

**DISTRIBUTION MAPS OF PACIFIC PLANTS**

174. *Eurya* Thunb.

**Name:** *Eurya* Thunb., Nova Genera Plantarum (1783) 68.

**Family:** *Theaceae*.

**Taxonomy and distribution:** A genus of c. 50 species with concentrations in China and New Guinea. Kobuski (1938) in his monograph recognized three subgenera and 53 species. Several species were described since but a number of others may have to be reduced. The subgenus *Ternstroemiopsis* comprises the two Hawaiian species, *Penteurya* which accommodates the majority of the New Guinea species was rejected by De Wit (1947) in his revision of the Malesian species.

Two other genera were in the past united with *Eurya* but are now recognized as distinct: *Cleyera* with one species from the Himalayas to Japan and c. 15 species from Mexico to Panama and *Freziera* (c. 38 species) confined to tropical America. A third genus of this amphipacific alliance was recognized by Airy Shaw (1937): *Symplococarpon* (9 species) which extends from Mexico to Colombia. Another allied genus is *Archboldiodendron* (New Guinea).

**Habit:** Medium-sized trees up to c. 20 m tall, at higher localities mostly shrubby, branches spreading, leaves distichous except in subg. *Ternstroemiopsis*. Most individuals have female flowers with only few bisexual flowers, male individuals are rare.

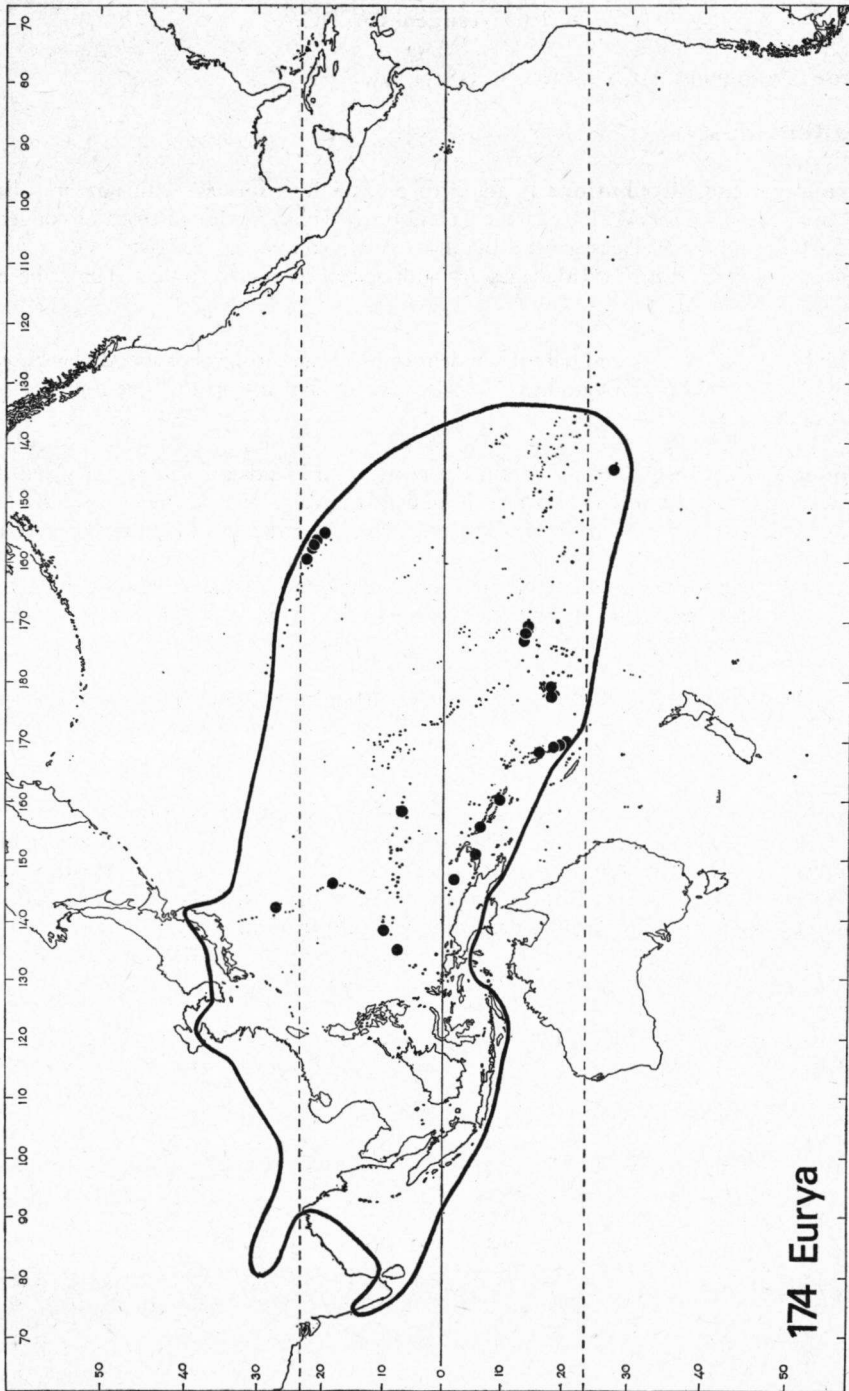
**Habitat and ecology:** Most species are common members of montane rain forest at altitudes between 1000—3000 m, some have been found in alpine shrubberies up to c. 4000 m (New Guinea). Others form part of the species-poor vegetation round craters. Some species are found in secondary thickets and may descend to near sea-level.

**Dispersal:** The fruits are dryish purple to black berries, 0.5—1 cm  $\varnothing$ , containing many small rugose seeds. They are eaten by birds.

**Map:** Localities have only been indicated in the Pacific.

**Sources:** H. K. Airy Shaw, Hook. Ic. 34 (1937) t. 3342; C. E. Kobuski, Ann. Mo. Bot. Gard. 25 (1938) 299—359; H. C. D. de Wit, Bull. Jard. Bot. Btzg III, 17 (1947) 329—375; Hsu Ping Sheng, Acta Phytotax. Sin. 9 (1964) 85—98. Numerous local floras and collections in the Rijksherbarium Leiden.

M. M. J. VAN BALGOOY.



175. *Nesogenes* A. DC.

**Name:** *Nesogenes* A. DC., Prod. 11 (1847) 703.

**Family:** *Verbenaceae*.

**Taxonomy and distribution:** A genus of perhaps four species, with puzzling distribution. *N. euphrasioides* A. DC. of the Tuamotus is widely separated from its congeners in E. Africa and the Malagasian area. Bentham & Hooker placed *Nesogenes* in the *Chloanthoideae*, between *Acharitea* (Madagascar) and *Sparothamnus* (Australia). The tribe as a whole centres in Australia.

**Habit:** Erect, up to c. 60 cm tall subsucculent or prostrate shrublets or woody herbs, with small opposite, linear to ovate leaves, flowers white, axillary up to three together on a short peduncle.

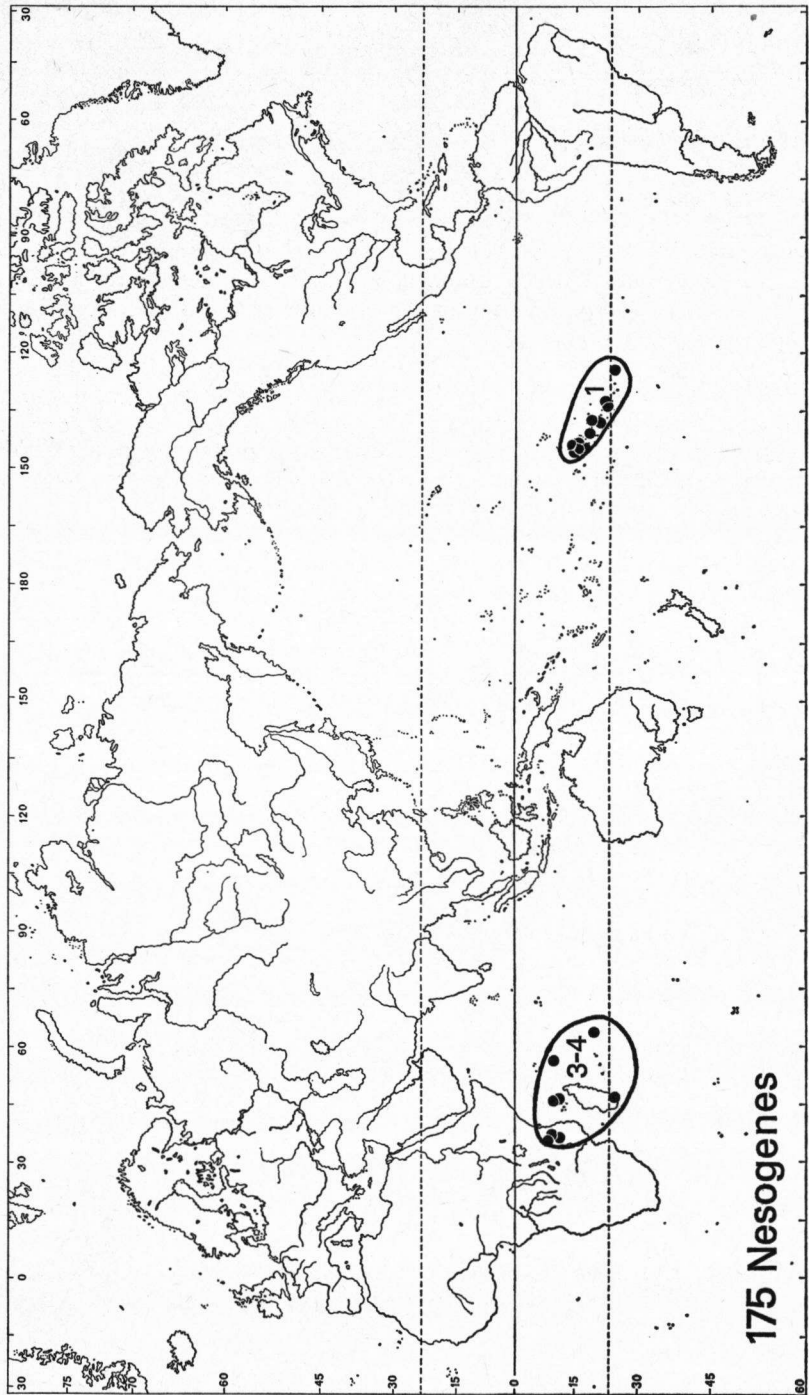
**Habitat and ecology:** Mostly confined to low coral islands on sandy, rocky soil near the sea, but one species has also been found in grassland at c. 400 m above sea-level (Tanganyika, E. Africa). On the whole rather rare, but where present often gregarious.

**Dispersal:** The fruit is a dry indehiscent capsule, a few mm in diameter, and it is enclosed by the persistent calyx. It contains 1—2 small seeds. Nothing is known about floating capacity or other means of dispersal.

**Note:** In the 'Dictionary of Australian genera' Miss Burbidge (1966) records *Nesogenes* for Whitsunday I., NE. Queensland. This is obviously in error for an islands of the same name in the Tuamotu Archipelago.

**Sources:** A. Gray, Proc. Am. Ac. Sc. 6 (1862) 51; Bentham & Hooker, Gen. Pl. 2 (1876) 1141; E. Drake del Castillo, Fl. Polyn. Fr. (1893) 151; W. B. Hemsley, J. Linn. Soc. Bot. 41 (1913) 311—316, 1 pl.; G. Taylor, J. Bot. 68 (1930) 84; J. Mildbraed, Notizbl. Berl.-Dahl. 11 (1933) 821; F. B. H. Brown, B. P. Bish. Mus. Bull. 130 (1935) 246. Dr. F. R. Fosberg (Washington) provided additional information.

M. M. J. VAN BALGOOY,



176. *Vicia menziesii* Sprengel

**Name:** *Vicia menziesii* Sprengel, Linn. Syst. Veget. ed. 16, 3 (1826) 267.

**Family:** Leguminosae (*Papil.*).

**Synonym:** *Vicia grandiflora* Smith, non Scop.

**Taxonomy:** *V. menziesii*, Hawaii Vetch, is closely allied to *V. gigantea* of North America and *V. nigricans* of South America. It may be separated from them by the length of the corolla and the absence of pellucid dots on the leaflets. *Vicia* with 100 to 150 species is the largest of the six genera in the *Vicieae*.

**Habit:** Coarse, strongly climbing, tendril-bearing, perennial? herb, with stems 3—5 mm thick; foliaceous stipules 20—30 by 10—20 mm; leaflets entire, 35—70 by 15—30 mm, 8—12 per leaf; flowers pale purple, drying yellow, 6—9 per raceme; corolla 25—30 mm, sharply curved; style flattened and upper portion encircled by soft hairs; seeds 5—6 mm  $\varnothing$ ; hilum circumlinear, occupying 75% of the seed circumference.

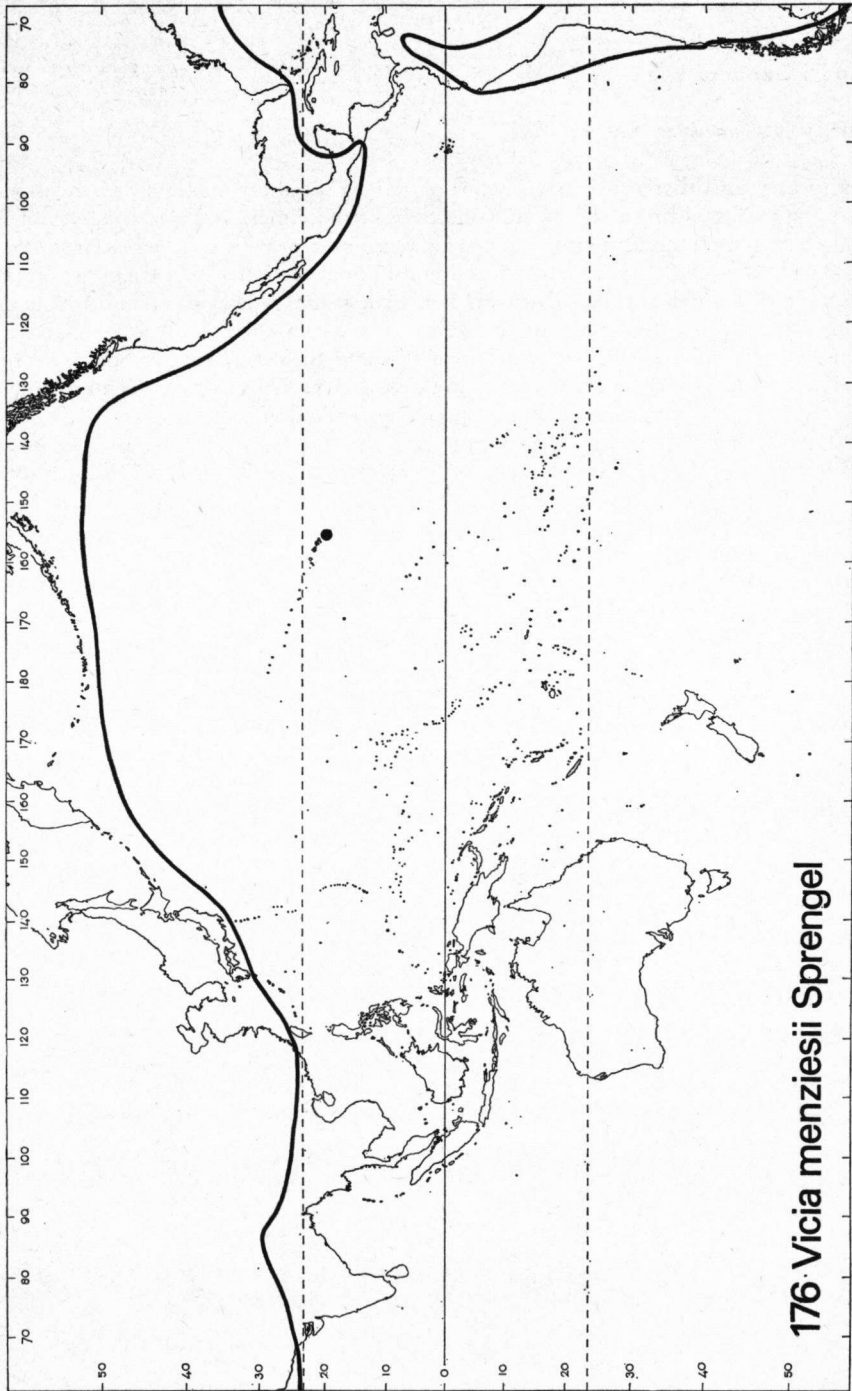
**Habitat:** Now extinct. Prior to 1920, restricted to the island of Hawaii on the forested slopes of Mauna Loa and Mauna Kea above 1800 m; climbing in shrubs in lava flow areas. This is the only species of *Vicia* in the Pacific. The last collection of this species was made in 1915. Apparently it was eradicated by feral goats and other foraging livestock that roamed the mountains. *Vicia* is essentially a north temperate genus, intrusions into the tropics are primarily depending on the presence of mountains.

**Dispersal:** The valves of the legume are thicker than usual in the genus. It is not known how much the valves twist during dehiscence. Based on observations of legumes of other species in the genera *Lathyrus* and *Vicia* the twisting should be minor. No information is available on the floating capacity of the legumes or seeds. The continental Vetches are dispersed by propulsion and by animals.

**Map:** The dot represents the locality of *V. menziesii*. The natural generic range of *Vicia* on the Northern hemisphere and S. America has been indicated by a line. Several cultivated species extend beyond this line.

**Sources:** C. R. Gunn in Degener & Degener, Fl. Haw. Suppl. Herbarium material from Bishop Museum, British Museum, Gray Herbarium, Linnean Herbarium, New York Botanical Garden, Smith Herbarium, and Smithsonian Institution.

C. R. GUNN.



176 *Vicia menziesii* Sprengel

177. *Gunnera* L.

**Name:** *Gunnera* Linné, Syst. Nat. ed. 12 (1767) 597; Mant. 1 (1767) 16.

**Family:** *Haloragaceae* (*Gunneraceae*).

**Taxonomy and distribution:** A genus of 30—50 species, pending a new revision on more numerous and more complete collections of the American representatives of sect. *Panke*. The genus is divided into 2 subgenera: *Ostenigunnera* with 1 species in Uruguay and SE. Brasil, and subg. *Gunnera*, which is divided into 3 sections. Sect. *Gunnera* comprises 13 species, 1 in Africa and Madagascar, 1 in Malesia and Melanesia, 1 in Tasmania and 10 in New Zealand of which 7 also in Stewart I. and 1 in Chatham I. Sect. *Misandra* has 3 species in South America, of which 1 in Falkland Is. Sect. *Panke* comprises 15 to 30 species of which 3 in Juan Fernandez, 1 in NE. and 1 in E. Brasil, 3 in Central America, and 7 in the Hawaii Is., the remaining species in the Andean range.

**Habit:** Perennial herbs, acaulous, often stoloniferous and small, or (sect. *Panke*) extremely robust with very large leaves and with a distinct stem up to 6 m high.

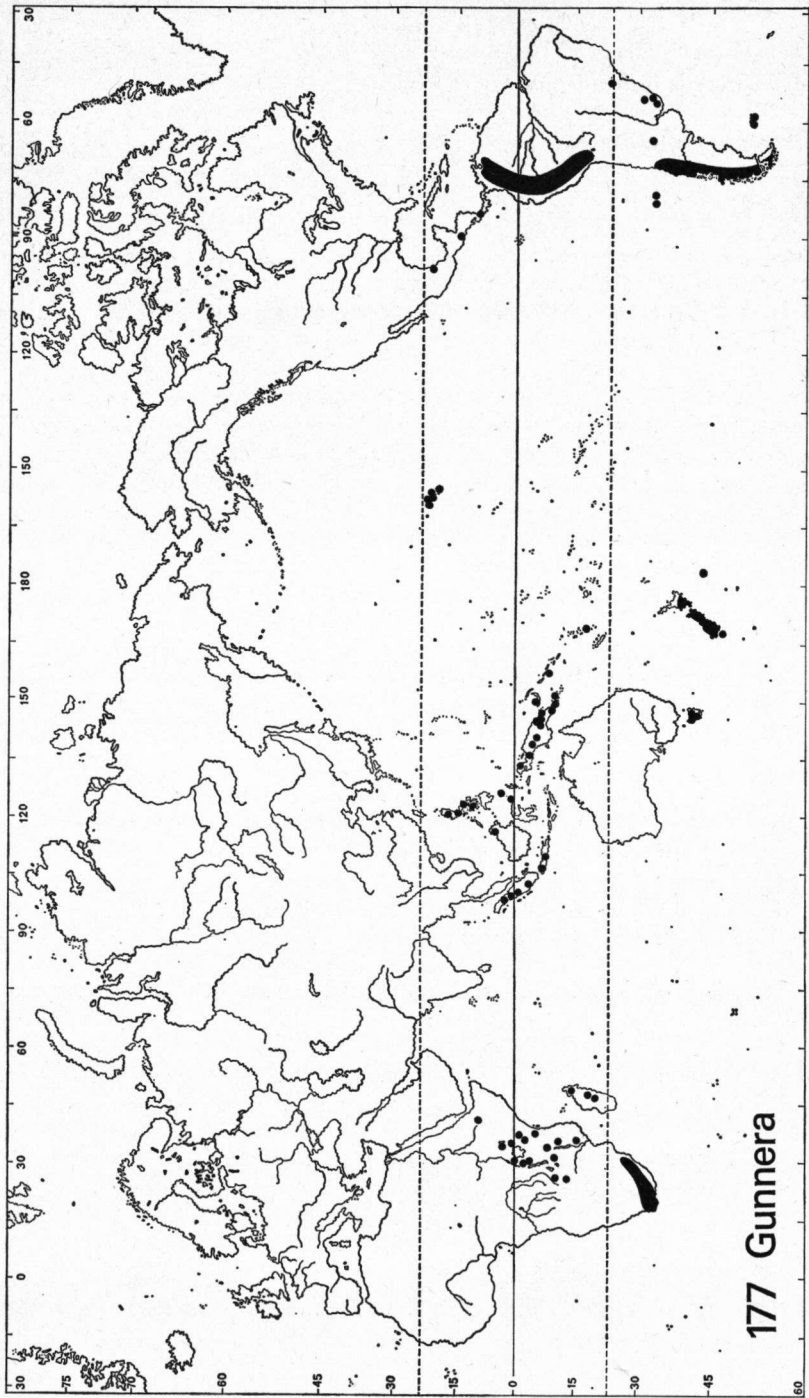
**Habitat and ecology:** Cold or cool, everwet localities, often on marshy soil, in the tropics only in the montane or even subalpine regions. Many species from both subgenera and all sections have a remarkable symbiosis with *Nostoc* species (*Cyanophyta*) which bring about N-fixation. In the African and Malesian species of *Gunnera* the same *Nostoc* species, *N. punctiforme* (Kütz) Hariot is found.

**Dispersal:** Fruit drupaceous or nut-like, yellow to red, mostly more or less fleshy or juicy, with a hard, 1-seeded stone, often numerous on dense, spike-like infrutescences.

**Sources:** F. J. W. Bader, Bot. Jahrb. 80 (1961) 281—293, from which I derived the information on the American species. A. Engler, Die Vegetation der Erde 9. Die Pflanzenwelt Afrikas III/2 (1921) 775. H. H. Allan, Fl. New Zeal. 1 (1961) 246—251. R. van der Meijden & N. Caspers, Fl. Mal. I, 7 (1971) 259—263.

R. VAN DER MEIJDEN.





178. *Heliconia indica* Lamk

**Name:** *Heliconia indica* Lamk, Encyl. I (1783) 426.

**Family:** *Musaceae* (*Strelitziaceae*).

**Synonym:** *Heliconia pako* A. C. Sm.

**Taxonomy and distribution:** The genus *Heliconia* consists of c. 50 species, all but the present one confined to America from Mexico and the West Indies to S. Brazil at 30° S.L. (Winkler, 1926, 1930). *H. indica* has often been confused with *H. bihai*, a neotropical species introduced as an ornamental in many tropical countries. Backer (1920) clearly pointed out the differences between the two species but apparently his paper was much overlooked. Conspicuous differences are the floral bracts which are bright red with a green and yellow margin in *H. bihai* and green in *H. indica*, the ovary is whitish and terete in *H. bihai*, yellow, orange or red, and trigonous in *H. indica*.

The greatest morphological diversity of *H. indica* is found in Melanesia (Fiji, Solomons), an endemic variety is recognized in the Solomons. Contrary to earlier opinions (e.g. expressed by Schumann, 1900) the species is certainly indigenous in the SW. Pacific. The exact natural boundary to the west is unknown. Probably it is still indigenous in the Moluccas and doubtfully so in Celebes. In the rest of Malesia it is apparently only found in cultivation.

**Habit:** Robust, tufted, suckering herb up to 7 m tall, with a pseudo-stem up to 4 m and banana like leaves. The inflorescence is terminal, usually pendulous, sometimes erect, often zig-zagging and bearing up to 20 floral bracts.

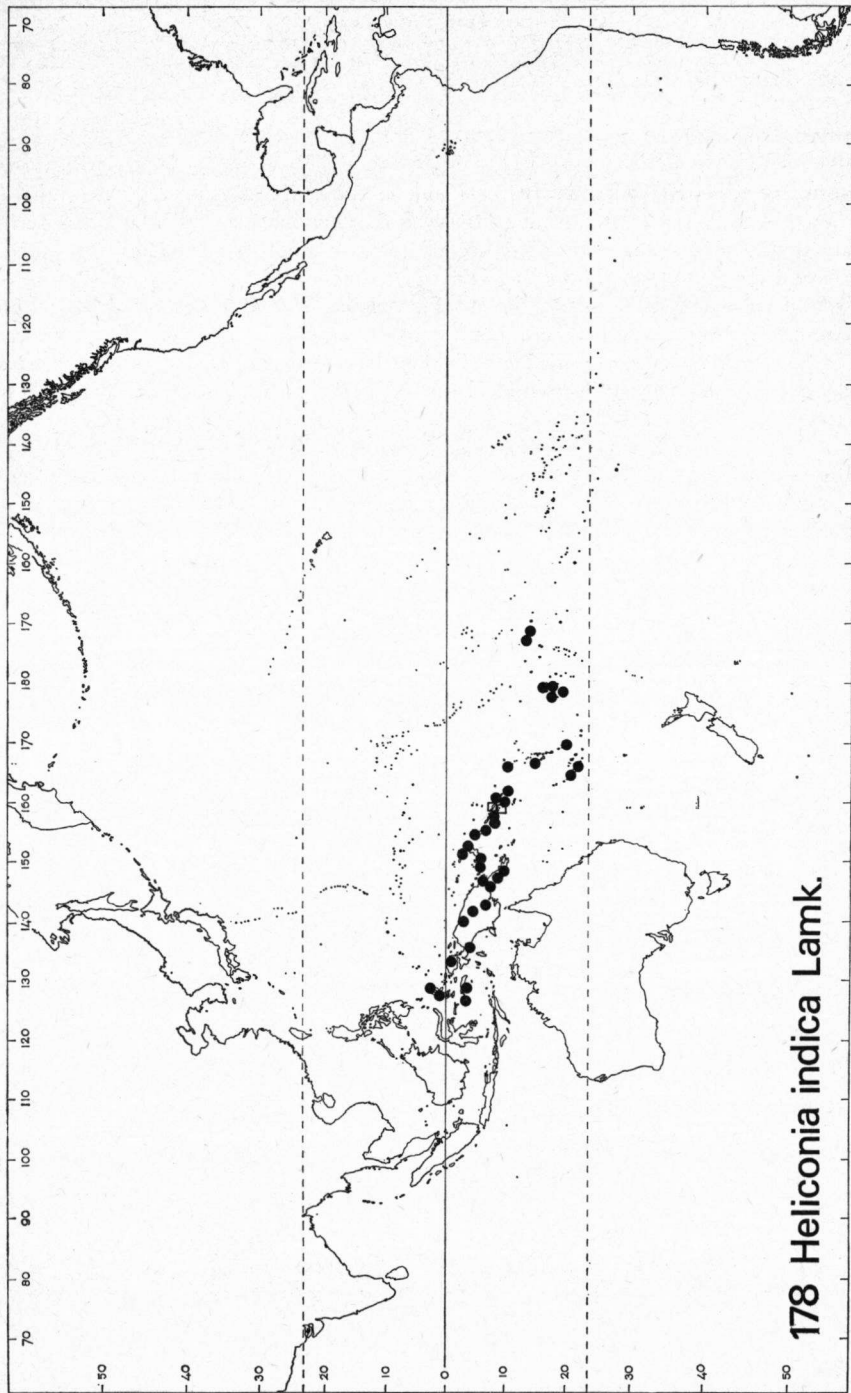
**Habitat and ecology:** Lowland rain forest, especially along river-banks and valleys, also in secondary forest, very common in Melanesia. Often cultivated as an ornamental and for its leaves which are used for wrapping and cooking.

**Fruit:** The ripe fruit is a yellow or orange to red, fleshy berry, up to 2 × 1.5 cm, containing 3 irregularly sculptured seeds 15 × 8 mm.

**Map:** The positively indigenous localities of *H. indica* have been indicated by dots, the localities of var. *lanata* Green by squares.

**Sources:** K. Schumann, Pfl. R., Heft 1 (1900) 33—40; C. A. Backer, Bull. Jard. Bot. Btzg. III, 2 (1920) 315—319; H. Winkler, Pflanzenareale 1. Reihe, Heft 2 (1926) map II; Ibid. in E. & P., Nat. Pfl. Fam. ed. 2, 15a (1930) 506—538; A. C. Smith, Contr. U.S. Nat. Herb. 37 (1967) 69—71; P. S. Green, Kew Bull. 23 (1969) 471—478. Collections of Kew, British Museum and Rijksherbarium Leiden.

M. M. J. VAN BALGOOY & P. S. GREEN.



179. *Trimenia* Seem.

**Name:** *Trimenia* Seem., Fl. Vit. (1871) 425, t. 99.

**Family:** *Trimeniaceae*.

**Taxonomy and distribution:** *Trimenia* and *Piptocalyx* (New Guinea, E. Australia) can best be placed in a separate family, *Trimeniaceae*. The alliance of this family is perhaps strongest with *Monimiaceae* but there are also distinct affinities with *Lauraceae*, *Chloranthaceae* and the Australian *Austrobaileyaceae*.

*Trimenia papuana* Ridl. is confined to E. Malesia, *T. neocaledonica* Bak. f. to New Caledonia. *T. weinmanniifolia* Seem. consists of the following subspecies: *bougainvilleensis* Rodenb. (Solomons), *weinmanniifolia* (Fiji and Samoa) and *marquesensis* (F. Brown) Rodenb. (Marquesas Is); the specimen from New Britain may represent a fourth subspecies.

**Habit:** Shrubs or small trees up to 10 m, with axillary or terminal few-flowered racemes. *T. neocaledonica* has bisexual flowers, *T. papuana* is polygamous, whereas *T. weinmanniifolia* is dioecious or monoecious.

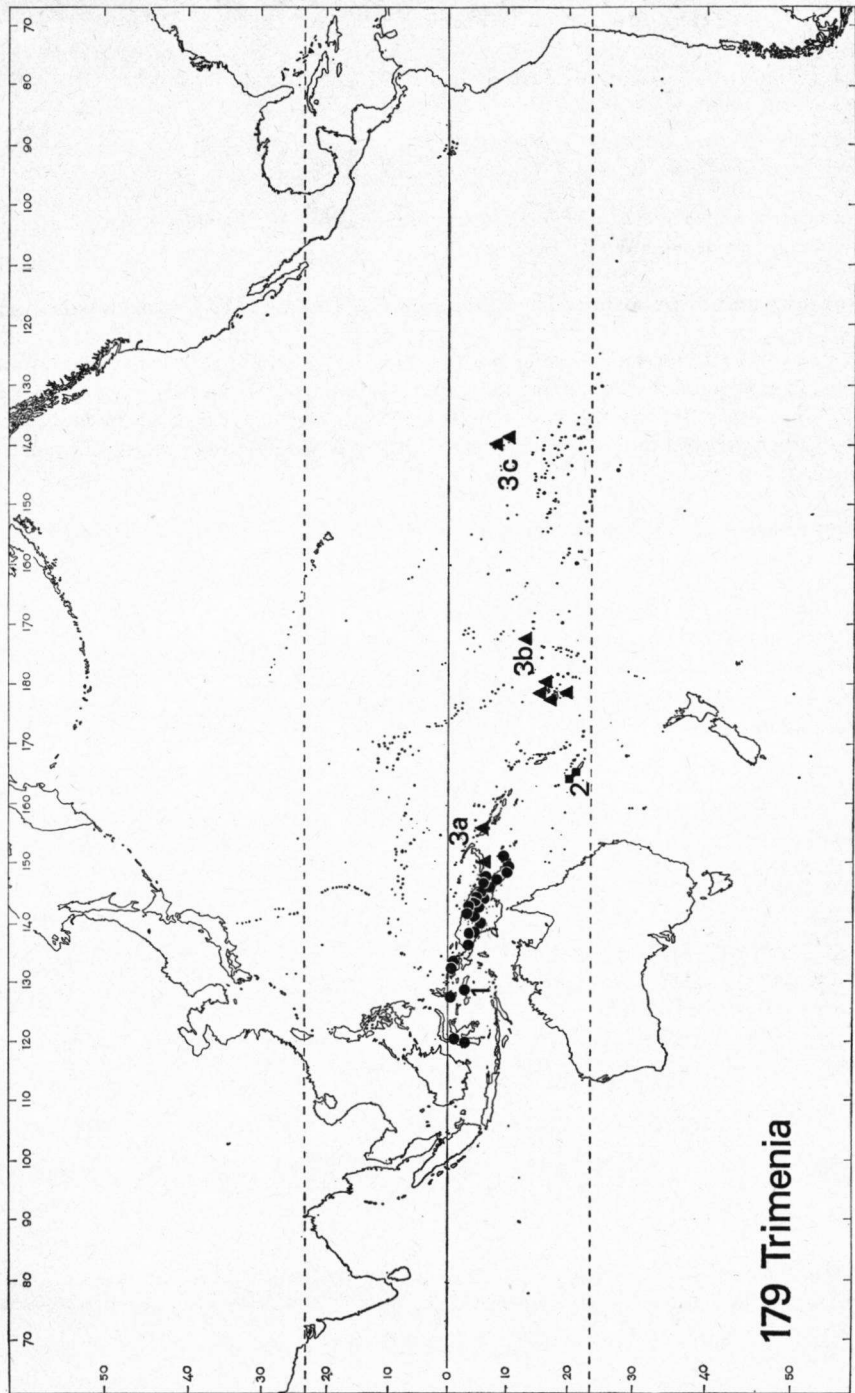
**Habitat and ecology:** In primary and secondary forest, common in New Guinea. In Malesia the altitudinal range is 1000—2700 m, in New Caledonia 360—1000 m, and in the rest of the Pacific 700—1700 m.

**Dispersal:** The ripe fruit is a juicy, red to purple berry, up to 7.5 × 5 mm, containing a single smooth to reticulate seed, 2—4 mm Ø.

**Map:** *T. papuana* is indicated with dots, *T. neocaledonica* with squares, *T. weinmanniifolia* with triangles (3a = ssp. *bougainvilleensis*, 3b = ssp. *weinmanniifolia*, 3c = ssp. *marquesensis*).

**Source:** W. F. Rodenburg, *Blumea* 19 (1971) 3—15.

M. M. J. VAN BALGOOY.



180. *Hedyotis romanzoffiensis* (Cham. & Schlechtend.) Fosb.

**Name:** *Hedyotis romanzoffiensis* (Cham. & Schlechtend.) Fosb., Occ. Pap. Bish. Mus. 13 (1937) 248.

**Family:** *Rubiaceae*.

**Synonyms:** *Kadua romanzoffiensis* Cham. & Schlechtend., *Gouldia romanzoffiensis* A. Gray, *Coprosma oceanica* W. R. B. Oliv.

**Taxonomy and distribution:** The large genus *Hedyotis* (incl. *Oldenlandia*) is widespread, especially in the tropics of both hemispheres. *H. romanzoffiensis* is so distinct that it is placed in a separate monotypic subgenus *Oceanica* by Fosberg (1943). It is very common in the Tuamotus and ranges westwards at least as far as the Tokelau Is.; reports from Niue I. and Ellice Is. are uncertain. It has been placed in other genera, e.g. in *Coprosma* (Oliver, 1935). Other strictly Polynesian subgenera of *Hedyotis* are *Kadua* (2 species, Hawaii) and *Polynesioties* (19 species, Hawaii, Society Is. and Rapa).

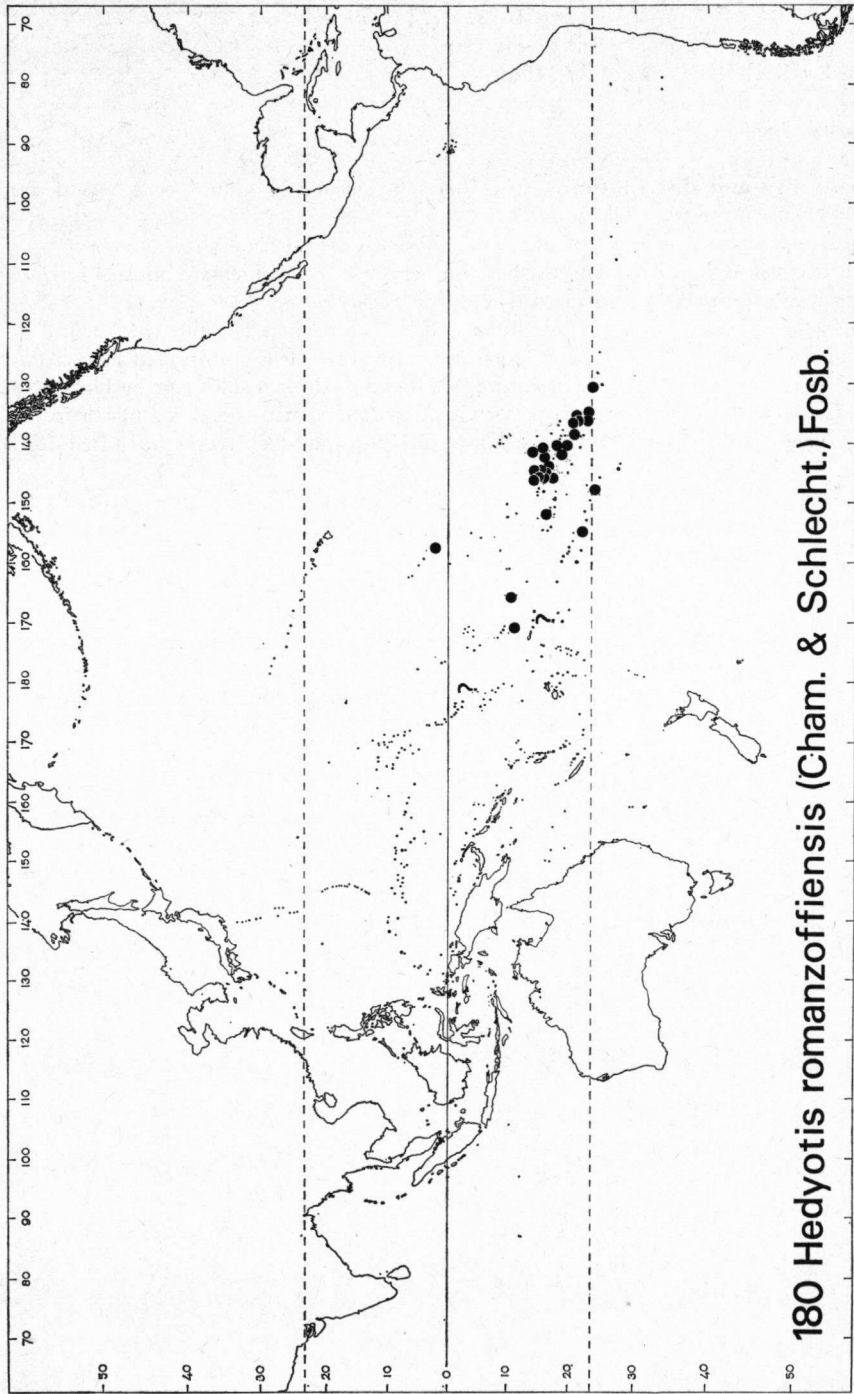
**Habit:** Erect small shrub, less than 1 m tall, with obovate fleshy leaves, inflorescence a 3-flowered terminal cyme, occasionally reduced to 1 flower, sometimes single flowers in upper axils. Flowers hermaphroditic, corolla pale green, fleshy, salver-shaped.

**Habitat:** The species is confined to coral islands and is found from 1—5 m above sea-level. Where present it is often common. Other strand plants restricted to small coral islands treated in this series are *Triumfetta procumbens* Forst. f. (Pac. Pl. Ar. 1, 1963, map 11), *Suriana maritima* L. (Pac. Pl. Ar. 2, 1966, map 35), and *Pisonia grandis* R. Br. (ibid., map 66).

**Dispersal:** The fruit is white to purple, c. 2 cm  $\varnothing$ , with slightly sclerified endocarp and thick spongy mesocarp. Fruit dehiscent loculicidally across disk, seeds angular, black. The thick aerenchymatous tissue suggests floating capacity. The fruits are also reported to be eaten by pigeons.

**Sources:** F. B. H. Brown, B. P. Bish. Mus. Bull. 130 (1935) 287, 288; W. R. B. Oliver, ibid. 132 (1935) 142; F. R. Fosberg, Occ. Pap. B. P. Bish. Mus. 13 (1937) 248—250; Ibid., B. P. Bish. Mus. Bull. 174 (1943) 67—69.

M. M. J. VAN BALGOOY.



180 *Hedyotis romanzoffensis* (Cham. & Schlecht.) Fosb.

181. *Bischofia javanica* Bl.

**Name:** *Bischofia javanica* Bl., Bijdr. (1826) 1168.

**Family:** *Euphorbiaceae*.

**Taxonomy and distribution:** Apart from *B. javanica* another species was described from China, *B. racemosa* Chen & Chu.

*Bischofia* was placed in a separate family *Bischofiaceae* by Airy Shaw (1965) on account of the three-foliolate leaves and the fleshy indehiscent fruit which are unusual for *Euphorbiaceae*. Whitmore (1972) classified it with the *Staphyleaceae*.

*B. javanica* ranges widely from India and the Himalayas far into the Pacific, but is absent from Ceylon, Malaya, and large parts of Borneo. It is common at least as far east as Samoa and Tonga. In older literature it is mentioned for Tahiti, e.g. by Drake (1893). Wilder (1931) states that the record for Cook by Cheeseman (1903) is a misidentification for *Allophylus* (*Sapind.*), but Airy Shaw (in litt.) found correctly identified *Bischofia* from Rarotonga.

In many Pacific islands a red dye is extracted from the fruits (Zepernick, 1967).

