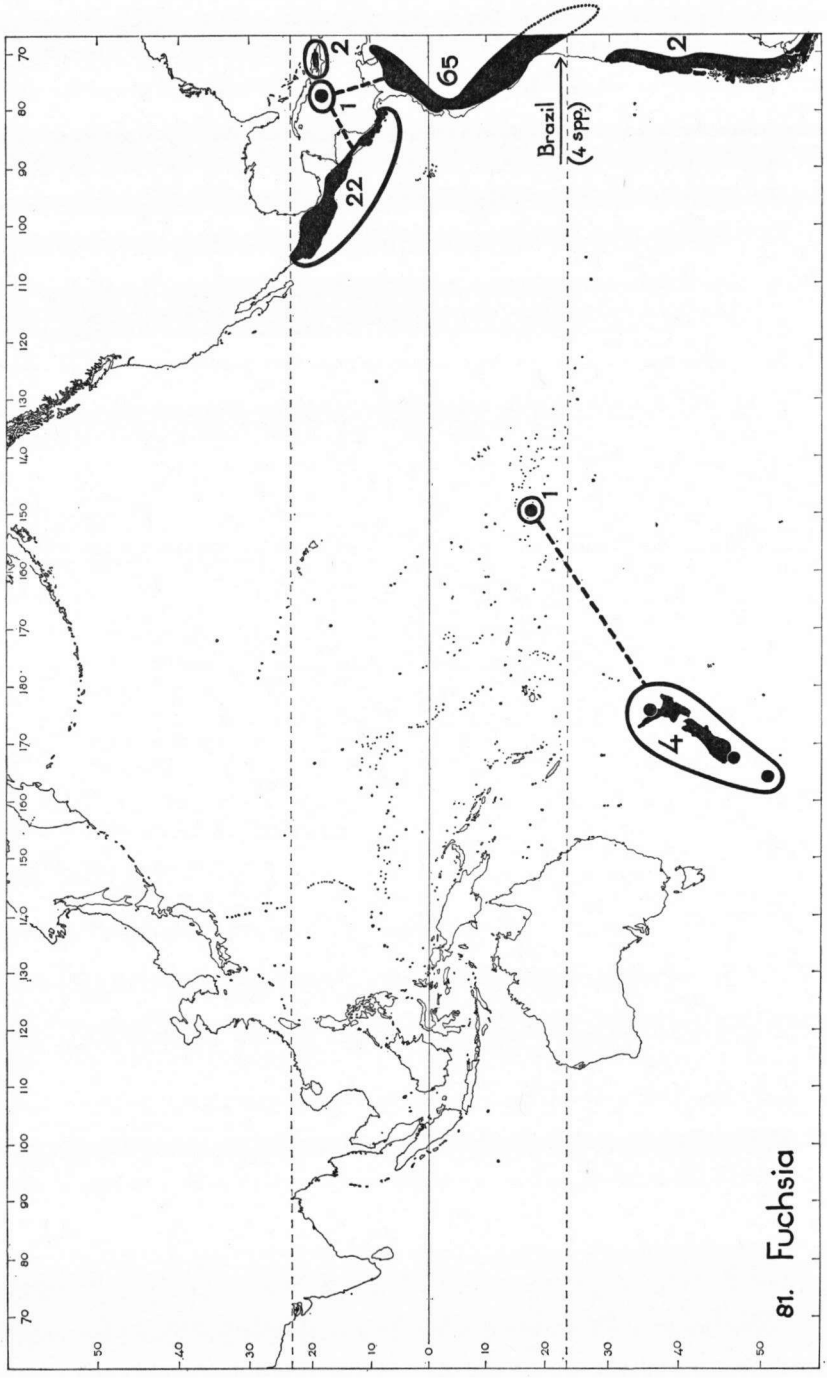
81. Fuchsia
Brazil
(4 spp.)
65
22
4
2
1

82. Nepenthes L.

Name: Nepenthes Linné, Gen. Pl. ed. 5 (1754) 909.

Family: *Nepenthaceae.*

Synonym: *Phyllamphora* Lour.

Notes: A genus of 67 species, with a centre of specific development in Malesia, where 59 species occur. Many species are of very restricted distribution, but according to Danser (1928, 416) some of these species may prove to be forms of wider spread ones. The genus is divided by Danser into 6 groups, 5 of which are confined to Malesia. *Vulgatae*, which comprises the most primitive species, covers the entire range of the genus. The *Nepenthaceae* bear a superficial resemblance to the Australian *Cephalotaceae* and the American *Sarraceniaceae*, to which, however, they are not closely related.

Habit: Dioecious shrubs, usually scandent, rarely prostrate or erect. Flowers in many-flowered racemes or panicles. The leaf consists of blade, tendril, ascidium (pitcher), and operculum (lid).

Habitat & Ecology: The species of *Nepenthes* are found in wet tropical, mostly montane rain-forest, from near sea-level up to c. 3000 m, preferably in open places or along streams and in marshes. Insects falling in the pitchers are digested by a fluid containing proteolytic enzymes, excreted by glands which line the inner wall of the pitcher.

Dispersal: The fruit is a leathery fusiform (1—3.5 cm long) loculicidally dehiscing capsule, containing numerous, filiform, very light seeds (3—25 mm long). According to MacFarlane (1908, 25) the capsules contain 100—500 seeds which are windborne.

Sources: J. M. MacFarlane, Pfl. R. Heft *36* (1908) 1—92, 19 figs; Philip. J. Sc. *33* (1927) 127—140; H. Lecomte, Fl. Gén. I.-C. *5* (1910) 47; B. H. Danser, Bull. Jard. Bot. Btzg III, *9* (1928) 249—438, 8 maps; ibid. III, *13* (1934) 465—469; ibid. III, *16* (1940) 268; R. Kanehira, En. Micr. Pl. (1935) 323.

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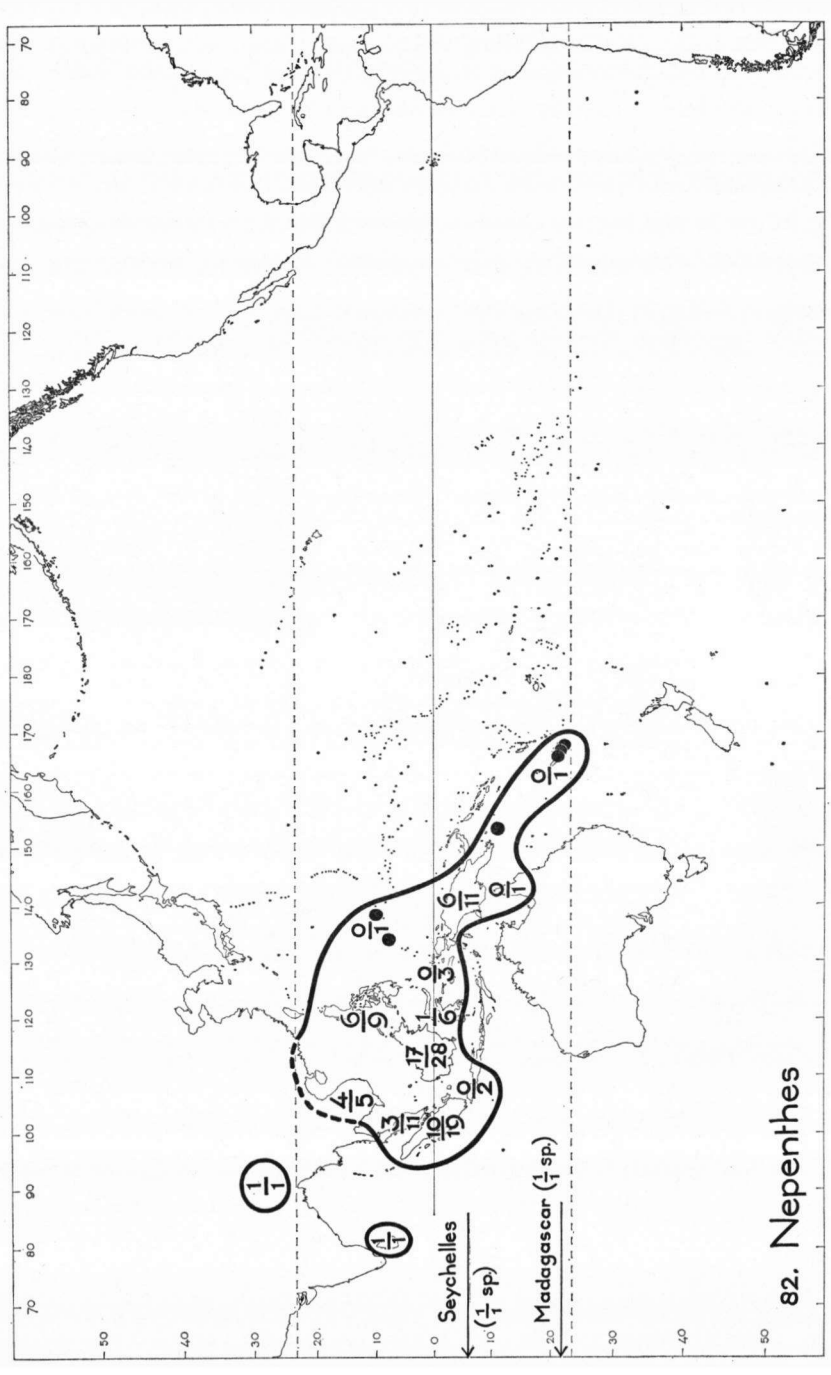

82. Nepenthes
Seychelles
(1/1 sp)
Madagascar (1/1 sp.)

83. **Microtropis** Wall. ex Meisn.

Name: Microtropis Wall. ex Meisn., Pl. Vasc. Gen. Tabl. Diagn. (1837) 68, nom. gen. cons.

Family: *Celastraceae.*

Synonyms: *Paracelastrus* Miq., *Otherodendron* Makino, *Chingithamnus* Hand.-Mazz.

Notes: A genus of amphi-Pacific distribution; a phenomenon exhibited by several Celastraceous genera. The exact number of species is not yet settled. Merrill and Freeman (1940) described 64 species from Indo-Malesia, of which 15 species occur in India and Burma; Indo-China (incl. also Hainan) has 8 species and East Asia (China, Formosa, Japan) 22. From Malesia 27 species were mentioned but Ding Hou recognizes only 13 species in this area. In Central America (Mexico, Guatemala, and Costa Rica) 4 species occur (Lundell, 1939).

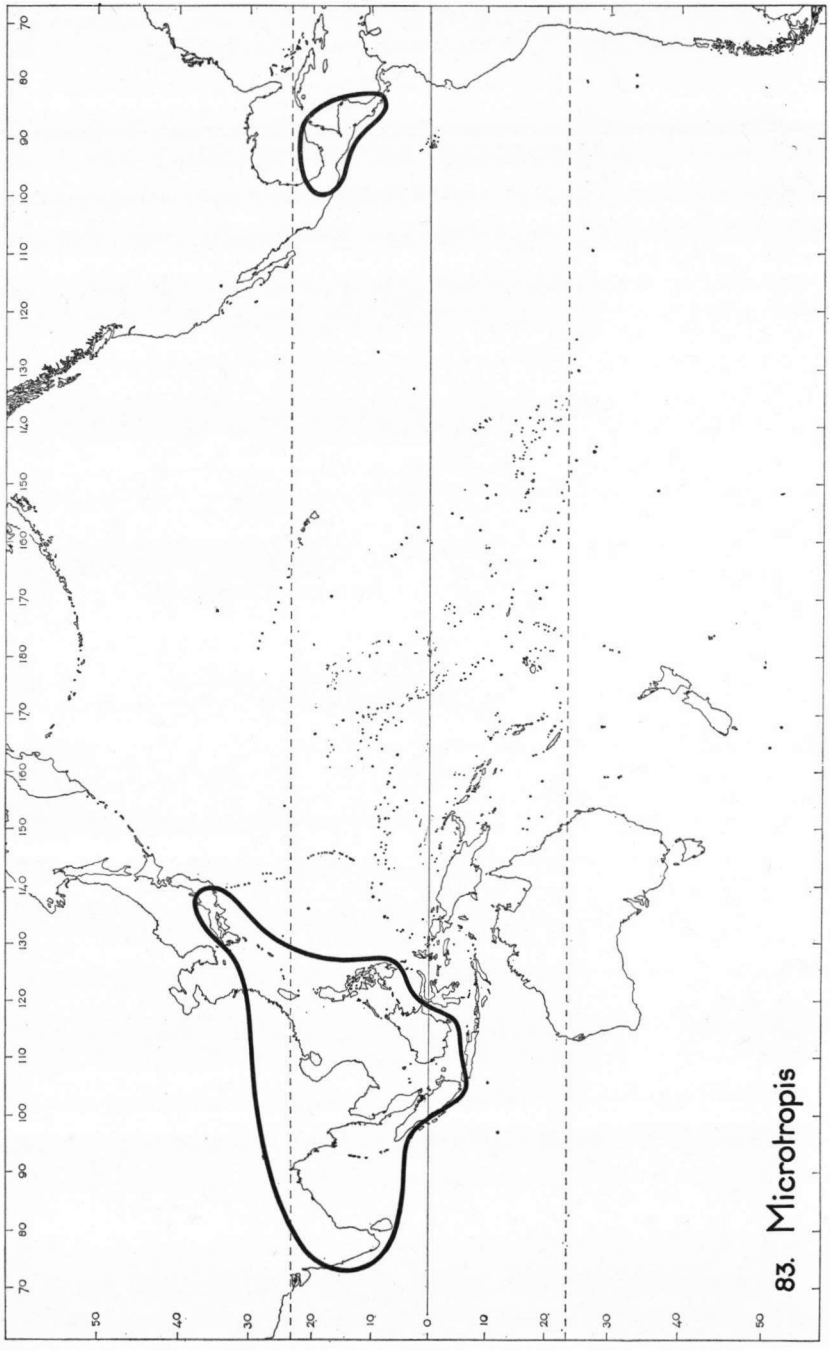
Habit: Shrubs or trees up to c. 15 m tall.

Habitat & Ecology: Tropical to subtropical lowland and montane rain-forests. In the tropics most species occur in the montane rain-forest up to 2700 m.

Fruit: The fruit is a subglobose to ellipsoid (often acuminate or beaked at the apex), 1—2-locular capsule, 1—2 cm long. It dehisces on one side exposing the solitary seed, which is enveloped by the fleshy aril. Seed and aril are red to red brown, which suggest dispersal by birds.

Sources: C. L. Lundell, Contr. Herb. Univ. Mich. *3* (1939) 23—35; E. D. Merrill & F. L. Freeman, Proc. Am. Acad. Arts & Sc. *73* (1940) 271—307; Ding Hou, Fl. Mal. I, *6* (1962) 272—280, fig. 15 (map); Blumea *13* (1966) 405—408.

M. M. J. VAN BALGOOY & DING HOU.


83. Microlropis

84. **Lysimachia mauritiana** Lamk

Name: Lysimachia mauritiana Lamk, Encycl. *3*, Bot. (1791) 572.

Family: *Primulaceae.*

Synonyms: See Bentvelzen (1962).

Taxonomy and distribution: *L. mauritiana* belongs to a genus of nearly worldwide distribution, mainly in the temperate zones of both hemispheres. According to Handel-Mazzetti (1928) there is a centre of specific development in the Sino-Himalayan region. The genus is absent from the cold regions of the Northern hemisphere and from New Zealand. *L. mauritiana* occupies a taxonomically somewhat isolated position within the genus; therefore it is often referred to a separate genus *Lubinia.* The distribution is remarkably disjunct, the species being found in the Mascarenes, East Asia, and in widely scattered localities in the Pacific. *L. rapensis* F. B. H. Brown from Rapa I. may be a local form of this species.

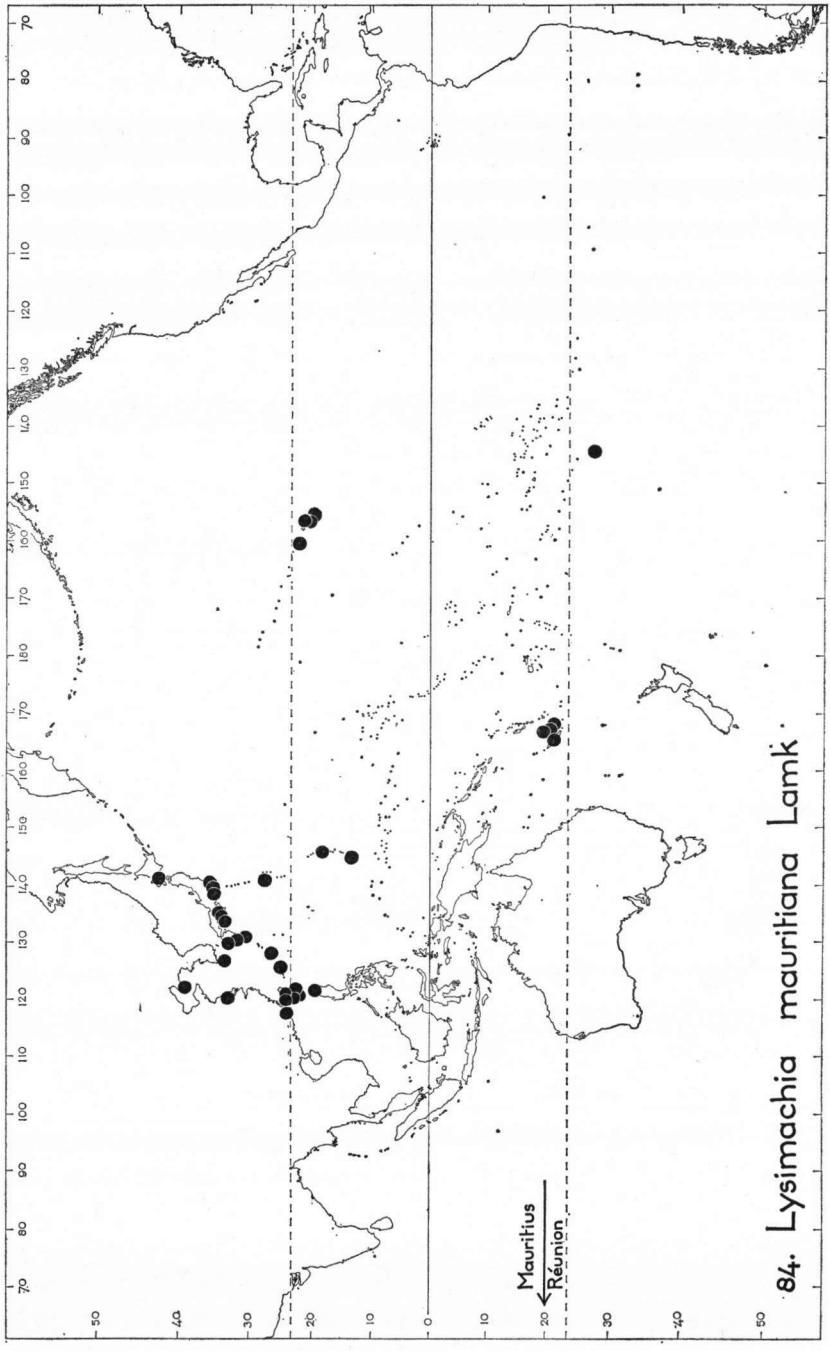
Habit: Robust, ascending or erect herb to c. 50 cm tall.

Habitat & Ecology: The species grows on coastal coral rocks and sandy beaches. In China it has also been found on coastal hills up to c. 400 m.

Dispersal: The fruit is a pyriform, irregularly dehiscing capsule c. 0.5 cm in diam., containing numerous minute seeds (c. 0.5 mm in diam.). The mode of dispersal of this species is unknown, but Ridley stated that seeds of *L. thyrsiflora* and *L. vulgaris* are buoyant.

Sources: Duby, in DC. Prod. *8* (1844) 60 (as *Lubinia*); Klatt, Abh. Naturwiss. Ver. Hamb. 4, *4* (1866) 31 (as *Lysimachia linearilobа*); W. Hillebrand, Fl. Hawaii. Is. (1888) 285 (as *L. spathulata*); Knuth, Pfl. R. *22* (1905) 273; Handel-Mazzetti, Not. R. Bot. Gard. Edinb. *16* (1928) 106; A. U. Däniker, Mitt. Bot. Mus. Univ. Zürich *142* (1933) 349 (as *L. lobelioides*); R. Kanehira, En. Micr. Pl. (1935) 387; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 222; A. Guillaumin, Fl. Nouv. Caléd. (1948) 270; E. H. Walker & R. Rodin, Contr. U.S. Nat. Herb. *30* (1949) 463; F. R. Fosberg, Pac. Sc. *12* (1958) 17—20; P. A. J. Bentvelzen, Fl. Mal. I, *6* (1962) 183—185, fig. 9 (map).

M. M. J. van Balgooy & P. A. J. Bentvelzen.


84. Lysimachia mauritiana Lamk.
Mauritius
Réunion

85. **Lysimachia decurrens** Forst. f.

Name: Lysimachia decurrens Forst. f., Prod. (1786) 12.

Family: *Primulaceae.*

Synonyms: See Bentvelzen (1962).

Notes: For taxonomic notes on the genus, see under *L. mauritiana.* The distribution of the species shows considerable gaps but with less spectacular disjunctions as compared with *L. mauritiana.* According to Däniker (1933, 350) the species may not be indigenous in Lifiu (Loyalties).

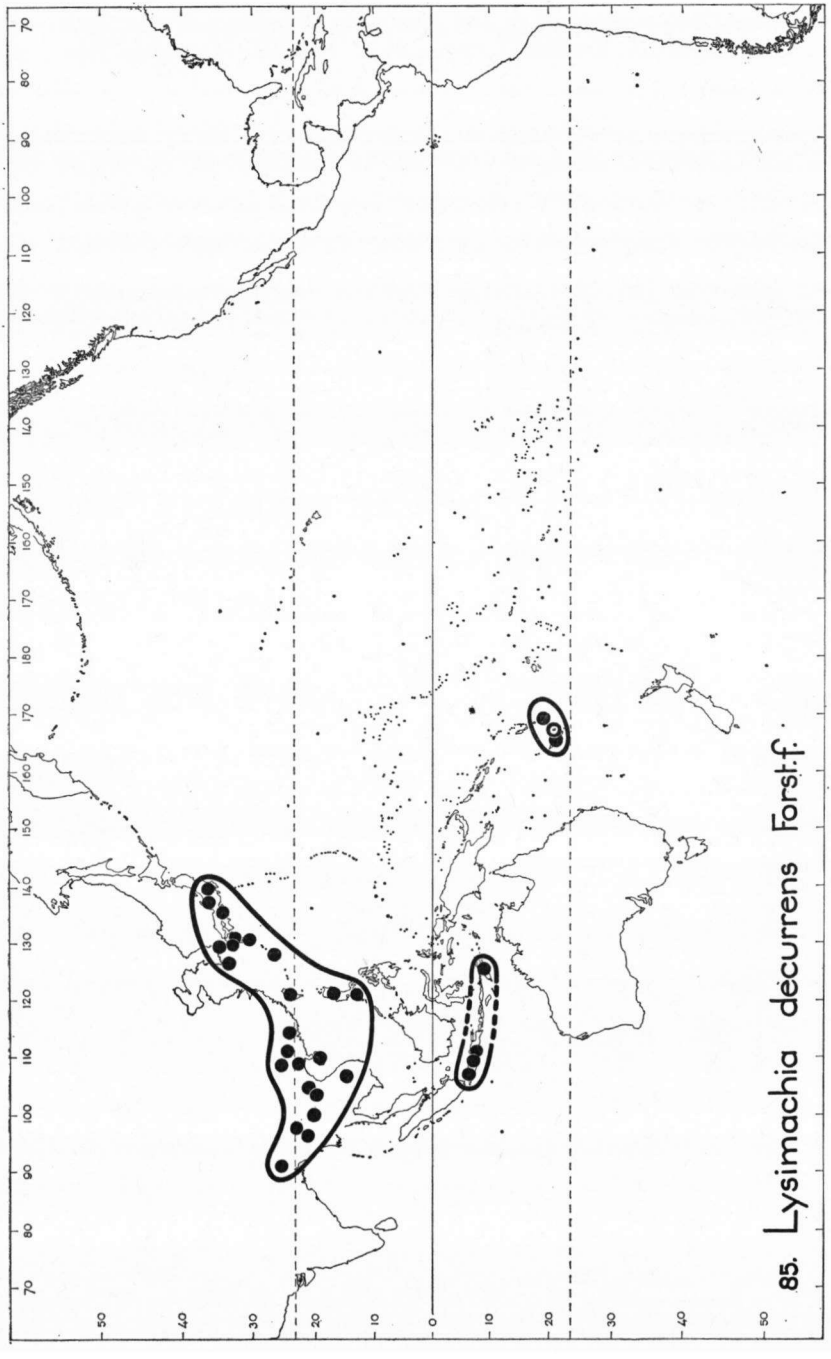
Habit: The same as *L. mauritiana.*

Habitat & Ecology: In continental Asia and Japan the species occurs from the lowland to c. 2000 m in the Himalayas. In Malesia it occurs exclusively between 1000 and 1500 m. In the Pacific it occurs in inland montane forest; according to Däniker (1933) descending to lowland stations along streams.

Fruit: Apart from the globose shape of the capsule there is no difference with that found in *L. mauritiana.*

Sources: Duby, in DC. Prod. *8* (1844) 67; Seemann, Fl. Vit. (1866) 147; Klatt, Abh. Naturwiss. Ver. Hamb. 4, *4* (1866) 6 (as *L. javanica*); F. v. Mueller, Contr. Phytog. New Hebr., repr. (1874) 17; Knuth, Pfl. R. *22* (1905) 296; Handel-Mazzetti, Not. R. Bot. Gard. Edinb. *16* (1928) 114; A. U. Däniker, Mitt. Bot. Mus. Univ. Zürich *142* (1933) 349—350; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *13* (1934) 238; P. A. J. Bentvelzen, Fl. Mal. I, *6* (1962) 185—186, fig. 10 (map).

M. M. J. VAN BALGOOY & P. A. J. BENTVELZEN.


85. Lysimachia decurrens Forst.f.

86. **Intsia** Thou.

Name: Intsia Thouars, Gen. Nov. Madag. (1806) 22.

Family: *Leguminosae* (*Caesalpiniaceae*).

Synonyms: For the extensive synonymy of these two species see Meijer Drees (1938) and de Wit (1941).

Notes: Many species have been described in this genus, but most likely there are only two good species: the Indo-Malesian *I. palembanica* Miq. (dotted line on the map) and *I. bijuga* (Coleb.) O.K., a variable species ranging from East Madagascar, and SE. Asia, throughout Malesia to North Australia and well into the Pacific, as far as the Marshall and Samoa Islands. The genus is closely allied to *Afzelia* (*Pahudia*) occurring in tropical Africa and Indo-Malesia.

Habit: Large trees, up to c. 50 m tall, often buttressed.

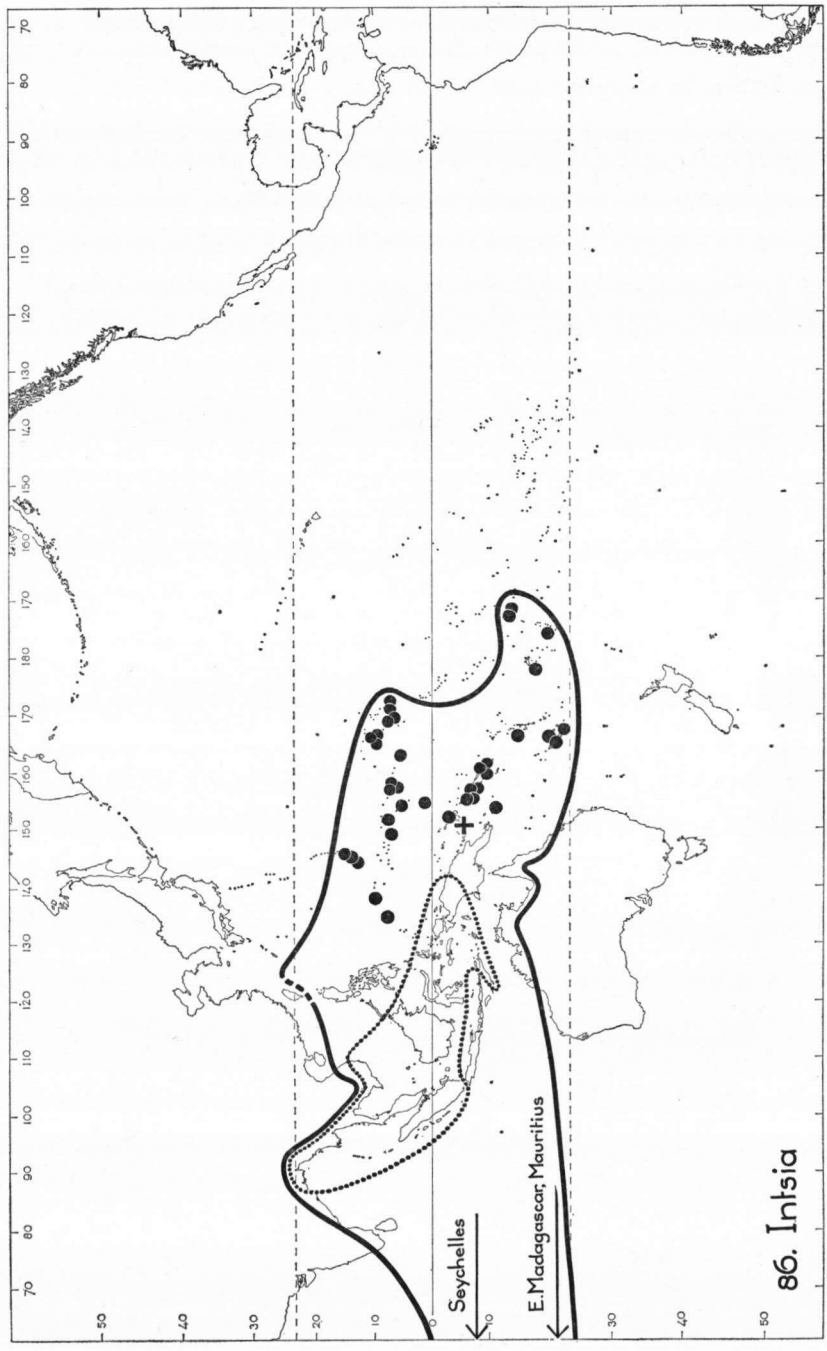
Habitat & Ecology: Tropical lowland rain-forest from the back-mangrove and coastal coralline or other rocks inland, occasionally found as high as 800 m above sea-level. It grows on both sandy and muddy soils, which may be inundated by fresh or brackish water.

Dispersal: The fruit is an elongate, compressed, dehiscent pod up to c. 40 cm by 4—8 cm, containing a number of disk-shaped or oblong seeds 2—4 cm in diam. The seeds of *I. bijuga* are frequently found on the beach. Ridley (1930) discussed the dispersal of this species at some length. The buoyancy of the seeds is variable. He quoted Guppy, who found that the seeds of littoral forms were larger and more buoyant than those of inland forms. According to Ridley and others, the absence of *Intsia* from places where they are to be expected may partly be explained by destruction of the seeds and seedlings by rats and crabs, as observed in Cocos-Keeling and Christmas Islands. As the timber (Moluccan iron-wood) is highly estimated mature trees have become locally rare.

Map: The area of *I. palembanica* Miq. is delineated by the dotted line.

Sources: H. N. Ridley, Dispersal of Plants (1930) 280; E. Meijer-Drees, Bull. Jard. Bot. Btzg III, *16* (1938) 83—96; H. C. D. de Wit, ibid. III, *17* (1941) 139—144, 1 map; J. Léonard, Reinwardtia *1* (1950) 61—66. Various Floras and other literature; collections in the Rijksherbarium Leyden. Dr. F. R. Fosberg (Washington, D.C.) has provided additional localities in the Pacific; Mr. R. Capuron (Tananarive, Madagascar) commented on the occurrence of *Intsia* in the Madagascar area.

M. M. J. VAN BALGOOY.


Seychelles
E. Madagascar, Mauritius
86. Intsia

87. **Lumnitzera littorea** (Jack) Voigt

Name: Lumnitzera littorea (Jack) Voigt, Hort. Suburb. Calc. (1845) 39.

Family: *Combretaceae.*

Synonyms: *Pyrrhanthus littoreus* Jack, *L. purpurea* Presl, *L. coccinea* W. & A.

Notes: The genus *Lumnitzera* Willd. consists of two widespread species: *L. littorea* (Jack) Voigt and *L. racemosa* Willd. In the field they are readily distinguished by the colour of the petals which is red in *L. littorea* and white in *L. racemosa*. As their areas partly overlap in Indo-Australia they have been mapped separately. *L. littorea* occurs from SE. Asia throughout Malesia, in parts of North and East Australia, and extends far into the Pacific.

Habit: Small trees occasionally up to c. 25 m and more with slender knee-shaped pneumatophores.

Habitat & Ecology: Both species are inhabitants of mangrove swamps and estuaries and often occur gregariously. Although their areas overlap for a great deal the two species apparently never occur in exactly the same habitat (Van Slooten, 1937). *L. racemosa* is nearly absent from the coast facing the Indian Ocean in West Malesia whereas *L. littorea* is nearly absent from the coasts facing the Java Sea. L. S. Smith (in litt.) pointed out that in Australia *L. racemosa* grows on rather sandy muds whereas *L. littorea* grows on very soft muds.

Dispersal: The indehiscent hard fleshy fruit is elliptic or clavate, becoming more or less corky or woody, c. 4 by 10 cm, and is crowned by the persistent calyx. According to Ridley (1930, 290) the fruits remain buoyant for months. Van Slooten (1937, 166) cited an observation by Guppy that *Lumnitzera* fruits are regularly washed ashore on the Cocos and Keeling Islands, but are destroyed by crabs.

Sources: See under 88. *Lumnitzera racemosa* Willd.

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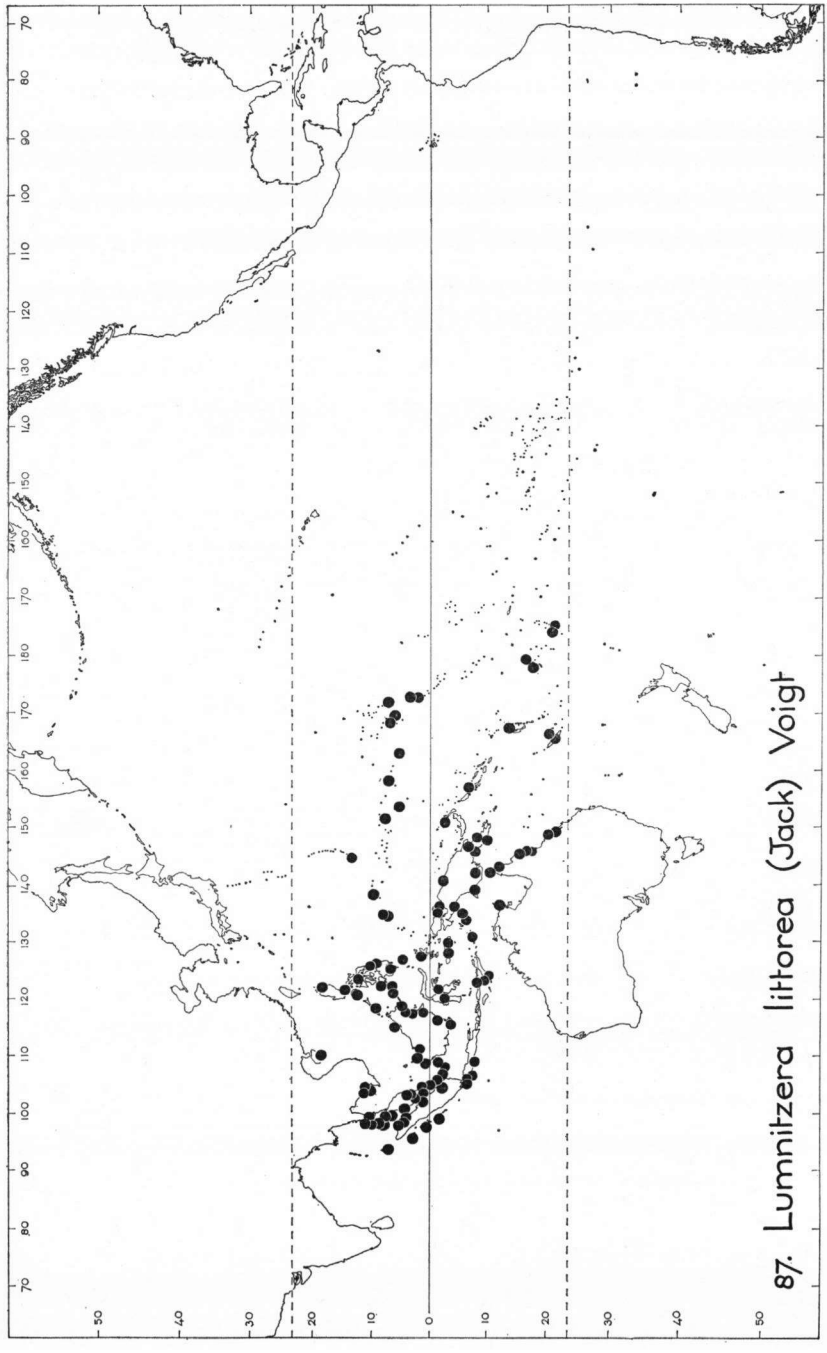
87. Lumnitzera littorea (Jack) Voigt

88. **Lumnitzera racemosa** Willd.

Name: Lumnitzera racemosa Willd., Neue Schr. Ges. Naturf. Fr. Berl. *4* (1803) 187.

Family: *Combretaceae.*

Synonyms: *L. rosea* Presl, *L. lutea* Presl, *Petaloma alba* Blanco.

Notes: The species has in the Pacific only been recorded with certainty from New Caledonia and the Loyalties, but it has a much wider distribution westward: Seychelles, W. Madagascar, E. Africa. Of this species a yellow-flowered variety occurs in the Lesser Sunda Islands (Timor and Alor).

Habit: Small tree or shurb up to c. 8 m tall without pneumatophores.

Habitat & Ecology: See 87. *Lumnitzera littorea* (Jack) Voigt.

Dispersal: See 87. *Lumnitzera littorea* (Jack) Voigt.

Sources: D. F. van Slooten, Bull. Jard. Bot. Btzg III, *6* (1924) 43—49; Blumea Suppl. *1* (1937) 162—175, 1 map; H. N. Ridley, Dispersal of Plants (1930) 194, 290; V. S. Summerhayes, Trans. Linn. Soc. Zool. *19* (1931) 277; A. W. Exell, Fl. Mal. I, *4* (1954) 585—589, 1 map; Ai Cheng Chao, Act. Phytotax. Sin. *7* (1958) 236, map. Various local floras and collections in the Rijksherbarium Leyden. Mr. L. S. Smith (Brisbane) provided the information concerning *Lumnitzera* in Australia. Dr. H. Santapau (Calcutta) and Dr. F. R. Fosberg (Washington, D.C.), respectively gave additional Asiatic and Pacific records.

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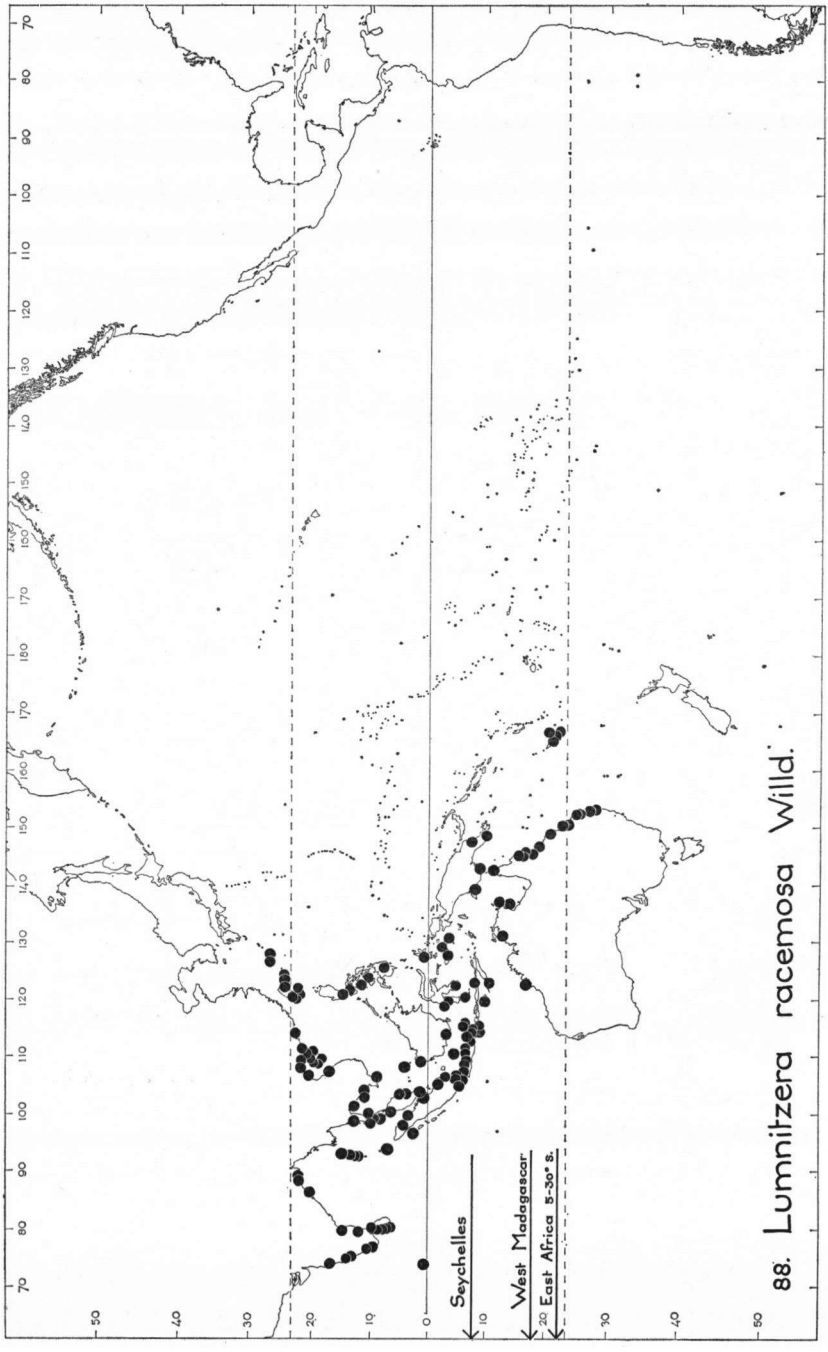

88. Lumnitzera racemosa Willd.
Seychelles
West Madagascar
East Africa 5-30° S.

89. **Agathis** Salisb.

Name: Agathis Salisb., Trans. Linn. Soc. *8* (1807) 311, nom. gen. cons.

Family: *Araucariaceae.*

Synonym: *Dammara* Lamk, nom. gen. rejic.

Notes: There is no agreement concerning the number of species. According to Meijer-Drees (1940) Malesia has 13 species divided over 3 sections, but Danser (unpublished MS) accepted only 3 species. In Australia there are 3 species, one along the Mary River (S. Queensland) and two between Ingham and Cooktown (N. Queensland). In New Caledonia probably 3 species, the New Hebrides 2, Fiji 1—2, and New Zealand 1. *Agathis* was recently also discovered in New Britain. The genus has repeatedly been mentioned or mapped for Indo-China, but this is apparently not based on actual collections. Mrs. M. L. Tardieu-Blot (in litt.) stated that the genus does not occur native in continental Asia.

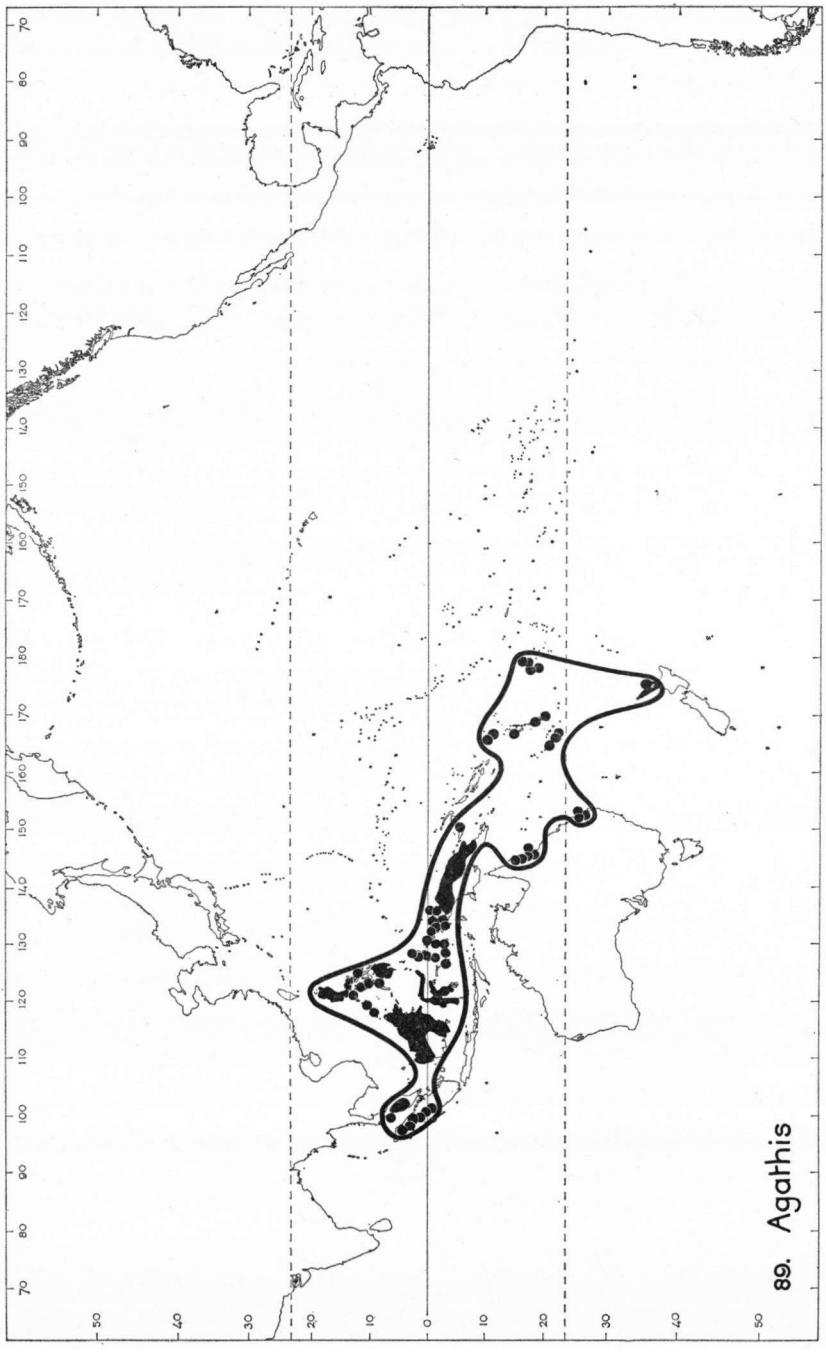
Habit: Medium-sized to large erect, resiniferous trees up to c. 70 m tall. Monoecious or dioecious.

Habitat & Ecology: From coastal to montane rain-forest (0—2200 m). In Borneo, Celebes, the Philippines, the Moluccas, West New Guinea, parts of Queensland and the West Pacific *Agathis* often forms an important component of the mixed forest on granitic, sandy, and clayey soils. Most species prefer hill or montane stations in the tropics (c. 1000 m).

Dispersal: The female cones are up to 10 cm long and contain many obovate to oblong compressed, winged, seeds (0.5—1.5 cm). They may be carried by wind. Guppy (cited by Ridley, 1930, 241) observed that the seeds of *A. vitiensis* (Seem.) Warb. remain buoyant for 7—10 days.

Sources: O. Warburg, Monsunia *1* (1900) 182—186; L. S. Gibbs, J. Linn. Soc. Bot. *39* (1909) 183; C. T. White, Contr. Arn. Arb. *4* (1933) 11; A. Guillaumin, Fl. Nouv. Caléd. (1948) 12; E. Meijer-Drees, Bull. Jard. Bot. Btzg III, *16* (1940) 455—474; Anonymous, Australian Forest Trees (1957) 202, 1 map; J. W. Bader, Decheniana *113* (1960) 73—74; H. H. Allan, Fl. New Zeal. *1* (1961) 114. Other literature and collections in the Rijksherbarium Leyden. Dr. L. S. Smith (Brisbane) provided the Australian localities, Mrs. M. L. Tardieu-Blot (Paris) provided the information on SE. Asia.

M. M. J. VAN BALGOOY.


89. Agathis

90. Korthalsella v. Tiegh.

Name: Korthalsella v. Tiegh., Bull. Soc. Bot. Fr. *43* (1896) 83.

Family: *Loranthaceae.*

Synonyms: *Bifaria* v. Tiegh., *Heterixia* v. Tiegh., *Pseudixus* Hayata.

Notes: In his revisions Danser (1937, 1940) distinguished 23 species. Most of the species are of rather limited distribution, some are even confined to a single island. *K. opuntia* (Thunb.) Merr. (● ●), however, is very wide-spread: from S. Africa (Cape), Abyssinia, Madagascar (this island has in addition two endemic species), Mascarenes, Seychelles, S. and E. Asia as far as and including S. Japan and Bonin, furthermore from West Malesia to West, South and East Australia and Lord Howe I. Another wide-spread species is *K. platycaula* (v. Tiegh.) Engl. (■ ■), of which the area has been delineated on the map. The distribution of the genus shows conspicuous gaps, being absent from the largest part of E. Malesia, Melanesia and the West and Central Pacific and North and West Australia.

Habit: Monoecious, parasitic subshrubs or herbs with strongly articulated stems and rudimentary leaves.

Habitat & Ecology: The species of *Korthalsella* are parasitic on various species of woody Dicotyledonous trees and shrubs and rarely on Conifers of the rain-forest. In the extratropical zones and on several Pacific islands some species may descend to near sea-level, but most species are found at montane altitudes up to c. 3000 m.

Fruit: The fruit is a small, ovoid, clavate or pear-shaped berry, 1—2 mm long, viscid when ripe, containing a single seed. Sahni (1933) observed that the seeds of *K. opuntia* are ejected to some distance and so get stuck on neighbouring twigs. Miss Stevenson (1934), however, found nothing of the kind in the New Zealandic species. It has never been observed that the fruits are eaten by birds.

Map: Dots mark the localities of *K. opuntia.* The localities of *K. platycaula* are indicated by squares, the area of this species is delineated. Triangles represent all other species. Figures indicate the number of species on each island or island group.

Sources: B. Sahni, J. Ind. Bot. Soc. *12* (1933) 96—101; G. B. Stevenson, Trans. R. Soc. New Zeal. *64* (1934) 175—190; B. H. Danser, Bull. Jard. Bot. Btzg III, *14* (1937) 115—159, 1 map; ibid. III, *16* (1940) 46, 264, 329—342; J. Wasscher, Blumea *4* (1941) 320, 1 map. Other literature and collections in the Rijksherbarium Leyden.

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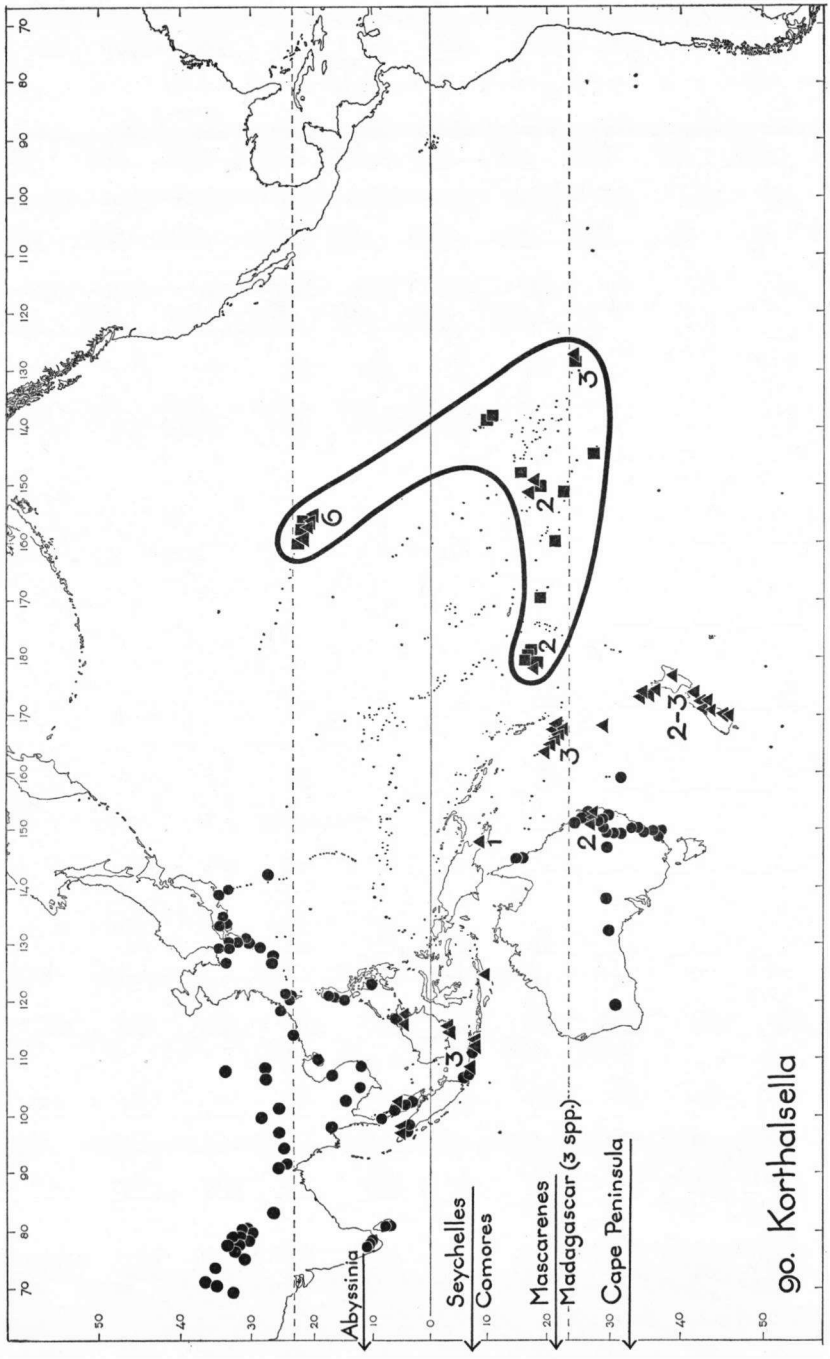

90. Korthalsella
Abyssinia
Seychelles
Comores
Mascarenes
Madagascar (3 spp.)
Cape Peninsula

91. **Fagraea** Thunb.

Name: Fagraea Thunberg, Vet. Acad. Handl. Stockh. *3* (1782) 132, t. 4.

Family: *Loganiaceae.*

Synonym: *Cyrtophyllum* Reinwardt.

Notes: There are about 35 species, distinctly centring in western Malesia. Two species, *F. berteriana* A. Gray and *F. gracilipes* A. Gray occur far into the Pacific proper; in Malesia both are restricted to New Guinea; their ranges have been delineated on the map. Apart from these two species only one reaches the Pacific viz. *F. racemosa* Wall. which ranges from SE. Asia throughout Malesia to the Solomons. The nearest allied genera are *Anthocleista* (Africa) and *Potalia* (S. America).

Habit: Trees or treelets, epiphytic or terrestrial, often straggling; shrubs, or woody climbers.

Habitat: Forested to open, lowland to montane vegetations.

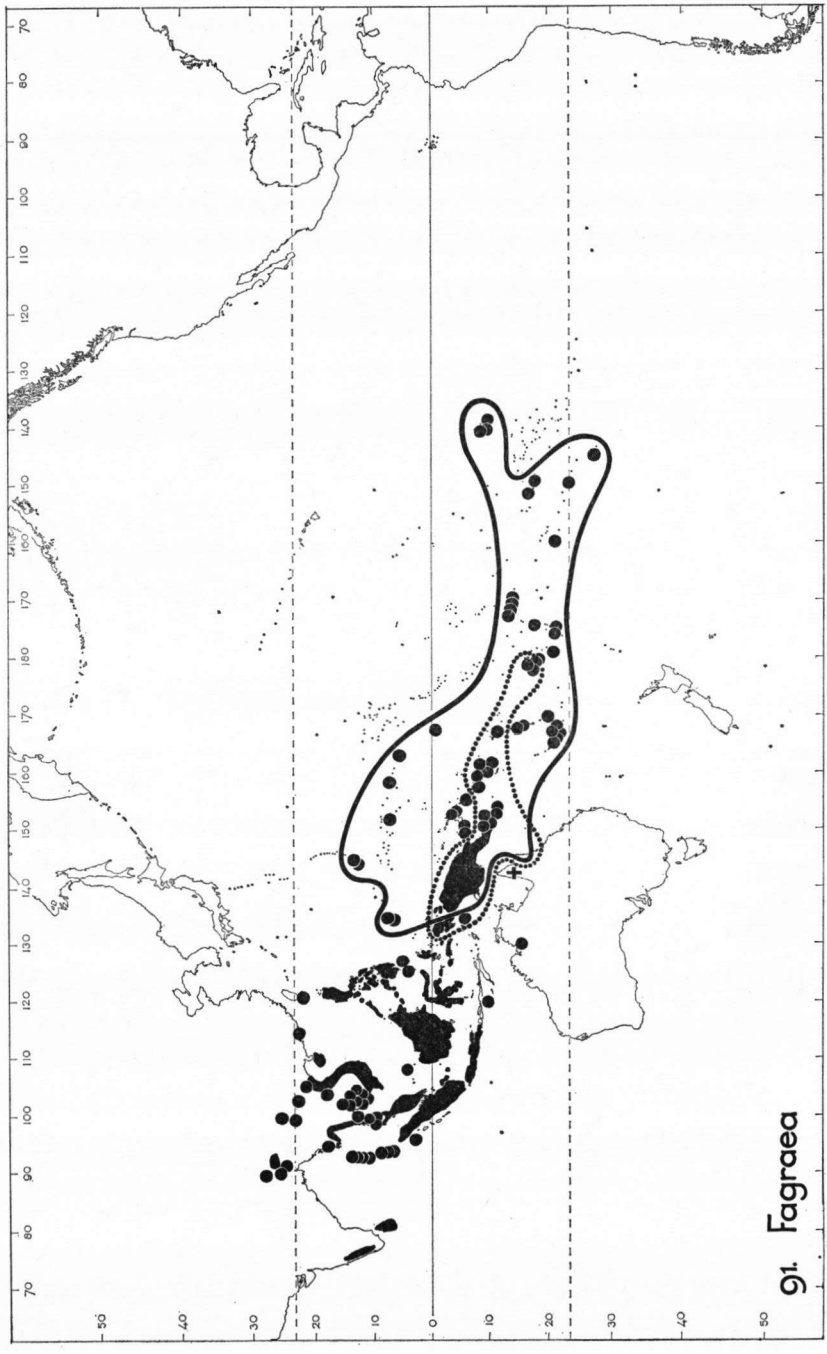
Ecology: Mainly inhabitants of primary and secondary vegetations under everwet conditions, light-demanding, growing as well in dry as in marshy or temporarily inundated localities, on fertile as well as on poor soils, some species also under seasonal conditions (but the genus is unknown from the Lesser Sunda Islands apart from Bali and from a single locality in Sumba, in Australia restricted to some regions in which a tropical rain-forest could develop); from sea-level up to 3000 m. The flowers are large, creamy white to yellow and fragrant, they are pollinated by insects, birds and possibly also by bats.

Dispersal: The fruit is a globose to oblong or ellipsoid berry, 0.5—15 cm long, whitish, green, yellow, or orange (sometimes dehiscent), containing many small seeds. Of many species the fruits are eaten by birds and bats, see v. d. Pijl (1957).

Map: Lined area: *F. berteriana*; dotted area: *F. gracilipes*; black areas: *Fagraea* spp. are common; black dots: isolated or insular localities.

Sources: L. van der Pijl, Acta Bot. Néerl. *6* (1957) 291—315; P. W. Leenhouts, Fl. Mal. I, *6* (1962) 299—336, fig. 3 (map). Dr. F. R. Fosberg (Washington, D.C.) has provided many Pacific localities.

M. M. J. van Balgooy & P. W. Leenhouts.


91. Fagraea

92. **Aegiceras** Gaertn.

Name: Aegiceras Gaertn., Fruct. *1* (1788) 216, t. 46.

Family: *Myrsinaceae* (*Aegiceratáceae*).

Taxonomy and distribution: A genus of two species: *A. corniculatum* (L.) Blanco (= *A. majus* Gaertn.) is widespread: from India, along the coast of South and East Asia, throughout Malesia, North and East Australia and reaching Bougainville I., Kolombangara I. (Solomons) and Lord Howe I. in the Pacific; *A. floridum* R. & S. is strictly Malesian. It is distinguished from the former by its smaller leaves and compound inflorescences.

Habit: Small, bushy trees or shrubs, provided with pneumatophores, rarely exceeding 8 m.

Habitat & Ecology: Shores of tidal rivers, mostly along the inner edge of mangrove. *A. corniculatum* is locally a common component of the mangrove, *A. floridum* is much less abundant. The flowers are arranged in clusters and are fragrant.

Dispersal: The fruit is up to c. 7 cm long, curved, and pointed, so as to resemble a horn. Fruits are produced in abundance and can float in seawater. The single seed germinates inside the tough pericarp. The outgrowing hypocotyl ruptures the testa which covers the cotyledons, and remains attached to the fruit-base by a threadlike placenta. The pericarp is only ruptured after the fruit has fallen. So the vivipary of *Aegiceras* is of a less advanced type than that found in *Bruguiera* and *Rhizophora*, where the pericarp is ruptured while the fruit is still attached to the tree.

Map: The line delineates the area of *A. corniculatum*. The dots represent localities of *A. floridum*.

Sources: A. F. W. Schimper, Indo-Mal. Strandflora (1891) 43—46; W. H. Brown, Minor Prod. Philip. Forests *1* (1920) 72—76; J. G. Watson, Mangrove Forests of the Malay Peninsula. Mal. For. Rec. *6* (1928); H. N. Ridley, Dispersal of Plants (1930) 299; D. F. van Slooten, Blumea Suppl. *1* (1937) 171, map; J. Hutchinson, Fam. Flow. Pl. *1* (1959) 347, map; local floras and collections in the Rijksherbarium Leyden. For information concerning *Aegiceras* in Australia thanks are due to Messrs Dr. R. H. Anderson (Sydney), S. L. Everist and L. S. Smith (Brisbane).

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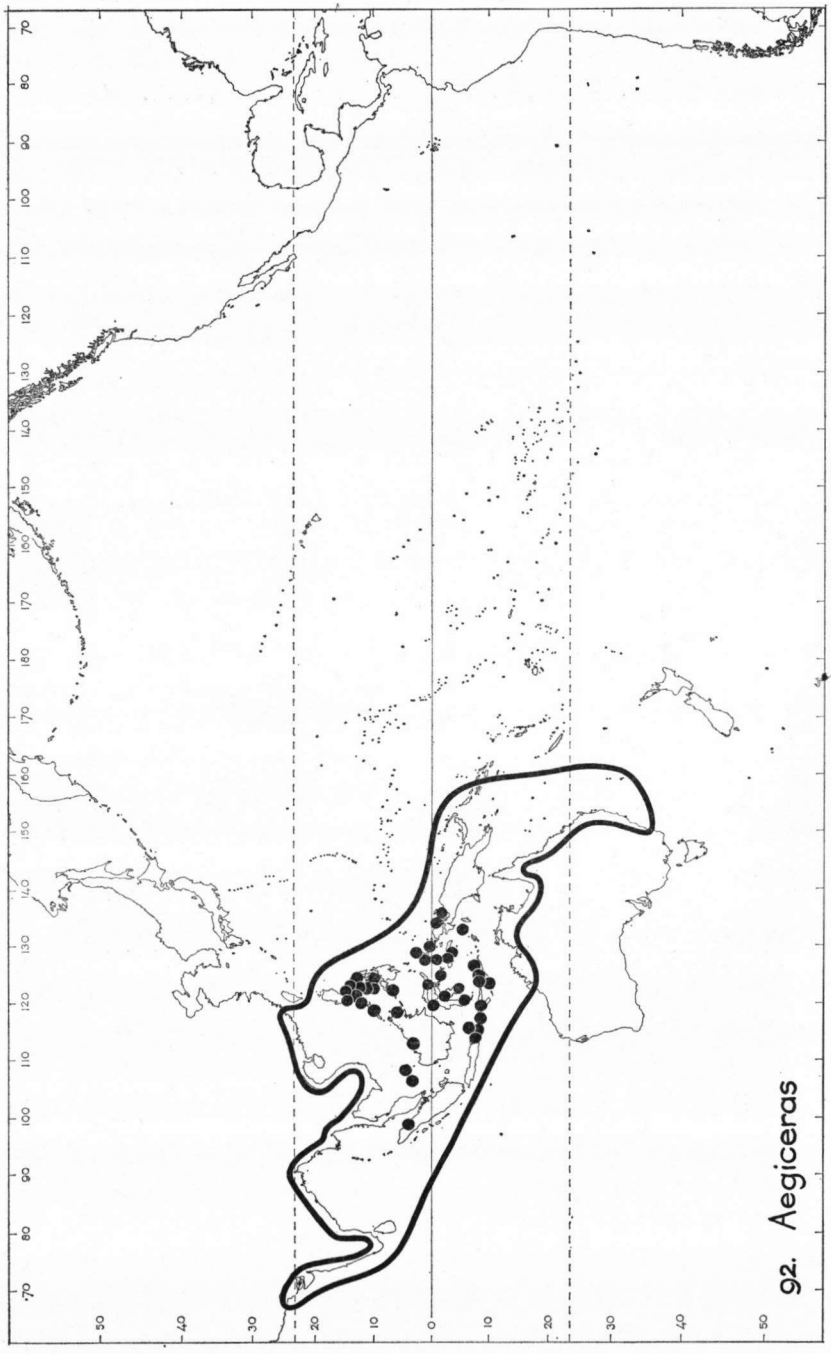
92. Aegiceras

93. **Pernettya** Gaud.

Name: Pernettya Gaudichaud, Voy. Freyc. Bot. (1826) 454, t. 67.

Family: *Ericaceae.*

Taxonomy and distribution: A genus of 17 species; specific discrimination is according to H. Sleumer (1935) very difficult owing to the small number of really constant characters. The distribution of the species is as follows: Tasmania and New Zealand have each 2 species; 4 species occur in Mexico of which one also in Guatemala; one is confined to Costa Rica and Panama; 4 species are found in Chile, Patagonia, Tierra del Fuego, one of which extends to the Falkland Islands. The Galapagos and Juan Fernandez Islands have each an endemic species allied to the Chilean *P. mucronata* (L.f.) Gaud. One species is peculiar to Columbia. One variable species, *P. prostrata* (Cav.) DC. has a wide distribution: from Costa Rica down the Andean chain as far south as Lago Argentino in South Chile. The genus is closely allied to *Gaultheria* which occurs in the temperate regions of both hemispheres and in the tropics on mountains. Intergeneric hybridization occurs frequently.

Habit: Small prostrate to erect shrubs up to 2 m tall.

Habitat & Ecology: In the tropics *Pernettyas* are exclusively found on high mountain ranges and volcanoes, ascending in the open alpine vegetation up to c. 5000 m. In the southern temperate zone (Tasmania, New Zealand, and subantarctic South America) they occur from sea-level to the alpine zone. Some species grow on dry rocky soil, others in marshes or along streams and lakes.

Dispersal: The fruit is a globose to subglobose 5-lobed berry (0.5—1 cm diam.) which is at the base enclosed by the persistent fleshy calyx and contains numerous, minute seeds. The colour of the fruit may be white, pink, red, or blackish. The berries are edible and are possibly eaten by birds.

Map: The dotted line delineates the area of *P. prostrata* (Cav.) DC.

Sources: B. L. Burtt & A. W. Hill, J. Linn. Soc. Bot. *49* (1935) 611—644; H. Sleumer, Notizbl. Berl.-Dahl. *12* (1935) 626—655; Lilloa *25* (1951) 528—556; Bot. Jahrb. *78* (1959) 478; W. H. Camp, Bull. Torr. Bot. Cl. *66* (1939) 7; J. Hutchinson, Fam. Flow. Pl. ed. 2, *1* (1959) 291, map; H. H. Allan, Fl. New Zeal. *1* (1961) 511—513.

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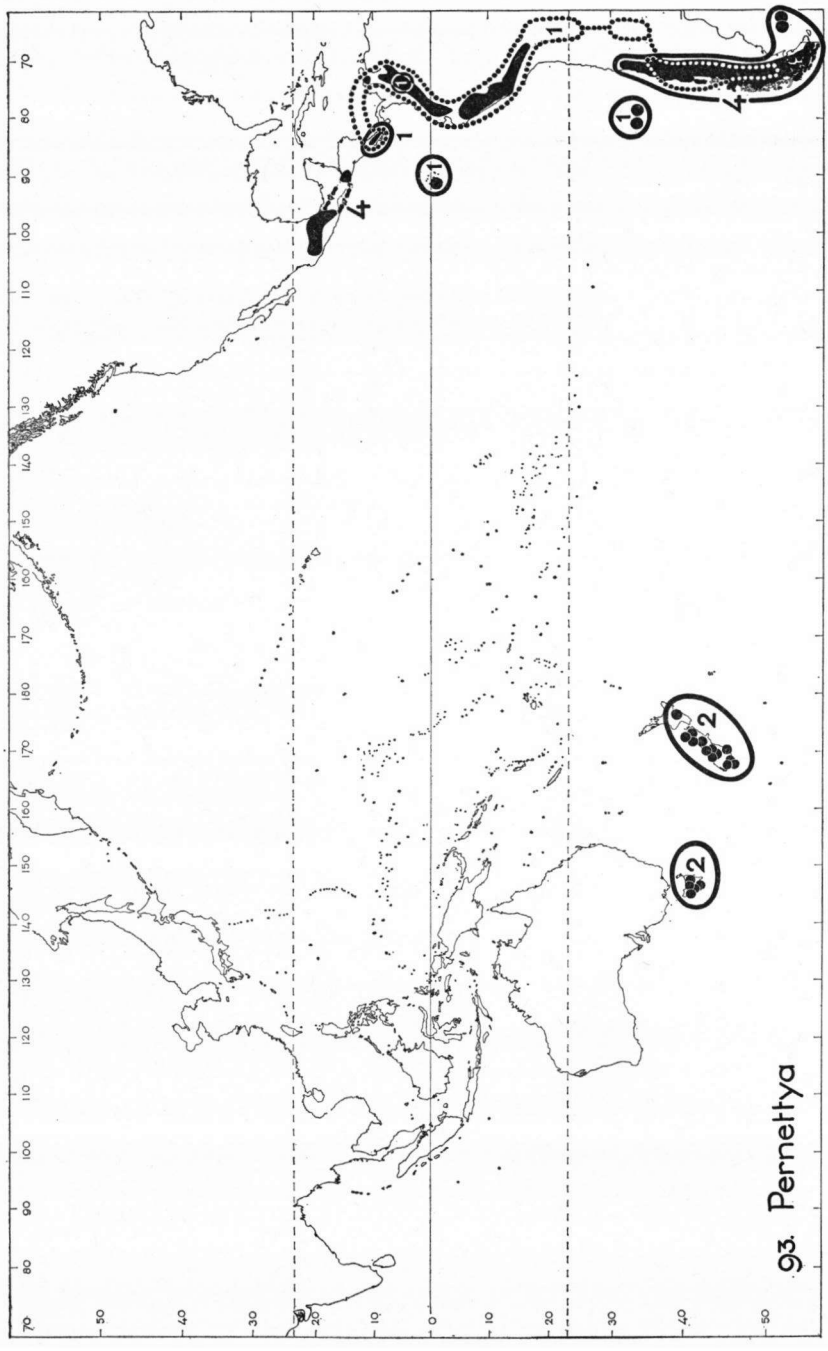

93. Pernettya

94. **Nesoluma** Baill.

Name: Nesoluma Baillon, Soc. Linn. Paris, Bull. *2* (1891) 964, nomen; Hist. Pl. *11* (1892) 279, descr. lat.

Family: *Sapotaceae.*

Synonym: *Chrysophyllum* L. sect. *Pleio-Chrysophyllum* Engl.

Taxonomy: A genus of 3 species: *N. polynesicum* (Hillebr.) Baill. is known from the Hawaiian Islands (Oahu, Lanai, Molokai, and Maui) and the Tubuai Islands (Rapa, Raivavae). *N. nadeaudii* (Drake) Pierre is confined to Tahiti and Moorea. *N. st.johnianum* Lam & Meeuse to Henderson I. The genus is allied to genera from Africa and Madagascar, New Caledonia and New Guinea, but closest of all to *Calvaria* of South East Africa, Madagascar and the Mascarenes with which it forms the subtribe *Calvariae* within the tribe *Sideroxilinae* (Lam, 1938).

Habit: Laticiferous trees of moderate size, up to 10 m tall.

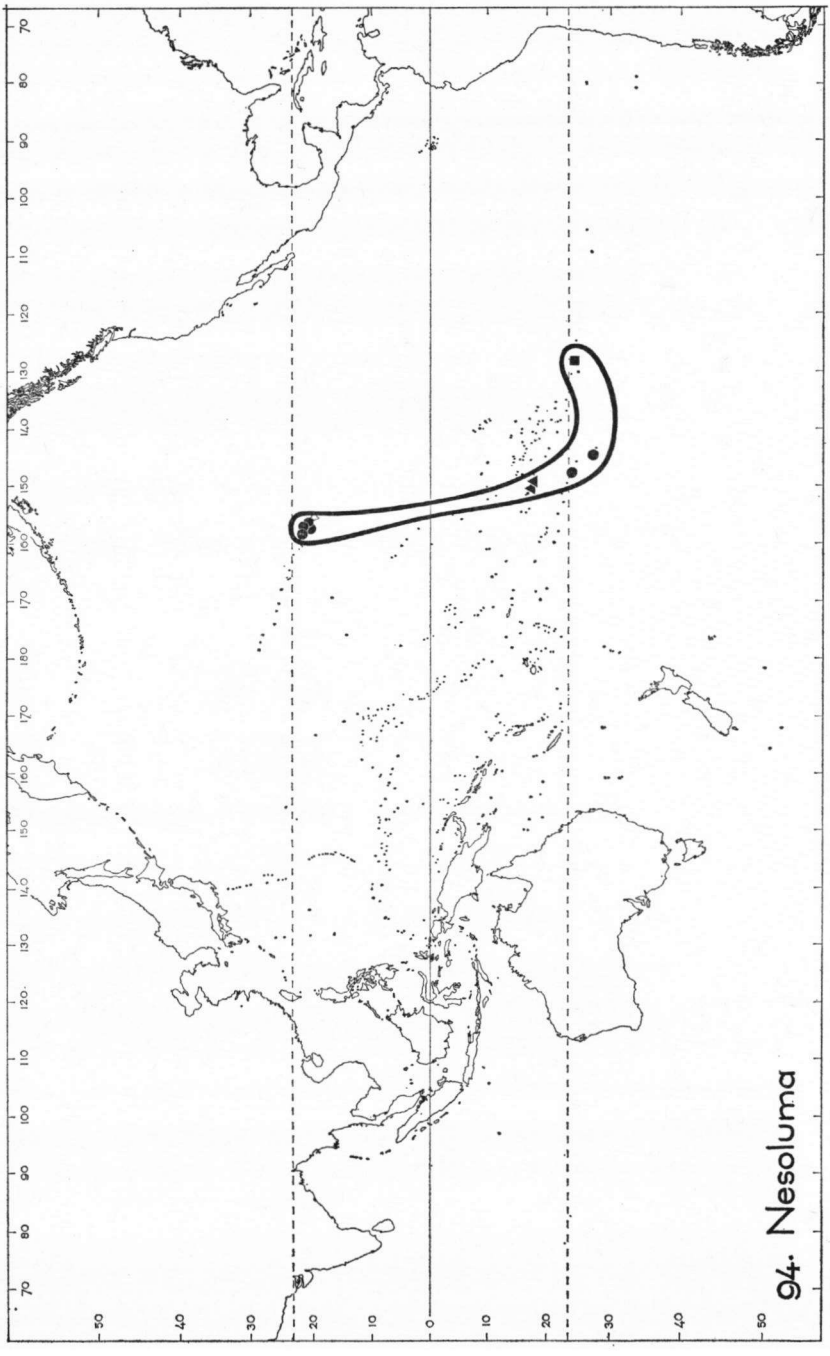
Habitat & Ecology: Trees of dry open forest and valleys, from near sea-level up to c. 800 m, on rocky or coral soils and lavastreams. *N. polynesicum* occurs abundantly in the Hawaiian Islands.

Fruit: The fruit is an ovoid, oblong to ellipsoid berry pointed at the apex, 1—2.5 cm long with a very thin pericarp, containing latex. The single seed has a thick, crustaceous testa. No observations are extant on dispersal in nature.

Map: Dots indicate localities of *N. polynesicum* (Hillebr.) Baill., triangles those of *N. nadeaudii* (Drake) Pierre, the square represents the locality of *N. st.johnianum* Lam & Meeuse.

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 277 (as *Chrysophyllum*); H. J. Lam & B. J. D. Meeuse, B. P. Bish. Mus. Occ. Pap. *14* (1938) 127—165; H. J. Lam, Proc. 6th Pac. Sc. Congr. *4* (1940) 676, fig. 3; Blumea *5* (1942) 31.

M. M. J. VAN BALGOOY.


94. Nesoluma

95. **Merrilliodendron megacarpum** (Hemsl.) Sleum.

Name: Merrilliodendron megacarpum (Hemsl.) Sleumer, Notizbl. Berl.-Dahl. *15* (1940) 243.

Family: *Icacinaceae.*

Synonyms: *Stemonurus megacarpus* Hemsl. in Hook. Ic. Pl. (1895) t. 2398; *Merrilliodendron rotense* Kaneh. (1934); *Peekeliodendron missionariorum* Sleum. (1937).

Notes: *M. megacarpum* is the only species of the genus.

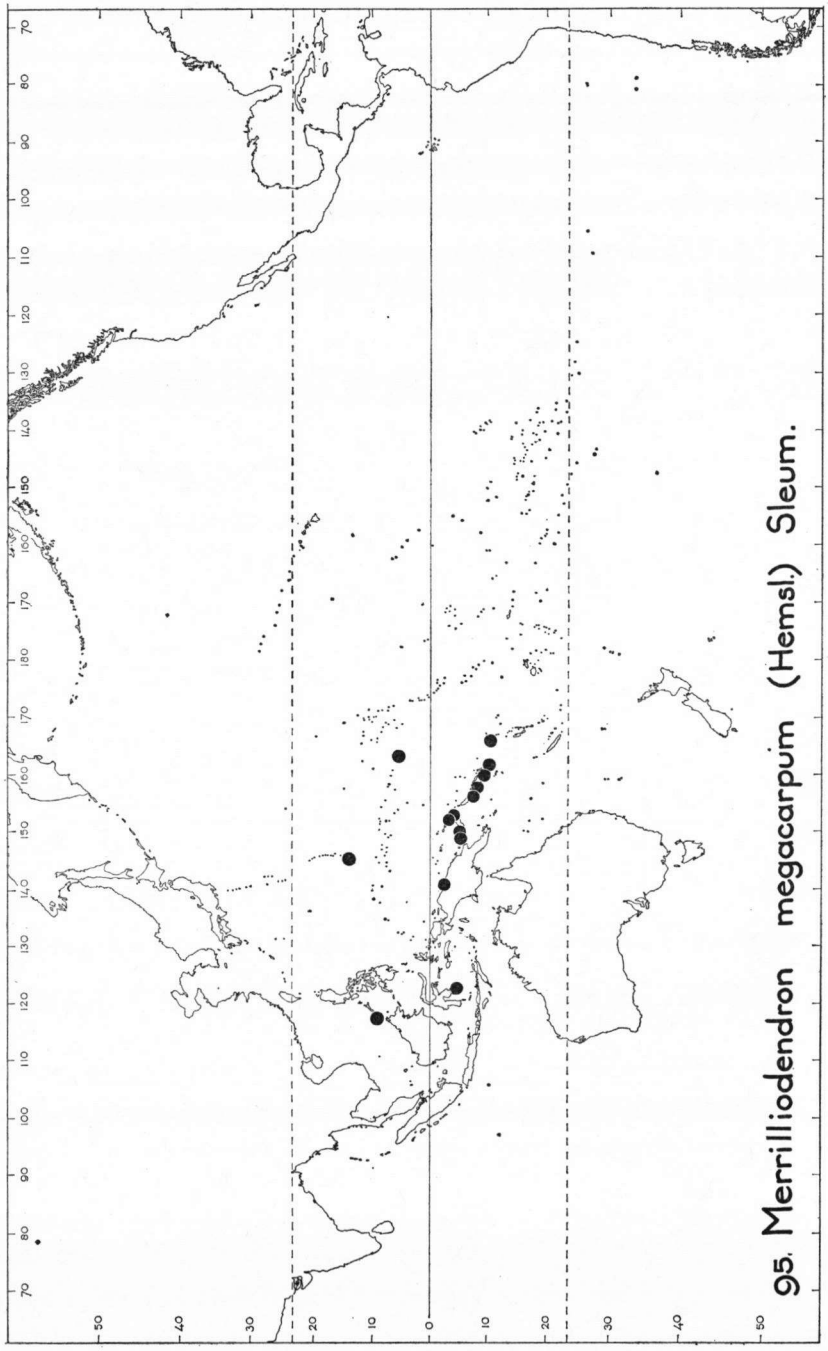
Habit: Tree of moderate size up to c. 20 m tall. Flowers and fruits in panicles.

Habitat & Ecology: Judging from the few collections a rather rare species. It is found as a constituent of the lowland and coastal rain-forest, and along the sandy beach. According to Peekel (1945) the species occurs scattered but is not uncommon in the Bismarck Archipelago, preferably in rather humid stations.

Dispersal: The fruit is a large, broadly ellipsoid, 1-seeded drupe, 4—6 by 2—3 cm. The thin exocarp decays at maturity; the endocarp is thick and woody or more or less corky, giving the fruit its power of buoyancy. Dispersal is obviously largely by water.

Sources: H. Sleumer, Notizbl. Berl.-Dahl. *13* (1937) 509; ibid. *15* (1940) 243; in E. & P. Pfl. Fam. ed. 2, *20b* (1942) 366; R. Kanehira, Bot. Mag. Tokyo *48* (1934) 920, fig. 7, 956; R. Kanehira & S. Hatusima, ibid. *54* (1940) 435; G. Peekel, MS. Fl. Bism. Arch. (1945) 1080. Collections in the Rijksherbarium Leyden and personal information by Dr. H. Sleumer.

M. M. J. VAN BALGOOY.


95. Merrilliodendron megacarpum (Hemsl.) Sleum.

96. **Eustrephus latifolius** R. Br. ex Sims

Name: Eustrephus latifolius R. Br. ex Sims, Bot. Mag. *31* (1809) t. 1245 and Prod. Fl. Nov. Holl. *1* (1810) 281.

Family: *Liliaceae* (*Philesiaceae*).

Synonyms: *E. angustifolius* R. Br. For the numerous other synonyms see Schlittler (1951, 212).

Taxonomy: The subfamily *Luzuriagoideae* (*Philesiaceae* sensu Hutchinson), to which the monotypic *Eustrephus* belongs, is mainly distributed over the extratropical southern hemisphere: *Lapagena* and *Philesia* in Chile, *Behnia* in South Africa (all monotypic), *Luzuriaga* with 3 species in South America from Peru to Tierra del Fuego and Falkland Islands, one of which extends to New Zealand, the monotypic *Geitonoplesium* which is almost sympatric with *Eustrephus* and finally the insufficiently known *Elachanthera* of Northwest Australia. *Eustrephus latifolius* is doubtfully indigenous in East Java.

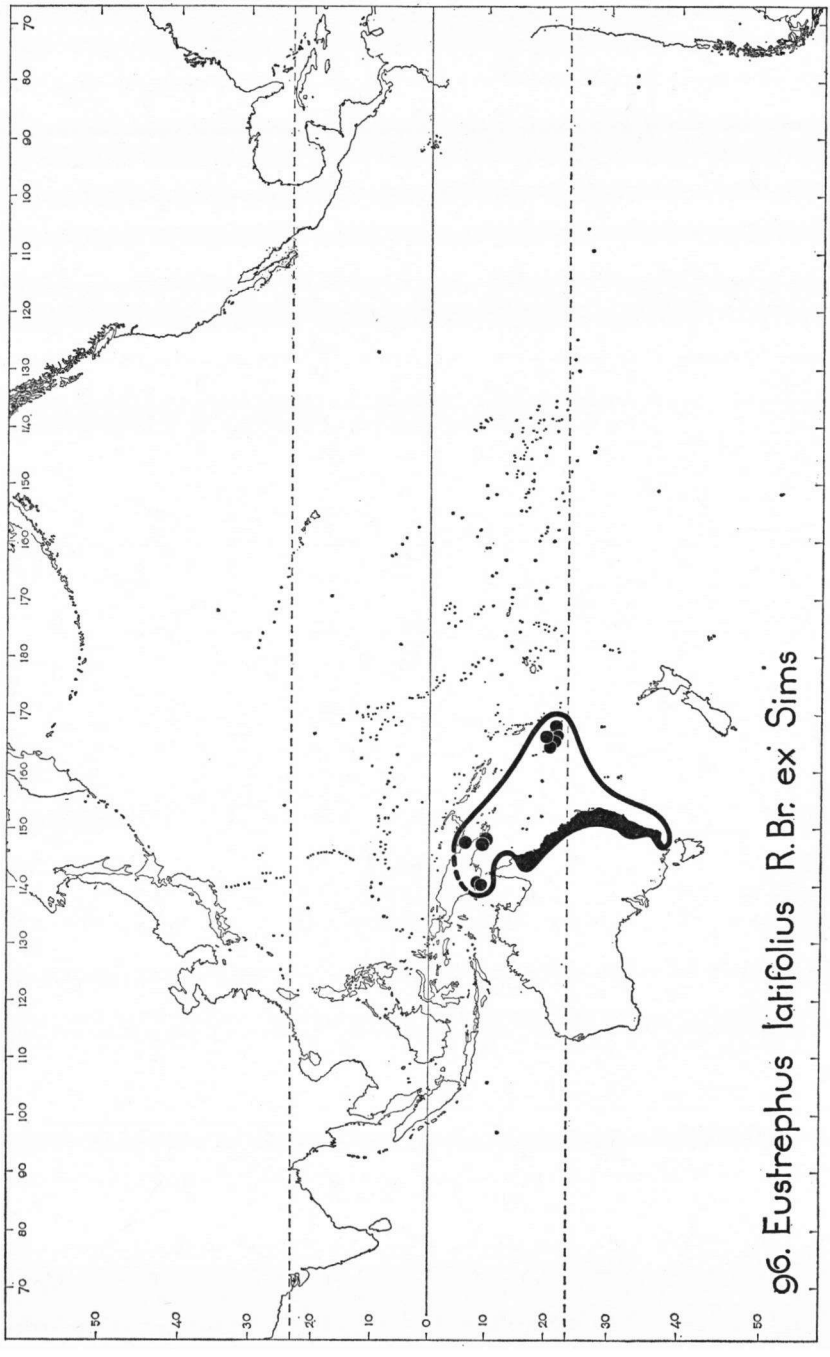
Habit: Scrambling or climbing, much branched shrub or liana, attaining a length of c. 5 m. The species is very variable especially in the form of the leaves.

Habitat & Ecology: The species is apparently rather indifferent to edaphic, climatic, and thermo-ecological requirements. It apparently thrives best in dense rain-forest but it is also found in secondary forest and open country subject to a dry monsoon. In New Guinea it occurs from near sea-level to c. 1500 m.

Fruit: The fruit is a globose, berry-like, 3-locular capsule, 1—3 cm in diam., yellow to orange-red when ripe. It may or may not dehisce. There are 1—10 seeds in each locus; the seeds are 4—6 mm in diam., black, round or compressed-ovate to triangular with a hard rugulose seed-coat.

Sources: K. Krause, in E. & P. Pfl. Fam. ed. 2, *15a* (1930) 378—381; J. Schlittler, Vierteljahrschr. Naturf. Ges. Zürich *94* (1949) Beih. 1, 1—28, 1 map; Mitt. Bot. Mus. Univ. Zürich *189* (1951) 175—239, 1 map. Collections in the Rijksherbarium Leyden.

M. M. J. VAN BALGOOY.


96. Eustrephus latifolius R.Br. ex Sims

97. Geitonoplesium cymosum (R. Br.) A. Cunn.

Name: Geitonoplesium cymosum (R. Br.) A. Cunn., Bot. Mag. *59* (1832) t. 3131.

Family: *Liliaceae* (*Philesiaceae*).

Synonyms: The species is known under various synonyms. See Schlittler (1951, 226).

Notes: As most of the *Luzuriagoideae Geitonoplesium* is monotypic. Its area resembles that of *Eustrephus* but is wider. The species is closely allied to *Eustrephus latifolius*, and shows parallel development (Schlitler, 1951). For further notes see 96. *Eustrephus latifolius*.

Habit: As *Eustrephus*.

Habitat & Ecology: The same as for *Eustrephus*, but *Geitonoplesium* has been found at slightly higher altitudes, viz 1900 m, in the Arfak Mts (New Guinea).

Fruit: The fruit is similar in structure to that of *Eustrephus* but is smaller (1—1.5 cm in diam.), purple, blue or black, containing 1—10 black triangular-ovate, smooth seeds (4—8 mm in diam.).

Sources: See 96. *Eustrephus latifolius*.

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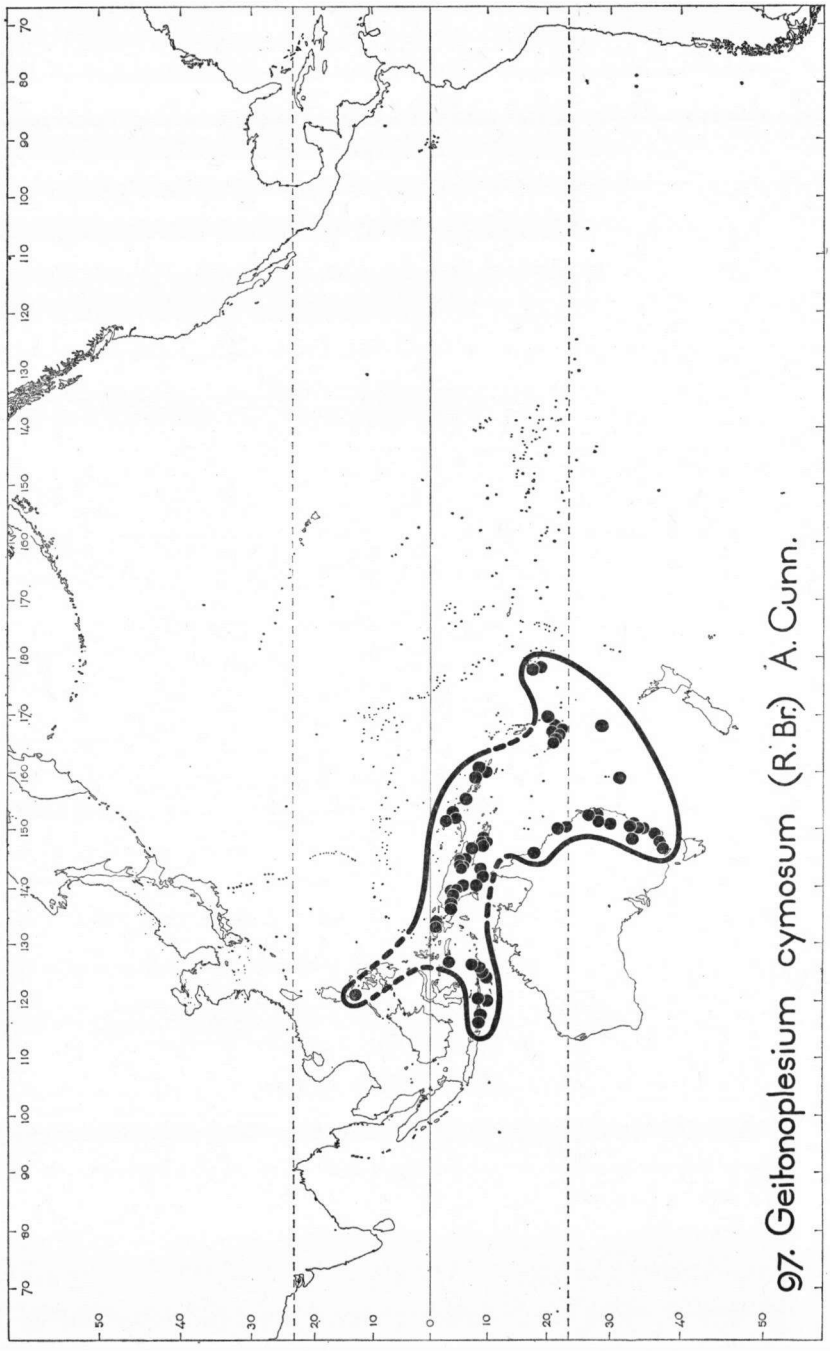
97. Geitonoplesium cymosum (R. Br.) A. Cunn.

98. **Herpolirion** Hook. f.

Name: Herpolirion Hook. f., Fl. Nov. Zel. (1853) 258.

Family: *Liliaceae.*

Notes: A monotypic genus, according to Krause allied to *Xeronema* (see map 99).

Habit: Slender tufted perennial herbs with narrow sheathing leaves and creeping rhizomes, c. 5 cm in height. Flowers blue or white, solitary.

Habitat & Ecology: Confined to alpine heights in most of its range, descending to sea-level in Otago (S. New Zealand) and Stewart I. In swampy or moist open places.

Fruit: The fruit is a globose 2—3-celled loculicidal capsule (½—1 cm in diam.) enclosed in the persistent perianth, containing many oblong-ovate seeds with a smooth, crustaceous black testa.

Sources: G. Bentham, Fl. Austr. 7 (1878) 60; L. Rodway, Tasm. Fl. (1903) 219; T. F. Cheeseman, Manual New Zeal. Fl. (1906) 720; A. J. Ewart, Fl. Vict. (1930) 291; K. Krause, in E. & P. Pfl. Fam. ed. 2, *15a* (1930) 294; R. M. Laing & E. W. Blackwell, Pl. New Zeal. ed. 5 (1949) 111.

99. **Xeronema** Brongn. & Gris

Name: Xeronema Brongn. & Gris., Bull. Soc. Bot. Fr. *11* (1864) 316.

Family: *Liliaceae.*

Synonym: *Scleronema* Brongn. & Gris.

Notes: A genus of 2 species: *X. callistemon* Oliv. in Poor Knights I. and Hen I. (off North New Zealand), and *X. moorei* Brongn. & Gris in New Caledonia.

Habit: Rather robust stoloniferous perennial herbs with tufts of stiff linear leaves, occasionally attaining a height of 1 m or more, with bright red, terminal inflorescences.

Habitat & Ecology: Both species grow on exposed, well-drained rocky soil; the New Zealand species from near sea-level up to 300 m, the New Caledonian one between 500—1600 m. In suitable places they may form large dense tufts.

Dispersal: The fruits are 3-celled, dehiscent (c. 0.5 cm in diam.) capsules borne on dense one-sided racemes, which measure 10—30 cm. According to Miss Moore (1957, 360) there are numerous seeds in each capsule, but many fail to mature, and some escape only if the capsule disintegrates. The seeds are ovate to oblong more or less convex on one side; the testa is locally produced into cylindrical processes. Miss Moore observed that occasionally clumps of *Xeronema* may break off and be carried by the sea. She considers it, however, very unlikely that the plants are dispersed in this way.

Sources: W. R. B. Oliver, Trans. New Zeal. Inst. *56* (1926) 1—5; K. Krause, in E. & P. Pfl. Fam. ed. 2, *15a* (1930) 294; L. M. Cranwell, Rec. Auckl. Inst. & Mus. *2* (1937) 101—110, map; R. M. Laing & E. W. Blackwell, Pl. New Zeal. ed. 5 (1949) 111—113; L. B. Moore, Pac. Sc. *11* (1957) 355—362, 1 map.

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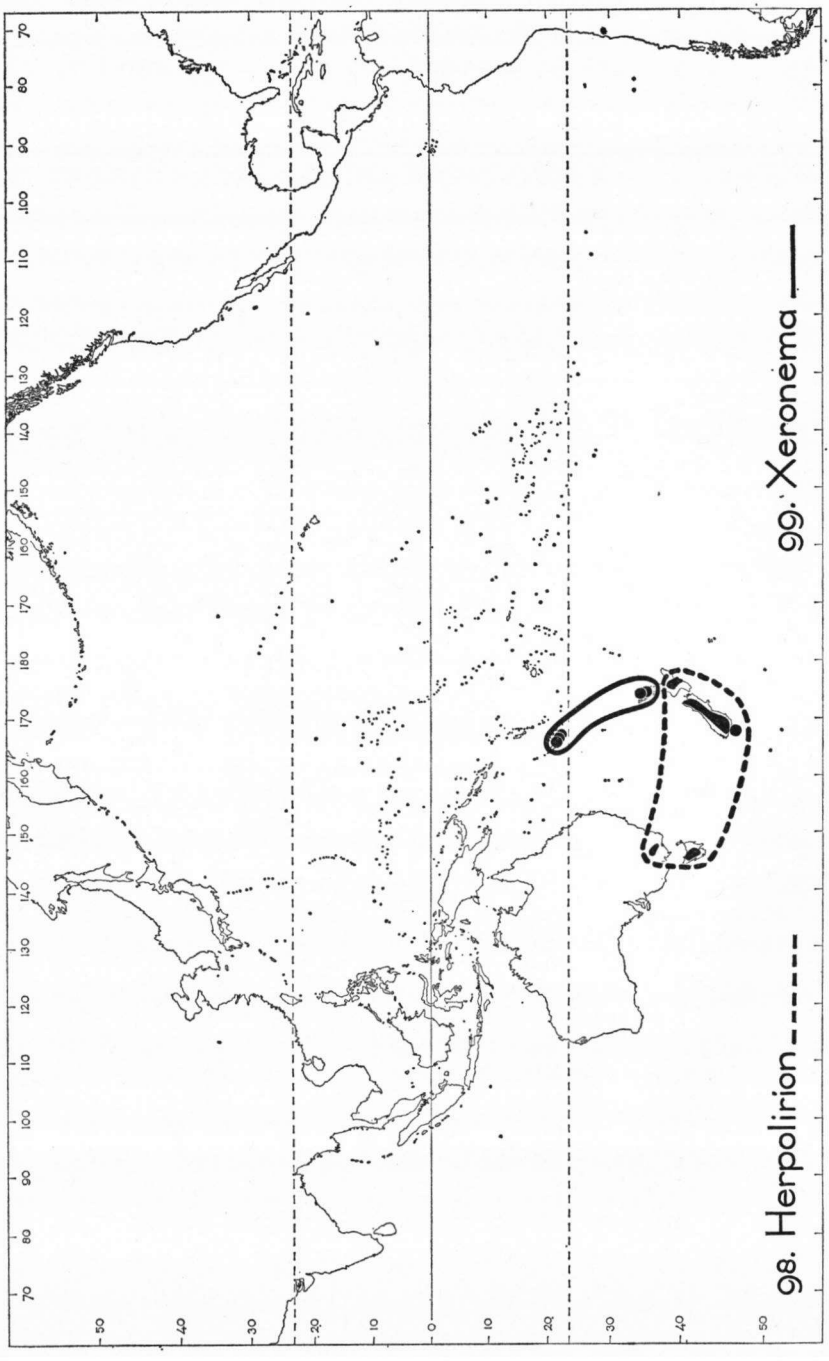
98. Herpolirion
99. Xeronema

100. **Elatostema** Forst.

Name: Elatostema J. R. & G. Forster, Char. Gen. Pl. (1776) 105.

Family: *Urticaceae.*

Synonyms: *Polychroa* Lour., *Pellionia* Gaud., *Elatostematoides* C. B. Rob., *Langeveldia* Gaud.

Taxonomy and distribution: A large genus of c. 400 described species. As after a thorough revision the number of species will probably be reduced considerably, the number of species for each island group given here is very provisional. On the present map localities have only been indicated in the Pacific. H. Schröter & H. Winkler (1935) have divided the genus into 4 sections of which the distribution is as follows: Sect. *Elatostema* has the range of the genus. Sect. *Pellionia* occurs from S. India and Ceylon throughout continental SE. Asia to S. Japan and throughout Malesia as far east as Fiji. Sect. *Elatostematoides* ranges throughout Malesia except Malaya as far east as Fiji and Samoa. Sect. *Weddellia* is confined to parts of the Himalaya, China, Luzon, Sumatra, and Java (see H. Schröter & H. Winkler, 1935, tab. VII fig. 38—41). The genus is allied to *Procris*, which has a similar distribution, and the pantropical genus *Pilea*.

Habit: Mostly low perennial herbs, rarely woody, attaining a height of c. 1.5 m. Most species are dioecious, some monoecious.

Habitat & Ecology: The majority of the species belong to the floor-vegetation of everwet tropical rain-forest, where they often are the most important constituent. In monsoon forest they occur principally along streams. They thrive best on soil rich in humus but may also occur on sandy, rocky or limey soils. *Elatostemas* occur from near sea-level to c. 3000 m, occasionally even up to c. 4000 m in the Himalayas. Some species of sect. *Elatostema* enter the subtropical or even warm-temperate zone (China, S. Japan, New Zealand). The flowers are minute, greenish or whitish, borne in dense clusters and are obviously pollinated by wind.

Dispersal: There is no obvious dispersal agent. The fruit is a yellow to red ovate to ellipsoid small achene, 0.5—2 mm long, borne in profusion in the inflorescences which vary from loose cymes to fleshy glomerules.

Sources: F. Reinecke, Bot. Jahrb. *25* (1898) 619—626; H. Winkler, ibid. *57* (1922) 520—562; Nova Guin. Bot. *14* (1924) 121—128; W. A. Setchell, Un. Cal. Publ. Bot. *12* (1926) 168—172; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 48; R. Kanehira, En. Micr. Pl. (1935) 309; H. Schröter & H. Winkler, in Fedde, Rep. 83, Beih. *1* & *2* (1935) 4 maps; A. C. Smith, Sargentia *1* (1942) 13—23; J. Arn. Arb. *27* (1946) 319; ibid. *31* (1950) 150—153; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 19; L. M. Perry, J. Arn. Arb. *32* (1951) 369—389; S. F. Glassman, B. P. Bish. Mus. Bull. *209* (1952) 81; H. Hara & H. Kanai, Distr. Maps Japan *1* (1958) 2; H. H. Allan, Fl. New Zeal. *1* (1961) 405. Various local Floras and collections in the Rijksherbarium Leyden.

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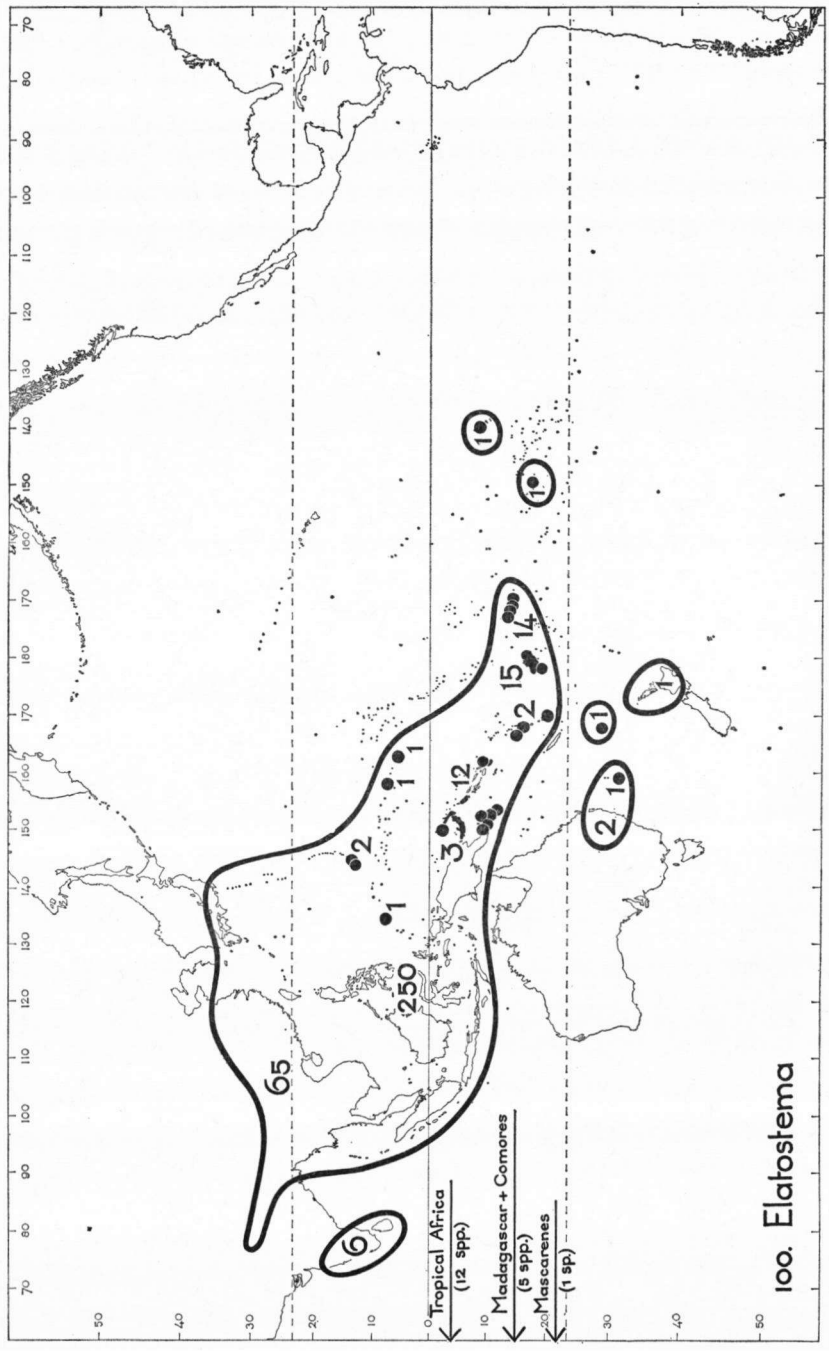
100. Elatostema
Tropical Africa
(12 spp.)
Madagascar + Comores
(5 spp.)
Mascarenes
(1 sp.)
65
6
250
1
2
1
1
1
3
12
2
15
14
1
1
2
1
1
1

101. **Pittosporum** Banks ex Gaertn.

Name: Pittosporum Banks ex Gaertn., Fruct. *1* (1788) 286, t. 59.

Family: *Pittosporaceae.*

Synonyms: *Senacia* Lamk, *Pseuditea* Hassk., *Glyaspermum* Zoll. & Mor. For other synonyms see Pritzel (1930, 273).

Taxonomy and distribution: *Pittosporum* is an old world genus. One species is isolated on Madeira and Teneriffe; in Africa the genus is spread from the Ivory Coast in the west to Somaliland and Yemen in the east and to the Cape Province in the south. Furthermore it occurs in Madagascar and adjacent islands to South and East Asia, throughout Malesia and Australia and far into the Pacific (east to the Hawaiian Islands, Tahiti, Rapa I. and Henderson I.). Over 200 species have been described but the exact number is as yet unknown. Various authors have dealt with *Pittosporum* in a partial area only. Centres of specific development are Africa, Madagascar, China, SE. Australia, New Zealand, New Caledonia, and Hawaii. The family is essentially Australian, 6 genera being confined to this continent, 2 are also represented in East Malesia. As there is no world revision the species density has not been indicated.

Habit: Small, much-branched shrubs or small trees, sometimes epiphytic, mostly under 10 m, but some species occasionally up to 30 m tall. In all species there is a tendency to sexual dimorphism. Some species are said to be completely dioecious.

Habitat & Ecology: Most *Pittosporums* are components of the tropical rain-forest substage. Some species occur in monsoon forest, dry savannahs, rocky and sandy sea-shores, along the edge of mangroves and swamps, whereas others occur in montane to subalpine forest. Several species enter the subtropical and temperate zone. The altitudinal range is from sea-level to c. 4000 m (New Guinea and China). Sometimes *Pittosporums* are found in secondary forest and as pioneers on land slips, lavastreams, etc. The flowers are rather small (up to 1 cm in diam.), usually white or creamy, and are fragrant. Pollination is most likely by insects.

Dispersal: The fruit is an ovoid, ellipsoid or pyriform, coriaceous or woody capsule, 0.5—4.5 cm, dehiscing loculicidally with 2—5 valves. Mature fruits are mostly yellow or orange, sometimes reddish, brown or green. The seeds are compressed smooth or wrinkled and of irregular shape (2—10 mm in diam.), red or black and usually coated by a viscid fluid. Though in most species the fruits are borne in profusion and are rather conspicuous, observations on dispersal are very scanty. Ridley (1930) stated that in New Zealand introduced opossums feed on *Pittosporum* fruits and Cufodontis (1960) 36 cited an observation by Greenway of birds devouring *Pittosporum* seeds.

Note: On the otherwise excellent map of Cufodontis (1960, 177) *Pittosporum* is indicated for Christmas I. in the Central Pacific obviously in error for Christmas I. in the Indian Ocean.

Sources: E. Pritzel, in E. & P. Pfl. Fam. ed. 2, *18a* (1930) 273—281; H. N. Ridley, Dispersal of Plants (1930) 382; E. E. Sherff, Field Mus. Nat. Hist. Bot. *22* (1942) 467—566; M. Gowda, J. Arn. Arb. *32* (1951) 263—343, 1 map; G. Cufodontis, in Fedde, Rep. *55* (1952) 27—113, fig. 2, 6, 8 (maps); Bol. Soc. Brot. *34* (1960) 159—177, 1 map; H. L. Li, J. Wash. Acad. Sc. *43* (1953) 43—46; R. C. Cooper, Ann. Mo. Bot. Gard. *43* (1956) 87—188, fig. 5—36 (maps); K. Bakker & C. G. G. J. van Steenis, Fl. Mal. I, *5* (1957) 345—362; K. Bakker, Blumea *12* (1962) 426. Other literature, floras and collections in the Rijksherbarium Leyden.

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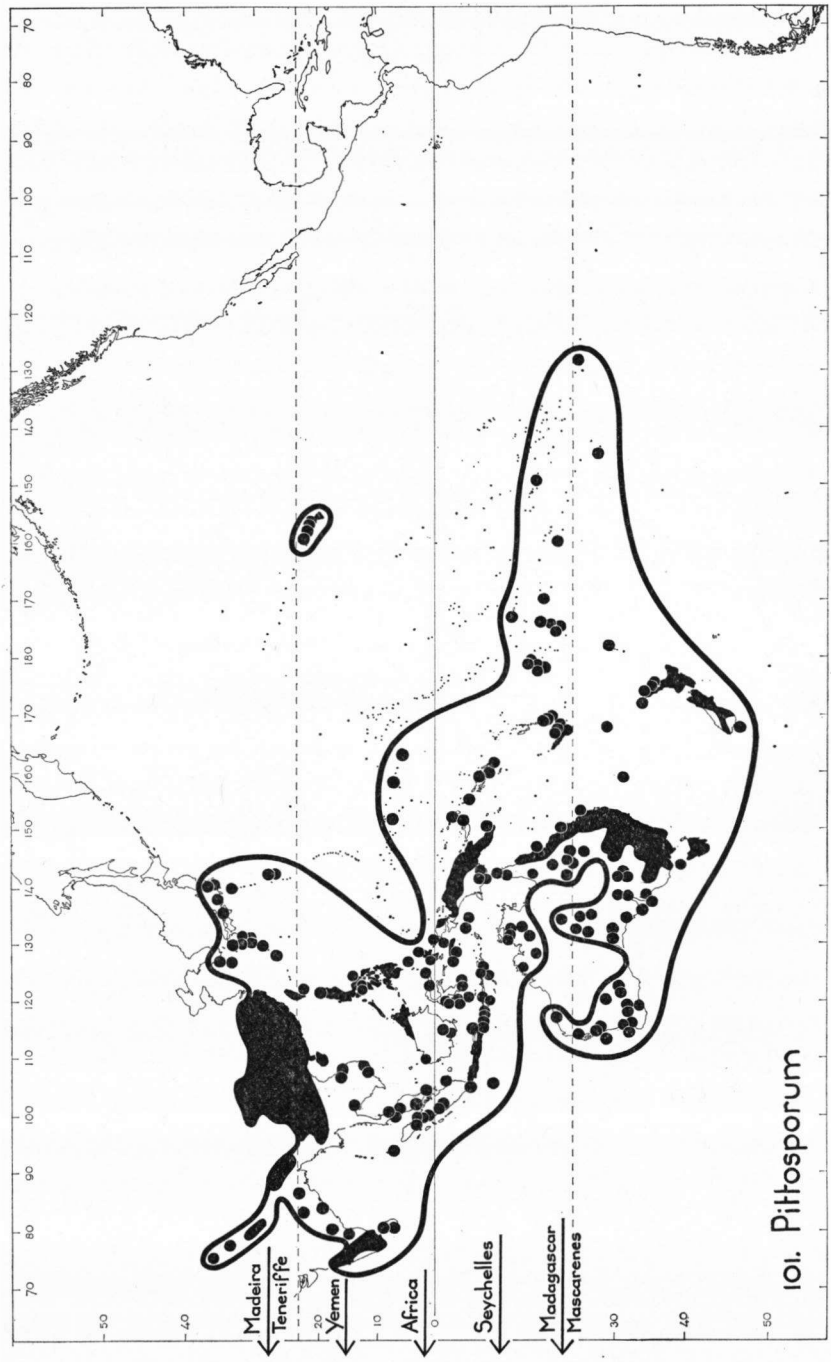

Madeira
Teneriffe
Yemen
Africa
Seychelles
Madagascar
Mascarenes
101. Pittosporum

102. **Araucaria** Juss.

Name: Araucaria Juss., Gen. Pl. (1789) 413.

Family: *Araucariaceae.*

Synonyms: See Pilger (1926).

Taxonomy and distribution: A genus of 13 species divided into 3 sections: Sect. *Colymbea*: one species in Brazil (Prov. Rio Grande do Sul to Minas Geraes) and doubtfully recorded for Bolivia (Florin, 1940, 80), another species occurs in Central Chile and adjacent Argentina (Prov. Neuquen) and one species in Queensland. Sect. *Eutacta*: five species in New Caledonia and adjacent islands, one confined to Norfolk I., and another from East Australia to New Guinea. *A. columnaris* (Forst.) Hook. also occurs on Aneytum (New Hebrides) but is most likely introduced (Guillaumin, 1948). Sect. *Intermedia* comprises three endemic New Guinean species.

Fossils: It has been suggested that *Araucaria* has been of worldwide distribution. Fossil remains of this genus, or closely allied genera, have been described from Jurassic to Tertiary deposits in Europe, India, South Africa, Australia, Tasmania, New Zealand, Patagonia, Tierra del Fuego, Antarctica, Kerguelen Islands and Seymour I. (Seward & Conway, 1934; Florin, 1940). Florin expressed doubt about the identity of many of the pre-Tertiary fossils.

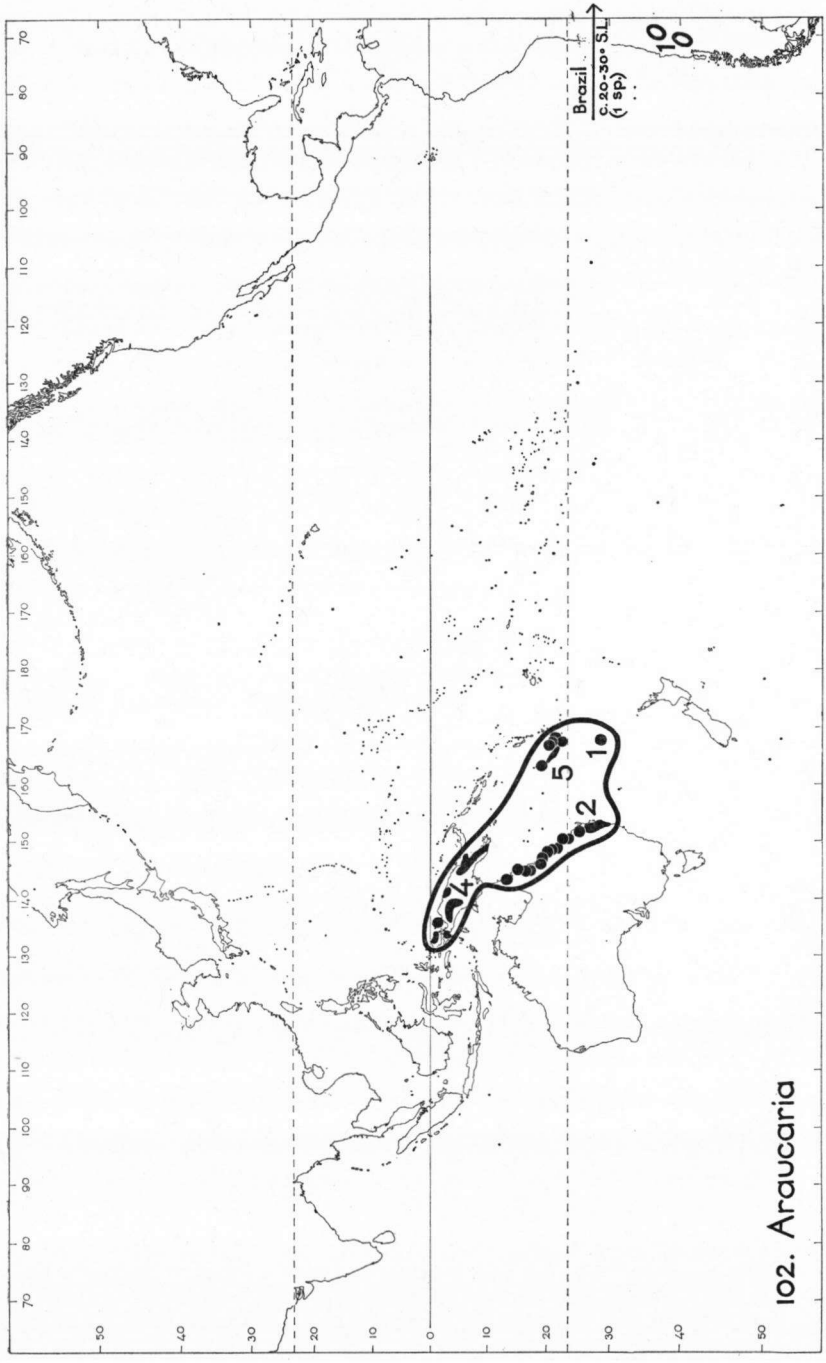
Habit: Large, erect, resiniferous trees, usually attaining 50—60 m, rarely more. Most species are dioecious, but some species may occasionally be monoecious.

Habitat & Ecology: Dominant upper-storey trees of the everwet tropical montane and subtropical rain-forest ascending to c. 4000 m in New Guinea. Some species descend to near sea-level, e.g. *A. cunninghamii* Ait. in Queensland and *A. columnaris* (Forst.) Hook. in New Caledonia. *Araucarias* thrive best on moist rich soils.

Dispersal: The female cone is globose to ellipsoid, 10—35 cm in diam. and contains a great number of one-seeded carpels (over 1000 carpels per cone in some species). The carpels are compressed, ovate to lanceolate up to 7 cm long, and winged in sect. *Eutacta*. They come free from the cone at maturity. In some species the seeds are detached from the carpel. The seeds of the American species and those of the Australian *A. bidwillii* Hook. are eaten by man. Water dispersal is unlikely as the seeds readily sink. Wind is possibly a more effective dispersal agent, although the seeds are rather heavy and not likely to be dispersed over appreciable distance.

Sources: C. Lauterbach, Bot. Jahrb. *50* (1914) 48—51; R. Pilger, in E. & P. Pfl. Fam. ed. *2*, *13* (1926) 249—266; A. U. Däniker, Mitt. Bot. Mus. Un. Zürich *142* (1932) 46—49; A. C. Steward & V. Conway, Ann. Bot. *48* (1934) 715—741, map II & III; R. Florin, Kungl. Sv. Vet. Akad. Handl. III, *19*, *2* (1940) fig. 5 (map); C. T. White, J. Arn. Arb. *28* (1947) 259; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 5; W. D. Francis, Australian Rain-forest Trees (1951) 60—66; Anonymous, Forest Trees of Australia (1957) 204—209, 2 maps; L. B. Smith, Contr. U.S. Nat. Herb. *35* (1962) fig. 41 (map). Other literature and collections in the Rijksherbarium Leyden. Mr. L. S. Smith (Brisbane) has provided the Australian localities.

M. M. J. VAN BALGOOY.


Brazil
c. 20-30° S.L.
(1 sp.)
10
10
1
2
3
4
5
102. Araucaria

103. **Melicytus** Forst.

Name: Melicytus J. R. & G. Forster, Char. Gen. Pl. (1776) 124.

Family: *Violaceae.*

Synonym: *Tachites* Soland. ex Gaertn.

Taxonomy: A genus of 4—5 species, of which 4 are represented in New Zealand. One of these species, *M. ramiflorus* Forst., extends to Norfolk I., Kermadec, Tonga, Samoa and Fiji Islands. The Fijian population is considered as a separate species by Gillespie (1932): *M. fasciger* Gillespie. The genus is closely allied to 104. *Hymenanthera.*

Habit: Dioecious shrubs or small trees up to c. 10 m tall.