**Habit:** Large, more or less deciduous tree.

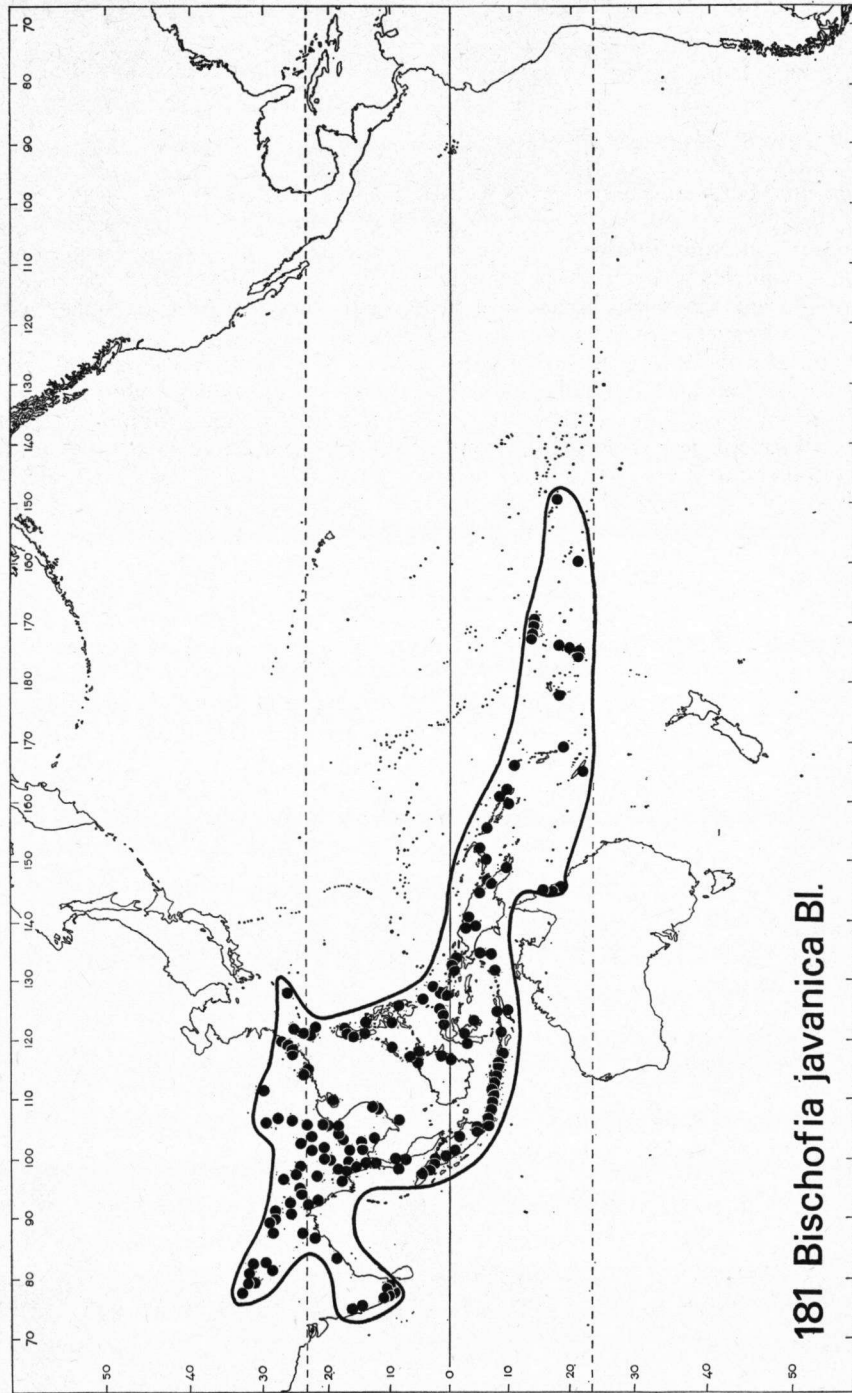
**Habitat and ecology:** In primary lowland forest, along river-banks, also in swamps, apparently demanding a good water supply (Airy Shaw, 1967), but also on hill tops.

**Dispersal:** Fruit fleshy, indehiscent, up to 1.5 cm long, containing 3—6 shining, dark brown seeds.

**Sources:** E. Drake del Castillo, Flore Polyn. Fr. (1893) 182; T. F. Cheeseman, Trans. Linn. Soc. Lond., Bot. 6 (1903) 295; G. P. Wilder, B. P. Bish. Mus. Bull. 86 (1931) 70; H. K. Airy Shaw, Kew Bull. 18 (1965) 252—254; *ibid.* 21 (1967) 327—329; B. Zepernick, Willdenowia Beih. 5 (1967); T. C. Whitmore, Tree Fl. Malaya 1 (1972) 446. Continental Asiatic localities were supplied by Dr. H. R. Fletcher (Edinburgh) and Mr. H. K. Airy Shaw (Kew), the Australian ones by the late Mr. L. S. Smith.

M. M. J. VAN BALGOOY & E. F. DE VOGEL.





182. *Maranthes* Bl.

**Name:** *Maranthes* Bl., Bijdr. (1825) 89.

**Family:** *Rosaceae* (*Chrysobalanaceae*).

**Synonyms:** For complete synonymy see Kostermans (1965).

**Taxonomy and distribution:** A genus of 11 species with a disjunct area, the centre of which is tropical Africa with 10 species, while one species, *M. corymbosa* Bl., ranges from Tenasserim and Peninsular Thailand over Malesia and tropical N. Australia to the Pacific, where it is known from the Palau Is., the Bismarck Archipelago, D'Entrecasteaux Is., the Louisiades, the Solomons and the Santa Cruz Is. This species is also known from 3 collections in Panama (Prance, 1968, 1972). It is there found in undisturbed forest, but Prance stated that the forests in this area have been subject to regular disturbance in the past, as Panama is part of an old land-route. He thinks it probably introduced, but for what reason is not clear. The wood is not commonly used in Malesia, as it is too hard and too heavy while no other parts of the plant are used and the collections from Panama are from big trees, so that it is possible that this species is native here.

**Habit:** *Maranthes corymbosa* is a tree up to 40 m and a trunk diameter up to 160 cm.

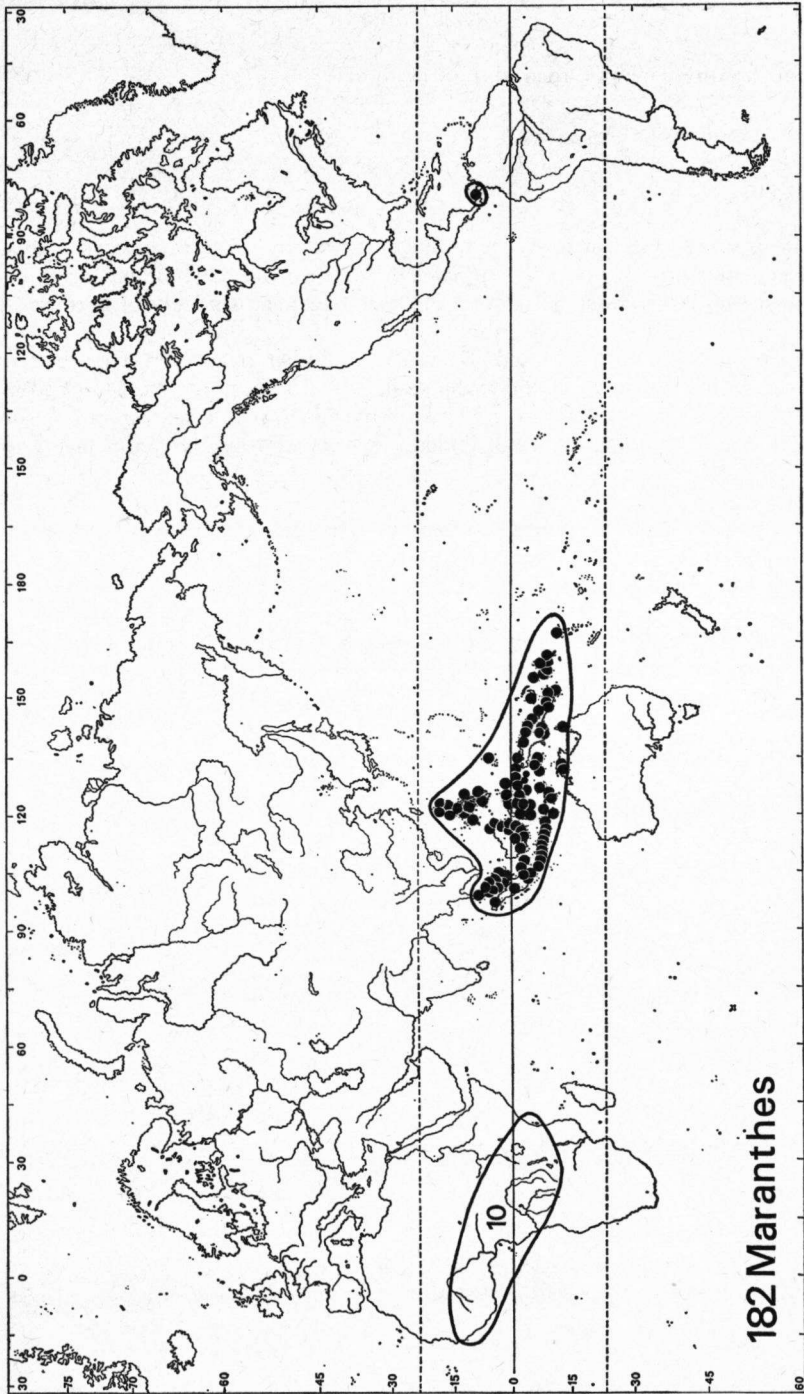
**Habitat and ecology:** *M. corymbosa* is a forest dweller and is found on all kinds of soil.

**Dispersal:** The black fruit of *M. corymbosa* is eaten by hornbills and flying foxes. The first are capable of keeping large fruits for a long time in the intestinal tract; when fed with c. 2.5 cm long fruits of *Chrysobalanus icaco* it took for the first seeds of 1.25 cm c. 10 hours, for the last seeds 20 hours to be excreted (Ridley, 1930). The fruit of *M. corymbosa* is up to 4 cm long, with a fleshy, sweet exocarp of only c. 1 mm thick.

**Map:** Only the localities of *M. corymbosa* have been indicated.

**Sources:** H. N. Ridley, *Dispersal* (1930) 400, 448; A. J. G. H. Kostermans, *Candollea* 20 (1965) 103—142; G. T. Prance, *Brittonia* 20 (1968) 203, 204; *Fl. Neotr.* 9 (1972) 201, 202.

E. F. DE VOGEL.



183. *Treubia* Goeb.

**Name:** *Treubia* Goeb., Organ. d. Pfl. (1930) 911.

**Family:** *Treubiaceae*.

**Synonym:** *Apotreubia* Hatt. & Mizut.

**Taxonomy and distribution:** The monogeneric family *Treubiaceae* occupies an isolated position within the *Metzgeriales* (*Hepaticae*). The genus as a whole has more or less a circumpacific distribution, but one of the two subgenera is mainly of northern Pacific, the other of southern Pacific distribution. Of subgenus *Apotreubia* one species is known from Assam, Formosa, Japan and W. Canada, another from New Guinea. Subgenus *Treubia* has one species extending from Malesia to Samoa (the populations from New Caledonia, Fiji, and Samoa are considered distinct subspecies); another species is known from Tasmania and New Zealand. Endemic species are found in Tasmania, Tahiti and Chile.

**Habit:** Intermediate in structure between leafy and thallose hepatics.

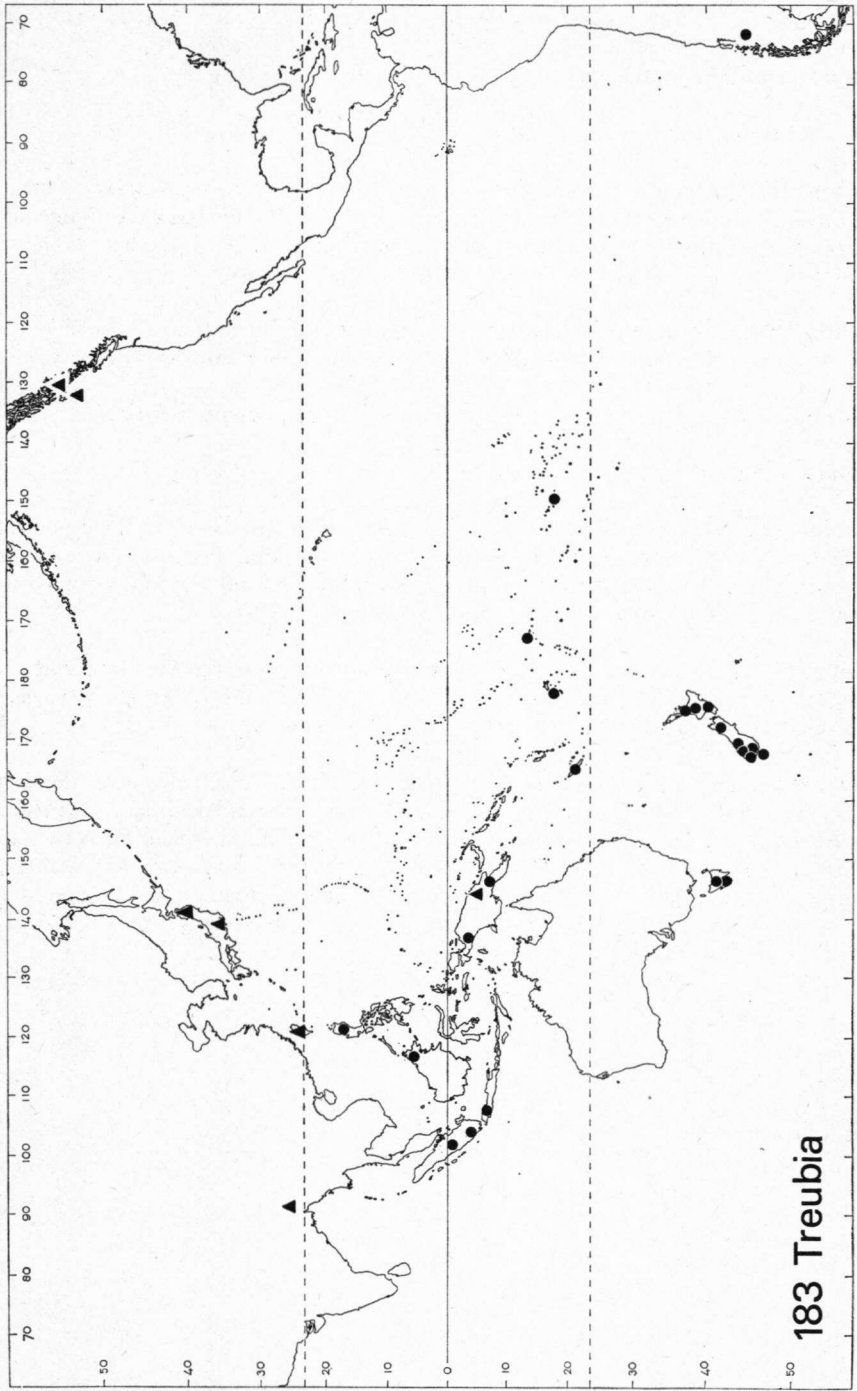
**Habitat and ecology:** Usually in shaded places with constant high air humidity, but some species are able to survive short dry periods. In primary forest, sometimes along roads, on rocks, stems or exposed soil, also in trickles of running water. In Malesia found between 1600 and 3600 m, in the Pacific at 500—1700 m, in temperate regions even lower to near sea-level.

**Dispersal:** Reproduction is by spores and gemmae.

**Map:** Localities of subgenus *Apotreubia* are indicated by triangles and those of subgenus *Treubia* by dots.

**Sources:** S. Hattori, A. J. Sharp, M. Mizutani, Z. Iwatzuki, *The Bryologist* 69 (1966) 488—492; R. M. Schuster & G. A. M. Scott, *J. Hattori Bot. Lab.* 32 (1969) 219—268. Collections of the Rijksherbarium Leiden.

M. M. J. VAN BALGOOY & E. F. DE VOGEL.



184. *Montia fontana* L.

**Name:** *Montia fontana* L., Sp. Pl. (1753) 87.

**Family:** *Portulacaceae*.

**Synonyms:** *M. fontana* ssp. *chondrosperma* (Fenzl) Walters, var. *chondrosperma* Fenzl, ssp. *intermedia* (Beeby) Walters, var. *intermedia* Beeby, ssp. *rivularis* (Gmelin) Schuebler & Martens, ssp. *variabilis* Walters, *M. lamprosperma* Cham., *M. limosa* Decher, *M. lusitanica* Sampaio, *M. minor* Gmelin, *M. rivularis* Gmelin, *M. verna* Neck.

**Taxonomy:** The genus *Montia* is unsatisfactorily delimited against *Claytonia* L. *M. fontana* forms a distinct species. In the opinion of some authors *Montia* is monotypic.

**Distribution:** In temperate regions of both hemispheres, except S. Africa.

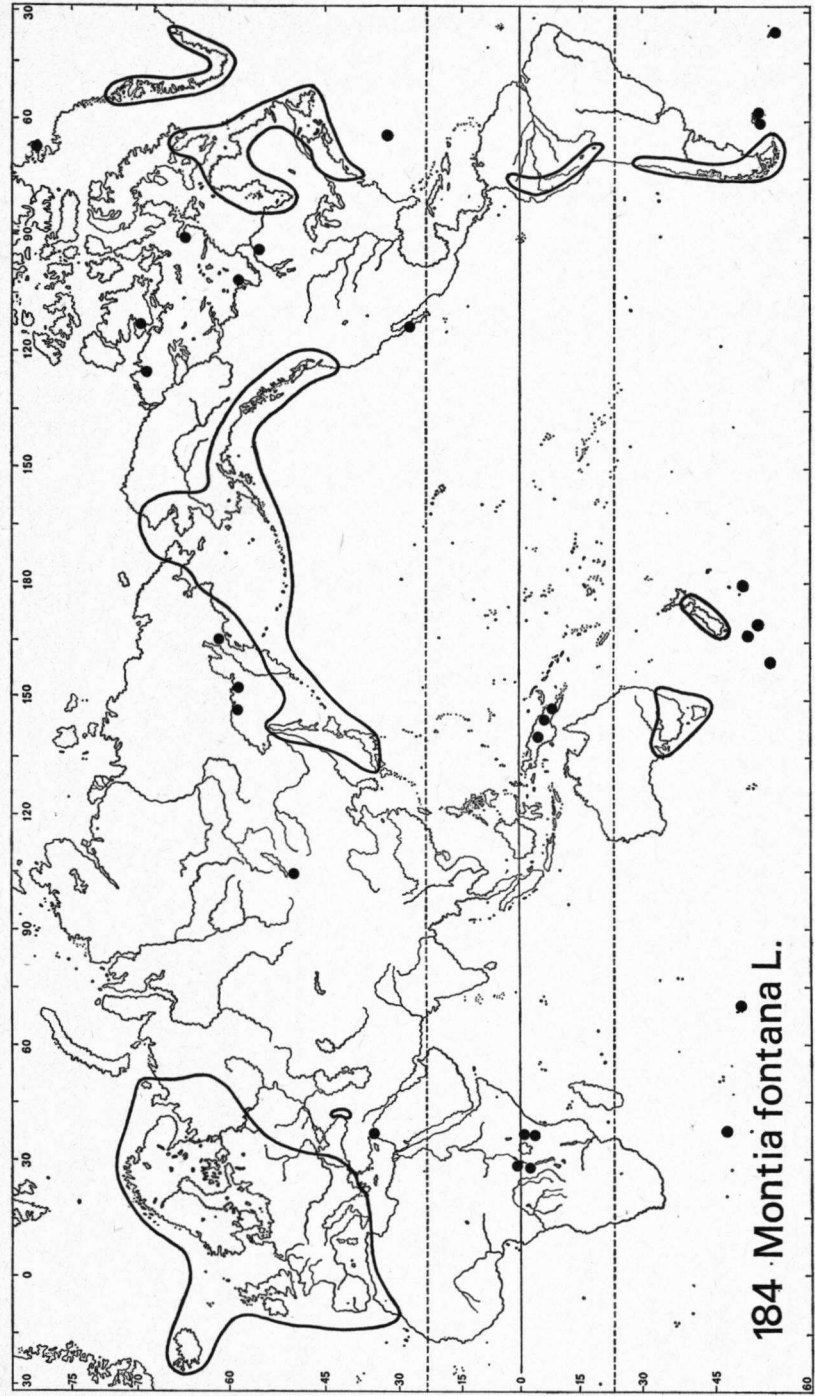
**Habit:** Annual, erect or prostrate, creeping herbs.

**Habitat and ecology:** Along rivulets, in marshes, wet grasslands, in dune pools. According to Walters (1964) *M. fontana* is probably calciphobe. In temperate zones from sea-level up to the subalpine region, in Malesia (New Guinea) at 3600 m, in Africa at 3800 m (Lake Edouard) and 4600 m (Kilimanjaro).

**Dispersal:** The stems easily root and break off, they can be transported by rivulets. The fruit is a valved capsule. Seeds 1—3, c. 1 mm Ø, with a smooth (in race '*fontana*') or tubercled surface (in the races '*chondrosperma*' and '*rivularis*').

**Sources:** J. D. Hooker, Handb. New Zeal. Fl. (1864) 26; L. Hauman, Fl. Congo Belg. Ruanda-Urundi 2 (1951) 126; E. Hultén, Kungl. Sv. Vet. Akad. Handl. (1958) 239; Fl. Alaska (1968) 410; P. A. Munz, Calif. Fl. (1959) 301; H. H. Allan, Fl. New Zeal. 1 (1961) 220; A. Lourteig & P. Cour, C.N.F.R.A. 3 (1963) map 7; S. M. Walters, Fl. Europ. 1 (1964) 114; O. Hedberg, Acta Phytogeogr. Suec. (1964) 119, 127, 129; H. Meusel, E. Jäger & E. Weinert, Vgl. Chorol. Zentr. Europ. Fl. (1965) map 136a; M. J. Coe, Ecol. Mt. Kenya (1967) 45.

R. GEESINK.



185. *Pterostylis* R. Br.

**Name:** *Pterostylis* R. Br., Prod. Fl. Nov. Holl. (1810) 326.

**Family:** *Orchidaceae*.

**Taxonomy and distribution:** A genus of about 100 species. Most species are found in Australia, Tasmania, and New Zealand, also known from Lord Howe I. (Hoogland, in litt.), Chatham, New Caledonia, New Guinea, and Ceram.

**Habit:** Small terrestrial herbs, with more or less uniform appearance (the flowers are rather alike in structure).

**Habitat and ecology:** In the tropics at high altitudes (up to 3600 m in New Guinea), in the temperate regions from sea-level into the mountains, mostly on humid, occasionally also in dry places.

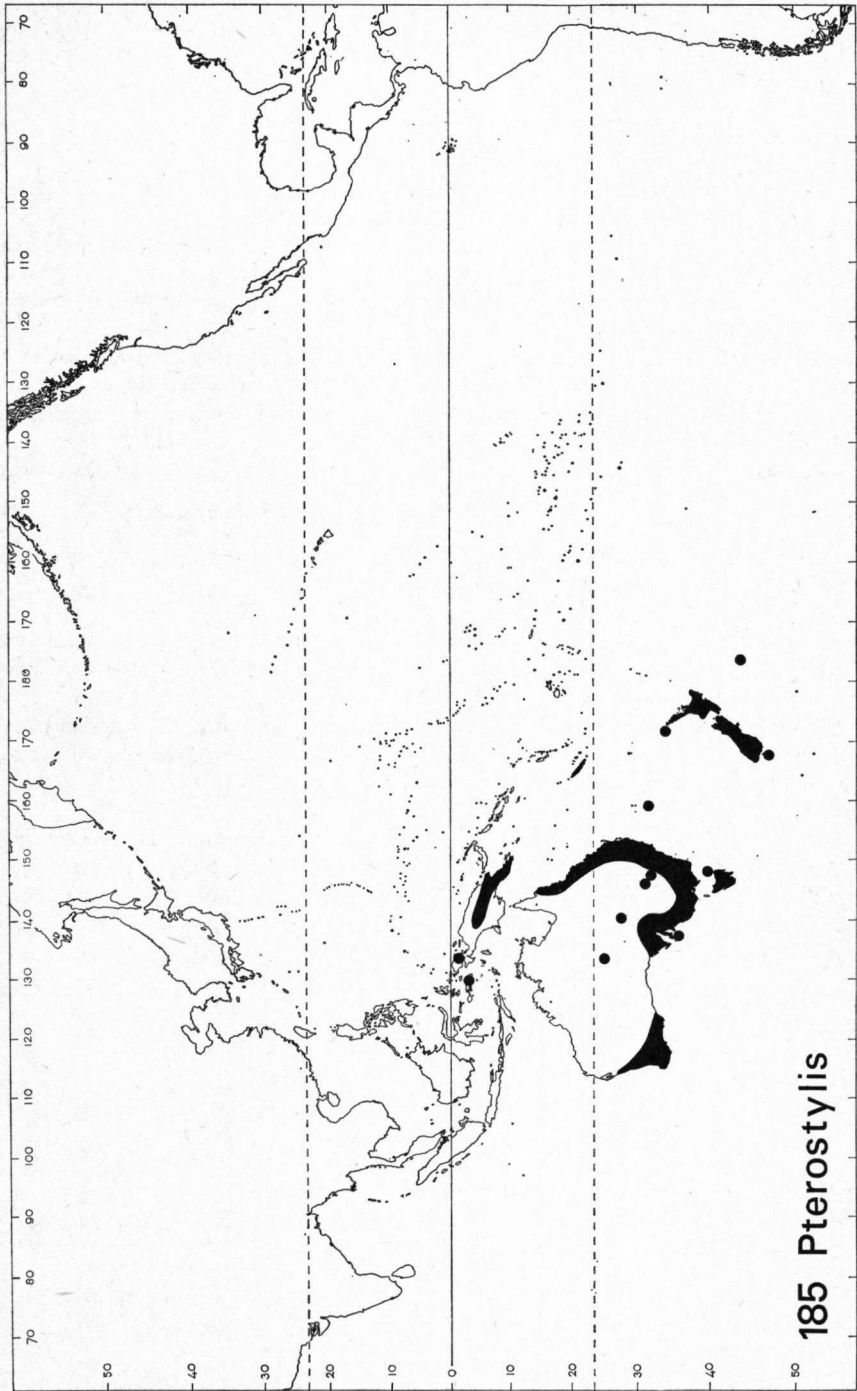
The flowers have an ingenious way to trap insects (gnats and mosquitoes) for fertilisation. At the base of the lip nectar is secreted. The lip is very sensitive, when touched by an insect it immediately closes the opening of the hood. The only way to escape is between the wings of the column, where the insect comes into contact with pollinia. The stigmas are rather broad, an insect that is struggling for freedom in the closed flower will come into contact with it, and so pollinates the flower.

**Dispersal:** The 'dust-seed' is probably dispersed by wind.

**Sources:** H. M. R. Rupp, Proc. Linn. Soc. N. S. W. 58 (1933) 421—428; R. Erickson, Orchids of the West, ed. 2 (1965) 35—43; L. Cady, *Pterostylis*, an illustrated check-list of the genus *Pterostylis* (Orchid.), Austr. Pl. 5 (1969) 60—91. Various local floras. Collections in the Rijksherbarium Leiden.

E. F. DE VOGEL.





186. *Vitex trifolia* L.

**Name:** *Vitex trifolia* L., Sp. Pl. (1753) 638.

**Family:** *Verbenaceae*.

**Taxonomy and distribution:** The genus *Vitex* is of pantropical distribution, some species extending to the subtropical parts of Europe and Asia.

*Vitex trifolia* ranges from India to Japan in the north, New South Wales in the south and Hawaii and SE. Polynesia in the east. Outside this native area the species is often cultivated (California, Florida, S. Africa and W. Europe) and may locally run wild (Afghanistan, Kenya and Madagascar).

The subspecies *littoralis* Steen. is sometimes regarded as a distinct coastal species. It is characterized by its radiating rooting branches with small erect lateral shoots. According to Ridley (1930) specimens transplanted to inland stations develop the normal erect habit, but Corner (1939) observed no change in habit after transplantation.

Several varieties have been distinguished, mostly of wide distribution; only var. *variegata* Mold. is apparently limited to Hawaii.

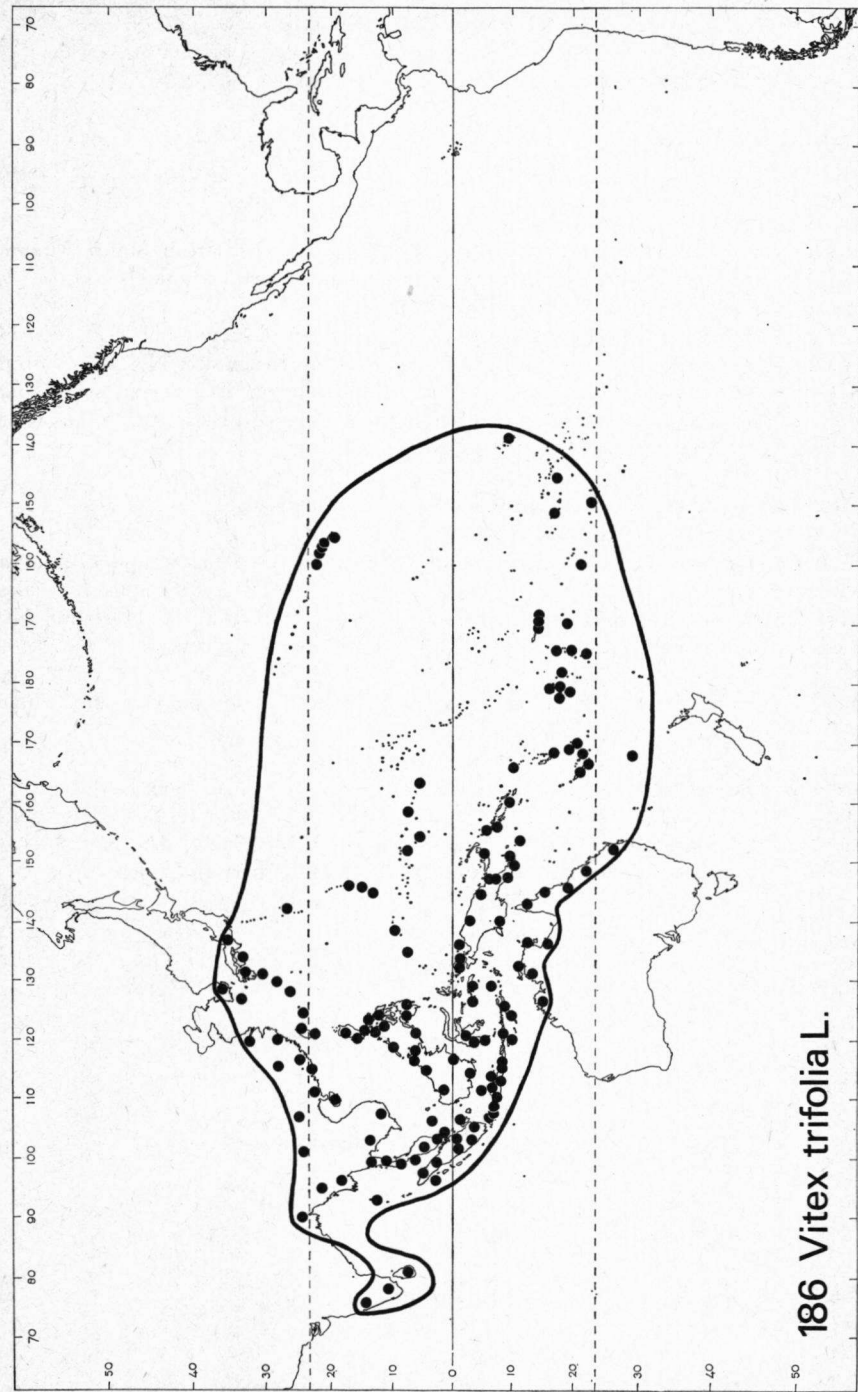
**Habit:** Erect bushy shrubs to medium-sized trees (ssp. *trifolia*) or prostrate shrubs (ssp. *littoralis*).

**Habitat:** Various: beaches, dunes, grasslands, open places, along streams, secondary and primary forest; up to c. 900 m in Fiji and at 1200—2000 m in New Guinea (in cultivation).

**Dispersal:** The small drupe with its light corky pericarp is found in river- and beach-drift. The wide distribution is ascribed to dispersal by sea-currents, but also dispersal by pigeons may play a role locally (Ridley, l.c.).

**Sources:** H. J. Lam, The Verbenaceae of the Malay Archipelago, Thesis Groningen, 1919; H. N. Ridley, Dispersal (1930) 309; E. J. H. Corner, Gard. Bull. Str. Settl. 10 (1939) 256—260; H. N. Moldenke, The known geogr. distr. of the members of the Verbenaceae, New York, 1949; Phytologia 4 (1952) 65—88; Ibid. 8 (1961) 61—95; C. G. G. J. van Steenis, Blumea 8 (1957) 514—517. Collections in the Rijksherbarium Leiden.

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187. *Drapetes* Banks ex Lamk

**Name:** *Drapetes* Banks ex Lamk, J. Hist. Nat. Paris 1 (1792) 188.

**Family:** *Thymelaeaceae*.

**Synonym:** *Kelleria* Endl.

**Taxonomy and distribution:** The genus was first described from South America. The Old World species were originally not considered to belong to the same genus. See Ding Hou (1960) for a complete historical account.

*D. ericoides* Hook. f. is found in Borneo (Mt. Kinabalu) and New Guinea, *D. tasmanica* Hook. f. occurs in Tasmania and the summit area of Mt. Kosciusko, N.S.W., Australia (McLuckie & Petrie, 1927), according to Dr. J. H. Willis (in litt.) one of several taxa showing this distribution; five species are restricted to New Zealand, one to Fuegia and the Falkland Is. (Moore, 1968).

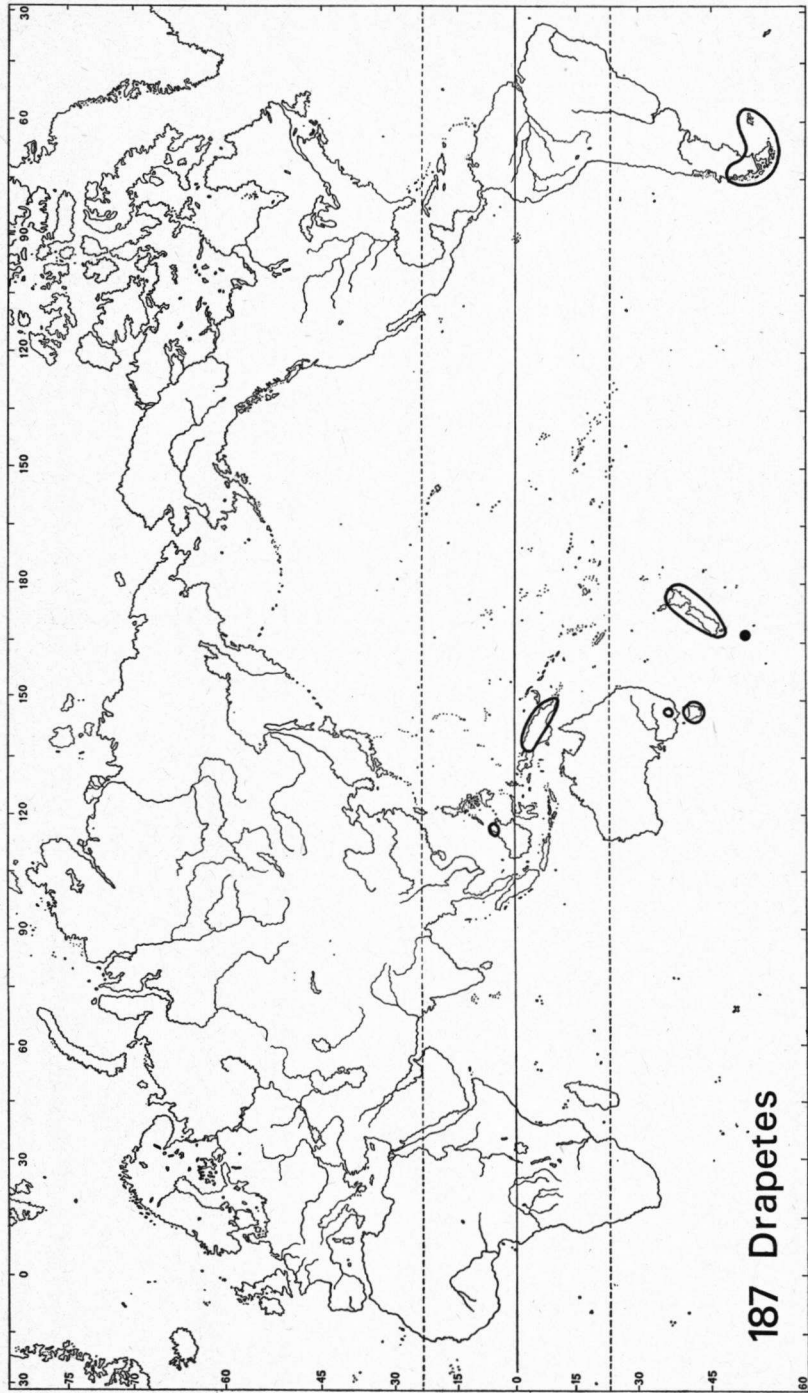
**Habit:** Prostrate to erect, ericoid shrublets, often forming mats.

**Habitat and ecology:** All species are found in wet exposed places under montane, subalpine or alpine conditions, usually in grassland or bogs on granitic soils. In Malesia they are confined to the highest mountains, the lowest locality being Lake Habbema, New Guinea, at 2800 m. The species at high latitudes descend to low altitudes.

**Dispersal:** The fruit is a drupe up to 2 mm  $\varnothing$  with a thin fleshy pericarp and contains a single seed, enclosed by the endocarp.

**Sources:** C. Skottsberg, Kungl. Sv. Vet. Akad. Handl. 56, 5 (1916) 269; I. McLuckie & A. H. K. Petrie, Proc. Linn. Soc. N.S.W. 52, 1 (1927) 217; W. Domke, Bibl. Bot. Heft 11 (1934) map 17; Ding Hou, Fl. Mal. I, 6 (1960) 43—44; D. M. Moore, Brit. Ant. Surv. 60 (1968) 86. Various local floras and collections in the Rijksherbarium Leiden.

E. F. DE VOGEL.



188. *Pimelea* Banks & Sol. ex Gaertn.

**Name:** *Pimelea* Banks & Sol. ex Gaertn., Fruct. 1 (1788) 186, nom. cons.

**Family:** *Thymelaeaceae*.

**Taxonomy and distribution:** The genus consists of c. 80 species, divided in some sections, of which the main centre is Australia with c. 65 endemic species. Another important centre is New Zealand with c. 15 species, all endemic. One species is known from the Chatham Is., one from Lord Howe I., several from Tasmania, one species extends from NE. Australia to the Louisiades, D'Entrecasteaux Is., New Guinea, and is also known from one collection from northern Luzon, while another species extends to the Lesser Sunda Is. (Sumba and Timor).

Domke (1934) gives a map in which also New Caledonia is included, giving also a locality on Luzon in the neighbourhood of Manila, but I have not found this confirmed.

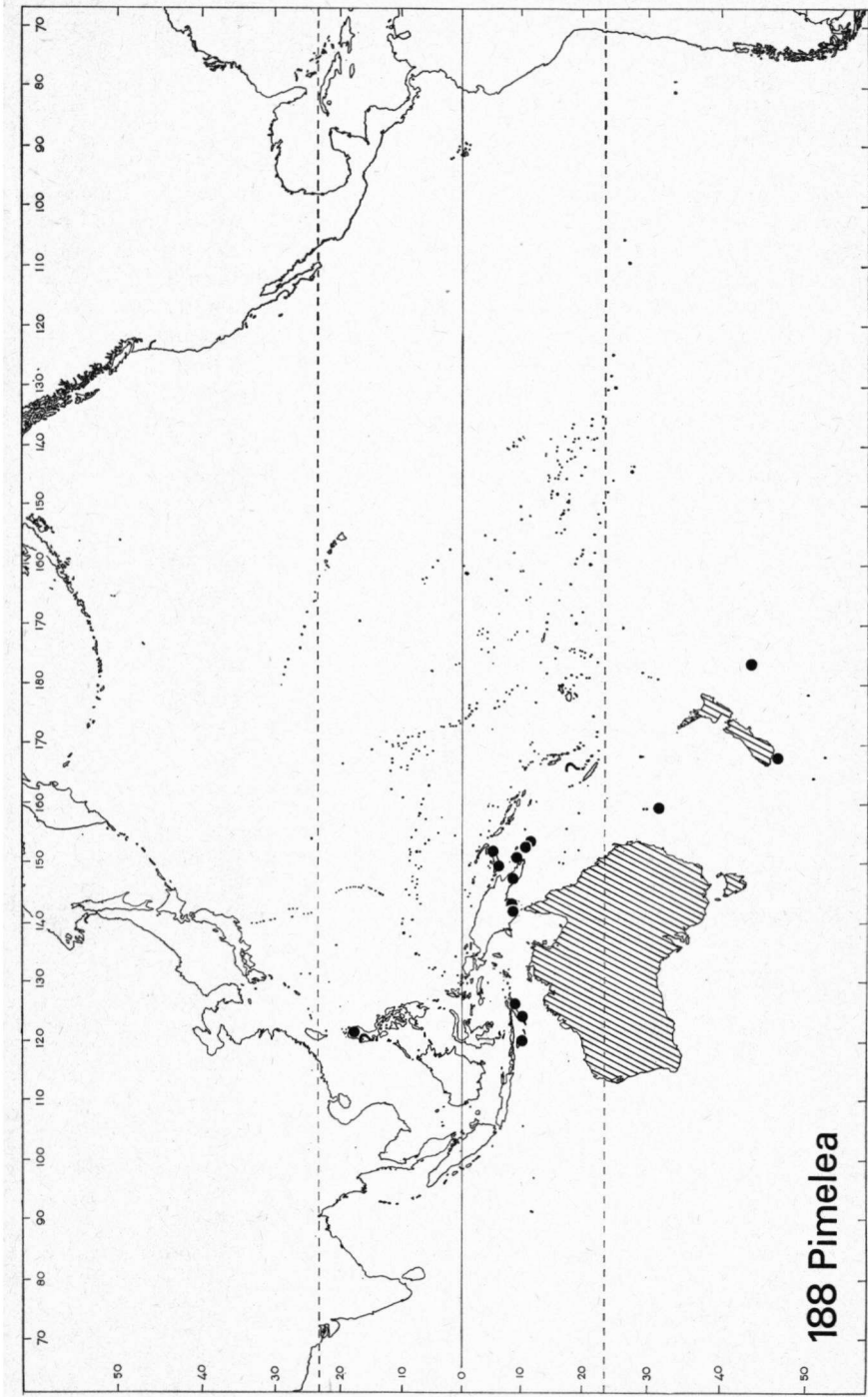
**Habit:** Usually much-branched, prostrate to erect herbs or shrubs, usually not taller than 1 m, sometimes exceeding 2 m.

**Habitat and ecology:** Lowland to subalpine areas, usually on open, rocky or sandy places, the Malesian species not found above 1000 m altitude. According to Burbidge (1966) most of the Australian species prefer the more temperate southern regions, a few are found in the tropical regions, while one or two are found throughout the central arid part of Australia.

**Fruit and seed:** The fruits are small drupes, dry or baccate, rarely over 5 mm long, containing one albuminous seed.

**Sources:** W. Domke, *Bibl. Bot.* Heft 111 (1934) map 18; Ding Hou, *Fl. Mal.* I, 6 (1960) 44—47, fig. 21; N. T. Burbidge, *Dict. Austr. Pl. Gen.* (1966) 232. Various local floras and collections of the Rijksherbarium Leiden.

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188 *Pimelea*

189. *Persoonia* Sm.

**Name:** *Persoonia* Sm., Trans. Linn. Soc. 4 (1798) 215.

**Family:** *Proteaceae*.

**Taxonomy and distribution:** A genus of about 60 species, divided into the following sections: *Persoonia* (*Amblyanthera*), occurring in SW. and SE. Australia and in Tasmania; *Pycnostylis*, in SW. and N. Australia; *Acranthera* restricted to the SW. division of S. Australia and an unnamed section formed by the New Zealand endemic *P. toru* A. Cunn. Johnson & Briggs (1962) state; 'Though all four groups are manifestly related, these do not seem any closer to each other than one of them (*P. toru*) is to *Garnieria*, and some readjustment of generic limits is probably desirable.

**Habit:** Shrubs or small trees.

**Habitat:** Open forest and shrubberies from near sea-level to moderate altitudes, avoiding very arid areas.

**Dispersal:** The fruit is an ellipsoid drupe up to 2 cm long, with a fleshy exocarp and a very hard endocarp, containing 1—2 seeds. The drupe of *P. toru* is red, the seeds c. 6 mm long. The fruits of *P. saccata* and *P. falcata* are eaten by the Aborigines.

**Map:** The area of sect. *Persoonia* is indicated by —, of sect. *Pycnostylis* by . . ., of sect. *Acranthera* by —.—.—., of *P. toru* by |||||.

**Sources:** G. Bentham, Fl. Austral. 5 (1870) 380—403; R. L. Specht & C. P. Mountford, Arnhemland Exp. (1958) 221, 489; L. A. S. Johnson & B. G. Briggs, Austr. J. Bot. 11 (1963) 30, fig. 2, 36. Various local floras.

190. *Garnieria* (Brongn. & Gris) Brongn. & Gris

**Name:** *Garnieria* (Brongn. & Gris) Brongn. & Gris, Bull. Soc. Bot. Fr. 18 (1871) 189.

**Family:** *Proteaceae*.

**Taxonomy and distribution:** A monotypic genus, allied to *Persoonia* and confined to New Caledonia.

**Habit:** Shrubs or small trees up to 10 m.

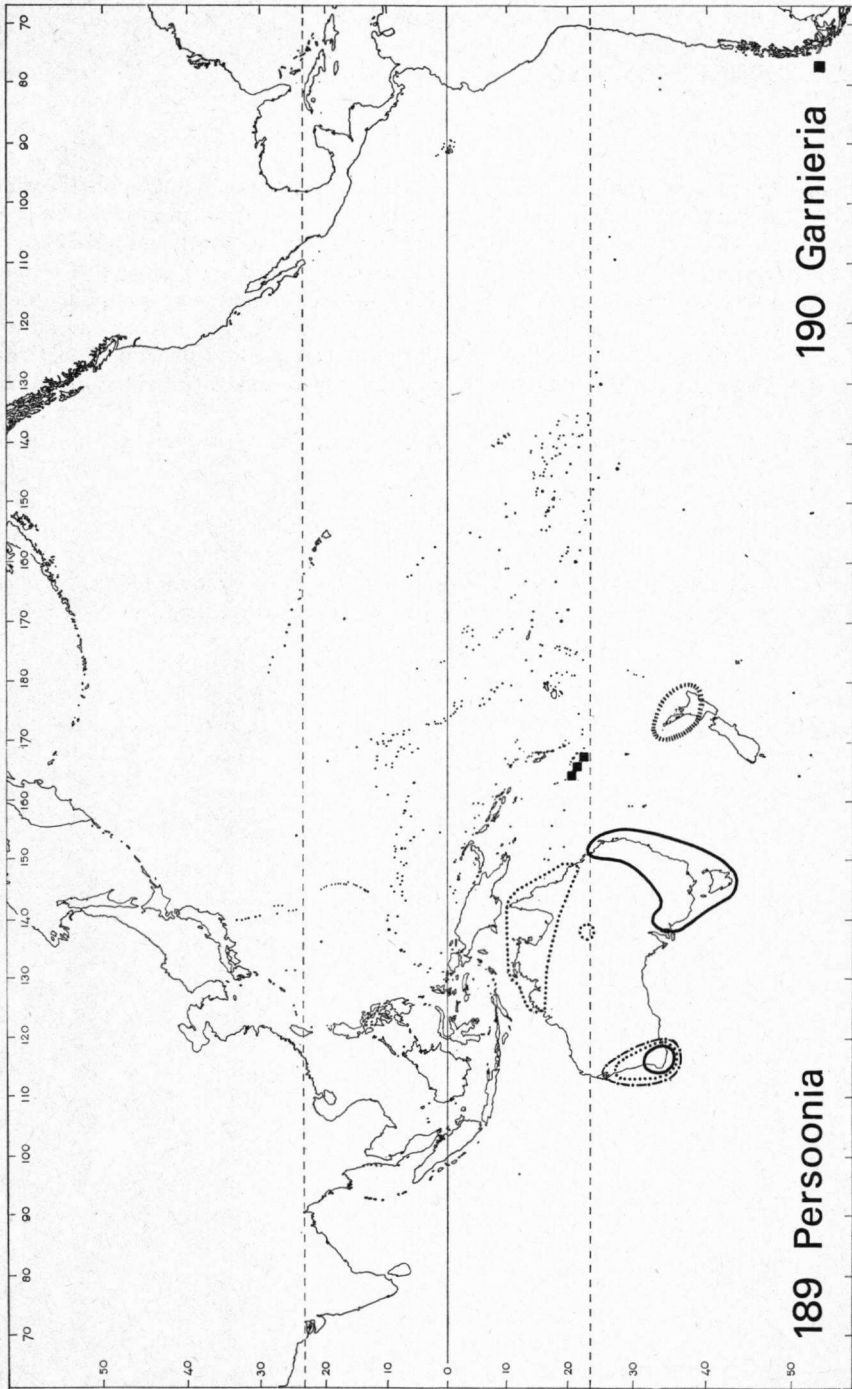
**Habitat:** In the hills from 100 to 900 m, in maquis and open forest throughout New Caledonia.

**Dispersal:** The fruit is an obovoid drupe, up to 3.5 cm long, turning black at maturity, the exocarp is c. 3 mm thick, fleshy, turning woody, the hard woody endocarp contains 3—7 seeds.

**Source:** R. Viot, Fl. Nouv. Caléd. 2 (1968) 74—78, map.

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191. *Knightia* R. Br.

**Name:** *Knightia* R. Br., Trans. Linn. Soc. 10 (1810) 193.

**Family:** *Proteaceae*.

**Taxonomy and distribution:** The genus consists of three species, the single New Zealand species is placed in one subgenus, the two New Caledonian ones in another (*Eucarpha*).

New Zealand is at present very poor in *Proteaceae*, but macrofossils and fossil pollen of at least 20 entities suggest much better representation in the past. The genus *Knightia* is represented by fossil pollen that is 'comparable in every respect with the pollen of the recent species' (Couper, 1960), and is known from the Upper Cretaceous onward. Extinction of *Proteaceae* in New Zealand apparently took place at the end of the Upper Cretaceous, the Eocene, the Middle and Upper Oligocene and as late as the Pleistocene.

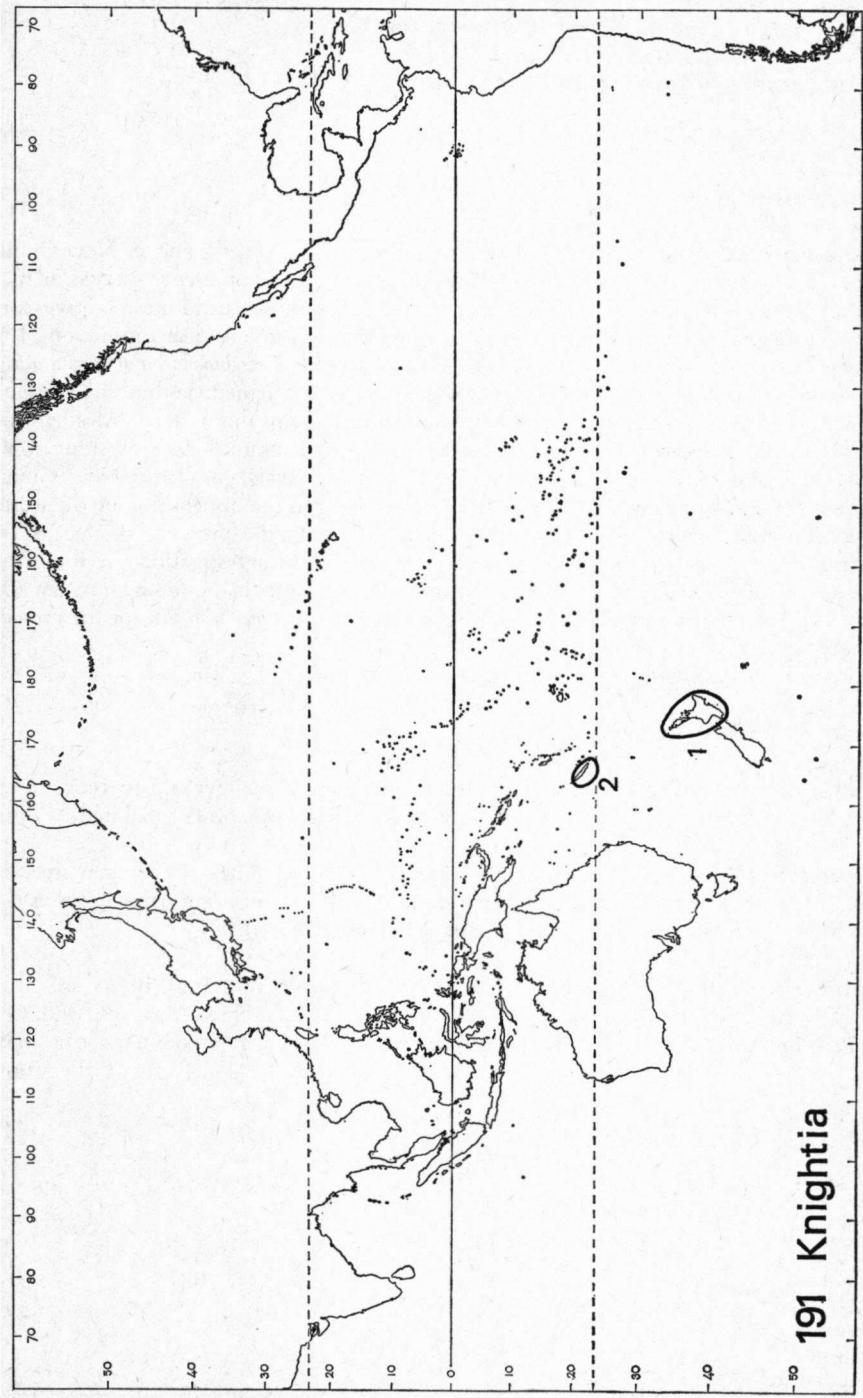
**Habit:** Shrubs or trees, the New Caledonian species up to 10, the New Zealand one up to 30 m high.

**Habitat:** Lowland to lower montane open forest and maquis, up to 1200 m.

**Dispersal:** The fruit is a woody capsule up to c. 4 cm long, opening longitudinally by two valves and containing several winged seeds. In *K. excelsa* R. Br. from New Zealand the seeds are c. 1 cm with a wing at one end of 1.5 cm.

**Sources:** R. A. Couper, New Zeal. Geol. Surv. Paleont. Bull. 32 (1960) 48—52; H. H. Allan, Fl. New Zeal. 1 (1961) 299—300; R. Virot, Fl. Nouv. Caléd. 2 (1968) 236—246.

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192. *Archidendron* F. v. M.

**Name:** *Archidendron* F. v. M., *Fragm. Phytogr. Austr.* 5 (1865) 59.

**Family:** *Leguminosae* (*Mimos.*).

**Synonyms:** *Pithecellobium* sect. *Archidendron* (F. v. M.) Mohl.

**Taxonomy and distribution:** A genus of about 30 species, centering in New Guinea. It is kept as a genus by De Wit (1942, 1952) on account of the presence of two or more (up to 15) carpels per flower, a remarkable feature in *Leguminosae*. In addition he gives some more characters, which, although not always present, will give a clear distinction of the genera if taken in combination. Kostermans (1954) considers *Archidendron* also as a genus, but the characters as used by De Wit (1952) could not be confirmed; he thinks the mode of dehiscence of the pod the most important, but does not discuss this in detail. Mohlenbrock (1966) regards *Archidendron* as a section of *Pithecellobium*, distinguishing 4 subsections, viz. *Alatae* and *Stipulatae*, both restricted to New Guinea, *Pendulosae*, from New Guinea, Moluccas and S. Mindanao, while subsect. *Archidendron* has the distribution of the section except for the absence in Mindanao. He states that only the presence of one or two ovaries holds to distinguish all species, but that during his investigations he found one specimen of *Archidendron* of which half the number of flowers had one single ovary. One species of *Pithecellobium* could not be distinguished from *Archidendron* but for the presence of only one ovary.

The maps in Mohlenbrock's paper are not very accurate.

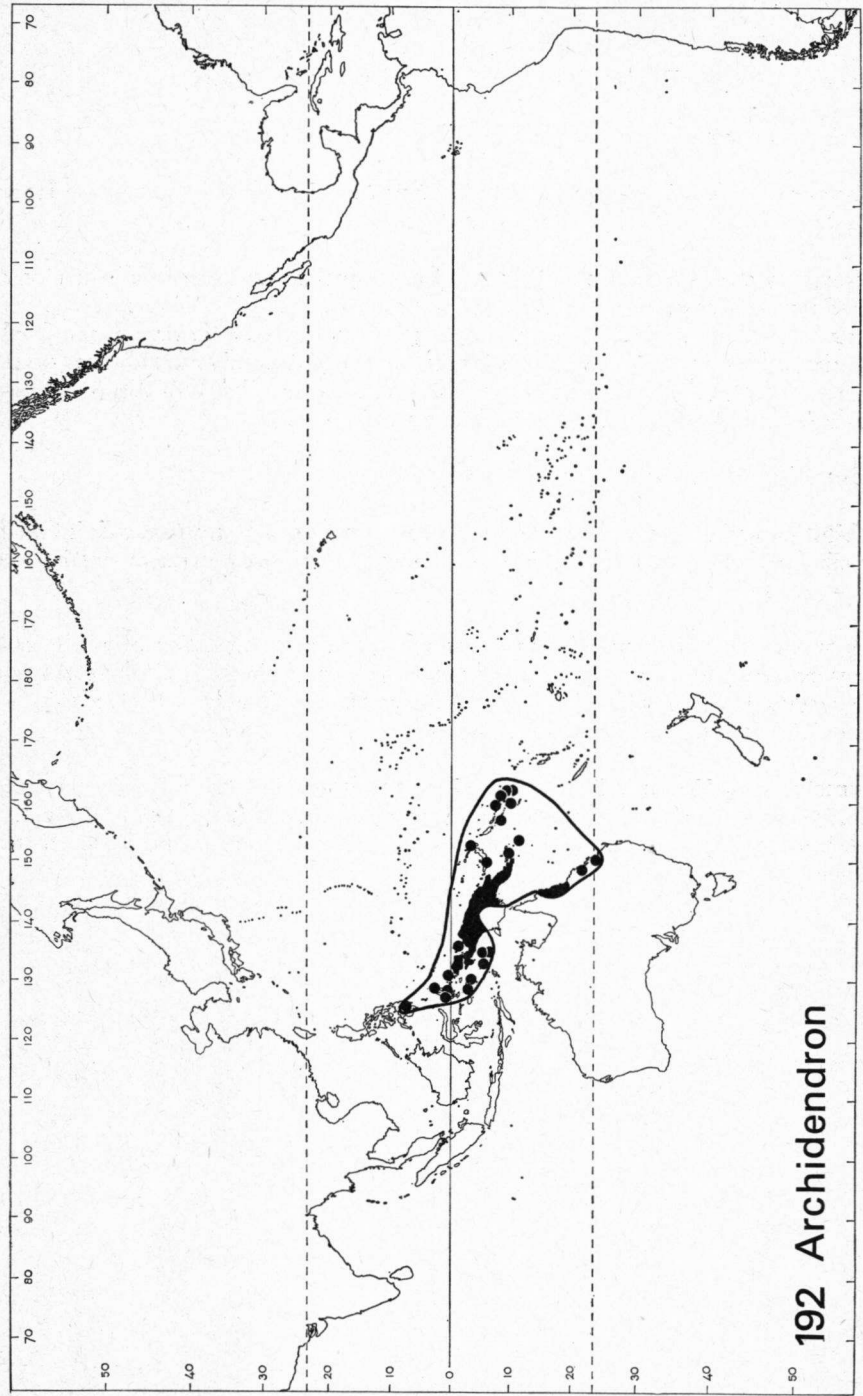
**Habit:** Shrubs or trees, up to 40 m tall.

**Habitat and ecology:** The species are found from about sea-level up to 1600 m, and grow in primary forests. The usually hollow branches are sometimes inhabited by ants.

**Dispersal:** The twisted pods are usually brightly coloured. They open when ripe, and contain several blackish seeds. The seeds, although they contain no nutriment unless they are crushed, are eaten by birds (Ridley, 1930, as *Pithecellobium*).

**Sources:** H. N. Ridley, *Dispersal* (1930) 430; H. C. D. de Wit, *Bull. Bot. Gard. Btzg. III*, 17 (1942) 256—272; Reinwardtia 2 (1952) 69—96; A. J. G. H. Kostermans, *Bull. Org. Sc. Res. Indon.* 20 (1954) 1—4; R. H. Mohlenbrock, *Webbia* 21 (1966) 653—724, maps.

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192 Archidendron

193. *Citronella* D. Don

**Name:** *Citronella* D. Don, Edinb. New Phil. Journ. 13 (1832) 243.

**Family:** *Icacinaceae*.

**Synonyms:** *Villaresia* Ruiz & Pavon, *Chariessa* Miq. For other synonyms see Howard (1942).

**Taxonomy and distribution:** A genus of c. 20 species about equally divided over its two disjunct areas in Old and New World: sect. *Citronella* (= *Eucitronella*) occurs in Central and South America down to about 39° latitude, sect. *Euchariessa* is restricted to Malesia, E. Australia and the Pacific as far east as Samoa. According to Howard (1942) *C. costaricensis* (Donn. Sm.) shows a closer relationship to the Old World species, except for the 'pores' (domatia), but he keeps it in sect. *Citronella*.

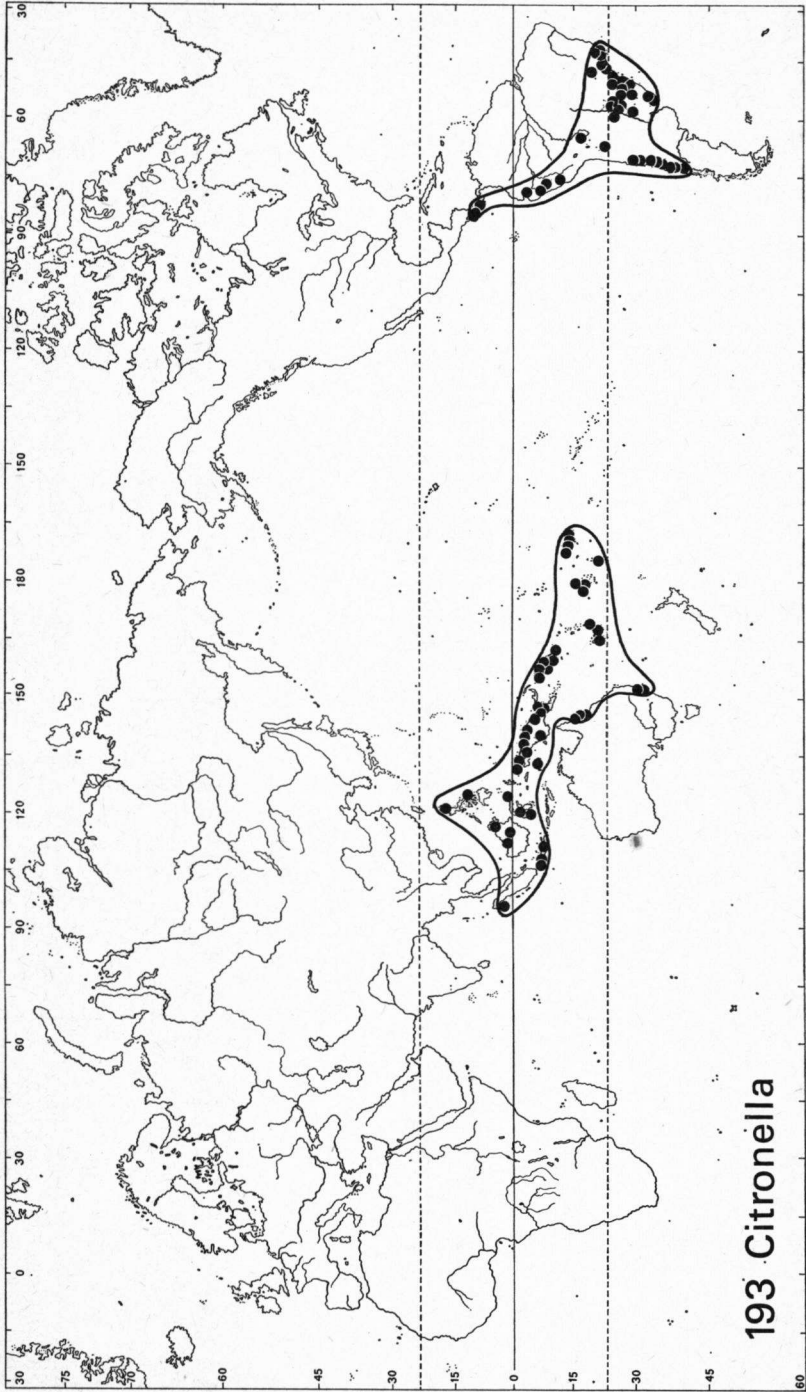
**Habit:** Shrubs or trees, up to 40 m.

**Habitat and ecology:** In the Malesian and Pacific parts of the area *Citronella* is found in the rain forest up to 1600 m, the American *Citronella* species occur in the mountain forests, up to 2500 m in Costa Rica.

**Dispersal:** The fruit is an ellipsoid drupe 1—3.5 cm long, consisting of a thin, rather fleshy exocarp and a leathery to woody endocarp, containing 1 seed, the other ovule being reduced. The only mention made on dispersal is to be found in Yuncker (1959) who stated: 'The fruit is said to be relished by birds'.

**Sources:** R. A. Howard, Contr. Gray Herb. 142 (1942) 60—89; T. G. Yuncker, B. P. Bish. Mus. Bull. 220 (1959) 172—173; H. Sleumer, Blumea 17 (1969) 186—188; Ibid., Fl. Mal. I, 7 (1971) 4—7, map. Various local floras and collections in the Rijksherbarium Leiden.

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194. *Myristica* Gron.

**Name:** *Myristica* [L., Gen. Pl. ed. 2 (1742) 524] Gronovius, Fl. Or. (1755) 141.

**Family:** *Myristicaceae*.

**Taxonomy and distribution:** A genus of 72 species, of which the centre is situated in New Guinea, from where 40 species are known, 34 being endemic. The genus ranges from W. India to Samoa, and is nowhere found outside the tropics. In the latest revision by Sinclair (1968) two sections are distinguished, sect. *Myristica* consisting of 9 series, sect. *Fatua* of 10 series. Several species are endemic in the Pacific.

**Habit:** Small shrubs to medium-sized trees, from 3 m up to c. 45 m tall.

**Habitat and ecology:** Dioecious plants. Most species restricted to the lowland, but some are restricted to the higher areas, usually not found below 1000 m, and found as high up as 2000 m. Some species seem to prefer the sea-shore, on rock or sand, one is found in the inner part of the mangrove and on muddy river banks within influence of the sea. Some species are known from swamp and peat forest, most are known from primary rain forest.

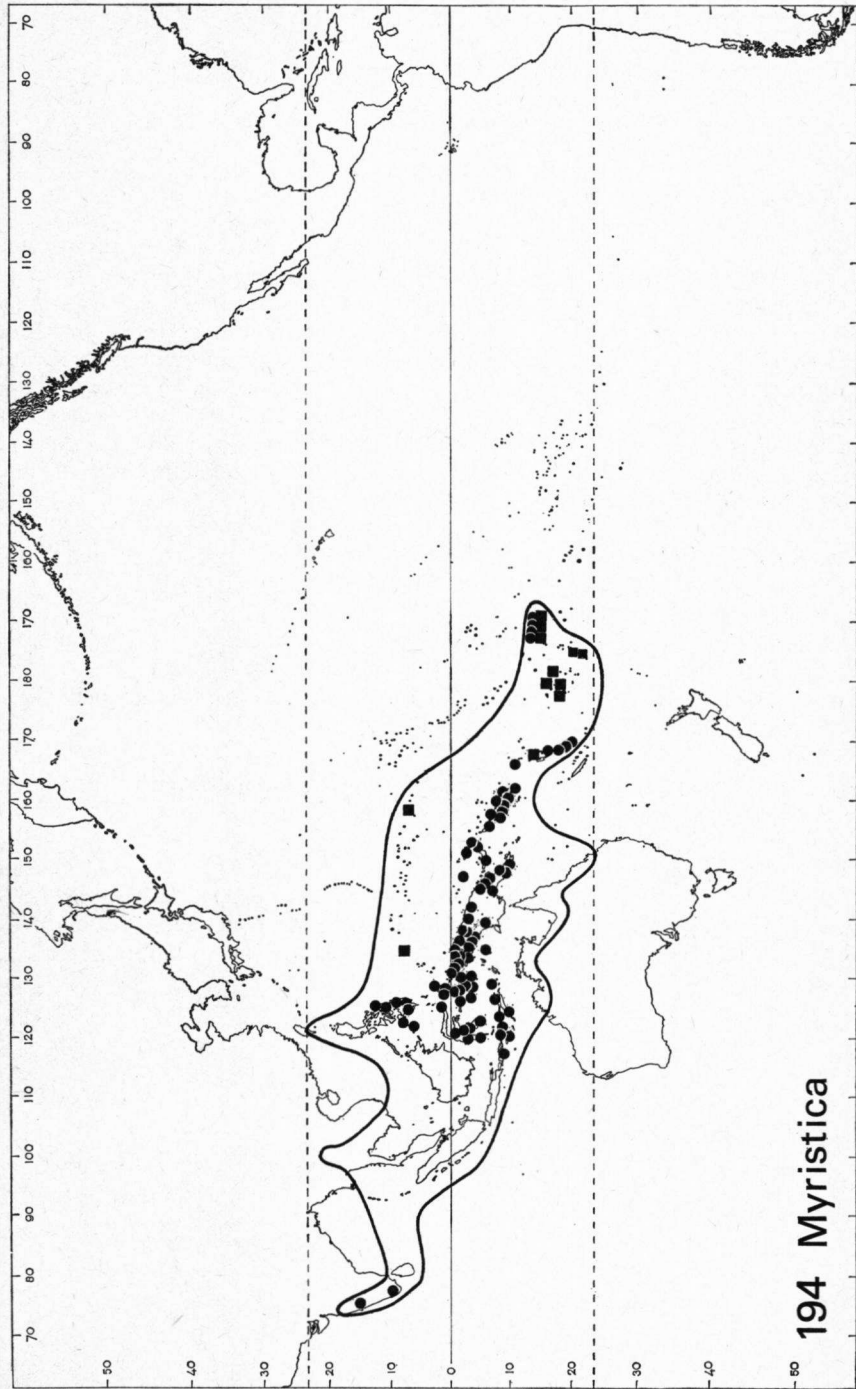
**Dispersal:** The fruits are of different size, the smallest are c. 1.3 cm long, the most common measurements are between 4 and 7 cm, while the length is seldom more than 10 cm. It is a one-seeded capsule, which splits into 2 valves, showing a usually yellow or orange aril, wholly or partly covering the seed. The fruits are usually dispersed by birds; fruit pigeons feed on *Myristica* species, swallowing the entire fruit, the seed is not damaged after having passed the intestines. It is not known how long it takes the fruit to pass. As these pigeons can fly long distances, it is possible that they are responsible partly for the dispersal of the species. Also a hornbill capable of long flight is known to feed on nutmegs. A bird of paradise, *Parotia*, was found with its stomach full of nutmegs and figs. Fallen fruits are often carried away by rodents. They are also carried about by rushes of water and rain, unopened fruits of different species are found drifting off the Solomons and off the Moluccas, but as the fruit does not float for a long time, and the dehisced, ripe fruits sink, this cannot be a very effective means of dispersal (Ridley, 1930).

**Map:** The generic range of *Myristica* is given in outline, dots represent localities of *M. fatua* and squares those of *M. hypargyreae*, which have the widest distribution in the Pacific.

**Sources:** H. N. Ridley, Dispersal (1930) 225, 375, 427, 458, 460, 486, 499, 500; J. Sinclair, Gard. Bull. Sing. 23 (1968) 1-540.

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194 *Myristica*

195. *Curculigo* Gaertn. sect. *Curculigo*

**Name:** *Curculigo* Gaertn., Fruct. Sem. Pl. 1 (1788) 63, sect. *Curculigo*.

**Family:** *Amaryllidaceae* (*Hyppoxidaceae*).

**Synonyms:** For complete synonymy see Geerinck (1969).

**Taxonomy and distribution:** This section — sometimes regarded as a genus — consists of only a few species which are rather closely related. The genus is for the greater part restricted to the tropics, and each of the continents has one species being very common and widespread; sometimes some local forms are regarded as distinct species. In Africa it is known from S. of the Sahara to the Cape, but is absent from the southwestern dry part; in Asia it ranges from the Himalayas and Deccan and Ceylon over SE. Asia north of the Yangtze Kiang and Malesia towards S. Japan and N. New South Wales, in the Pacific known from the Marianas, the Solomons, the Louisiades, the Loyalties and New Caledonia. In America it is restricted to the Caribbean islands, and ranges from Honduras southwards to the Amazone area.

**Habit:** Small, orchid-like terrestrial herbs with usually solitary flowers and narrow leaves.

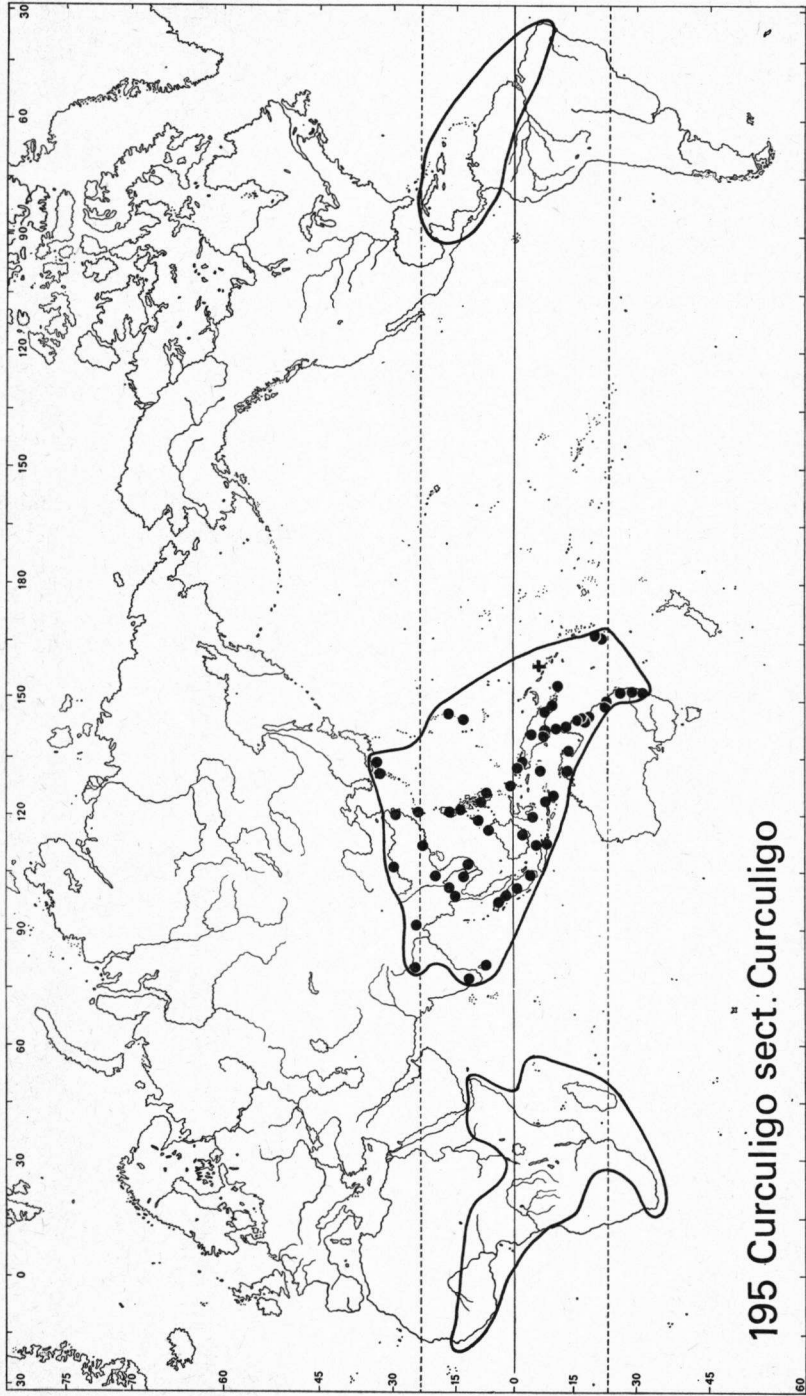
**Habitat:** Tropical and subtropical lowland forest.

**Dispersal:** The fruits are berry-like and dehiscent, they contain 3—9 small, slightly ribbed, ellipsoid, black seeds. No dispersal means are known.

**Map:** Localities have only been indicated in the Indo-Australian area, the ranges in Africa and America are given in outline.

**Sources:** Pax & Hoffmann in E. & P., Nat. Pfl. Fam. ed. 2, 15a (1930) 426; D. Geerinck, Bull. Jard. Bot. Nat. Belg. 39 (1969) 70—72. Collections of the Rijksherbarium Leiden. Mr. D. Geerinck (Bruxelles) kindly listed all localities of material represented in the Kew and Brussels herbaria, while Miss C. L. F. Ichaso (Rio de Janeiro) informed me about some American localities.

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196. *Curculigo* sect. *Molineria* (Colla) Benth.

**Name:** *Curculigo* sect. *Molineria* (Colla) Benth. in Benth. & Hook. f., Gen. Pl. 3 (1883) 718.

**Family:** *Amaryllidaceae* (*Hypoxidaceae*).

**Taxonomy and distribution:** A section comprising about 7 species in need of a revision, ranging from the Himalayas south of the Yangtze Kiang towards Chekiang, and over Malesia towards New Guinea and Queensland, Rockingham Bay, avoiding the Lesser Sunda Islands; in the Pacific known from the Bismarcks and Solomons.

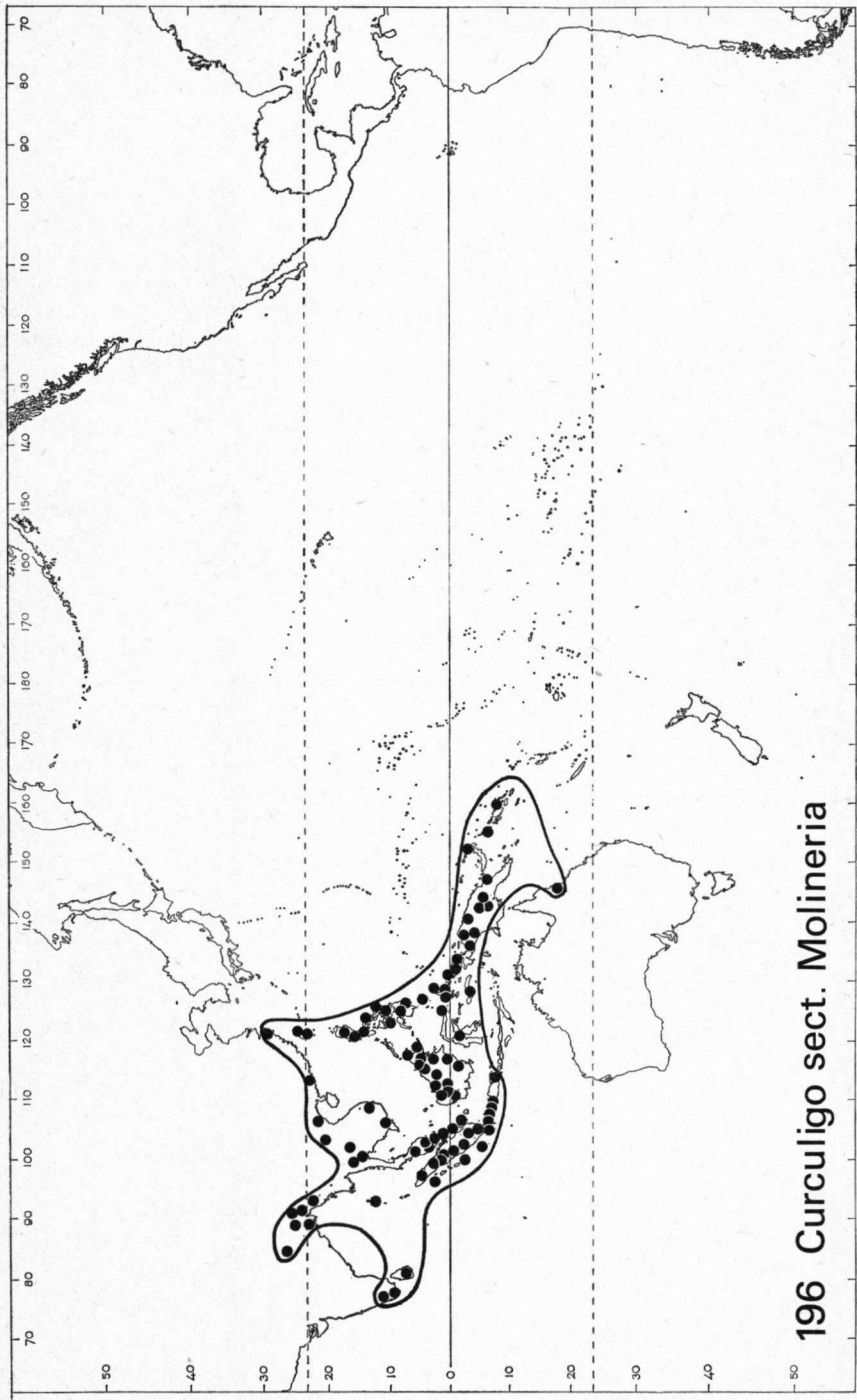
**Habit:** Plants with orchid-like plicate leaves as in *Neuwiedia* or *Lepidogyne*, with the flowers usually in thick many-flowered panicles or racemes with large bracts.

**Habitat:** In tropical and subtropical rain forest, up to c. 2200 m.

**Dispersal:** The berry-like, green, white or pinkish, indehiscent fruits are soft and sweet, and are taken away by rats. The tubercled seeds are probably not injured by them (Ridley, 1930).

**Sources:** Pax & Hoffmann in E. & P., Nat. Pfl. Fam. ed. 2, 15a (1930) 425; H. N. Ridley, Dispersal (1930) 373; D. Geerinck, Bull. Jard. Bot. Nat. Belg. 39 (1969) 72. Collections of the Rijksherbarium Leiden.

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197. *Lagunaria patersonia* (Andr.) Endl.

**Name:** *Lagunaria patersonia* (Andr.) Endl., Prod. Fl. Norf. (1833) 75.

**Family:** *Malvaceae*.

**Synonym:** *Hibiscus patersonius* Andr.

**Taxonomy and distribution:** The monotypic genus *Lagunaria* is closely related to *Hibiscus*. The species is native to Norfolk and Philip Is. and Lord Howe I. In Australia it is indigenous only in a restricted part of Queensland, introduced and often naturalized locally in New South Wales, Victoria, Tasmania, S. Australia, and New Caledonia (arrows). The Norfolk and Philip Is. population may be subspecifically different from the mainland one by the early falling bracteoles and the hairiness of the young parts and some other, minor characters as stated by Bentham, but he added that these differences may not be constant.

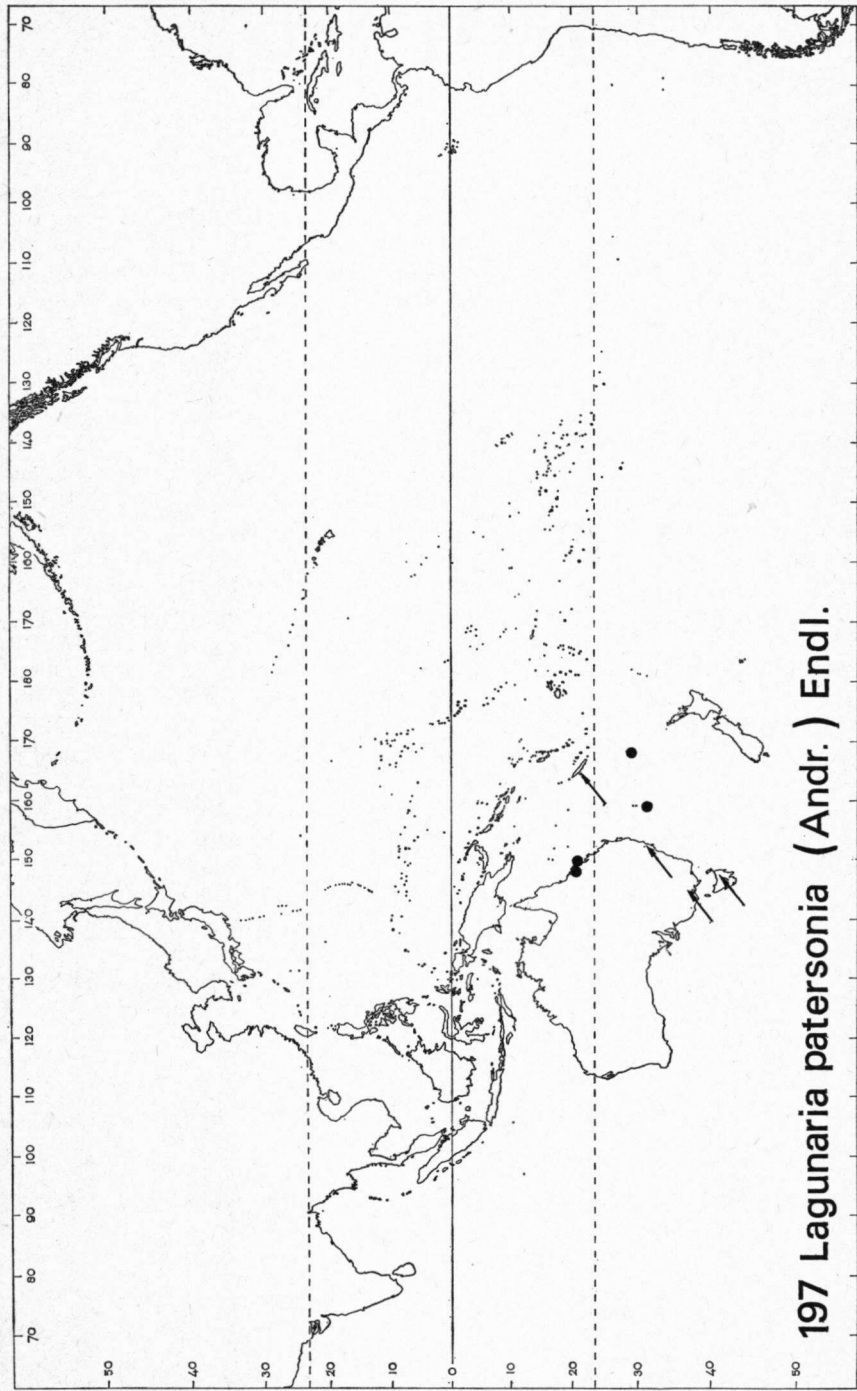
**Habit:** Tree, up to c. 15 m, usually with a growth of numerous adventitious shoots on the trunk and branches (White, 1925).

**Habitat:** In forest and on coastal cliffs in Norfolk and Lord Howe I.

**Fruit:** The fruit is a loculicidally dehiscent capsule, c. 2 cm Ø, containing numerous fine needles and 10 or more reniform seeds, up to 6 mm long.

**Sources:** G. Bentham, Fl. Austr. 1 (1863) 218—219; C. T. White, An elementary Text-book of Australian Forest Botany 1 (1925) 36; J. S. Turner, C. N. Smithers & R. D. Hoogland, The conservation of Norfolk Island (1968) 11, 18, 35.

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197 *Lagunaria patersonia* (Andr.) Endl.

198. *Gyrocarpus* Jacq.

**Name:** *Gyrocarpus* Jacq., Amer. (1763) 282.

**Family:** *Hernandiaceae*.

**Taxonomy and distribution:** A pantropic genus of only 3 species, *G. hababensis* Chiov. restricted to East Africa from just below the equator to Eritrea, *G. jatrophifolius* Domin, known from the Mexican state Sinaloa southwards to Costa Rica, and *G. americanus* Jacq., a pantropic species. In the latter 8 subspecies can be distinguished, of which 3 are native in Madagascar, one restricted to the Upper Niger area westwards to Senegal, one ranges from Eritrea along the east coast to Transvaal, SW. Africa and S. Angola, one is endemic to Kimberley and Northern Territory in Australia, one is known from Queensland, the Philippines and the Lesser Sunda Islands. The type subspecies is more or less pantropic; it is found in E. Kenya and E. Tanzania and has in SE. Asia a disjunct area ranging from the Deccan Peninsula over the Andamans, Burma and Malayan islands and Vietnam towards the Philippines, in the other part of the area being found in Christmas I., E. Java, the Lesser Sunda Islands, Queensland and E. New Guinea. The last-mentioned subspecies also occurs in the Pacific (Solomons, New Hebrides, New Caledonia, Fiji, Tonga, Samoa, and Tahiti) and is known from Central and South America, ranging from Guatemala southwards to Santander and eastwards to about Trinidad. It seems to be very local, although the fruits strand on many coasts.