Habitat & Ecology: Common in lowland and montane forest and forest borders in New Zealand. In the other Pacific islands exclusively in hill stations as a rather rare component of the undergrowth in the rain-forest from 300 to 1500 m altitude. The flowers are small, yellow, fragrant and produce much nectar; they are pollinated by insects.

Dispersal: The fruit is a globose to ovoid berry, 3—7 cm in diam., white, blue or purple, containing (1—)4—6(—12) seeds. The berries are often produced in profusion in axillary fascicles and are readily eaten by birds, among others by *Prosthemadura novaezelandiae.*

Map: Localities of *Melicytus* have been indicated by dots, the complete area has been delineated by a full line.

Sources: L. S. Gibbs, Trans. Linn. Soc. Lond. Bot. *39* (1909) 140; W. R. B. Oliver, Trans. New Zeal. Inst. *42* (1909) 157, 141; H. N. Ridley, Dispersal of Plants (1930) 465, 475; J. W. Gillespie, B. P. Bish. Mus. Bull. *91* (1932) 20; E. Christophersen, ibid. *128* (1935) 149—151; T. G. Yuncker, ibid. *220* (1959) 189; H. H. Allan, Fl. New Zeal. *1* (1961) 191—193.

104. **Hymenanthera** R. Br.

Name: Hymenanthera R. Br., in Tuckey, Narrat. Exped. Expl. Congo (1818) 442.

Family: *Violaceae.*

Synonym: *Solenantha* G. Don.

Taxonomy: A genus of 8 species, 5 in New Zealand, 1 each in Chatham and Norfolk I., and 1 in Australia, Tasmania, and Lord Howe I. According to Beuzenberg (1961, 337) „*Melicytus* and *Hymenanthera* cannot be sharply separated, as, firstly, the species form a graded series characterised by a progressive reduction and fusion of floral parts, and, secondly, an intergeneric hybrid has a regular meiosis and normal pollen." The species concerned are: *Melicytus lanceolatus* Hook. f. and *Hymenanthera chathamica* (F. v. M.) Kirk.

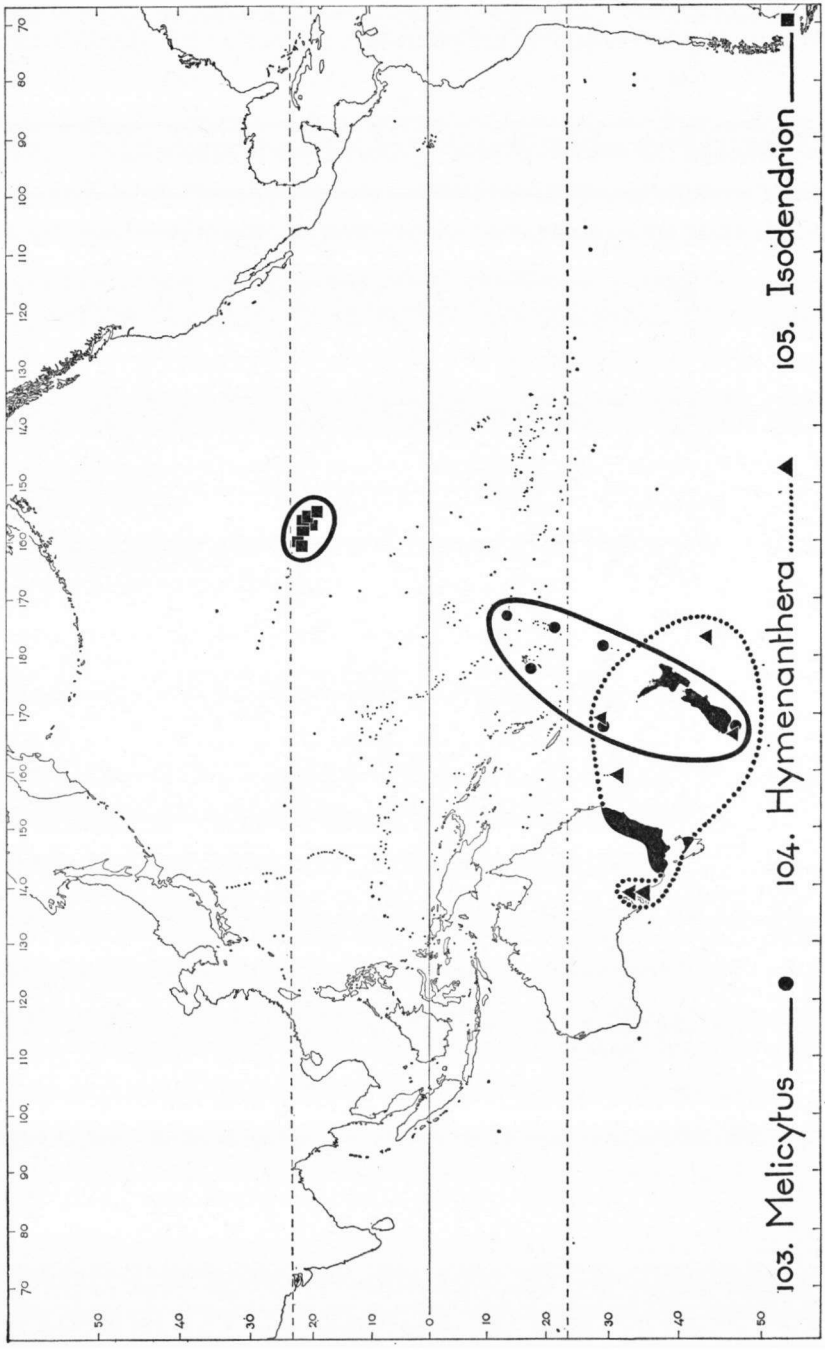
Habit: Shrubs or small trees up to c. 3 m tall, often spiny. Dioecious or flowers bisexual. *H. alpina* (Kirk) Oliv. is a low spreading shrub of only c. ½ m.

Habit & Ecology: Common in coastal rocky habitats and forest borders, *H. alpina* in montane and subalpine rocky stations in South New Zealand. According to Willis (in litt.) the Australian *H. dentata* R. Br. ranges from sea-level to the Alps at 1800 m, but is most frequently riparian. The flowers are similar to those of *Melicytus.*

Dispersal: The fruit is similar to that of 103. *Melicytus*, but contains only (1—)2(—4) seeds. The fruits are most likely eaten by birds.

Map: Localities indicated by triangles, the area delineated by a dotted line.

Sources: W. R. B. Oliver, Trans. New Zeal. Inst. *49* (1917) 143; H. Melchior, in E. & P. Pfl. Fam. ed. 2, *21* (1925) 354; A. J. Ewart, Fl. Vict. (1930) 777; H. H. Allan, Fl. New Zeal. *1* (1961) 193—196; E. J. Beuzenberg, New Zeal. J. Sc. *4* (1961) 337—349. Mr. J. H. Willis (Melbourne) has kindly provided information concerning the Australian species.


103. Melicytus
104. Hymenanthera
105. Isodendrion

105. **Isodendrion** A. Gray

Name: Isodendrion A. Gray, Proc. Am. Acad. Arts Sci. *2* (1852) 324.

Family: *Violaceae.*

Notes: In his revision of this Hawaiian genus St.John (1952) distinguished 14 species most of which are extremely rare or have not been found since 1871. *Isodendrion* is allied to 103. *Melicytus* and 104. *Hymenanthera.*

Habit: Erect shrubs up to 2 m, rarely 3 m tall.

Habitat & Ecology: Bare rocks, dry forest and valleys in the foothills up to c. 1000 m altitude. Little is known of the ecology, as most species are apparently extinct, and the few remaining very rare. The small, axillary flowers are yellowish or greenish.

Dispersal: The fruit is an ovoid to ellipsoid, 3-lobed capsule, 7—12 mm long, beaked by the persistent style, dehiscing by 3 valves. Each valve contains 2(—4) seeds which are 2—3.5 mm in diam. Of many species the fruit is, however, unknown.

Sources: H. Melchior, in E. & P., Pfl. Fam. ed. 2, *21* (1925) 355; H. St.John, Pac. Sc. *6* (1952) 213—255, fig. 15 (map).

106. **Xylosma** G. Forst.

Name: Xylosma G. Forster, Prod. (1786) 72, nom. gen. cons.

Family: *Flacourtiaceae.*

Synonym: *Myroxylon* J. R. & G. Forst., Char. Gen. Pl. (1776) 125.

Taxonomy and distribution: A genus of over 100 species. Nearly 70 in tropical and subtropical America, from Mexico, West Indies and Central America to the northern and northeastern provinces of Argentina and to Uruguay in the south. In Asia 6 species from the Northwest Himalaya to Indo-China, South and East China, South Japan, Hainan, Formosa and Ryu Kyu, 4 species in Malesia, and 2 in East Queensland. The distribution of the Pacific species, as far as known, is as follows: One species is confined to the Marianas. The Solomons (Guadalcanal) have one species also found in New Guinea and the Moluccas. Lord Howe I. has one endemic species and shares a second one with Queensland. New Caledonia and adjacent islands have 15 species, 12 endemic in New Caledonia proper, one peculiar to I. de Pins and one to Lifu, whereas one occurs both on New Caledonia and the Loyalties. The New Hebrides (Aneytum) have one endemic species, Fiji 4, of which 2 endemic, one also on Tonga, another also on Tonga and Niue. Samoa has one endemic species which is also doubtfully mentioned for Niue. One species is widely spread in SE. Polynesia and is also doubtfully mentioned for New Caledonia. Finally one species is peculiar to the Hawaiian Islands.

Habit: Dioecious, medium-sized trees or shrubs, up to c. 25 m, often armed.

Habitat & Ecology: Tropical lowland to montane and subtropical rain-forest, also in secondary forests and in the vegetation of the rocky coasts, in periodically dry regions, in savannahs confined to gallery forest. In the Pacific *Xylosma* species occur scattered from sea-level up to c. 1500 m altitude.

Dispersal: The fruit is a globose to ovoid, rather dry berry, up to c. 1 cm in diam., black or red when ripe, containing 2—8 thin-arillate seeds. The fruits are often produced in great numbers on axillary racemes. They might be eaten by birds.

Sources: Manuscript of a revision and personal information by Dr. H. Sleumer, and literature.

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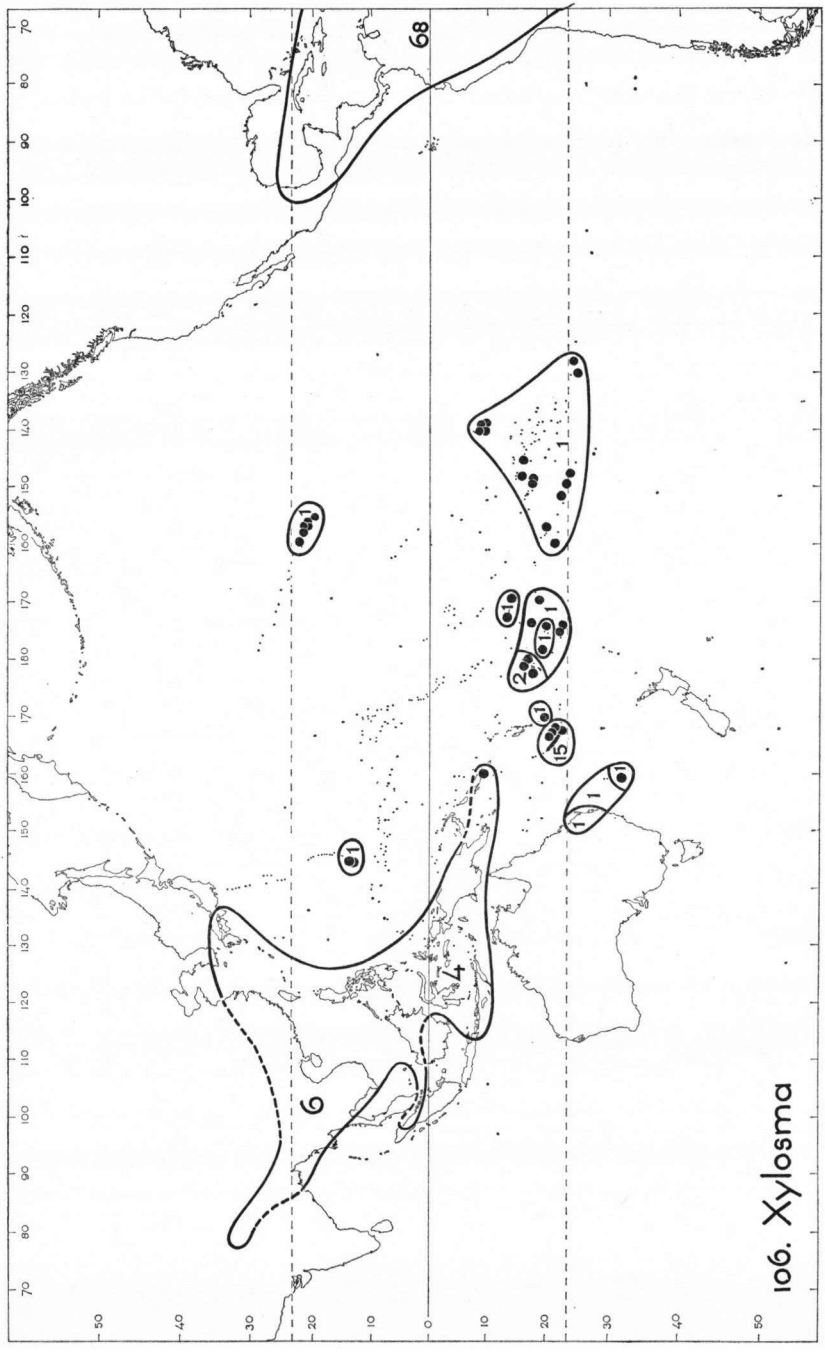

106. Xylosma
68
47
9

107. **Balanops** Baill.

Name: Balanops Baillon, Adansonia *10* (1871) 117.

Family: *Balanopsidaceae.*

Synonym: *Trilocularia* Schlechtendal.

Taxonomy and distribution: A genus of which 14 species have been described, most of which are insufficiently known. New Caledonia appears to be the centre of specific development with 10 species. In East Queensland 2 species occur; 1 species each are endemic to the New Hebrides and Fiji. The species from the latter islands and another one from New Caledonia were formerly referred to a separate genus, *Trilocularia* Schlechtendal, but Hjelmquist (1948) has shown that the character used to separate it from *Balanops*, viz 3-locular against 2-locular ovaries, varies within the Fijian species.

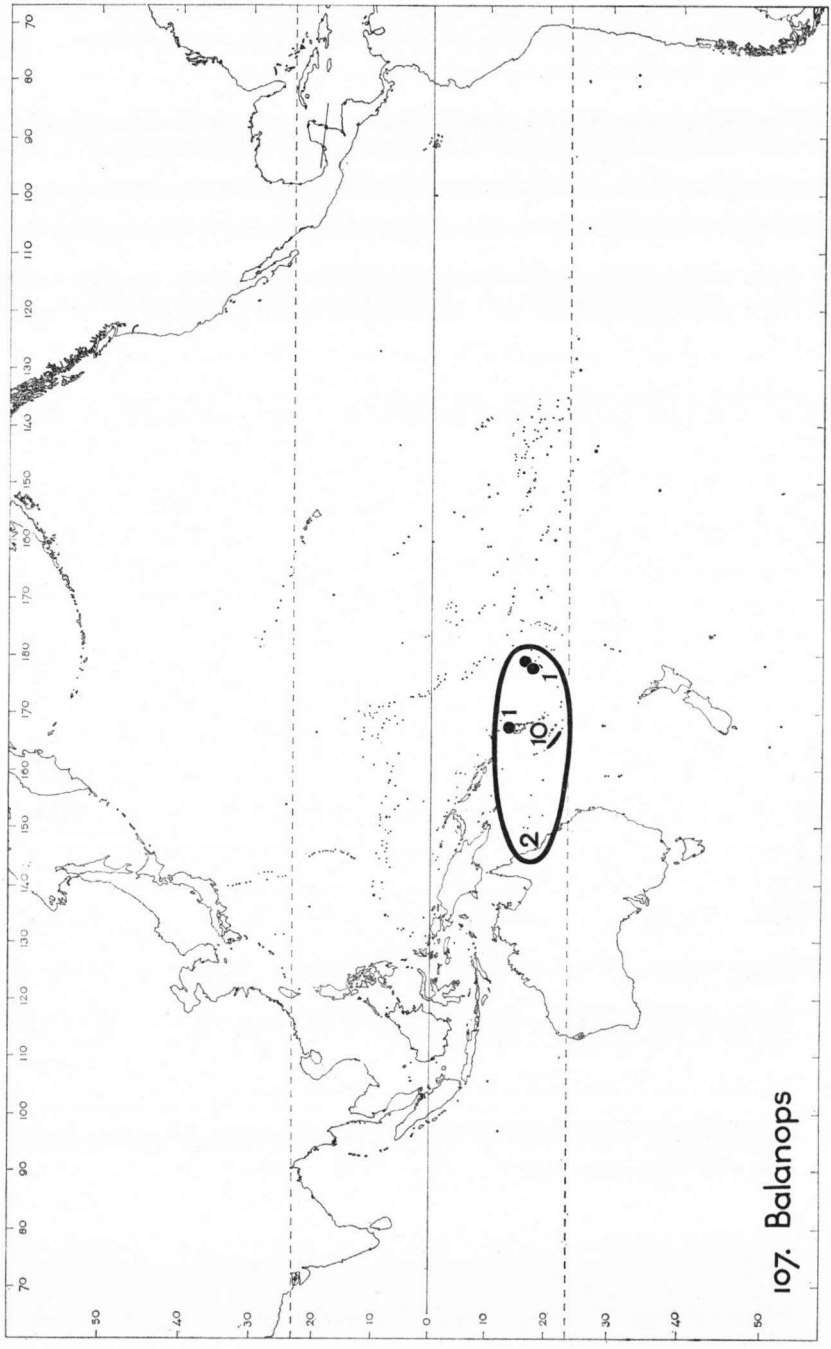
Habit: Dioecious shrubs or small trees up to c. 15 m tall. Male flowers in catkins, female flowers solitary in an involucre of bracts.

Habitat & Ecology: Scattered or locally frequent in the rain-forest on dry or swampy soil, from near sea-level to c. 1200 m altitude. Little is known about the ecology.

Fruit: The fruit is an ovoid, 1—2 cm long drupe, yellow or orange when ripe, containing 1—2 woody, 1-seeded pyrenes with a thin shining exocarp and a thin fleshy mesocarp. Nothing is recorded in literature about dispersal, but Mrs Clemens annotated a sheet of *B. australiana* F. v. M. with: "Yellow fruit, eaten by birds."

Sources: F. M. Bailey, Fl. Queensl. *5* (1902) 1457—1458; C. T. White, Contr. Arn. Arb. *4* (1933) 14—15; A. C. Smith, Sargentia *1* (1943) 11—12; J. Arn. Arb. *31* (1950) 149, 150; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 17; Fl. Nouv. Caléd. (1948) 92; H. Hjelmquist, Bot. Notis. Suppl. *2* (1948) 64—70; W. D. Francis, Austr. Rain-forest Trees (1951) 385, 388; J. Hutchinson, Fam. Flow. Pl. ed. 2, *1* (1959) 189—190. Collections in the Rijksherbarium Leyden.

M. M. J. VAN BALGOOY.


107. Balanops
1
1
10
2

108. **Arytera** Bl.

Name: Arytera Blume, Rumphia *3* (1847) 169.

Family: *Sapindaceae.*

Notes: Radlkofer (1934) in his monograph recognized 23 species. Later 2 more species were described. The centre of specific diversity is situated in E. Australia, where 3 of his 4 sections occur. Section *Arytera* extends from India to Australia and New Caledonia. Section *Azarytera* is strictly Melanesian.
The number of infrageneric taxa, however, has to be critically re-examined. It is unlikely that after a revision the generic area will change much.
Other Sapindaceous genera with practically sympatric distributions are: *Alectryon* (an outlying species in Hawaii), *Cupaniopsis*, *Elattostachys*, *Guioa*, *Harpullia*, and *Pometia* (map 50).

Habit: Monoecious shrubs or trees up to c. 30 m.

Habitat & Ecology: Mainly lowland but also in the submontane rain-forest, 0—1500 m, locally common. Flowers small, white, 2—3 mm diam. in dense axillary panicles, weakly fragrant.

Dispersal: The fruit is a coriaceous or woody 2—3-lobed capsule, often compressed, dehiscing loculicidally, 0.5—2.5 cm in diam. The mature fruits are yellow, orange or brown, and are often produced in abundance. The seeds are black, purple or reddish, almost completely enveloped in a thin, fleshy aril which may be yellow, red or translucent. The seeds, 1—3 per fruit, are ellipsoid, 4—12 mm long, with a crustaceous testa. They are probably eaten by birds and other animals but observations are curiously lacking.

Sources: A. U. Däniker, Mitt. Bot. Mus. Un. Zürich *142* (1933) 249—250; C. T. White, Contr. Arn. Arb. *4* (1933) 63; Proc. Roy. Soc. Queensl. *47* (1935) 132—133; L. Radlkofer, Pfl. R. Heft *98* (1934) 1268—1288; Th. Herzog, Pfl. Areale 4, *4* (1936) Karte 37a; G. Peekel, MS. Fl. Bism. (1945) Nachtr. 1, 99—100; A. Guillaumin, Fl. Nouv. Caléd. (1948) 201; A. C. Smith, J. Arn. Arb. *31* (1950) 298; W. D. Francis, Austr. Rain-forest Trees (1951) 260; T. G. Yuncker, B. P. Bish. Mus. Bull. *220* (1959) 176. Collections in the Rijksherbarium Leyden.

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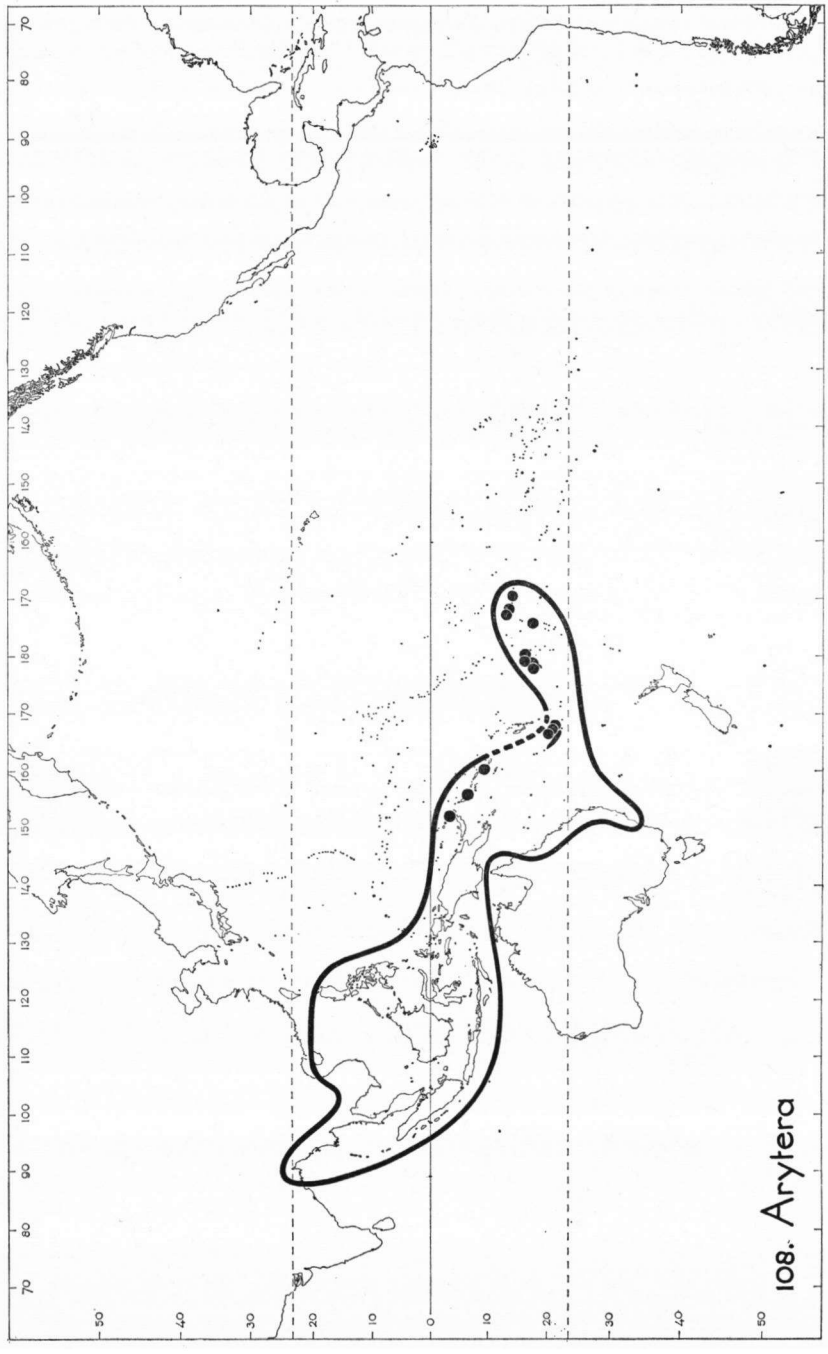
108. Arytera

109. **Tristiropsis** Radlk.

Name: Tristiropsis Radlk. in Durand, Ind. Gen. (1888) 76.

Family: *Sapindaceae.*

Synonym: *Palaoea* Kan.

Notes: A genus of 2 species: one confined to Borneo, the other widespread and comprising all 9 species distinguished by Radlkofer (1932), and 2 species described subsequently.
Though certainly native both south (Christmas I.) and north (Bawean and Kangean) of Java, *Tristiropsis* has been found in this island only in cultivation.

Habit: Trees, monoecious, up to 35 (—50) m tall, with a bole 60 cm across, often buttressed. Leaves bipinnate. Many-flowered inflorescences towards the ends of the branches.

Habitat & Ecology: Upper-storey components of primary and secondary forest in the lowland, rarely above 500 m. Locally common. On various soiltypes, but apparently a high groundwater level is essential.

Dispersal: Fruit subdrupaceous, non-dehiscent c. 1,5—3 cm across, (1—)3(—5)-celled. Pericarp fibrous, endocarp woody. One non-arillate seed per cell. No dispersal agents are known.

Map: Triangles indicate the localities of *T. ferruginea* Leenh., dots those of *T. acutangula* Radlk.

Sources: L. Radlkofer, Pfl. R. Heft *98* (1932) 861—867; R. Kanehira, Bot. Mag. Tokyo *49* (1935) 271; R. Kanehira & T. Hatusima, ibid. *57* (1943) 83; E. Meyer Drees, Comm. For. Inst. *33* (1951) 110; P. v. Royen, Man. For. Trees Pap. & N. G. *2* (1964) 49; P. W. Leenhouts, Blumea *13* (1966) 395; Revision of *Tristiropsis* for Fl. Mal. (unpublished) by Dr. P. W. Leenhouts.

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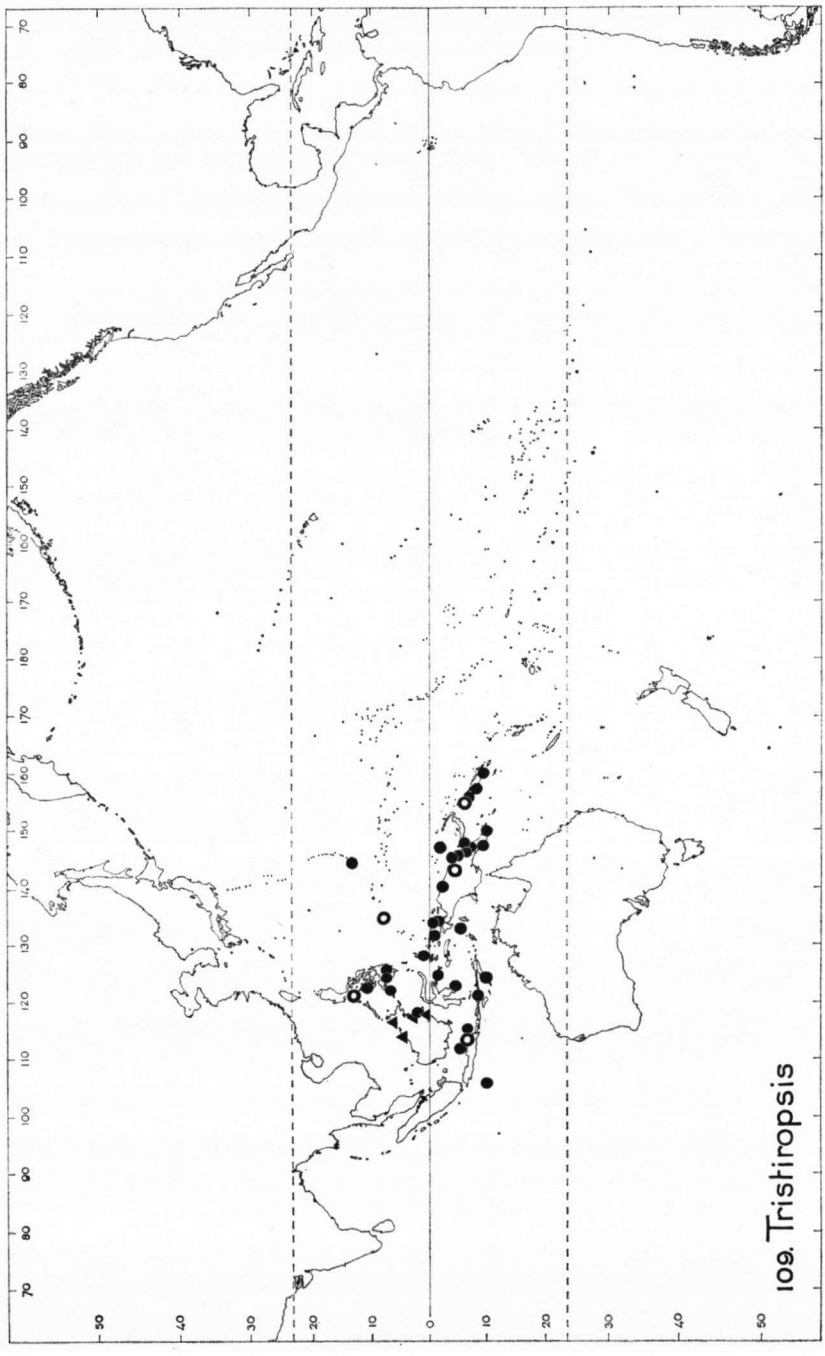
109. Tristiropsis

110. **Ryssopterys** Bl. ex Juss.

Name: Ryssopterys Blume ex Jussieu, Ann. Sc. Nat. II, *13* (1840) 286.

Family: *Malpighiaceae.*

Taxonomy and distribution: A genus of c. 6 species. *R. timoriensis* (DC.) Juss. covers nearly the entire range of the genus. It has a distinct var. *discolor* (Gaud.) Jacobs in the eastern part of its range: East New Guinea, Solomons, New Hebrides, New Caledonia (dotted line on the map). *R. tiliaefolia* (Vent.) Juss. occurs from Java eastwards to Sumbawa, and in this area replaces the former species almost entirely. New Caledonia is the headquarters of the genus with c. 5 species.

Habit: Lianas, or straggling, rarely creeping shrubs.

Habitat & Ecology: Rain-forest, brushwood, also in dry habitats, locally common, from sea-level up to c. 1500 m. Flowering and fruiting is profuse. The flowers are 1—2.5 cm in diam., yellow and fragrant, pollination is probably effected by insects.

Dispersal: The fruit consists of 1—3 coarsely winged indehiscent mericarps which can conveniently be called samaras. Each samara measures c. 2—6 cm and may be carried some distance by the wind.

Map: The area of *R. timoriensis* (DC.) Juss. var. *discolor* (Gaud.) Jacobs has been delineated by a dotted line.

Sources: Mainly the revision of the Malesian species by M. Jacobs, Fl. Mal. I, 5 (1955) 139—144, fig. 13 (map). Other literature: R. Kanehira, En. Micr. Pl. (1935) 345; A. Guillaumin, Ann. Mus. Col. Mars. *56* (1948) 29; Fl. Nouv. Caléd. (1948) 174. Personal information from Dr. M. Jacobs.

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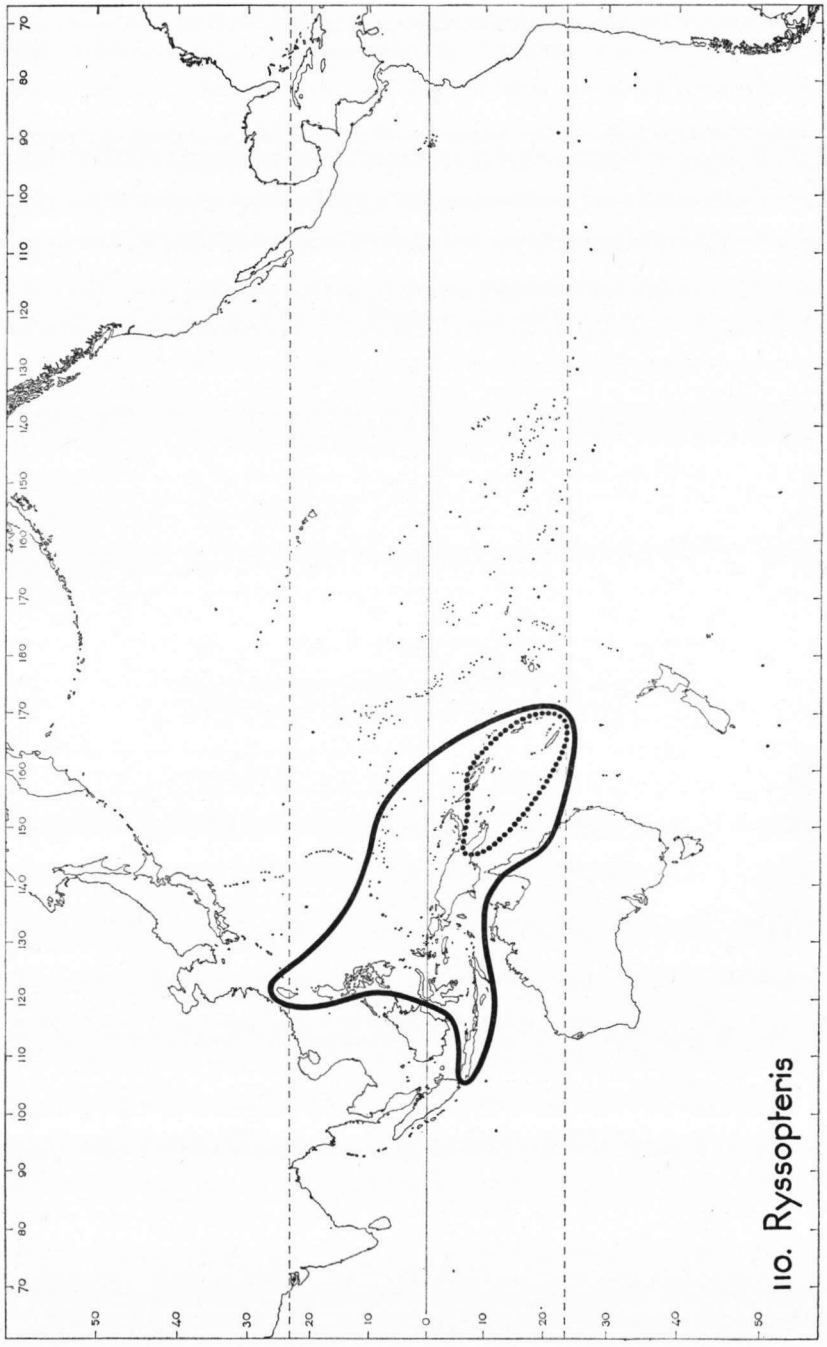
110. Ryssopteris

111. **Pericopsis mooniana** Thw.

Name: Pericopsis mooniana Thwaites, Enum. (1864) 413.

Family: *Leguminosae.*

Synonyms: *Ormosia villamilii* Merr., *Pericopsis ponapensis* Hosok.

Notes: A species of a genus principally developed in tropical Africa with 5 species which were formerly known under the generic name of *Afrormosia* Harms. The present species ranges from Ceylon in the west to Ponape in the east. The genus is unknown from continental Asia. It was formerly considered as one of the exceptional cases of a genus occurring on both sides of Makassar Strait not represented in either the Philippines and/or the Lesser Sunda Islands (listed by van Steenis, 1932) but by the recent reduction of the Philippine *Ormosia villamilii* to *Pericopsis* this genus has to be removed from this list. *Pericopsis* is closely allied to *Haplormosia* Harms (tropical Africa) and *Ormosia* Jacks. (tropical Southeast Asia, Malesia and tropical America).

Habit: Tree of variable size, up to c. 30 m.

Habitat & Ecology: Lowland and coastal rain-forest on both sandy and clayey soils. Usually scattered, nowhere very common. Flowers c. 2 cm in diam., purple (Hosokawa).

Dispersal: The fruit is a compressed coriaceous, non-dehiscent pod, brown at maturity, up to 11 cm long and 3.5 cm broad, containing 1—6 oblong compressed white seeds which are c. 1 cm long. No data on dispersal are available in literature.

Sources: C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *12* (1932) 257—258, 263, map 10; T. Hosokawa, Act. Phytotax. Geob. *13* (1943) 168—171, fig. 4; M. S. Knaap-van Meeuwen, Bull. Jard. Bot. Brux. *32* (1962) 213—219, fig. 20 (map). Localities in Malesia based on collections in the Rijksherbarium Leyden, and literature.

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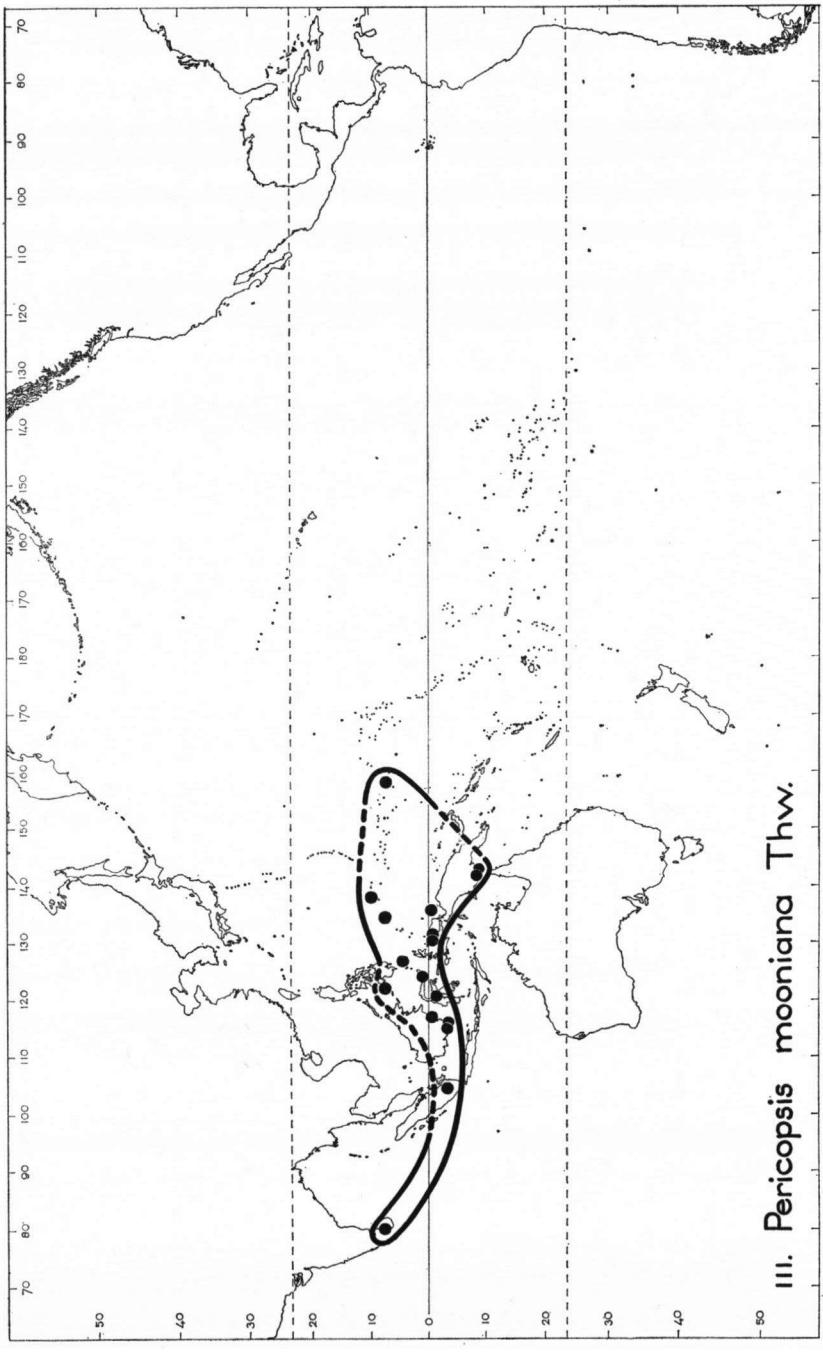

111. Pericopsis mooniana Thw.

112. **Thismia** Griff.

Name: Thismia Griff., Proc. Linn. Soc. *1* (1844) 221.

Family: *Burmanniaceae.*

Taxonomy and distribution: A genus of 23 species, according to Jonker's monograph, showing a most remarkable patchy distribution. The majority of the species have only once been collected. It is not unlikely that these small inconspicuous herbs have often been overlooked, which may be partly responsible for certain disjunctions in the generic area. Especially the distribution of sect. *Rodwaya* is curious, one species being found in Tasmania and New Zealand, the other in the United States near Chicago. The other sections are distributed as follows: sect. *Myostoma* is confined with one species to Brazil (Rio de Janeiro); sect. *Ophiomeris* has 4 species in Brazil (Prov. Rio de Janeiro and Espirito Santo) and 1 species in Panama; sect. *Thismia* has 1 species in Ceylon, 1 in Burma (Tenasserim), 6 confined to Malaya and 2 to Borneo, whereas 1 species is common to Sumatra and Java; sect. *Sarcosiphon* consists of 1 Bornean, 1 Javanese, and 1 New Guinean species, which may also occur in Malaya.

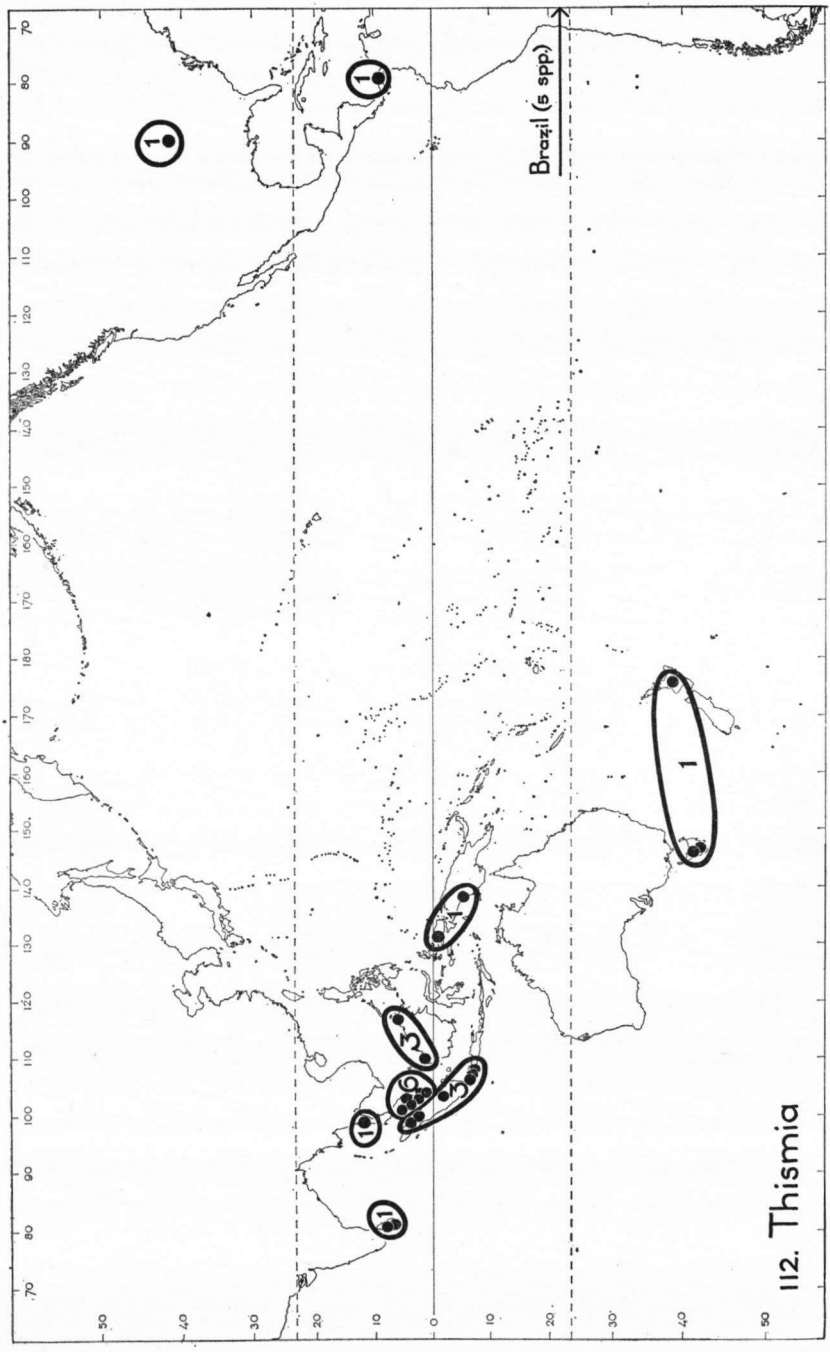
Habit: Minute, succulent, echlorophyllose herbs, consisting of an underground part and flower-bearing erect stems which may be up to 22 cm high; leaves small, scale-like.

Habitat & Ecology: Most species grow in the dense tropical everwet lowland rain-forest, saprophytic on decaying wood and leaves. The two species of sect. *Rodwaya* are the only extra-tropical species, *T. americana* Pfeif. being further aberrant in that it was collected in open prairie among bryophytes under prairie plants. As a saprophyte it grows in symbiosis with a mycorrhizal fungus.

Dispersal: The fruit is a cup-shaped fleshy, obviously indehiscent capsule (2—8 mm in diam.), containing numerous minute seeds which might be windborne. Although on the forest floor of tropical rain-forest wind is hardly ever discernible.

Sources: F. P. Jonker, A monograph of the *Burmanniaceae.* Thesis, Utrecht 1938; Fl. Mal. I, *4* (1948) 21—25.

M. M. J. VAN BALGOOY.


Brazil (6 spp.)
112. Thismia

113. **Metrosideros** Banks ex Gaertn.

Name: Metrosideros Banks ex Gaertn., Fruct. *1* (1788) 170, t. 34.

Family: *Myrtaceae.*

Synonym: *Nania* Miq.

Notes: A genus of 30—40 species perhaps much less after a revision, of which it is in urgent need. The species from the Bonin Is is fairly isolated geographically as the genus is unknown from the Marianas and Carolines. A similar case is that of 75. *Santalum*. One rather aberrant species in South Africa. The others are distributed from East Malesia, North Australia, far into the South Pacific and also in Hawaii. Centres of speciation are New Zealand and New Caledonia with each 10 species, New Guinea with c. 6 and Hawaii with 5 species. The closest affinities are among others with the monotypic *Tepualia* (temperate Chile) and the montane genus *Mearnsia* (one species in the Philippines, four in New Guinea, one in the Solomons, and one in New Caledonia).

Habit: Much-branching trees of usually moderate size, up to c. 30 m, rarely lianas (New Zealand).

Habitat: Lowland to montane and occasionally subalpine forest in New Zealand and adjacent islands. Mainly montane in the tropics. In Malesia and the Hawaiian islands up to c. 2700 m. The widespread Pacific species *M. collina* (Forst.) Gray (= *M. polymorpha* Gaudich. = *M. villosa* Smith) is most commonly found at moderate elevations and is an extremely common pioneer on lavas in Hawaii.

Ecology: Swampy and everwet dense rain-forest, also in dryer exposed places. Frequently gregarious and dominant. A peculiar fact is the abundance in one island group and the scarcity or absence in an adjacent one. For instance New Caledonia has 10 species, but none has been recorded from the Loyalties. In Fiji *M. collina* is very frequent, on Tonga and Samoa it is rare. The same species is common in Tahiti but apparently absent from Raiatea and Makatea. The flowers are rich in nectar, red, yellow, or white, borne in profusion on compound cymes or racemes. They attract many insects and birds.

Dispersal: The fruits which are produced in profusion are small (0.3—1 cm) urceolate to globose, leathery, or woody capsules, loculicidally dehiscing with 3 valves or dehiscing irregularly. Seeds numerous, linear, or fusiform. Wind dispersal seems most likely.

Sources: Numerous local floras and other literature; collections in the Rijksherbarium Leyden. Information concerning *Metrosideros* in Australia was provided by Mr. L. S. Smith (Brisbane).

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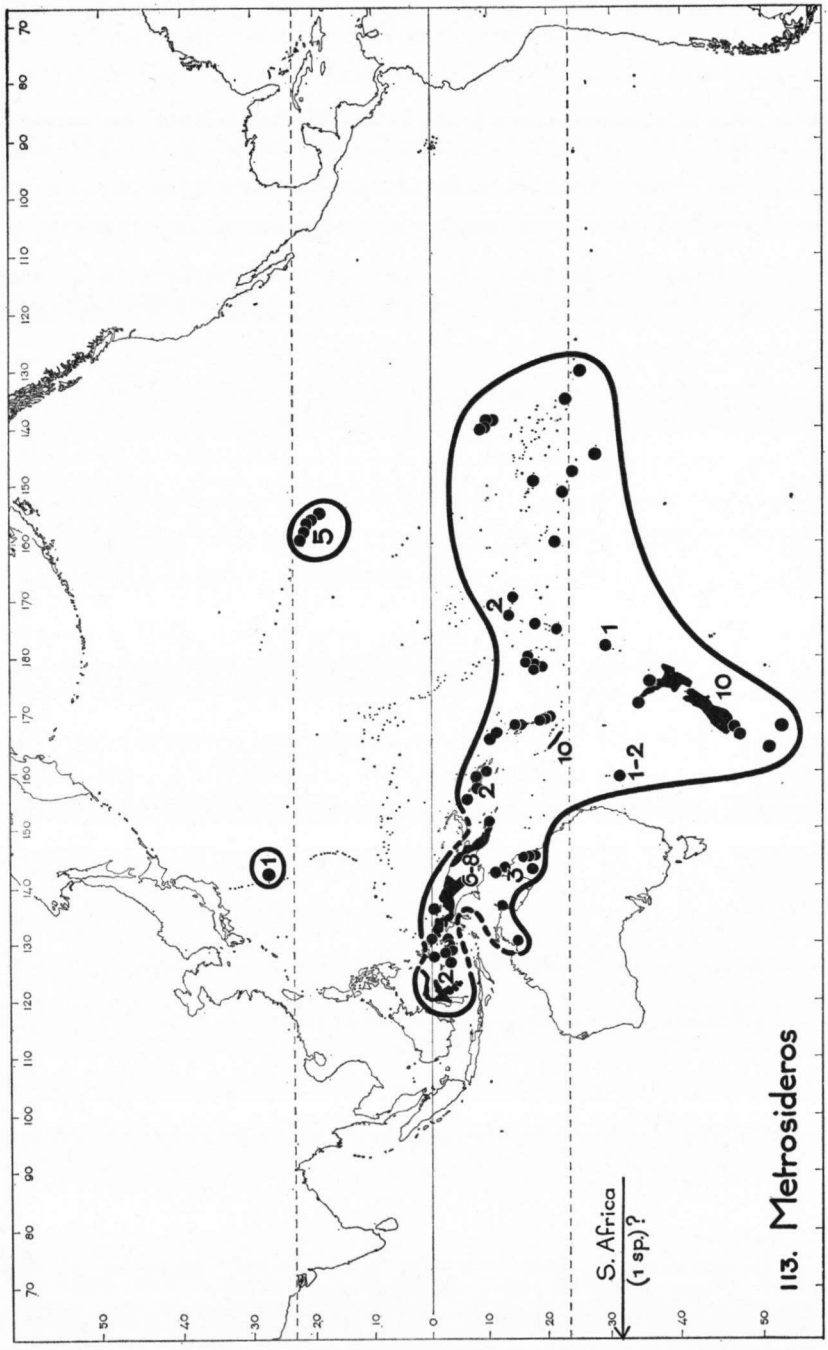

113. Metrosideros
S. Africa
(1 sp.)?

114. **Enhalus acoroides** (L.f.) Rich. ex Steud.

Name: Enhalus acoroides (L.f.) Rich. ex Steud., Nom. Bot. ed. 2, *1* (1840) 554.

Family: *Hydrocharitaceae.*

Synonyms: *Stratiotes acoroides* L.f., *Enhalus koenigi* Rich., *Enhalus marinus* Griff.

Notes: *Enhalus acoroides* is the only representative of its genus and is widely distributed along the Indian Ocean and in the seas of Malesia reaching its northern limit in the Ryu Kyu Archipelago.

Habit: Coarse sea-grass. Leaves ribbon-like with obtuse apices, 30—150 by 1¼—1¾ cm, 2—6 enclosed by a flattened, membranous sheath which arises from a to 1½ cm thick rhizome with cord-like unramified roots. Rhizome densely clothed by the persistent fibrous strands of decayed leaves.

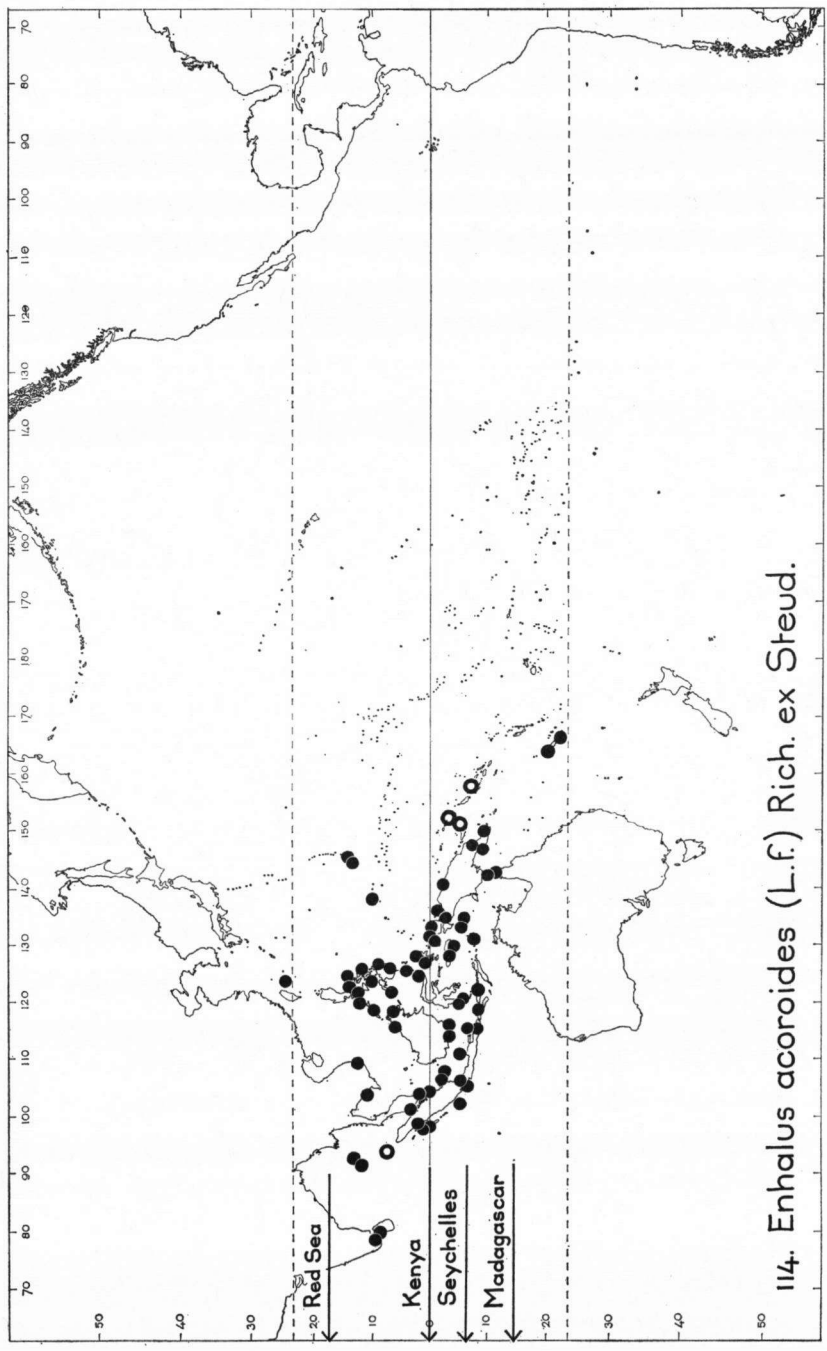
Habitat: In the lower part of the eulittoral belt, and in the sublittoral down to 4 m depth, the optimum being between the levels of mean low-water-mark and mean low water springs. The species forms dense vegetations on sandy and muddy bottoms, which may be mixed with coarser material. In sheltered places it is common, but it avoids places where fresh water flows into the sea.

Ecology: *Enhalus acoroides* is a really megatherm species as according to Miki (Bot. Mag. Tokyo *48*, 1934, 136, 141) its northern limit coincides with the 23° C February water isotherm. The species is often accompanied by other sea-grasses, in particular by *Halophila ovalis* (R.Br.) Hook. f. Flowering takes place only in sites which are uncovered for a short time during low water springs as a consequence of the remarkable flower biology (Svedelius, Ann. R. Bot. Gard. Perad. *2*, 1904, 267—297; Troll, Flora *125*, 1931, 427—456; Ernst-Schwarzenbach, Ber. Schweiz. Bot. Ges. *55*, 1945, 61). The pollination takes place on the water surface; ♂ flowers drift loosely on the surface. After fertilisation the female peduncle becomes spirally coiled and contracts, and unrolls again when the fruit is ripe.

Dispersal: The fruit is ovate, 5—7 cm, green, with an upward directed, hairy fringe continuing into its acuminate apex. The seeds are 1—1½ cm. When the fruit bursts, the exceedingly thin testa of the seed breaks off around the hypocotyl and persists as a ragged easily-loosening cap on top of the cotyledon; so the embryo is liberated from the fruit. The embryo sinks down into the mud, where it germinates immediately. Thus the seeds are not suitable for long-distance dispersal. As *Enhalus* is a common food of the dugong, *Dugong dugon*, and of turtles, these animals may play a part in the dispersal.

Sources: C. H. Ostenfeld, Pflanzenareale 1^3 (1927) 36, map 21; W. A. Setchell, Am. Nat. *69* (1935) 562, map 1; C. den Hartog, Fl. Mal. I, *5* (1957) 402—404, f. 13. Herbarium material from Leyden, Kew, British Museum, Paris, Bogor, and Singapore.

C. den Hartog.



114. Enhalus acoroides (L.f.) Rich. ex Steud.

115. **Thalassia hemprichii** (Ehrenb.) Aschers.

Name: Thalassia hemprichii (Ehrenb.) Aschers. in Petermann's Mitt. *17* (1871) 242.

Family: *Hydrocharitaceae.*

Synonym: *Schizotheca hemprichii* Ehrenb.

Notes: *Thalassia hemprichii* is widely distributed along the coasts of the Indian Ocean. In Africa it reaches as far south as Inhaca I. (26° S) and north to the Red Sea. In the Caribbean Sea the closely allied *Th. testudinum* Banks ex König is very common. The exact frontier of its area of distribution in the Pacific is unknown. The "Coral Atoll Research Program" has revealed the occurrence of this species in some islands of the Carolines, Marshalls and Gilberts, and it may be expected to occur on many more islands of the West Pacific.

Habit: A sea-grass with linear leaves, 10—40 by ½—1 cm, 2—6 together within a transparent sheath, which arises from a creeping, terete rhizome. Perennial.

Habitat: In the upper part of the sublittoral belt down to 5 m depth; also in pools on tidal flats and coral reefs. In sheltered bays on muddy coral-sand *Thalassia hemprichii* often forms submarine meadows.