**Habit:** Deciduous trees, rarely shrubs.

**Habitat and ecology:** *G. americanus* is known from the beach as well as from the inland, from dry parts as well as from river-banks. Var. *americanus* is usually found near the shore, but it is also known from more inland, where it ascends to 700 m. *G. jatrophifolius* is known from moist forests and bush as well as from dry forests and cactus bush, ascending from sea-level incidentally up to 1800 m. Of *G. americanus* the trees are leafless when in fruit.

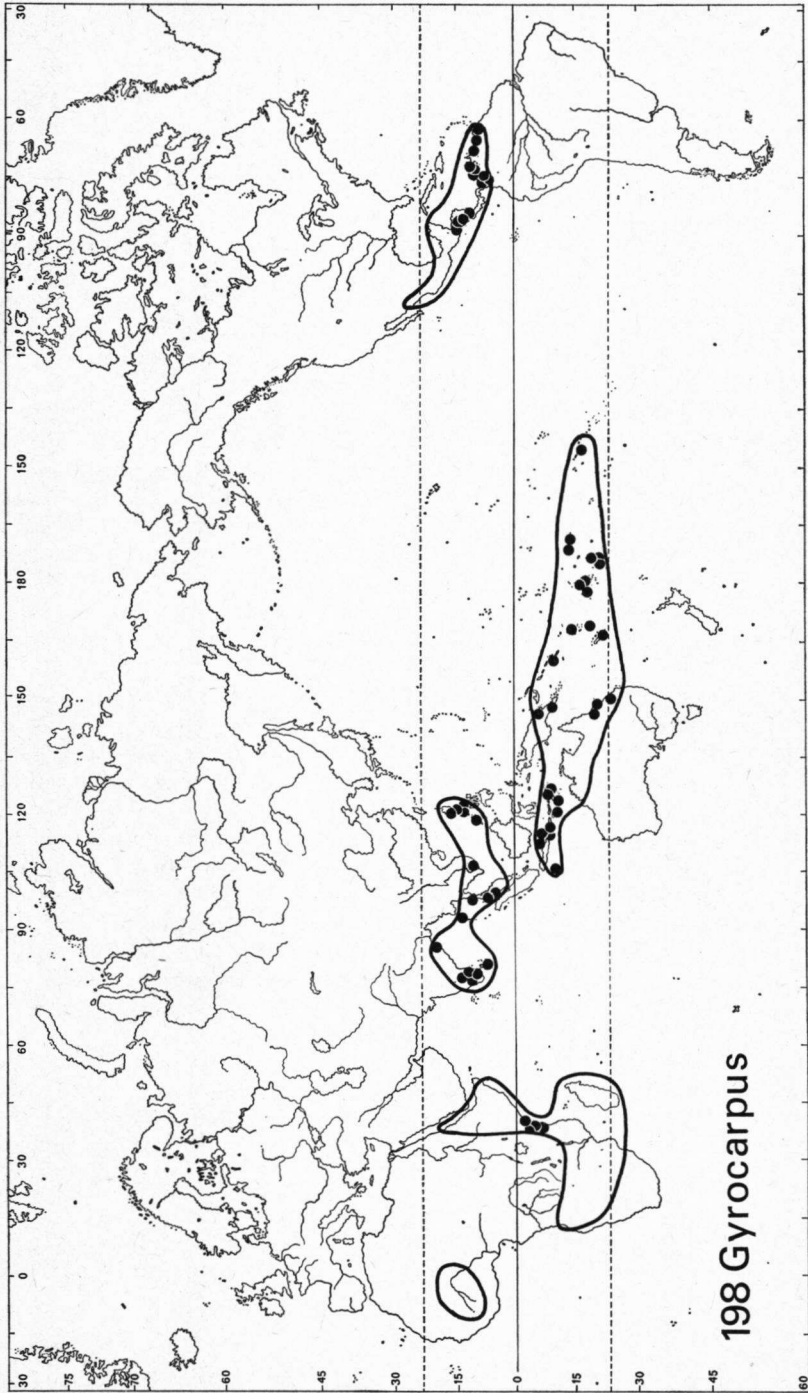
**Dispersal:** The fruit of *G. americanus* is an ovoid drupe, 1—2 cm long, with two wings 4—10 cm long. The narrow, long wings on the calyx tube, which are persistent in fruit, allow the fruit to fly for small distances; according to Rangachari (Ridley, 1930) this can be nearly a mile. Long distance dispersal can happen because lots of fruits are blown either in streams or in the sea, the buoyancy being at least 2 months in all fruits of which the wings were removed, without affecting the fertility.

**Map:** On the map the range of the genus is given in outline. The dots represent localities of the widespread *G. americanus* ssp. *americanus*.

**Sources:** H. N. Ridley, Dispersal (1930) 109, 313, 314; K. Kubitzki, Bot. Jahrb. 89 (1969) 78—120, 180—192. Various local floras.

E. F. DE VOGEL.





199. *Hernandia* L.

**Name:** *Hernandia* [Plum., Gem. (1703) 6] L., Sp. Pl. (1753) 981.

**Family:** *Hernandiaceae*.

**Synonyms:** *Hazomalania* Capuron, *Biasolettia* Presl.

**Taxonomy and distribution:** A genus of 24 species. Three subgenera can be recognized: the monotypic subg. *Hazomalania*, restricted to the south part of Madagascar, the monotypic subg. *Valvanthera*, restricted to Queensland, and subg. *Hernandia*, which is pantropic, except for the African mainland. The most primitive characters are found in the first two subgenera. Within subg. *Hernandia* 4 groups can be distinguished which represent different stages of evolution, and seem to be natural units. The *bivalvis*-group is restricted to Queensland, the *moerenhoutiana*-group is found in the Pacific and in Central America, the *ovigera*-group is the most widespread with a disjunct area: one species in the Gulf of Guinea, one in the Mascarenes, one in S. Malesia, the Solomons up to the Marianas, one in the Society and Tubuai Is., and four species in Central America, while the *peltata*-group ranges from Africa and Madagascar to the Tuamotu Archipelago, with *H. peltata*, which has now to be named *H. nymphaeaefolia* (Presl) Kubitzki (Kubitzki, 1970), one species on Tahiti and one in the Marquesas Is., and one in Central America.

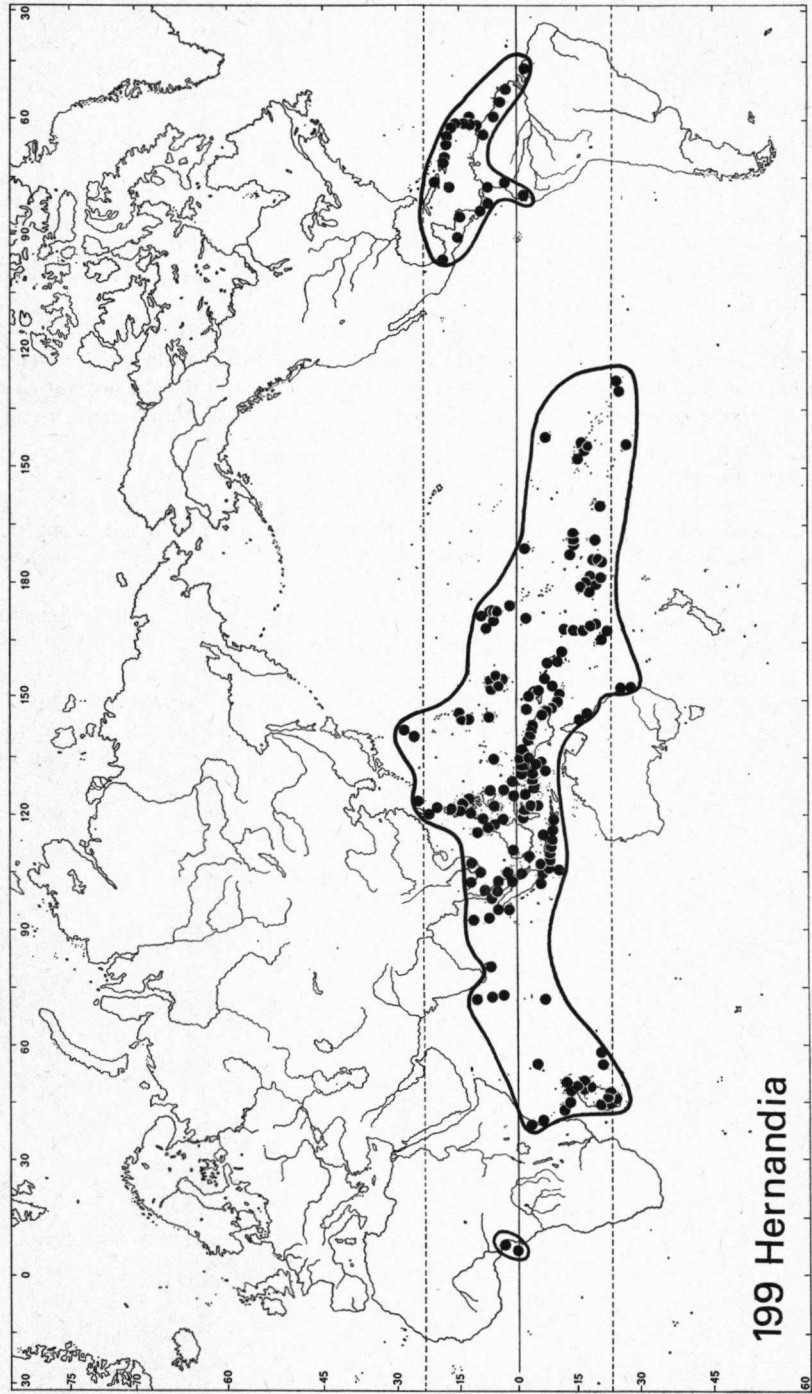
**Habit:** Small to medium-sized trees, sometimes deciduous.

**Habitat and ecology:** Most of the species are found inland in primary, sometimes secondary forest usually not higher than 700 m, sometimes up to 1500 m, some species descending to the beach. The most widespread species, *H. nymphaeaefolia*, is mainly restricted to the beach, in the Barringtonia formation, and is never found inland.

**Dispersal:** The fruit is loosely enclosed in the involucre which is (sometimes?) coloured and fleshy. The fruits of *H. nymphaeaefolia* are eaten by bats (v. d. Pijl, 1957). As the fruits float it is possible that they are transported with rivers. The fruits of *H. nymphaeaefolia* float for a rather long time, at least 68 days; Ridley (1930) states that they float for months. In the drift the drupe is usually found worn to the hard endocarp, apparently this does not affect the buoyancy. Kubitzki (1969) does not agree with Ridley (1930) that the dispersal of *H. ovigera* is by means of the fruit floating oversea within the involucre, as this species does not occur on the beach.

**Sources:** H. N. Ridley, Dispersal (1930) 312, 313, 314; L. v. d. Pijl, Acta Bot. Neerl. 6 (1957) 291—315; K. Kubitzki, Bot. Jahrb. 89 (1969) 78—157; Ibid. 90 (1970) 272. Various local floras.

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200. *Lophopyxis* Hook. f.

**Name:** *Lophopyxis* Hook. f., Ic. Pl. 18 (1887) t. 1714.

**Family:** *Lophopyxidaceae*.

**Synonyms:** For complete synonymy see Sleumer (1968).

**Taxonomy:** A monotypic genus that has been placed in several families, among which *Euphorbiaceae* and *Icacinaceae*, but perhaps best regarded as a separate family within the *Geraniales-Sapindales-Celastrales*.

**Distribution:** *L. maingayi* ranges from Malaya over N. Borneo through E. Malesia to Palau and the Solomons. It is one of the few genera occurring on both sides of Macassar Strait and not in the Philippines or the Lesser Sunda Islands (see Van Steenis, 1932).

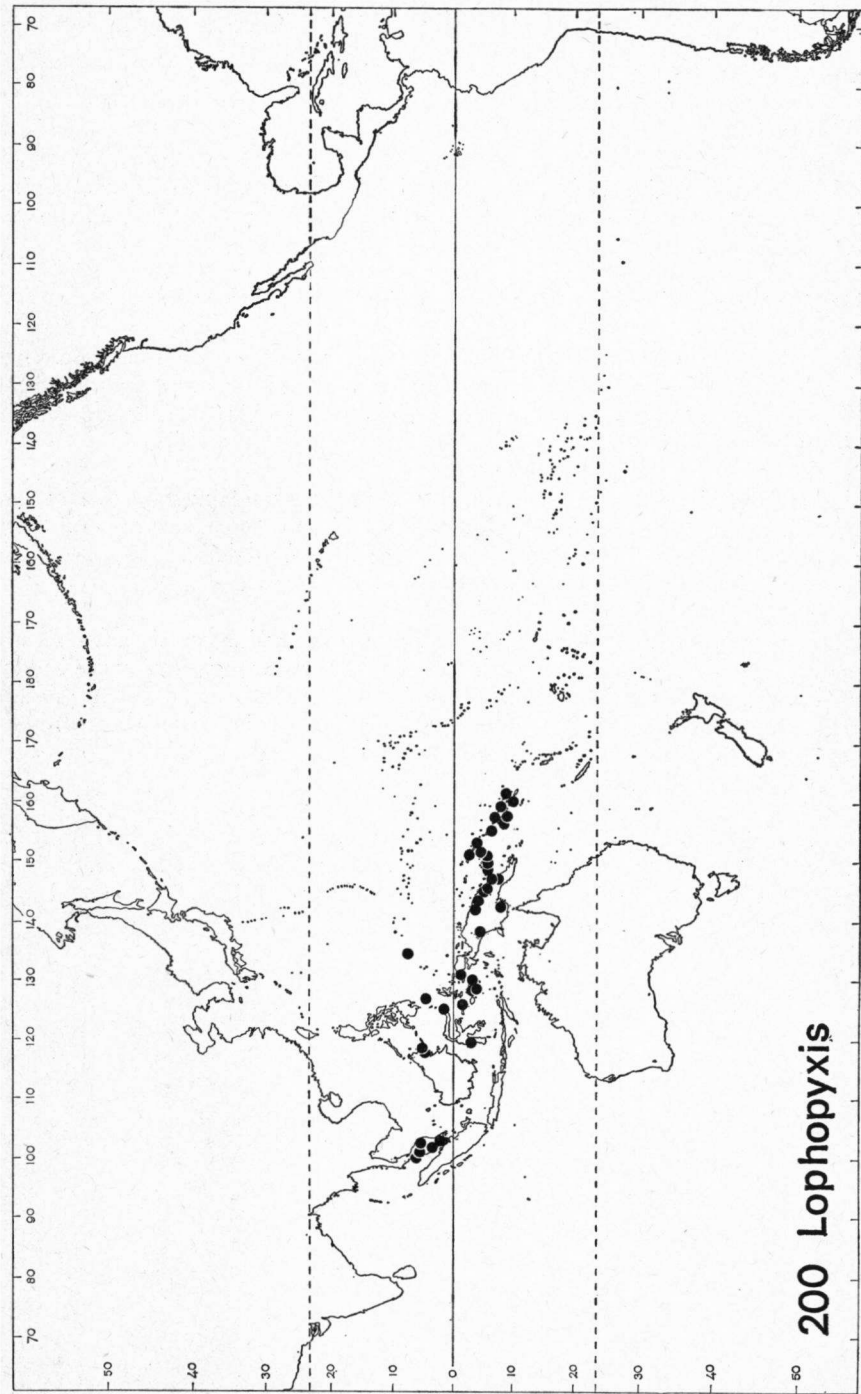
**Habit:** Small trees, climbing shrubs or lianas, up to 35 m long.

**Habitat:** Restricted to the lowlands below 300 m, in primary rain forest, along stream-banks, also occasionally in coastal and mangrove forest.

**Dispersal:** The fruit is indehiscent, up to 3.5 cm long, provided with 5 longitudinal chartaceous wings up to 8 mm wide and contains a single seed.

**Sources:** C. G. G. J. van Steenis, Bull. Jard. Bot. Btzg. III, 12 (1932) 258—265; H. O. Sleumer, Blumea 16 (1968) 321—323; *Ibid.*, Fl. Mal. I, 7 (1971) 89—91, map.

E. F. DE VOGEL.



201. *Pemphis* J. R. & G. Forst.

**Name:** *Pemphis* J. R. & G. Forst., Char. Gen. Pl. (1776) 67.

**Family:** *Lythraceae*.

**Taxonomy and distribution:** A genus consisting of two species: *P. madagascariensis* (Baker) Koehne restricted to the inlands of Madagascar (squares) and the widespread *P. acidula* Forst. (dots).

**Habit:** Shrubs or small trees, up to 11 m, sometimes dwarfed to prostrate shrubs.

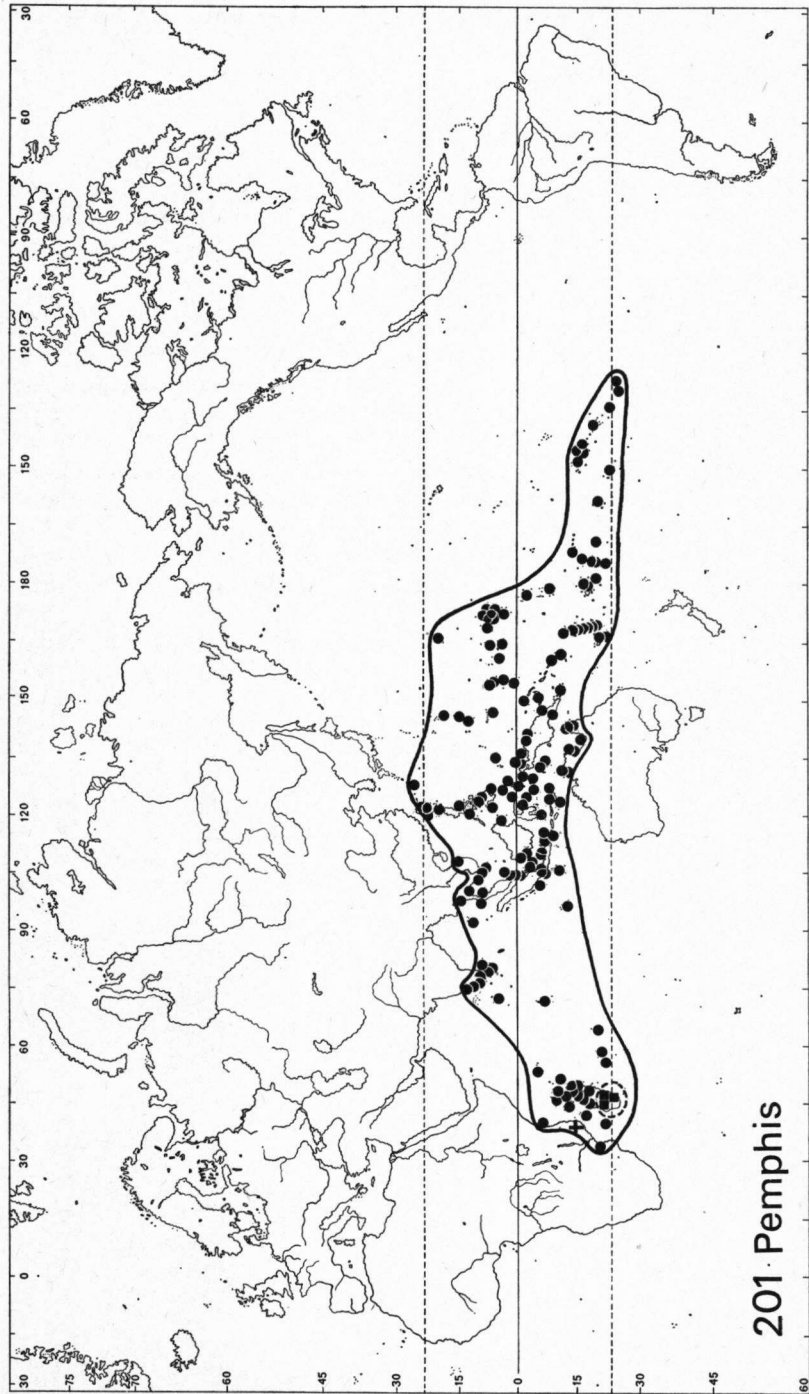
**Habitat:** *P. madagascariensis* inhabits the mountainous interior of S. Madagascar from 100—800 m altitude. *P. acidula* is a littoral species. On atolls it is often abundant, whereas according to Sauer (1967) 'it has never been found in the granitic Seychelles although it is dominant in the outlying islands'.

**Ecology:** *P. acidula* prefers coral and limestone soils, either solid limestone rock or sandy seashores. According to Hatheway (1953) small cavities in the coastal rocks filled with sand act as seed beds for *Pemphis*. He mentions the species from different biotopes: lagoon shores, dunès, boulder ramparts, saline flats and even mangrove.

**Dispersal:** According to Ridley (1930) the capsules of *P. acidula* contain a few seeds up to 3 mm long. They can float for months on account of the spongy testa which is drawn out into wings. Seeds have been found in cavities of washed up pumice. Some species of birds (frigate birds and boobies) use twigs of this species as nesting material. According to Guppy as cited by Ridley (l.c. 557) the fruits of *P. acidula* get entangled in the plumage of the birds by means of their broken peduncles.

**Sources:** H. N. Ridley, Dispersal (1930) 252, 292, 557; W. H. Hatheway, Atoll Res. Bull. 16 (1953) 1—68; J. D. Sauer, Plant and Man on the Seychelles coast (1967) 75. Various local floras and collections of the Rijksherbarium Leiden. The late Mr. L. S. Smith provided the Australian localities.

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202. *Kingiodendron* Harms

**Name:** *Kingiodendron* Harms in E. & P., Nat. Pfl. Fam. Nachtr. 1 (1897) 194.

**Family:** *Leguminosae* (*Caesalp.*).

**Taxonomy and distribution:** A genus of only 4 species, with a disjunct area, one species known from the Deccan Peninsula (India), one restricted to the Solomons, one known from New Guinea, the Solomons and Fiji, the fourth species ranging from the Philippines over New Guinea to the Solomons.

**Habit:** Large trees up to 30 m.

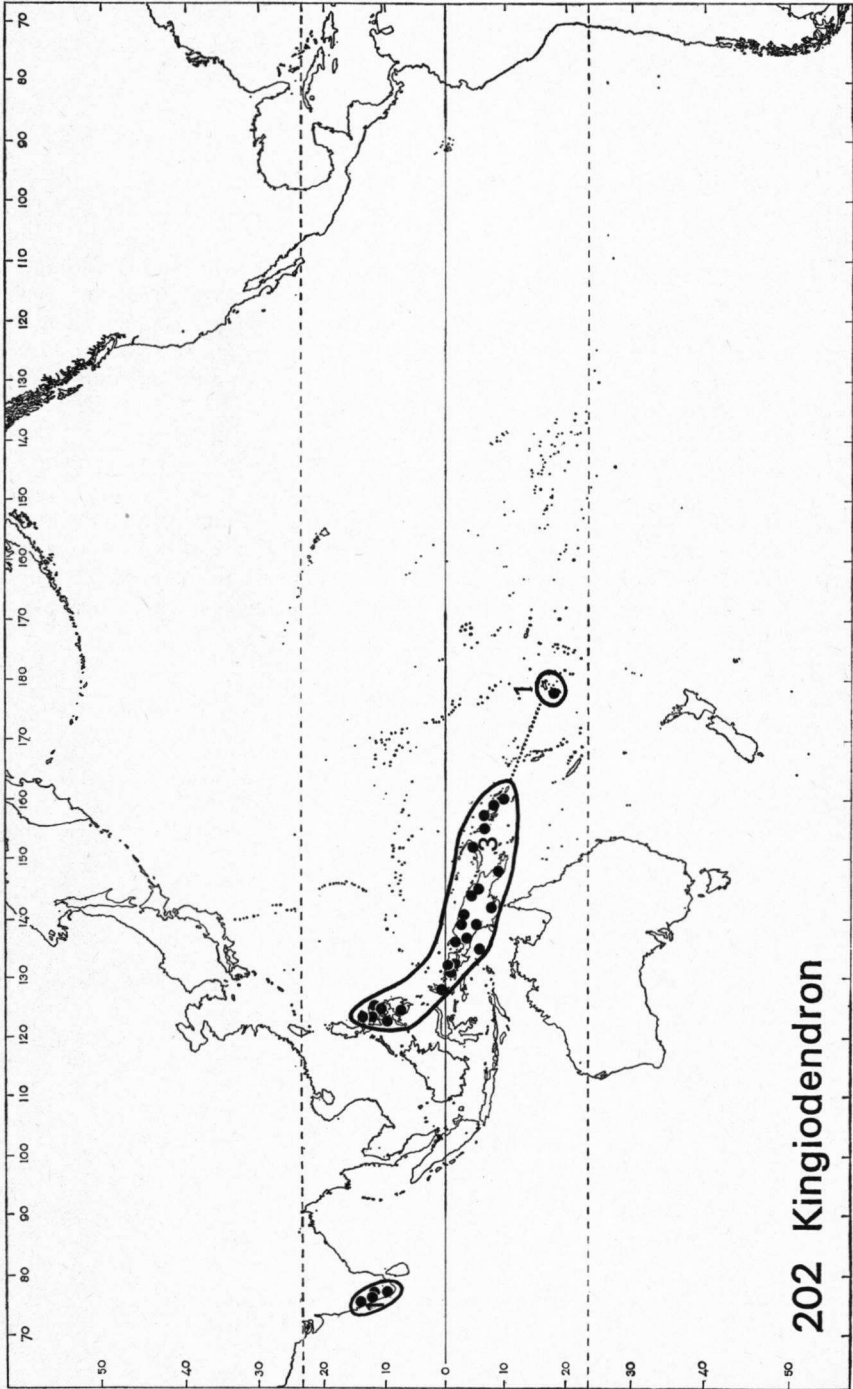
**Habitat and ecology:** In evergreen forests, up to 1000 m. In India they flower in February, the pods ripen in May—June (Troup, 1921).

**Fruit:** Pod woody, globular to flat ellipsoid, 3—8 cm long, 3—4 cm broad, containing a single seed. The seed of the Indian species germinates in the pod, when growing out the cotyledons remain there (Troup, l.c.).

**Sources:** R. S. Troup, The silviculture of Indian trees 2 (1921) 361, 362, 363; M. S. Knaap-van Meeuwen, *Blumea* 18 (1970) 46—50.

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203. *Maniltoa* Scheff.

**Name:** *Maniltoa* Scheff., Ann. Jard. Bot. Btzg. 1 (1876) 20.

**Family:** *Leguminosae* (*Caesalp.*).

**Taxonomy and distribution:** This genus consists of about 15 species, and covers a disjunct area. One species is known from East Bengal and Assam, Cambodia and from the Malay Peninsula, the other species are found in the area from Celebes over New Guinea, the Bismarcks and Solomons towards the Fiji and Tonga Is., in the Carolines the genus has been found on Truk. The main centre is New Guinea with 9 species, a smaller centre is found in Fiji, where 5 species occur. Two groups can be recognized, one comprising 3 species: *M. brassii* M. & P., *M. rosea* (K. Sch.) van Meeuwen, and *M. mariettae* van Meeuwen, restricted to New Guinea, the other group having the distribution of the genus. One E. Malesian species extends to Cape York.

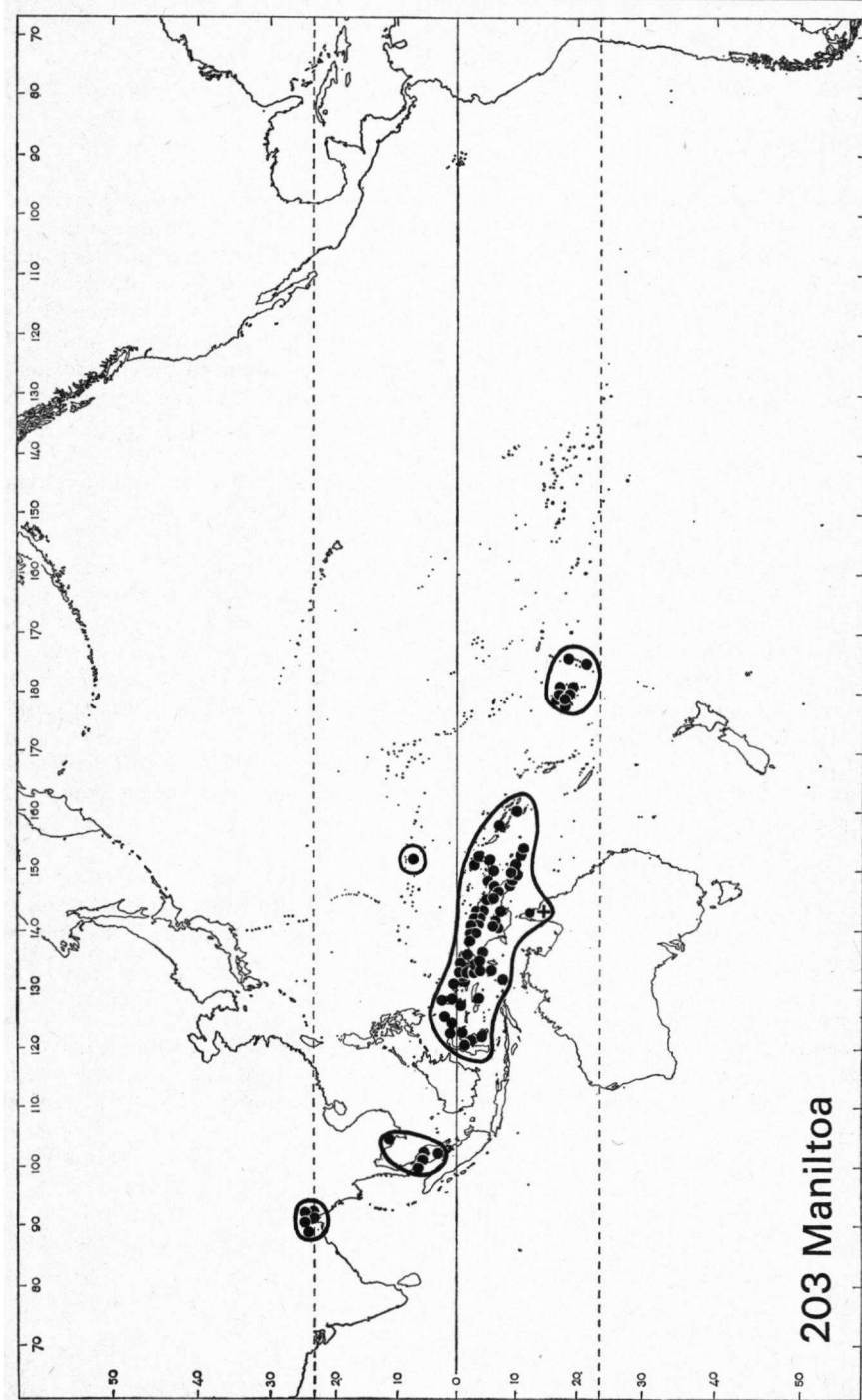
**Habit:** Shrubs or trees, up to 40 m.

**Habitat and ecology:** Restricted to the lowland primary forest, from sea-level up to 1300 m. Often found in swampy places, near tidal creeks or along streams, occasionally in the mangrove (*M. brassii*). On the north coast of W. New Guinea trees with a diameter over 35 cm breast height appear to be present per hectare in a number of 0.5—2.1 average (Vink in Knaap-van Meeuwen, 1970).

**Fruit:** The woody, indehiscent pod is up to 7.5 by 5 by 1 cm, and usually contains one seed. There is no obvious dispersal agent.

**Sources:** M. S. Knaap-van Meeuwen, *Blumea* 18 (1970) 31—46. Various local floras and collections of the Rijksherbarium Leiden.

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204. *Parkia* R. Br.

**Name:** *Parkia* R. Br., in Denham & Clapperton, Narr. Trav. Disc. Afr. App. (1826) 234.

**Family:** *Leguminosae* (*Mimos.*).

**Taxonomy and distribution:** A pantropical genus in which c. 40 species have been described. Two sections are recognized: *Parkia* practically covering the area of the genus and *Paryphosphaera* restricted to the neotropics. Hagos (1962) accepted only four species for Africa reducing eight names to synonymy. About the same number of species occur in Indo-Malesia. Endemic species have been described from W. New Guinea (*P. versteeghii* M. & P.), Palau (*P. parvifoliola* Hosok.), Ponape (*P. komor* Kaneh.) and Fiji (*P. parrii* Horne). The number of species in the neotropics is estimated by Dr. Cowan (in litt.) at 20 spp. Morphologic diversity is greatest among the American species and least in the African ones.

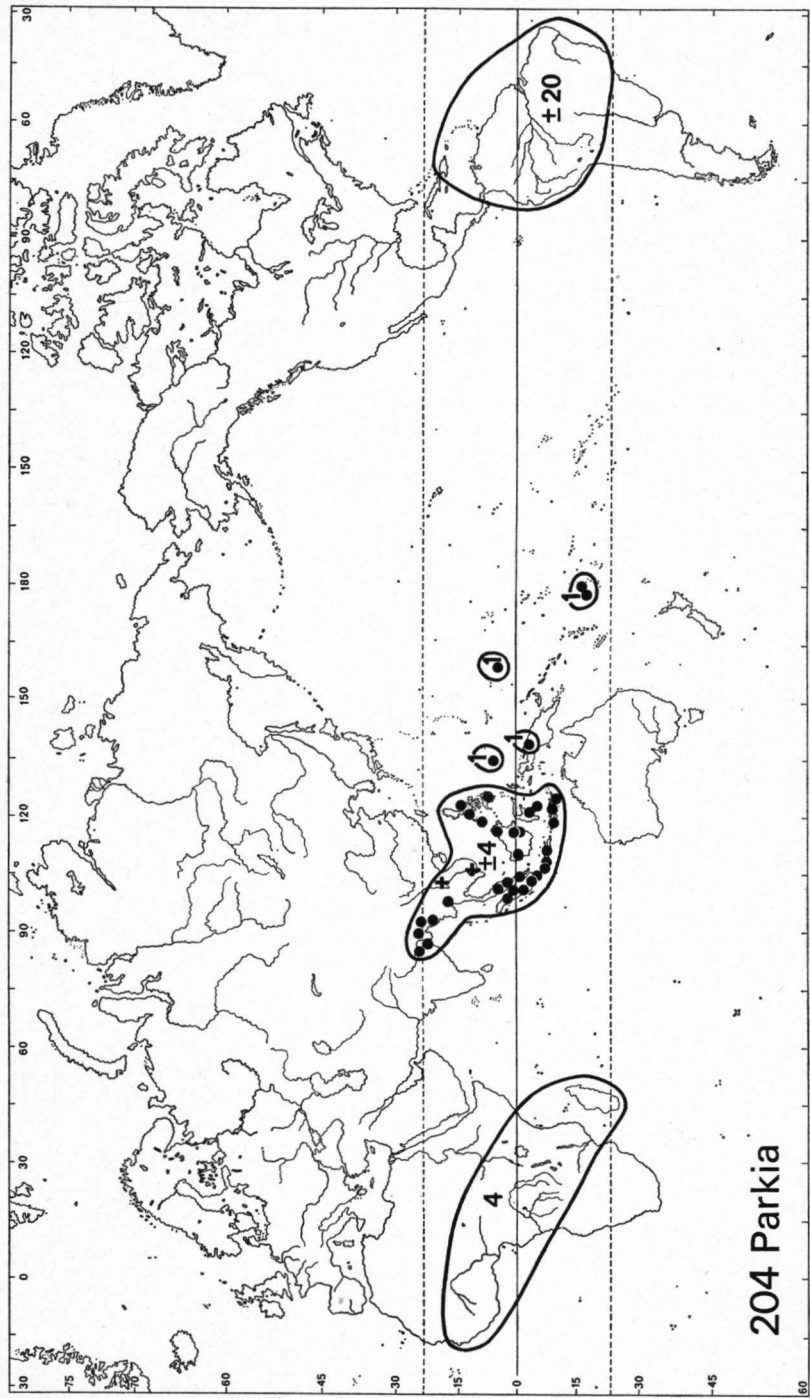
**Habit:** Moderate to large trees, with spreading branches, the compact inflorescences often on long flagellate stalks, hanging free from the foliage.

**Habitat and ecology:** In forest at low to medium altitudes (1000 m). *P. speciosa* Hassk. is cultivated in Malasia for its edible seeds. The type of inflorescence makes most species suitable for pollination by bats, although this is not true for the S. American *P. ulei* (Harms) Kuhlm. and *P. parviceps* Ducke. The African *P. clappertoniana* Keay is visited by two bat species *Nanonycteris veldkampii* and *Epomophorus gambianus*. These apparently only feed on the nectar, no pollen having been found in their stomachs (Baker & Harris, 1957). The stigmas in this species only protrude when the pollen has been shed. The flowers have a fruity smell unlike those of the Malesian *P. roxburghii* G. Don and *P. speciosa* that are semi-fetid and are eaten by bats (v.d. Pijl, 1936). Through the damage done only a few pods in every inflorescence develop.

**Dispersal:** The pods are leathery, indehiscent. The seeds of some species are eaten by man and according to Ridley (1930) also by a hornbill (*Rhinoplax vigil*), but this can hardly lead to effective dispersal since the soft seeds are easily damaged. Osmaston (1965) reports birds feeding on *Parkia* seeds.

**Sources:** G. Bentham, Trans. Linn. Soc. 30 (1875) 360—363; Taubert in E. & P., Nat. Pfl. Fam. III, 3 (1894) 123; H. N. Ridley, Dispersal (1930) 486; L. v. d. Pijl, Flora 31 (1936) 11—13; H. G. Baker & B. J. Harris, Evolution 11 (1957) 449—460; T. H. Hagos, Acta Bot. Neerl. 11 (1962) 231—265; H. A. Osmaston, Commonw. For. Rev. 44 (1965) 97—105.

E. F. DE VOGEL.



205. *Prosopis insularum* (Guill.) Bret.

**Name:** *Prosopis insularum* (Guill.) Bret., Acta Bot. Neerl. 9 (1960) 397.

**Family:** *Leguminosae* (*Mimos.*).

**Synonymy:** *Leucaena insularum* (Guill.) Dänik.; *Leucaena forsteri* Bth.; *Piptadenia novo-guineensis* Warb.

**Taxonomy:** Breteler (1960) removed this species from *Leucaena* to *Prosopis* on account of its glanduliferous anthers, its indehiscent pods and the seeds containing endosperm. Fosberg & Stone (1965) maintain the species in *Leucaena*, the only character against it being the presence of glands on the anther tips, a feature consistently found in *Prosopis*.

Breteler recognized two subspecies: the type species ranges from the Solomons to SE. Polynesia, ssp. *novo-guineensis* (Warb.) Bret. from the Moluccas to the Solomons.

Fosberg & Stone reduce these ssp. to varieties (under *Leucaena*) and add a new variety from Guam (Marianas).

Guinet (1969) re-instated the genus *Schleinitzia* of Warburg (Bot. Jahrb. 13, 1891, 336) on the basis of pollen morphology to accommodate *Prosopis insularum* and *Xylia hoffmannii* Drake. The pollen characters of this genus are more differentiated than those of *Prosopis*, *Piptadenia* and *Leucaena*. The alliance is apparently closest to the Old World genera *Dichrostachys* and *Xylia*.

**Note:** *Prosopis insularum* can easily be distinguished by the leaves from the neotropical *Leucaena leucocephala* (Lamk) De Wit [= *L. latisiliqua* (L.) Gillis, see Taxon 23, 1974, 185], which is widely naturalized in the Pacific. The former has less than 10 pinnae with less than 20 pairs of leaflets, the latter more than 10 pinnae with more than 20 pairs of leaflets.

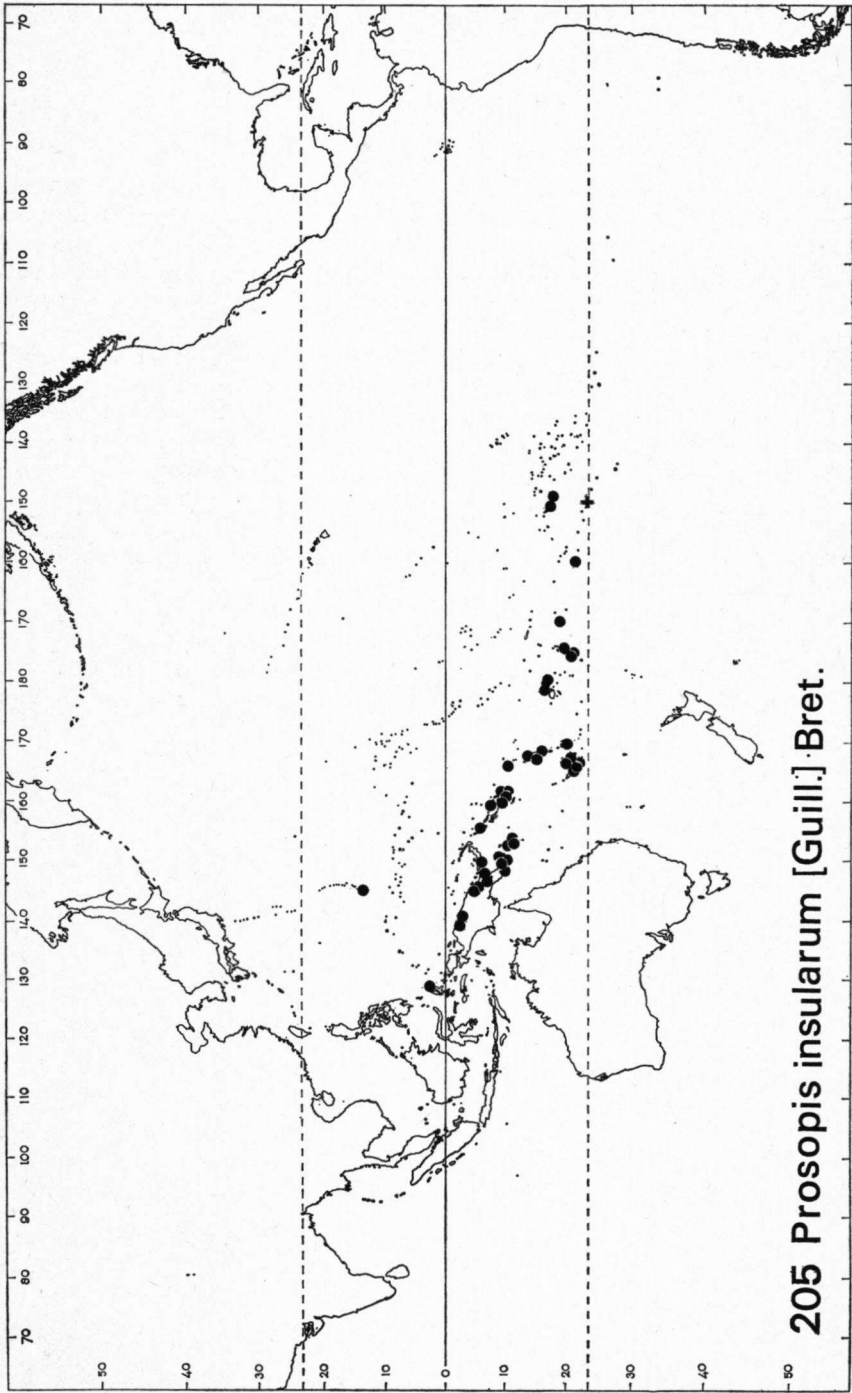
**Habit:** Shrubs or small trees, occasionally up to 20 m high.

**Habitat:** In lowland forests, savannas and along the coast.

**Fruit:** The fruit is a septate pod up to 10 cm long and 2 cm wide, indehiscent except sometimes marginally, containing up to 15 seeds. The seeds are flat, ovoid, 5—7 × 2—4 mm, smooth, brown or black.

**Sources:** F. J. Breteler, Acta Bot. Neerl. 9 (1960) 397—403; F. R. Fosberg & B. C. Stone, Micronesica 2 (1965) 67—70; P. Guinet, Les Mimosacées, étude de Palynologie fondamentale, Correlations, Evolution (1969) 33, 81, 86, tab. 21. Collections in the Rijksherbarium Leiden.

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205 *Prosopis insularum* [Guill.] Bret.

206. *Phyllachne* J. R. & G. Forst.

**Name:** *Phyllachne* J. R. & G. Forst., Char. Gen. Pl. (1776) 115.

**Family:** *Stylidiaceae*.

**Taxonomy and distribution:** A small genus with three species in New Zealand of which two endemic, the third also occurring in Tasmania, and one species in West Patagonia from the Chonos Archipelago to Tierra del Fuego. Cain (Found. Pl. Geogr., 1944, 309), probably following Good (New Phytol. 24, 1925, 226) also included the Falkland Islands in his map of the genus, but it is not mentioned in any flora of these islands.

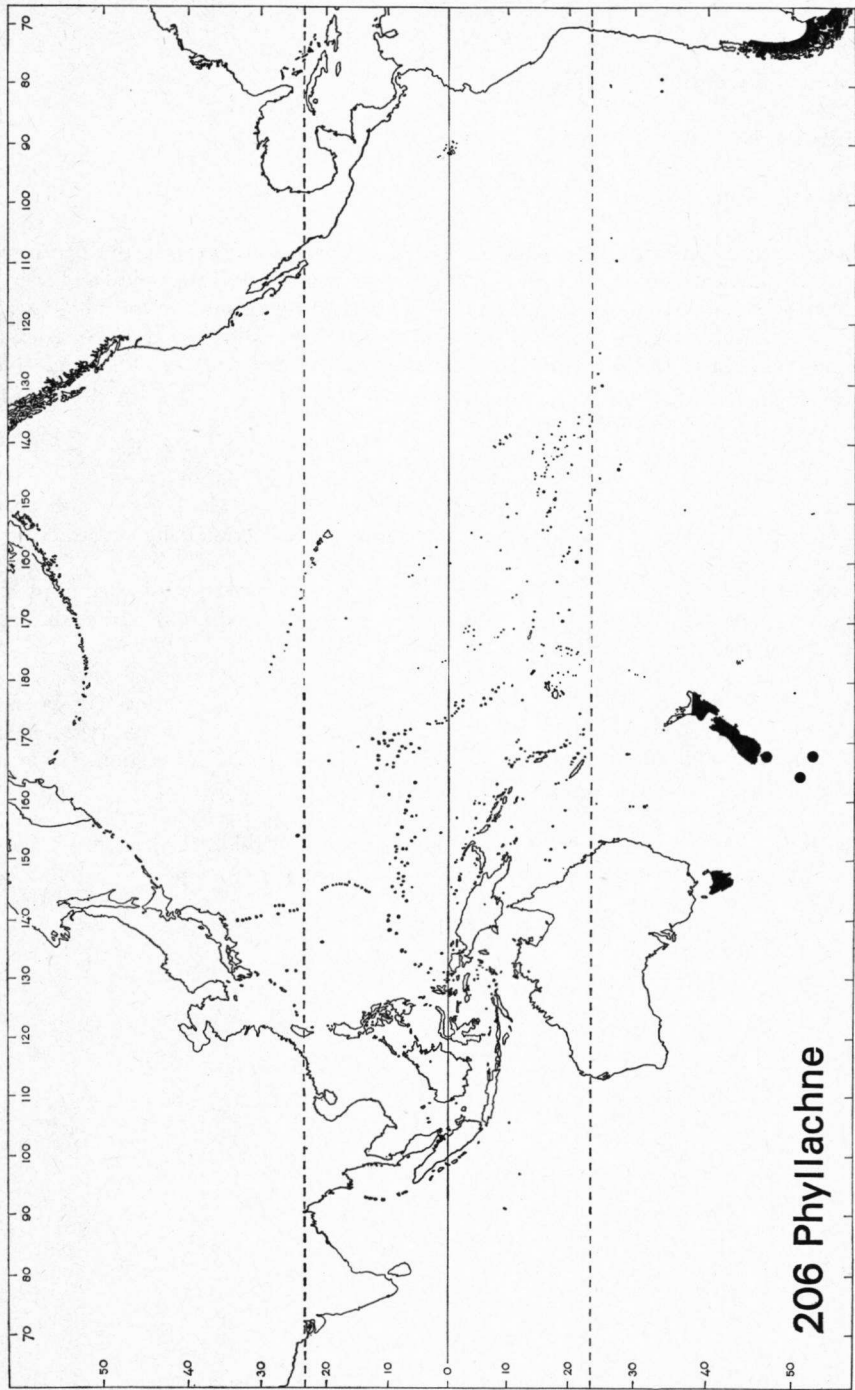
**Habit:** 'Polster' plants, forming firm cushions or mats up to 10 cm high and several feet across.

**Habitat and ecology:** In New Zealand and Tasmania in higher montane and sub-alpine stations, in rocky places and peat bogs. In the Campbell Is. and Patagonia descending to sea-level.

**Fruit:** The fruit is a not or irregularly dehiscent capsule c. 2 mm  $\varnothing$  and contains up to 8 minute seeds.

**Sources:** C. Skottsberg, Kungl. Sv. Vet. Akad. Handl. 56, 5 (1916) 309; W. M. Curtis, Pap. Proc. R. Soc. Tasm. 1946 (1947) 31—33; H. H. Allan, Fl. New Zeal. 1 (1961) 802.  
E. F. DE VOGEL.





207. *Tetracera* L.

**Name:** *Tetracera* L., Sp. Pl. (1753) 533.

**Family:** *Dilleniaceae*.

**Synonym:** *Delima* L.

**Taxonomy and distribution:** Kubitzki (1970) recognizes 44 species in this pantropical genus, which are accommodated in two sections; the type section is pantropical and contains 35 species belonging to two species groups that can be distinguished on morphological as well as chemical characters, section *Akara* is restricted to the Old World. In America and in Indo-Australia there are 15 species, in Africa (incl. Madagascar) 14. The single New Caledonian species is endemic.

**Habit:** Shrubs or lianas.

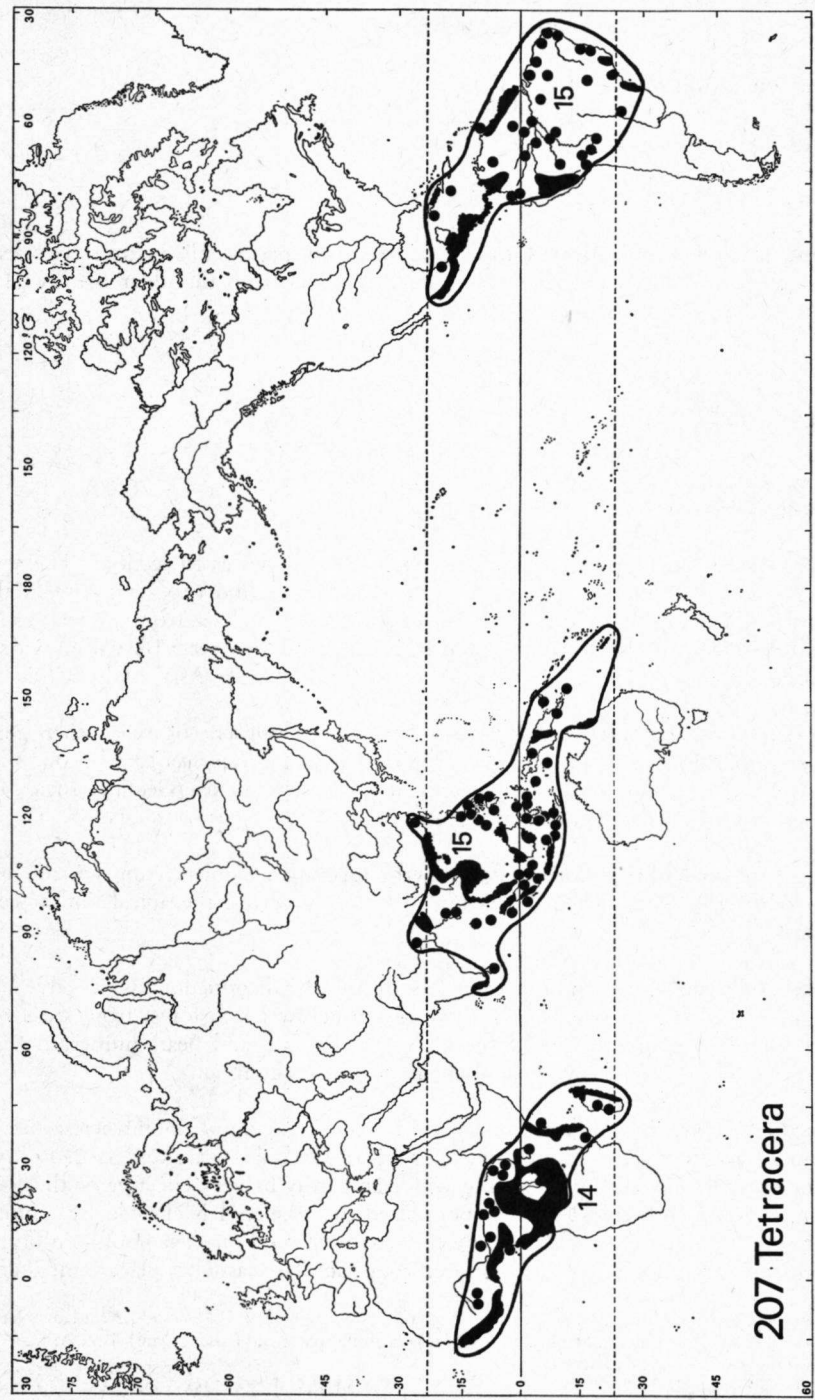
**Habitat and ecology:** In dry to swampy forest, savannas, along rivers and coasts; mostly in the lowlands, below 1000 m, but some species occasionally recorded up to 1500 m.

In the New World species male flowers as well as bisexual flowers exist, each producing a different type of pollen; the first have tricolporate pollen which is fertile, the latter produce cryptoporate pollen which is probably sterile.

**Dispersal:** The small capsules open with two valves, exposing the few (1—4) seeds. These are ovoid, 2—5 mm long, smooth, brown to black and covered by a red oil-containing aril. The capsule in section *Akara* and in some species of section *Tetracera* is also red. Dispersal by birds is suggested but this has yet to be observed.

**Sources:** R. D. Hoogland, Fl. Mal. I, 4 (1951) 141—148; *Ibid.*, Reinwardtia 2 (1953) 185—224; Kubitzki, Mitt. Bot. Staatssamml. München 7 (1970) 1—98.

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208. *Balanophora* J. R. & G. Forst.

**Name:** *Balanophora* J. R. & G. Forst., Char. Gen. Pl. 99 (1776) 50.

**Family:** *Balanophoraceae*.

**Synonyms:** See Hansen (1972, 84).

**Taxonomy and distribution:** Of the c. 90 described species only 15 are recognized by Hansen (l.c.). Hansen's subdivision of the genus differs from the older one by Harms (1935) and can be summarized as follows:

Subg. *Balanophora*

Sect. *Balanophora* (2 spp.) a.o. *B. fungosa*

Sect. *Dibalaniella* (3 spp.) a.o. *B. papuana*

Sect. *Alopecosathe* (1 sp.)

Sect. *Polyplethia* (5 spp.) a.o. *B. abbreviata* and *B. wilderi*

Subg. *Balanía*

Sect. *Dibivolva* (1 sp.)

Sect. *Neobalanía* (3 spp.)

*Balanophora* is best represented in Asia both as to species as to sections. The species occurring in the Pacific are: *B. fungosa* J. R. & G. Forst. (India to Ryu Kyu, Malesia, Queensland, Micronesia, Melanesia), *B. papuana* Schlecht. (Malesia, from Sumatra to New Britain), *B. wilderi* Setch. (Rarotonga and Rapa I.) and *B. abbreviata* Bl. with a wide and disjunct distribution (Congo, Comores, Madagascar, India, SE. Asia, Malesia, SE. Polynesia).

The subfamily *Balanophoroideae* consists besides *Balanophora* of two other genera: the monotypic *Thonningia* occurring in tropical Africa and *Langsdorffia* with one species in S. America, a second one recently described from New Guinea (Geesink, 1972), and a third one from Madagascar (Hansen, 1974).

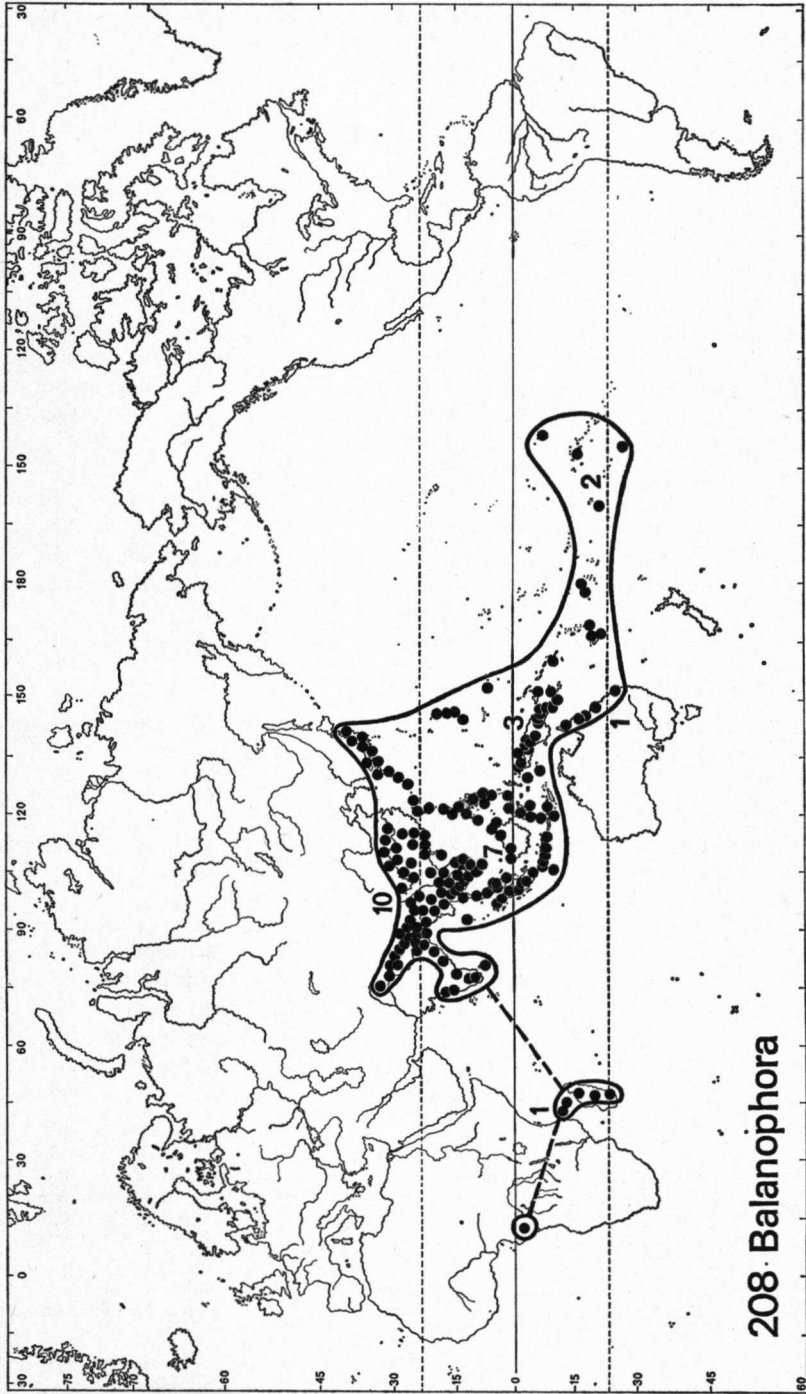
**Habit:** Echlorophyllose, rootless, fleshy herbs forming irregular redbrown to yellow masses or tangles of branched tubers up to c. 30 cm across; the apical, inflorescence-bearing part covered by leaves.

**Habitat and ecology:** Parasitic on roots of mostly dicotyledonous woody species belonging to a wide range of families. Mostly in everwet rain forest from sea-level to c. 3300 m. The inflorescence is borne above the ground and bears numerous ♂ or ♀ flowers or both. It is unknown how pollination is brought about.

**Dispersal:** The fruits come free upon maturity and decaying of the infructescence. It is unknown how the fruits — minute as the seeds of Orchids — are dispersed. Rainwash and wind are the most likely agents but wind can hardly be very effective on the floor of the rain forest. Van Steenis (1972) hypothesized that dispersal is effected by ungulates, treading on the forest floor and carrying the seed with mud on their hoofs and bringing them in this way into contact with injured roots, similarly as takes place with *Rafflesia*.

**Sources:** H. Harms in E. & P., Nat. Pfl. Fam. ed. 2, 16b (1935) 296—339; R. Geesink, Acta Bot. Neerl. 21 (1972) 102—106; C. G. G. J. van Steenis, Mount. Fl. Java (1972) pl. 5; B. Hansen, Dansk Bot. Ark. 28 (1972) 1—188; *Ibid.*, Bot. Tidssk. 69 (1974) 59.

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209. *Uncinia* Pers.

**Name:** *Uncinia* Pers., Syn. Pl. 2 (1807) 534.

**Family:** *Cyperaceae*.

**Taxonomy and distribution:** A predominantly southern hemisphere genus, with strong speciation in New Zealand (Hamlin, 1959) and Patagonia (Barros, 1969). The exact number of species is as yet unknown, especially since opinions on specific delimitation vary rather considerably. This is demonstrated by the treatments of *Uncinia compacta* R. Br. by Hamlin (1963) and by Lourteig (1968). Kükenthal (1909) divided the genus in two subgenera, one monotypic and confined to S. America, the other consisting of two sections, one exclusively American, the other with some species in America and the bulk in the Old World. Hamlin (1958) largely followed Kükenthal's classification but considered the 3 infrageneric taxa as sections, 2 of which were further divided into series.

The genus is represented in Australia by four spp., two endemic, one also in Malesia, another also in New Zealand and Subantarctic Is. (Willis, in litt.).

The Pacific (New Caledonia, Lord Howe, Tahiti, Hawaii) species are identical or closely allied to the New Zealand *U. uncinata* (L. f.) Kük.

According to Walton (in litt.) there are no endemic species in the Subantarctic Islands, only two wide-spread major species, derived from America and New Zealand respectively and with overlapping areas in the Atlantic and Indian Oceans.

*Uncinia* is closely allied to the more widely spread and morphologically more diversified genus *Carex*.

**Habit:** Perennial, tufted, grass-like herbs, sometimes producing rhizomes, the inflorescence a terminal bisexual spikelet.

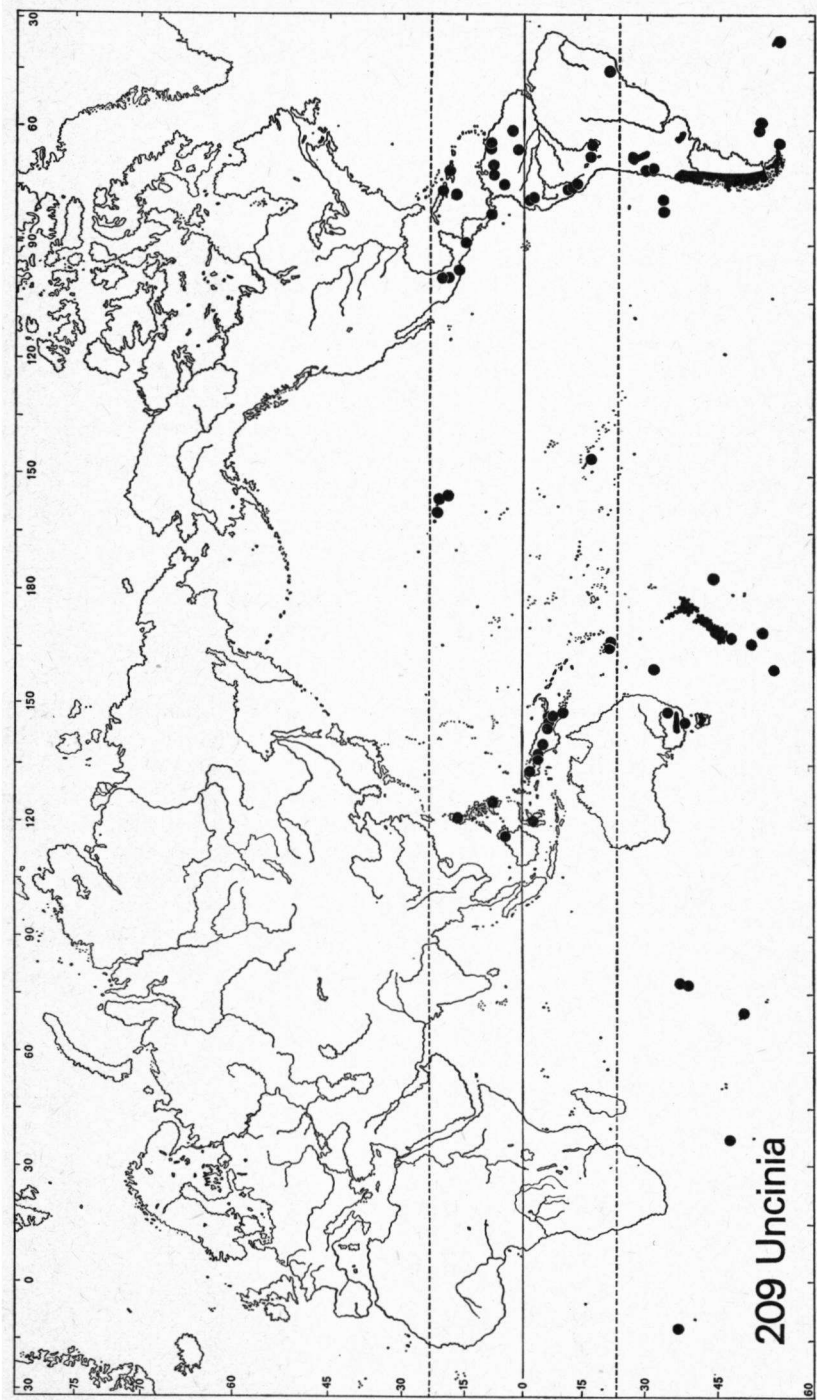
**Habitat and ecology:** Floor of subalpine and mossy forest in the tropics; in forest, along bogs, in tussock grassland in temperate latitudes, where they may descend to sea-level; often gregarious.

**Dispersal:** The smooth trigonous nut is small (2—3 × 1 mm) and is enclosed by a utricle; it is provided with a rhachilla (the reduced axis of the spikelet) produced beyond the utricle and strongly hooked. Dispersal by migratory and sea birds is therefore the most feasible means of dispersal (Ridley, 1930). Hamlin (1959, 78—80) provides actual observations by Dr. Falla of *Uncinia* seeds in the plumage of *Puffinus griseus*. In Tahiti I found *Uncinia* on high ridge crests near the holes of burrowing petrels (*Pterodroma*).

The distribution of *Uncinia* is almost a copy of that of *Nertera* (Pac. Pl. Ar. 2, map 54), which, however, has berries.

**Sources:** G. Kükenthal, Pfl. R. Heft 38 (1909) 50—67; H. N. Ridley, Dispersal (1930) 557; E. Nelmes, Kew Bull. (1949) 140—145; B. G. Hamlin, Rec. Dom. Mus. 3 (1958) 85—88; *Ibid.*, Dom. Mus. Bull. 19 (1959) 1—106; *Ibid.*, Trans. R. Soc. New Zeal. Bot. 2 (1963) 127—131; A. Lourteig, C.N.F.R.A., Biol. 23 (1968) 25—31; S. S. Hooper, Res. Norw. Sci. Exp. Tristan 54 (1968) 9; M. Barros in M. N. Correa, Fl. Patagonica 2 (1969) 58—62; T. M. Koyama, Mem. N. Y. Bot. Gard. 18 (1969) 27; L. B. Moore & F. Edgar, Fl. New Zeal. 2 (1970) 215—235; J. H. Kern, Fl. Mal. MS. Additional information was obtained from Miss M. Munoz S. (Santiago), Dr. T. M. Koyama (New York), D. W. H. Walton (Birmingham), and Dr. J. H. Willis (Brighton).

M. M. J. VAN BALGOOY.



210. *Scaevola plumieri* (L.) Vahl

**Name:** *Scaevola plumieri* (L.) Vahl, Symb. Bot. 2 (1791) 36.

**Family:** *Goodeniaceae*.

**Synonyms:** *S. lobelia* Murr., *S. thunbergii* Eckl. & Zeyh.

**Taxonomy and distribution:** Most of the c. 80 species of *Scaevola* are confined to Australia which is also the centre of the family. *S. plumieri* belongs to a group of fleshy fruited species found mainly outside Australia. The majority of these were placed in sect. *Sarcocarpaea* (= sect. *Scaevola*) by Krause (1912).

*S. plumieri* is a widespread littoral species, known from few localities on the Pacific side of America and from various places from Bermuda and Florida down to S. Brasil. In Africa it ranges from Senegal to Angola on the W. coast and from the Cape to Somalia on the E. coast and thence to Madagascar, Mascarenes, S. India and Ceylon.

*S. socotrensis* described from Socotra I. (St. John, 1962) is probably a form of this polymorphic species. Its habitat (rock crevices at 50 m alt.) is unusual but *S. taccada*, the only other littoral species has also been recorded from inland stations.

**Habit:** Mostly a prostrate shrub, up to c. 1 m, leaves alternate, fleshy.

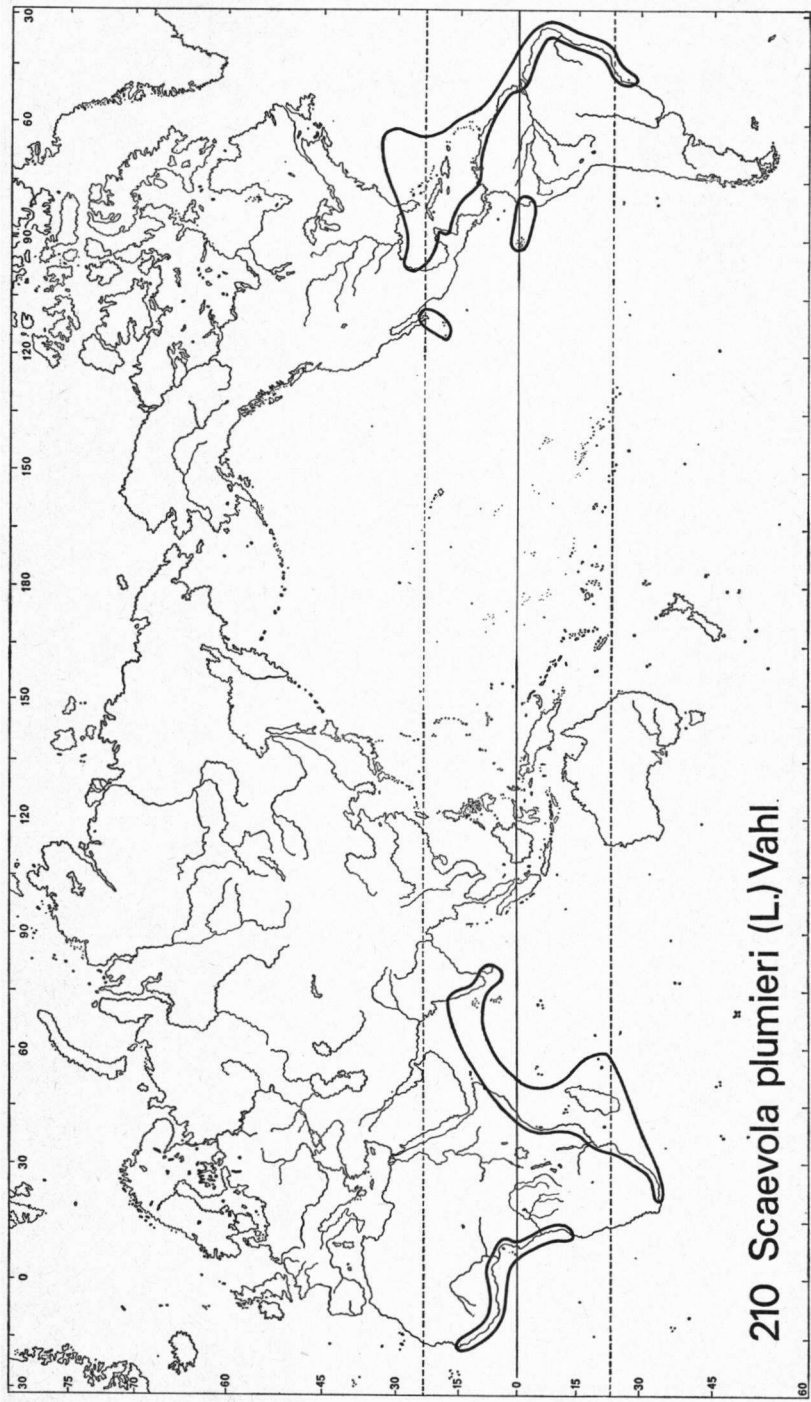
**Habitat:** Sandy and rocky, tropical to subtropical coast, often on dunes.

**Dispersal:** The fruit is a blue to black subglobose drupe, 1—1.5 cm long. After decay of the fleshy mesocarp the stone can float for 4—5 months (Guppy, 1917), the seeds retaining their viability. The buoyancy is due to the fact that only one of the two seeds develops, one cell remaining empty. Local dispersal by birds (emus) has been observed in the Australian *S. spinescens* R. Br. and is likely to happen in all fleshy fruited *Scaevolae*, but the wide distribution of *S. plumieri* must be attributed to sea-dispersal.

**Sources:** See under *S. taccada* (map 211).

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211. *Scaevola taccada* (Gaertn.) Roxb.

**Name:** *Scaevola taccada* (Gaertn.) Roxb., Hort. Beng. (1814) 15.

**Family:** *Goodeniaceae*.

**Synonyms:** *S. sericea* Vahl, *S. frutescens* (Mill.) Krause, *S. koenigii* Vahl.

**Taxonomy and distribution:** *S. taccada* ranges from E. Africa and Madagascar eastwards to Hawaii and SE. Polynesia. Thus its area overlaps that of *S. plumieri* in the western part of the Indian Ocean.

Apart from these two littoral species a number of possibly allied inland species are known from Malesia and several high islands in the Pacific. These are usually considered to be derived from *S. taccada*, but in most cases the affinity is not so close. Of the Hawaiian endemics one, *S. glabra* H. & A., shows some similarities to *S. coccinea* Dänik. of New Caledonia, whilst others show similarities to the group of species close to *S. floribunda* A. Gray (Fiji) stretching from the New Hebrides to the Marquesas Is. In addition the common inland *S. spinescens* R. Br. of Australia shows similarities to all these species.

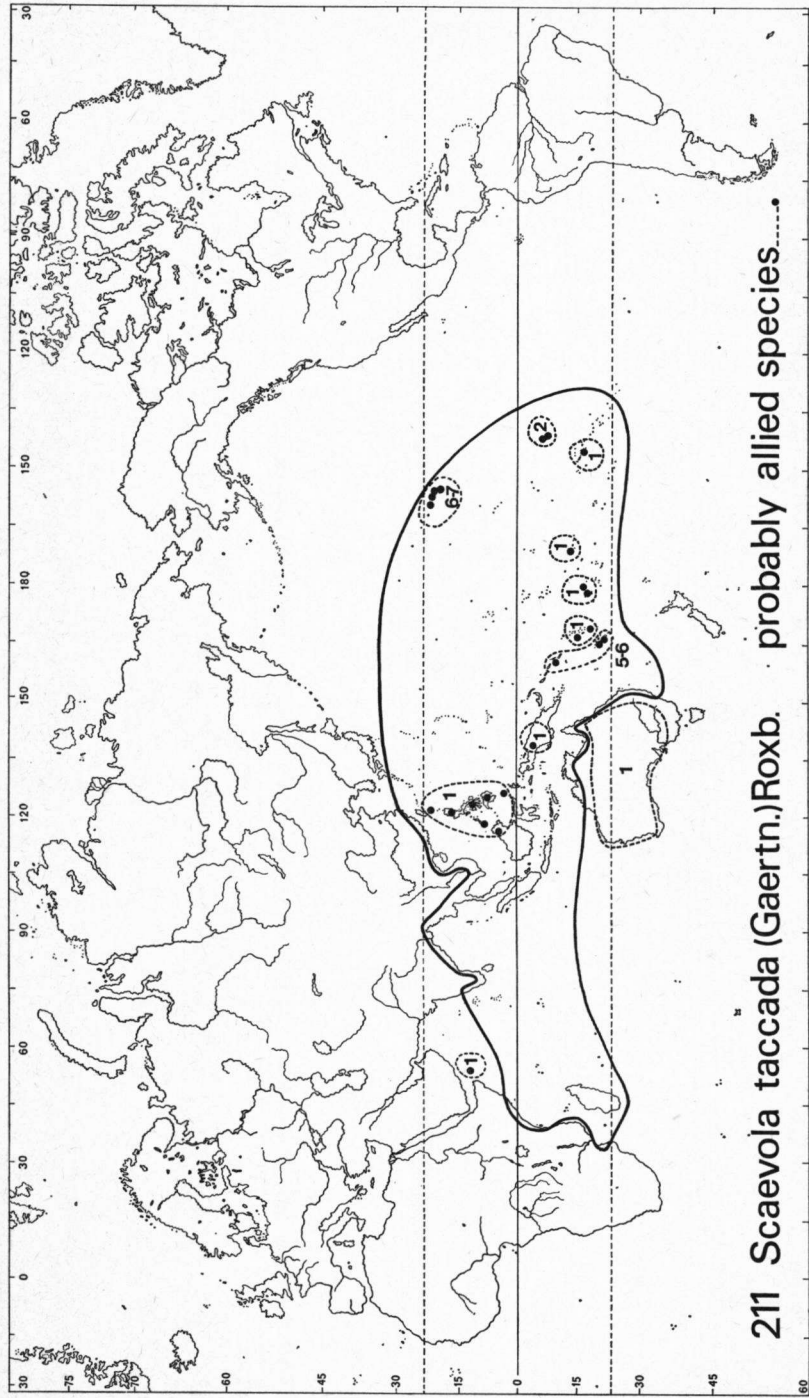
**Habit:** Usually an erect shrub, a few meters high, sometimes a treelet up to 7 m, with crowded, large, obovate leaves; procumbent small-leaved forms have been described from Polynesia.

**Habitat and ecology:** Sandy and rocky or coralline coasts, sometimes gregarious behind the 'pes-caprae' formation. Occasionally extending some distance inland. Pollination of the white scentless flowers is by bees but self-pollination has been observed and even seems to be the rule in Hawaii (Gillett, 1966).

**Dispersal:** The fruit is a white fleshy drupe c. 1.5 cm across, the stone is covered by a corky layer which causes its buoyancy. Guppy found the stones to float for a year, the seeds retaining their viability. See also under *S. plumieri* (map 210).

**Sources:** K. Krause, Pfl. R. Heft 54 (1912) 117—168; H. B. Guppy, Plants, Seeds and Currents (1917) 227—236; P. W. Leenhouts, Fl. Mal. I, 5 (1957) 339—344, 567—569; *Ibid.*, 6 (1972) 951, 952; G. W. Gillett, Evolution 20 (1966) 506—516; S. Carlquist, Ann. Mo. Bot. Gard. 56 (1969) 358—390, 469—470; H. St. John, Webbia 17 (1962) 45—48. Unpublished notes by R. C. Carolin and material from various herbaria. Additional information on the distribution of *S. plumieri* in America was provided by Dr. J. J. Wurdack (Washington DC).

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211 *Scaevola taccada* (Gaertn.) Roxb. probably allied species.....

212. *Lagenophora* Cass.

**Name:** *Lagenophora* Cass., Bull. Soc. Philomat. 12 (1816) 199.

**Family:** *Compositae*.

**Taxonomy and distribution:** According to Cabrera (1966) the genus comprises 15 species, which fall apart into two sections: *Pseudomyriactis* Cabr. with three species in Central America and Venezuela, and *Lagenophora*. Of this section three species occur in temperate South America, one extending to the Falkland Is., Tristan da Cunha and Gough Is., and another to Juan Fernandez. From New Zealand and adjacent islands six species are known, one extending to New Caledonia and New Guinea. Of the three Australian species, one is endemic, another is also known from New Guinea, and the third ranges from continental Asia and Ryu Kyu Is. to Tasmania and New Caledonia. An endemic species was recently described from Maui, Hawaii by St. John (1971). The genus is closely allied to *Keysseria* (E. Malesia, Fiji, Hawaii), *Laestadia* (tropical South America), *Myriactis* (SE. Asia, Malesia), and *Solenogyne* (Japan, Australia).

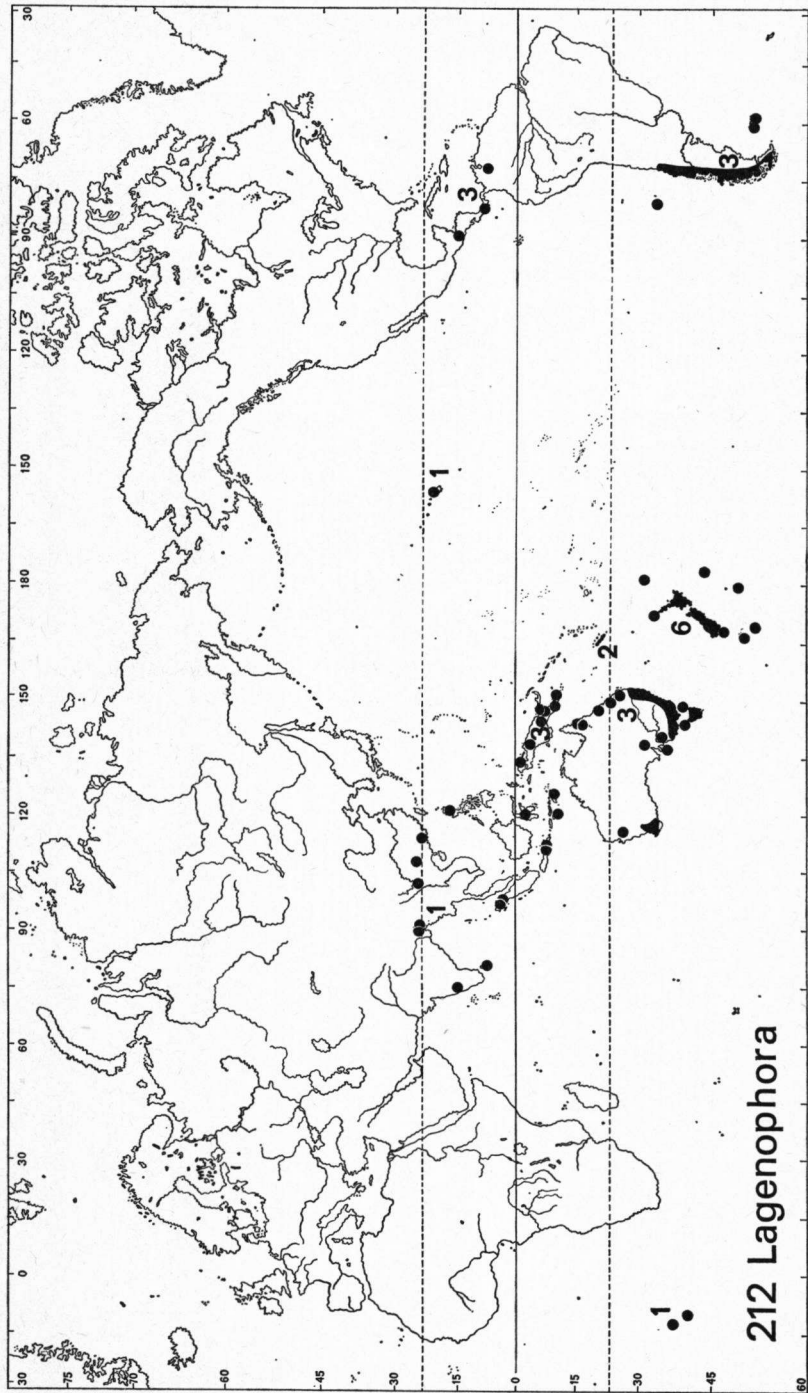
**Habit:** Small stoloniferous perennial herbs, flowerheads in all but one species solitary.

**Habitat and ecology:** In light forest, forest margins, grassland and wet open places, at high stations in tropical America but descending to moderate altitudes (as low as 800 m) in Malesia.

**Dispersal:** The achenes have no pappus, they are provided with a glandular sticky beak instead. Epizoid dispersal is therefore the most likely means of transport.

**Sources:** G. L. Davis, Proc. Linn. Soc. N.S.W. 75 (1950) 122—132; H. H. Allan, Fl. New Zeal. 1 (1961) 605—609; A. L. Cabrera, Blumea 14 (1966) 285—308, map; J. Th. Koster, Nova Guinea Bot. 24 (1966) 588—592; H. St. John, Pac. Sc. 25 (1971) 37—79.

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213. *Keysseria* Laut.

**Name:** *Keysseria* Lauterbach, Fedde Rep. 13 (1914) 241.

**Family:** *Compositae*.

**Taxonomy and distribution:** A genus best represented in New Guinea with 8 species, one of which also occurs in Celebes, one species in Borneo, another on Vanua Levu (Fiji, once collected) and 4 in Hawaii.

The genus is allied to *Lagenophora* (map 212) and *Myriactis* (Indo-Malesia).

**Habit:** Low perennial shrublets or herbs, usually with procumbent stems and producing rhizomes; leaves crowded, flowerheads solitary. Plants often viscid.

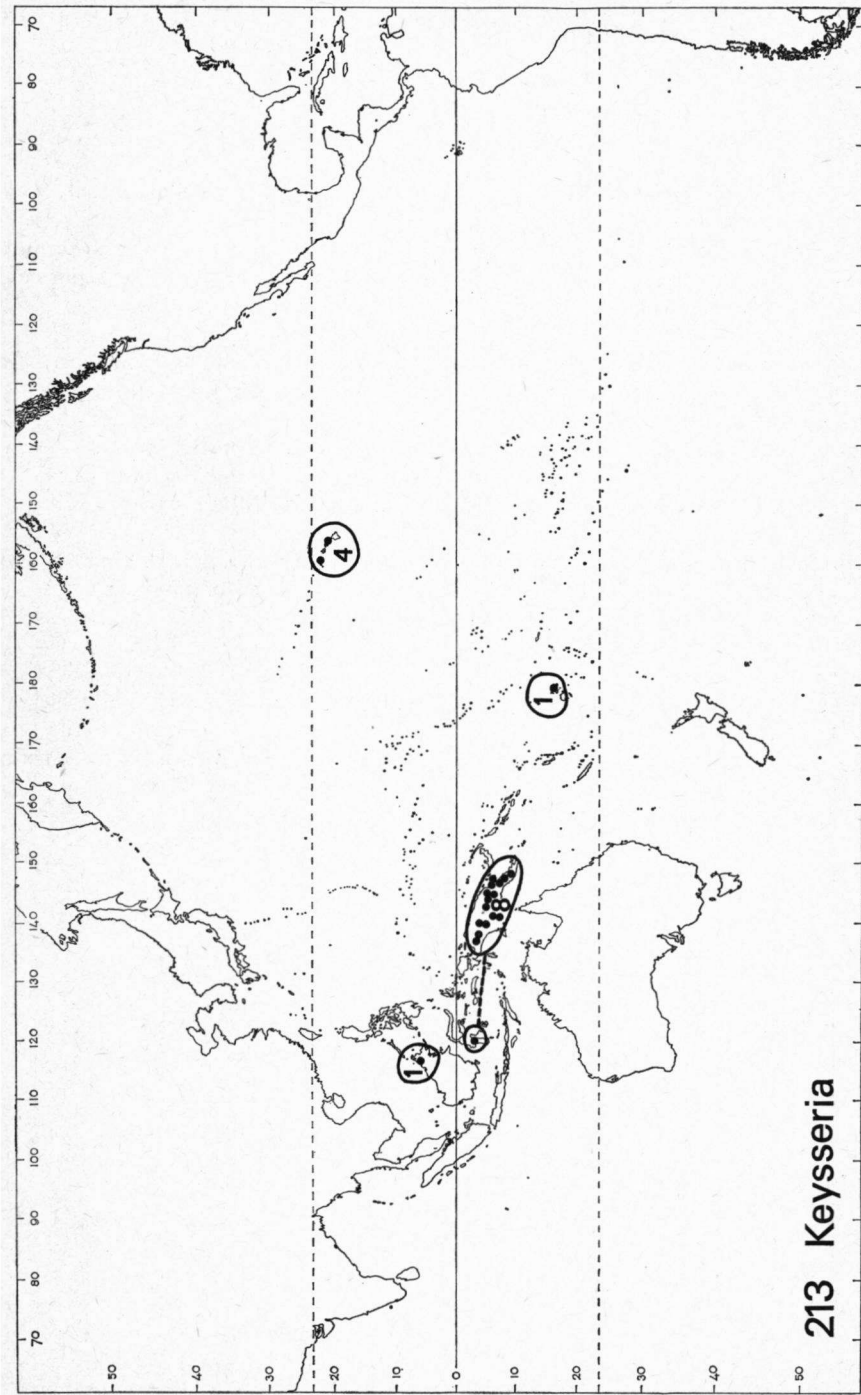
**Habitat and ecology:** In Malesia confined to the highest mountains, where they occur between 2400—4400 m, but mostly in the alpine zone above 3300 m. The Hawaiian species have been found in open bogs between 1000—1700 m.