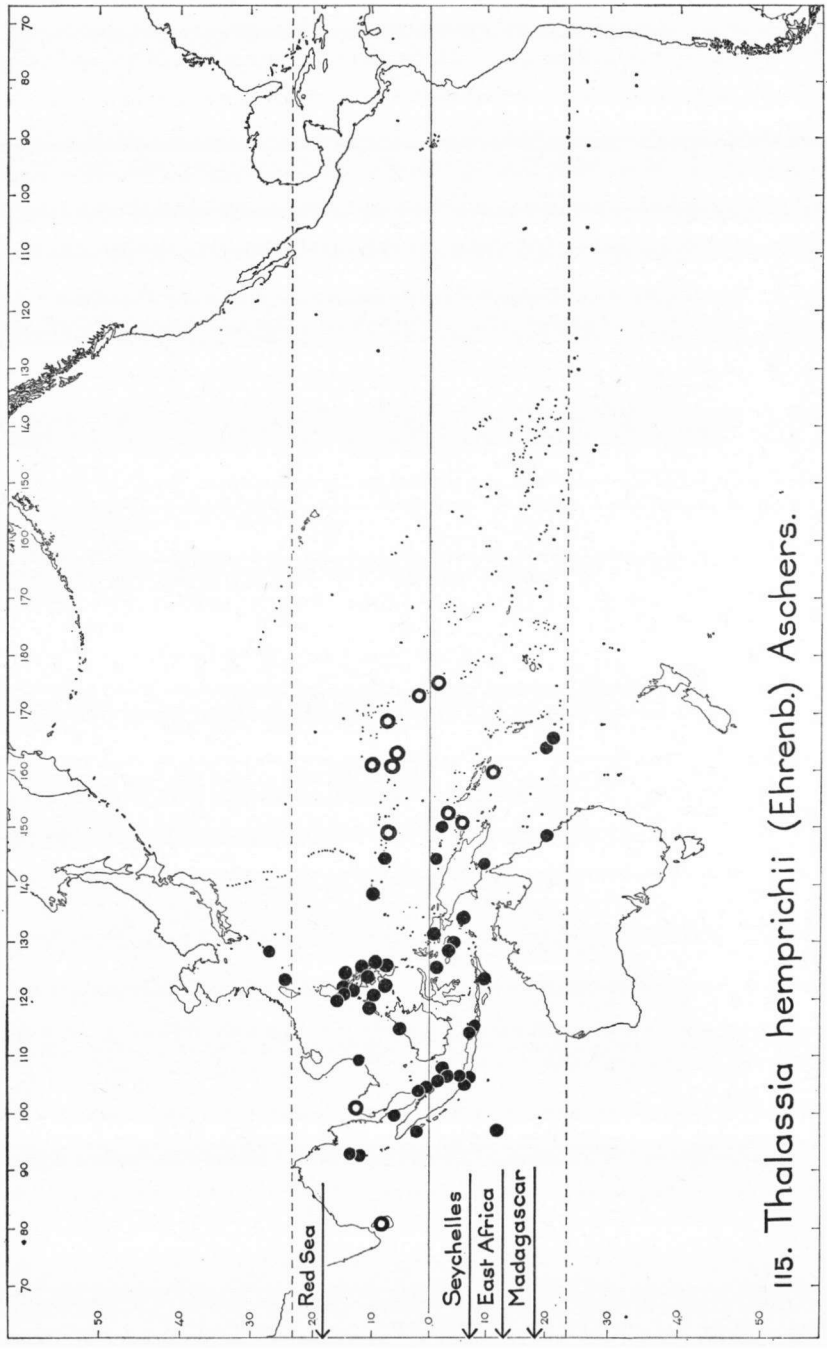
Ecology: The species is megatherm, as according to Miki (Bot. Mag. Tokyo *48*,1934, 136—138, 141) the northern border of its distribution coincides with the 21° C February water isotherm. It may be dominant from mean low water springs down to 3½ m depth dependent on the transparency of the water, and may then be accompanied by several other sea-grasses. Pascasio & Santos (Bull. Nat. & Appl. Sc. Philip. *1*, 1930, 1—19, 5 pl.) mention *Enhalus acoroides*, *Cymodocea serrulata*, *C. rotundata*, *Halodule uninervis*, *Halophila ovalis*, and *H. spinulosa* as accompanying a species from the Philippine island of Mindoro. The pollination of the flowers takes place entirely submerged. The pollen grains are spherical and embedded in a gelatinous mass which later becomes a sort of moniliform chain; they germinate before reaching the stigmas of the female flowers.

Dispersal: Fruits globose, rugose, 2—2½ by 1¾—3¼ cm, when ripe bursting open with c. 20 valves. They have no buoyancy and ripen below the water surface. Seeds 3—9, 8 by 8 mm, the thickened basal portion dark-brown, the cotyledon greenish. The seeds seem to require a long resting period before germination begins. Uprooted shoots soon die and are not important as a means of dispersal.

Map: Dots represent localities verified by the author, circles reliable literature-records.

Sources: C. H. Ostenfeld, Pflanzenareale 1[3] (1927) 36, map 22; W. A. Setchell, Proc. Cal. Ac. Sc. IV, *21* (1935) 269; Am. Nat. *69* (1935) 563, map 2; H. St. John, Pac. Sc. *2* (1948) 107, 272; F. R. Fosberg, Atoll Res. Bull. *23* (1953) 21; ibid. *39* (1955) 2; E. T. Moul, ibid. *57* (1957) 7; R. L. A. Catala, ibid. *59* (1957) 110; C. den Hartog, Fl. Mal. I, 5 (1957) 406—407, f. 14; W. A. Niering, Atoll Res. Bull. *76* (1961) 3. Herbarium material from Leyden, Kew, British Museum, Copenhagen, Paris, Bogor, and Singapore.

C. DEN HARTOG.



115. Thalassia hemprichii (Ehrenb.) Aschers.

116. **Halophila ovalis** (R.Br.) Hook. f.

Name: Halophila ovalis (R.Br.) Hook. f., Fl. Tasman. *2* (1858) 45.

Family: *Hydrocharitaceae.*

Synonyms: *Caulinia ovalis* R.Br., *Kernera ovalis* Schult., *Halophila ovata* (non Gaud.) Aschers., *Lemnopsis major* Zoll., *Halophila major* Miq., *Halophila euphlebia* Makino.

Notes: *Halophila ovalis* is widely distributed along the coasts of the Indian Ocean, the Red Sea, and along the Australian and East Asian marginal seas of the Pacific. Its southernmost locality in Africa is Knysna lagoon (Cape Province) at 34° S. In Australia it reaches southward to Tasmania at 41° S. Probably it occurs along the whole southern coast of Australia. In the Pacific proper the species is not common.
The specimens from SE. Australia are considerably larger in size than specimens from the other parts of its area of distribution.

Habit: A small sea-grass with oblong-elliptic to ovate leaves, 1—4 by ½—2 (7) cm, in pairs on a thin, creeping stem. Perennial.

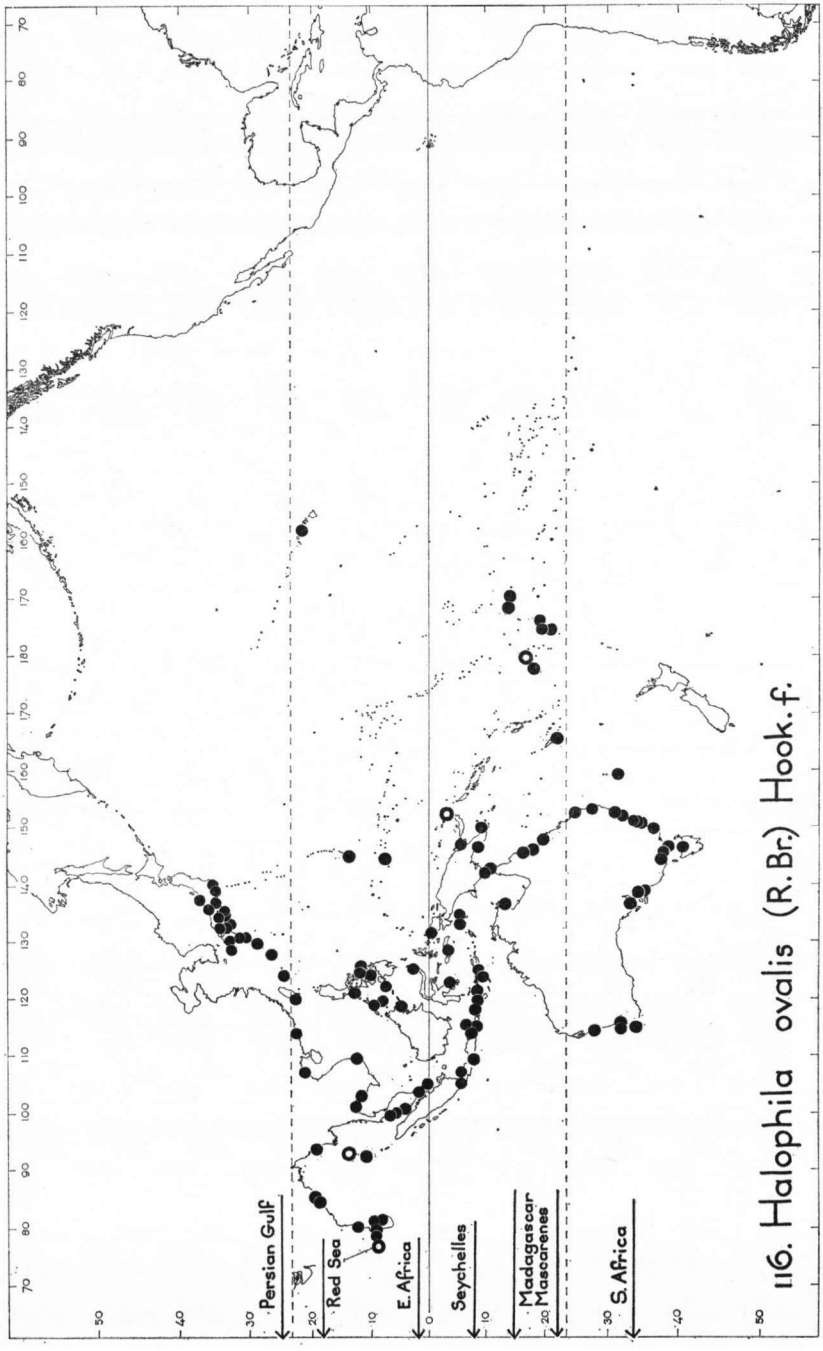
Habitat: In the lower part of the eulittoral belt, and in the sublittoral down to 6 m depth. In sheltered places on sandy as well as on reduced, sulphide-containing muddy bottoms. Also in pools on coral reefs. Mostly gregarious.

Ecology: *H. ovalis* is the most eurytherm species of the genus *Halophila*, as it extends far beyond the tropics. The northern limit of its distribution in Japan coincides with the 10° C February water isotherm (Miki, 1934).
In Malesia *H. ovalis* is mostly associated with other seagrasses, e.g. *Enhalus acoroides*, *Thalassia hemprichii* or *Halodule* sp. According to Ferguson Wood (Proc. Linn. Soc. N.S.W. *84*, 1959, 219 and 222) the species dominates along the east coast of Australia in deep water, while in shallow water it is sparse or subdominant and accompanied by species of *Zostera* and *Posidonia*.
In the Pacific it forms mostly pure stands, only associating with algae. It demands a salinity from 18—35 $^0/_{00}$ Cl′, and is favoured by a slight pollution of the water.
The pollination of the inconspicuous flowers takes place entirely submerged. The pollen grains are globose, but remain united in strings, an adaptation for increasing their floating-capacity.

Dispersal: The fruits are globular, 3—4 mm, and contain c. 20 seeds. Neither fruits nor seeds have buoyancy or other means for long-distance dispersal. Moreover, flowering seems to take place rarely, as nearly all herbarium material is sterile. Female flowers and fruits, but no male flowers are known from Japan. Therefore Miki suggested that reproduction in Japanese waters may be parthenogenetical. In extra-tropical Australian waters male and female flowers as well as fruits have been found.

Sources: C. H. Ostenfeld, Pflanzenareale 1[3] (1928) 37, map 23; S. Miki, Bot. Mag. Tokyo *48* (1934) 138—141, f. 5, 6; W. A. Setchell, Am. Nat. *69* (1935) 564, map 3; C. den Hartog, Fl. Mal. I, *5* (1957) 382, 408—410, f. 16. Herbarium material from Leyden, Kew, British Museum, Copenhagen, Paris, Firenze, Bogor, Singapore, Perth, Sydney, Melbourne, Adelaide, Brisbane, Los Angeles (Allan Hancock Foundation), Pretoria, Johannesburg, and Calcutta.

C. den Hartog.



116. Halophila ovalis (R. Br.) Hook. f.

117. **Halophila minor** (Zoll.) Hartog

Name: Halophila minor (Zoll.) den Hartog, Fl. Mal. I, 5 (1957) 40, f. 17b.

Family: *Hydrocharitaceae.*

Synonyms: *Halophila ovata* Gaud., *H. lemnopsis* Miq., *Lemnopsis minor* Zoll.

Notes: *Halophila minor* is closely allied to the more robust *H. ovalis*. It is distinguished by the size of its leaf-blades, which have 3—8 pairs of cross-veins ascending at an angle of 70—90°. *H. ovalis* has larger leaf-blades (1—4 by ½—2 cm) with 12—25 pairs of cross-veins ascending at an angle of 45—60°. *H. minor* is an Indo-Malesian species, widely distributed in the Malesian waters and extending up to the Gulf of Siam and India. Recently it has been discovered in Kenya. In the Pacific it is known from the Marianas and New Caledonia.

Habit: A small sea-grass with oblong-elliptic to ovate leaves, 7—14 by 3—5 mm, in pairs on a thin, creeping stem. Annual.

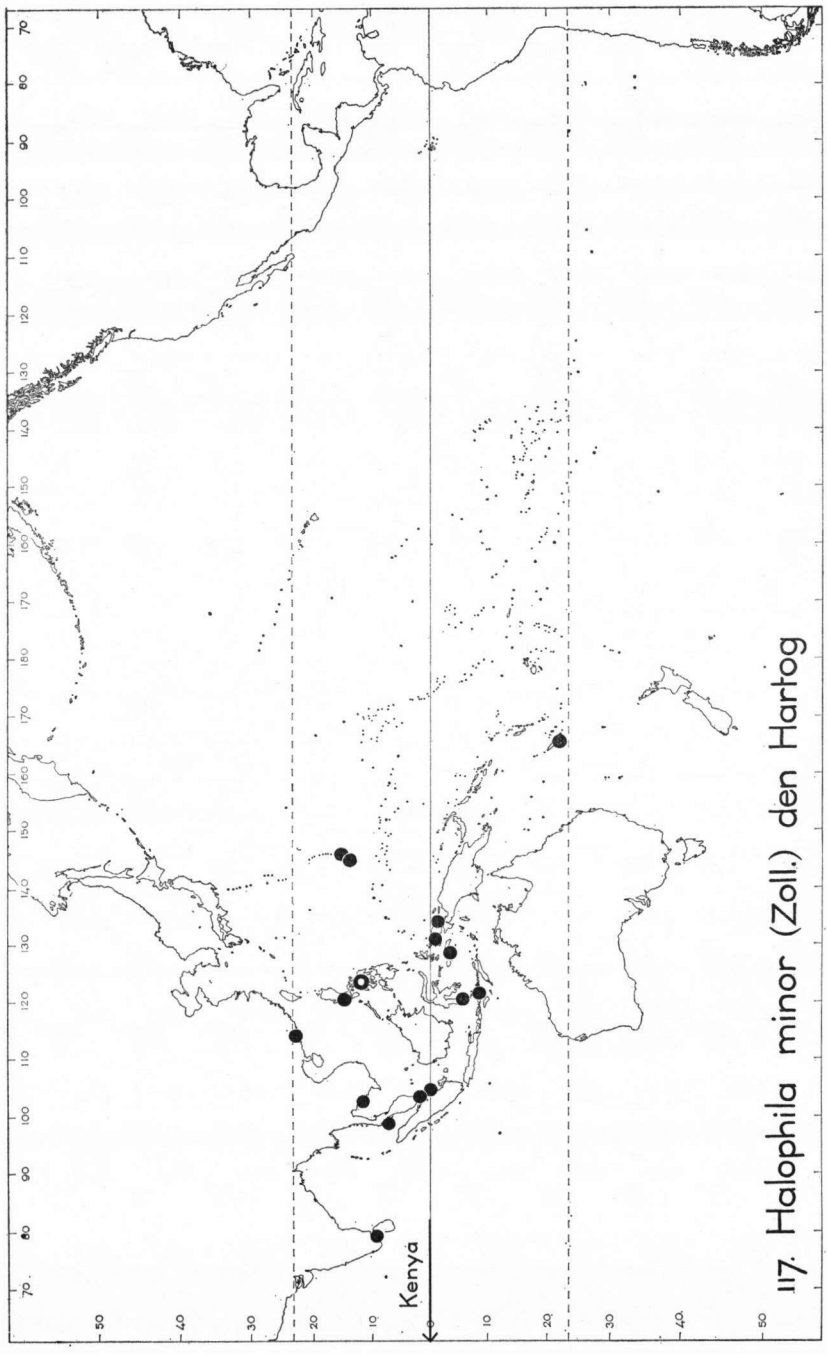
Habitat: In the lower part of the eulittoral and in the uppermost part of the sublittoral belt, in sheltered localities on sandy bottoms, mostly gregarious.

Ecology: *H. minor* occurs mostly in pure stands, only accompanied by algae. Sometimes it grows together with other sea-grasses, e.g. *Halodule uninervis*. Flowering takes place under the water surface. After fruiting the plants disappear. Male flowers are unknown.

Dispersal: The fruits are globular, 2—4 mm, and contain c. 20 seeds. As is the case in *H. ovalis* neither fruits nor seeds have any buoyancy.

Sources: C. H. Ostenfeld, Pflanzenareale 1[3] (1927) 37, 38, map 23. Herbarium material from Leyden, Kew, British Museum, Copenhagen, Paris, Los Angeles (Allan Hancock Foundation), Singapore, and Bogor.

C. DEN HARTOG.



117. Halophila minor (Zoll.) den Hartog

118. **Halophila decipiens** Ostenf.

Name: Halophila decipiens Ostenf., Bot. Tidsskr. *24* (1902) 260 c.f.

Family: *Hydrocharitaceae.*

Synonym: *Halophila baillonis* (non Aschers. 1874) Holm.

Notes: The species is easily distinguished from *H. ovalis* by the serrulate, hairy leaves. Moreover, it is monoecious. *H. decipiens* has two varieties. The var. *decipiens* has hairs on one side of the leaf-blades only, and glabrous spathal leaves. The var. *pubescens* Hartog (*H. baillonis* (non Aschers.) Holm) has hairs on both sides of the leaf-blades, and the spathal leaves have a hairy outerside. *H. decipiens* is the most widely spread species of the genus *Halophila*. It may be considered pantropic as it occurs in the Indian and Pacific Oceans as well as in the Caribbean. The typical variety is distributed in Malesia, Australia, India, and the Seychelles, the var. *pubescens* in the Caribbean, Tahiti, New Caledonia and Ceylon.

Habit: A small sea-grass with oblong-elliptic leaves, 10—23 by 3—6 mm, in pairs on very short shoots arising from a thin creeping stem. Perennial.

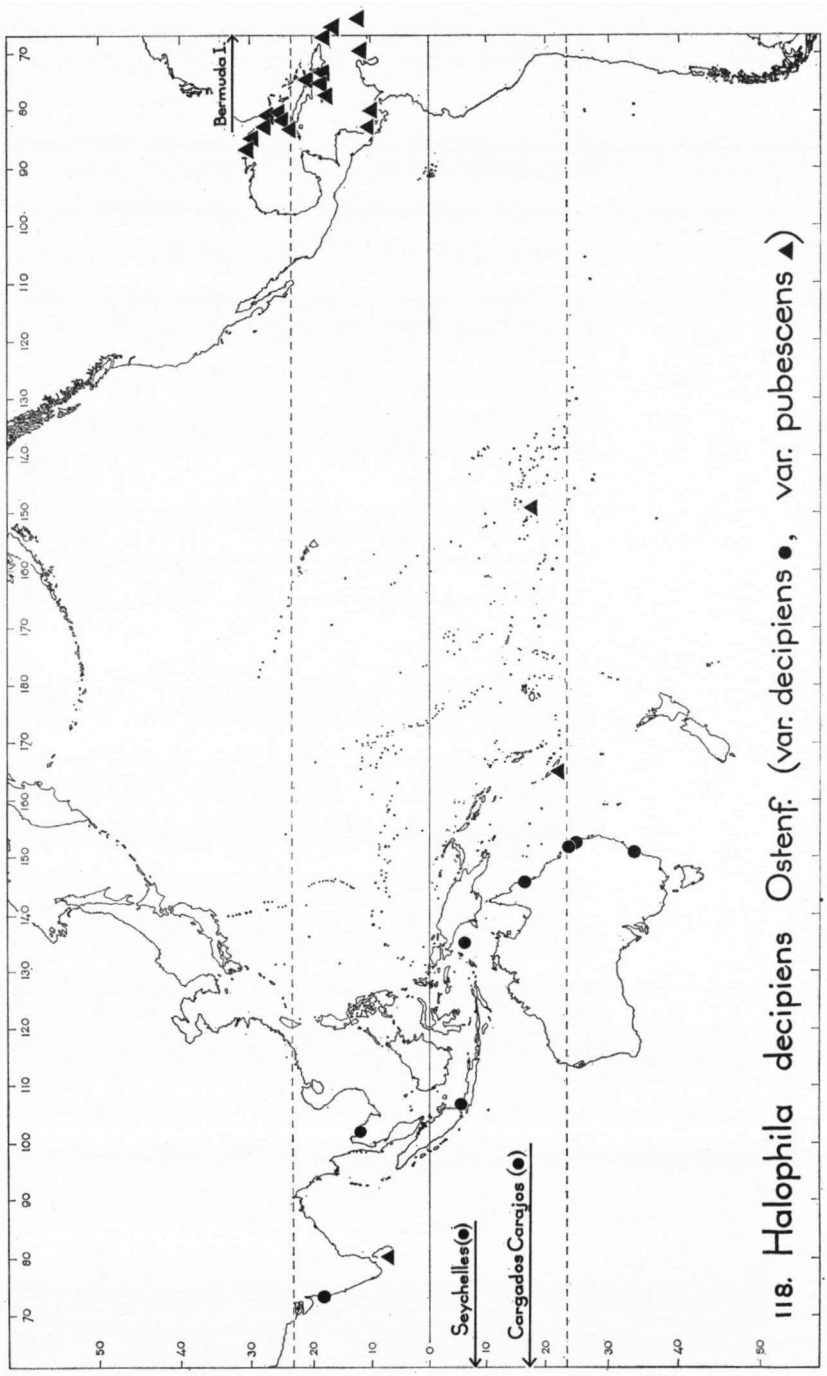
Habitat: On muddy bottoms and coarse coral-sand in the sublittoral, from 1 to 50 m depth dependent on the transparency of the water.

Ecology: This megatherm species is rarely accompanied by phanerogams, but often by algae such as *Halimeda*, *Udotea* and "Lithothamnia". As is the case in the other *Halophila* species flowering takes place submerged.

Dispersal: The fruits are broadly elliptic, 2½ by 1½ mm, and contain c. 30 ovate seeds.

Sources: C. H. Ostenfeld, Pflanzenareale 1[3] (1927) 37, 38, map 23; C. den Hartog, Fl. Mal. I, *5* (1957) 410—411, f. 18; Acta Bot. Neerl. *8* (1959) 485—488; R. C. Phillips, Florida State Board of Conservation, Professional Papers *2* (1960) 63—64. Herbarium material from Kew, British Museum, Copenhagen, Paris (Laboratoire de Phanerogamie, Laboratoire Biologie végétale marine), Melbourne, Los Angeles (Allan Hancock Foundation), and Bogor.

C. DEN HARTOG.


118. Halophila decipiens Ostenf. (var. decipiens ●, var. pubescens ▲)
Bermuda I.
Seychelles(●)
Cargados Carajos (●)

119. **Halophila beccarii** Aschers.

Name: Halophila beccarii Aschers., Nuov. Giorn. Bot. Ital. *3* (1871) 302.

Family: *Hydrocharitaceae.*

Notes: *Halophila beccarii* is the only species of *Halophila* in which the midrib crosses the intramarginal nerves and reaches the tip of the leaf. It is the only representative of the sect. *Microhalophila* and is confined to the coasts of the Bay of Bengal and the South China Sea, not intruding into the Pacific proper.

Habit: A minute sea-grass with a thin creeping stem from which arise 1—1½ cm long lateral shoots, bearing at the top 6—10 lanceolate leaves with sheathing petioles.

Habitat: In the lowest part of the eulittoral belt, uncovered only during low water springs, and in the upper part of the sublittoral. In sheltered places on sandy or muddy bottom in the brackish water of river mouths. Also sometimes in the subgrowth of mangrove swamps (Singapore) or in fish-ponds (Batticaloa, Ceylon; Manila, Luzon).

Ecology: According to Pham-Hoang Ho (Contribution a l'étude du peuplement du littoral rocheux du Sud-Vietnam; Thesis. Paris, 1961, p. 102) *H. beccarii* is associated with *H. ovalis*, and rarely accompanied by *Halodule uninervis*. Some algae seem to be characteristic for this association, which covers 10—20 % of the bottom only. In other places *H. beccarii* grows only in pure stands.

Dispersal: The fruits are ovate, recurved after anthesis and contain only 1—4 ovate seeds. No adaptations for long-distance dispersal are known.

Sources: C. H. Ostenfeld, Pflanzenareale 1[3] (1927) 37, 38, map 24; C. den Hartog, Fl. Mal. I, *5* (1957) 411—412, f. 17a. Herbarium material from Leyden, Kew, British Museum, Copenhagen, Paris, Los Angeles (Allan Hancock Foundation), Firenze, Singapore, and Bogor.

120. **Halophila spinulosa** (R.Br.) Aschers.

Name: Halophila spinulosa (R.Br.) Aschers. in Neumayer, Anl. Wiss. Beob. Reis. ed. 1, *1* (1875) 368.

Family: *Hydrocharitaceae.*

Synonyms: *Caulinia spinulosa* R.Br., *Kernera spinulosa* Schult.

Notes: The species is easily distinguished from all known sea-grasses by the distichous arrangement of the leaves, as in *Potamogeton densus*. *H. spinulosa* is very isolated in the genus *Halophila*, being the only species of the sect. *Aschersonia*. It is widely distributed in Malesia and along the coasts of Western Australia and Queensland. So far it has not been found in the Pacific proper.

Habit: A small sea-grass with a thin creeping stem from which arise 5—18 cm long, erect lateral shoots with 10—20 pairs of sessile, distichously arranged leaves, 10—23 by 2—5 mm. Perennial.

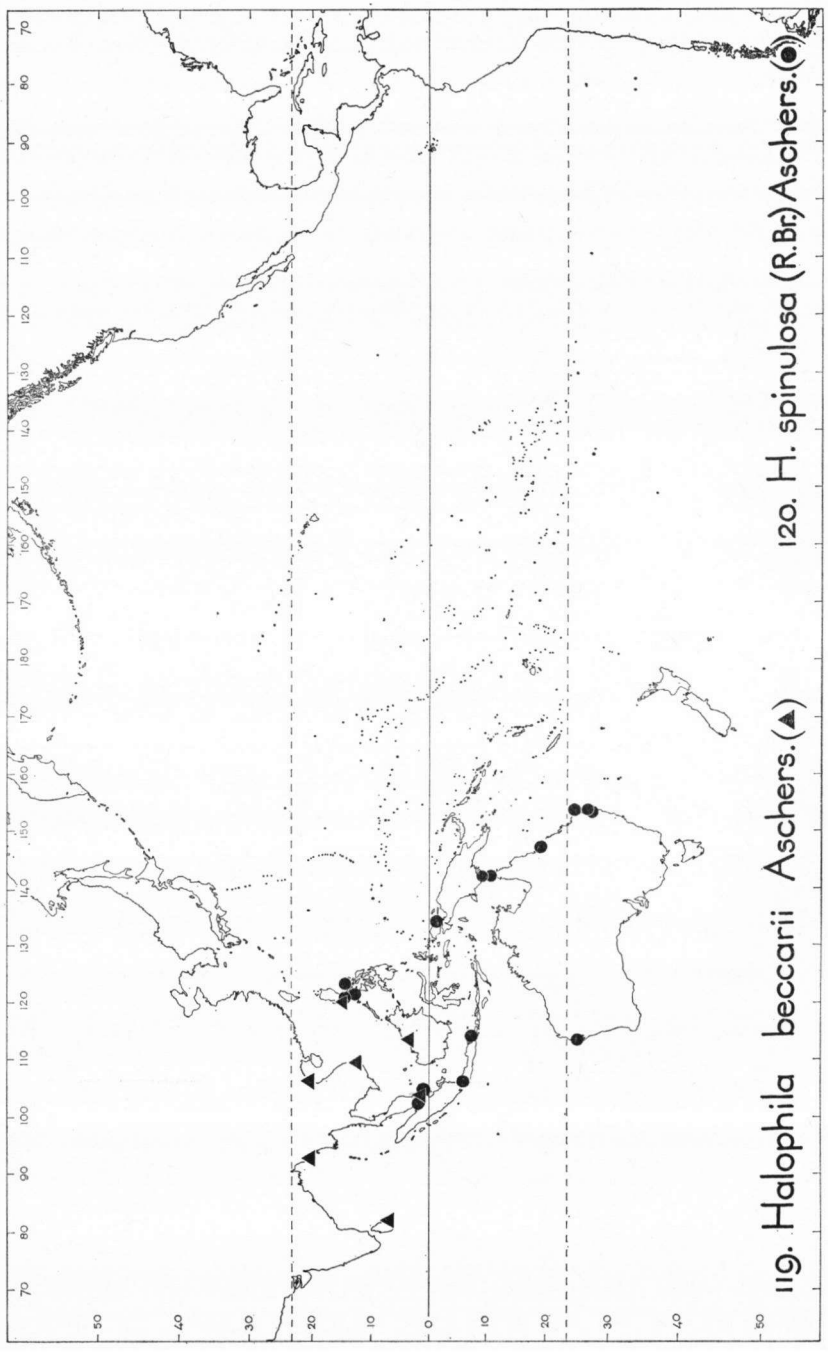
Habitat: In the sublittoral belt from low-water-mark down to 11 m depth, on coral reefs, but also on sandy and muddy bottoms.

Ecology: According to Pascasio & Santos (Nat. Appl. Sc. Bull. Univ. Philip. *1*, 1930, 4) the species occurs in the submarine meadows of *Thalassia hemprichii*. In Johore (Malaya) it was collected among *Enhalus acoroides* by Sinclair.

Dispersal: The fruits are ovate, compressed, 4—6 mm, and contain 20—30 seeds. No means for long-distance dispersal are known.

Sources: C. H. Ostenfeld, Pflanzenareale 1[3] (1927) 37, 38, map 24; C. den Hartog, Fl. Mal. I, *5* (1957) 412—413, f. 19. Herbarium material from Leyden, Kew, British Museum, Copenhagen, Paris, Brisbane, Melbourne, Bogor, and Singapore.

C. DEN HARTOG.


119. Halophila beccarii Aschers.(▲)
120. H. spinulosa (R.Br.) Aschers.(●)

121. **Halophila baillonis** Aschers. ex Hook. f.

Name: Halophila baillonis Aschers. ex Hook. f., J. Linn. Soc. *14* (1874) 317.

Family: *Hydrocharitaceae.*

Synonym: *Halophila aschersonii* Ostenf.

Notes: *H. baillonis* differs from the closely allied *H. engelmanni* Aschers. by its distinctly petioled, obtuse leaves. The latter species is known from Florida, the Bahamas and Cuba. Together they form the sect. *Americanae* which is confined to the American tropics. *H. baillonis* is widely distributed in the West Indies, reaching Pernambuco in Brazil. In the Pacific only one locality is known.

Habit: A small sea-grass with a creeping stem from which arise erect lateral shoots with a pair of scales halfway along their length and with 2—3 pairs of pseudoverticillate leaves at the top. Leaves oblong, elliptic to lanceolate, 5—22 by 2—8 mm.

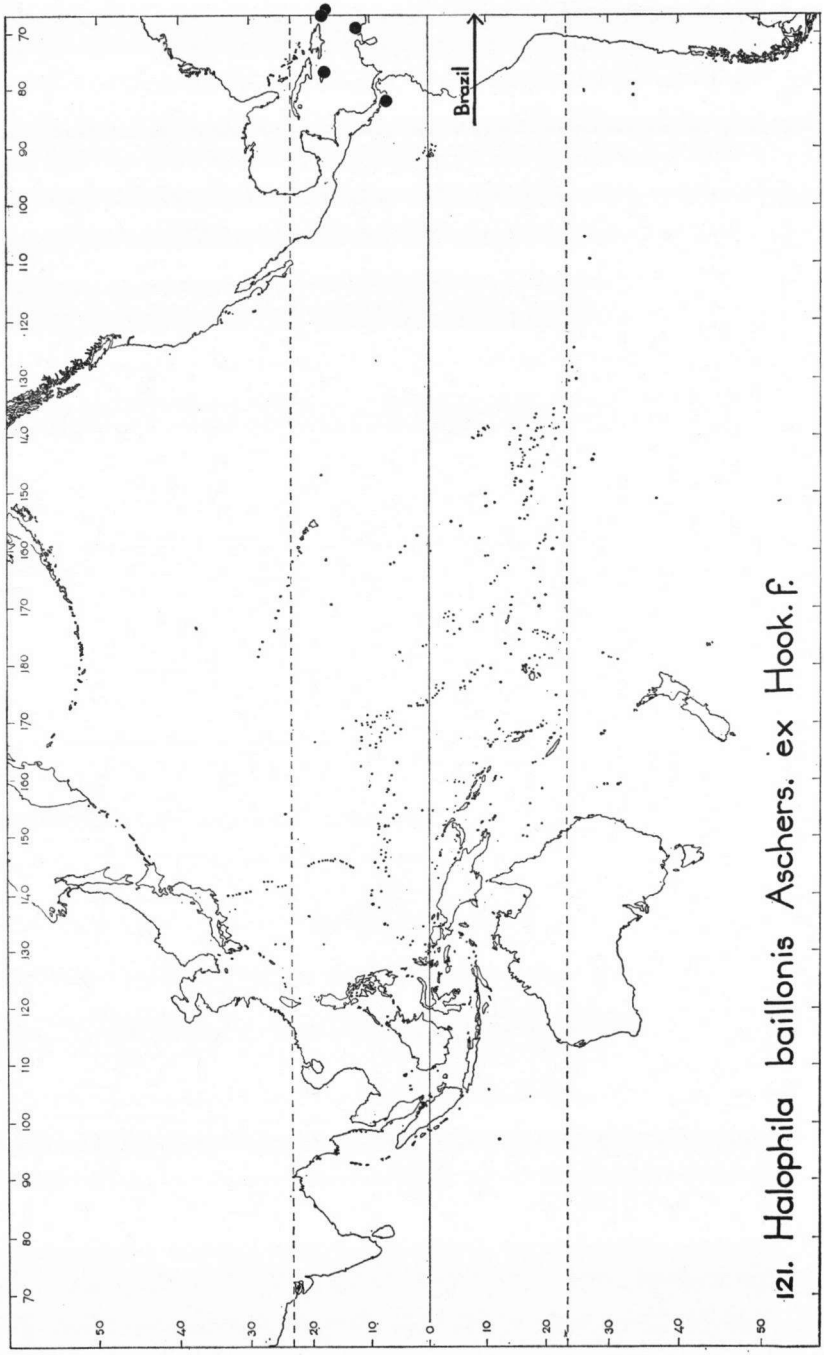
Habitat: In the Pacific the species has only been found at Isla Jicarón (Panama) on a silty bottom at 3½—5 m depth. In the West Indian waters it occurs in sheltered places on mud, but also on coarse sand in depths from 1 to 30 m, depending on the transparency of the water.

Ecology: At Isla Jicarón the species grows together with *Halodule beaudettei* (Hartog) Hartog. In West Indian localities it has been found together with *Halophila decipiens* var. *pubescens.*

Dispersal: The fruits are globular, 2—3 mm, and contain 10—20 seeds. No means for long-distance dispersal are known.

Sources: C. H. Ostenfeld, Bot. Tidsskr. *24* (1902) 239—240, c.f.; Pflanzenareale 1^3 (1927) 37—38, map 24; C. den Hartog, Acta Bot. Neerl. *8* (1959) 488—489, f. 1f; Pacif. Natur. 1^{15} (1960) 7—8. Herbarium material of Leyden, Kew, British Museum, Copenhagen, and Utrecht.

C. DEN HARTOG.



121. Halophila baillonis Aschers. ex Hook. f.

122. Melastoma L.

Name: Melastoma Linné, Gen. Pl. ed. 5 (1754) 184.

Family: *Melastomataceae.*

Notes: A large genus in which some 100 species have been described; according to Dr. Bakhuizen van den Brink this number is much too high. The delimitation of the species is difficult and I have refrained from indicating their density on the map. The genus itself, however, is well defined and so is its area. Southeast Asia and Malesia is the centre of specific development. An outlying species occurs in the Seychelles. In continental Asia the genus is represented westward as far as the Punjab. To the northeast it goes as far as c. 30° N in China and the Ryu Kyu Islands. To the south it reaches c. 26° S in Queensland. Eastward the generic area stretches as far as Tahiti (*M. denticulatum* Labill.); this species is found westward to New Caledonia and the New Hebrides. In the remaining part of the Pacific the genus is mainly represented by the widespread *M. polyanthum* Bl., often referred to as *M. malabathricum* L.

Habit: Shrubs, sometimes small trees.

Habitat & Ecology: Most frequent in secondary vegetation, as pioneers in clearings on landslides and in margin of lowland and montane rain-forest, also in monsoon forest but avoiding arid habitats. In the tropics some species ascend to c. 2500 m. The flowers are large, up to c. 8 cm wide, white pink or purple and are pollinated by bees and possibly other insects (Van der Pijl, 1939).

Dispersal: The fruit is mostly a berry-like capsule (up to c. 1 cm diam.), dehiscing irregularly at maturity and exposing a red or purple, fleshy pulp in which the numerous minute seeds are imbedded. The pulp of many species is sweet and is a favorite food for various species of birds.

Sources: H. N. Ridley, Dispersal of Plants (1930) 391, 403, 481, 501; L. van der Pijl, Trop. Natuur *28* (1939) 169; H. L. Li, J. Arn. Arb. *25* (1944) 1—9; R. C. Bakhuizen van den Brink, Rec. Trav. Bot. Néerl. *40* (1946) 55—103; Vierteljahrschr. Naturf. Ges. Zürich *94* (1949) 183—188. Various local floras. Collections in the Rijksherbarium Leyden and personal information by Dr. R. C. Bakhuizen van den Brink.

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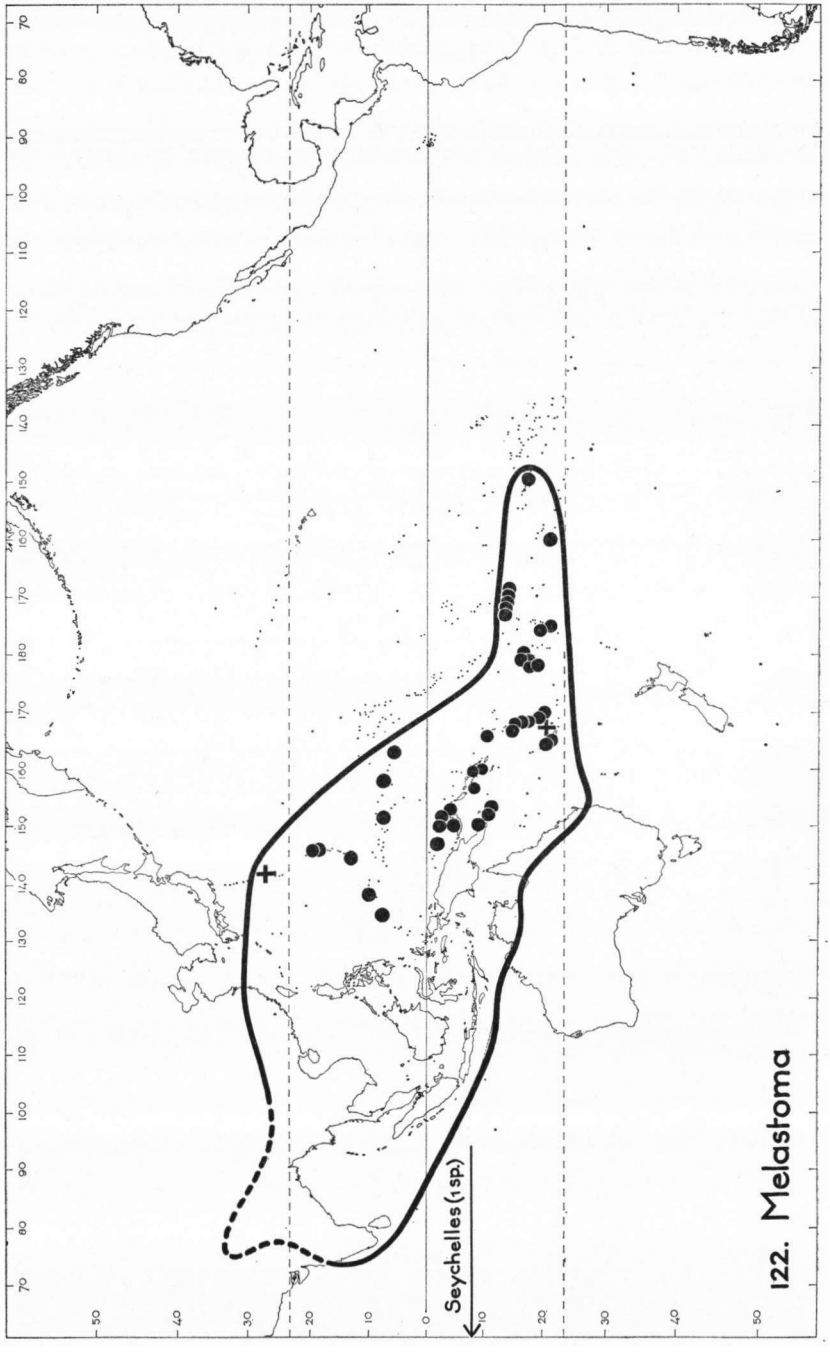
122. Melastoma
Seychelles (1 sp.)

123. **Astronia** Bl.

Name: Astronia Blume, Bijdr. Fl. Ned. Ind. *17* (1826) 1080.

Family: *Melastomataceae.*

Synonym: *Astronidium* A. Gray.

Taxonomy and distribution: As the genus is not critically revised, the number of species and their distribution is not yet known in detail. From the number of described species we may infer that the Philippines are the centre of specific development, but according to Dr. Bakhuizen van den Brink many species should be reduced. Several authors, including A. C. Smith and F. Markgraf, maintain the genus *Astronidium* for the Pacific species, but according to Dr. Bakhuizen van den Brink it should be considered to represent a section of *Astronia*. Sect. *Astronidium* comprises all Pacific species, besides two from New Guinea and one from North Borneo, whereas sect. *Astronia* occurs throughout Malesia as far east as the Louisiades and the Solomons.

Habit: Shrubs or moderate-sized trees rarely exceeding 20 m, with terminal many-flowered inflorescences.

Habit & Ecology: In the substage of tropical lowland to montane rain-forest from near sea-level to c. 2500 m. Several *Astronia* species are a common constituent of the forests on many Pacific islands.

Dispersal: The fruit is a small subglobose capsule, up to c. 1 cm in diam., dehising irregularly and containing many linear seeds, which may be wind-borne.

Map: Localities of sect. *Astronidium* have been indicated only in the Pacific proper; the dotted line marks the western limit of distribution of this section.

Sources: F. Markgraf, Notizbl. Berl.-Dahl. *12* (1936) 47—50; A. C. Smith, Sargentia *1* (1942) 87—95; R. C. Bakhuizen van den Brink, Rec. Trav. Bot. Néerl. *40* (1946) 297—306. Various local floras and other literature, collections in the Rijksherbarium Leyden, and personal information by Dr. Bakhuizen van den Brink.

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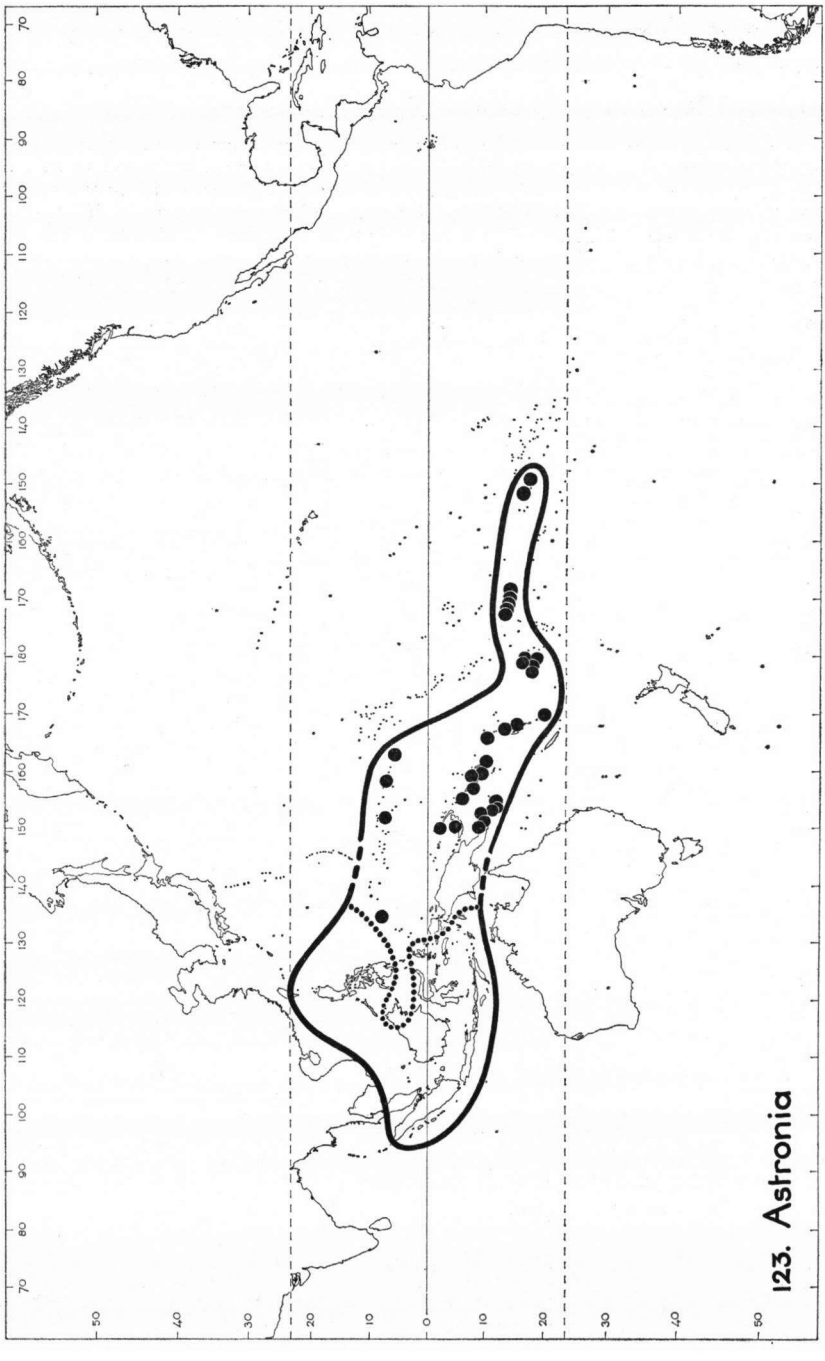
123. Astronia

124. Kopsia Bl.

Name: **Kopsia** Blume, Cat. Gew. Buitenzorg (1823) 12, nom. gen. cons.

Family: *Apocynaceae.*

Synonyms: *Calpicarpum* Don, *Kentrochrosia* Laut. & Schum.

Notes: A genus comprising c. 20 species; the centre of specific development is W. Malesia (Borneo and Malaya), see the recent preliminary revision by Mrs E. H. L. Timmerman. Most species have a limited distribution. *K. fruticosa* Roxb. is widely cultivated as an ornamental, hence its localities have not been indicated. The only species ranging into the Pacific is *K. flavida* Bl. It occurs from the Philippines, Celebes, and the Moluccas to New Guinea, the Solomons and New Hebrides, and may be expected in the Bismarcks as well. According to Pichon (1948) *Kopsia* is closely allied to the tropical American genus *Vallesia* (map 125) from which it is readily distinguished by the phyllotaxy, being opposite in *Kopsia* and alternate in *Vallesia.*

Habit: Shrubs or small laticiferous trees. Flowers in terminal cymes.

Habitat: Tropical lowland rain-forest or secondary forest, occasionally ascending to ± 1200 m. Also along rivers and swamps, on clay, limestone, or soils rich in humus. The flowers are rather large (1—5 cm diam.), provided with a narrow corolla-tube (1—4.5 cm long), white, pink, or red, in some species scented. Pollination is most likely by *Lepidoptera* and other insects, but fruiting specimens are apparently very rare. In some species the fruit is unknown.

Dispersal: Unknown. The fruit is an ellipsoid, terete, or flattened drupe (1½—3 cm long), often with an adaxial spur-like appendage. The mesocarp is leathery fibrous when the fruit is ripe, the endocarp is thin, papyraceous.

Map: Localities of *K. flavida* Bl. are indicated by squares, those of other species by dots.

Sources: F. Markgraf, Nova Guinea *14* (1925) 284; Bot. Jahrb. *61* (1928) 195—196; J. Pitard, in Fl. Gén. I.-C. *3* (1932) 1132—1134; W. G. Craib, Fl. Siam. En. *2* (1939) 437—438; E. D. Merrill & L. M. Perry, Philip. J. Sc. *76* (1941) 19—21; M. Pichon, Mém. Mus. Nat. Hist. Nat. n.s. *27* (1948) 171—173; E. H. L. Timmerman-v. d. Sleesen, Prelim. Rev. Malaysian *Kopsia.* Fl. Mal. Misc. Rec. *1* (1959) 1—66. Collections in the Rijksherbarium Leyden.

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125. Vallesia R. & P.

Name: **Vallesia** R. & P., Fl. Peruv. Chil. Prodr. (1794) 28.

Family: *Apocynaceae.*

Notes: There are 6 to 8 species, best developed in Mexico and the Greater Antilles. One species, *V. dichotoma* R. & P. (= *V. glabra* (Cav.) Link), is widespread and occurs in Mexico, the Galapagos Is, Columbia, Ecuador, Peru, Bolivia, North Argentina, and Paraguay. *V. macrocarpa* Hillebr. was separated by Schumann (1897) as the type of the monotypic *Pteralyxia,* endemic in Hawaii. Pichon considers *Vallesia* closest allied to *Kopsia.*

Habit: Shrubs or small trees.

Habitat & Ecology: Semi-arid and slightly alkaline habitats such as dry arroyos and canyon bottoms. In the West Indies *V. antillana* Woods. is most abundant in dry thickets on coral rocks and soil.

Dispersal: Probably by birds, since the fruit is a small drupe, red when ripe.

Sources: K. Schumann, in E. & P. Pfl. Fam. 4, *2* (1897) 151; M. Pichon, Mém. Mus. Nat. Hist. Nat. n.s. *27* (1948) 170—171; E. Meyer, The genus *Vallesia* — A systematic study. Thesis (unpubl.) Washington Univ., St. Louis, U.S.A.

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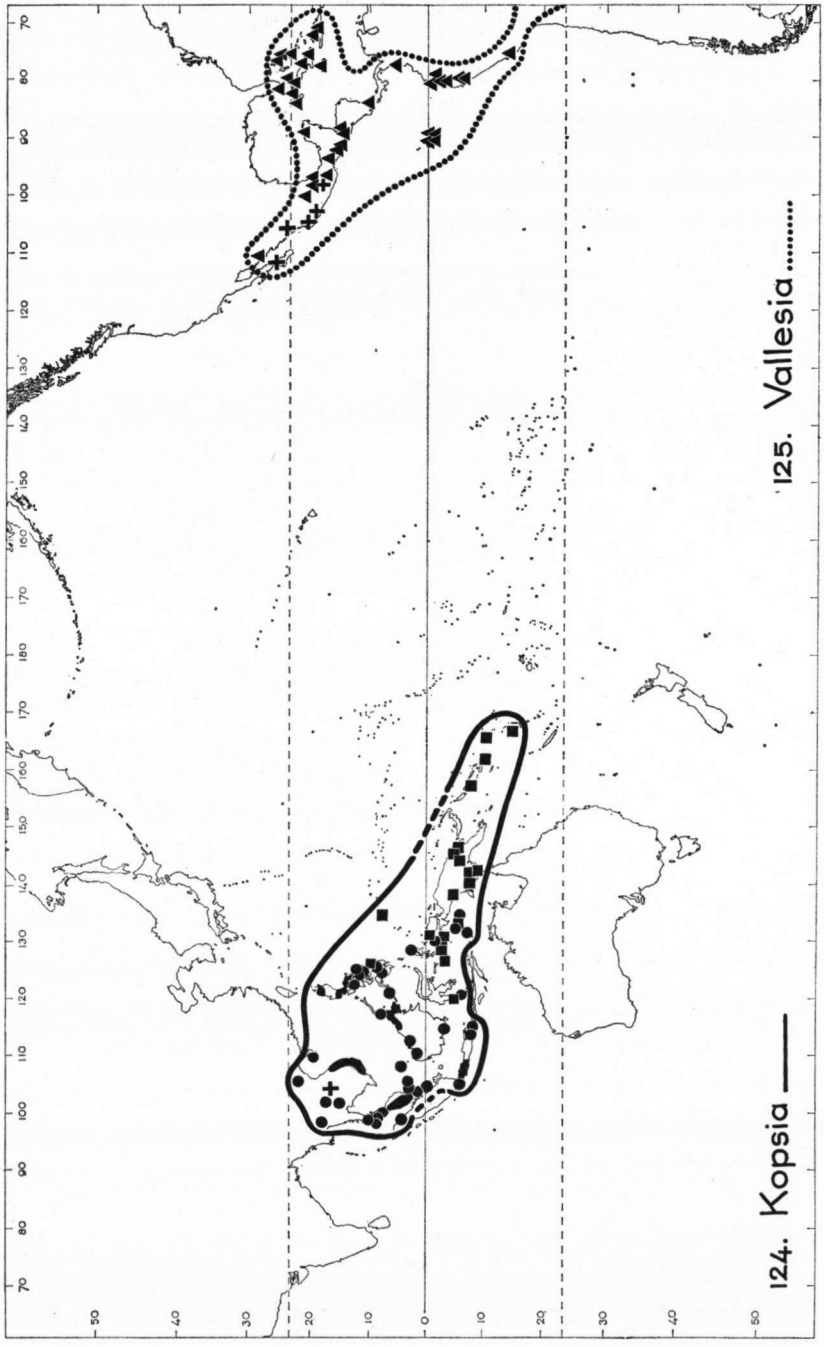
124. Kopsia
125. Vallesia

126. Ophioglossum pendulum L.

Name: Ophioglossum pendulum Linné, Sp. Pl. ed. 2 (1763) 1518.

Family: *Ophioglossaceae.*

Synonyms: *Ophioderma pendulum* (L.) Presl, *Ophioglossum falcatum* (Presl) Fowl.

Taxonomy: A very variable species. The fronds vary from long and pendent, hardly pedunculate to pedunculate-falcate with shorter dimensions and more rigid texture. The latter form is considered as a separate species by St. John and others, but most authors deny it specific rank. The genus is of worldwide distribution. Together with two rare Malesian species, *O. pendulum* forms a distinct subgenus *Ophioderma.*

Habit: Epiphytic, herbaceous ferns, forming clusters of fronds.

Habitat & Ecology: Mostly everwet tropical rain-forest ascending to c. 2000 m, penetrating into the warm-temperate zone in the Ryu Kyu Islands and E. Australia. In dry regions confined to humid well-forested ravines. Often found growing in tufts of other epiphytic ferns such as *Platycerium* and *Asplenium*, very rarely on rocks.

Dispersal: The fertile part of the frond is provided with two rows of sporangia which open with a transverse slit and produce large quantities of spores, which measure c. 50 μ in diam. and may easily be carried by the wind.

Comment: Many genera of *Pteropsida* have a wide distribution and are therefore less well suited for phytogeographical purpose at generic level. At species-level some interesting areas may be found. *O. pendulum* shows a distribution which is none too rare for taxa of Phanerogams.

Map: Dots represent records verified by the second undersigned, circles are from reliable literature sources, crosses stand for unlocalized records.

Sources: R. T. Clausen, Mem. Torr. Bot. Cl. *19* (1938); H. St. John, Occ. Pap. B. P. Bish. Mus. *17* (1943) 177—182, 1 map; B. C. Stone, Micronesica *1* (1964) 155; and other literature. Collections from various herbaria.

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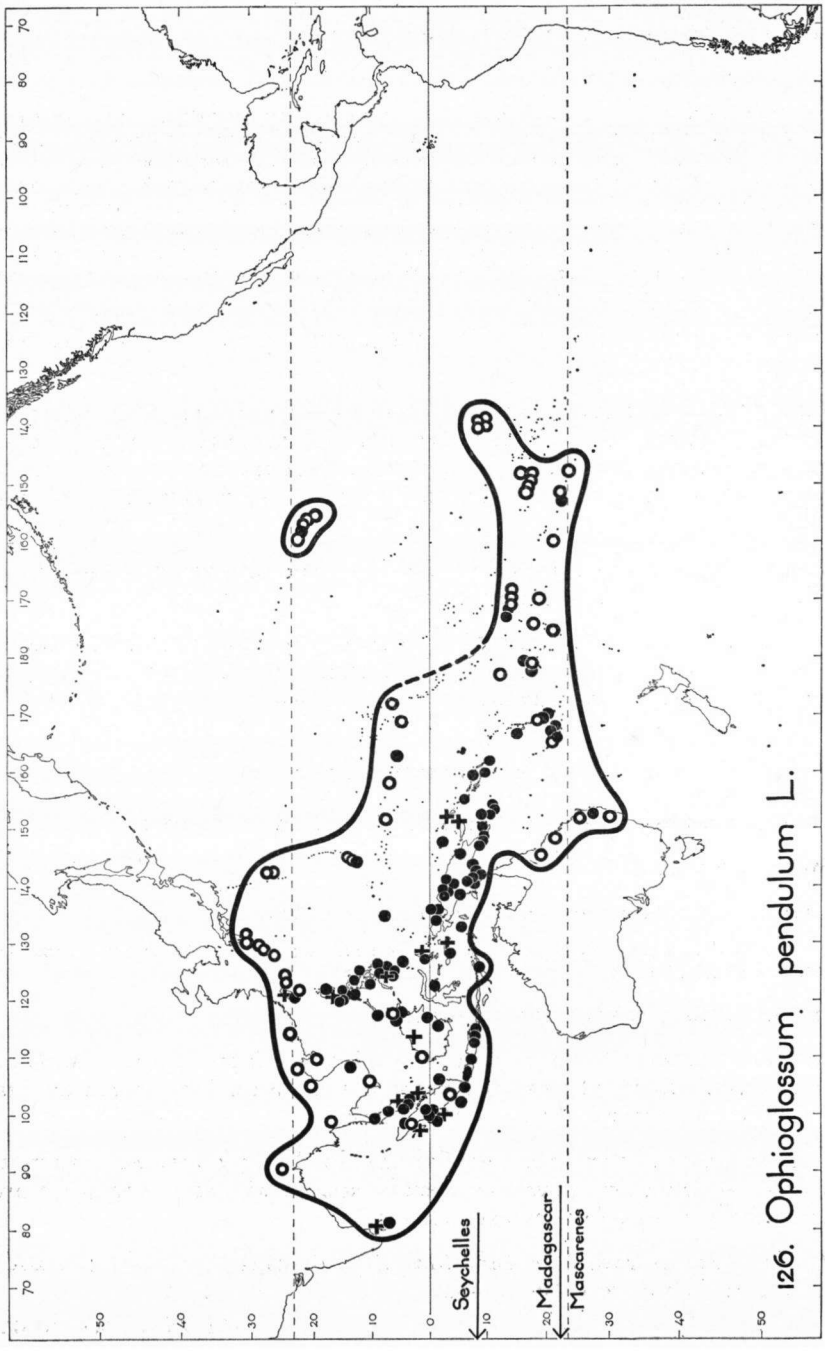

126. Ophioglossum pendulum L.

127. Fitchia Hook. f.

Name: **Fitchia** Hook. f., J. Bot. Lond. *4* (1845) 640.

Family: *Compositae.*

Taxonomy: A genus of 6 species, some of which may be conspecific, confined to SE. Polynesia. The species are distributed from west to east as follows: *F. speciosa* Cheesem. in Rarotonga I., *F. cuneata* Moore in Raiatea I., *F. cordata* Grant & Carlq. from Bora-bora I., *F. nutans* Hook. f. and *F. tahitensis* Nadeaud in Tahiti, *F. rapensis* F. B. H. Brown from Rapa I., and *F. mangarevensis* F. B. H. Brown from Mangareva. The affinities of the genus are doubtful. It has been associated with different tribes. On the strength of a thorough anatomical investigation Carlquist (1961) placed *Fitchia* in a separate subtribe *Fitchiinae* of the *Heliantheae* and considered *Oparanthus* and *Petrobium* (endemic in St. Helena) as its closest allies. *Fitchia* is one of a number of arborescent *Compositae* of which in the Pacific especially Juan Fernandez, Hawaii and Rapa I. are well provided.