Often gregarious in grasslands, swamps and on rocky ridges.

**Dispersal:** Unknown. The achene is 1—3 mm long, compressed, somewhat warty and lacking pappus, but in Malesian specimens always empty. Propagation is apparently strictly vegetative through the rhizomes.

**Sources:** J. Mattfeld, Bot. Jahrb. 68 (1937) 249—251; A. L. Cabrera, Blumea 14 (1966) 307; J. Th. Koster, Nova Guinea Bot. 24 (1966) 597—608. Collections in the Rijksherbarium Leiden.

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214. *Lindenia* Benth.

**Name:** *Lindenia* Benth., Pl. Hartweg. (1857) 351.

**Family:** *Rubiaceae*.

**Taxonomy and distribution:** The genus consists of two species, geographically widely separated. *L. rivalis* Benth. (*L. acutiflora* Hook.) is known from C. America where it extends from Michoacan, Mexico to Panama (Standley, 1924), *L. vitiensis* Seem. (*L. austro-caledonica* Brongn.) occurs in New Caledonia and Fiji and is also reported by Seemann (1873, 430) from Samoa but this needs confirmation.

**Habit:** Shrubs c. 1 m high. Typical rheophytes with elongate narrow somewhat falcate leaves. Flowers large creamy white, borne terminally, very fragrant.

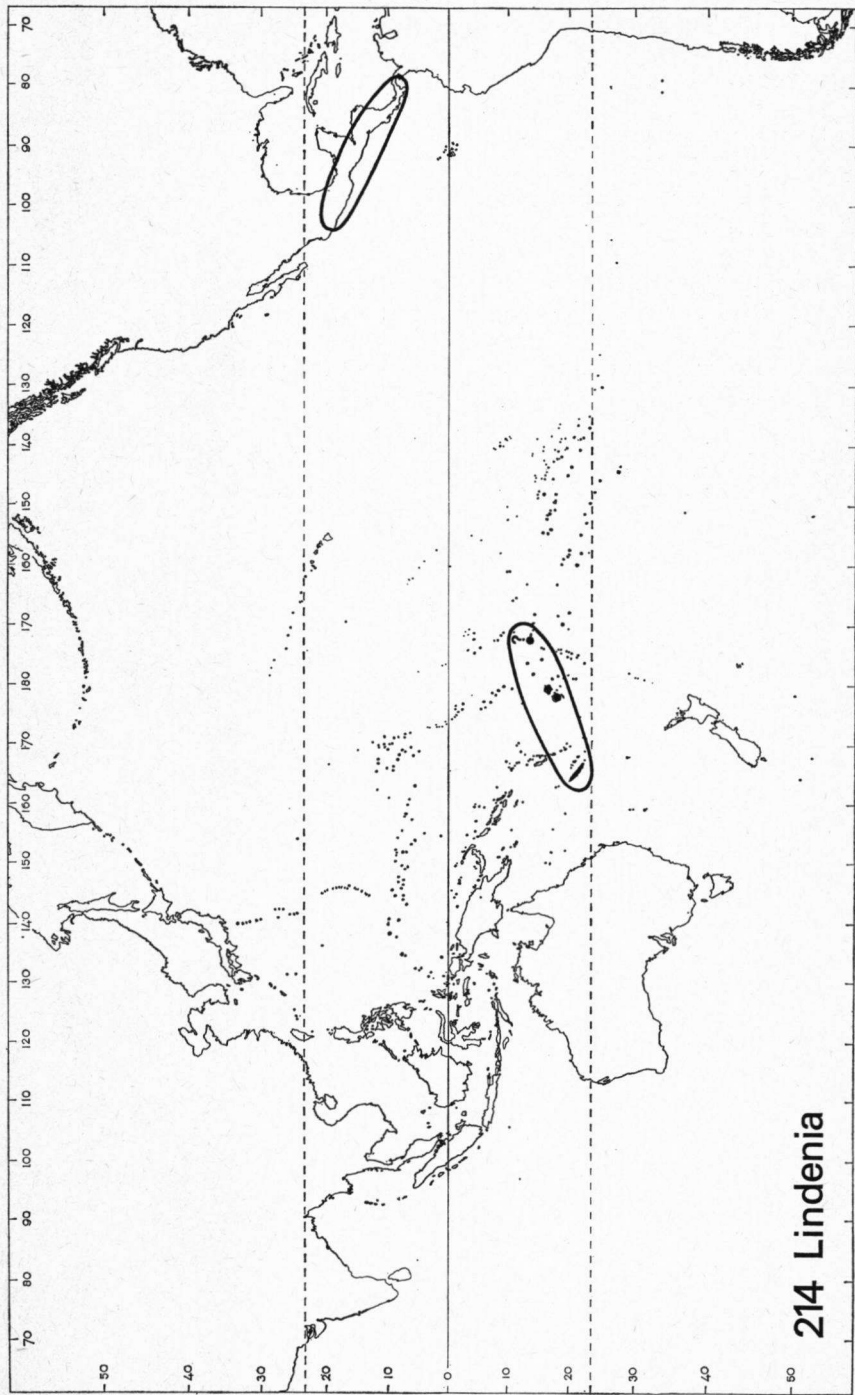
**Habitat and ecology:** Both species are found along the banks of streams, in the lowland as well as in the mountains. In Fiji *L. vitiensis* is usually accompanied by other rheophytes of the genera *Acalypha*-Euph., *Dolicholobium*-Rub. and *Ficus*-Mor.

**Dispersal:** The capsules are 2—3 cm long, dehiscing at maturity and releasing numerous seeds of c. 1.5 mm diameter. The seeds are covered by a layer of air-bearing tissue (cf. *Bikkia*, Pac. Pl. Ar. 2, map 78) which causes their buoyancy.

**Sources:** B. Seemann, Bonplandia 10 (1862) 33, 34; Ibid., Fl. Vit. (1866, 1873) 128, 430; H. B. Guppy, Plant Dispersal (1906) 395, 396; P. C. Standley, Contr. U.S. Nat. Herb. 23 (1924) 1358.

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215. *Lindsaea gueriniana* (Gaud.) Desv.

**Name:** *Lindsaea gueriniana* (Gaud.) Desv., Prodr. (1827) 312.

**Family:** 'Polypodiaceae', *Lindsaea* group.

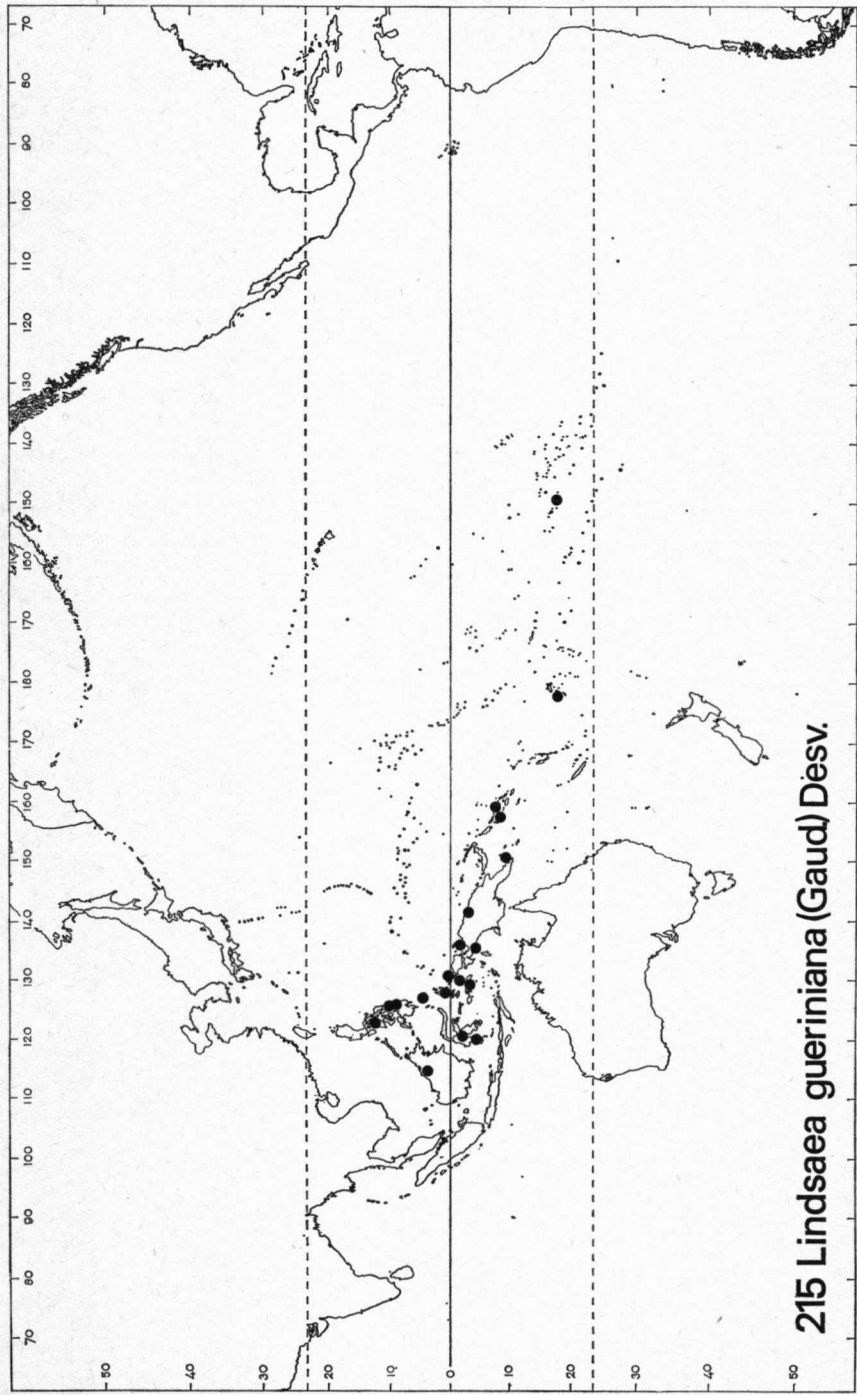
**Synonyms:** *Isoloma guerinianum* (Gaud.) Fée; *Isoloma schizolomae* (v.A.v.R.) Tagawa; *Schizoloma fuliginum* Copel.

**Taxonomy:** *Isoloma* has usually been treated as a distinct genus but was reduced to a section of *Lindsaea* by Kramer (Blumea 15, 1968, 560).

**Habitat:** Terrestrial, in forests in open, rather dry places, to 750 m alt. Many collections are from small islands, e.g., Dinagat, Rawak, Japan.

**Sources:** Herbarium specimens; see Kramer, Blumea 18 (1970) 178; Fl. Mal. II, 1 (1971) 230, 231. The find from Viti Levu is still more recent.

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215 *Lindseea gueriniana* (Gaud) Desv.

216. *Lindsaea rigida* J. Smith in Hooker

**Name:** *Lindsaea rigida* J. Smith in Hooker, Sp. Fil. 1 (1846) 217, pl. 63.

**Family:** 'Polypodiaceae', *Lindsaea* group.

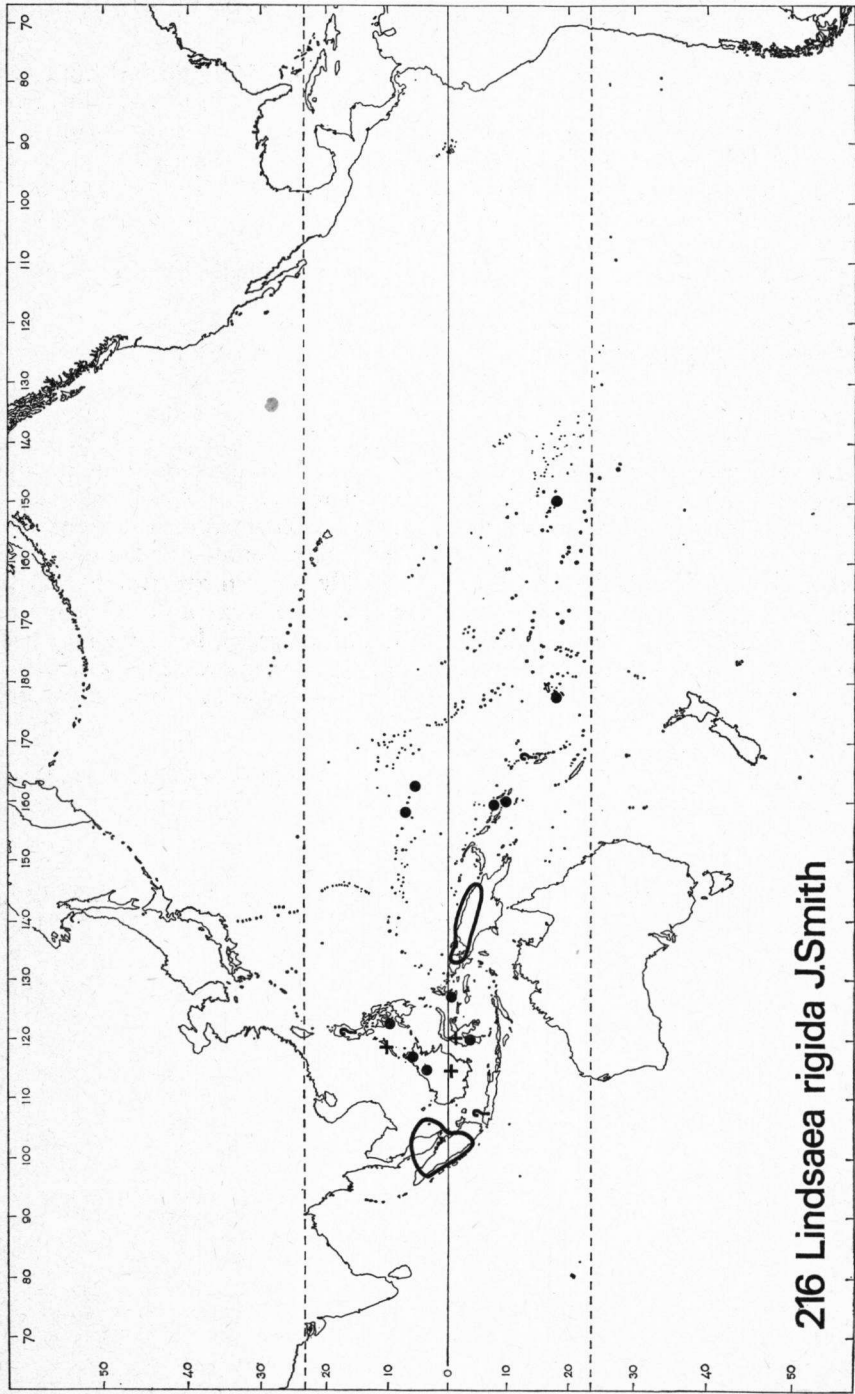
**Synonyms:** *L. monosora* Copel.; *L. diplosora* v.A.v.R.; *L. triplosora* v.A.v.R.; *L. sepikensis* Brause.

**Taxonomy:** A variable yet distinctive member of the epiphytic section *Lindsaenium* (Fée) Kramer which occurs from Malaya to the Society Is., with the greatest concentration of species in New Guinea.

**Habitat:** Epiphytic, less often epilithic or terrestrial, usually between 1000 and 2000 m.

**Sources:** Herbarium material; see Kramer, *Blumea* 18 (1970) 184; *Fl. Mal.* II, 1 (1971) 245. The report from Kusaie is from Ito (*Bot. Mag. Tokyo* 67, 1954, 218). The find from Fiji dates from after the completion of the account of the Pacific Lindsaeoids (Kramer, 1970). Records from Singapore, Java, Luzon, and the New Hebrides require confirmation.

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216 *Lindseea rigida* J. Smith

217. *Lindsaea repens* (Bory) Thwaites

**Name:** *Lindsaea repens* (Bory) Thwaites, En. Pl. Zeyl. (1864) 388; Beddome, Ferns S. India (1864?) pl. 209. Var. *cheilosora* Kramer, Blumea 18 (1970) 181. Var. *delicatula* (Christ) Kramer, Blumea 15 (1968) 569. Var. *lingulata* Kramer, Blumea 18 (1970) 181. Var. *macraeana* (Hooker & Arnott) Mett. ex Kuhn; Miquel, Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 277. Var. *marquesensis* E. Brown, Bull. Bish. Mus. 89 (1931) 51, pl. 9. Var. *pectinata* (Bl.) Mett. ex Kuhn; Miq. Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 277. Var. *pseudohemiptera* v.A.v.R., Bull. Jard. Bot. Btzg. II, 2 (1920) 157, f. C. Var. *sessilis* (Copeland) Kramer, Blumea 15 (1968) 568. Var. *submarginalis* Kramer, Blumea 15 (1968) 569.

**Family:** 'Polypodiaceae', *Lindsaea* group.

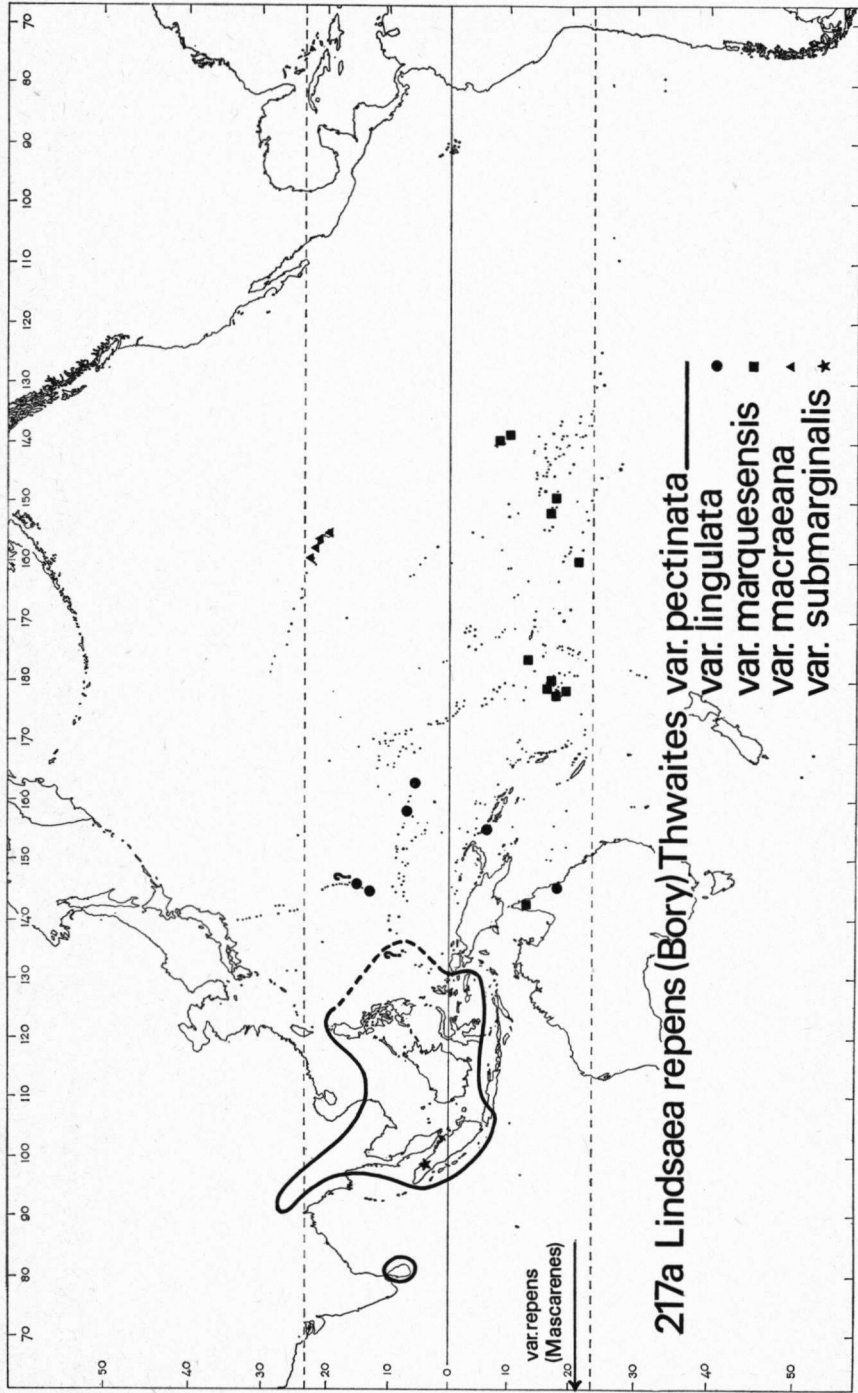
**Taxonomy and synonymy:** *Lindsaea repens* appears in the literature under various names, partly names applied here to varieties but used in a wider sense, e.g. *L. pectinata* and *L. macraeana*. Kramer (cited below) merged all local forms into one comprehensive species distributed from the Mascarenes to eastern Polynesia. Some of the local forms are mutually geographically exclusive, other only partly so, still others occur entirely within the range of one or more other forms. In such cases there is nearly always some intergradation between them in the area of overlap, notably between var. *pectinata* and var. *sessilis*. Because of this phenomenon, and as the differences between them are as a rule slight, the local forms are treated as varieties, not as subspecies, but some may prove distinct enough to merit a higher taxonomic rank, e.g., vars. *macraeana* and *cheilosora*.

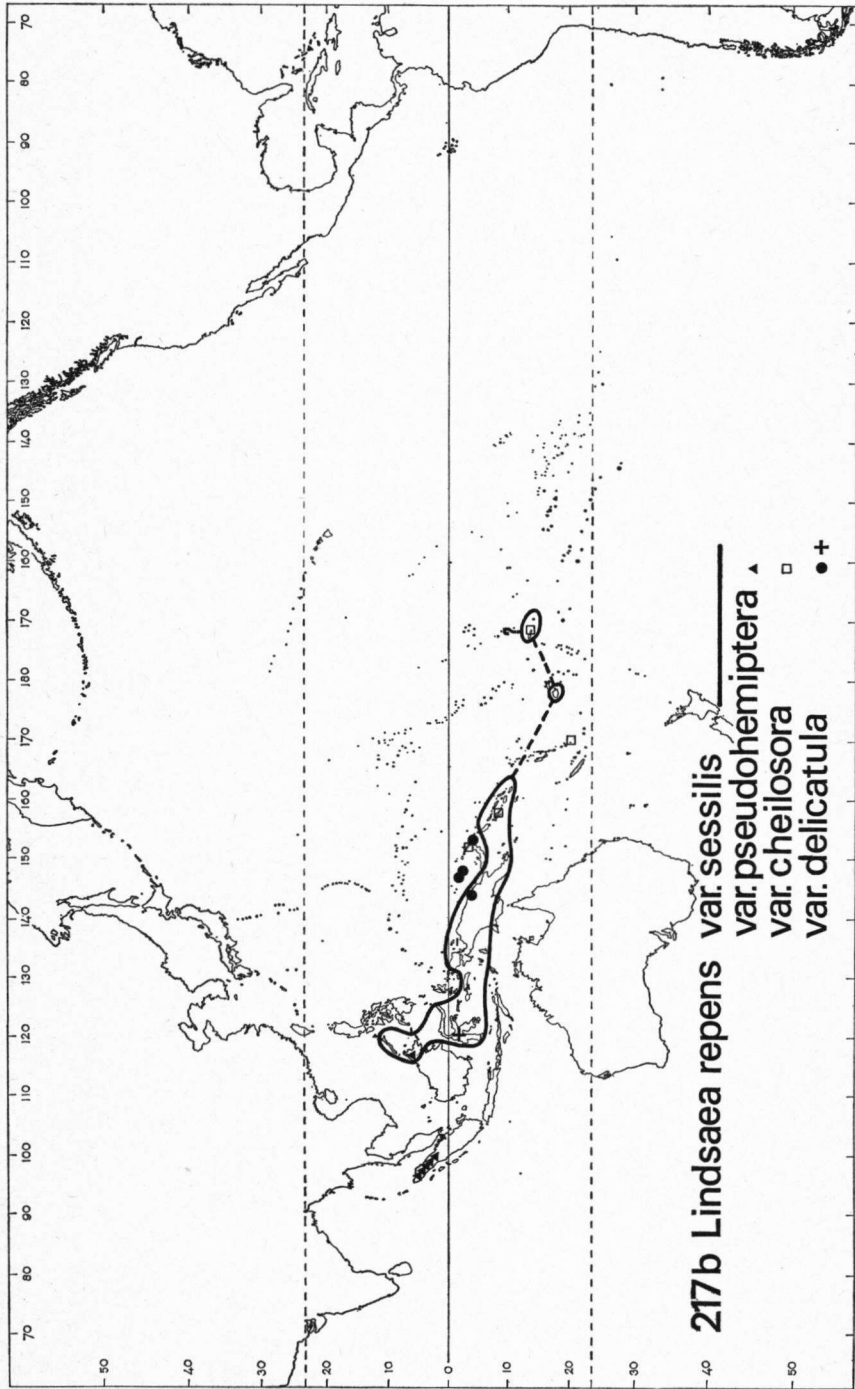
The absence of the species from Madagascar and New Caledonia and its great scarcity in Queensland are not readily explained.

**Ecology:** All varieties are forest epiphytes, the more widespread ones extending to lower altitude, the more local ones usually being confined to higher elevation. All finds of var. *delicatula* are from sago-palm swamps.

**Sources:** Herbarium material; see Kramer, Blumea 18 (1970) 180—184; Fl. Mal. II, 1 (1971) 237—240; Bull. Jard. Bot. Nat. Belg. 42 (1972) 341; Gard. Bull. Sing. 26 (1972) 45.

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218. *Lindsaea tenuifolia* Bl. species group

**Names:** *Lindsaea tetragona* Kramer, *Blumea* 15 (1968) 564; *L. tenuifolia* Blume, *En. Pl. Jav.* (1828) 219; *L. polyclena* Kramer, *Blumea* 15 (1968) 565.

**Family:** 'Polypodiaceae', *Lindsaea* group.

**Synonyms:** These species were treated as one until separated by Kramer (l.c.). The synonyms *L. triquetra* (Baker) Christ. and *L. blumeana* (Hook.) Kuhn have been used for *L. tenuifolia*.

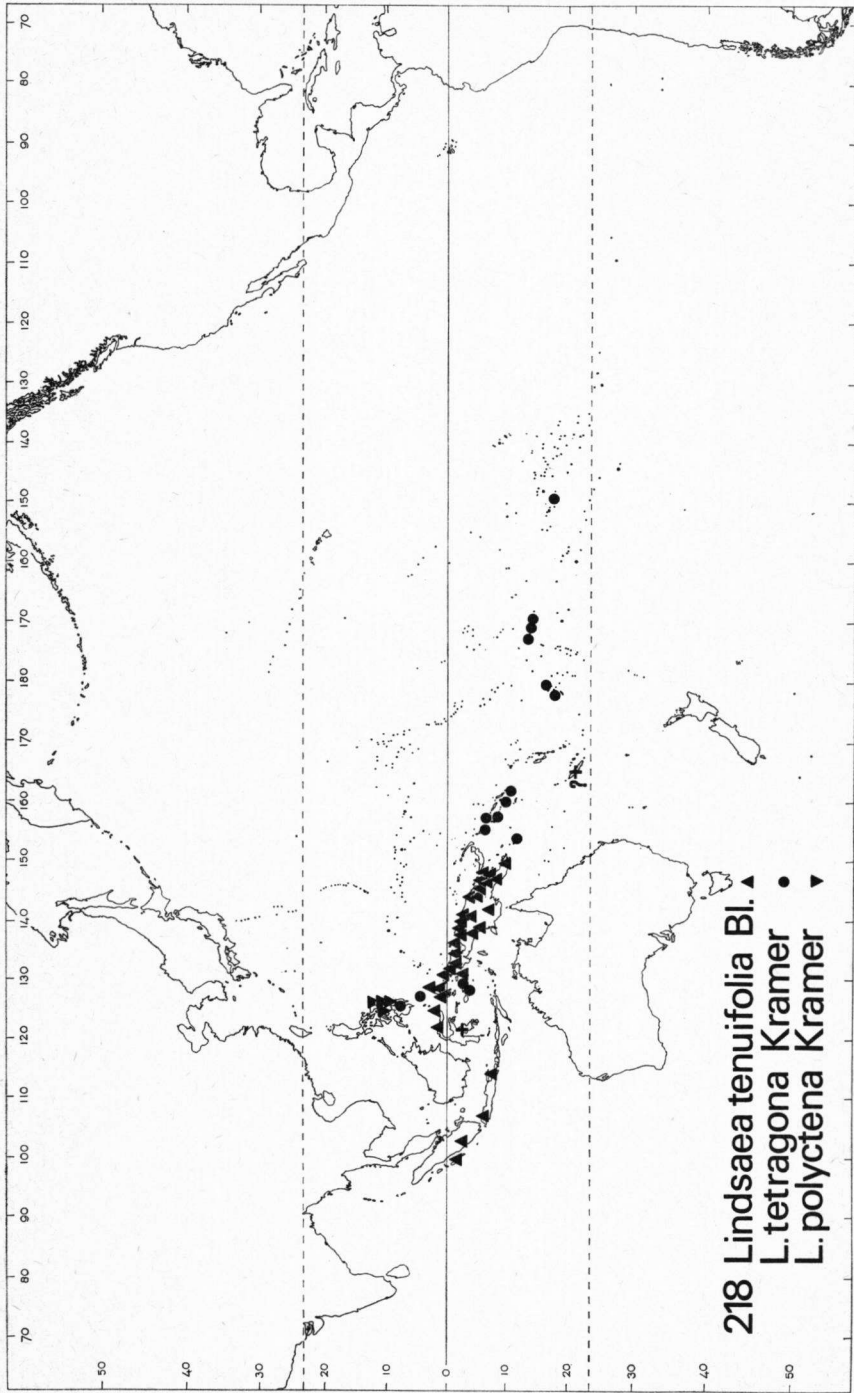
**Taxonomy:** A closely knit group of species within the Old World representatives of *Lindsaea* sect. *Temnolindsaea* Kramer; other relatives are *L. kingii* in *New Guinea*, the Moluccas, and San Cristóbal, *L. multisora* in Celebes, *L. natunae* in the Natuna and Riouw Is., and *L. francii* in *New Caledonia*. More distantly related are the New World representatives and *L. kirkii* in the Seychelles.

**Distribution:** Both *L. tetragona* and *L. tenuifolia* have unusual patterns of distribution, the former occurring to the West and far to the East of but not on *New Guinea*, the latter being particularly common in *New Guinea*, less so in the Moluccas, and occurring very sparingly west to *Sumatra* and *Siberut*.

**Habitat:** All species inhabit forest floor at lower and middle altitude.

**Sources:** Herbarium specimens; see Kramer, *Blumea* 18 (1970) 171, and *Fl. Mal.* II, 1 (1971) 213—216, map 4.

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219. *Lindsaea* section *Tropidolindsaea* Kramer

**Name:** *Lindsaea* sect. *Tropidolindsaea* Kramer, Acta Bot. Neerl. 6 (1957) 267.

**Family:** 'Polypodiaceae', *Lindsaea* group.

**Taxonomy:** A rather isolated section of four closely related species; possible relatives are the widespread paleotropic species *L. odorata* Roxb. (= *L. cultrata* auct., section *Osmolindsaea*) and the Madagascan sect. *Sambirania* (Tardieu-Blot) Kramer.

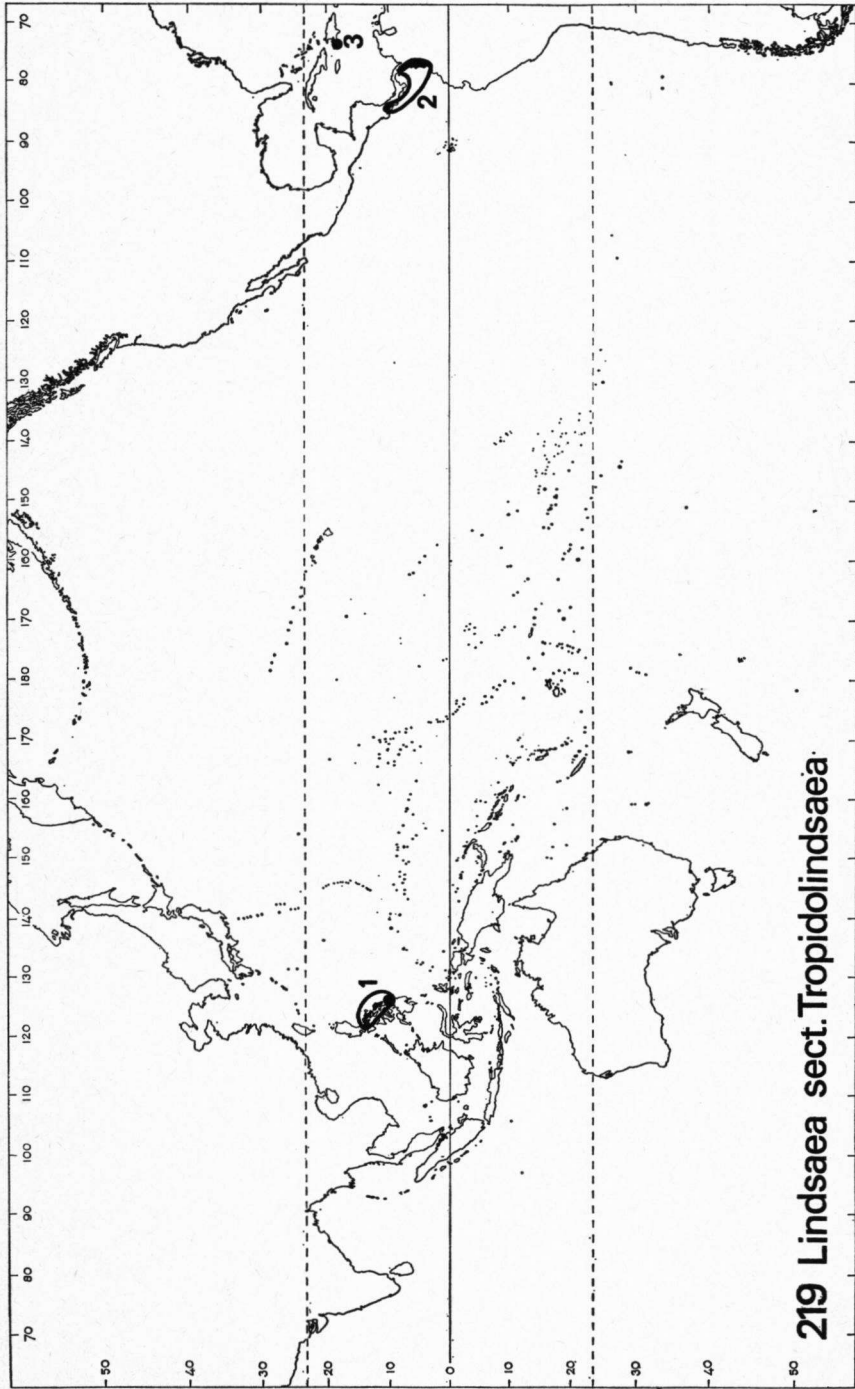
**Habitat:** All species of this group appear to be rare, and the number of ecological data is quite small. Most, if not all, species seem to prefer open habitats.

**Distribution:** *L. protensa* C. Chr. is confined to the SW. peninsula of Hispaniola, *L. pratensis* Maxon to Costa Rica, *L. seemannii* J. Smith (non Carr.) to SE. Panama and W. Colombia, and *L. adiantoides* J. Smith (non Bl.) Kuhn (syn. *L. humilis* Kuhn in Miq.; *L. tropidorachis* v.A.v.R.; *L. trimarginata* C. Chr.) to the islands of Luzon, Samar, and Dinagat, on the E. flank of the Philippines. The two last-named species are particularly closely related.

**Map:** Indicated with 1: *L. adiantoides*, 2: *L. pratensis* and *L. seemannii*, 3: *L. protensa*.

**Sources:** Herbarium specimens; see Kramer, Acta Bot. Neerl. 6 (1957) 267—271; Fl. Mal. II, 1 (1971) 229.

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219 *Lindsaea* sect. *Tropidolindsaea*

220. *Sphenomeris biflora* (Kaulf.) Tagawa

**Name:** *Sphenomeris biflora* (Kaulf.) Tagawa, J. Jap. Bot. 33 (1958) 203.

**Family:** 'Polypodiaceae', *Lindsaea* group.

**Synonyms:** *Odontosoria tsoongii* Ching; *Stenoloma littorale* Tagawa; *Sphenomeris chusana* (L.) Copel. var. *littoralis* (Tagawa) H. Ito.

**Taxonomy:** Often confused with the closely related *Sph. chinensis* (L.) Maxon [*Sph. chusana* (L.) Copel.]; see Kramer, *Blumea* 15 (1968) 573.

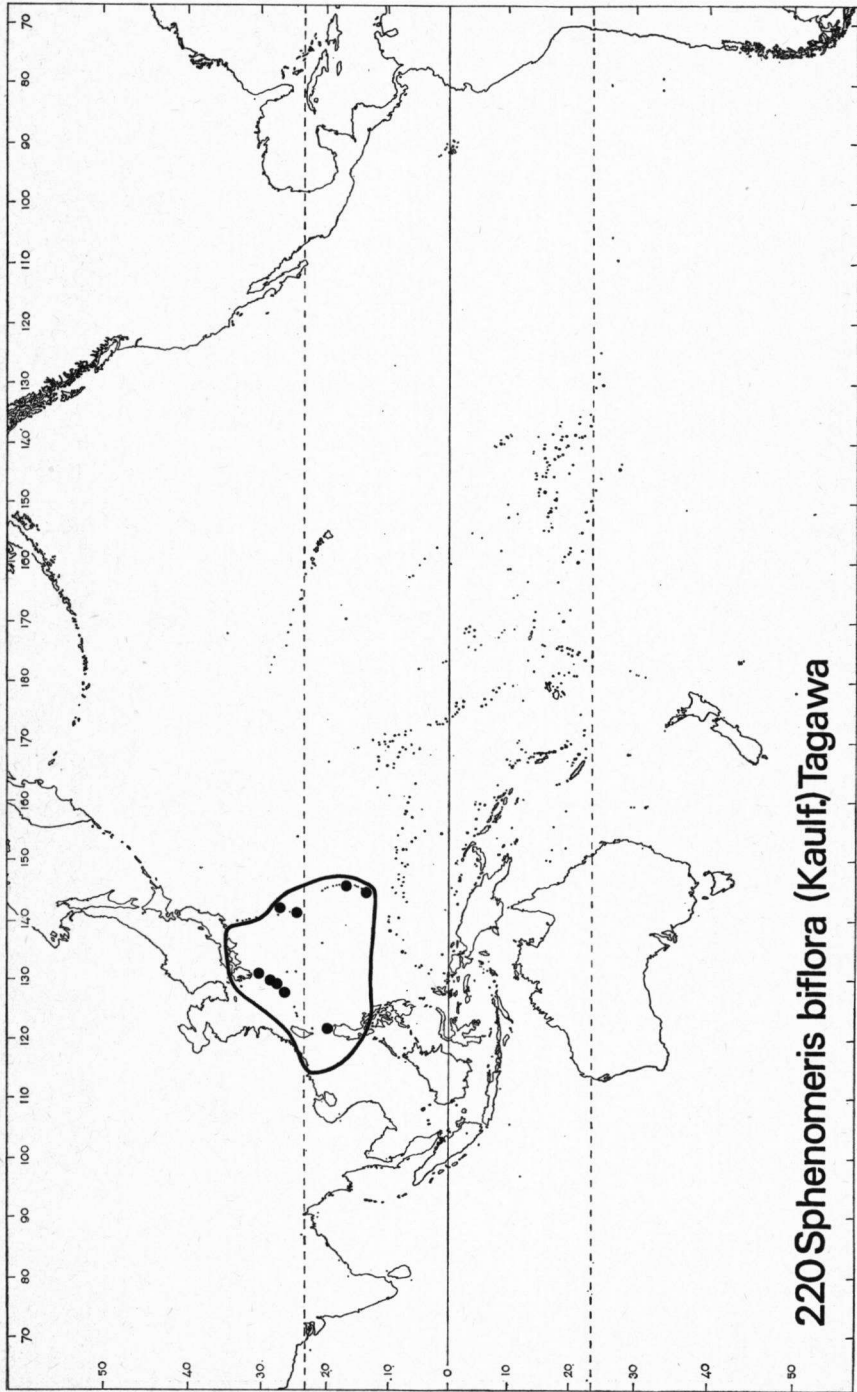
**Habitat:** Exposed places, often near the coast, mostly at lower elevation; never in forest shade.

**Distribution:** In most parts of its range much less common than the much more widespread *Sph. chinensis* (see map 221), but replacing that species in Guam and the Bonin and Volcano Is, probably also locally in Japan.

The distribution in continental areas and in larger islands is on the map indicated by outline, viz. in S. Japan, Taiwan, Luzon, and SE. China (there mostly on small offshore islands).

**Sources:** Herbarium material; see Kramer, *Blumea* 18 (1970) 162; *Fl. Mal.* II, 1 (1971) 182; *Gard. Bull. Sing.* 26 (1972) 4.