Habit: Shrubs or small trees, up to c. 10 m, *F. speciosa* often provided with supporting aerial roots.

Habitat & Ecology: Ridges, and crevices of rocks up to the summits of the islands. In Rarotonga *F. speciosa* is gregarious; it grows along streams and forms a conspicuous element of the forest (Wilder, 1931). Flowers in large, campanulate, homogamous (only disc-florets) heads, c. 4 cm in diam., yellow or orange, and producing a copious supply of nectar.

Dispersal: Unknown. The fruits are elongate, flattened, hairy achenes (1—4 cm long) provided with two long, brittle, hairy awns.

Sources: G. P. Wilder, B. P. Bish. Mus. Bull. *86* (1931) 105; F. B. H. Brown, ibid. *130* (1935) 364—368; S. Carlquist, Univ. Cal. Publ. Bot. *29* (1957) 1—144, 1 map; S. Carlquist & M. L. Grant, Pac. Sc. *17* (1963) 282—298.

128. Oparanthus Sherff

Name: **Oparanthus** Sherff, Occ. Pap. B. P. Bish. Mus. *12* (1937) 9.

Family: *Compositae.*

Synonym: *Chrysogonum* sect. *Quadrimera* F. B. H. Brown.

Notes: A genus of 4 species, 3 confined to Rapa I., one endemic in Hiva Oa (Marquesas Islands). For a discussion see 127. *Fitchia.*

Habit: As *Fitchia*, but without prop-roots.

Habitat & Ecology: Rather common in thickets of slopes and ridges in Rapa I. *O. albus* (F. B. H. Brown) Sherff is a rare species in Hiva Oa. The florets form small, white, yellow or greenish heads, 3—15 mm diam.

Dispersal: Unknown; fertile fruits are produced by the ray florets. At maturity they are small (4—5 mm long), ovate, compressed achenes with acute or winged margins and provided with two smooth awns on top.

Sources: F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 340—345; S. Carlquist, Univ. Cal. Publ. Bot. *29* (1957) 1—144.

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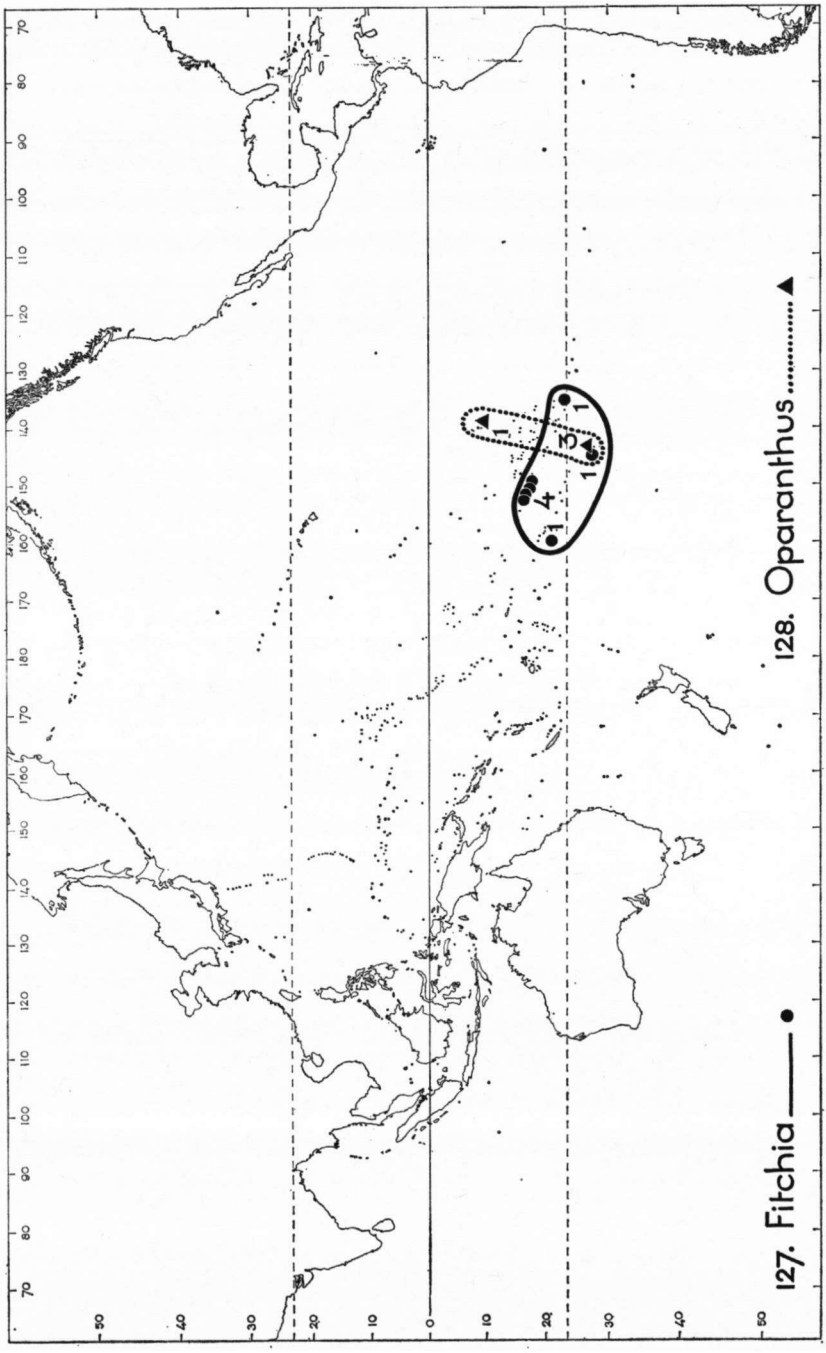

127. Fitchia
128. Oparanthus

129. **Batis** P. Br.

Name: Batis P. Browne, Hist. Jamaic. *1* (1756) 356.

Family: *Batidaceae.*

Notes: The single genus of this family comprises 2 species which occur very wide apart. *B. maritima* L. occurs along the Pacific and Atlantic coasts of tropical and subtropical America and in the Galapagos Islands. The northern limits of distribution are well established. In S. America the species has been collected as far south as Callao (Peru) on the Pacific coast and Georgetown (British Guiana) on the Atlantic coast, but Ostenfeld (1931) and Cowan (in litt.) expect it to extend further down. It also occurs in Hawaii but is probably not native here (Hillebrand, 1888). The other species, *B. argillicola* v. Royen, is known from South New Guinea near Merauke and Karumba in N. Queensland (Blake, 1963).

Habit: Low shrubs; *B. argillicola* is monoecious; it is stronger branched but smaller, up to c. 70 cm and has solitary flowers and fruits; *B. maritima* is dioecious; it has overhanging branches and is higher, up to c. 2 m; its flowers and fruits are arranged in spikes.

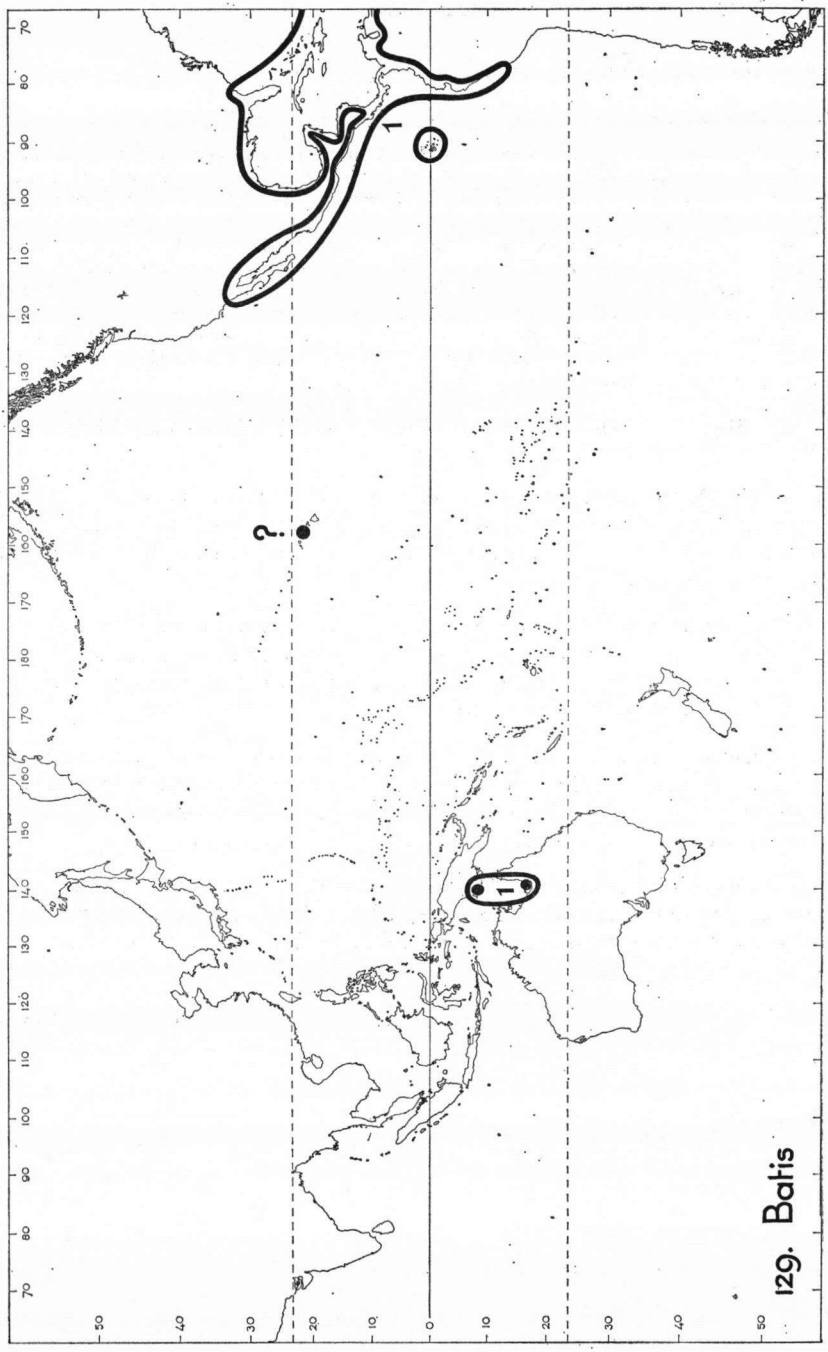
Habitat & Ecology: Both species inhabit saline clay plains which may be periodically (*B. argillicola*) or regularly (*B. maritima*) flooded, or on sandy plains occasionally. Both often grow gregariously. The New Guinean species is found associated with *Tecticornia cinerea* (F. v. M.) Bailey (*Chenop.*), *Eriachne pallescens* R.Br. (*Gram.*) and scattered *Avicennia marina* (Forsk.) Vierh. (*Verb.*) (Van Royen, 1956, 177). The American species often grows together with *Salicornia* (*Chenop.*) and *Avicennia*. Uphof (1931, 12) also mentions a succession of *Distichlis spicata* (L.) Green (*Gram.*), *B. maritima* and *Acrostichum aureum* L. (*Polypod.*). Pollination is most likely by wind.

Dispersal: The fruit in *B. argillicola* is an oblique septicidal 4-celled fleshy capsule, c. 1 cm long and 0.5 cm in diam.; ripe seeds are unknown. In *B. maritima* 3—8 fruits are united in a fleshy, finally spongy or corky catkin (c. 0.5 cm long) each fruit containing up to 4 seeds. The catkin may as a whole be transported by water. According to Ridley (Dispersal of Plants 1930, 311) the fruits are detached in seawater and can float for two weeks, after which the fruit decays. The seeds may float for another three months. Locally the species propagates by rooting of the overhanging branches.

Map: The question mark near Hawaii indicates the doubtful indigenity of *B. maritima* in these islands.

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 381; J. C. Th. Uphof, Oester. Bot. Zeitschr. *79* (1930) 355—367; Pflanzenareale 3. Reihe, Heft *2* (1931) 11—12, Karte 11; P. van Royen, Nova Guinea n.s. *7* (1956) 175—180, 187—195; Fl. Mal. I, *5* (1957) 414—415; S. T. Blake, Proc. R. Soc. Queensl. *73* (1963) 61. Dr. R. S. Cowan (Washington, D.C.) and Dr. A. Cronquist (New York) have kindly supplied information on the distribution in America.

M. M. J. VAN BALGOOY.


1
?!
1
129. Batis

130. Argemone L.

Name: Argemone Linné, Gen. Pl. ed. 5 (1754) 225.

Family: *Papaveraceae.*

Distribution: According to Ownbey's monograph (1958, 1961) the genus comprises 28 species, concentrated primarily in the United States and Mexico, especially in Texas, New Mexico, and Arizona, and the northern provinces of Mexico. A smaller centre is in Chile where 4 species occur; one of these extends to Argentina, Uruguay, Paraguay, Peru, Bolivia and Ecuador. The single Hawaiian species, *A. glauca* L. ex Pope, is allied to the Chilean *A. hunnemannii* Otto & Dietr. Some species are weeds of which the native area is obscure. A number of these are of local distribution, within the indigenous area of the genus. Others, however, are widespread, e.g. *A. ochroleuca* Sweet, which apart from Mexico, is also reported from Australia. *A. mexicana* L. is a weed introduced into many warm countries all over the world. In America it occurs from the SE. United States, throughout Central America and the West Indies to E. Brazil, Uruguay, N. Argentina, and Peru (dotted line). According to Ownbey (1958, 31) it is certainly native only in the West Indies, parts of the United States, and Central America.

Habit: Annual or perennial laticiferous herbs, mostly under 1 m (one a shrub of 2 m) with spiny leaves and stem.

Habitat & Ecology: In the tropics and subtropics some species ascend to c. 3000 m, but in the extratropical range others also descend to near sea-level. On rocky, sandy, or clayey soils, in valleys, cañons, deserts and prairies, also in pastures; several species adventitious on disturbed soils.

Dispersal: The fruit is a unilocular, ovate to oblong or lanceolate, glabrous or spiny capsule, splitting apically with 3—7 valves. It contains numerous small, subspherical, black seeds, 1—3 mm long, with reticulate testa. The seeds may be carried by water, occasionally also by birds or ants (Ridley).

Map: The map tries to give only the native area of *Argemone*. The distribution of *A. mexicana* L. in America is delineated by the dotted line. The remaining species occur in two disjunct areas, each delineated by a full line. The broken line indicates the relationship between the Hawaiian and one of the Chilean species.

Sources: H. N. Ridley, Dispersal of Plants (1930) 463, 525; G. B. Ownbey, Monograph of *Argemone* in N. America and West Indies. Mem. Torr. Bot. Cl. *21* (1958) 1—149, 4 maps; *Argemone* in South America and Hawaii. Brittonia *13* (1961) 91—109, 6 maps.

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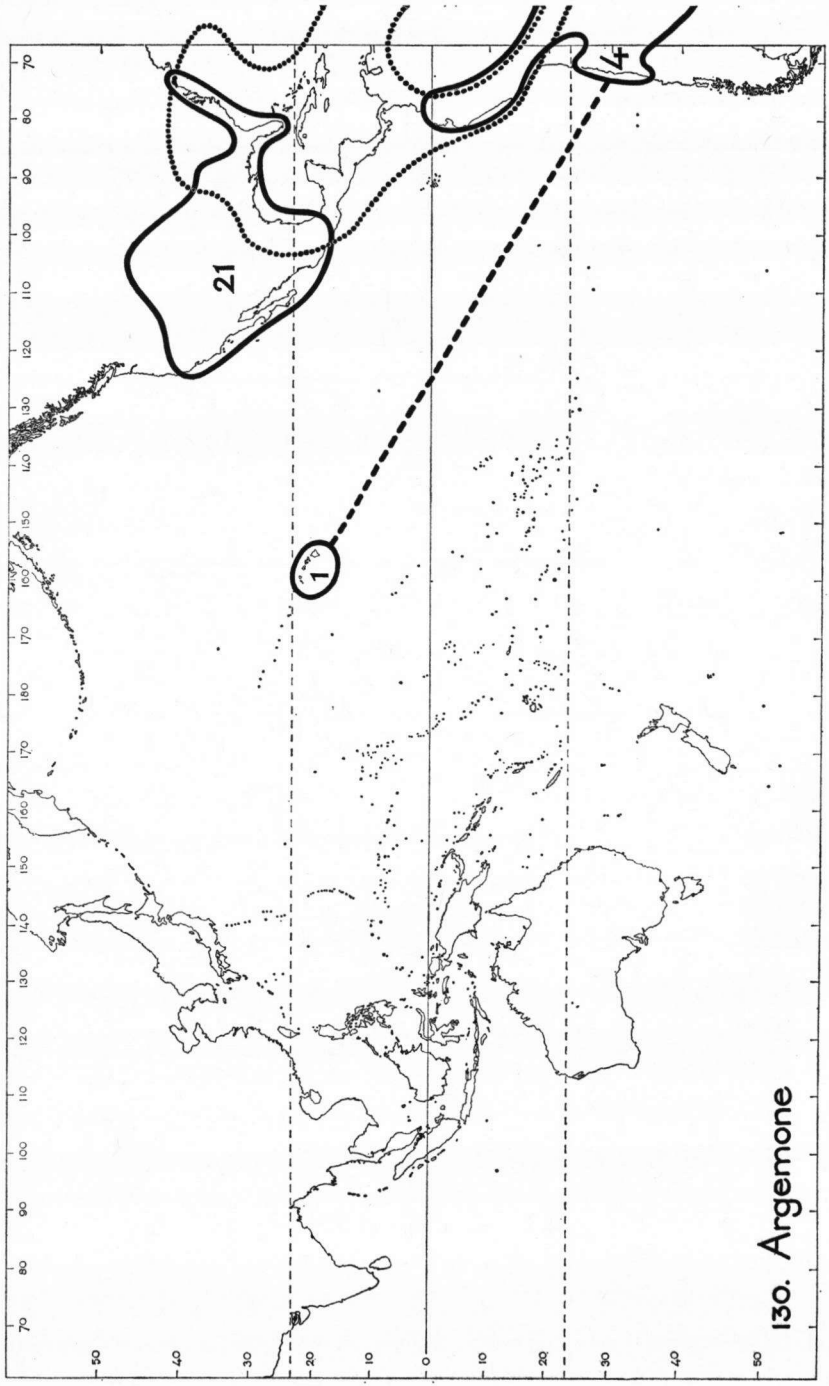
21
4
1
130. Argemone

131. Lycium L.

Name: Lycium Linné, Gen. Pl. ed. 5 (1754) 88.

Family: *Solanaceae.*

Notes: A rather large genus comprising c. 70 species, best developed in extratropical America, especially in Argentina. In the Old World the genus is best represented in Africa where c. 20 species occur, concentrated mainly in the Cape Province. In Eurasia c. 5 species of *Lycium* are found from western Europe through East Europe, the Near East, and Central Asia to China and Japan. One species is confined to Australia. The Pacific species are distributed as follows: *L. griseolum* endemic in the Bonin Is, *L. carolinianum* Walt. var. *sandwicense* (Gray) Hitchcock in Hawaii, Easter I. (where it is of aboriginal introduction according to some authors), Rapa, and Tongatapu. Other varieties of this species occur in N. America. Finally one species is peculiar to the Galapagos Is: *L. minimum* Hitchcock. A number of closely allied genera are confined to America.

Habit: Erect or spreading, often armed shrubs or treelets.

Habitat & Ecology: Temperate to subtropical, some species even in tropical parts of both hemispheres. Generally in arid or semi-arid open vegetation types, such as dry savannahs, deserts and sand-dune vegetation. Almost completely absent from the tropical parts of Asia, Malesia, Australia, and the Pacific. The specimens in the South Pacific were collected near the coast.

Dispersal: The fruit is mostly a small, ovoid to oblong berry 2—10 mm, red, or sometimes yellow when ripe, containing 5—60 seeds, in some species the fruit is sclerenchymatous and contains few seeds. Birds and mammals may aid in dissemination.

Sources: C. L. Hitchcock, Monograph of Lycium in the Western Hemisphere. Ann. Mo. Bot. Gard. *19* (1932) 179—374, 12 pl.; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 259; F. A. Barkley, Lilloa *26* (1953) 177—238; A. N. Steward, Vasc. Pl. Lower Yangtze (1958) 247; T. G. Yuncker, B. P. Bish. Mus. Bull. *220* (1959) 239; and various other literature sources. The localities in Korea, Formosa, Ryu Kyu Is, Japan and Bonin Is were provided by Prof. H. Hara (Tokyo). The continental Asiatic localities are based on the collections in Kew and Calcutta and were supplied by Mr. C. Jeffrey (Kew) and Dr. H. Santapau (Calcutta) respectively. Mr. J. H. Willis (Melbourne) has mapped the localities in Australia.

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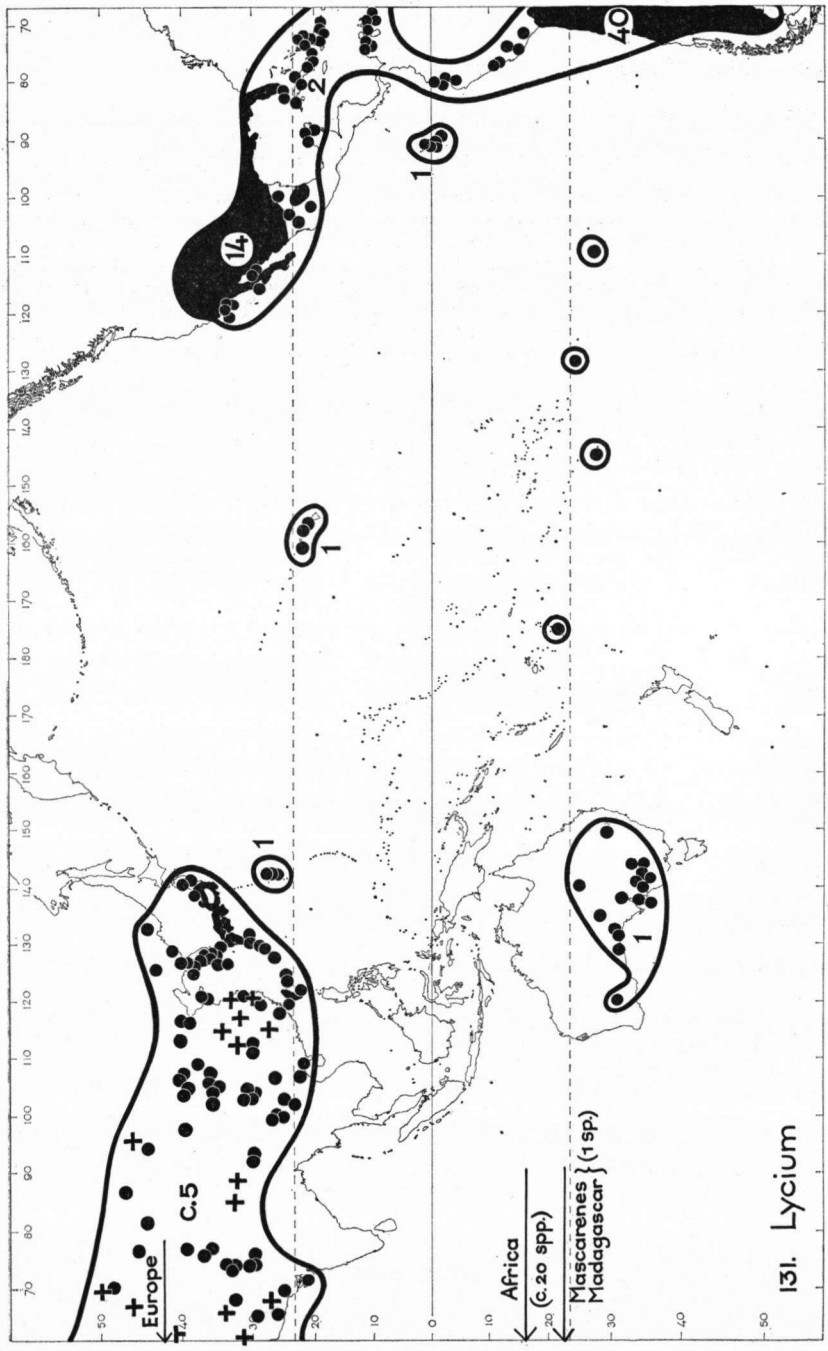
131. Lycium
Europe
c.5
Africa
(c.20 spp.)
Mascarenes
Madagascar
(1 sp)
14
2
1
1
1
1
40

132. Dillenia L.

Name: Dillenia Linné, Gen. Pl. ed. 5 (1754) 239.

Family: *Dilleniaceae.*

Synonyms: *Wormia* Rottb.; for other synonyms see Hoogland (1951, 1952).

Notes: A genus of nearly 60 species, best developed in SE. Asia and Malesia. One species is shared by Madagascar and Ceylon, another is confined to the Seychelles. In the north some species extend into S. China and the southern slopes of the Himalaya. The North Australian species *D. alata* (R.Br. ex DC.) Mart. also occurs in New Guinea. Some widespread species occur in SE. Asia and W. Malesia, e.g. *D. indica* L. (India, throughout SE. Asia and W. Malesia: Sumatra, Malaya, Borneo, Java) and *D. pentagyna* Roxb., with the same distribution as the former in continental Asia, but in Malesia only found in the seasonal regions of Java, the Lesser Sunda Islands, and South Celebes (Hoogland 1951, fig. 12). Local endemics are mostly found in the eastern part of the range, viz the Philippines, New Guinea, and the West Pacific.

Habit: Trees; occasionally up to c. 40 m tall.

Habit & Ecology: Most species belong to the tropical rain-forest or sometimes secondary vegetation, on dry to marshy soil. A number of deciduous species occur in monsoon forest and savannahs, but *D. alata* from the savannahs of Australia and New Guinea is evergreen. The altitudinal range is from sea-level up to c. 2000 m, but most species are found below 1000 m. The flowers are large, white or yellow, and conspicuous, borne on racemes. Pollination is probably by insects.

Dispersal: The fruit which is enclosed by rather fleshy sepals, varies in size from 1–c. 15 cm. It may or may not be dehiscent. In all dehiscent fruits the seeds are provided with a yellowish or reddish aril. Each fruit contains few to many seeds, measuring up to c. 5 mm in diam. The seeds of the species with dehiscent fruits are eaten by birds. According to Ridley, Dispersal of Plants (1930) 426, 481, the black seeds covered by a scarlet aril of *D. suffruticosa* are a favourite food of bulbuls (*Pycnonotidae*). The indehiscent ones mainly serve as food to mammals (e.g. elephants). Of some species the fruits are eaten by man. Fruits of *D. indica* are also known to be dispersed by water.

Map: The figure above the line indicates the number of endemic species, that below the line the total number of species for each partial area or island group. Localities have only been indicated in the Pacific islands.

Sources: Revisions of the genus by R. D. Hoogland, Fl. Mal. I, *4* (1951) 154—174; Blumea *7* (1953) 1—145; Blumea *9* (1959) 577—589. Collections in the Rijksherbarium Leyden.

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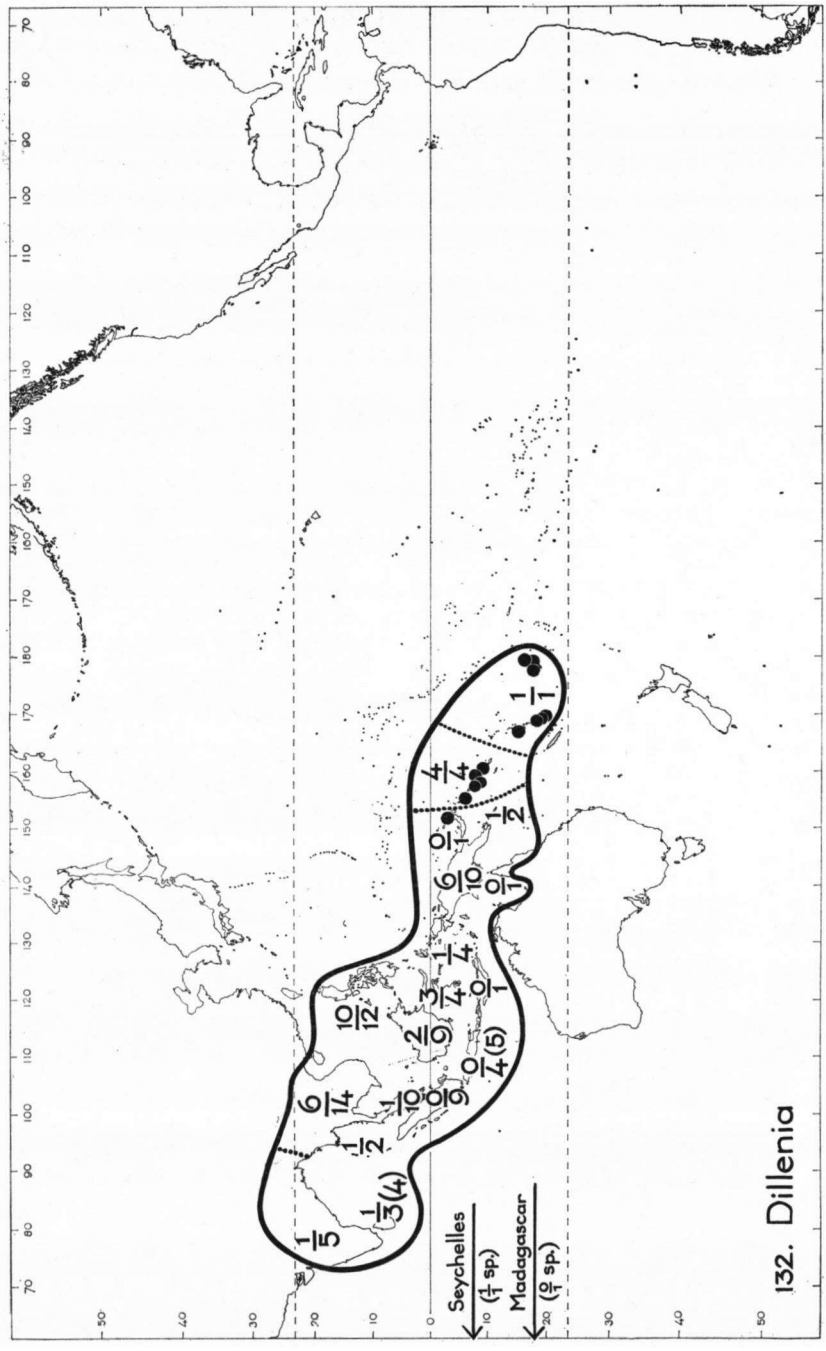
132. Dillenia
Seychelles (1/1 sp.)
Madagascar (0/9 sp.)

133. **Hibbertia** Andr.

Name: Hibbertia Andrews, Bot. Rep. (1800) t. 126.

Family: *Dilleniaceae.*

Notes: A large genus of over 100 species, which has not been revised. It is best developed in Australia, including also Tasmania, where c. 100 species occur. For New Caledonia c. 25 species have been described. One species is endemic in Madagascar. Two of the Australian species penetrate into Malesia, one in South New Guinea, the other is known from the Aru Islands, Waigeo I. and North New Guinea (Arfak Mts). One of the New Caledonian species also occurs in Fiji.

Habit: Mostly small, erect, much-branched shrubs under 2 m tall. Sometimes scandent or arborescent, some New Caledonian species reach c. 6 m in height. Flowers bright yellow, sometimes orange or white, conspicuous.

Habitat & Ecology: Lowland, dunes, hills, and mountains up to c. 3000 m in New Guinea. In open forest, savannahs or heath, along rivers and occasionally in bogs or in rain-forest. Mostly on dry sandy or gravelly soil but also on loamy and clayey soils.

Dispersal: The fruit consists of 1—5 (rarely more) free or nearly free small carpels which measure only a few mm, up to c. 1 cm in some large-fruited New Caledonian species. The carpels open along the inner suture. Each carpel contains 1—5(—15) ovoid or globular, shining seeds which are enclosed in a thin aril.

Sources: G. Bentham, Fl. Austr. *1* (1863) 17—41; F. M. Bailey, Queensl. Fl. *1* (1899) 11—17; A. J. Ewart, Fl. Vict. (1930) 766—770; A. C. Smith, B. P. Bish. Mus. Bull. *141* (1936) 97; A. Guillaumin, Fl. Nouv. Caléd. (1948) 213—215; R. D. Hoogland, Fl. Mal. I, *4* (1951) 150—151, 1 map; Black, Fl. S. Austr. *3* (1952) 574—577; W. M. Curtis, Stud. Fl. Tasm. *1* (1956) 20—23. Collections in the Rijksherbarium Leyden.

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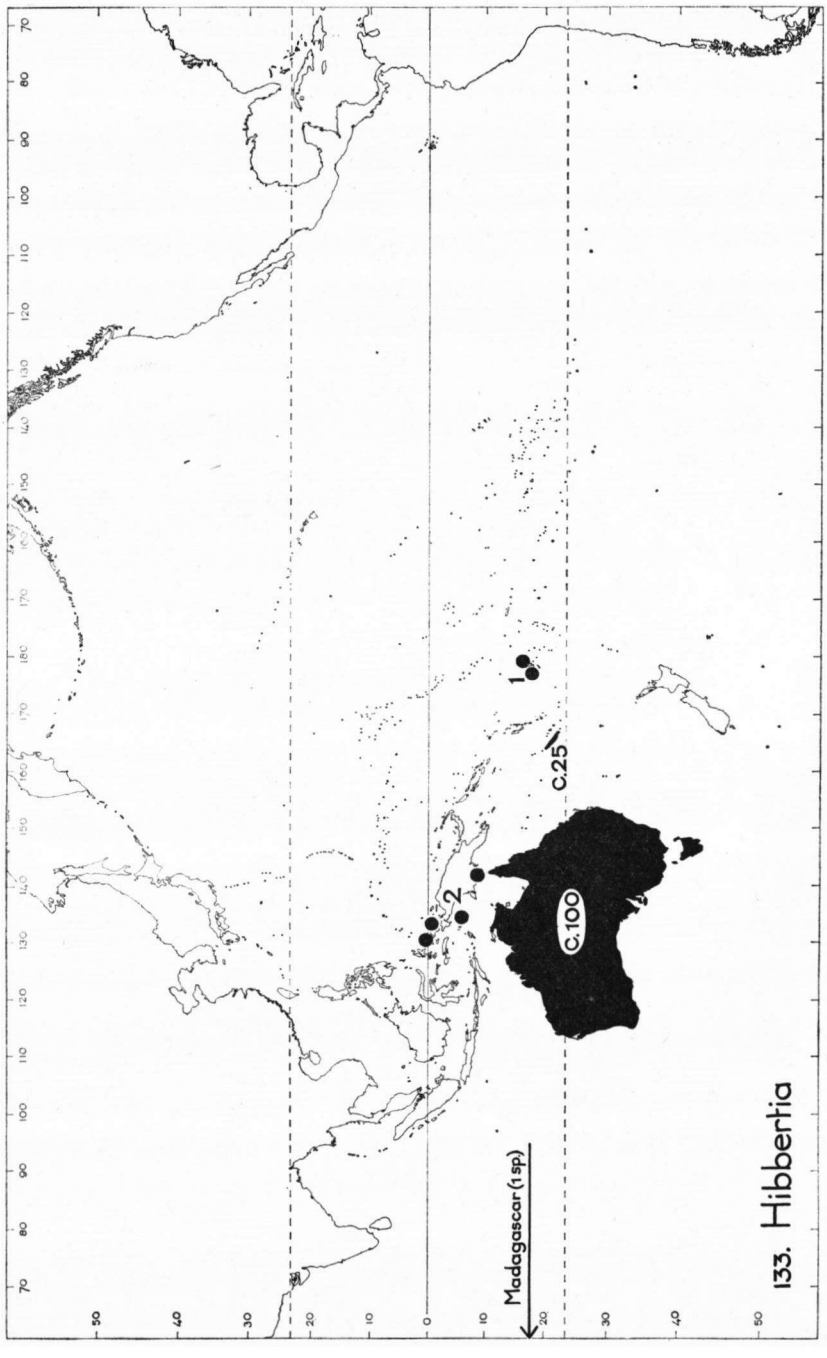

133. Hibberia
C.100
C.25
1
2
Madagascar (1 sp)

134. **Chrysophyllum roxburghii** G. Don

Name: Chrysophyllum roxburghii G. Don, Gen. Syst. *4* (1837) 33.

Family: *Sapotaceae.*

Synonym: *Chrysophyllum lanceolatum* (Bl.) DC. incl. var. *stellatocarpon* v. Royen and var. *papuanum* C. T. White.

Notes: The genus comprises 100—200 species and is of pantropical distribution, best developed in America and Africa; c. 25 species occur in the Indo-Australian region, from India and Southeast Asia, throughout Malesia and East Australia, eastwards as far as New Caledonia from where 16 endemic species have been described.

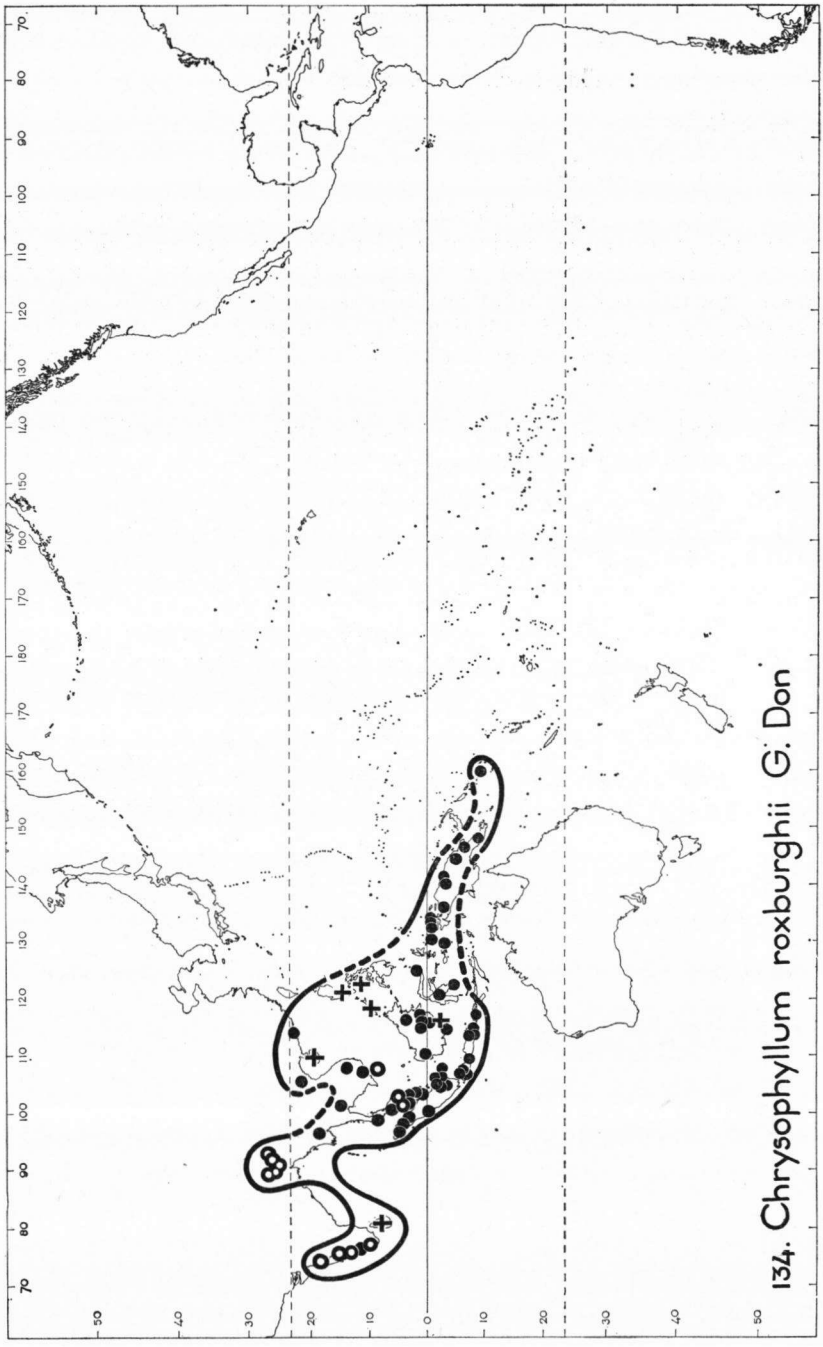
Habit: Large trees, often buttressed, up to 55 m tall.

Habitat & Ecology: An upper storey tree of the primary rain-forest from 0—1200 m. On well-drained, sandy, limey or clayey soils.

Dispersal: The fruit is a globose to 5-winged laticiferous, light-green to yellowish berry, 1.5—6 cm in diam., containing 1—5 seeds. Nothing is known about means of dispersal, but birds (fruit-pigeons) and bats may eat the fruits.

Sources: H. J. Lam, Bull. Jard. Bot. Btzg III, *7* (1925) 187—188; W. Vink, Blumea *9* (1958) 28—33.

W. Vink.


134. Chrysophyllum roxburghii G. Don

135. **Lepechinia** Willd.

Name: Lepechinia Willd., Hort. Berol. *1* (1803) 21.

Family: *Labiatae.*

Synonym: *Sphacele* Benth.

Notes: A genus of c. 40 species divided into 8 sections. Except 2, all species are confined to the Americas, where they occur in more or less disjunct areas from California, through Central America, and southward along the Andes to Chile and North and East Argentina, one species in Brazil, one in Haiti. One section is represented with one species in Chile and another far-flung species in Réunion I. in the Indian Ocean. The Hawaiian species *L. hastata* (Gray) Epl. also occurs in Mexico (Baya California, and Socorro I.). The closely allied monotypic genus *Chaunostoma* is confined to Mexico.

Habit: Perennial herbs, shrubs or small trees. Flowers in terminal panicles or in clusters in the axils of the upper leaves, purple, blue or white.

Habitat & Ecology: *L. hastata* is mentioned to grow gregariously at 750—1000 m in Maui I., on the summit of Socorro I. (c. 300 m) and at c. 2000 m in Baya California. The other species are found in tropical montane forests and descend also to coastal habitats in the warm-temperate zone.

Dispersal: Unknown. The fruits are small, black, stony nuts, 2—4 mm. According to Hillebrand (1888, 345) the Hawaiian species rarely produces ripe seeds as the flowers are attacked by insects.

Map: The area of the single Pacific species is delineated by a dotted line.

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 344—345; C. Epling, in Fedde, Rep. Beih. *85* (1937) 15—27; Brittonia *6* (1948) 352—364, 7 maps; C. Epling & M. E. Mathias, ibid. *8* (1957) 305.

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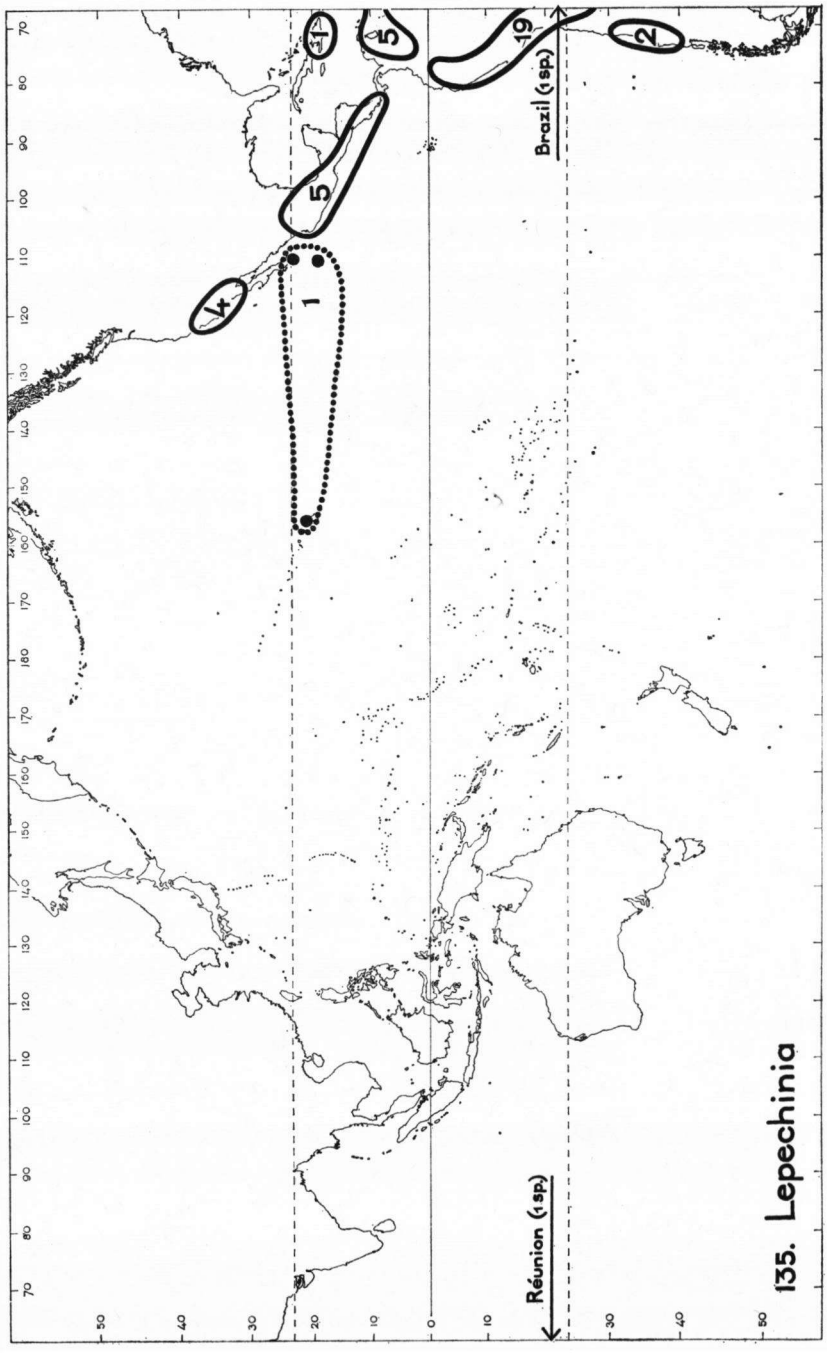
135. Lepechinia
Réunion (1 sp.)
Brazil (1 sp.)
1
5
5
19
2
1x

136. **Erythroxylum** P. Br.

Name: Erythroxylum P. Browne, Hist. Jamaica *1* (1756) 278.

Family: *Erythroxylaceae.*

Synonym: *Erythroxylon* L.

Taxonomy: A large genus of c. 200 species, of which c. 150 in tropical to subtropical America, from Mexico and the West Indies southward to Bolivia, North Argentina, Uruguay and Brazil. In the Old World c. 50 species, best developed in Madagascar, few species in Africa and Indo-Australia. Only 3 species occur in the Pacific proper: *E. novocaledonicum* O. E. Schulz, and *E. couveleense* A. Guill. endemic in New Caledonia, and *E. ecarinatum* Burck in the Solomons and Louisiades extending westwards to East Malesia (New Guinea, Moluccas, and Celebes) and North Queensland. Both species belong to sect. *Coelocarpus*, which is further represented in Australia, SE. Asia and Africa. The only two other small genera of this family are confined to tropical Africa.

Habit: Shrubs or trees, *E. ecarinatum* is a large tree up to 37 m tall, *E. novocaledonicum* is a shrub or small tree.

Habitat & Ecology: In both tropical lowland or montane rain-forest and in open dry forest or even in arid stations, on granitic, sandy or clayey soils. A few species slightly overstep the tropics of Cancer and Capricorn. *E. ecarinatum* is a tree of everwet rain-forest, whereas *E. novocaledonicum* is a xerophytic shrub of open places. The altitudinal range is from sea-level up to c. 2000 m. All species of *Erythroxylum* have heterostylous flowers (see Burck, 1893 and Payens, 1958). The flowers are small, yellow or greenish-white, fragrant and are pollinated by bees and other insects.

Dispersal: The fruit is an ovoid to oblong, sometimes compressed, 3-locular drupe, from a few mm to c. 3 cm long in which only one seed develops. The exocarp is thin and fleshy and turns red at maturity. They are eaten by birds (Schulz, 1931, 134). The empty spaces formed by the sterile cells may give the fruit some buoyancy. Experiments with cultivated species have shown that the power of germination is rapidly lost (Payens, 1958, 545).

Map: All localities of *E. ecarinatum* are indicated by dots, those of *E. novocaledonicum* and *E. couveleense* by triangles.

Sources: W. Burck, Ned. Kruidk. Arch. *6* (1895) 254—262; O. E. Schulz, Pfl. R. Heft *29* (1907); in E. & P. Pfl. Fam. ed. 2, *19a* (1931) 130—142; A. U. Däniker, Mitt. Bot. Mus. Un. Zürich *142* (1932) 195; C. T. White, J. Arn. Arb. *31* (1950) 89; J. P. D. W. Payens, Fl. Mal. I, *5* (1958) 543—552; A. Guillaumin, Mém. Mus. Nat. Hist. Nat. *15* (1964) 57. Local floras. Collections from various herbaria. Personal information was obtained from Mr. Payens.

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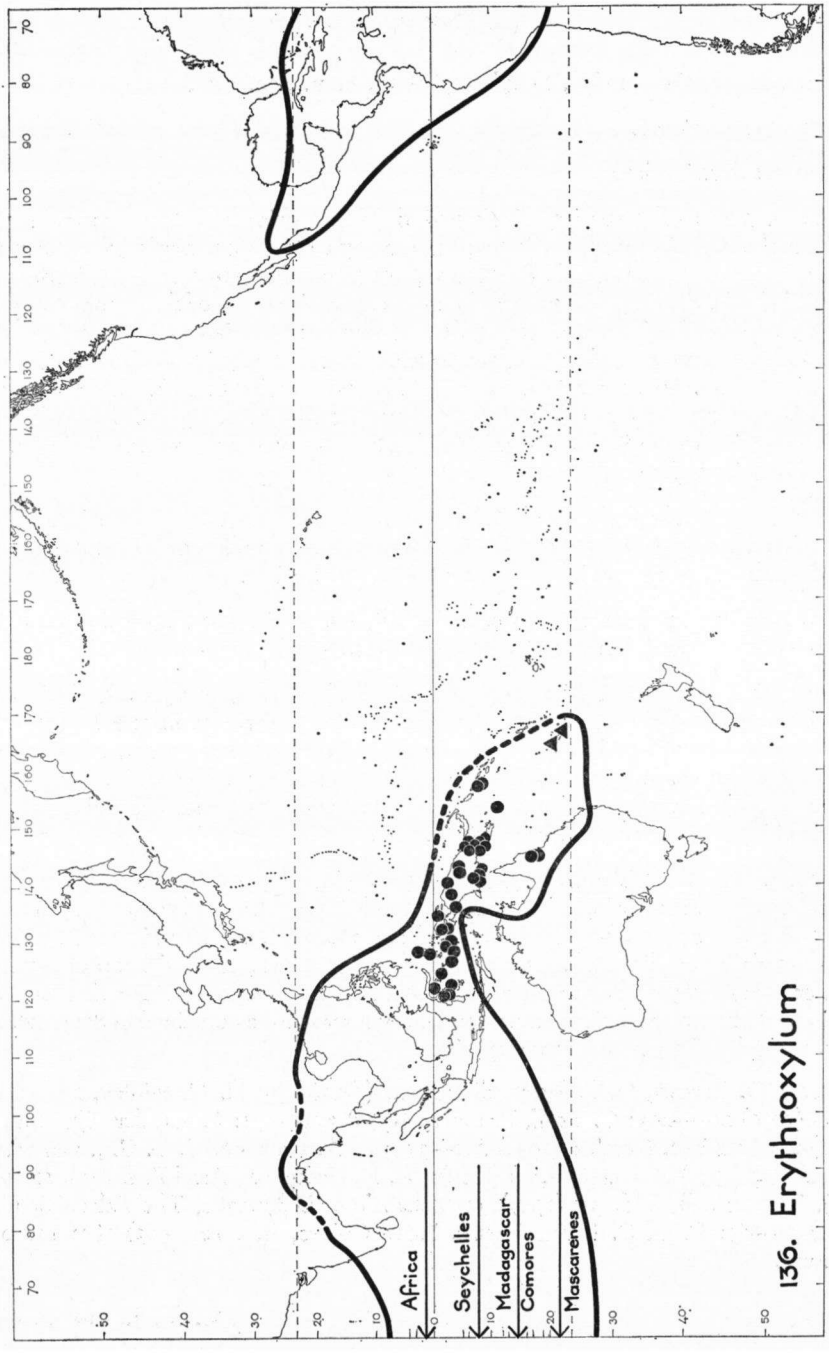

Africa
Seychelles
Madagascar
Comores
Mascarenes
136. Erythroxylum

137. Sonneratia L.f.

Name: **Sonneratia** Linné f., Suppl. (1781) 38, nom. gen. cons.

Family: *Sonneratiaceae.*

Synonym: *Blatti* Adans.

Notes: A genus of 5 species, distributed from E. Africa and Madagascar, through continental SE. Asia, northwards to southern Ryu Kyu, southwards to N. Australia and eastwards to the Marshalls (Hatheway, 1953, Marshall, 1957), New Hebrides and New Caledonia. *S. alba* J. Sm. practically covers the entire range of the genus. *S. caseolaris* (L.) Engl. (*S. acida* L.f.) occurs from India, throughout Malesia to N. Australia, Micronesia, and the New Hebrides. *S. apetala* Buch.-Ham. and *S. griffithii* Kurz are confined to continental SE. Asia, whereas *S. ovata* Back. is a rare species found in scattered localities from Siam to New Guinea (see Backer & van Steenis, 1951, fig. 5). The only other genus belonging to the *Sonneratiaceae* is *Duabanga* represented with one species in SE. Asia and another in Malesia.

Fossils: Fossils of plants closely allied to *Sonneratia* have been found in Tertiary deposits of the Deccan peninsula (Mahabale & Deshpande, 1957). Pollen of *Sonneratia* has been found in the Tertiary marine deposits off-shore Brunei (J. Muller, in litt.).

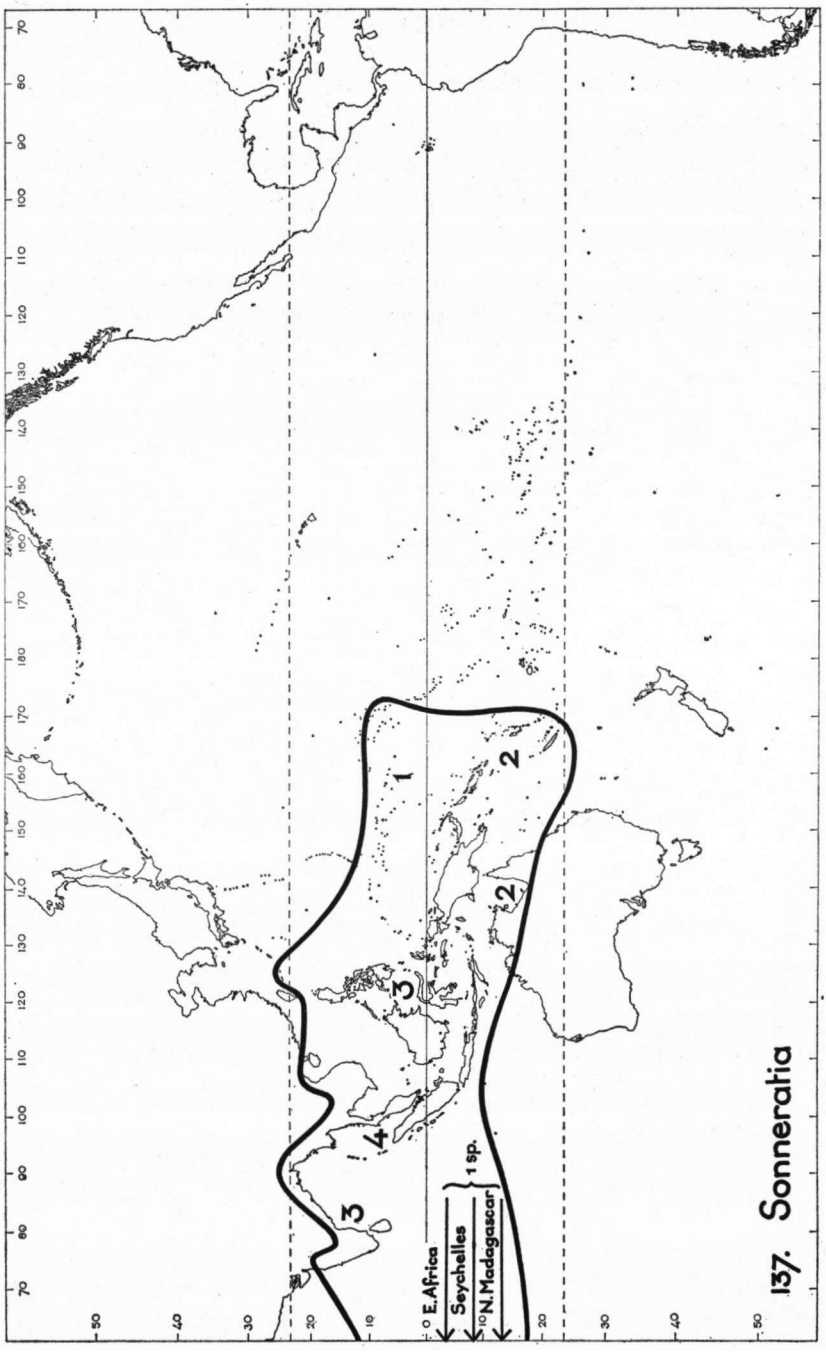
Habit: Medium-sized trees up to c. 20 m tall, with many asparagus-like pneumatophores borne on long horizontal roots (see Troll, 1931).

Habitat & Ecology: Tropical coralline or muddy shores, mangroves, tidal creeks, estuaries, sometimes found inland along the banks of tidal rivers, in one case found on a peaty bank of an inland lake (Sentani Lake, N. New Guinea; see v. Steenis, 1963). The large nocturnal flowers produce copious amounts of nectar and emit a strong smell. Beccari (1902) noted honeysuckers visiting the flowers and van der Pijl (1936) saw bats drinking the nectar of *S. caseolaris* flowers.

Dispersal: The fruit is a large green or yellowish, depressed-globose berry, up to c. 8 cm in diam., containing many seeds embedded in a fetid, acid pulp. They are eaten by animals, e.g. by bats (see v. d. Pijl, 1957) and monkeys, and also by man. According to Ridley the main dispersal agent is sea-water as the seeds, released upon decay of the fruit, are very buoyant due to their light testa. Among mangrove plants these seeds are the smallest known and lack the usual amount of reserve food contained in the cotyledons or hypocotyls of other mangrove species.

Sources: O. Beccari, Nelle foreste di Borneo (1902) 140; H. N. Ridley, Dispersal of Plants (1930) 292—293; C. Troll, Planta *13* (1931) 311—473; L. van der Pijl, Flora *131* (1936) 25; Acta Bot. Neerl. *6* (1957) 291—315; C. A. Backer & C. G. G. J. van Steenis, Fl. Mal I, *4* (1951) 280—288, fig. 5 (map); W. H. Hatheway, Atoll Res. Bull. *16* (1953) 38; J. T. Marshall, ibid. *56* (1957) 3; Mahabale & Deshpande, The Palaeobotanist *6* (1957) 51—63; C. G. G. J. van Steenis, Nova Guinea, Bot. *12* (1963) 189; and other literature.

M. M. J. van Balgooy.


137. Sonneratia
E. Africa
Seychelles
N. Madagascar
1 sp.
1
2
2
3
3
4

138. **Amyema** v. Tiegh.

Name: Amyema v. Tiegh., Bull. Soc. Bot. Fr. *41* (1894) 499.

Family: *Loranthaceae.*

Taxonomy and distribution: A genus of c. 100 species, best developed in Australia, New Guinea and the Philippines. Few species in W. Malesia, two outlying species in Africa. Two species extend into the Pacific proper, viz: *A. artensis* (Montr.) Dans. (Samoa, New Hebrides, New Caledonia, New Guinea, Bismarcks and Ponape) and *A. scandens* (v. Tiegh.) Dans. (New Caledonia and Lifu, and New Guinea). Several of the species are insufficiently known and may prove to be only varieties of wider spread ones. One species is doubtfully mentioned for Tahiti (see Danser, 1936, 94).

Habit: Shrubs, parasitic on other plants, to which they are attached by suckers.