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220 *Sphenomeris biflora* (Kaulf.) Tagawa

221. *Sphenomeris chinensis* (L.) Maxon

**Name:** *Sphenomeris chinensis* (L.) Maxon, J. Wash. Ac. Sc. 3 (1913) 144; Un. Cal. Publ. Bot. 12 (1924) 31.

**Family:** 'Polypodiaceae', *Lindsaea* group.

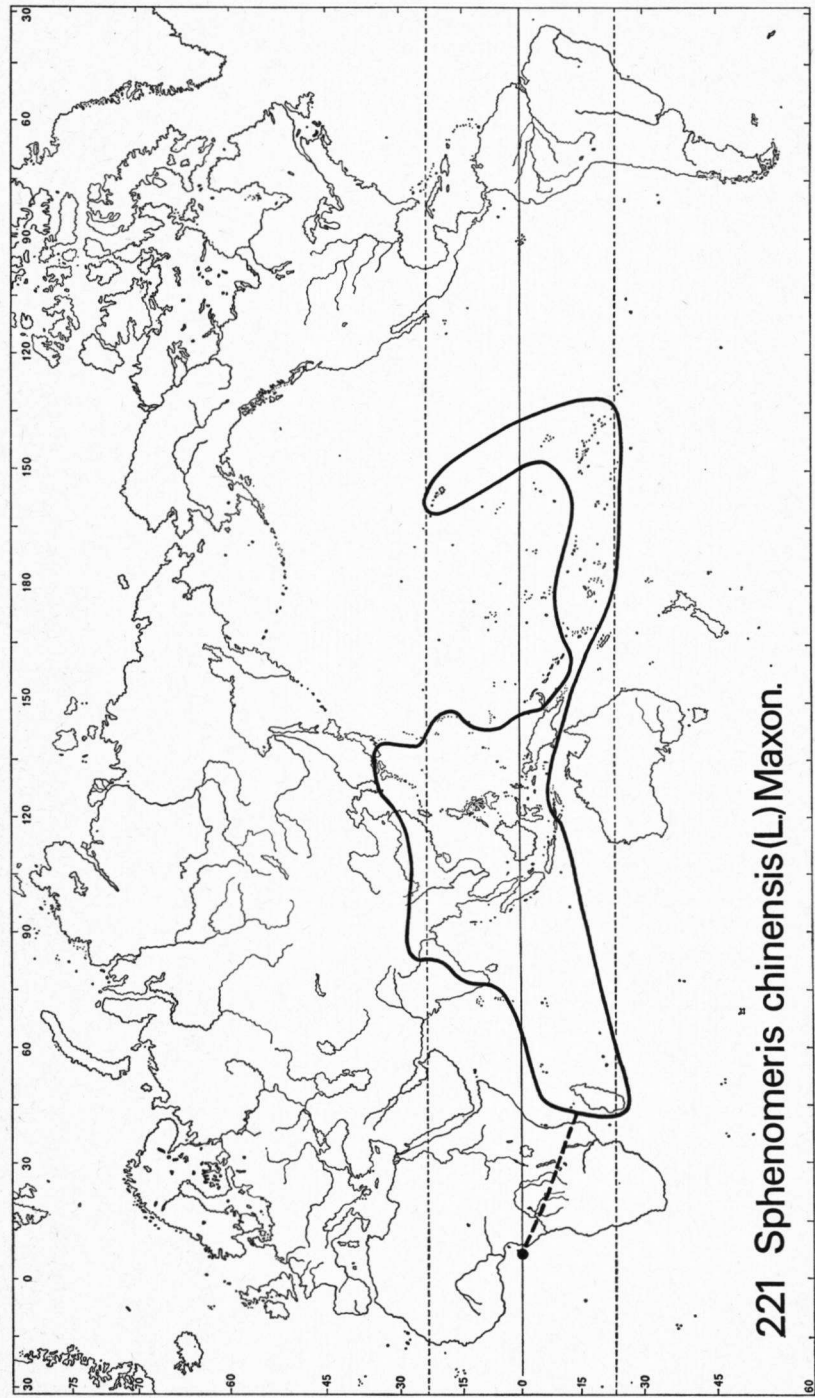
**Synonyms:** *Sphenomeris chusana* (L.) Copel.; *Odontosoria chinensis* (L.) J. Smith; *Stenoloma chinense* (L.) Bedd.

**Taxonomy:** Three varieties are distinguished, var. *rheophila* Kramer which occurs very locally in Sumatra and Malaya; var. *chinensis*; and var. *divaricata* (Christ.) Kramer. Var. *chinensis* occurs from Madagascar to eastern Polynesia, var. *divaricata* in Sao Tomé, Madagascar and neighbouring islands, Malesia, and sparingly in continental tropical Asia. Var. *chinensis* is rather heterogeneous, but it proved impossible to distinguish further varieties with herbarium material only. A very large, coarse form occurs in Hawaii, a form with very broad segments in Sumatra (where it has been confused with the East Malesian *Sph. retusa*), unusually narrow forms are frequent in Celebes and some parts of Polynesia and have also been found in Madagascar ('*Odontosoria palmii* Rosendahl'). In continental Africa *Sph. chinensis* is replaced by *Sph. afra* Kramer.

**Habitat:** By torrents and waterfalls (var. *rheophila*); in lightly to more deeply shaded places, mostly above 700 m (var. *divaricata*); in open to lightly shaded places, from lower altitude to ca. 2400 m (var. *chinensis*).

**Sources:** Herbarium material; see Kramer, *Blumea* 15 (1967) 572, 573; *Ibid.* 18 (1970) 163, 164; *Fl. Mal.* II, 1 (1971) 182—184; *Bull. Jard. Bot. Nat. Belg.* 42 (1972) 307—310; *Gard. Bull. Sing.* 26 (1972) 4—7.

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221 *Sphenomeris chinensis* (L.) Maxon.



222. *Tapeinidium denhamii* (Hook.) C. Chr.

**Name:** *Tapeinidium denhamii* (Hook.) C. Christensen, Ind. Fil. (1906) 631.

**Family:** 'Polypodiaceae', *Lindsaea* group.

**Synonyms:** *T. tenue* (Brack.) Copel.; *T. tenuis* Copel.

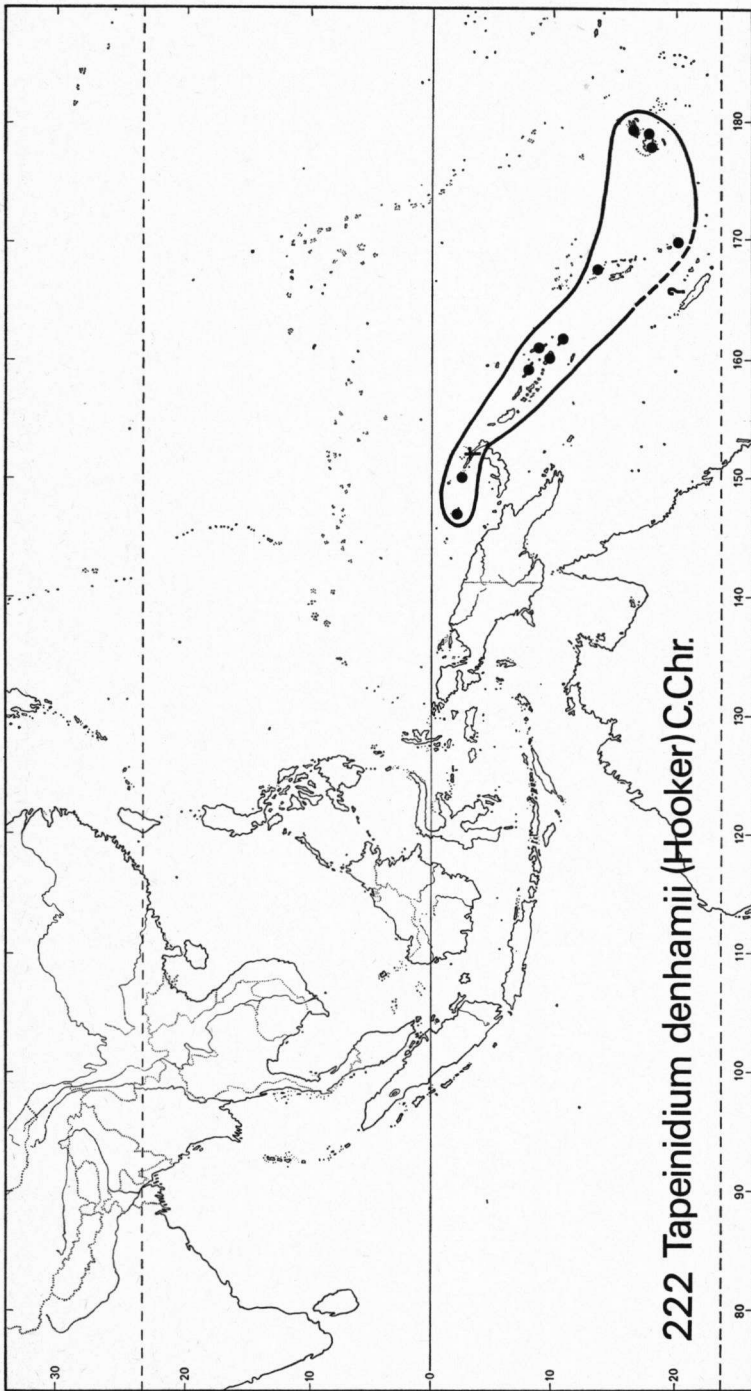
**Taxonomy:** One of the most finely dissected species in the genus, perhaps the most primitive.

**Habitat:** terrestrial in forests, 100—900 m.

**Sources:** Herbarium specimens; see Kramer, *Blumea* 15 (1967) 548; *Ibid.* 18 (1970) 164; *Fl. Mal.* II, 1 (1971) 186, f. 7.

The record from New Caledonia rests on two old, probably mislabelled specimens; there are no recent collections.

K. U. KRAMER.



223. *Zostera marina* L.

**Name:** *Zostera marina* L., Sp. Pl. (1753) 968.

**Family:** *Potamogetonaceae*.

**Synonyms:** See den Hartog, 1970, p. 45.

**Habit:** A sea-grass with linear leaves; leaf-blades up to 120 cm long and 2—12 mm wide. Perennial, eulittoral populations often annual.

**Habitat:** In the lower part of the eulittoral and in the sublittoral, locally descending to a depth of 30 m, forming extensive submarine meadows, on sandy and muddy bottoms.

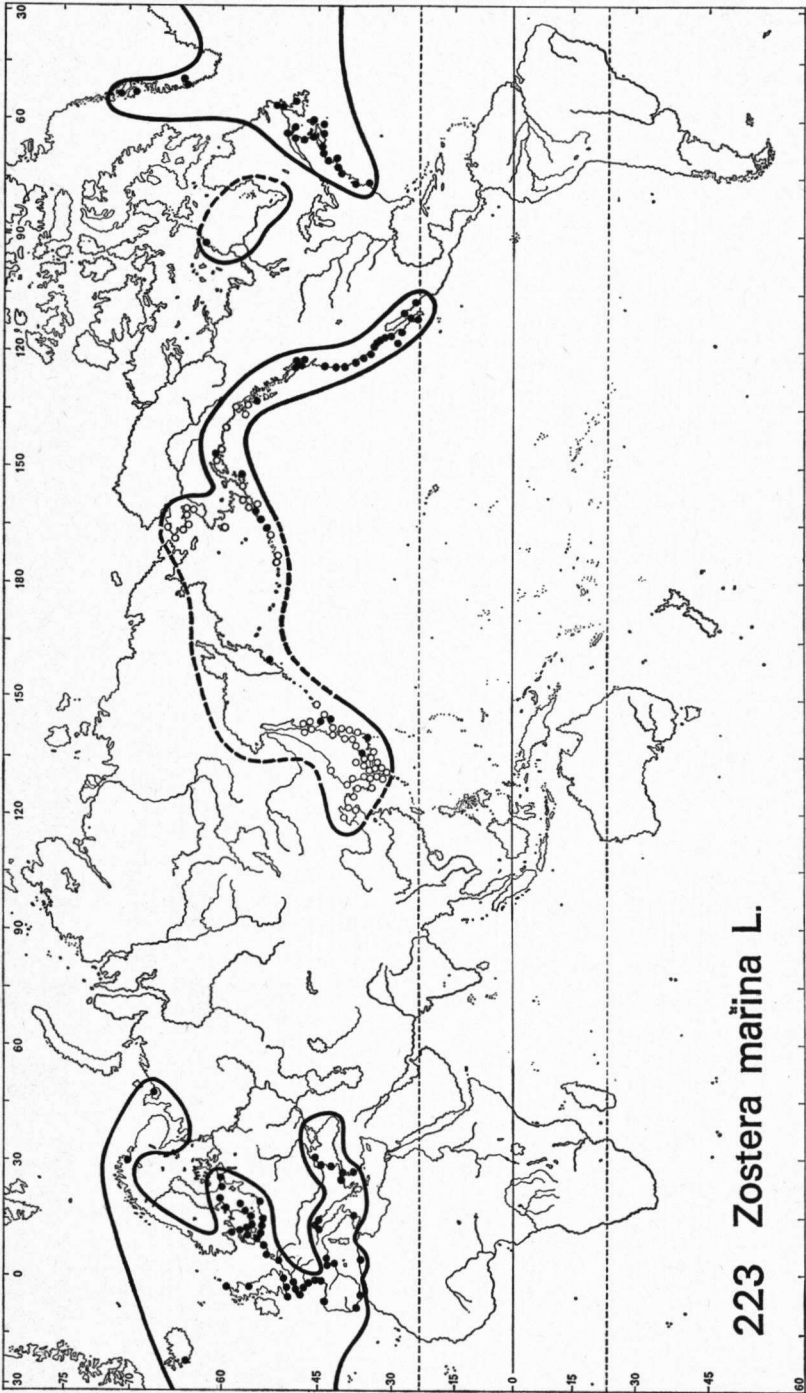
**Ecology:** *Zostera marina* stands are usually pure, but in brackish waters the species may sometimes be accompanied by *Ruppia cirrhosa* or *Potamogeton pectinatus*.

**Dispersal:** Transport takes place by floating generative shoots which usually become detached when the seeds are ripe. The ripe seeds drop from the spathe and sink to the bottom where they germinate immediately or in the next spring. The seeds have no floating capacity.

**Map:** Dots represent localities of specimens checked by the author, open circles reliable literature records. As no attempt was made to study extensively all material from the Atlantic coasts the dots in Europe and eastern North America certainly do not give a complete representation of the distribution of the species. For this reason the area has been delineated; a broken line indicates areas insufficiently known.

**Sources:** Ostenfeld, Rep. Dan. Ocean. Exp. Mediterranean 1908—10, II, K 2 (1918) 10, f. 5 (map); Hultén, Fl. Kamchatka 1 (1927) 75, map 55; Porsild, Rhodora 34 (1932) 90—94; Miki, Bot. Mag. Tokyo 47 (1933) 856, f. 6 (map); Juzepčuk, Fl. U.R.S.S. 1 (1934) 266; McRoy, Pacif. Sc. 22 (1968) 507—513, f. 1 (map); C. den Hartog, Sea-grasses of the world (1970) 44—60.

C. DEN HARTOG.



224. *Zostera japonica* Aschers. & Graebn.

**Name:** *Zostera japonica* Aschers. & Graebn., Pfl. R. Heft 31 (1907) 32.

**Family:** *Potamogetonaceae*.

**Synonyms:** *Zostera nana* Mertens ex Roth, excl. typ. for specimens collected in Eastern Asia.

**Habit:** A sea-grass with linear leaves; leaf-blades up to 30 cm long and 0.12—0.25 cm wide; leaf-tip slightly emarginate when old. Perennial.

**Habitat and ecology:** On sandy and muddy tidal flats and in brackish coastal lagoons, gregarious.

**Dispersal:** The small fruits have no floating capacity.

**Map:** Dots represent localities of which the material has been checked by the author; open circles indicate reliable records from literature.

**Sources:** Hultén, Fl. Kamchatka 1 (1927) 75, map 56; Miki, Bot. Mag. Tokyo. 47 (1933) 856; Juzepčuk, Fl. U.R.S.S. 1 (1934) 268; C. den Hartog, Sea-grasses of the world (1970) 71—74.

225. *Zostera capricorni* Aschers.

**Name:** *Zostera capricorni* Aschers., Sitz. Ber. Ges. naturf. Fr. Berlin 1876 (1876) 11.

**Family:** *Potamogetonaceae*.

**Habit:** A sea-grass with linear leaves; leaf-blades 7—50 by 0.2—0.5 cm wide, with 3—5 nerves; leaf-tip truncate, slightly denticulate. Perennial.

The differences in size and habit between eulittoral and sublittoral forms of this species have contributed greatly to the confusion in the taxonomy of Australian *Zostera* species.

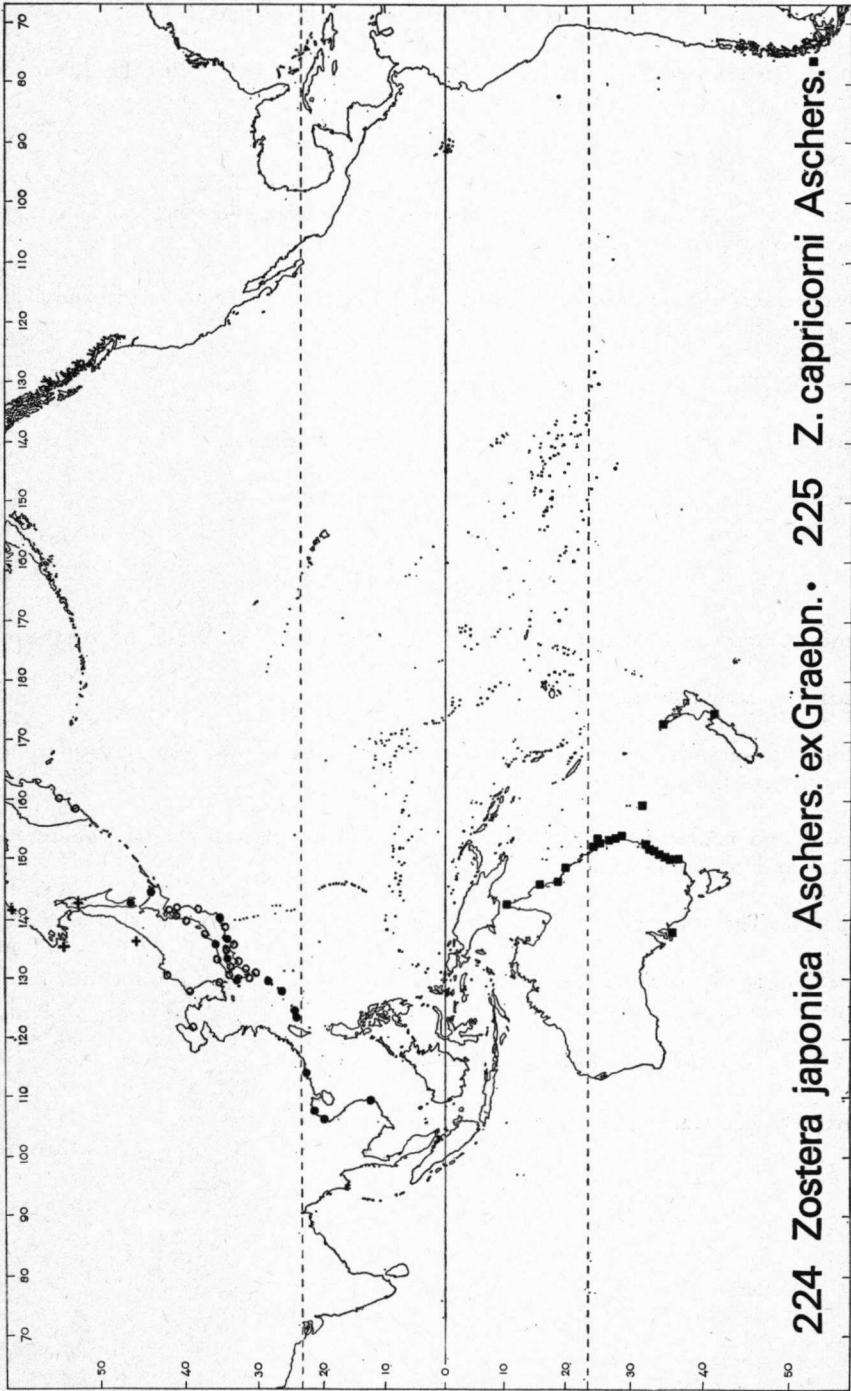
**Habitat and ecology:** On sandy and muddy tidal flats, in the polyhaline section of estuaries and lagoons and in the sublittoral down to at least 6 m depth.

**Dispersal:** The seeds are unable to float.

**Map:** Only records checked by the author are given on the map.

**Source:** C. den Hartog, Sea-grasses of the world (1970) 81—87.

C. DEN HARTOG.



226. *Zostera muelleri* Irmisch ex Aschers.

**Name:** *Zostera muelleri* Irmisch ex Aschers., Sitz. Ber. Ges. naturf. Fr. Berlin 1867 (1867) 15.

**Family:** *Potamogetonaceae*.

**Habit:** A sea-grass with linear leaves; leaf-blades 5—30 by 0.1—0.2 cm; leaf-tip obtuse or truncate, deeply notched. Perennial.

**Habitat and ecology:** On sheltered intertidal mud and sand flats, in estuaries and shallow polyhaline sea-inlets and lagoons.

**Dispersal:** The seeds have no floating capacity.

**Map:** Only records checked by the author are given on the map.

**Source:** C. den Hartog, *Sea-grasses of the world* (1970) 87—91.

227. *Zostera novazelandica* Setchell

**Name:** *Zostera novazelandica* Setchell, Proc. Nat. Acad. Sc. Wash. 19 (1933) 816.

**Family:** *Potamogetonaceae*.

**Habit:** A sea-grass with linear leaves; leaf-blades 3—50 by 0.07—0.2 cm; leaf-tip truncate or slightly emarginate. Perennial.

**Habitat and ecology:** On shallow tidal flats and in brackish coastal lagoons; very tolerant to decrease in salinity.

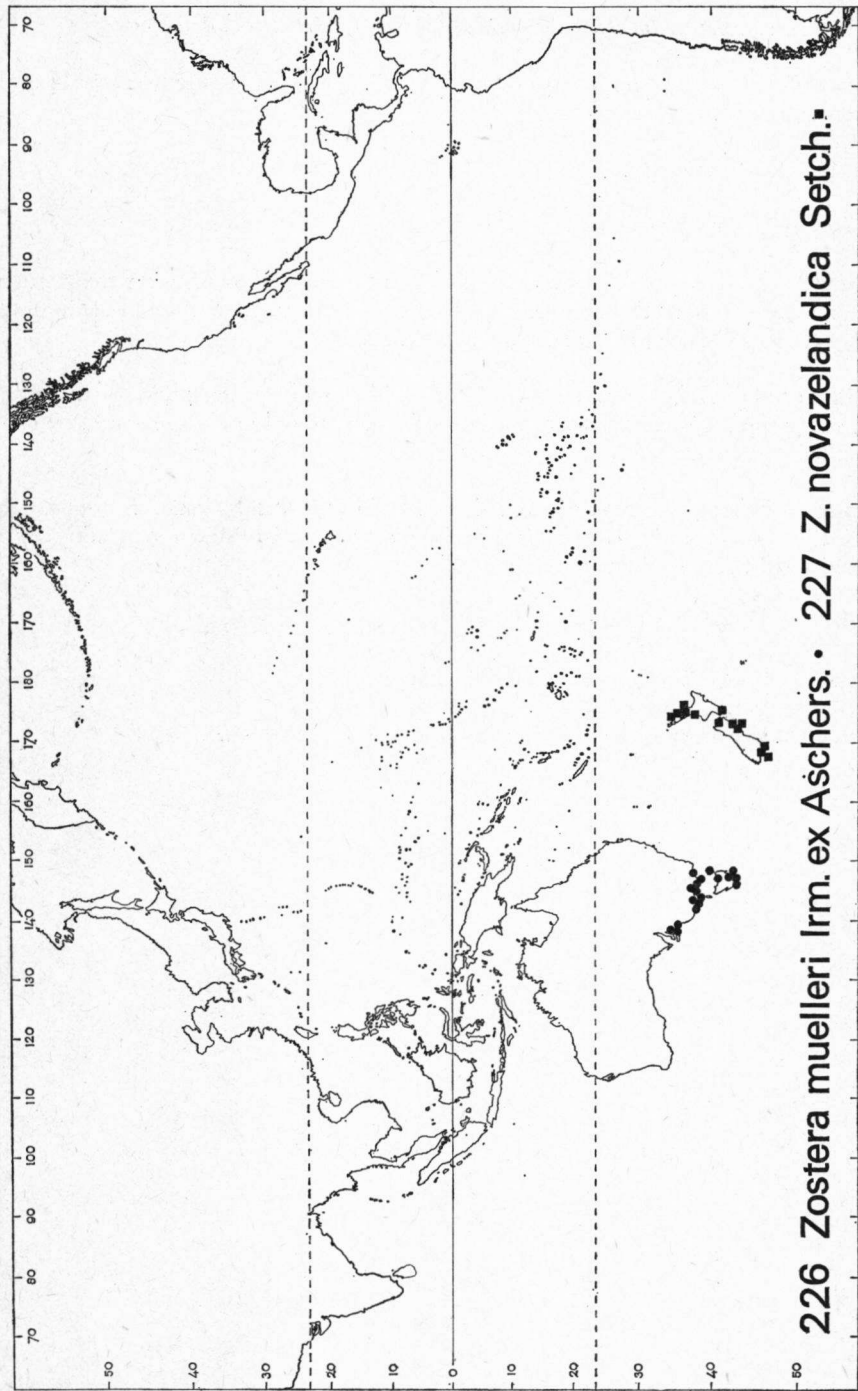
**Dispersal:** The seeds have no floating capacity.

**Note:** The species is closely related to *Z. capricorni* from which it is sometimes hard to distinguish in the vegetative condition.

**Map:** Only records checked by the author are given on the map.

**Source:** C. den Hartog, *Sea-grasses of the world* (1970) 93—96.

C. DEN HARTOG.



226 *Zostera muelleri* Irm. ex Aschers. • 227 *Z. novaezelandica* Setch.



228. *Heterozostera tasmanica* (Martens ex Aschers.) den Hartog

**Name:** *Heterozostera tasmanica* (Martens ex Aschers.) den Hartog, Sea-grasses of the world (1970) 116.

**Family:** *Potamogetonaceae*.

**Synonym:** *Zostera tasmanica* Martens ex Aschers.

**Habit:** A sea-grass with linear leaves, distichously arranged along erect stems arising from a lignified, sympodial rhizome; leaf-blades 5—25 by 0.10—0.25 cm; leaf-tip obtuse with a central, shallow, triangular notch. Perennial.

**Habitat:** Sublittoral, but as a result of competition with coarse species of the genera *Amphibolis* and *Posidonia* usually restricted to the belt around low-water mark, on sandy and muddy bottoms.

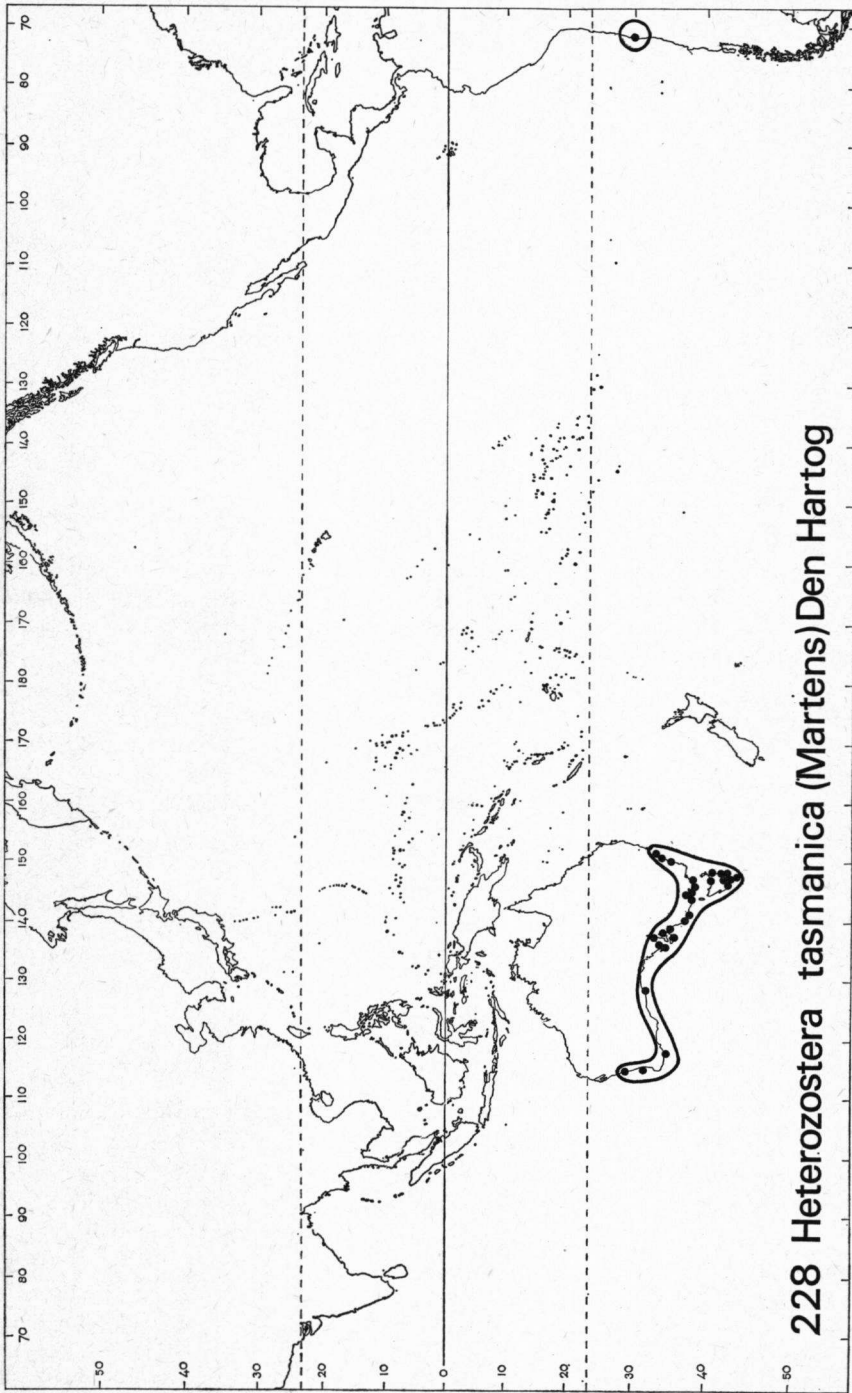
**Ecology:** Although *H. tasmanica* usually occurs in pure stands, it can be found interspersed in beds of *Posidonia australis* and *Amphibolis antarctica*. Mixed vegetations of *H. tasmanica* and *Zostera muelleri* occur as well.

**Dispersal:** The seeds are unable to float.

**Map:** All records have been checked by the author.

**Source:** C. den Hartog, Sea-grasses of the world (1970) 116—120.

C. DEN HARTOG.



229. *Halodule uninervis* (Forsk.) Aschers.

**Name:** *Halodule uninervis* (Forsk.) Aschers., in Boissier, Fl. Orient. 5 (1882) 24.

**Family:** *Potamogetonaceae*.

**Synonyms:** *Zostera uninervis* Forsk., *Diplanthera uninervis* (Forsk.) Aschers.; for other synonyms see den Hartog (1970) 147.

**Note:** *H. uninervis* is closely related to *H. beaudettei*.

**Habit:** A sea-grass with linear leaves; leaf-blades 6—15 by 0.025—0.35 cm; leaf-tips with two linear lateral teeth and a broad, obtuse median tooth. Rhizome creeping, rooting at the nodes. Perennial.

**Habitat:** In the lower part of the eulittoral and the upper part of the sublittoral, down to at least 30 m depth on sandy and muddy bottoms in sheltered localities and in pools on coral reefs, mostly gregarious.

**Ecology:** The species is megathermic; according to Miki (Bot. Mag. Tokyo 48, 1934, 132, 135), its northern limit coincides with the 21° C February isotherm. The species occurs mostly in more or less pure stands, but may be associated with *Cymodocea rotundata*, *C. serrulata*, *Thalassia hemprichii*, *Halophila ovalis*, etc. Flowering has been rarely observed, but is probably not uncommon.

The flowers are inconspicuous and occur for the greater part below the surface of the substratum. The female flowers consist of 2 free carpels with a 28—42 mm long, apically inserted style. The male flowers consist of two dorsally joined anthers attached at slightly different levels on a 6—20 mm long common stalk.

**Dispersal:** The fruits have a stony pericarp, and are subglobose-ovoid or globose, and more or less compressed. No means for bridging long distances are known.

**Map:** Only records checked by the author are given on the map.

230. *Halodule beaudettei* (den Hartog) den Hartog

**Name:** *Halodule beaudettei* (den Hartog) den Hartog, Blumea 12 (1964) 303.

**Family:** *Potamogetonaceae*.

**Synonyms:** *Diplanthera beaudettei* den Hartog, *Diplanthera dawsonii* den Hartog.

**Notes:** The species has been confused with *H. wrightii* Aschers. which has a bidentate leaf-tip.

**Habit:** A small sea-grass with linear leaves; leaf-blades 5—20 by 0.050—0.15 cm; leaf-tip tridentate; median tooth acute and prominent. Rhizome creeping, rooting at the nodes. Perennial.

**Habitat:** In the lower part of the eulittoral and the upper part of the sublittoral, on sandy and muddy bottoms in sheltered places, usually gregarious.

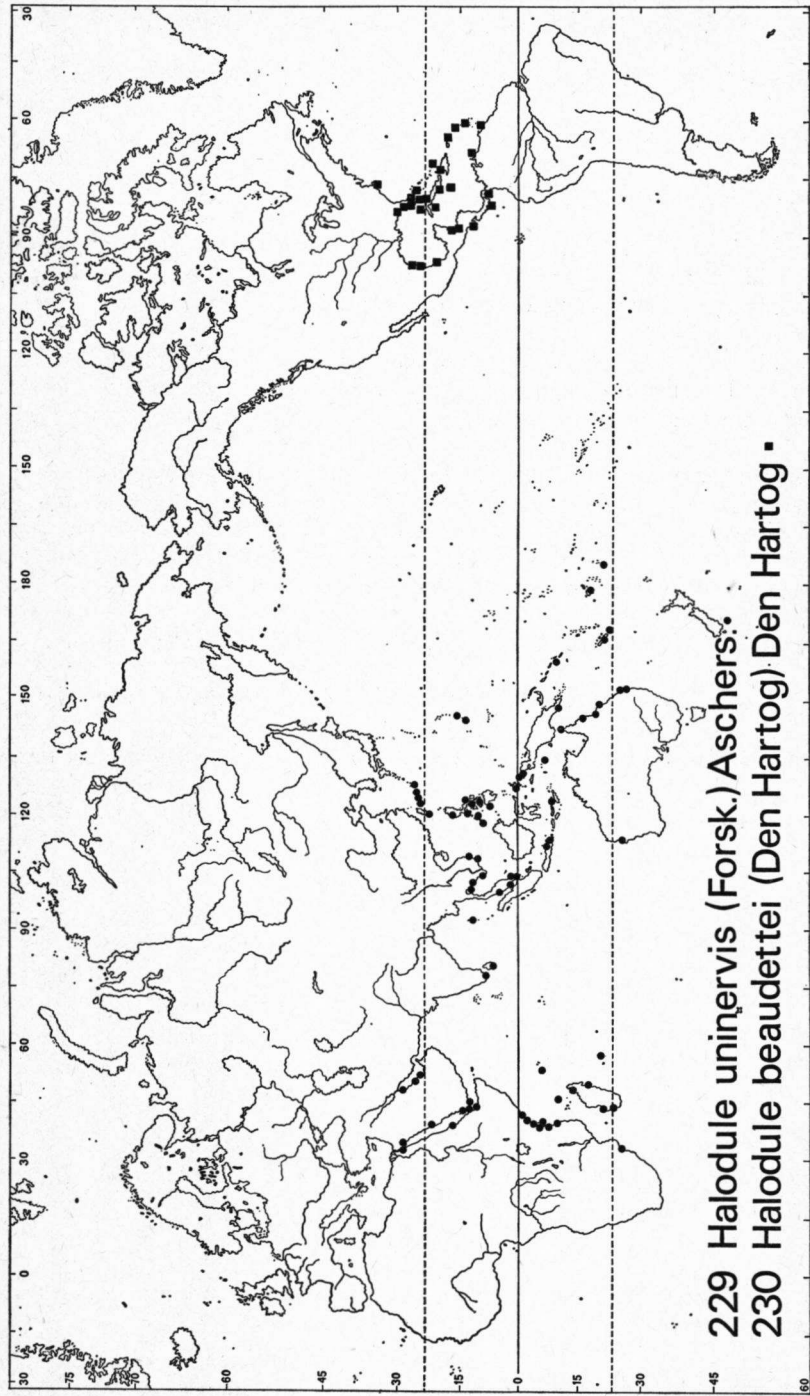
**Ecology:** The species forms extensive meadows in the sublittoral when *Thalassia testudinum* is absent, e.g. along the Pacific coast of Panama. Elsewhere it is restricted to the lower eulittoral and open places in the *Thalassia* beds. Flowers not yet known.

**Dispersal:** Fruits not yet known.

**Map:** Only records checked by the author are given on the map.

**Sources** (maps 229 & 230): C. den Hartog, Blumea 12 (1964) 297—303; *Ibid.*, Sea-grasses of the world (1970) 147—154. Material in the Rijksherbarium Leiden.

C. DEN HARTOG.



231. *Halodule pinifolia* (Miki) den Hartog

**Name:** *Halodule pinifolia* (Miki) den Hartog, *Blumea* 12 (1964) 309.

**Family:** *Potamogetonaceae*.

**Synonym:** *Diplanthera pinifolia* Miki.

**Habit:** A small sea-grass with linear leaves; leaf-blades 5—20 by 0.06—0.12 cm; leaf-tips obtuse, with more or less irregular serratures; lateral teeth faintly developed or absent. Rhizome creeping and rooting at the nodes. Perennial.

**Habitat:** In the lower part of the eulittoral and the upper part of the sublittoral, on sandy and muddy bottoms in sheltered places, in pools on coral reefs, and also in localities exposed to the surf.

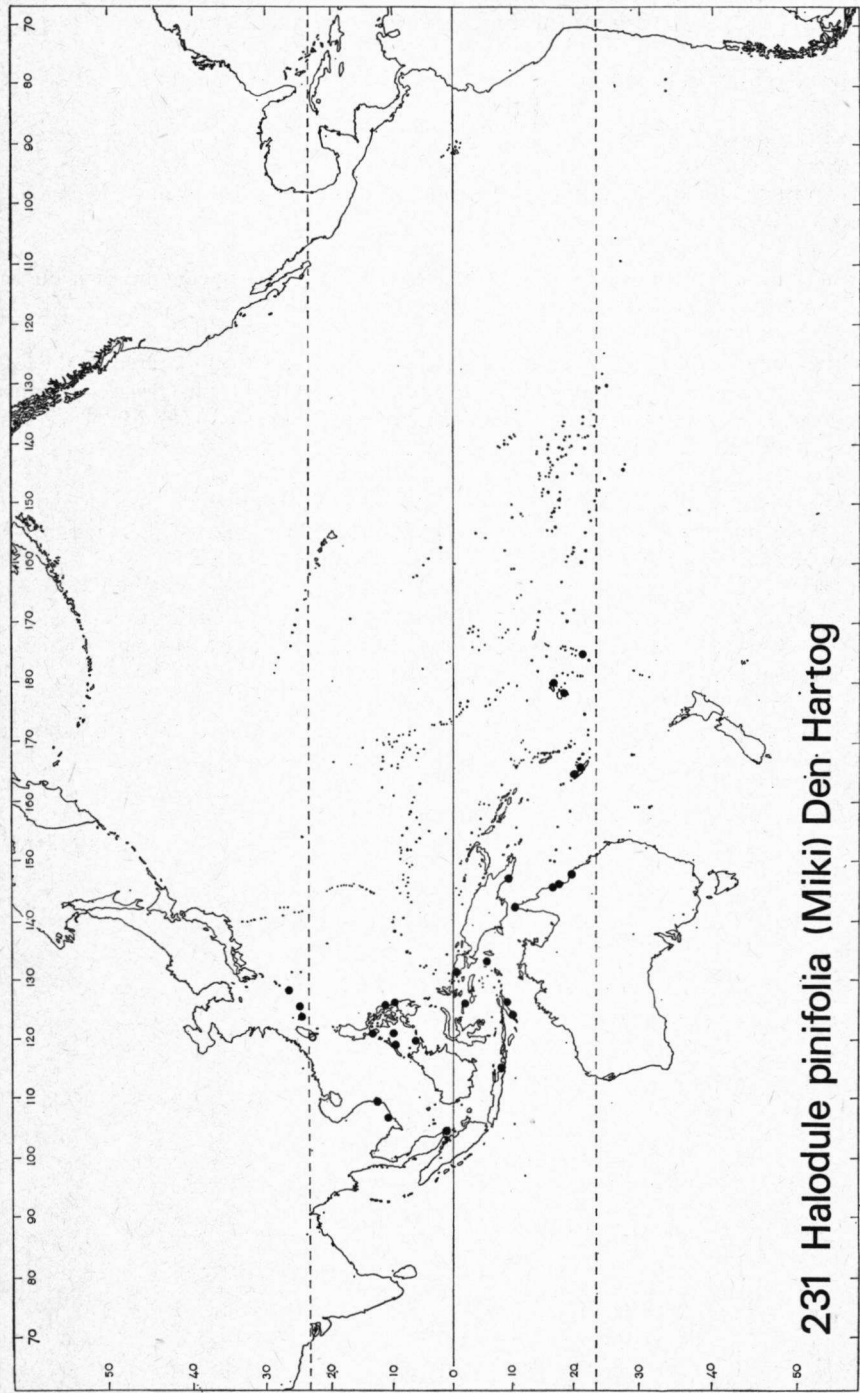
**Ecology:** *H. pinifolia* is a megathermic species; the northern border of its area coincides with the 21° C February isotherm (S. Miki, *Bot. Mag. Tokyo* 48, 1934, 132, 135). It is a typical pioneer species, which is not able to compete with other species; consequently it occurs in pure stands or together with other pioneers, e.g. *Halophila ovalis* and *H. ovata*. Although not often observed, flowering is probably not uncommon.

**Dispersal:** Fruits have been found a few times; they have no floating capacity.

**Map:** All records have been checked by the author, except for that of Taiwan (Miki, l.c.).

**Sources:** C. den Hartog, *Blumea* 12 (1964) 309—311; *Ibid.*, *Sea-grasses of the world* (1970) 158—160.

C. DEN HARTOG.



232. *Syringodium isoetifolium* (Aschers.) Dandy

**Name:** *Syringodium isoetifolium* (Aschers.) Dandy, J. Bot. 77 (1939) 116.

**Family:** *Potamogetonaceae*.

**Synonyms:** *Cymodocea isoetifolia* Aschers., *Phucagrostis isoetifolia* O. Kuntze, *Phycoschoenus isoetifolia* Nakai.

**Habit:** A sea-grass with up to 30 cm long subulate leaves and a wide sheath at the base. Rhizome creeping, rooting at the nodes. Perennial.

**Habitat:** In the upper part of the sublittoral belt down to 6 m depth, rarely in the lower part of the eulittoral, forming submarine meadows together with *Cymodocea serrulata*, *C. rotundata*, *Thalassia hemprichii*, *Halodule uninervis* and *Halophila ovalis*. Mainly on sandy bottoms in sheltered localities, but also in pools on coral reefs.

**Ecology:** A megathermic species, whose northern limit more or less coincides with the 21° C February water isotherm (S. Miki, Bot. Mag. Tokyo 48, 1934, 132, f. 7). The conspicuous cymose inflorescences have often been found.

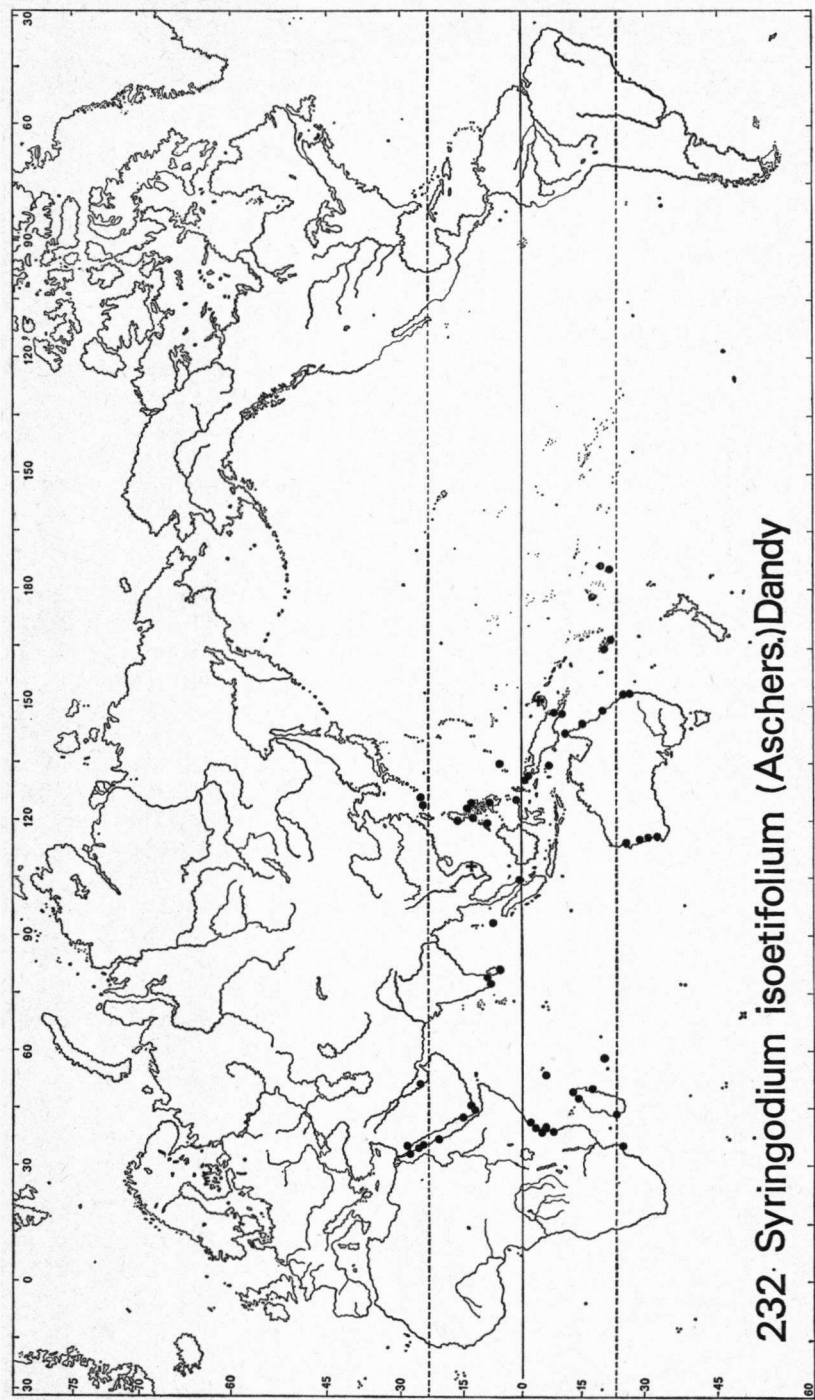
**Dispersal:** The small fruits are obliquely ellipsoid, rostrate and unable to float.