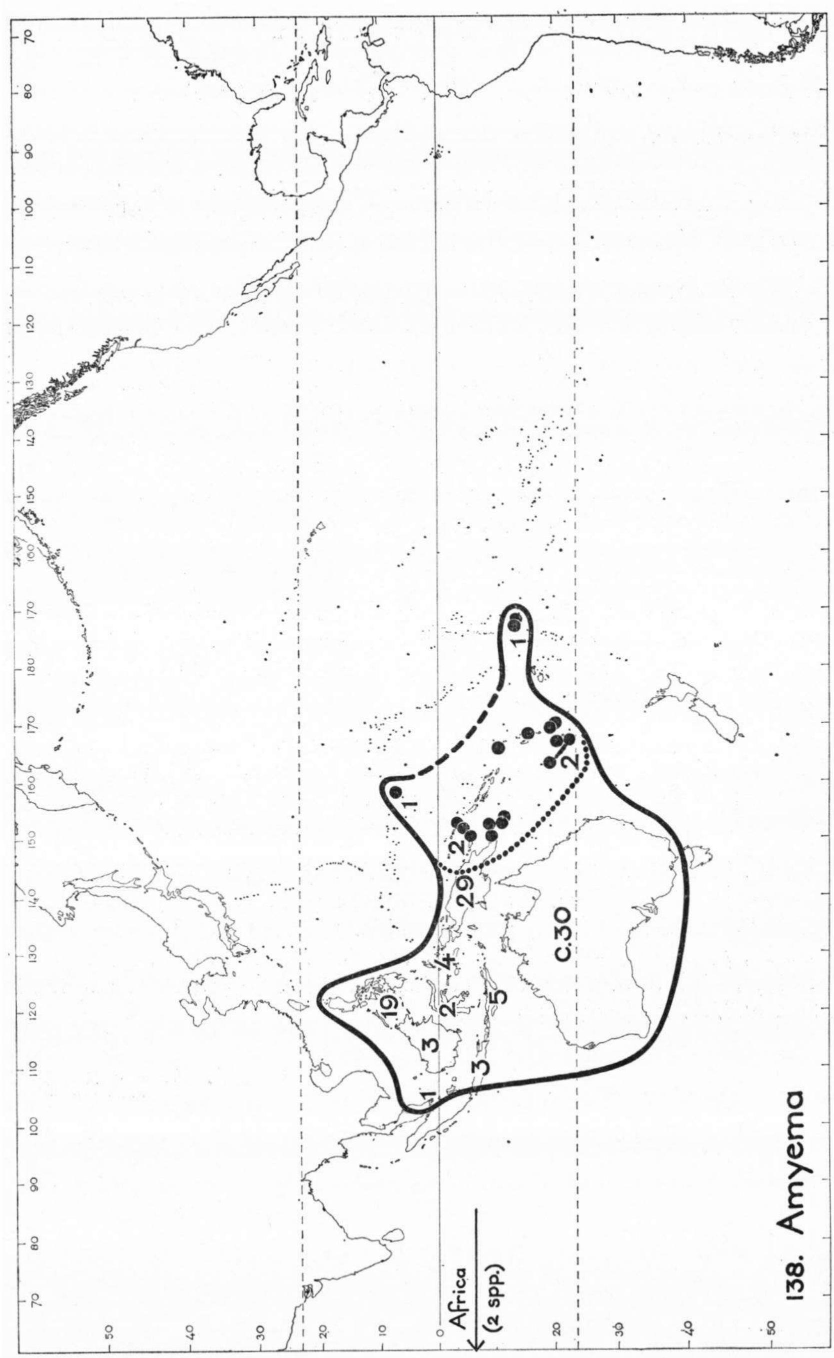
Habitat & Ecology: As most other *Loranthaceae Amyemas* are parasitic on a wide range of hosts. They occur in both tropical lowland and montane rain-forest, monsoon forest, deserts, and well into the temperate zone in Australia. Apparently most species thrive best in montane stations above 1000 m, up to c. 4000 m in New Guinea, and high up in the Australian Alps. But several others occur near sea-level. The flowers are brightly coloured: yellow, pink or red and produce abundant honey. They are pollinated principally by birds of the families *Nectarinidae* (honeysuckers) and *Dicaeidae* (flowerpeckers). But self-fertilisation, and pollination by insects, also occurs.

Dispersal: The fruits are small ellipsoid 5—15 by 3—6 mm, baccate or drupaceous; the seed is enveloped in a sweet, sticky viscid mass. The berries are eaten by birds, mainly *Dicaeidae*, which are the principal dispersal agency; they are rapidly digested; the kernels pass the intestinal tract undamaged and are wiped off on the bark of branches and twigs to which they adhere by the sticky outer layer (see the account by W. M. Docters van Leeuwen, 1927 and 1954, where also a summary of literature is given).

Map: Numerals indicate the number of species for each island or island group. *A. artensis* occurs throughout the region east of the dotted line.

Sources: W. F. Blakeley, Proc. Linn. Soc. N.S.W. *47* (1922) 391—414; ibid. *48* (1923) 130—152; ibid. *49* (1924) 79—90; ibid. *50* (1925) 21—23; B. H. Danser, Bull. Jard. Bot. Btzg III, *11* (1931) 318—355; Verh. Kon. Akad. Wet. A'dam *29* (1933) 25—35; Philip. J. Sc. *58* (1935) 61—90; Bull. Jard. Bot. Btzg III, *14* (1936) 87—95; Engler & Krause, in E. & P. Pfl. Fam. ed. 2, *16b* (1935) 149; W. M. Docters van Leeuwen, Ann. Jard. Bot. Btzg *38* (1927) 121—130; Beaufortia *4* (1954) 105—205. Other literature and collections in the Rijksherbarium Leyden.

M. M. J. VAN BALGOOY.


138. Amyema
Africa
(2 spp.)
c.30
29
19
1
2
3
4
5

139. **Amylotheca** v. Tiegh.

Name: Amylotheca van Tieghem, Bull. Soc. Bot. Fr. *41* (1894) 261.

Family: *Loranthaceae.*

Taxonomy and distribution: A genus of c. 40 species. As in 138. *Amyema* there is a concentration of species in the Philippines, New Guinea, and Australia. The genus, though not occurring in Africa, extends much farther into the Pacific, as far as the Marquesas. In Australia it is limited to the coastal regions on the north and east. The three East Pacific species *A. mercieri* (v. Tiegh.) Dans. (Marquesas), *A. forsteriana* (Schultes) Dans. (Society Islands) and *A. insularum* (A. Gray) Dans. (Fiji to Cook Is) are very closely allied. *A. dictyophleba* (F. v. M.) v. Tiegh. of New Caledonia is common in East Australia and rare in New Guinea. *A. pyramidata* (v. Tiegh.) Dans. is endemic in New Caledonia. The New Hebridean species *Lysiana banksiana* (Guillaum.) Dans. belongs to *Amylotheca* according to Barlow (1963). The Solomon Islands species are closely allied to or conspecific with the New Guinean species. The Malayan and Bornean, and some Philippine species, form a very distinct section and should perhaps be referred to a separate genus (cf. Danser, 1931, 239).

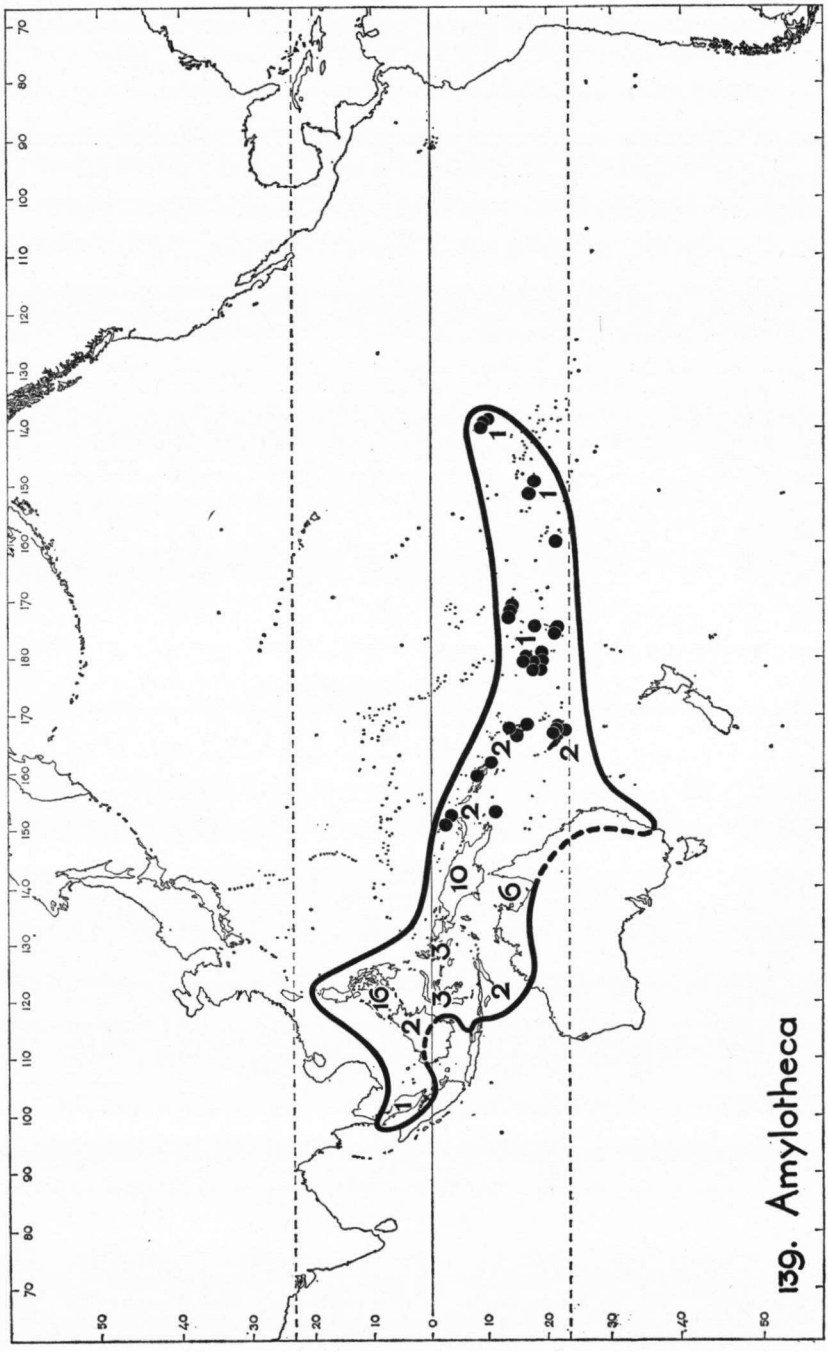
Habit: Similar as in 138. *Amyema.*

Habitat & Ecology: As 138. *Amyema,* but obviously *Amylotheca* is more confined to the tropics, being found outside it only in New South Wales. In Malesia *Amylothecas* ascend to 3000 m. In the Pacific they are found from near sea-level to 1500 m, but more commonly in submontane stations.

Dispersal: Probably the same holds as for 138. *Amyema.* It must be added, however, that the distribution of both *Amyema* and *Amylotheca* extends far beyond that of the *Diceidae* which in the Pacific are only represented as far eastwards as the Solomons (see e.g. Mayr, 1945). But other birds may also aid in dissemination.

Sources: W. F. Blakeley, Proc. Linn. Soc. N.S.W. *49* (1924) 91—96; ibid. *50* (1925) 11—12, 21—24; B. H. Danser, Bull. Jard. Bot. Btzg III, *11* (1931) 238—254; Verh. Kon. Akad. Wet. A'dam *29* (1933) 35—40; Philip. J. Sc. *58* (1935) 3—30; Bull. Jard. Bot. Btzg III, *14* (1936) 74—86; Engler & Krause, in E. & P. Pfl. Fam. ed. 2, *16b* (1935) 138; E. Mayr, Birds of the Southwest Pacific, MacMillan (1945); B. A. Barlow, Proc. Linn. Soc. N.S.W. *83* (1963) 137—150.

M. M. J. VAN BALGOOY.


139. Amylotheca

140. **Phyllocladus** L. C. & A. Rich.

Name: Phyllocladus L. C. & A. Rich., Comment. Bot. Conif. (1826) 38.

Family: *Podocarpaceae.*

Distribution: A genus of five species, three in New Zealand, one in Tasmania, one in Malesia.

Fossils: Fossil Conifers considered to be allied to *Phyllocladus* have been described from Greenland, North America and Europe. According to Florin (1940, 74—75): "There is no proof that any of the genera *Protophyllocladus* Berry, *Phyllocladopsis* Fontaine, or *Phyllocladites* Heer from Cretaceous strata in the Northern Hemisphere are related to the recent genus. South of the equator, on the other hand, some sterile remains which in all probability are referable to *Phyllocladus* are recorded from the Eocene of South Island, New Zealand, from the Miocene of northern New South Wales and Victoria and from Quaternary deposits in southern New Zealand." Fossil *Phyllocladus* pollen occurs in Tertiary sediments throughout S. Australia and New Zealand (Couper, 1960) and according to Miss Cranwell (1959) almost certainly also in Seymour I. (western Antarctica).

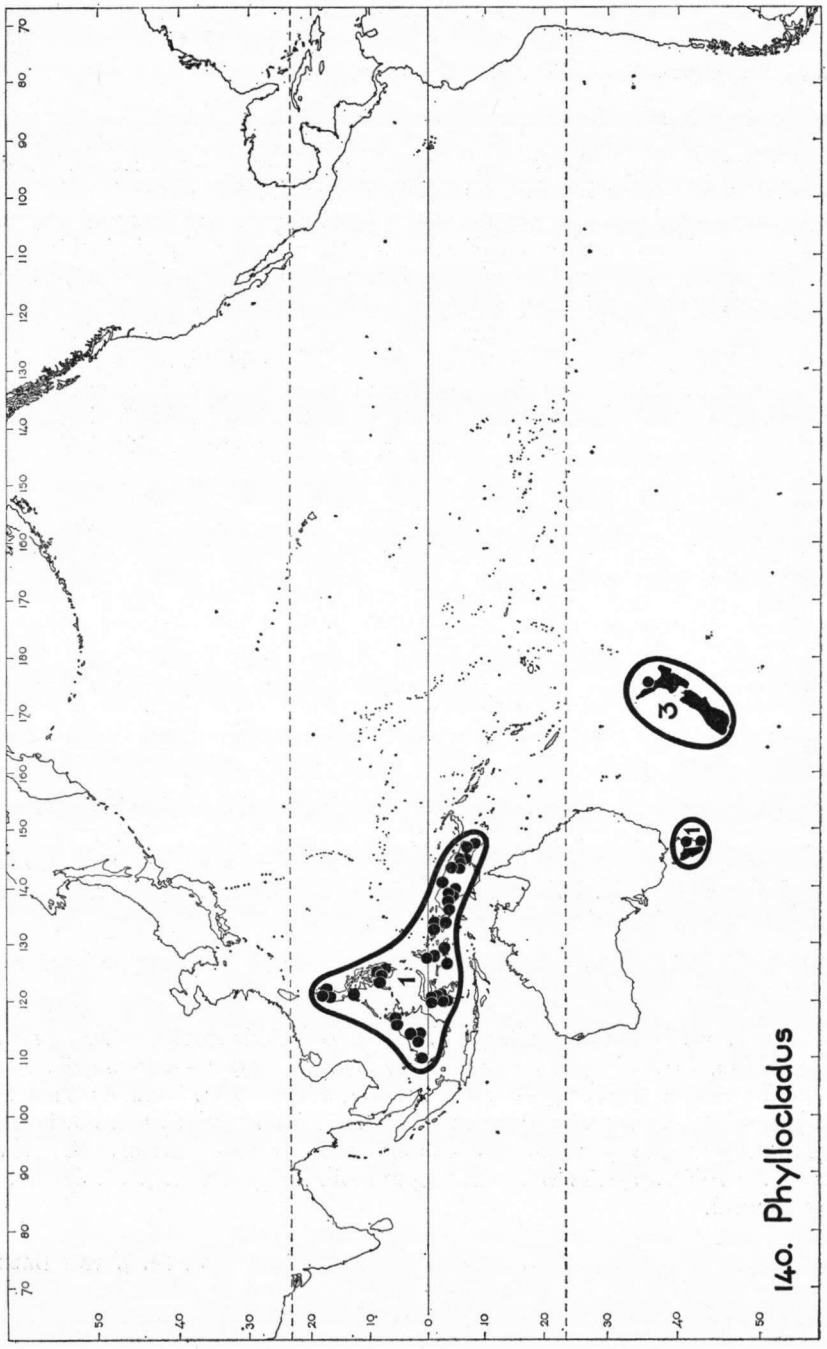
Habit: Monoecious to dioecious shrubs or trees, 20—30 m tall. The leaves are reduced to small scales, the branchlets transformed to cladodes.

Habitat & Ecology: In New Zealand *Ph. alpinus* Hook. f. is especially abundant in subalpine forest up to c. 1500 m. It descends to sea-level in the southern part of its range. The other two species are locally very common components of the lowland and lower montane forest below 1000 m. The Tasmanian species occurs in temperate rain-forest in association with among others *Nothofagus* and *Eucryphia*, which form the climax association in the highest rainfall belts. The species is best developed below c. 500 m. In Malesia *Ph. hypophyllus* Hook. f. is nearly confined to montane and subalpine forest (mostly between 1000—3000 m) of which it is locally a very important constituent. It may ascend to 3600 m but is recorded as low as 700 m in Borneo and the Moluccas.

Dispersal: The seed is c. 5 mm long, ovoid, covered by a membranous aril, and is partly enclosed by two fleshy, or leathery scales, solitary or in cones containing up to 20 seeds. No dispersal agent known.

Sources: T. Kirk, Forest Fl. New Zeal. (1893) 9—10, 195—200; R. Pilger, Bot. Jahrb. *54* (1917) 211; in E. & P. Pfl. Fam. ed. 2, *13* (1926) 249; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *13* (1934) 193; R. Florin, Kungl. Sv. Vet. Ak. Handl. 19, *2* (1940) 3—105, fig. 4, map; W. M. Curtis, Stud. Fl. Tasm. *1* (1956) 2; Anonymous, Forest Trees Austr. (1957) 220, 1 map; L. M. Cranwell, Nature *184* (1959) 1782—1785; R. A. Couper, Proc. R. Soc. ser. B, *152* (1960) 497, fig. 21 (map); H. H. Allan, Fl. New Zeal. *1* (1961) 112; collections in the Rijksherbarium Leyden.

M. M. J. VAN BALGOOY.


140. Phyllocladus
1
2
3

141. Strychnos L.

Name: Strychnos Linné, Gen. Pl. ed. 5 (1754) 86.

Family: *Loganiaceae.*

Taxonomy and distribution: A large genus, comprising 150—200 species. The centre of specific development is Africa, especially Cameroon. Several sections into which the genus can be divided, are confined to this continent. Dr. Leeuwenberg, who is preparing a revision of *Strychnos* in Africa, estimates the number of species in this continent at 70; few occur in Madagascar; a single widespread one is found in the Seychelles and Mascarenes. In the American tropics Krukoff and Monachino recognized 49 species. Dr. Leenhouts, who revised the genus for Malesia, thinks that after revision about the same number of species will prove to occur in Australasia. In this area the genus is concentrated in SE. Asia, attenuating towards the east, with two Malesian species in Australia, and two in the Pacific: *S. colubrina* L. distributed from India throughout Malesia to NE. Queensland, the Bismarcks, and Solomons; *S. vitiensis* A. W. Hill is confined to Fiji.

Habit: Mostly lianas, occasionally attaining a length of over 100 m (Leeuwenberg in litt.), often provided with spines or tendrils. Some species are shrubs or trees, *S. mitis* S. Moore of Africa reaches 35 m.

Habitat & Ecology: Lowland tropical rain-forest and gallery-forest, occasionally extending to the subtropics, mostly below 1500 m, rarely found at 2000 m, the highest record being 2300 m. The lianas often extend over several trees in the rain-forest, they are most commonly found along rivers and in other moist habitats. But a number of species, especially the shrubby ones, occur in dry vegetation types such as monsoon forest and savannahs.

Dispersal: The fruit is a berry, generally ovoid or spheroid, varying in size from 1 to nearly 20 cm diam. and in colour: green, brown, yellow, or orange. It consists of a leathery or woody shell, smooth or warty, containing few to many seeds (up to c. 150) embedded in a soft pulp. Of several species the fruits are eaten by birds, according to Dr. Leeuwenberg in Africa also by monkeys.

Map: Numerals indicate the species-density of the partial areas; Pacific localities only are indicated.

Sources: A. W. Hill, Kew Bull. (1917) 121—210 (Asiatic species); B. A. Krukoff & J. Monachino, Brittonia *4* (1942) 248—322; ibid. *5* (1943) 21—24; Lloydia *9* (1946) 62—72; Brittonia *6* (1948) 343—351 (American species); P. W. Leenhouts Fl. Mal. I, *6* (1962) 343—361. Information concerning *Strychnos* in Australasia was obtained from Dr. P. W. Leenhouts (Leyden) who also assisted in preparing the map. Unpublished data on the African species were kindly put available by Dr. A. J. M. Leeuwenberg (Wageningen).

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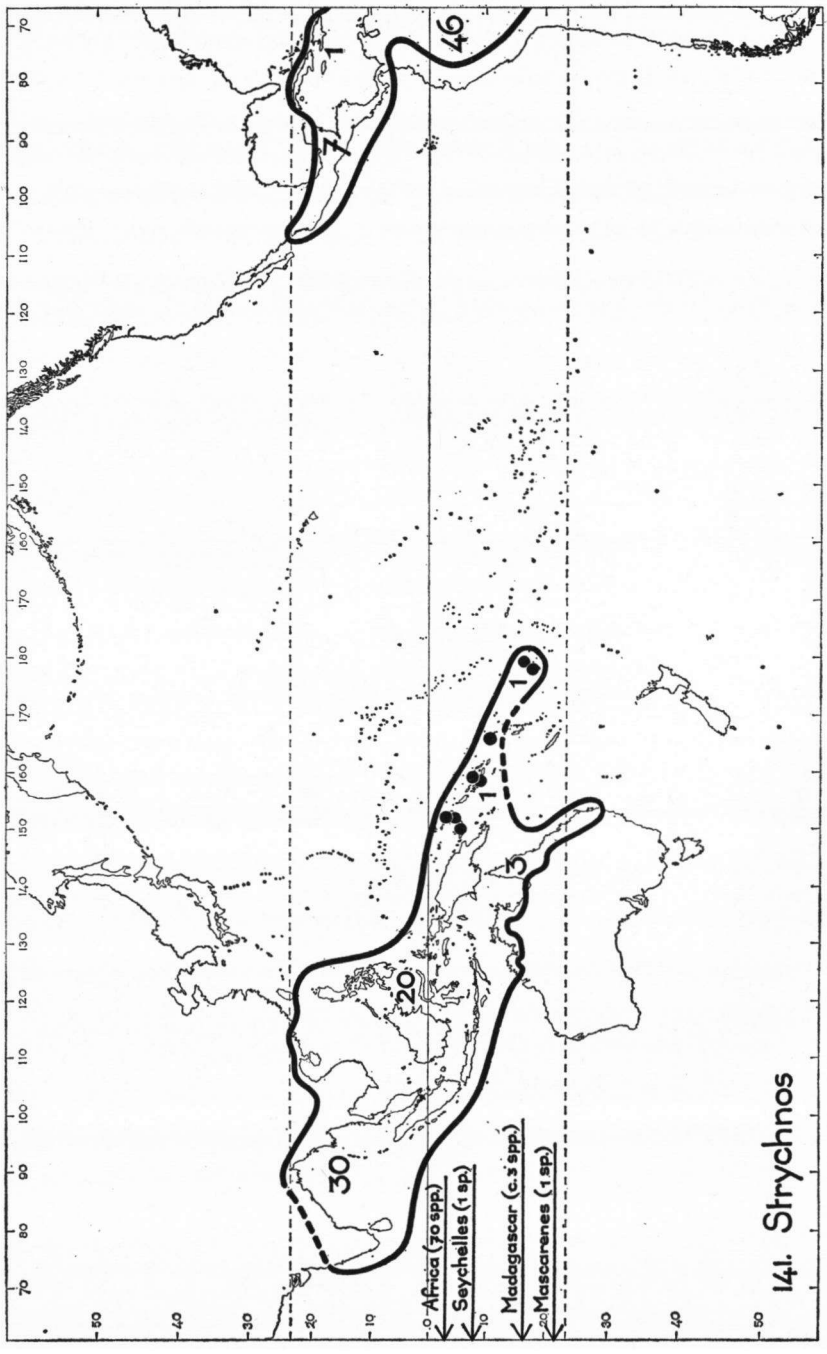
141. Strychnos
Africa (70 spp.)
Seychelles (1 sp.)
Madagascar (c. 3 spp.)
Mascarenes (1 sp.)
30
20
1
1
3
7
1
46

142. **Terminalia samoensis** Rech.

Name: Terminalia samoensis Rechinger, in Fedde, Rep. *4* (1907) 229.

Family: *Combretaceae.*

Taxonomy: This species is very near to *T. littoralis* Seem. of Fiji and Tonga. Other close allies are *T. crassifolia* Exell, restricted to South New Guinea, and *T. insularis* C. T. White of Thursday I. (North Queensland). *T. saffordii* Merr. from Guam (Marianas), based on a single collection, may be the same species, which is supported by the fact that *T. samoensis* has later been found on that island.

Habit: Shrubs or trees of variable size.

Habitat & Ecology: A component of the littoral vegetation, growing on coral limestone, also on sandy and gravelly soil, often together with species of the *Barringtonia* formation such as *Scaevola, Messerschmidia* (*Tournefortia*), *Guettarda, Pandanus tectorius,* etc. On many coral atolls this species is one of the commonest trees. It has very rarely been found in the larger islands.

Dispersal: The fruit is a compressed-ovoid or -ellipsoid drupe c. 2 by 1 cm. The exocarp is thin fleshy and turns red at maturity. The dried fruit has a pericarp consisting of a sclerenchymatous inner layer, a middle layer with small airspaces and a corky outer layer. The fruits are fit for water transport and show the typical design for buoyancy and rough landing as other beach plants. In other *Terminalia* species the fruits are known also to be eaten, and dispersed, by bats (v. d. Pijl, 1957), but this has not been expressly observed or stated for the present species.

Sources: A. W. Exell, Fl. Mal. I, *4* (1954) 568; W. H. Hatheway, Atoll Res. Bull. *16* (1953) 35; J. L. Gressit, ibid. *21* (1953) 4; F. R. Fosberg, ibid. *39* (1955) 16; ibid. *68* (1959) 6; W. A. Niering, ibid. *49* (1956) 13; J. T. Marshall, ibid. *56* (1957) 4; E. T. Moul, ibid. *57* (1957) 19; L. v. d. Pijl, Acta Bot. Neerl. *6* (1957) 291—315. Collections in the Rijksherbarium Leyden.

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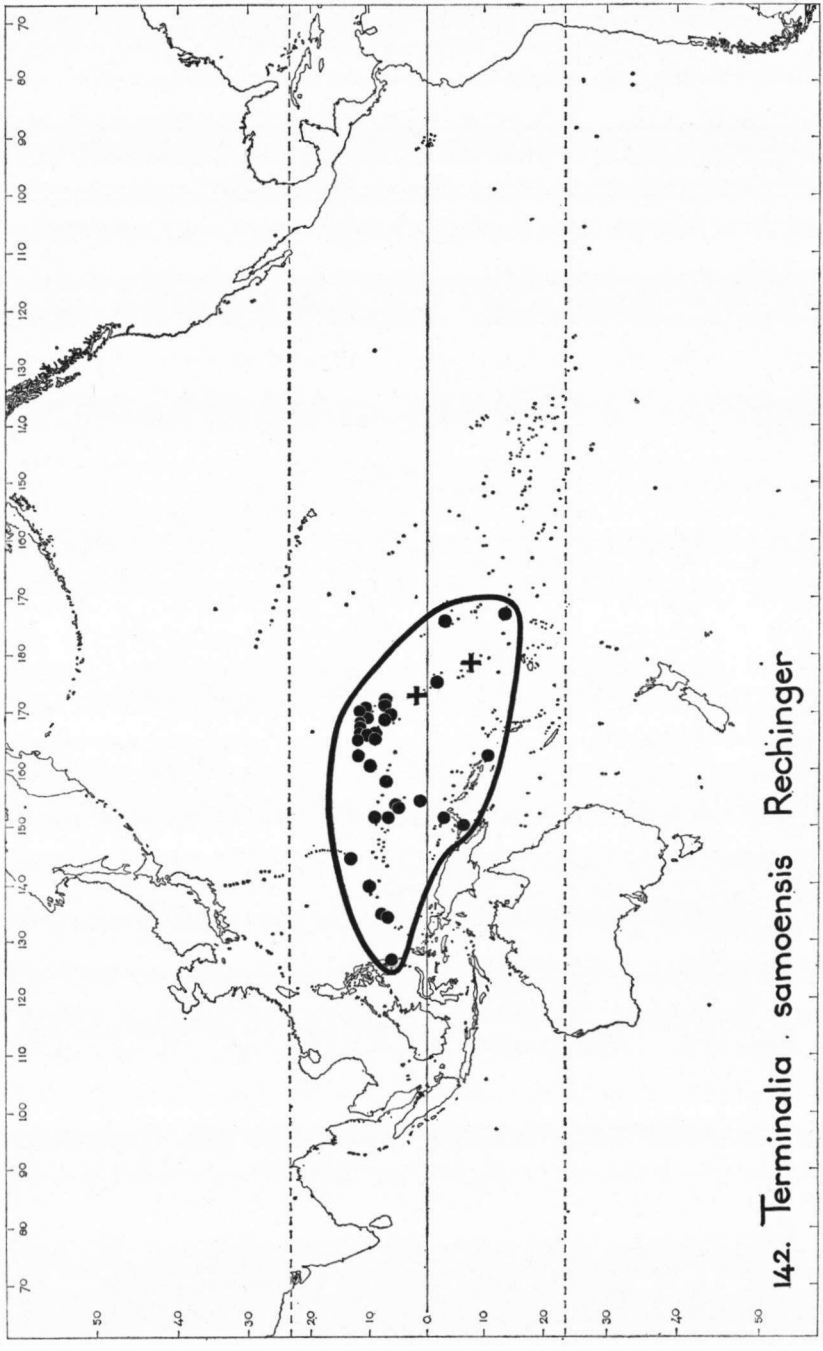
142. Terminalia . samoensis Rechinger

143. **Stackhousia** J. E. Sm.

Name: Stackhousia J. E. Smith, Trans. Linn. Soc. Lond. *4* (1798) 218.

Family: *Stackhousiaceae.*

Taxonomy and distribution: A genus best developed in Australia (and Tasmania), where about 15 species occur. *S. intermedia* F. M. Bailey is distributed from Australia to Malesia and the West Carolines (localities outside Australia indicated by dots on the map). Its distribution in Malesia is disjunct, its occurrence in Sumatra being separated from the E. Malesian localities. The other extra-Australian species is *S. minima* Hook. f. which is endemic in New Zealand. This species is closely allied to a species of Tasmania and SE. Australia. Besides *Stackhousia* only the monotypic Australian genera *Macgregoria* and *Tripterococcus* belong to this family; the latter genus is often united with *Stackhousia.*

Habit: Slender, annual or perennial herbs, with rhizomes. Mostly erect, the alpine species cushion-like.

Habitat & Ecology: Open places, grasslands, on a wide range of soil types, in both arid and damp stations; some species in montane and subalpine bogs (New Zealand, Tasmania, and the Australian Alps) up to c. 2000 m. *S. intermedia* is found in Malesia mainly in montane stations up to c. 1500 m; in New Guinea and the Carolines it also occurs near sea-level. The flowers are small, white, creamy or yellow and fragrant, borne on terminal racemes, probably entomophilous.

Dispersal: The fruit falls apart in (2—)3(—5) indehiscent ovoid cocci, which may be smooth, reticulate or angled, 1—4 mm long. They contain a single seed.

Sources: A. J. Ewart, Fl. Vict. (1931) 733; F. I. Brouwer, Blumea *3* (1938) 174—178; Fl. Mal. I, *4* (1948) 35; J. Mattfeld, in E. & P. Pfl. Fam. ed. 2, *20b* (1942) 250—254; J. M. Black, Fl. S. Austr. *3* (1952) 537; W. M. Curtis, Stud. Fl. Tasm. *1* (1956) 107; H. H. Allan, Fl. New Zeal. *1* (1961) 408. Other literature and collections in the Rijksherbarium Leyden.

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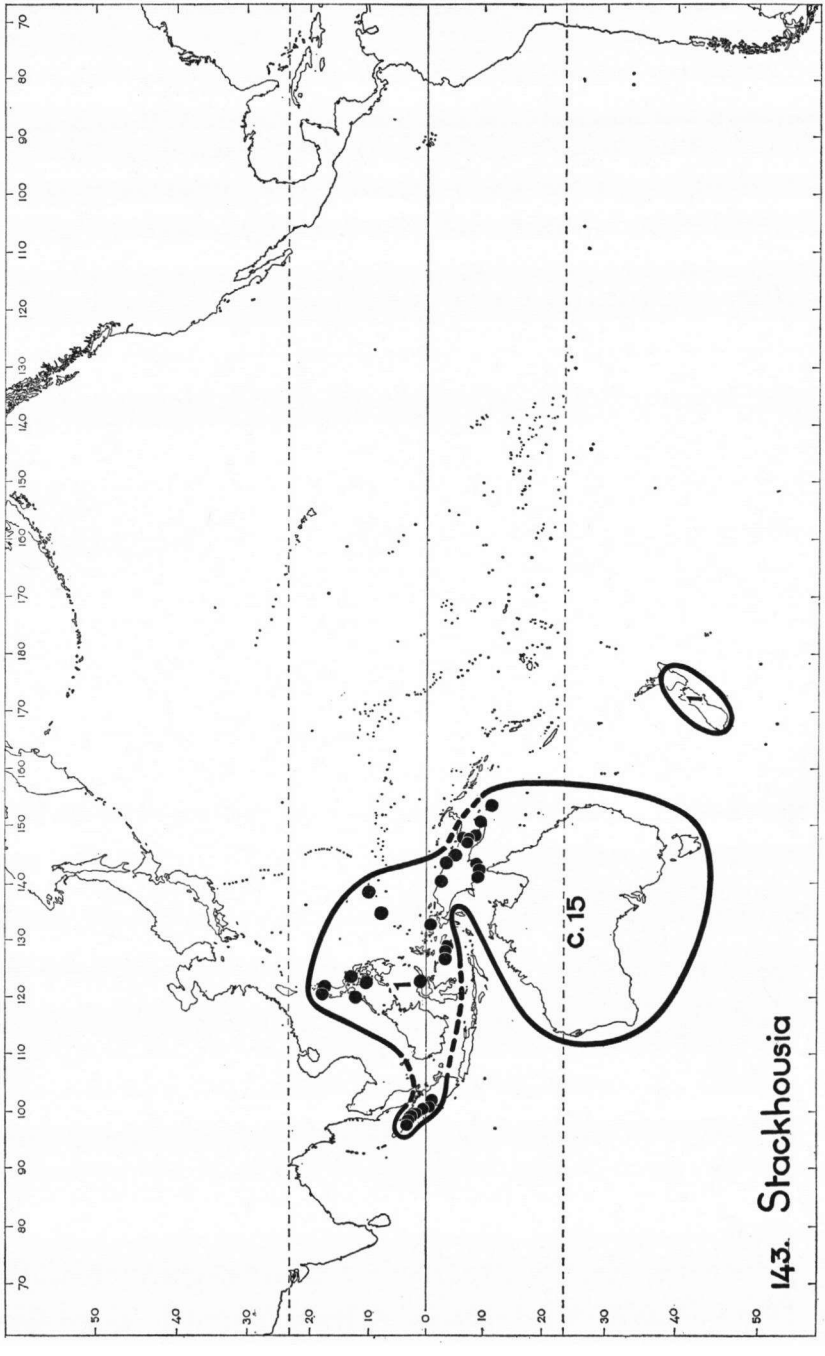
143. Stackhousia
c. 15
1
1

144. **Pennantia** Forst.

Name: Pennantia J. R. & G. Forster, Char. Gen. Pl. (1776) 133, t. 76.

Family: *Icacinaceae.*

Notes: A genus comprising the following three species: *P. corymbosa* Forst. (New Zealand), *P. endlicheri* Reiss. (Norfolk I.) closely allied to the former, and *P. cunninghamii* Miers, confined to East Australia.

Habit: Dioecious trees, or flowers polygamous. The Australian species is a fairly large forest tree attaining a height of c. 25 m. The other species are smaller up to c. 10 m tall. Flowers in terminal panicles.

Habitat & Ecology: Locally common in lowland subtropical to temperate forest, the only locality in the tropics is on the Atherton Tableland (Queensland).

Dispersal: The fruit is a small ovoid drupe c. 1 cm long, with a fleshy, black exocarp and a stony or leathery one-seeded endocarp.

Sources: T. Kirk, For. Fl. New Zeal. (1889) 36; R. M. Laing, Trans. New Zeal. Inst. *47* (1915) 25; H. Sleumer, in E. & P. Pfl. Fam. ed. 2, *20b* (1942) 370; W. D. Francis, Austr. Rain-forest Trees (1951) 244; H. H. Allan, Fl. New Zeal. *1* (1961) 408.

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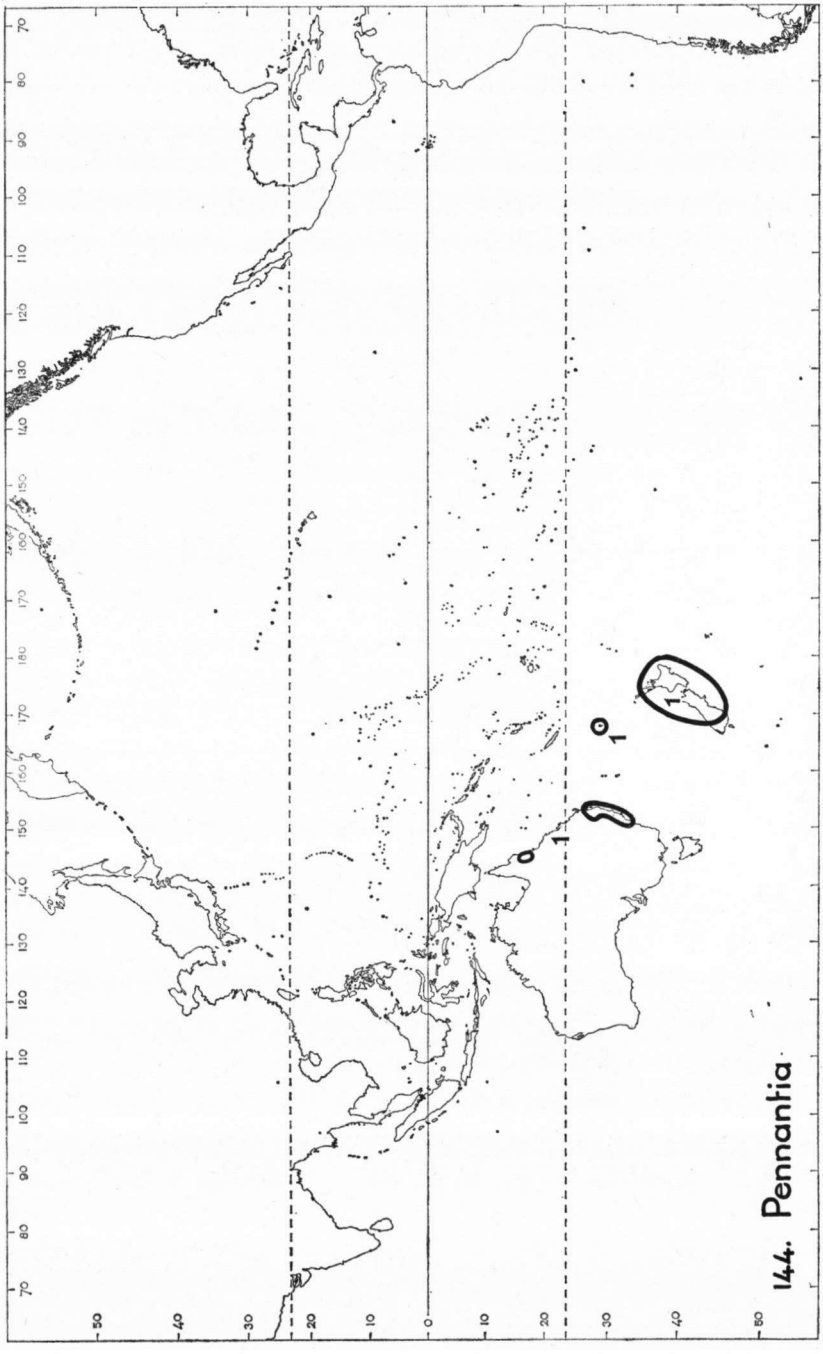
144. Pennantia

145. **Trematolobelia** Zahlb.

Name: Trematolobelia Zahlb., Coll. Haw. Publ. Bull. *2* (1913) 45.

Family: *Campanulaceae-Lobelioideae.*

Notes: A genus of two species confined to the Hawaiian Islands. The endemism both as to genera and species of *Campanulaceae-Lobelioideae* in Hawaii is remarkably high. Of the 29 genera accepted by Wimmer (in Pfl. R. Heft *106*, 1943 and *107*, 1953) no less than 6 are endemic in Hawaii, whereas a seventh genus has an endemic Hawaiian section. The largest treelike members of the family are Hawaiian species of the genera *Clermontia*, *Cyanea*, and *Delissea* which may attain a height of c. 15 m. The arborescent habit is otherwise only known from the African highland-*Lobelias* and from some SE. Polynesian species. The affinity of *Trematolobelia* is with the Polynesian *Sclerotheca*.

Habit: Arborescent shrubs up to 4 m tall.

Habitat & Ecology: Hills and mountains above 600 m. On ridges along streams and in open bogs. The flowers are pink, curved, c. 5 cm long and are borne profusely on long racemes. Pollination is most likely, as in the majority of Hawaiian *Lobelioideae*, by *Drepanidae*, an endemic Hawaiian family of birds. Insects might also play a part.

Dispersal: The fruit is a leathery capsule, 8—12 mm, with numerous pores, through which the minute seeds (1 mm) escape. A detailed account of the fruit is given by Carlquist (1962). The seeds have no wings or appendages.

Sources: J. F. Rock, Monogr. Haw. Lobelioideae, Publ. B. P. Bish. Mus. (1919) 41, 141—148; F. E. Wimmer, Pfl. R. Heft *107* (1953) 756—758; S. Carlquist, Pac. Sc. *16* (1962) 126—134, 20 figs.

146. **Sclerotheca** DC.

Name: Sclerotheca A. de Candolle, Prod. *7* (1839) 356.

Family: *Campanulaceae-Lobelioideae.*

Notes: A genus with three species on Tahiti and a fourth one on Rarotonga (Cook Is.).

Habit: Shrubs or treelets up to 8 m high.

Habitat & Ecology: Hills and mountain-slopes between 500—1500 m in rain-forest, apparently rather rare and local.

Dispersal: The fruit is a leathery unilocular capsule ± 1 cm long containing many minute seeds (1 mm), which escape through two apical pores; they do not possess wings or other appendages.

Sources: E. Drake del Castillo, Fl. Polyn. Fr. (1893) 113; T. F. Cheeseman, Trans. Linn. Soc. Lond. *2* (1903) 205; F. E. Wimmer, Pfl. R. Heft *107* (1953) 754—756.

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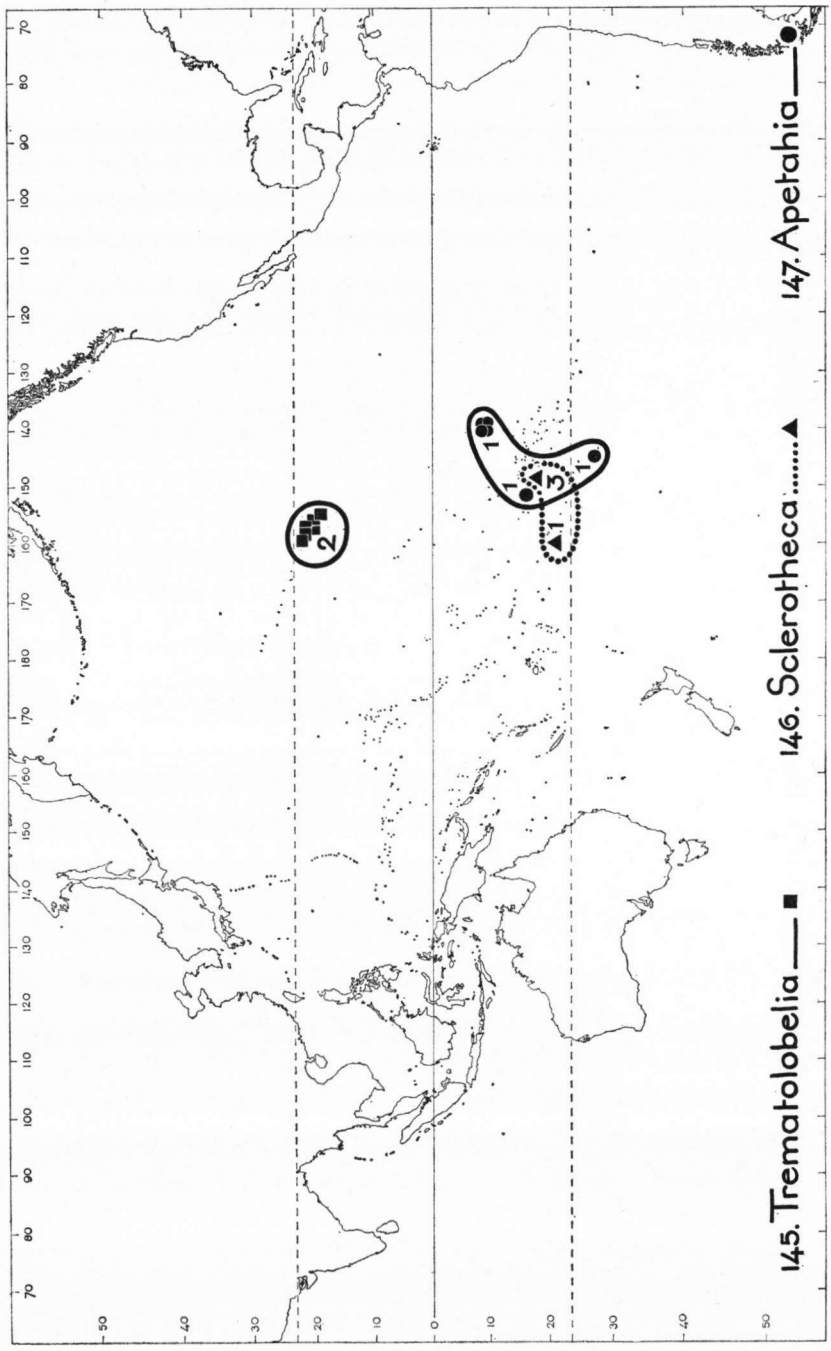

145. Trematolobelia
146. Sclerotheca
147. Apetahia

147. **Apetahia** Baill.

Name: Apetahia Baillon, Bull. Soc. Linn. Paris *1* (1882) 310.

Family: *Campanulaceae-Lobelioideae.*

Notes: A SE. Polynesian genus comprising three species: one in the Marquesas Is, one in Raiatea (Society Islands) and one in Rapa. Apart from *Sclerotheca* and *Apetahia* there is a third endemic SE. Polynesian genus: *Cyrtandroidea* of the Marquesas.

Habit: Shrubs or treelets, the Rapan species attaining a height of 8 m.

Habitat & Ecology: All species are rare, they occur in bogs, valleys and on mountain slopes; the Rapan species was collected at 160—170 m, the other species at 500—900 m.

Dispersal: The fruit is a leathery unilocular capsule 1—2 cm long dehiscing apically. Seeds many, small (1 mm) without wings or other appendages.

Sources: F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 325—328 (as *Sclerotheca*); F. E. Wimmer, Pfl. R. Heft *107* (1953) 728—730.

148. **Phaleria** Jack

Name: Phaleria Jack, Mal. Misc. *2* (1822) 59.

Family: *Thymelaeaceae.*

Synonyms: *Drimyspermum* Reinw., *Leucosmia* Benth.

Notes: A genus of c. 20 species, best developed in New Guinea and Melanesia: Fiji, 9 species (Smith, 1942), of which 2 extend to Samoa and Tonga, 1 endemic species in the New Hebrides, allied to Fijian species; perhaps 2 undescribed species from the Solomons. New Guinea and adjacent islands have 7 species, of which 3 endemic (1 confined to Goodenough I.). The species of the Bismarck and Palau Is are Malesian. There are 3 species in North and East Australia, 1 is endemic, 2 occur also in Malesia. Finally one Malesian species extends as far west as Ceylon. *Phaleria* is unknown from continental Asia (except Malaya) and New Caledonia.

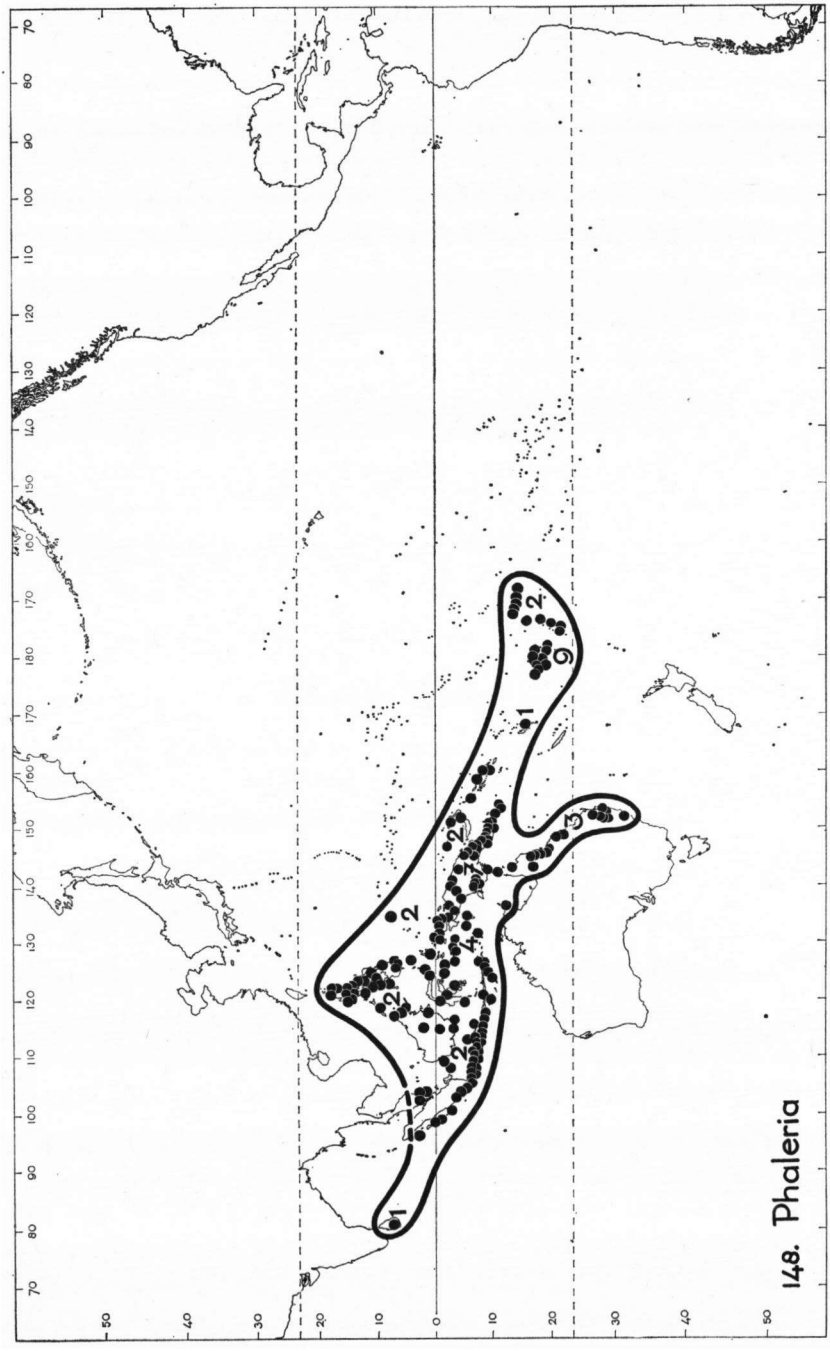
Habit: Shrubs or small trees, mostly under 10 m.

Habitat & Ecology: Undergrowth of everwet tropical rain-forest, mostly lowland, but ascending to 1750 m. Some species also occur in areas subject to seasonal drought. Flowers are produced in abundance on terminal or axillary inflorescences; occasionally cauliflorous. Pollination is most likely by insects.

Dispersal: The fruit is a 1—2-seeded, globose, ovoid, or ellipsoid drupe, 0.5—5.5 cm, the exo- and mesocarp is generally fleshy fibrous, sometimes more or less woody, the endocarp coriaceous. The fruits are brown, red, or black, and although pertinent data are wanting, endozoic dispersal by birds and possibly mammals looks the most obvious method of dispersal. Some species may have water-borne fruits.

Sources: R. Kanehira, Bot. Mag. Tokyo *47* (1933) 675; W. Domke, Bibl. Bot. *111* (1934) 123, map 6; J. Léandri, Bull. Mus. Hist. Nat. Paris *9* (1937) 298; E. Christophersen, B. P. Bish. Mus. Bull. *154* (1938) 18; A. C. Smith, Sargentia *1* (1942) 67—73; T. G. Yuncker, B. P. Bish. Mus. Bull. *184* (1945) 53; ibid. *220* (1959) 195; Ding Hou, Fl. Mal. I, *6* (1960) 15—23, fig. 4, 7 (maps). Collections in the Rijksherbarium Leyden. Mr. L. S. Smith (Brisbane) has kindly commented on the Australian species and distribution.

M. M. J. VAN BALGOOY.


148. Phaleria

149. **Gevuina** Mol.

Name: Gevuina Molina, Saggio Chile ed. 1 (1782) 184.

Family: *Proteaceae.*

Synonyms: *Bleasdalea* F. v. M., *Guevina* Endl.

Notes: *Gevuina* is one of four Proteaceous genera occurring on both sides of the southern Pacific. One species of *Gevuina* occurs in Central Chile and along the border with Argentina. One species is known from few localities in N. New Guinea and a third from few localities in NE. Queensland. A close ally is the Pacific genus *Kermadecia* (map 150).

Habit: Shrubs or small trees up to c. 20 m tall.

Habitat & Ecology: The Chilean species is a common component of the temperate rain-forest, where it forms part of the substage. The Australian and New Guinean species have been found in the undergrowth of the rain-forest between 800—1200 m, where they may be very common locally.

Fruit: The fruit in the New Guinean species is unknown. The fruit of the Chilean and Australian species is indehiscent, globose, c. 1 cm diam., has a hard thin pericarp, and generally contains a single seed. The means of dispersal is unknown.

Sources: C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. 56, 5 (1916); W. D. Francis, Austr. Rain-forest Trees (1951) 390 (as *Kermadecia*); H. Sleumer, Bot. Jahrb. *76* (1955) 184; Blumea *8* (1955) 5; Fl. Mal. I, 5 (1955) 152—154, 1 map. Collections in the Rijksherbarium Leyden and personal information by Dr. H. Sleumer.

150. **Kermadecia** Brongn. & Gris

Name: Kermadecia Brongn. & Gris, Bull. Soc. Bot. Fr. *10* (1863) 228.

Family: *Proteaceae.*

Notes: A genus in which 10 species have been described, in need of a revision. New Caledonia appears to be the centre of speciation with 7 species. Of these *K. austro-caledonica* should perhaps be excluded from the genus (Sleumer, Blumea *8*, 1955, 6), one species in the New Hebrides, two in Fiji, of which one also in Samoa.

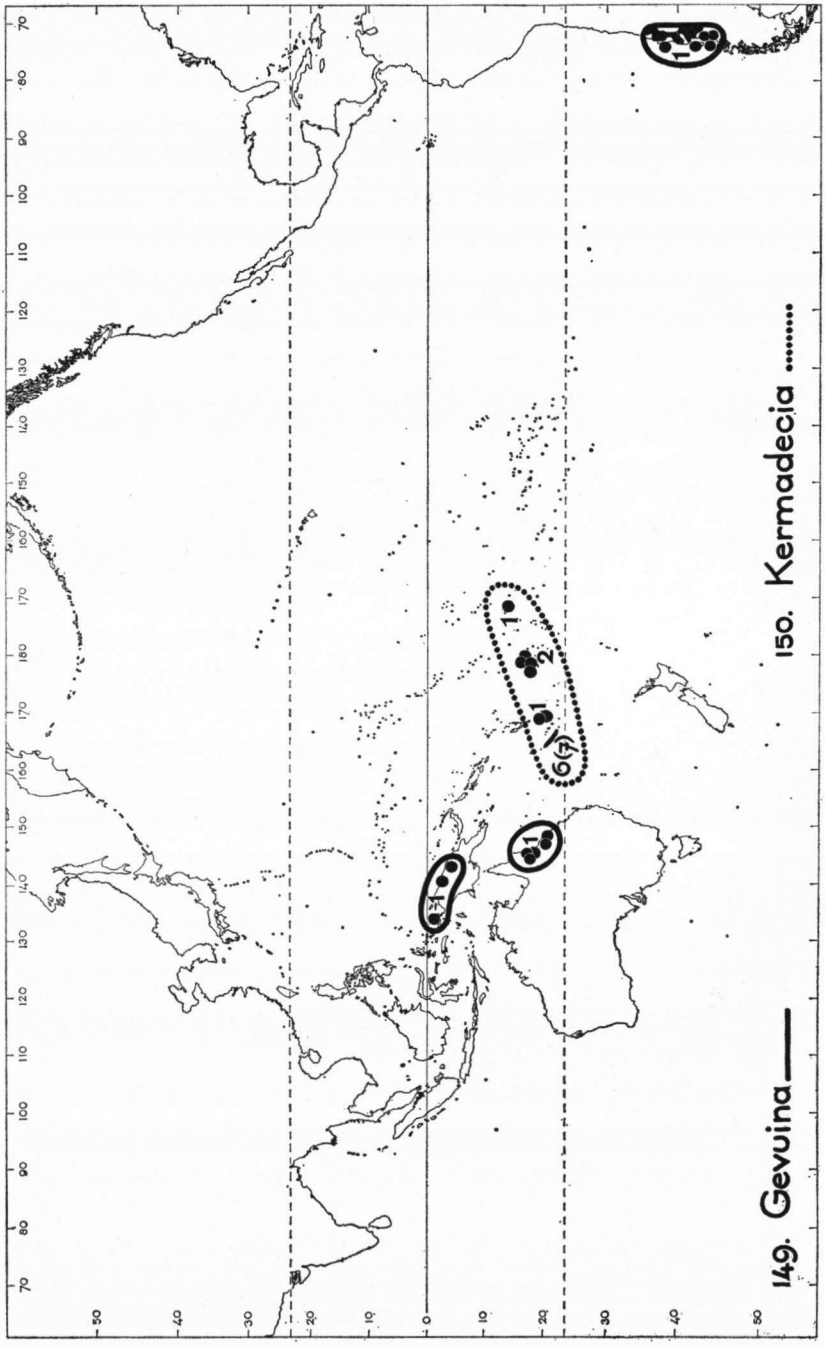
Habit: Medium-sized trees up to c. 25 m tall.

Habitat & Ecology: Under-storey of dense rain-forest between 100 and 1000 m. Some species are rather rare, but others are abundant locally.

Fruit: The fruit is ovate-compressed, drupaceous, 2—4 cm, with a coriaceous pericarp and is apparently rarely produced. Dispersal agent unknown.

Sources: W. B. Turrill, in Hook. Ic. *31* (1915) pl. 3022; J. W. Gillespie, B. P. Bish. Mus. Bull. *91* (1932) 4; A. Guillaumin, J. Arn. Arb. *13* (1932) 87; Bull. Soc. Bot. Fr. *82* (1935) 277; A. C. Smith, B. P. Bish. Mus. Bull. *141* (1936) 47—49; P. Sarlin, Bois et Forêts de la Nouv. Caléd. (1954) 105—107; H. Sleumer, Fl. Mal. I, 5 (1955) 152, map. Collections in the Rijksherbarium Leyden and personal information by Dr. H. Sleumer.

M. M. J. VAN BALGOOY.


149. Gevuina
150. Kermadecia
1
2
1
1
6(?)
1
1

151. **Dendromyza** Dans.

Name: Dendromyza Danser, Nova Guinea n.s. *4* (1940) 133.

Family: *Santalaceae.*

Taxonomy: A genus best developed in New Guinea, where six species occur; of these one is widespread and extremely variable, covering the range of the genus: from Sumatra and Malaya, throughout Malesia (except Lesser Sunda Is and South Moluccas) to the Louisiades and Solomons (Isabel I.). One species in Morotai (North Moluccas) and one confined to Bougainville I. (Solomons). The latter is taxonomically very isolated from the remaining species of the genus. An as yet unidentified species was collected on New Britain by Mr. D. Sayers.

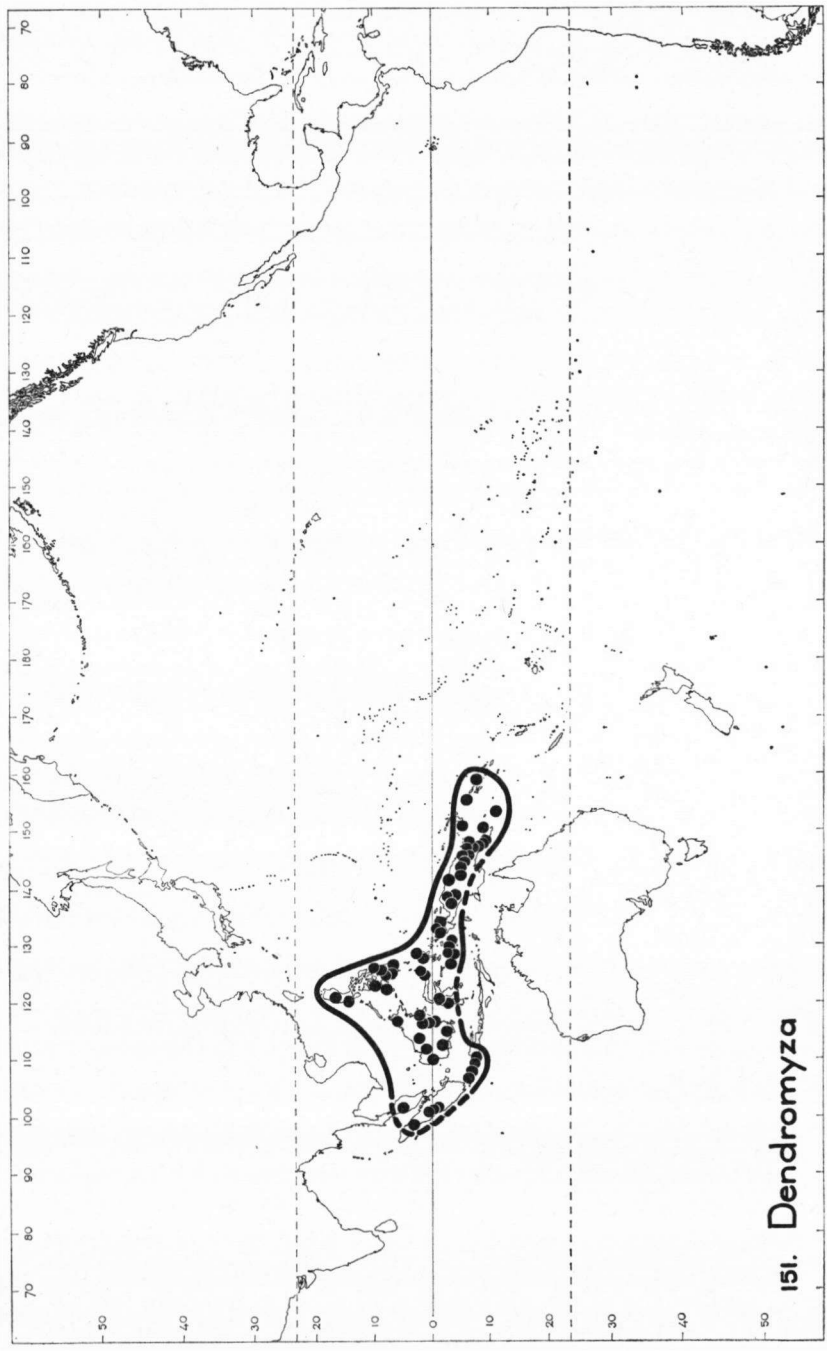
Habit: Creeping or climbing parasitic shrubs.

Habitat & Ecology: Dendromyzas are parasitic on the stems and twigs of various species of trees and shrubs, mainly in rain-forest but also on Myrtaceous and Ericaceous subalpine scrub vegetation in New Guinea, from near sea-level up to c. 2600 m.

Dispersal: The fruit is a drupe up to c. 1 cm long, red or purple at maturity, which suggests dispersal by birds. At full maturity the exo- and mesocarp decay whereupon the single pyrene comes free, which is provided with hairy appendages and is often sticky. This facilitates attachment to objects and may help in exozoic dispersal, but field observations are altogether lacking.

Sources: B. H. Danser, Nova Guinea n.s. *6* (1955) 262—268. Personal information by the late Dr. H. U. Stauffer (Zürich).

M. M. J. VAN BALGOOY.


151. Dendromyza

152. **Todea** Willd.

Name: Todea Willd., Schrift. Akad. Erfurt (1802) 14.

Family: *Osmundaceae.*

Taxonomy and distribution: A fern genus of Antarctic-Atlantic distribution: South Africa, where it extends from the Cape to Drakensberg in Transvaal, South and East Australia, Tasmania and New Zealand, where it is confined to the northernmost tip of North I., Three Kings and Poor Knights Is. *Todea* is generally regarded as monotypic. It is closely allied to 153. *Leptopteris*, which some authors treat as a subgenus or section of *Todea*. The two taxa are, however, easily distinguished by their leaves, being coriaceous in *Todea* and filmy in *Leptopteris*.

Fossils: Fossil finds of *Todea* or closely allied taxa suggest a former worldwide distribution of the genus (Seward & Ford, 1903).

Habit: A treefern with a stout, short, often branching trunk, and large bipinnate coriaceous fronds, reaching 1—2 m or more, crowded at the top.

Habitat & Ecology: Subtropical to temperate forest along rivers and gullies or in swamps, but in New Zealand also on more or less dry, exposed habitats. Locally abundant. Slow-growing but resistant to burning (Cranwell, 1937).

Dispersal: The sporangia form irregular felt-like masses on the underside of the lower pinnules of the basal pinnae. Spores are produced in abundance.

Sources: G. Bentham, Fl. Austr. *7* (1878) 699; F. M. Bailey, Queensl. Fl. *6* (1902) 1939; L. Rodway, Tasm. Fl. (1903) 291; A. C. Seward & S. O. Ford, Trans. Linn. Soc. Lond. *6* (1903) 237; K. Domin, Bibl. Bot. *85* (1915) 212—213; L. M. Cranwell, Rec. Auckl. Inst. Mus. *2* (1937) 101—110, 2 maps; J. M. Black, Fl. S. Austr. *1* (1943) 40; H. H. Allan, Fl. New Zeal. *1* (1961) 15; other literature.

153. **Leptopteris** Presl

Name: Leptopteris Presl, Suppl. Tent. Pterid. (1845) 70.

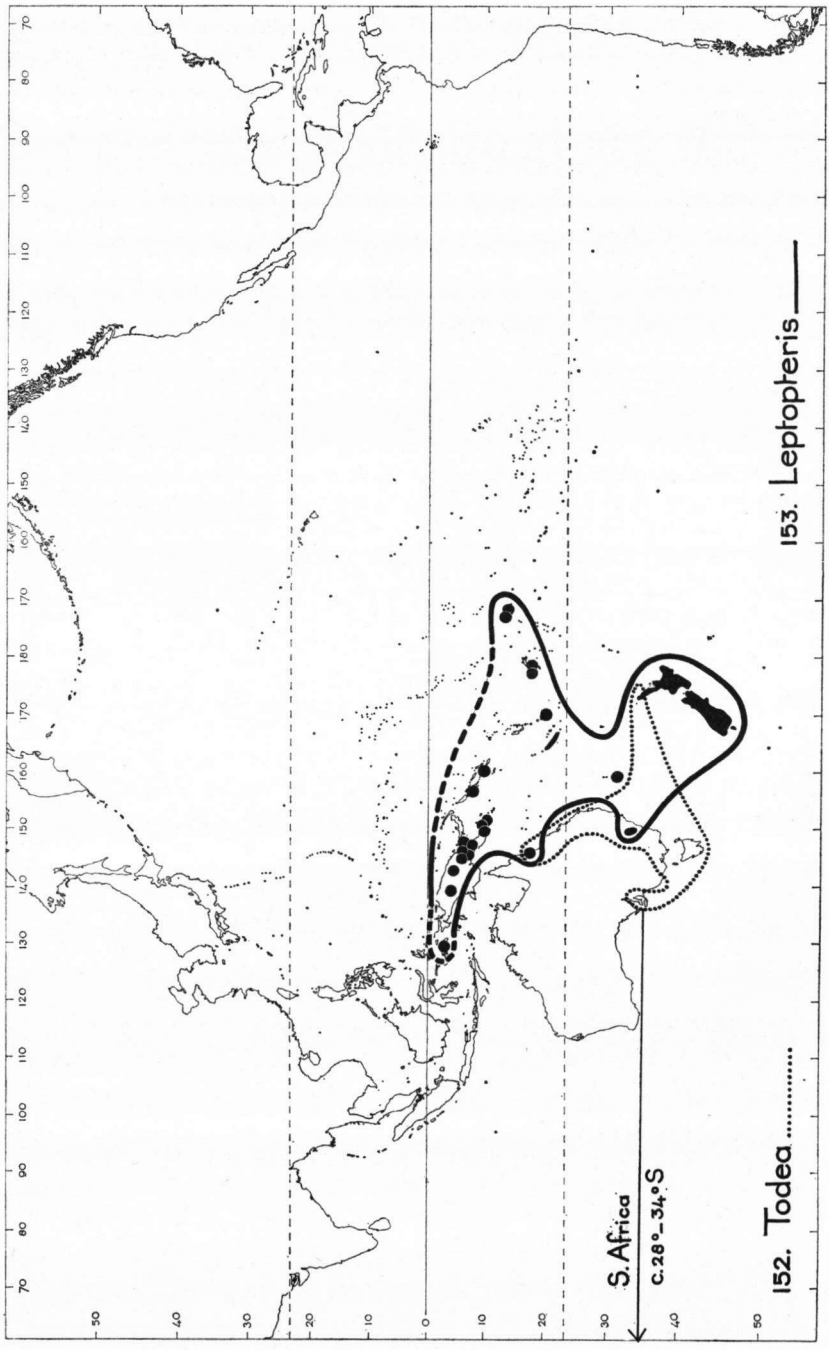
Family: *Osmundaceae.*

Taxonomy and distribution: Although the genus itself is well-defined, the species are still insufficiently known. The range of *Leptopteris* is from New Zealand, Lord Howe I., and East Australia to New Guinea and Ceram in the west. To the east it extends to New Caledonia, the New Hebrides, Fiji, and Samoa Is. For further notes see 152. *Todea*.

Habit: Resembles *Todea* but the pinnules are finely incised, and are membranous as in *Hymenophyllaceae*.

Habitat & Ecology: Common in dense lowland to montane forest in New Zealand, occasionally ascending to the subalpine zone as dwarfed specimens. Scattered but often locally abundant in the remaining part of its area. In Malesia found in everwet montane forest and subalpine vegetation from 1100—2400 m, but in Normanby I. (d'Entrecasteaux Is) collected at 820 m. In the Pacific *Leptopteris* is found in mountain or hill stations, generally above c. 500 m, up to c. 1100 m.

Dispersal: The sporangia are less numerous than in *Todea*, and are arranged in irregular sori along the veins of the pinnules. There are less spores per sporangium than in *Todea*.


153. Leptopteris
152. Todea
S. Africa
c. 28°–34° S

Sources: G. Bentham, Fl. Austr. *7* (1878) 699; F. M. Bailey, Queensl. Fl. *6* (1902) 1939; K. Rechinger, Denkschr. Kais. Akad. Wiss. Wien *85* (1908) 60; E. Rosenstock, in Fedde, Rep. *10* (1912) 342; W. R. B. Oliver, Trans. New Zeal. Inst. *49* (1917) 125; G. Brause, Bot. Jahrb. *56* (1921) 213; E. B. Copeland, B. P. Bish. Mus. Bull. *59* (1929) 22; A. Guillaumin, J. Arn. Arb. *12* (1931) 125; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *13* (1934) 170; C. Christensen, B. P. Bish. Mus. Bull. *177* (1943) 9—10; H. H. Allan, Fl. New Zeal. *1* (1961) 15—16; other literature and collections of the Rijksherbarium Leyden.

154. **Tmesipteris** Bernh.

Name: Tmesipteris Bernh., in Schrader, J. Bot. *2* (1800) 131, t. 2.

Family: *Psilotaceae.*

Taxonomy and distribution: A genus of *Lycopsida* in which c. 10 species have been described mostly from SE. Australia; some authors recognize only a single polymorphic species: *T. tannensis* Bernh. The only other genus of the family, *Psilotum*, occurs widely throughout the tropics to the warm-temperate regions of the world and is found on many islands of the Pacific. Barber (1957) has shown that the number of chromosomes is extremely high (2n = 200 — 400), indicating a high polyploidy.

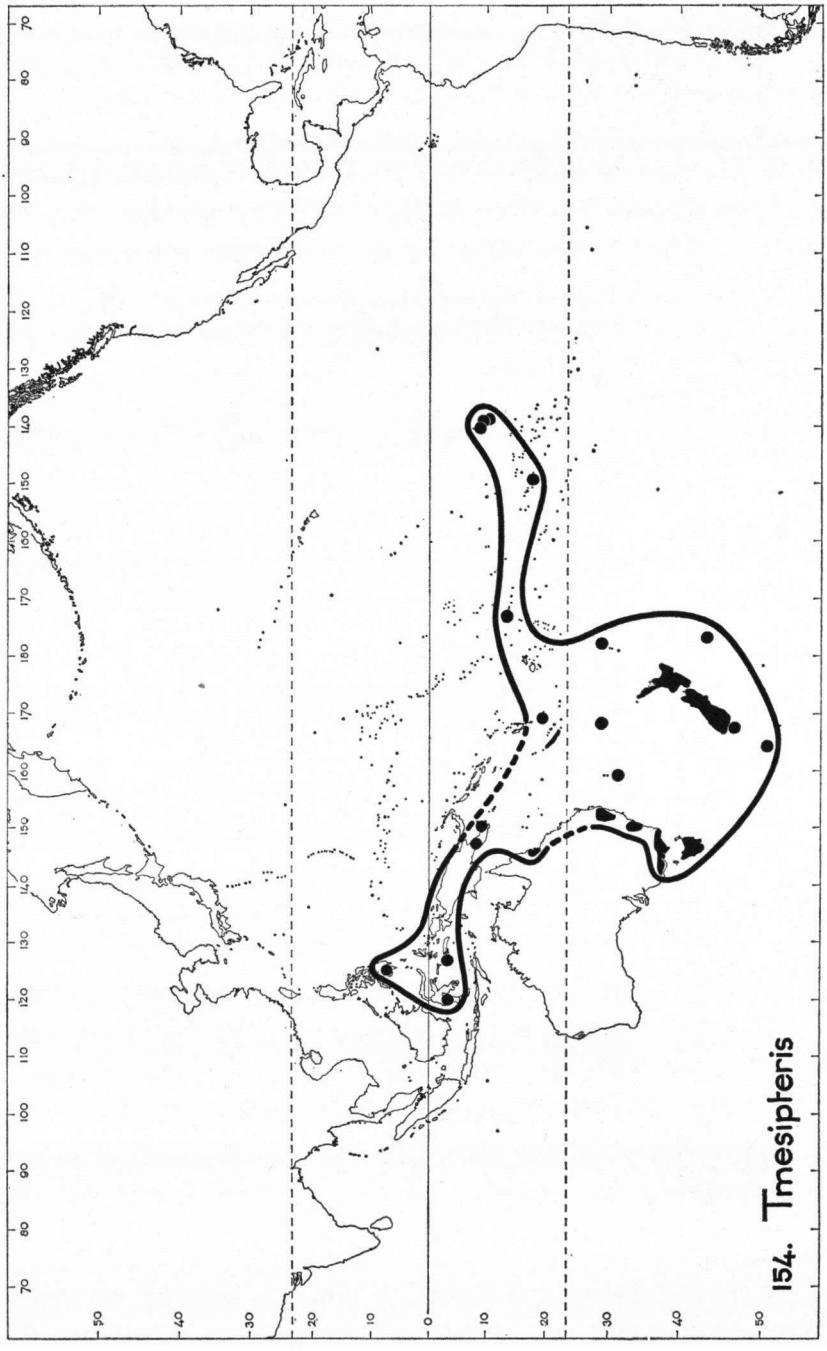
Habit: Slender herbs, the axis bearing leaf-like scales; the plant resembles a *Lycopodium*.

Habitat & Ecology: An epiphytic herb, generally on the trunks of tree-ferns, of dense everwet temperate and montane tropical rain-forest. In Malesia not found below 1100 m. In the tropical Pacific islands generally above 500 m and in New Zealand from near sea-level up to about 1000 m. Common in the higher latitudes, rare and local in the tropics.

Dispersal: The sporangia, borne on the tips of the fertile leaves, are c. 3—6 mm long, and contain numerous spores which, according to Brown & Brown (1931) measure 30—70 μ.

Sources: G. Bentham, Fl. Austr. *7* (1878) 680—681; E. Drake del Castillo, Fl. Polyn. Fr. (1893) 329; L. Rodway, Tasm. Fl. (1903) 280; W. R. B. Oliver, Trans. New Zeal. Inst. *49* (1917) 117; E. D. W. Brown & F. B. H. Brown, Bull. B. P. Bish. Mus. *89* (1931) 109—110; E. B. Copeland, ibid. *93* (1932) 82; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *13* (1934) 174, 356; C. Christensen, B. P. Bish. Mus. Bull. *177* (1943) 128; N. A. Wakefield, Vict. Nat. *60* (1943) 142; H. N. Barber, Proc. Linn. Soc. N.S.W. *82* (1957) 201—208; H. H. Allan, Fl. New Zeal. *1* (1961) 1. Other literature and collections in the Rijksherbarium Leyden. Additional information was obtained from Dr. R. E. Holttum (Kew).

M. M. J. VAN BALGOOY.


154. Tmesipteris

155. **Selliera** Cav.

Name: Selliera Cav., Anal. Nat. Hist. *1* (1799) 41, t. 5.

Family: *Goodeniaceae.*

Taxonomy: A small genus comprising 1—3 species. *S. exigua* F. v. M. described from Western Australia may not belong to the genus and is probably a *Velleia.* The genus is closely allied to, but quite distinct from the Australian genus *Goodenia.*

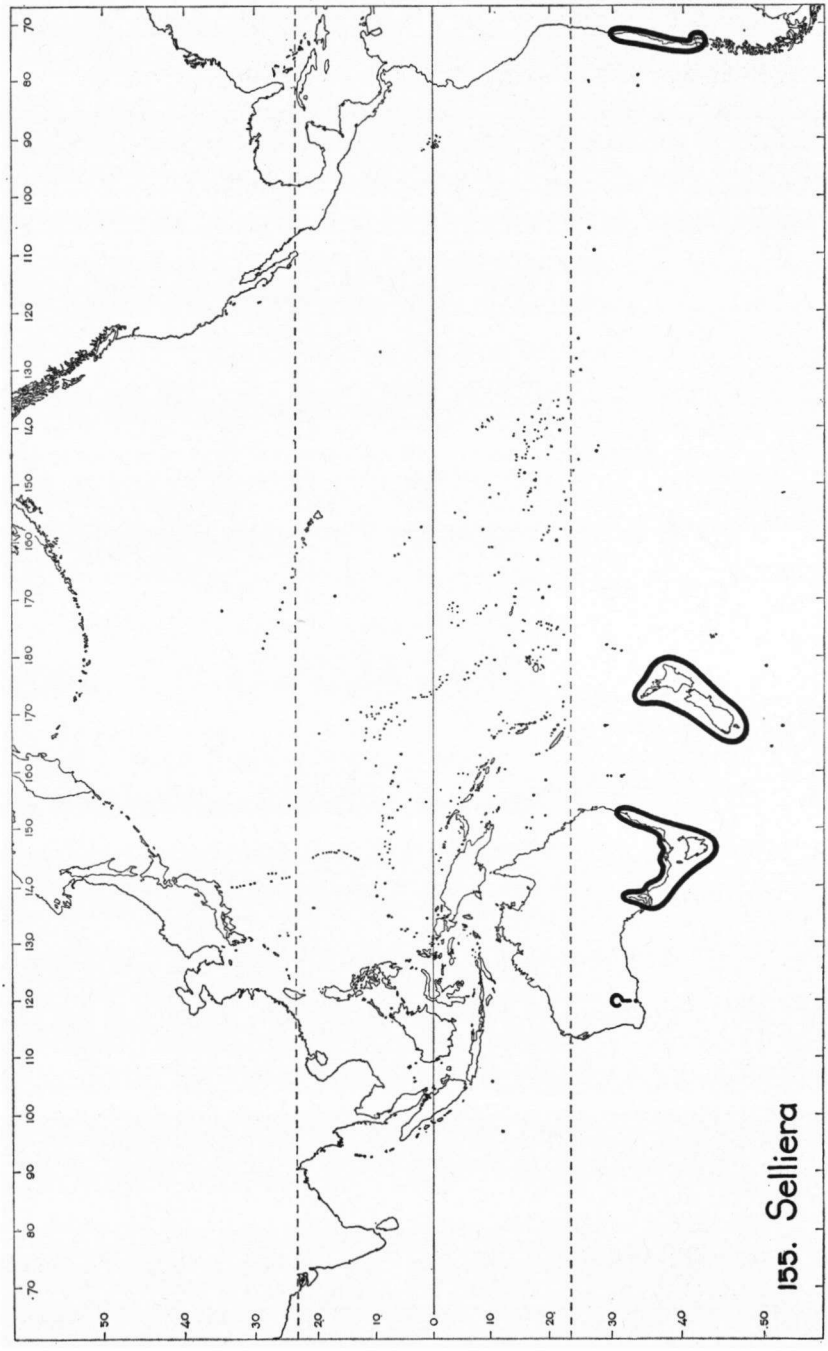
Habit: Prostrate, perennial herbs, rooting at the internodes.

Habitat & Ecology: Salt-marshes of temperate East Australia, Tasmania, New Zealand, and central Chile; locally, e.g. in New Zealand, also along streams and inland lakes, up to c. 1000 m above sea-level (Allan). Not found on any of the subantarctic islands.

Dispersal: The ripe fruit is more or less fleshy, ovoid, c. 5 mm long, indehiscent, and contains many flattened seeds, which have a thickened, mucilaginous margin. Birds might carry about the sticky seeds epizoically.

Sources: L. Rodway, Tasm. Fl. (1903) 102; C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. 56, 5 (1916); A. J. Ewart, Fl. Vict. (1931) 1074; J. M. Black, Fl. S. Austr. ed. 2, *4* (1957) 828; H. H. Allan, Fl. New Zeal. *1* (1961) 795. Herbarium collections and unpublished notes by Dr. R. C. Carolin.

M. M. J. van Balgooy & R. C. Carolin.


155. Selliera
?

156. **Geranium** sect. **Andina** Knuth

Name: Geranium sect. **Andina** Knuth, Bot. Jahrb. *32* (1903) 222.

Family: *Geraniaceae.*

Taxonomy: A fairly well defined section, without any apparent close affinities to species of other sections. It is a definitely southern group with a centre of differentiation in the Andes of Ecuador, Peru, and Bolivia. One polymorphic species, *G. sessiliflorum* Cav., ranges from Peru throughout Chile and Patagonia, and occurs further in New Zealand, Tasmania, and the Australian Alps. About 30 species have been described but the actual number after revision may not exceed 15.

Habit: Short-stemmed, perennial herbs of rosette-like habit, and often densely hairy.

Habitat & Ecology: In alpine and subalpine associations, ranging from sea-level in the higher latitudes (Magellan Strait, S. New Zealand) to nearly 5000 m in the central Andes.

Dispersal: The fruit is a beaked capsule 1—2 cm long, and consists of 3—5 mericarps containing a single smooth seed, c. 2 mm. The liberation of the seeds happens as is usual in the genus *Geranium*: the mericarps curl up suddenly, remaining attached at the apex, by which movement the seeds are ejaculated over a short distance.

Sources: R. Knuth, Pfl. R. Heft *53* (1912) 78—89; H. H. Allan, Fl. New Zeal. *1* (1961) 234—235.

R. C. CAROLIN.

157. **Geranium** sect. **Neurophyllodes** A. Gray

Name: Geranium sect. **Neurophyllodes** A. Gray, U.S. Expl. Exp. Bot. (1854) 310.

Family: *Geraniaceae.*

Taxonomy: A distinct, taxonomically and geographically isolated section in *Geranium* confined to some of the Hawaiian Islands, characterized by the shrubby habit of its species. According to Fosberg (1936) 4 species can be distinguished. Most of the species have become extremely rare.

Habit: Shrubs or small trees, 1—3 m, *G. arboreum* Gray up to c. 4 m tall.

Habitat & Ecology: Summits and slopes of the highest volcanoes on dry lava streams and on cinder, but *G. humile* Hillebr. only grows in the everwet open bogs of Maui and Kauai.

Dispersal: See under 156. sect. *Andina.*

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 54—57; F. R. Fosberg, Occ. Pap. B. P. Bish. Mus. 12, *16* (1936) 1—19.

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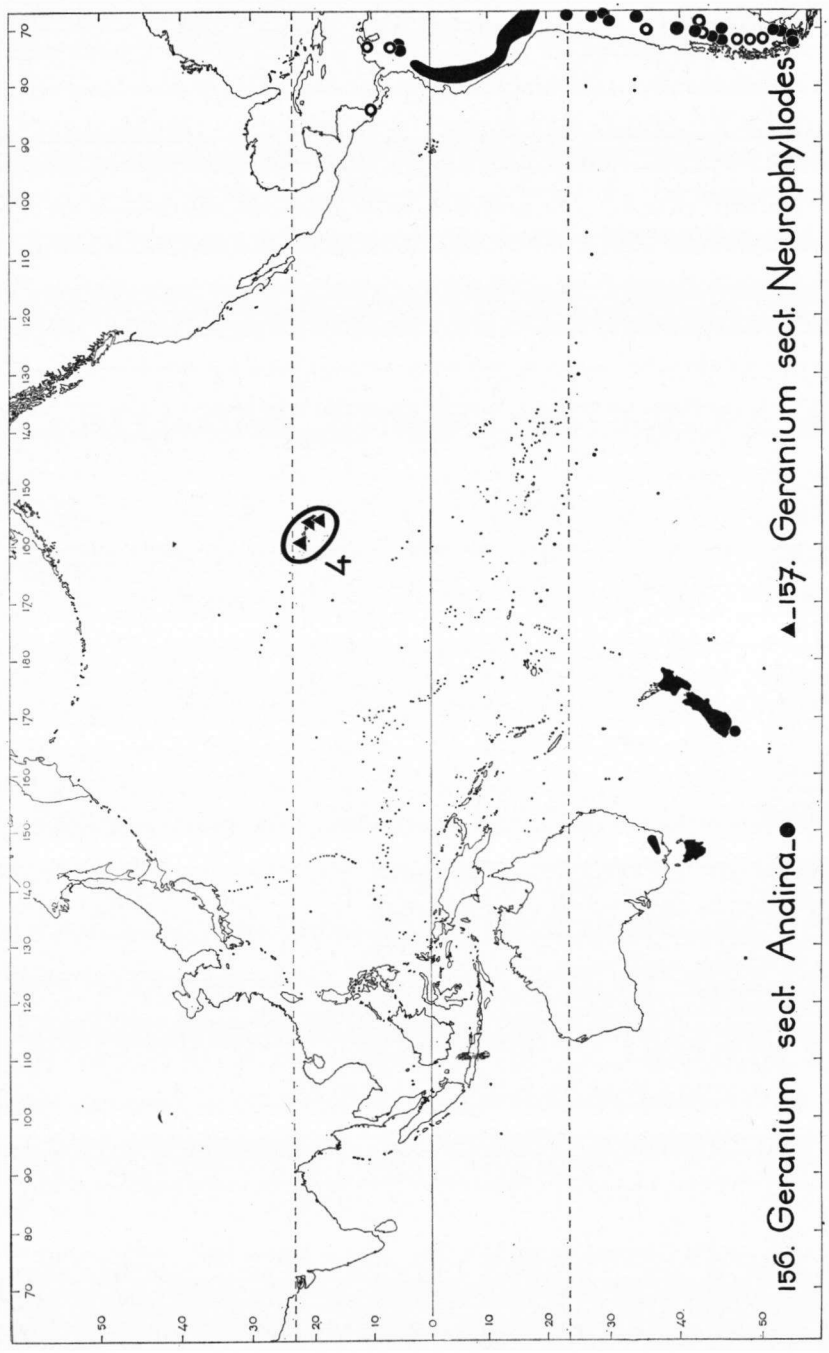

156. Geranium sect. Andina
157. Geranium sect. Neurophyllodes

158. **Geranium** sect. **Chilensia** Knuth and sect. **Australiensia** Knuth

Name: Geranium sect. **Chilensia** Knuth, Heft *53* (1912) 68 & **Geranium** sect. **Australiensia** Knuth, l.c. 150.

Taxonomy and distribution: The two sections of Knuth are here considered to form one not too well defined taxonomical entity. Species of this group on the one hand show relationships with sect. *Columbinum* Koch, best developed in N. America and with sect. *Striata* Knuth, centring in the Himalayan region on the other. The group ranges from the Peruvian Andes eastwards to S. Brazil and Uruguay and southwards to Patagonia and Fuegia, some subantarctic islands, including Juan Fernandez, to New Zealand, Tasmania and S. Australia. A few species occur on some high mountains in Malesia; one is probably introduced in Hawaii. Most of the South American species are imperfectly known; the group will probably comprise c. 20 species in all.

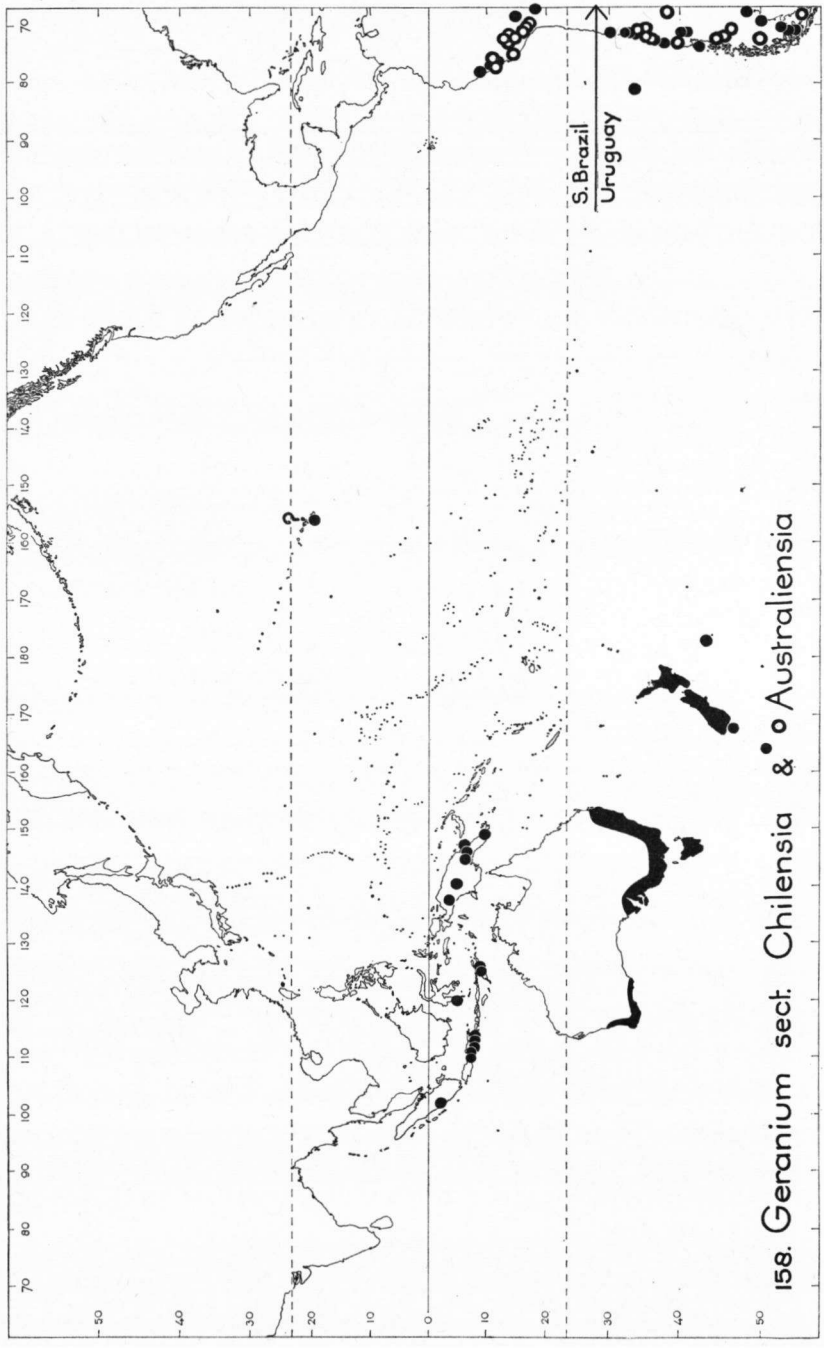
Habit: Perennial, rarely biennial herbs.

Habitat & Ecology: Temperate to subtropical regions and on high mountains in the tropics, in a variety of habitats; from dry savannahs to alpine grassland and to the margins of subtropical rain-forest. In Malesia known from montane, subalpine, and alpine stations from 1800—4000 m.

Dispersal: See under sect. *Andina* (map 156).

Sources: R. Knuth, Pfl. R. Heft *53* (1912) 68—78, 150—151; C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg III, *13* (1934) 210; H. H. Allan, Fl. New Zeal. *1* (1961) 233—237; R. C. Carolin, Proc. Linn. Soc. N.S.W. *89* (1964) 328—361.

M. M. J. VAN BALGOOY & R. C. CAROLIN.


158. Geranium sect. Chilensia & Australiensia
S. Brazil
Uruguay

159. **Pelargonium** L'Hér. ex Ait.

Name: Pelargonium L'Hér. ex Ait., Geraniol. (1787) t. 7, 35, 43, 44.

Family: *Geraniaceae.*

Taxonomy and distribution: A large genus comprising c. 200 species, divided into 15 sections (Knuth, 1912); mostly developed in South Africa. One species is endemic in Tristan da Cunha in the South Atlantic, one in Madagascar. Northwards the genus is represented as far as Asia Minor and Iran. One species extends to the Nilgiri Hills in South India, but its indigenity there is questioned by some authors.The seven Australian species belong to sect. *Peristera* and sect. *Polyactium* according to Knuth. Both have a centre of diversity in S. Africa although sect. *Polyactium* may not be the correct position of the Australian species. One of these also extends to New Zealand and the Chatham Is.

Habit: Annual or perennial herbs or low shrubs.

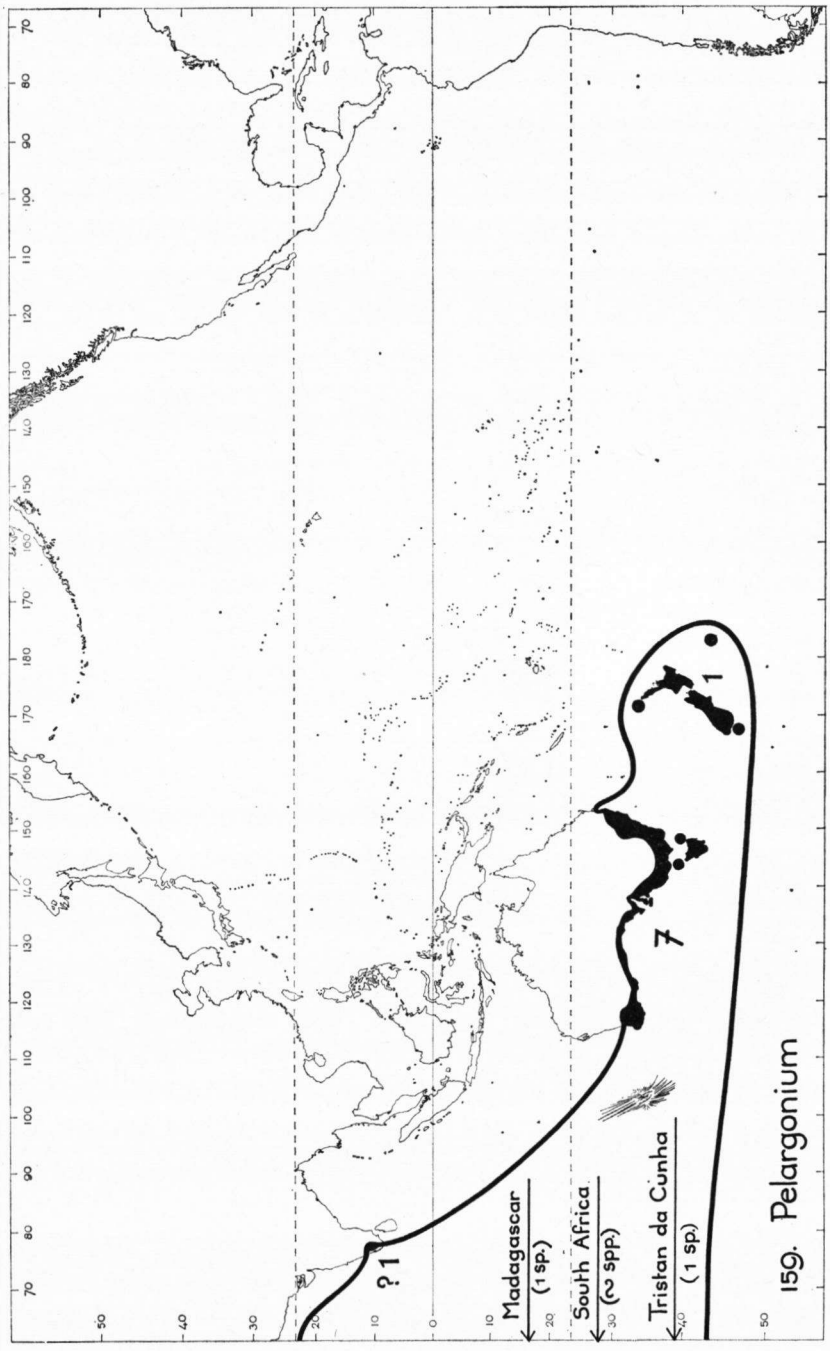
Habitat & Ecology: The genus is best developed in warm-temperate South Africa. Also in Australia the species are confined to the temperate region. *Pelargoniums* mostly occur on maritime sand-dunes to subalpine woodland, generally on granitic soils inland.

Dispersal: The fruit is a schizocarp, splitting into five mericarps each containing a single seed. The mericarps are provided with long silky hairs which may aid in dispersal by wind, but this does not look very efficient.

Map: The question mark indicates that *Pelargonium* is doubtfully native in India.

Sources: R. Knuth, Pfl. R. Heft *53* (1912) 316—545; E. & P. Pfl. Fam. ed. 2, *19a* (1931) 58—63; R. C. Carolin, Proc. Linn. Soc. N.S.W. *86* (1961) 280—294, 3 maps; H. H. Allan, Fl. New Zeal. *1* (1961) 237.

R. C. Carolin.


?1
Madagascar
(1 sp.)
South Africa
(~ spp)
Tristan da Cunha
(1 sp.)
7
1
159. Pelargonium

160. **Sophora** sect. **Edwardsia** (Salisb.) Bak. ser. **Tetrapterae**

Name: Sophora sect. **Edwardsia** (Salisb.) Bak., in Hook. f. Fl. Br. Ind. *2* (1878) 251.

Family: *Leguminosae.*

Synonym: *Edwardsia* Salisb., Trans. Linn. Soc. Lond. *9* (1808) 298, t. 26.

Notes: The genus *Sophora* comprises c. 50 species and is of worldwide distribution; one species, the pantropic *S. tomentosa* L. is a common beach-plant throughout the Pacific. Good (1953) summarized the following unpublished information from Dr. Tsoong: "Salisbury's genus *Edwardsia* can not be sustained but a new ser. *Tetrapterae* is proposed, represented on Lord Howe, New Zealand, Chatham, Juan Fernandez, Easter I., Hawaii, Chile, and Réunion." In this information the records of Gough I. (Indian Ocean) and Rapa and Raivavae (SE. Polynesia), clearly belonging to this group, are obviously unintentionally omitted. A closely allied series comprises two Indian montane species. So the distribution is a tricentric subantarctic one, as species are found in the southern part of all three oceans. The Hawaiian localities are the only ones north of the equator.

Habit: Shrubs or small trees, not exceeding 15 m.

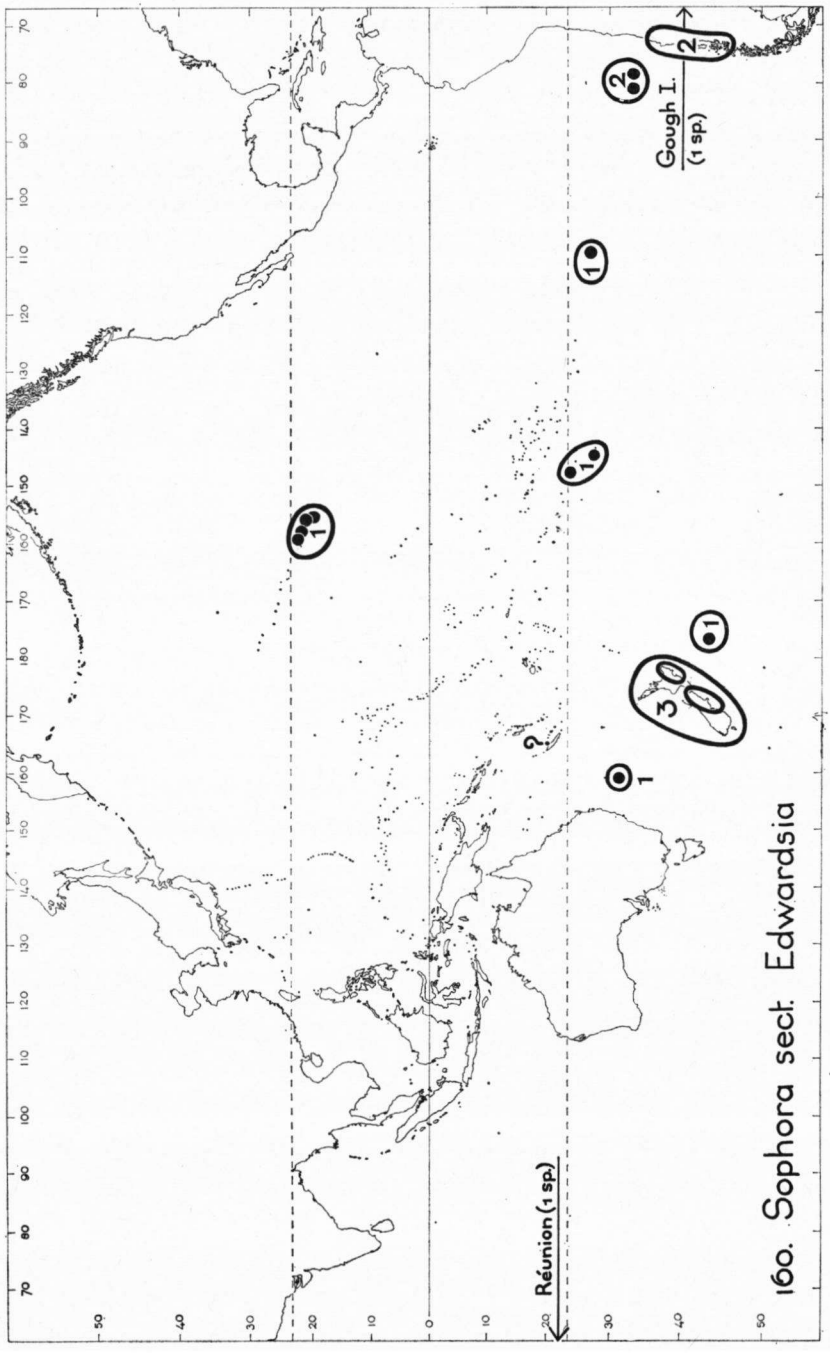
Habitat & Ecology: The species of this series are always found in inland localities, in forest, along stream-sides, and on mountain slopes. *S. chrysophylla* (Salisb.) Seem. is one of the main constituents of the upper forest zone on several Hawaiian islands, especially in the drier portions. The flowers are yellow, conspicuous, and are borne on drooping racemes. Skottsberg (1921, 521, ff.) has observed that on Juan Fernandez the flowers are visited by humming birds. Elsewhere insects might play a role in pollination.

Dispersal: The pod is up to c. 20 cm long, and contains 3—8 seeds. In many species the pod is provided with 4 distinct corky wings, in others these are represented by indistinct ridges. Very often the pods dehisce on the tree and the seeds are dropped. The floating capacity of these varies. Guppy (1906) found that the seeds of the Hawaiian species do not float, but that those of the Chilean species float for one month or more. See also Ridley (1930).

Map: The figures indicate the number of species occurring in each delineated area. The specific areas are as yet insufficiently know. Guillaumin mentions *S. tetraptera* from New Caledonia but I have no certainty that it is native there, hence the question mark.

Sources: K. Reiche, Fl. Chile *2* (1898) 52—53; H. B. Guppy, Observations of a Naturalist in the Pacific *2* (1906) 148, 580; C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. 56, 5 (1916) 247; Nat. Hist. Juan Fernandez *2* (1921) 137—142, 521—534; Proc. 6th Pac. Sc. Congr. *4*, Bot. (1940) 700 (map); W. R. B. Oliver, Trans. New Zeal. Inst. *49* (1917) 139; J. F. Rock, Indig. Trees Hawaii (1917) 185—189; H. N. Ridley, Dispersal of Plants (1930) 277—278; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 120; A. K. Chock, Pac. Sc. *10* (1956) 136—158, 4 maps; R. D. Good, Geogr. Flow. Pl. ed. 2 (1953) 107 fig. 34 (map), 116; H. H. Allan, Fl. New Zeal. *1* (1961) 369—371.

M. M. J. VAN BALGOOY.


160. Sophora sect. Edwardsia
Réunion (1 sp.)
Gough I. (1 sp.)

161. **Libertia** Spreng.

Name: Libertia Spreng., Syst. *1* (1825) 127, 168, nom. gen. cons.

Family: *Iridaceae.*

Taxonomy and distribution: A genus of Antarctic-Pacific distribution, comprising c. 10 species; *L. pulchella* (R. Br.) Spreng. is widespread: Papuan highlands, SE. Australia, Tasmania, and New Zealand; another endemic species in Australia and perhaps 2 in New Zealand. In South America the genus is best represented in Chile; one species extends also to Juan Fernandez, whereas 1 species each have been described from the Bolivian and Columbian Andes. The genus may be expected to turn up in Peru and Ecuador as well.

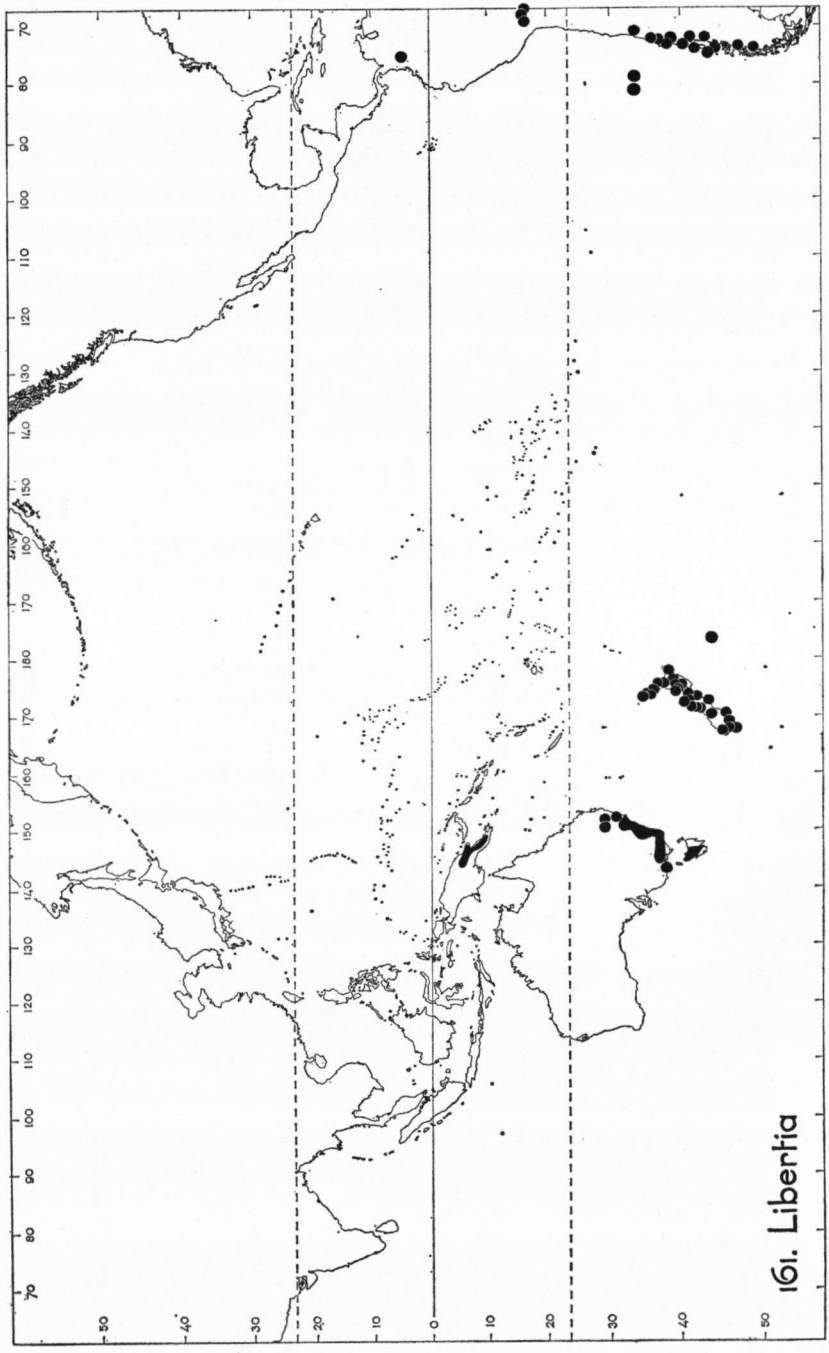
Habit: Perennial herbs, with a creeping rhizome, and tufts of linear leaves.

Habitat & Ecology: Temperate to subtropical forest, damp and shaded places, also in more open alpine vegetation. Mostly montane, but descending to near the coast in the higher latitudes. In the tropical mountains, exclusively at high altitudes, up to c. 3500 m in New Guinea.

Dispersal: As in most *Iridaceae*, the fruit is a subglobose, trigonous, coriaceous, or thin-walled capsule, 0.5—1.5 cm diam., dehiscing loculicidally with 3 valves, and containing many flattened or angular, smooth seeds.

Sources: L. Rodway, Tasm. Fl. (1903) 209; T. F. Cheeseman, Man. New Zeal. Fl. (1906) 698—700; C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. *56, 5* (1916) 191; Nat. Hist. Juan Fernandez *2* (1921) 113; L. Diels, Bot. Jahrb. *62* (1929) 462; in E. & P. Pfl. Fam. ed. 2, *15a* (1930) 480; R. C. Foster, Contr. Gray Herb. *127* (1939) 44—45; ibid. *161* (1946) 4—5; J. H. Willis, Handb. Fl. Vict. *1* (1962) 334—335; collections Rijksherbarium Leyden. Miss Dr. L. B. Moore (Christchurch) provided information concerning *Libertia* in New Zealand; Dr. R. H. Anderson, Dr. R. S. Cowan, and Dr. A. Cronquist have plotted the localities as represented in the National Herbarium Sydney, the U.S. National Herbarium, and the Herbarium of the New York Botanical Gardens respectively.

M. M. J. VAN BALGOOY.


161. Liberia

162. **Leptocarpus** R. Br.

Name: Leptocarpus R. Br., Prod. (1810) 250.

Family: *Restionaceae.*

Taxonomy and distribution: The family is nearly confined to Australia and Africa. *Leptocarpus* is the only genus of circum-antarctic distribution, if at least the S. African species are not considered to represent a separate genus (*Calopsis*), an opinion held by Gilg-Benedict and others. *L. chilensis* (Steud.) Mast. is the only *Restionacea* in South America. The genus is further represented in New Zealand and the Chatham Is with 1 species; Australia: 6 species in West Australia, of which 1 extends to East Australia and Tasmania, 1 is confined to SE. Australia and Tasmania, c. 3 species in N. Australia and Queensland of which 1 also in S. New Guinea, and 1 species confined to the Aru Is. Finally 1 species is found in SE. Asia, from Malaya through Indo-China to Hainan.

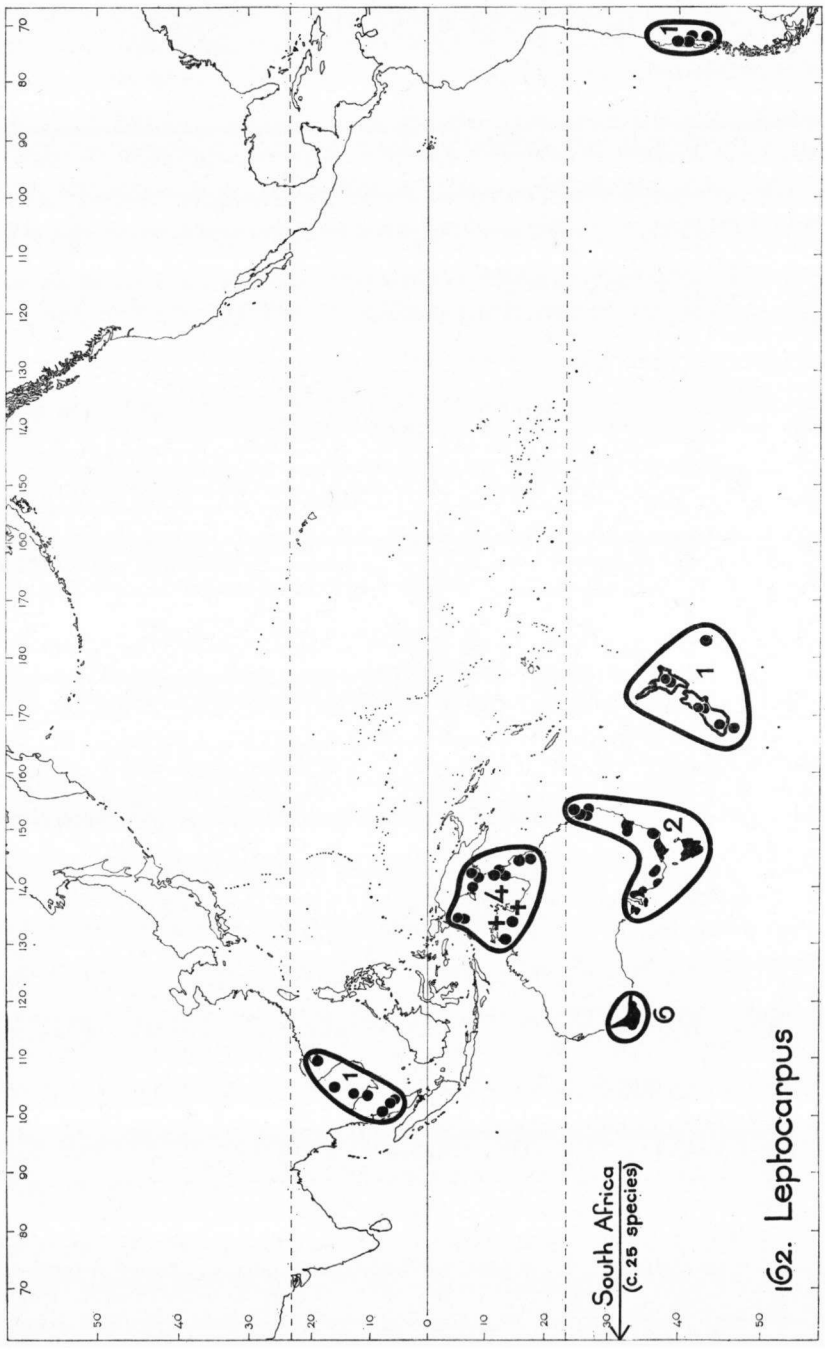
Habit: Grass-like perennial herbs up to c. 1½ m high, mostly dioecious, rarely monoecious, or with bisexual flowers; inflorescences in long panicles or dense spikes.

Habitat & Ecology: In savannahs, grassland, fresh- and saltwater swamps, and along the seashore, often abundant and replacing grasses and sedges. Although the majority of the species are found in the temperate zone, the tropical ones are not found in montane habitats but in the lowland.

Dispersal: The fruit is a small, elliptic or obovate, trigonous capsule c. 1 mm long, indehiscent, or splitting at the angles; it contains a single seed.

Sources: M. T. Masters, in DC. Mon. Phan. *1* (1878) 329—345; G. Bentham, Fl. Austr. *7* (1878) 230—237; Ch. Gilg-Benedict, in E. & P. Pfl. Fam. ed. 2, *15a* (1930) 8—27; K. Bakker, Fl. Mal. I, *5* (1957) 416—420; and other literature. Prof. Dr. B. J. Grieve (Nedlands, Western Australia), Mr. L. S. Smith (Brisbane), and Dr. R. H. Anderson (Sydney) have provided the Australian localities, Dr. E. J. Godley (Christchurch) the distribution of the New Zealand species, the late Dr. N. Y. Sandwith (Kew) is responsible for the localities of the Chilean species.

M. M. J. VAN BALGOOY.


South Africa
(c. 25 species)
162. Leptocarpus

163. **Nothofagus** Bl.

Name: Nothofagus Bl., Mus. Lugd. Bat. *1* (1850) 307.

Family: *Fagaceae.*

Synonym: *Trisyngyne* Baill.

Taxonomy and distribution: A genus comprising c. 40 species, of Antarcto-Pacific distribution: c. 12 species in Chile and the adjacent Argentinian borderland from c. 33° S.L. to Fuegia and Staaten I., 4—5 endemic species in New Zealand and 5 in New Caledonia, 2 in Tasmania of which 1 also in Victoria, 1 in New South Wales and S. Queensland, and 16 species in New Guinea and d'Entrecasteaux Is (Goodenough and Normanby I.), one species was recently discovered in New Britain by Mr. D. Sayers. The genus is subdivided by van Steenis (1953, 1954) as follows:

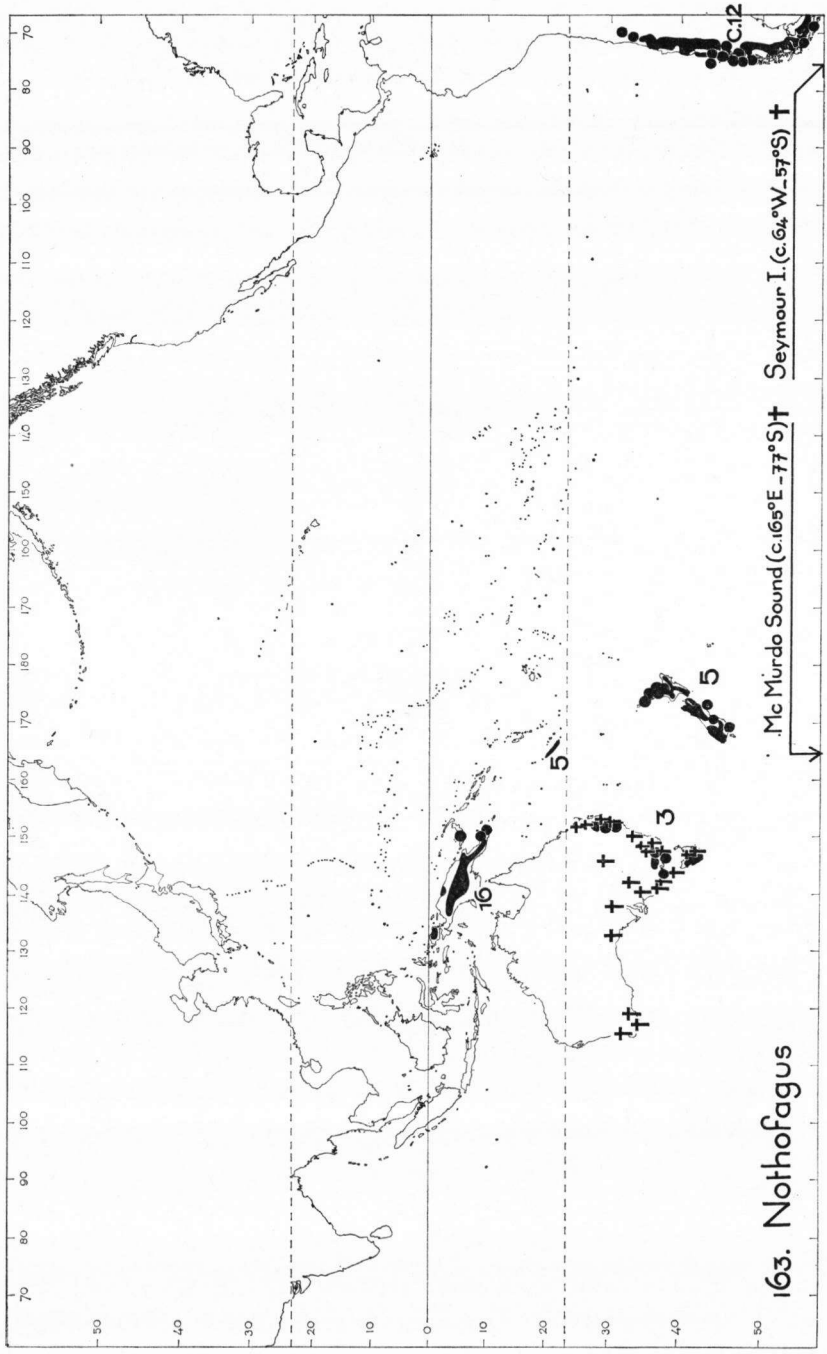
Sect. *Calucechinus* (Hombr. & Jacq.) Krass.: S. America
  Subsect. *Antarcticae* Steen.: S. America and Tasmania
  Subsect. *Pumiliae* Steen.: S. America
Sect. *Calusparassus* (Hombr. & Jacq.) Krass.
  Subsect. *Quadripartitae* Steen.: S. America, New Zealand, Tasmania, Australia
  Subsect. *Tripartitae* Steen.: New Zealand
  Subsect. *Bipartitae* Steen.: New Guinea, New Caledonia.

Nothofagus is the only southern hemisphere genus of the *Fagaceae*. With the northern temperate *Fagus* it forms the subfamily *Fagoideae*, a good example of bipolar plant distribution, a problem discussed by Du Rietz (1940).

Fossils: Both macro- and microfossil remains of *Nothofagus* have with certainty been found in SE. New Guinea, Australia, New Zealand, S. America, and Seymour I. (c. 64° W 57° S), from the Tertiary onwards. In New Zealand Couper (1953) and Te Punga (1948) have even found fossil pollen in Lower Cretaceous deposits. In Australia fossil leaves and pollen are so common that it is generally assumed that *Nothofagus* was abundant throughout the continent in pluvial Tertiary times. Subfossil pollen is also reported (in minute quantity or single grains) from islands where *Nothofagus* does not grow, e.g. in peat on Gough I. (Hafsten, 1960) and this is ascribed to long-distance dispersal of the pollen. In both recent and fossil pollen of *Nothofagus* 3 types can be distinguished (Cranwell, 1939; Cookson, 1952; Cookson & Pike, 1955): the *fusca* and *menziesii* type are found in species of both sections except in those of subsect. *Bipartitae* which have exclusively pollen of the *brassii* type. This type that is at present confined to the New Caledonian and New Guinean species has been shown to occur widely in Australian and New Zealandic Tertiary deposits. Pollen most likely belonging to this group are pictured by Auer et al. (1955) from Fuegia-Patagonia and recently reported also from Seymour I. (Cranwell, 1959). *Nothofagus* pollen has been described from the northern hemisphere by some authors but the identity is disputed by others. On the other hand fossil *Fagus* pollen has erroneously been described from the southern hemisphere.

Habit: Large canopy trees, occasionally of shrubby habit under unfavourable conditions.

Habitat & Ecology: In the temperate rain-forests of Chile, New Zealand and Tasmania, and in the montane rain-forest of New Guinea, *Nothofagus* forms a dominant component of the upper storey, many species reaching the timberline, and descending to near sea-level in the higher latitudes. In S. America *Nothofagus* is also found as a substage tree in the Conifer-dominated forest. The species of sect. *Calucechinus* comprising 7 S. American species and the Tasmanian *N. gunnii* (Hook. f.) Oerst. are deciduous. All species are monoecious. Great quantities of male flowers are produced simultaneously in a short lapse of time. Clouds of pollen can sometimes be observed above the forest. Pollination


163. Nothofagus
Mc Murdo Sound (c.165°E.-77°S)
Seymour I. (c.64°W.-57°S)
C.12
16
5
5
3

is obviously by wind. *Nothofagus* is a good indicator of cold to cool everwet rain-forest conditions.

Map: The present-day distribution has been indicated by shading and dots. Fossil localities, as far as occurring outside the present area, have been indicated by daggers.

Dispersal: Per cupule 1—3(—7) nuts are produced; in some New Guinean species the cupule is reduced. The nuts are often narrowly winged or ridged and do not exceed 1 cm. Birds and other animals are reported to be fond of the fruits but it is unknown whether they aid in dispersal. Nuts cannot stand immersion in seawater.

Sources: K. Reiche, Verh. Deut. Wiss. Ver. Santiago *3* (1897) 397—421; C. Skottsberg, Kungl. Sv. Vet. Ak. Handl. 56, *5* (1916) 203—205; L. Cockayne, Monogr. of the New Zeal. Beech Forests. New Zeal. State For. Bull. *4* (1926); L. M. Cranwell, Rec. Auckl. Inst. Mus. *2* (1939) 175—196; Nature *184* (1959) 1782—1785, 1 map (fossil distr.); Cranwell, Harrington & Speden, ibid. *186* (1960) 700—702; G. E. du Rietz, Acta Phyt. Suec. *13* (1940) 215—282, fig. 13 (map); I. C. Cookson, Proc. Linn. Soc. N.S.W. *71* (1946) 49—63, 1 map (fossil loc. in SE. Austr.), 2 pl.; I. C. Cookson & K. M. Pike, Austr. J. Bot. *3* (1955) 197—206, 1 pl.; Te Punga, New Zeal. J. Sc. Techn. B *29* (1948) 32; A. L. Poole, Trans. Proc. R. Soc. New Zeal. *78* (1950) 363—380, 502—508; R. A. Couper, New Zeal. Sc. Rev. *9* (1951) 5; New Zeal. Geol. Surv. Paleont. Bull. 22 (1953) 46—51, pl. 6; Proc. R. Soc. B *152* (1960) 491—500, fig. 17 (map); C. G. G. J. van Steenis, J. Arn. Arb. *34* (1953) 301—374, 22 fig.; ibid. *35* (1954) 266—267, 1 fig.; V. Auer, M. Salmi & K. Salminen, Ann. Acad. Sc. Fenn. III. Geol. Geogr. *43* (1955) 3, pl. 3, 5, 6; U. Hafsten, Proc. R. Soc. ser. B, *152* (1960) table p. 524—525. Miss Dr. I. C. Cookson has provided the information concerning fossil localities in Australia. Distribution records of living *Nothofagus* were further obtained from Mr. J. H. Willis (Melbourne) for Australia, Mr. A. L. Poole (Wellington) for New Zealand, and Drs A. Cronquist (New York) and N.Y. Sandwith (Kew) for America.

C. G. G. J. VAN STEENIS & M. M. J. VAN BALGOOY.

164. **Barringtonia racemosa** (L.) Spreng.

Name: Barringtonia racemosa (L.) Spreng., Syst. Veg. *3* (1826) 127.

Family: *Lecythidaceae.*

Taxonomy: The distribution of *B. racemosa* follows the general pattern displayed by many paleotropical coastal plants, cf. *Intsia* (map 86) extending from E. Africa, the S. Asiatic coast and Malesia, tropical Australia, into the Pacific, generally terminating in the east at, or slightly beyond the Andesite line. Closely allied endemic species are found in Melanesia: *B. salomonensis* Rech. (Solomons), *B. procera* (Miers) Knuth (Solomons, New Hebrides), *B. integrifolia* (Montr.) Schltr and *B. neocaledonica* Viell. (New Caledonia), *B. edulis* Seem. and *B. petiolata* A. C. Sm. (Fiji), and *B. samoensis* A. Gray (Samoa, New Hebrides). *B. asiatica* (L.) Kurz (*B. speciosa* Forst.) is the other species of this large genus that extends far into the Pacific, its native area is, however, hard to establish as it is often planted in Polynesia.

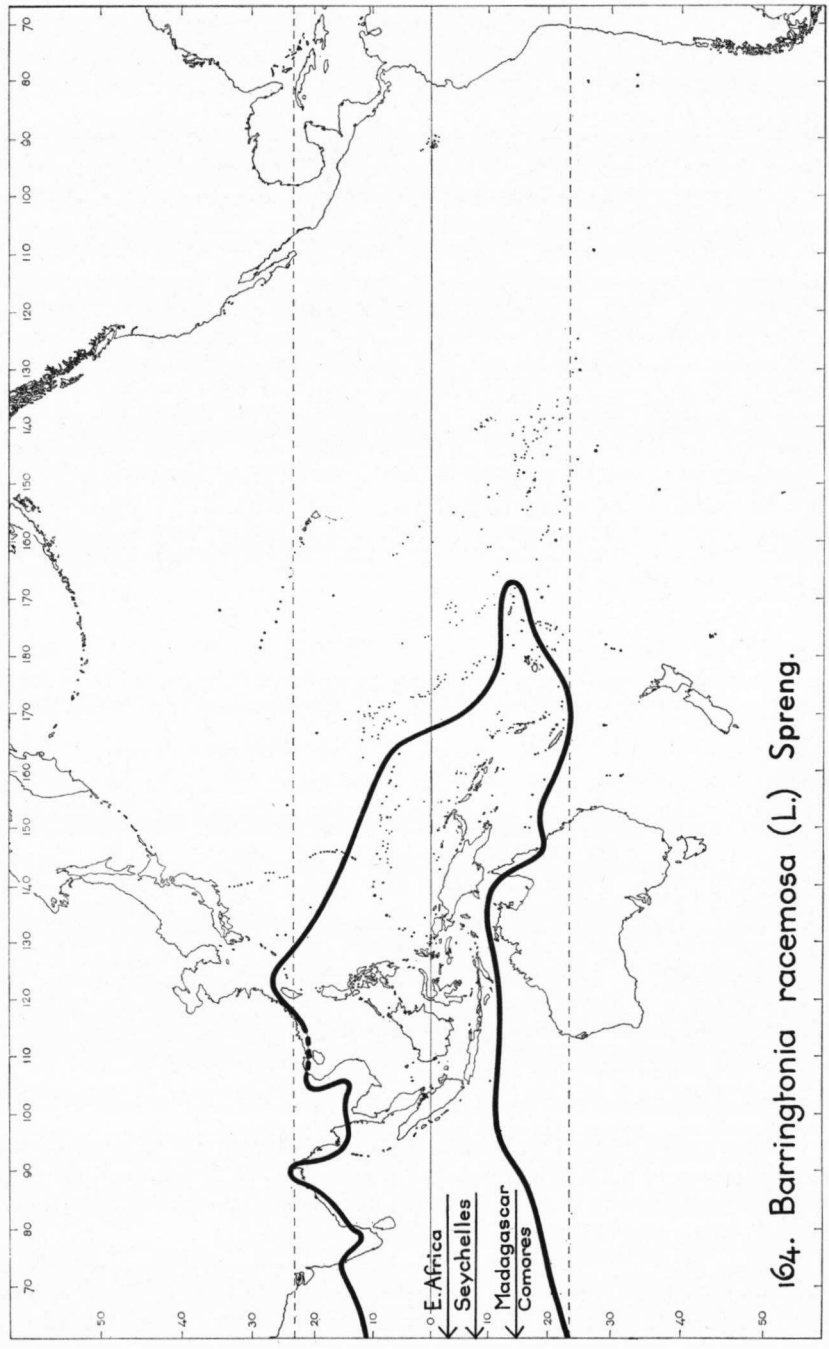
Habit: Large shrub or small tree, up to 20 m tall.

Habitat & Ecology: A species of littoral forests, along rivers and estuaries, usually not far inland. Sometimes also on coral islands. Flowers nocturnal in pendent, up to 1 m long, terminal inflorescences.

Dispersal: The fruit is angular, subglobose (3½—)4—5(—8) cm long, with a thick fibrous pericarp, which give it its buoyancy. Dispersal is obviously effected by both seawater and by streams inland.

Sources: H. N. Ridley, Dispersal (1930) 291; R. Knuth, Pfl. R. Heft *105* (1939) 17—19. Unpublished notes of Mr. Payens, who is preparing a monograph of *Barringtonia*.

M. M. J. VAN BALGOOY & J. P. D. W. PAYENS.


E. Africa
Seychelles
Madagascar
Comores
164. Barringtonia racemosa (L.) Spreng.

165. **Osteomeles** Lindl.

Name: Osteomeles Lindl., Trans. Linn. Soc. *13* (1821) 98, t. 8.

Family: *Rosaceae.*

Taxonomy: Several authors refer the American species to a separate genus *Hesperomeles*, mainly on account of the leaves, which are pinnate in the Asiatic/Pacific species and simple in the American ones. Schneider (1906) thinks *Hesperomeles* to be nearer *Crataegus*. I have provisionally treated the two taxa under *Osteomeles* pending a thorough revision of the group. The Old and New World species are indicated by different symbols on the map. In America the genus ranges more or less continuously from Bolivia northwards along the Andean chain to North Venezuela and isolated on some high central American mountains (Panama and Costa Rica). According to Dr. Cowan (in litt.) the region between Bogota (Columbia) and Merida (Venezuela) is the area of commonest occurrence of the group. The Asiatic and Pacific species are distributed in two disjunct areas astride the tropics of Cancer and Capricorn: Burma, Yunnan and Szechuan, Kwantung, Ryu Kyu Is, Bonin Is, Hawaiian Is, and the South Pacific: Eua (Tonga), Mangaia and Rarotonga (Cook) and Pitcairn I. According to Prof. Hara (in litt.) it is a matter of opinion to treat the geographically isolated populations as species or as taxa of subspecific level.

Habit: Erect or trailing shrubs.

Habitat & Ecology: Dry cañons and mountain slopes in America, most commonly at c. 3000 m. On open ridges and dry hills in the Pacific, also common on old lava flows in Hawaii where *O. anthyllidifolia* Lindl. forms dense tangles (Rock, 1913). In Szechuan (China) "restricted to the rivervalley where a dry hot climate obtains" (Sargent, 1913). In Hawaii the sweet-scented white flowers attract many wasps and bees (Rock).

Dispersal: The fruit is a small white, pink, or black berry, containing few seeds. Endozoic dispersal by birds is the most obvious means of dispersal.

Map: The localities of the Old World *Osteomeles* are indicated by dots, those of the New World by triangles. Shaded areas represent regions where the genus is particularly common.

Sources: W. Hillebrand, Fl. Hawaii. Is. (1888) 119; J. D. Hooker, Curt. Bot. Mag. *120* (1894) 7354; C. K. Schneider, Ill. Handb. Laubholzk. *1* (1906) 762; Bot. Jahrb. *42* (1908) 85; Ch. S. Sargent, Pl. Wilson. *1* (1913) 184; J. F. Rock, Indig. Trees Hawaii (1913) 25, 39, 46; H. Pittier, Contr. U.S. Nat. Herb. *20* (1918) 107—111; J. Cardot, Bull. Mus. Nat. Hist. Nat. Paris *28* (1922) 192—193; J. F. MacBride, Publ. Field Mus. Bot. *4* (1925) 81—82; ibid. *13* (1938) 1065—1069; G. P. Wilder, B. P. Bish. Mus. Bull. *86* (1931) 54; E. P. Killip, J. Wash. Acad. Sc. *24* (1934) 46—47; T. Tuyama, Bot. Mag. Tokyo *50* (1936) 29—31; P. C. Standley, Publ. Field Mus. Bot. *18* (1937) 480; R. E. Woodson, Ann. Mo. Bot. Gard. *26* (1939) 288; K. Suessenguth, Bot. Jahrb. *72* (1942) 275—276; T. G. Yuncker, B. P. Bish. Mus. Bull. *220* (1959) 126; and other literature. Information concerning Old World *Osteomeles* was provided by Prof. H. Hara (Tokyo), Mr. C. Jeffrey and Dr. R. Melville (Kew), Dr. R. S. Cowan (U.S. Nat. Herb.), and Dr. A. Cronquist (New York Bot. Gard.) have plotted the localities in America.

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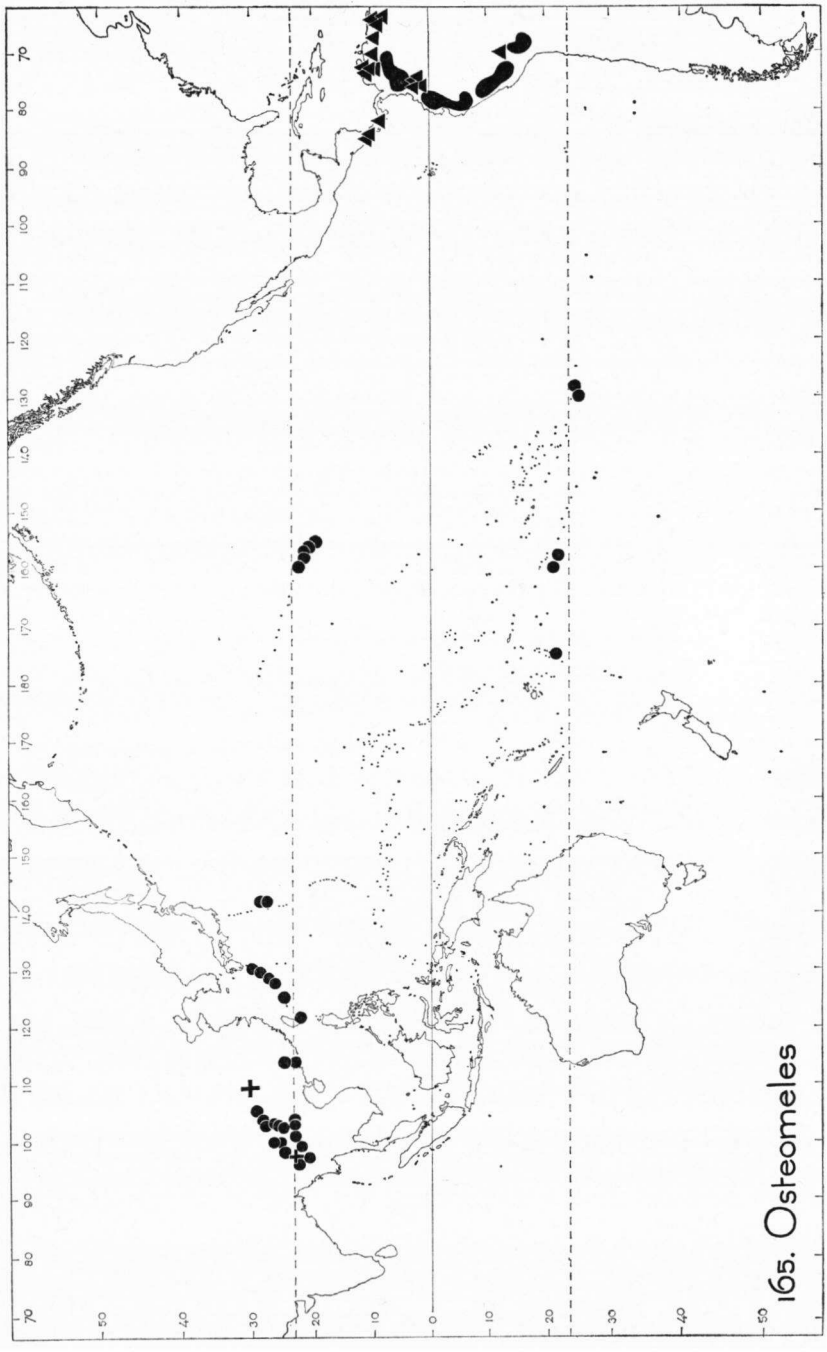

165. Osteomeles

166. Dicksonia L'Hér.

Name: Dicksonia L'Hér., Sert. Angl. (1788) 30.

Family: *Cyatheaceae.*

Taxonomy and distribution: A genus of 20—25 species, the majority of which are distributed from Malesia to Australia and the SW. Pacific incl. New Zealand; in America most species are found in the tropical mountains with isolated localities in Brazil and Argentina and 2 on Juan Fernandez (very near to a New Zealand species). One species is confined to St. Helena in the Atlantic Ocean but the genus is absent from Africa and the Asiatic mainland. According to Dr. Holttum (in litt.) *Dicksonia*, *Cibotium* (map 167), and *Culcita* (map 168) are on the decline whereas *Cyathea* s.l. is now very prolific and abundant throughout the wet tropics.

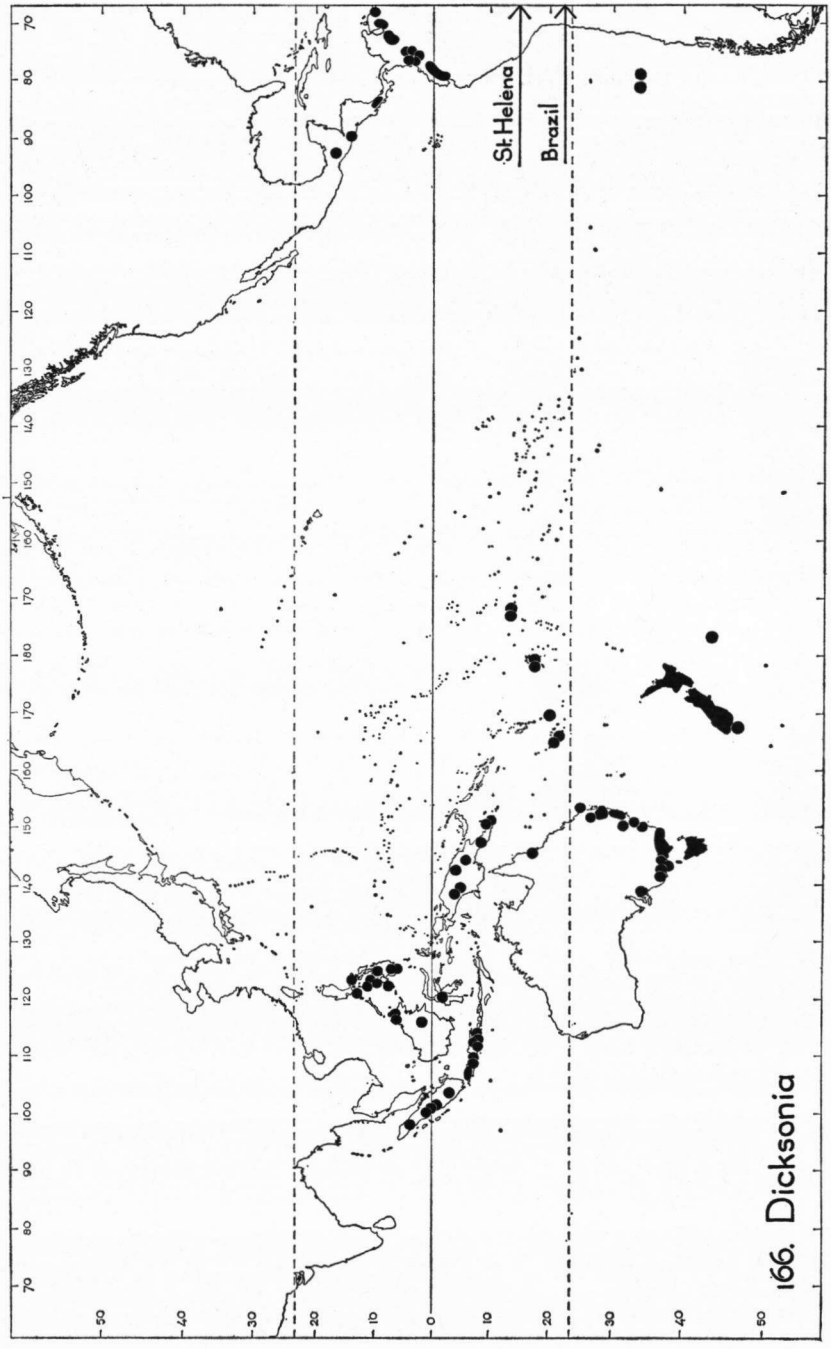
Habit: Tree-ferns with erect massive to slender trunks, coarsely hairy, covered by a matting of rootlets, and fronds up to 3 m and more long, crowded at the top.

Habitat & Ecology: In the undergrowth and along margins of montane tropical, and subtropical to temperate, everwet rain-forest, also on more or less exposed ridges and slopes and along streams. Often locally gregarious but on the whole rather scattered.

Dispersal: As in other ferns the spores are largely dependent on wind for dissemination.

Sources: G. Bentham, Fl. Austr. *7* (1878) 712—714; L. Diels in E. & P. Pfl. Fam. *1*, *4* (1902) 119—121; W. R. Maxon, Contr. U.S. Nat. Herb. *17* (1913) 153—156; K. Domin, Bibl. Bot. *85*[1] (1915) 25—26; C. Christensen & C. Skottsberg, Nat. Hist. Juan Fern. *2* (1920) 17—18; E. B. Copeland, B. P. Bish. Mus. Bull. *59* (1929) 67; Fern Fl. Philip. *1* (1958) 84; C. A. Backer & O. Posthumus, Varenfl. Java (1939) 22; C. Christensen, B. P. Bish. Mus. Bull. *177* (1943) 31; H. H. Allan, Fl. New Zeal. *1* (1961) 37—39; J. H. Willis, Handb. Fl. Vict. *1* (1962) 18; R. E. Holttum, Fl. Mal. II, *2* (1963) 158—162. Additional information was obtained from Dr. R. E. Holttum (Kew) concerning the Australasian species and Dr. C. V. Morton (Washington) about the American species.

M. M. J. VAN BALGOOY.


St. Helena
Brazil
166. Dicksonia

167. **Cibotium** Kaulf.

Name: Cibotium Kaulf., Berl. Jahrb. Pharm. *21* (1820) 53.

Family: *Cyatheaceae.*

Distribution: The area of *Cibotium* is almost sympatric with that of *Perrottetia* (map 52) but less extensive. In E. Asia and W. Malesia 3 species are accepted by Holttum (1963), 6 species have been described from Hawaii and 5 from Central America.

Habit: Tree-ferns with stout prostrate or, sometimes, erect trunks, densely woolly-hairy.

Habitat & Ecology: Scattered but abundant locally, forming dense groves along humid gorges and mountain slopes. In Hawaii many trees have been felled for the wool and the stem for orchid cultivation. The species are here most common between 600—1200 m. The Asiatic and American species have mostly been collected between 1000—2000 m.

Dispersal: The same as for *Dicksonia* (see sub 166).

Sources: R. H. Beddome, Ferns Br. Ind. & Ceylon (1892) 24; L. Diels, in E. & P. Pfl. Fam. 1, *4* (1902) 121; W. R. Maxon, Contr. U.S. Nat. Herb. *16* (1912) 54—58; C. A. Backer & O. Posthumus, Varenfl. Java (1939) 23; M. L. Tardieu-Blot & E. Christophersen, Fl. Gén. I.-C. *7* (1939) 78—80; R. E. Holttum, Ferns of Malaya (1954) 114; Fl. Mal. II, *2* (1963) 164—166; E. B. Copeland, Fern Fl. Philip. *1* (1958) 85; other literature and information from Dr. R. E. Holttum.

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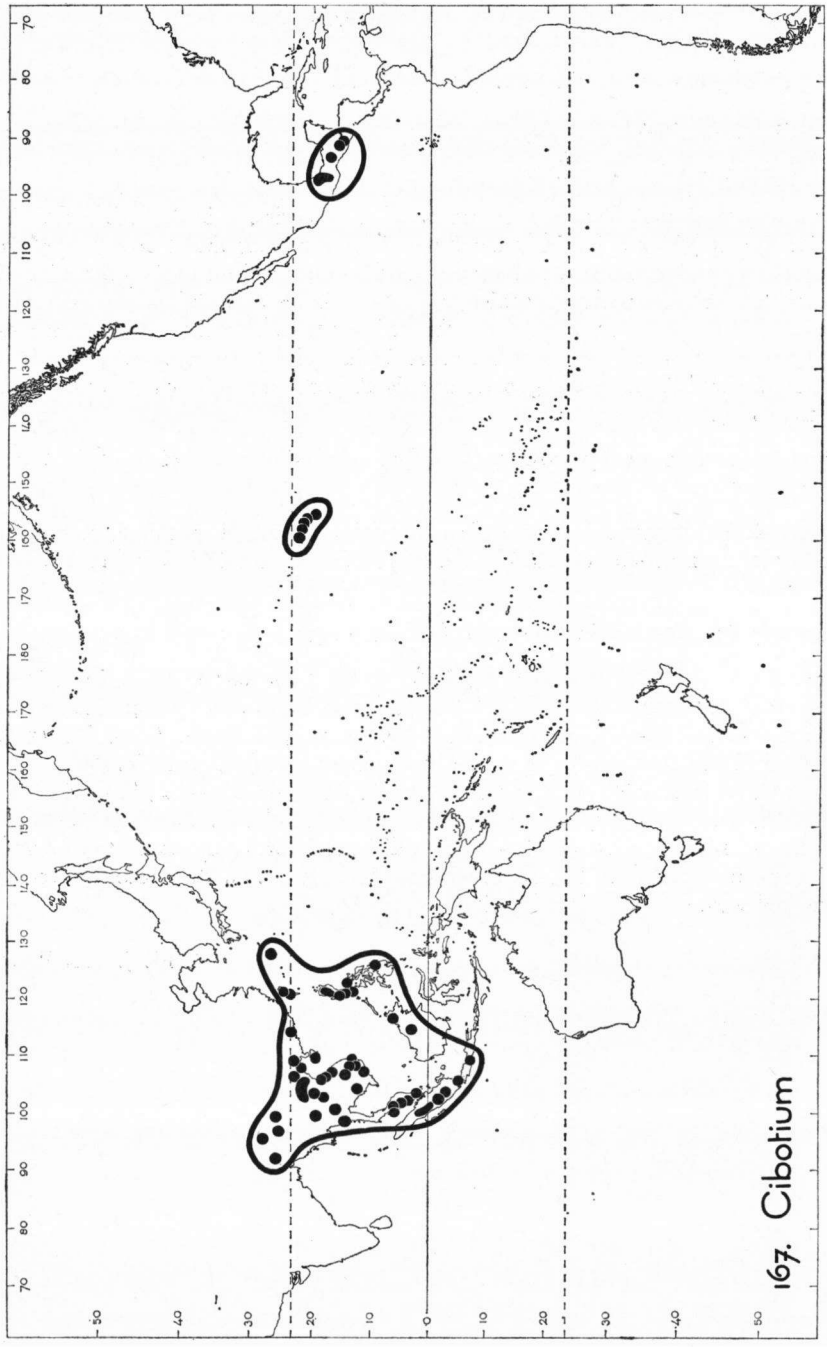

167. Cibotium

168. **Culcita** Presl

Name: Culcita Presl, Tent. Pter. (1836) 135, pl. 5, f. 5.

Family: *Cyatheaceae.*

Synonym: *Balantium* Kaulf.

Taxonomy and distribution: A genus of c. 7 species, 3 in Malesia, of which *C. straminea* (Labill.) Maxon is widely distributed from the Philippines throughout Melanesia to Samoa; 1 species confined to Australia, and another to Fiji. In America *C. coniifolia* (Hook.) Maxon occurs from Mexico, the West Indies and Columbia, to Venezuela, Brazil and Ecuador where it has been found in scattered localities. One species occurs widely isolated in the Canaries and Azores in the Atlantic Ocean. The genus is absent from Africa and Asia, so the generic area is almost sympatric with that of *Dicksonia* (see map 166).

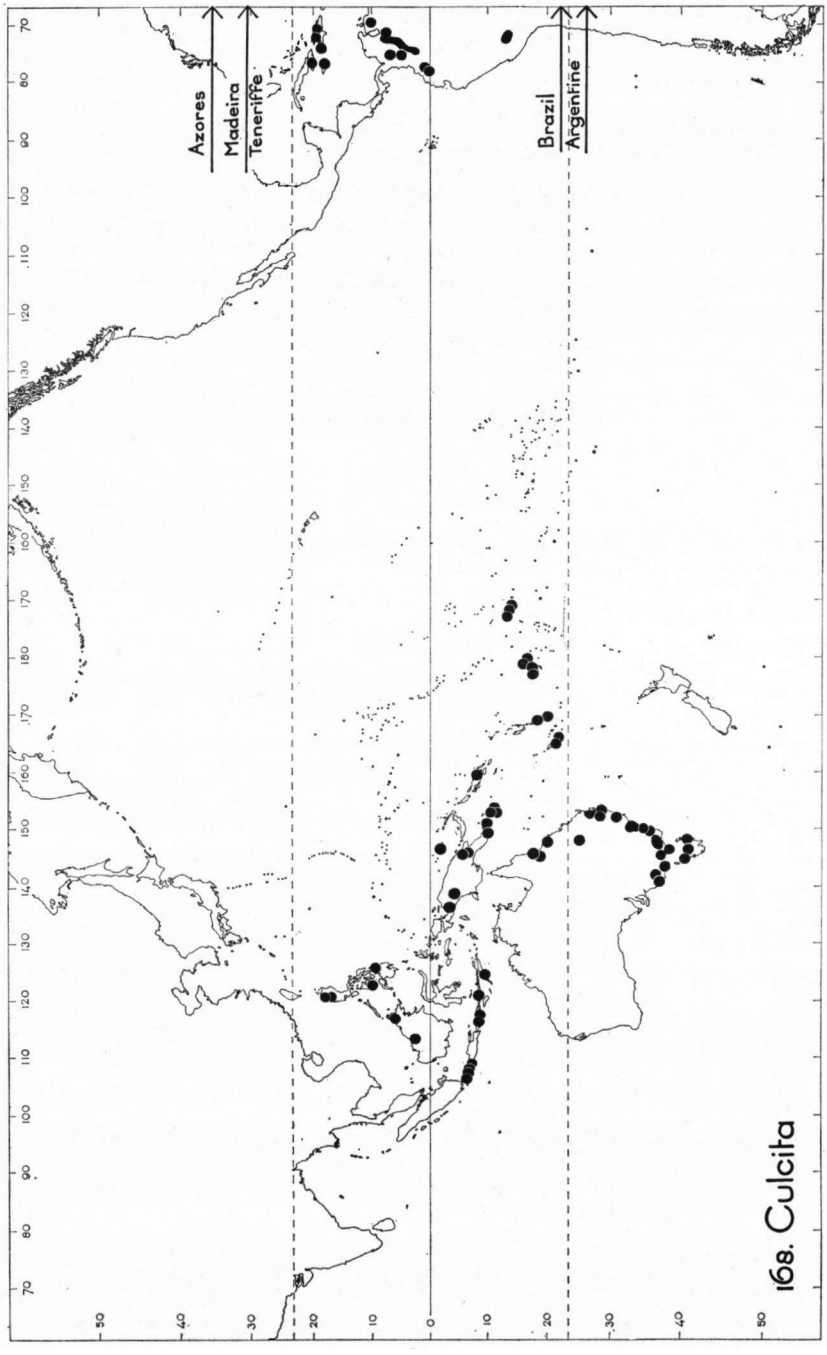
Habit: Stem stout, usually prostrate, therefore not attaining the height of the foregoing 2 genera.

Habitat & Ecology: A common fern throughout most of its range, coming down to lower levels in general than *Dicksonia.* As other tree-ferns *Culcita* is found in everwet rain-forest.

Dispersal: The same as for *Dicksonia* (see sub 166).

Sources: G. Bentham, Fl. Austr. *7* (1878) 716 (as *Davallia*); L. Diels, in E. & P. Pfl. Fam. 1, *4* (1902) 119; L. Rodway, Fl. Tasm. (1903) 288 (as *Davallia*); K. Domin, Bibl. Bot. *85*, *1* (1915) 72—73 (as *Davallia*); W. R. Maxon, J. Wash. Acad. Sc. *12* (1922) 454—460; E. B. Copeland, B. P. Bish. Mus. Bull. *59* (1929) 67; Fern Fl. Philip. *1* (1958) 85—86; C. A. Backer & O. Posthumus, Varenfl. Java (1939) 21—22; E. Christophersen, B. P. Bish. Mus. Bull. *177* (1943) 32; J. H. Willis, Handb. Fl. Vict. *1* (1962) 20; R. E. Holttum, Fl. Mal. II, *2* (1963) 166—169. Additional information about the Australasian species was obtained from Dr. R. E. Holttum (Kew); Dr. C. V. Morton (Washington) has helped with the American localities.

M. M. J. VAN BALGOOY.


Azores
Madeira
Teneriffe
Brazil
Argentine
168. Culcita

169. **Stillingia lineata** (Lamk) M.A.

Name: Stillingia lineata (Lamk) M.A.

Family: *Euphorbiaceae.*

Synonym: *Stillingia pacifica* M.A. in DC., Prod. 15, *2* (1866) 1156; Seem., Fl. Vitiensis (1867) 232.

Taxonomy: In the Indian Ocean islands Mauritius and Réunion a shrub is found with an astonishingly variable leaf-shape which may vary from obovate (4 by 2¾ cm) to oblong or narrow-elliptic (8 by 2½ cm) to broad elliptic (7½ by 5 cm) to narrow-obovate (12—15 by 3—5 cm) or even linear-lanceolate (20—25 by 2 cm). In small leaves the petiole is very short and the leaf-base rounded, in large leaves the petiole gets longer in proportion and the leaf-base becomes very narrow-cuneate. In his monograph Pax (1912) arranged the many names under which it is described under three varieties, all based on leaf-shape. He kept *S. lineata* apart from the Fijian *S. pacifica* M. A. by the difference in the shape of the glands below the bracts, but according to Airy Shaw (1963) this does not seem to hold. Shaw provisionally kept it apart from *S. lineata* because of the more markedly crenate leaf margin "and in view of the great geographical separation". In my opinion this minor leaf character, losing weight by the astounding variation of *S. lineata*, and not correlated with floral characters, can at most serve to give it racial rank, that is, nomenclaturally, the rank of a subspecies. This is supported by the fact that *ssp. lineata* is largely an inland plant whilst ssp. *pacifica* is, at least in Malesia, a species of the sandy beach, forming part of the Barringtonia scrub and forest. In view of this eco-geographical difference I accept the above mentioned synonym to represent a race, that is, taxonomically a subspecies, of *S. lineata*, as *S. lineata* spp. *pacifica* (M.A.) Steen., *comb. nov.*

Habit: Densely branched, laticiferous, more or less succulent shrub or smallish tree 2—10 m; branches brittle, thickish, bearing the obovate, spirally arranged leaves crowded towards the end, covered with many large leaf-scars; young foliage slightly sticky by resin. Inflorescence a terminal spike with small greenish-yellow flowers, all male or the lower female.

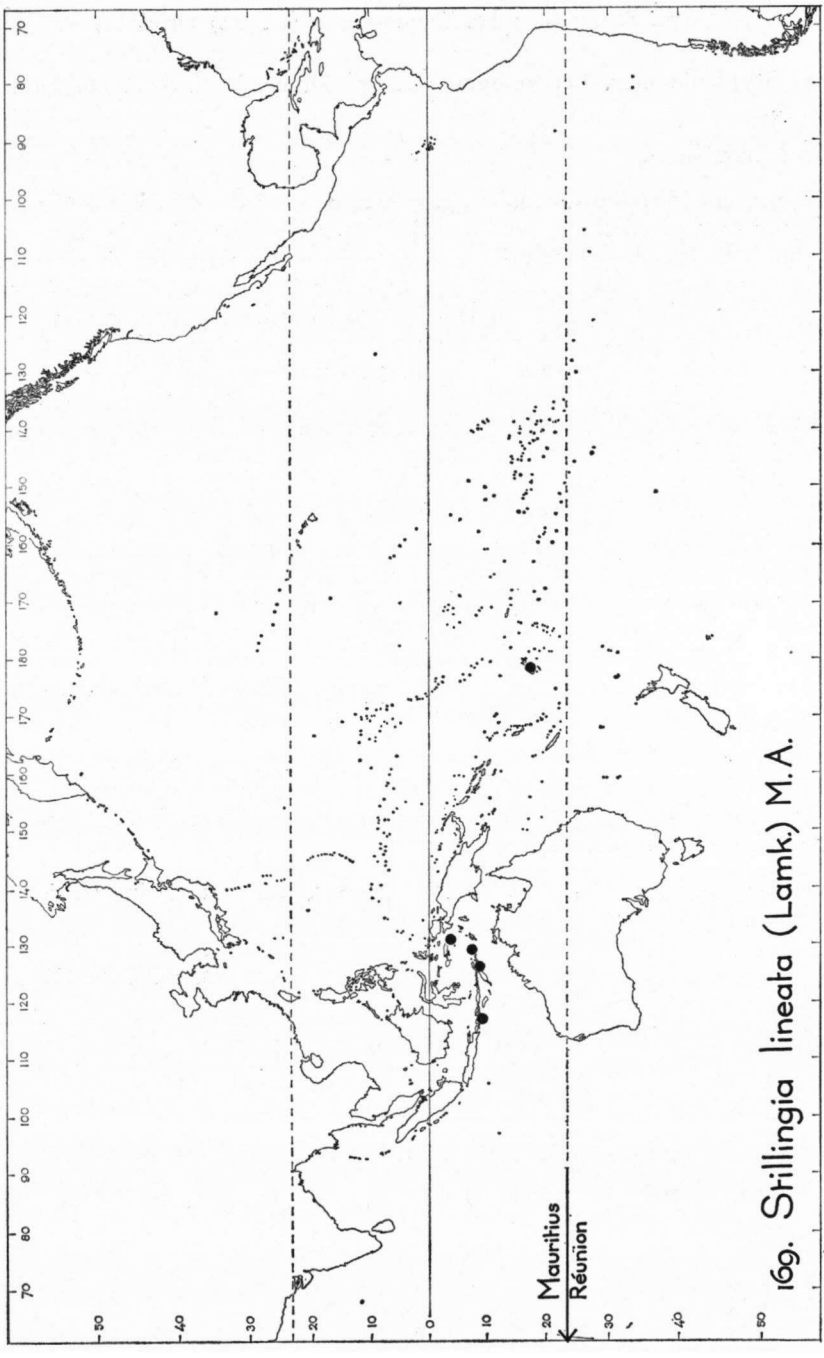
Habitat: All Malesian specimens are from the sandy beach.

Dispersal: Capsule c. 1 cm diam., usually with 3 carunculate seeds, the lower portion of the capsule persistent. Judging from the habitat probably dispersed by seawater, but nothing is known about buoyancy of the fruits.

Notes: The geographical disjunction between Malesia and Mauritius-Réunion is obviously ancient, but is also known from other beach plants, e.g. *Lysimachia mauritiana* Lamk. The disjunction is also found in the ranges of the following genera: *Ochrosia* (*Apoc.*), *Thoracostachyum* (*Cyp.*), *Lepechinia* (*Lab.*), *Sophora* sect. *Edwardsia* ser. *Tetrapterae* (*Legum.*), *Astelia* (*Lil.*), *Myoporum* (*Myop.*), *Pisonia* (*Nyctag.*), *Smythea* (*Rhamn.*), *Antirrhoea* (*Rub.*), *Cossignia* (*Sapind.*), *Soulamea* (*Simaroub.*), *Pipturus* (*Urtic.*). Compare maps 34, 47, 59, and 160.

Sources: Pax, Pfl. R. Heft *52* (1912) 183; Airy Shaw, Kew Bull. *16* (1963) 372. Material at Leyden Herbarium and information from Dr. Wurdack, Washington.

C. G. G. J. VAN STEENIS.


169. Stillingia lineata (Lamk.) M.A.
Mauritius
Réunion

170. **Styphelia** subg. **Leucopogon** (R. Br.) Drude

Name: Styphelia subg. **Leucopogon** (R. Br.) Drude, in E. & P. Pfl. Fam. 4, *1* (1889) 78.

Family: *Epacridaceae.*

Taxonomy and distribution: The *Epacridaceae* are best developed in Australia and are further represented throughout Malesia, barely reaching SE. Asia and scattered throughout the Pacific especially in the southern part. A single outlying monotypic genus occurs in temperate S. America (*Lebetanthus*). The genus *Styphelia* ranges throughout the entire area of the family in the Old World. Of the 5 subgenera accepted by Sleumer 3 are represented in the Pacific. Subg. *Lecopogon* centres in Australia where more than 100 species have been described; 7 species are found in Malesia of which 1 extends eastwards to the Solomons. Over 10 species have been described from New Caledonia 1 of which also occurs in the New Hebrides and Fiji. Of the 4 New Zealand species 1 is also found in Chatham, Lord Howe I., Tasmania, and Australia.

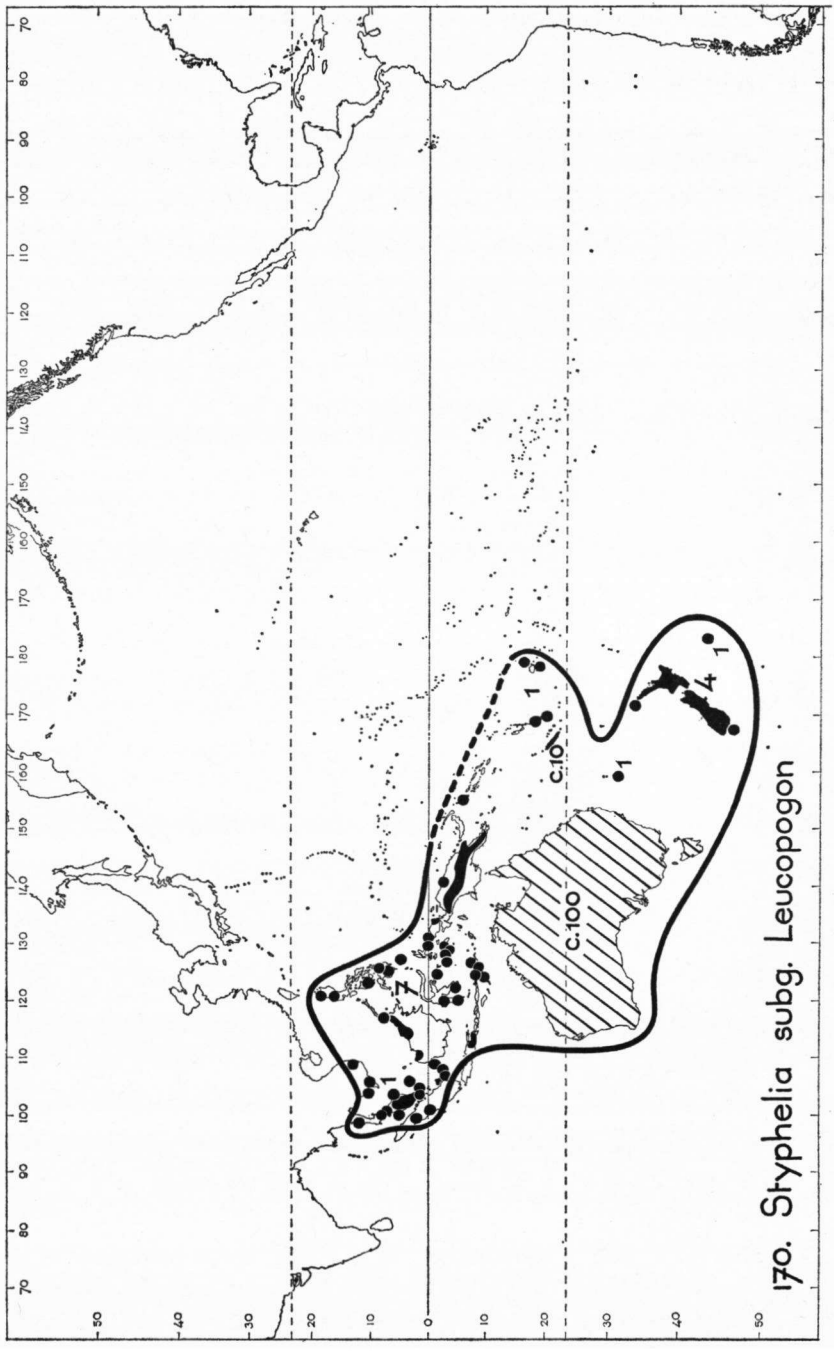
Habit: Erect to prostrate shrubs, as a rule with small, crowded coriaceous leaves.

Habitat & Ecology: Most species inhabit exposed more or less arid places and well drained soils in both the south temperate and tropical zone. At lower latitude several species are found near sea-level, in coastal dunes, on sandstone, rocks and open grassland. Other species form part of the alpine and subalpine vegetation, often ascending to very high altitudes; in New Guinea *S. suaveolens* (Hook. f.) Warb. has been collected at 4700 m on Mt. Carstensz and on the summit of Mt. Wilhelm (c. 4500 m). Few species are found in marshes and other everwet habitats.

Dispersal: The fruit is a subglobose drupe, with a fleshy mesocarp and a stony endocarp, rarely exceeding 1 cm in diam., white, yellow, orange or red when ripe. The most obvious means of dispersal is by birds. I frequently observed birds feeding on the sweet fruits of *S. suaveolens* on Mt. Wilhelm.

Sources: H. Sleumer, Blumea *12* (1963) 146—155, and personal information from Dr. Sleumer; local floras.

M. M. J. VAN BALGOOY.


170. Styphelia subg. Leucopogon
c.100
c.10
1
2
1
1
4
1

171. **Styphelia** subg. **Cyathodes** (Labill. em. R. Br.) Drude

Name: Styphelia subg. **Cyathodes** (Labill. em. R. Br.) Drude in E. & P. Pfl. Fam. 4, *1* (1889) 78.

Family: *Epacridaceae.*

Notes: The distribution of subg. *Cyathodes* is of a type resembling that of *Santalum* (see map 75). The majority of species is restricted to Tasmania and New Zealand. Endemic species are found in the Chatham and Society Is, Rapa, Hawaii, the Marianas, and the eastern tip of New Guinea. The Marianas species comes closest to one of the Hawaiian species, viz. *S. tameiameiae* (Cham.) F. v. M., which is also found on Nukuhiva (Marquesas). According to Dr. Sleumer the affinity of the Rapan and Society Is species has to be sought with the New Guinean and one of the New Zealandic species.

Habit: Similar to subg. *Leucopogon*, see map 170.

Habitat & Ecology: See under subg. *Leucopogon*. All the Pacific species have been collected at inland stations on open slopes, lavastreams, and volcanoes. One of the most important components of the upper vegetation zone of the high Hawaiian mountains.

Dispersal: The same as in subg. *Leucopogon*.

Sources: H. Sleumer, Blumea *12* (1963) 155—163 and personal information from him. Other sources: L. Rodway, Tasm. Fl. (1903) 113—115; A. J. Ewart, Fl. Vict. (1930); J. H. Moore, B. P. Bish. Mus. Bull. *102* (1933) 36; R. Kanehira, Bot. Mag. Tokyo *48* (1934) 734; F. B. H. Brown, B. P. Bish. Mus. Bull. *130* (1935) 218; H. H. Allan, Fl. New Zeal. *1* (1961) 514—518.

172. **Styphelia** subg. **Cyathopsis** (Brongn. & Gris) Drude

Name: Styphelia subg. **Cyathopsis** (Brongn. & Gris) Drude, in E. & P. Pfl. Fam. 4, *1* (1889) 78.

Family: *Epacridaceae.*

Notes: The only species of this subgenus is confined to New Caledonia.

Habit: Similar as subg. *Leucopogon*.

Habitat & Ecology: Restricted to the highest parts of New Caledonia, where it appears to be uncommon.

Dispersal: The fruit is a small drupe as in other *Styphelias*.

Source: A. Brongniart & A. Gris, Bull. Soc. Bot. Fr. *11* (1864) 66.

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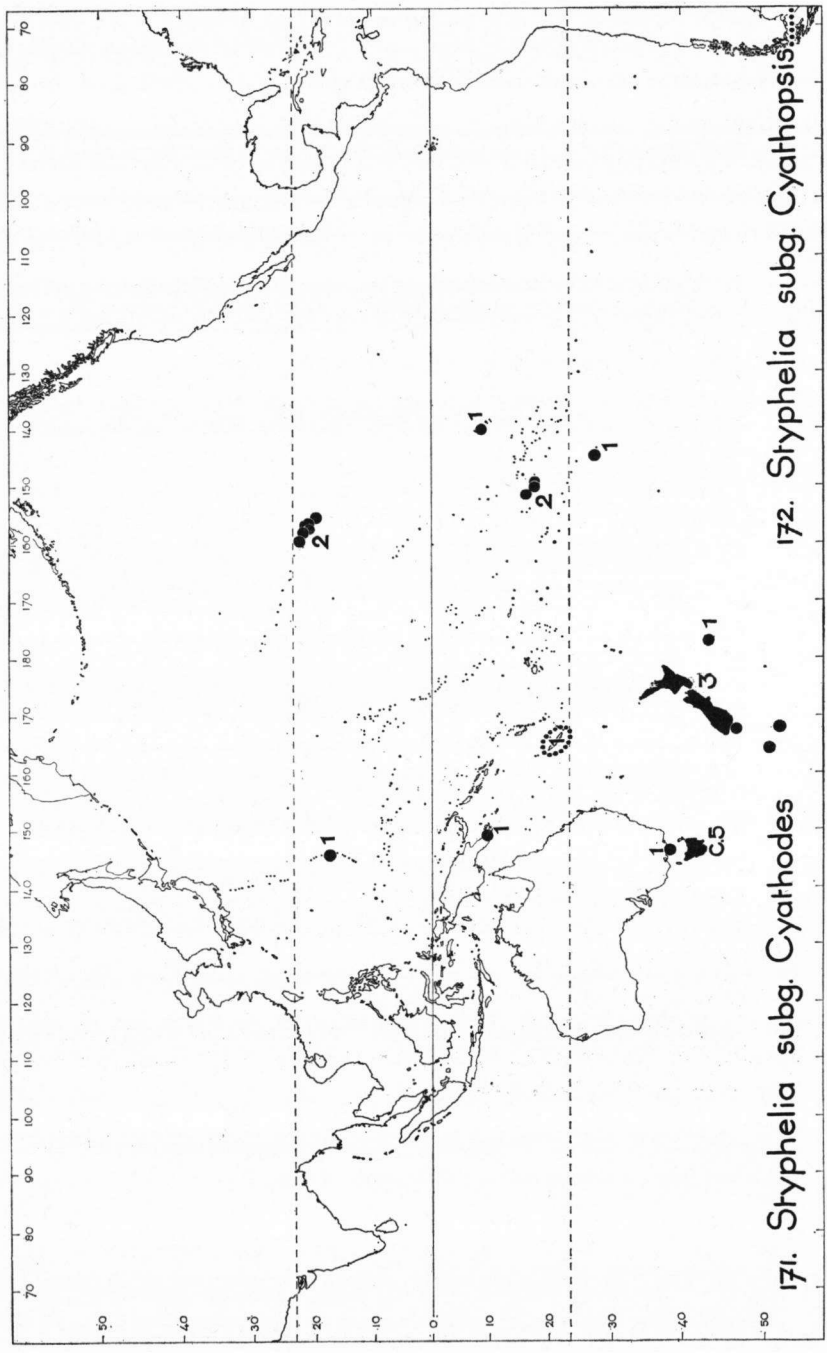
171. Styphelia subg. Cyathodes
172. Styphelia subg. Cyathopsis

173. Nyssa L.

Name: Nyssa Linné, Gen. Pl. ed. 5 (1754) 478.

Family: *Nyssaceae.*

Taxonomy and distribution: A small genus confined to eastern North America (4 species) and eastern Asia (2 species); a pattern of distribution found in a number of plant taxa, enumerated and discussed by Li (1952). In America the range of *N. sylvatica* Marshall is from Maine and the Great Lakes to Florida and Texas, with isolated localities in Mexico (Hidalgo, Puebla, and Chiapas), the other 3 species being confined to the SE. United States. In Asia *N. javanica* (Bl.) Wang. occurs from the Himalayas to Tonkin and Hainan and southwards to Malaya, Sumatra, Java, and Borneo; not recorded for the Indo-Chinese Peninsula. *N. sinensis* Oliv. is distributed from Kiangsu in the north to Kwantung and Kwangsi in the south, and Yunnan and Upper Burma in the west. There is good fossil evidence that species of *Nyssa* occupied most of the northern hemisphere in Tertiary times.
The *Nyssaceae* further comprise two monotypic Chinese genera.

Habit: Variable, the same species may be found as large forest-tree or as a dwarf-shrub along rivers and in swamps.

Habitat & Ecology: Plants dioecious or with polygamous flowers. Most species appear to be bound to very humid localities, the American species mostly in swamps along riverbanks, or as a member of the mixed mesophytic forest. In swamps of western Florida dwarfed *Nyssas* have been found. *N. sinensis* occurs in hilly stations throughout most of its range, where it is one of the upper-storey trees in the deciduous temperate forest. In the south it is found in evergreen subtropical forest. *N. javanica* is a component of montane forest under both everwet and periodically dry conditions ascending to 2400 m in the Himalayas and 1600 m in Malesia.
According to Eyde (1963, 6) the flowers attract many insects that may largely effect pollination, but there are indications for wind pollination as well.

Dispersal: The fruit is an ovoid to ellipsoid drupe averaging 1—2 cm in length but occasionally up to c. 4 cm. At maturity it turns purple or red. Birds are fond of the fruits and may be the most important dispersal agent. Rodents may also play a role.

Sources: J. Wasscher, Fl. Mal. I, *4* (1948) 29—31; H. L. Li, Trans. Am. Phil. Soc. n.s., *42* (1952) 371—429, map 35; C. W. Wang, The forests of China (1961), Publ. no. 5, Harvard Univ., Cambridge; R. H. Eyde, J. Arn. Arb. *44* (1963) 1—59, 7 maps, 5 pl.; R. H. Eyde & E. S. Barghoorn, ibid. 328—376.

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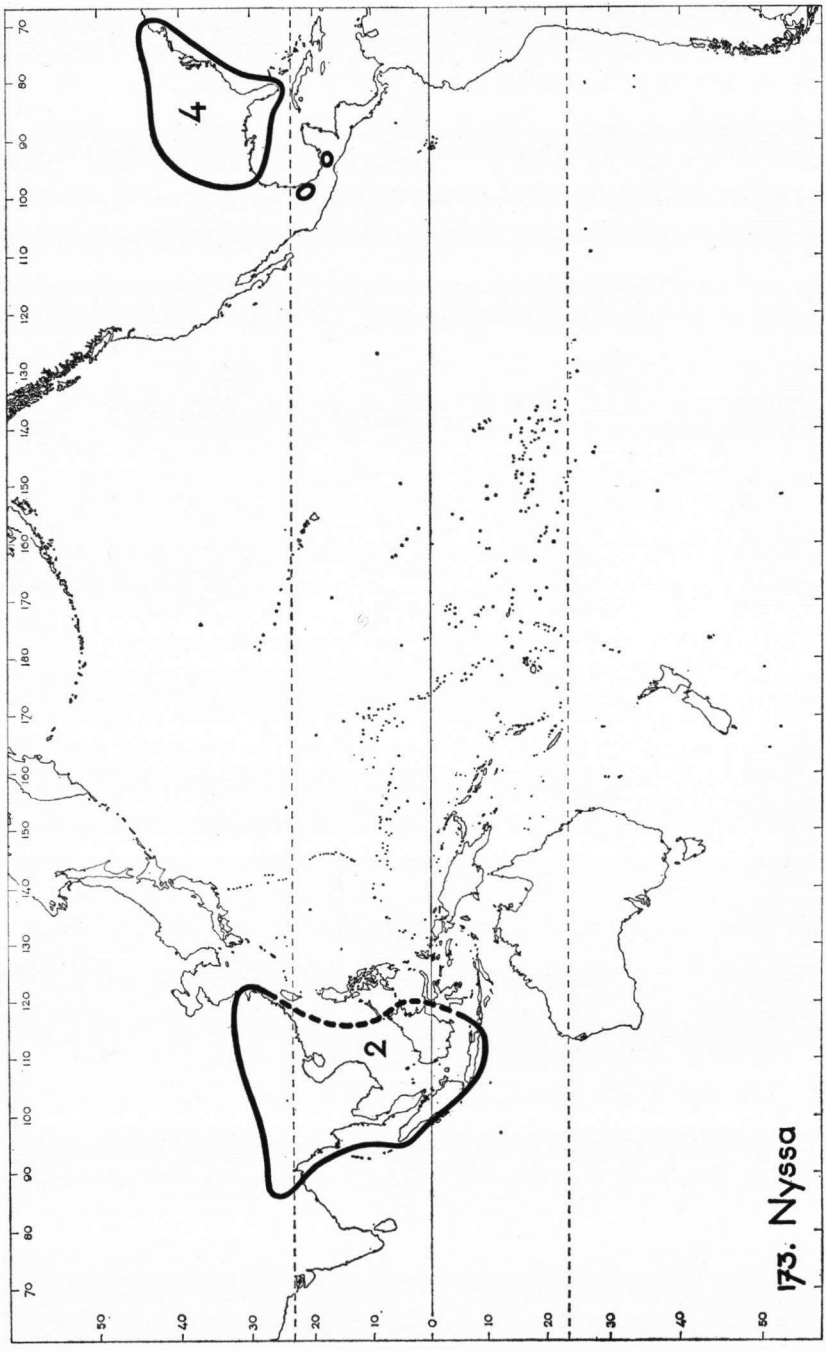
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173. Nyssa