The records from Western Australia, except those from Shark Bay and Carnarvon, are based on material washed up along the beach.

**Map:** All records have been checked by the author, the record from the Bismarck Archipelago after Ascherson (1907).

**Source:** C. den Hartog, *Sea-grasses of the world* (1970) 177—183.

C. DEN HARTOG.





233. *Thalassodendron ciliatum* (Forsk.) den Hartog

**Name:** *Thalassodendron ciliatum* (Forsk.) den Hartog, Sea-grasses of the world (1970) 188.

**Family:** *Potamogetonaceae*.

**Synonyms:** *Zostera ciliata* Forsk., *Thalassia ciliata* König, *Cymodocea ciliata* Ehrenb. ex Aschers., *Phucagrostis ciliata* Ehrenb. & Hempr. ex O. Kuntze, *Amphibolis ciliata* Mold.; for other synonyms see den Hartog (l.c.).

**Habit:** A coarse sea-grass with a sympodial, ligneous rhizome and elongate, sometimes branched stems, bearing apically the linear to falcate leaves; leaf-blades 10—15 by 0.6—1.3 cm with a denticulate tip and 17—27 nerves; leaf-scars closed. Perennial.

**Habitat:** In the sublittoral belt down to at least 30 m depth, forming extensive monotonous submarine meadows with hardly any other sea-grass species as a companion, on sandy bottoms and on coral reefs. Exceptionally in rock pools in the lower part of the intertidal belt.

**Ecology:** The flowering biology of this species is very remarkable. When ripe the male flowers, consisting of 2 dorsally connate anthers become released from the plants and rise to the surface where the pollen is liberated. The 2, 30—40 mm long stigmata project from the sheaths of the female flowers. (F. M. Isaac, J. E. Afr. Nat. Hist. Soc. and Nat. Mus. 27, 1968, 29—47; Phytomorphology 19, 1969, 44—51.)

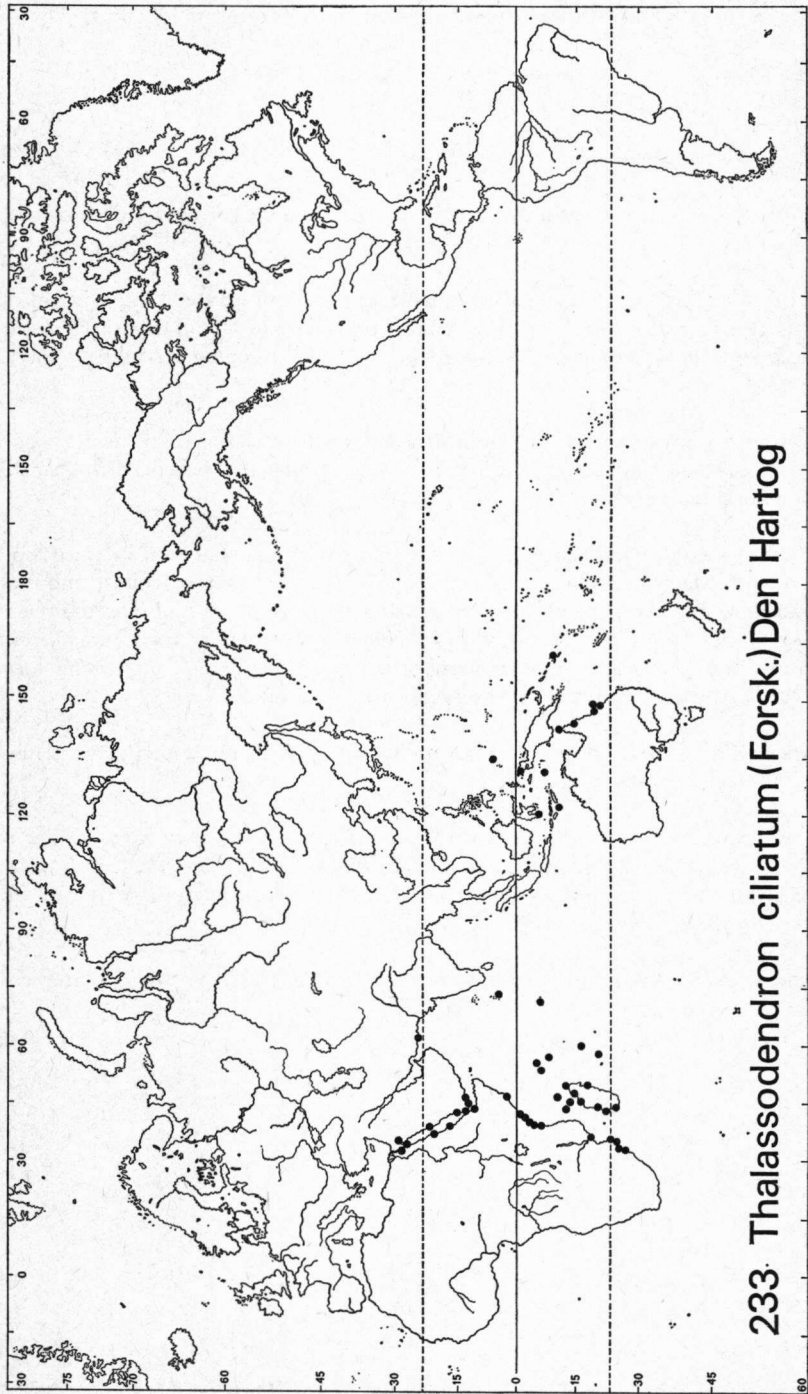
**Dispersal:** The false fruit is composed of 2 fertilized carpels and the innermost female bract. This bract enlarges and becomes fleshy; the margins of its sheating base enclose the carpels and fuse. After fertilization only one of the ovaries develops. The cradling bract is often still attached to the mother plant, when germination starts. After becoming detached the bract floats at the surface, while the seedling develops. When 5—8 leaves and 6—8 adventitious roots have been formed, the seedling becomes liberated from the bract and sinks to the bottom.

**Distribution:** The area of *Th. ciliatum* consists of two widely disjunct parts. The species forms extensive beds in the Red Sea and the western part of the Indian Ocean, but in the western Pacific it is a rare species forming isolated populations. The only other species in this genus is confined to SW. Australia.

**Map:** All data have been checked by the author.

**Sources:** C. den Hartog, Sea-grasses of the world (1970) 188—194, 273—275. Material in the Rijksherbarium Leiden.

C. DEN HARTOG.



233. *Thalassodendron ciliatum* (Forsk.) Den Hartog

234. *Cymodocea rotundata* Ehrenb. & Hempr. ex Aschers.

**Name:** *Cymodocea rotundata* Ehrenb. & Hempr. ex Aschers., Sitz. Ber. Ges. naturf. Fr. Berlin 1870 (1870) 84.

**Family:** *Potamogetonaceae*.

**Synonyms:** *Phucagrostis rotundata* Ehrenb. & Hempr. ex O. Kuntze, *Cymodocea acaulis* Peter.

**Habit:** A sea-grass with linear leaves; leaf-blades 7—15 by 0.2—0.4 cm, with an obtuse, faintly serrulate and sometimes emarginate tip. Nerves 9—15. Leaf-scars closed. Old sheaths persisting as a ragged scarious mass. Rhizome creeping, rooting at the nodes. Perennial.

**Habitat:** In the upper part of the sublittoral and near low-water mark where it becomes uncovered only during very low spring tides. In the intertidal belt occurring in shallow pools on coral reefs and mud flats.

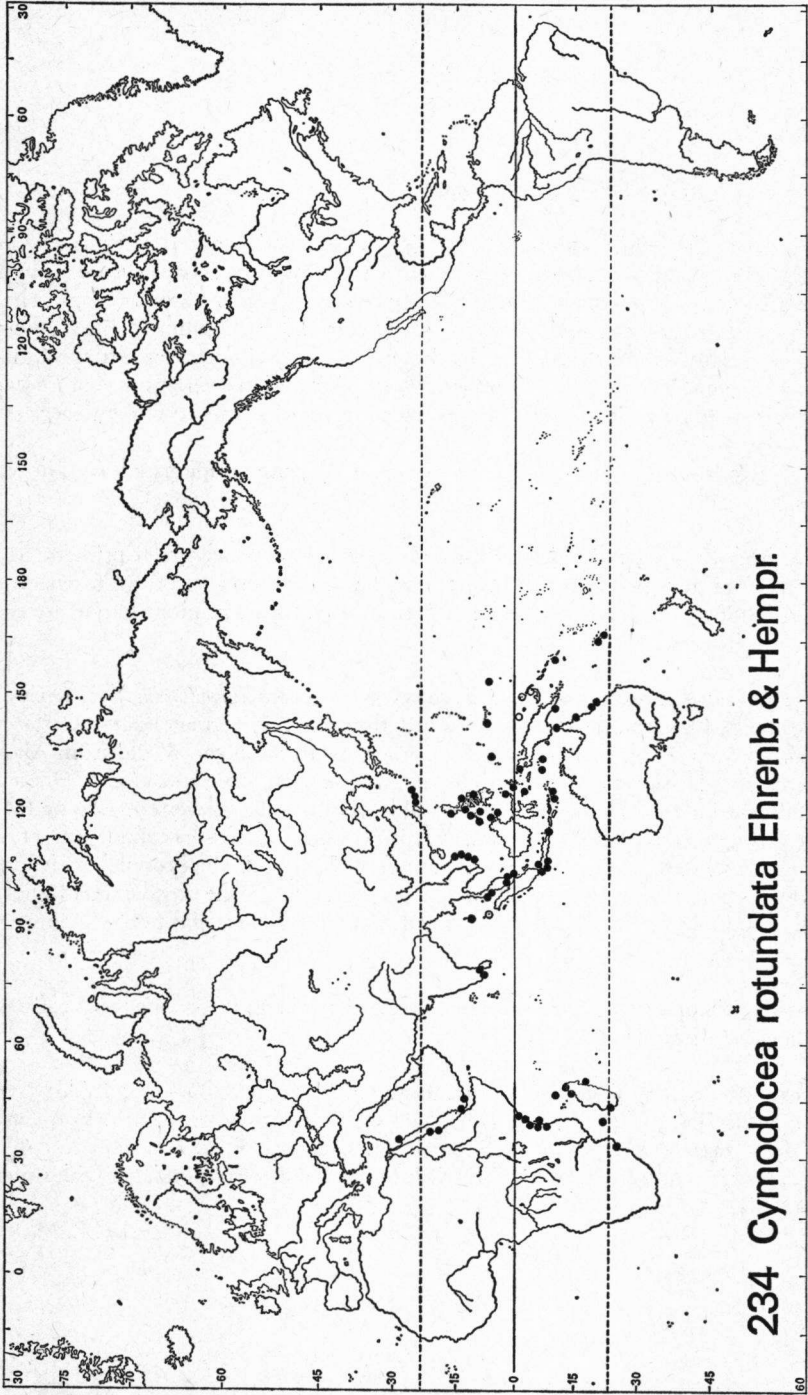
**Ecology:** A megathermic species which does not pass the 21° C February water isotherm (S. Miki, Bot. Mag. Tokyo 48, 1934, f. 7). It is tolerant to decreased salinity and is able to penetrate into the estuaries of small rivers. It occurs in pure stands or together with *Halodule* species, in Malesia mostly with *H. pinifolia*, more rarely with *H. uninervis*. The association of *C. rotundata* with *C. serrulata* has been recorded from several localities. Flowering and fruiting have been observed only a few times.

**Dispersal:** The stony fruits are 10 mm long, 6 by 1.5 mm wide, with 3 denticulate dorsal ridges. They have no floating capacity.

**Map:** All records checked by the author are indicated on the map by dots. The record from the Nicobar Is. is based on Ostenfeld (Pfl. Areale 1, 4, 1927, 48, map 37) and the records from the Anachorettes and Bismarck Arch. are derived from Ascherson (Pfl. R. Heft. 31, 1907, 147).

**Sources:** C. den Hartog, Sea-grasses of the world (1970) 166—171. Material in the Rijks-herbarium Leiden.

C. DEN HARTOG.



234 *Cymodocea rotundata* Ehrenb. & Hempr.

235. *Engelhardia* Leschen. ex Bl.

**Name:** *Engelhardia* Leschen. ex Bl., Bijdr. 10 (1825) 528.

**Family:** *Juglandaceae*.

**Synonyms:** *Pterilema* Reinw., *Oreomunnea* Oerst.

**Taxonomy:** The genus comprises 5 species in Asia and Malesia (sections *Engelhardia* and *Psilocarpeae*) and 2 species in Mexico and C. America (sect. *Oreomunnea*). The latter species are often considered to form a distinct genus, e.g. by Stone (1972). The Old World species have been revised by Jacobs (1960) and by Manning (1966), the New World species by Manning (1966) and by Stone (l.c.). Very closely related to the American species is the genus *Alfaroa* with 6 species, whose distribution overlaps that of *Engelhardia* in southern Mexico to Costa Rica and extends through Panama to Colombia.

**Habit:** Trees, 5—30 m (in Costa Rica up to c. 50 m), with paripinnate leaves, flowers in catkins.

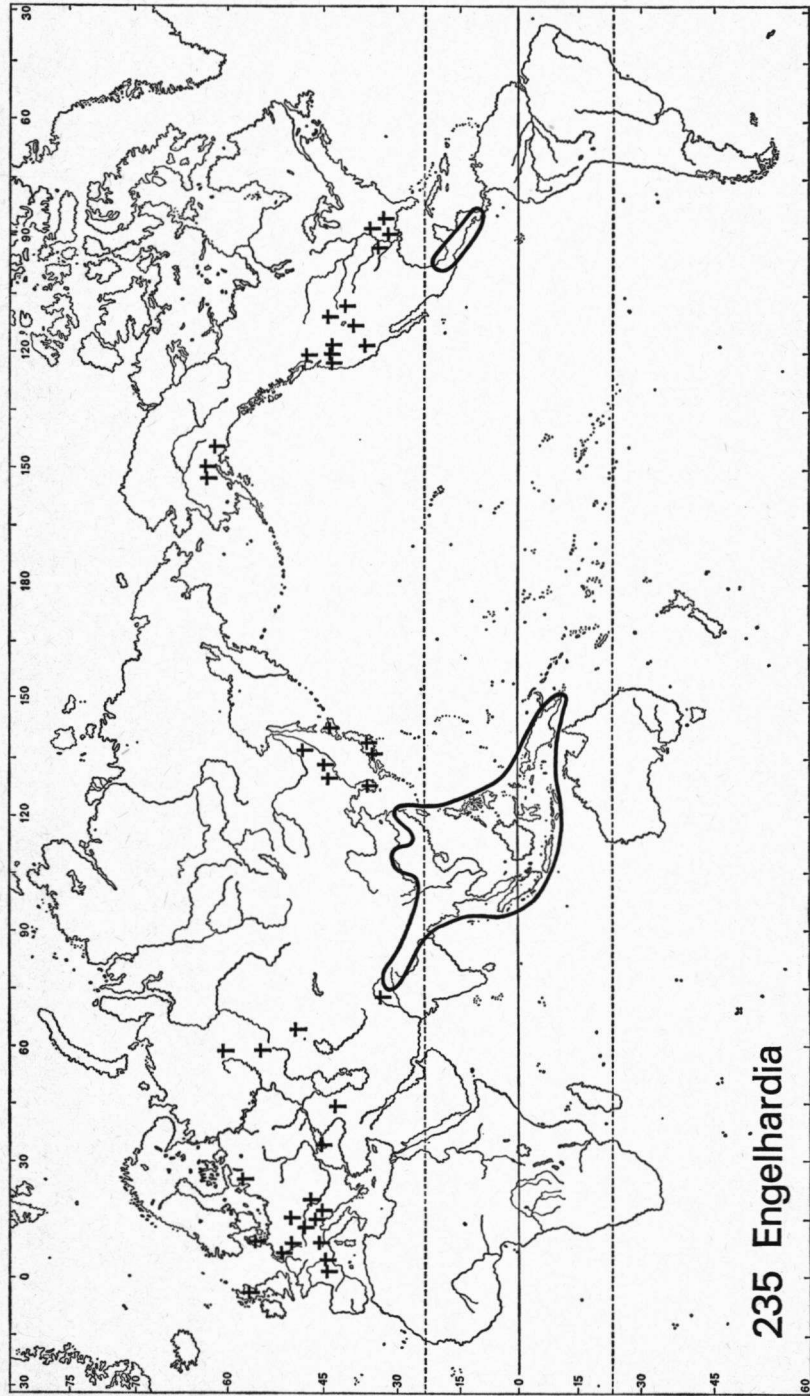
**Habitat and ecology:** Tropical rain-forest, or subtropical evergreen primary dryland forest, in tropical regions usually in mountainous areas, 1000—2200 m, often on steep wooded hillsides; fog belts of Central American mountains; in more temperate regions often at sea-level; sandy or clayey soil.

**Fossils:** In leaves, flowers, pollen and wood *Alfaroa*, and *Engelhardia* sect. *Oreomunnea* are essentially identical. In the fossil record through the Tertiary (latest Cretaceous?, Early and Middle Eocene) some of the specimens from the New World from Alaska to California and Mississippi belong to the sect. *Engelhardia*, some to the sect. *Oreomunnea* and some are intermediate. Fossils in the Old World occur in western Europe (Middle Eocene through Early Pliocene) as well as Japan (Miocene), Sikhote-Alin (Akhmetyev & Bratzeva, 1973) and Korea (Upper Oligocene) and Kashmir (Pleistocene). It is obvious that the western range is much restricted compared with the fossil range. The fossil records as indicated on the map (†) are based on bracts, leaflets and pollen grains. Pollen identification is often uncertain.

**Dispersal:** Wind, because of the leaf-like bracts of the fruit; Jacobs suggests that in some cases the whole fruiting catkin is dispersed.

**Sources:** W. E. Manning, Bull. Torr. Bot. Cl. 86 (1959) 190—198; Ibid. 93 (1966) 34—52; M. Jacobs, Fl. Mal. I, 6 (1960) 143—153; D. E. Stone, Ann. Mo. Bot. Gard. 59 (1972) 297—321; M. A. Akhmetiev & G. M. Bratzeva, Rev. Palaeob. & Palyn. 16 (1973) 123—132. Collections of 16 worldwide herbaria and correspondence with American paleobotanists.

W. E. MANNING.



236. *Inocarpus* J. R. & G. Forst.

**Name:** *Inocarpus* J. R. & G. Forst., Char. Gen. Pl. (1776) 33

**Family:** *Leguminosae* (*Papil.*).

**Taxonomy and distribution:** *Inocarpus* is a genus of two closely allied species, one—*I. papuanus* Kosterm.—limited to E. Malesia, the other—*I. fagiferus* (Park.) Fosb. (*I. edulis* Forst.)—extending from Malesia to SE. Polynesia. The exact limits of its natural distribution are unknown. It is believed to occur only in cultivation in the Philippines (Merrill, 1923) and Java (Backer & Bakhuizen, 1964). On the other hand it is apparently native in Christmas I., S. of Java (Ridley, 281) and Malaya (Corner, 1952). Throughout its range *I. fagiferus* is frequently planted for its edible seeds. For correct name of the species see St. John (1972).

A species of *Inocarpus* described from S. America belongs to another genus.

**Habit:** Fair-sized trees, up to 20 m tall, with large (30 cm and more) unifoliate leaves, the trunk often developing buttresses when old.

**Habitat and ecology:** *I. fagiferus* is one of the commonest trees along the estuaries of many high islands in the Pacific, often extending inland on the slopes to 500 m or more. Also found scattered in the rain forest.

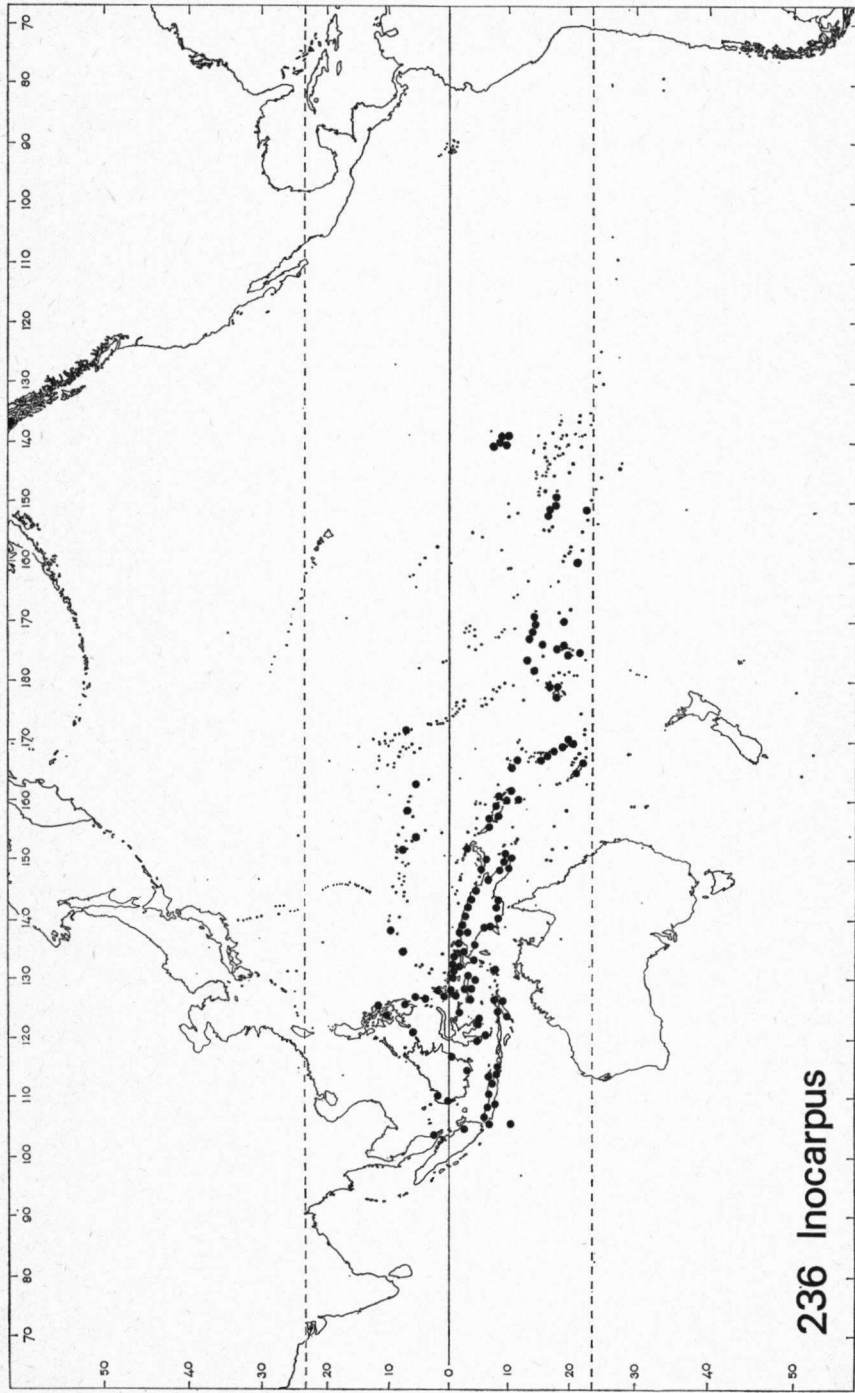
**Dispersal:** The fruit is a non-dehiscent, single seeded, compressed pod. The edible seed is enclosed by the thick more or less fleshy fibrous carpel. The ripe fruit is yellow in *I. fagiferus* and may measure up to  $10 \times 8 \times 3$  cm. The fruit of *I. papuanus* is red and is usually smaller.

Guppy (1906) found the fruits of *I. fagiferus* to float for a month or more, but the seeds apparently soon decay after contact with seawater. Nearly all the fruits he found on the shores of the sea and of estuaries contained seeds no longer viable. Dispersal by sea-currents is therefore not likely to be very effective over wide sea gaps. For this reason Guppy believed that the species owes its wide distribution in the Pacific to the action of man, a view not shared by Ridley, who considers the species as native in the Pacific.

Local dispersal of the fruits by rats, crabs and bats is reported by Ridley. Dispersal by flying foxes (*Pteropinae*) does not play a role in SE. Polynesia since they do not occur E. of Samoa; see v.d. Pijl (1957).

**Sources:** H. B. Guppy, Plant Dispersal (1906) 421, 422; E. D. Merrill, En. Phil. Fl. Pl. 2 (1923) 302; H. N. Ridley, Dispersal (1930) 281, 282, 348, 374, 529; E. J. H. Corner, Wayside Trees Mal. 1, ed. 2 (1952) 395; L. v.d. Pijl, Acta Bot. Neerl. 6 (1957) 291—315; C. A. Backer & R. C. Bakhuizen v. d. Brink, Flora of Java 1 (1964) 619; H. St. John, Biol. J. Linn. Soc. 4 (1972) 305—310. Numerous floras and collections in the Rijksherbarium Leiden.

M. M. J. VAN BALGOOY.





237. *Aristotelia* L'Hér.

**Name:** *Aristotelia* L'Hér., Stirp. Nov. (1786) 31, t. 16.

**Family:** *Elaeocarpaceae*.

**Taxonomy and distribution:** In my opinion the genus contains 5 species: *A. australasica* F.v.M. in NE. New South Wales and SE. Queensland, *A. pedunculata* (Labill.) Hook. f. in Tasmania, *A. serrata* (Forst.) Oliv. and *A. fruticosa* Hook. f., both in New Zealand and *A. chilensis* (Mol.) Stuntz (*A. macqui* L'Hér.) in Chile and adjacent Argentina. The latter species has been mentioned for Peru but according to Soukup (1972) in error.

Other species described in *Aristotelia* from Australia, New Guinea and the New Hebrides have been transferred to other genera.

*Aristotelia* is perhaps most closely allied to the S. American *Vallea* and not to the only other opposite-leaved genera of the Elaeocarpaceae: *Sericolea* (New Guinea) and *Aceratium* (E. Malesia to New Hebrides and Queensland).

**Habit:** Erect or procumbent shrubs or small trees with opposite leaves, flowers solitary or in racemes. The New Zealand species are dioecious.

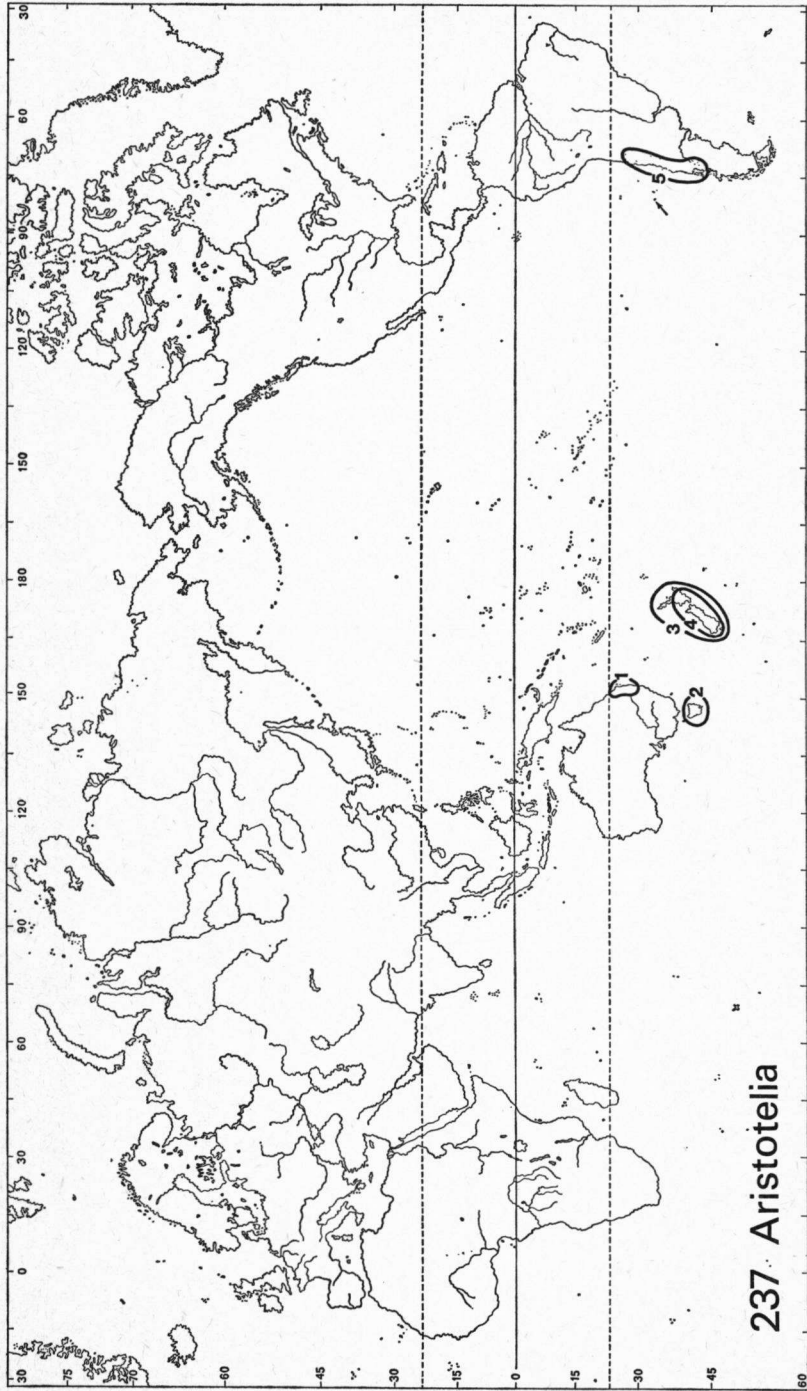
**Habitat and ecology:** Lowland and montane mixed forest. Some species have the tendency to behave like weeds, occupying newly cleared land. *A. chilensis* which has been introduced into the Juan Fernandez Islands locally forms dense thickets (Skottsberg, 1953), crowding out the original vegetation.

**Dispersal:** The fruits are juicy berries, 3—10 mm across, white, pink, red, purple or black and contain 1—6 angled seeds. The berries are readily eaten by birds.

**Map:** The species indicated as follows: 1 *A. australasica*, 2 *A. pedunculata*, 3 *A. serrata*, 4 *A. fruticosa*, 5 *A. chilensis*.

**Sources:** C. Skottsberg, Nat. Hist. Juan Fern. 2 (1953) 840; H. H. Allan, Fl. New Zeal. 1 (1961) 333—335; M. M. J. van Balgooy, Blumea 12 (1963) 79—88; J. Soukup, Biota 9 (1972) 193—195. Various local floras and collections in the herbaria of Melbourne, Sydney and Leiden. Additional information on *Aristotelia* in S. America was provided by Miss M. Munoz S. (Santiago) and Dr. J. J. Wurdack (Washington DC).

M. M. J. VAN BALGOOY.



238. *Caltha* L. sect. *Psychrophila* DC.

**Name:** *Caltha* L. sect. *Psychrophila* DC., Syst. Nat. 1 (1818) 307.

**Family:** *Ranunculaceae*.

**Taxonomy and distribution:** The genus *Caltha* is of bi-hemispheric distribution; sect. *Caltha* (4 spp.) is confined to the Northern hemisphere, sect. *Psychrophila* to the Southern. The six species of this section are distributed as follows: three spp. in S. America, of which one ranges from Equador to Fuegia and the Falkland Is., 2 spp. in New Zealand and one in SE. Australia and Tasmania.

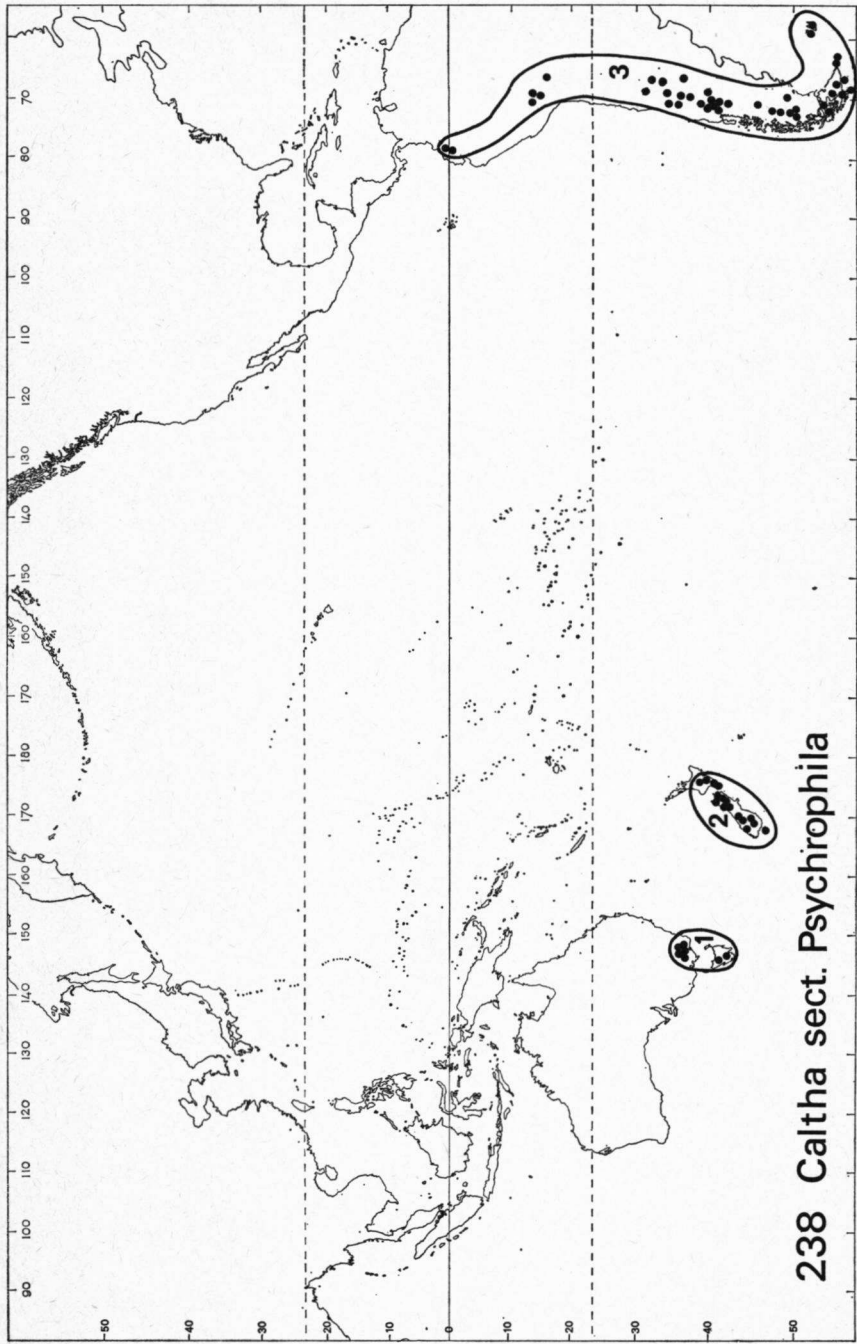
**Habit:** Perennial herbs, leaves simple on a short rhizome, laminae with basal appendages (by which the species of this section are distinguished from those of sect. *Caltha*). Flowers yellow or white, solitary on leafless peduncles.

**Habitat and ecology:** Alpine and subalpine marshes, wet open places and damp grasslands, from 4500 m in Equador to near sea-level in Fuegia, often gregarious.

**Dispersal:** Each flower produces few to many follicles each with 1—10 smooth seeds, 1—2 mm across, often with conspicuous raphe. In *C. palustris* L. of sect. *Caltha* the raphe makes the seed buoyant (Ridley, 1930; Smit, 1973, p. 126). In the same species vegetative reproduction by rooting at the nodes takes place frequently. There are no pertinent observations on the dispersal in species of sect. *Psychrophila*.

**Sources:** Mainly the monograph of the author: P. C. Smit, *Blumea* 21 (1973) 119—150. Other literature: H. N. Ridley, *Dispersal* (1930) 198; A. Lourteig, *Darwiniana* 9 (1951) 421—432; *Ibid.*, *Mem. Soc. Cienc. Nat. La Salle* 16 (1956) 52—54; H. H. Allan, *Fl. New Zeal.* 1 (1961) 165—166.

P. G. SMIT.



238 *Caltha* sect. *Psychrophila*

239. *Agatea* A. Gray

**Name:** *Agatea* A. Gray, Proc. Am. Ac. Arts Sc. 2 (1852) 323.

**Family:** *Violaceae*.

**Orthographic variant:** *Agation* Brongn.

**Taxonomy:** Several species have been described, most of them from New Caledonia (Guillaumin, 1942), but a cursory inspection of all these slightly different specimens suggests that eventually but one species can be recognized: *A. violaris* A. Gray.

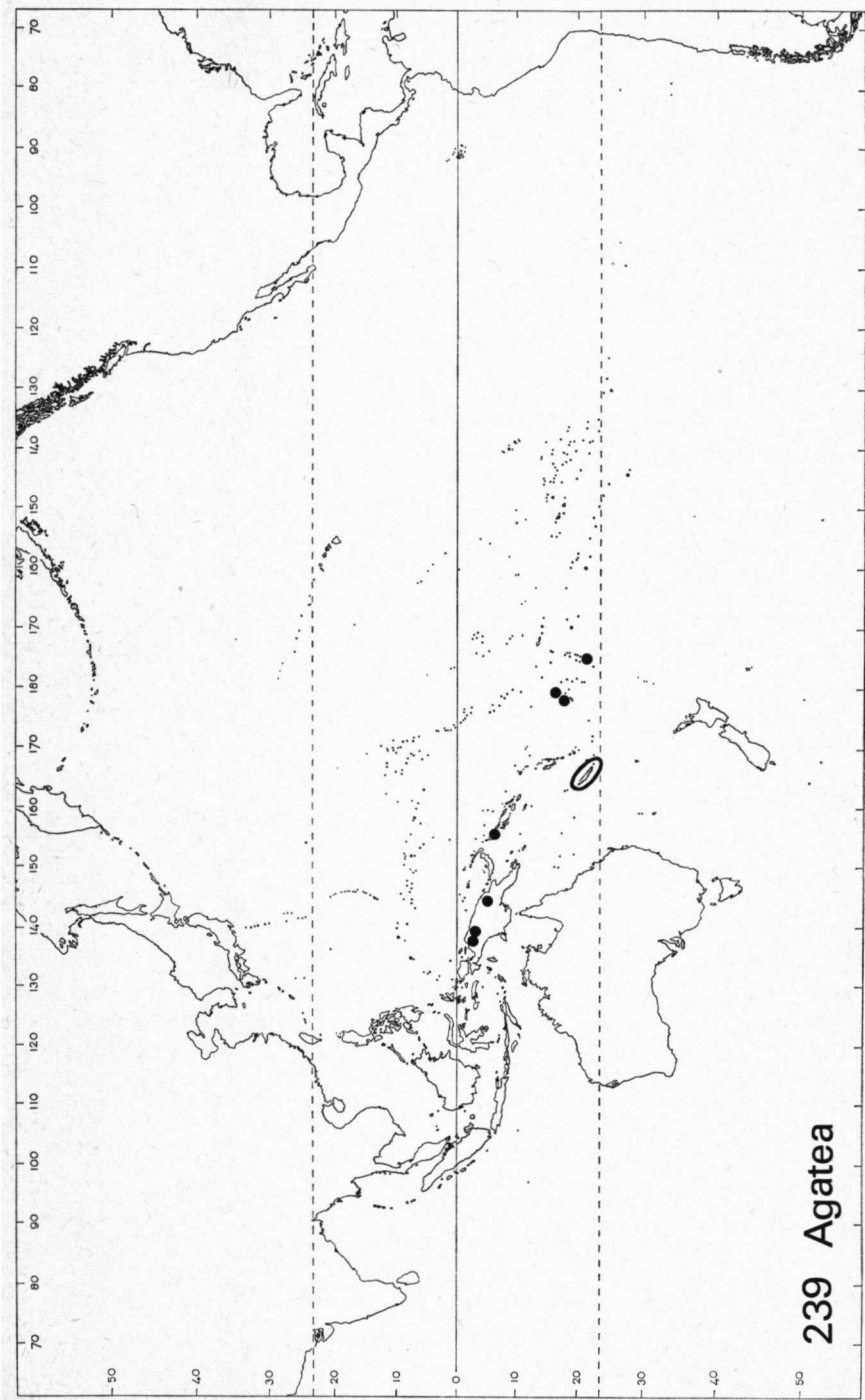
**Habit:** Climbing shrubs or lianas.

**Habitat and ecology:** Primary lowland rain-forest, apparently rare in Malesia, rather common in New Caledonia and Fiji, where it has been found up to 1000 m.

**Dispersal:** No actual data. The fruit is a woody or leathery elongate capsule, 1—5 cm, at maturity dehiscent with three valves (see description in Brongniart, 1861, and Jacobs, 1971). The seeds are numerous, winged, 1—2 cm across.

**Sources:** A. Brongniart, Bull. Soc. Bot. Fr. 8 (1861) 77—80; A. Guillaumin, Ibid. 89 (1942) 19, 20; A. C. Smith, Sargentia 1 (1942) 57, 58; M. Jacobs, Fl. Mal. I, 7 (1971) 192—194.

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240. *Adenia* Forsk.

**Name:** *Adenia* Forsk., Fl. Aegypt.-Arab. (1775) 77.

**Family:** *Passifloraceae*.

**Synonyms:** *Modecca* (Rheede) Lamk, for other synonyms see de Wilde (1971, p. 50).

**Taxonomy and distribution:** The Old World genus *Adenia* is mainly African and Madagascan. It consists of 92 spp. divided over 6 sections; 14 spp. occur in Indo-Australia.

Sect. *Adenia* (23 spp. in Africa and Madagascar)

Sect. *Microblepharis* (15 spp., of which 5 in SE. Asia and NW. Malesia)

Sect. *Blepharantes* (34 spp., of which 2 in SE. Asia)

Sect. *Erythrocarpus* (7 spp. in Asia, Malesia, N. Australia and W. Pacific; *A. heterophylla* east to Solomon Is, the only species ranging into the Pacific)

Sect. *Paschanthus* (1 sp. in Africa)

Sect. *Ophiocaulon* (12 spp. in Africa)

One species, *A. wightiana* (sect. *Microblepharis*) is with 2 subspecies distributed in E. Africa, and S. India and Ceylon. Many spp., especially in sect. *Adenia* and *Microblepharis*, have a limited distribution.

**Habit:** Erect herbs, or low shrubs (not in Indo-Australia) or small to large lianas, provided with tendrils, often with tubers or thickened rootstocks, or with a swollen stem-base (e.g. *A. hondala* from S. India and Ceylon). Some African spp. are thorny or spiny. Most spp. are dioecious. There is often a marked heterophylly, e.g. in the Malesian *A. cordifolia*, *A. macrophylla* and *A. heterophylla*.

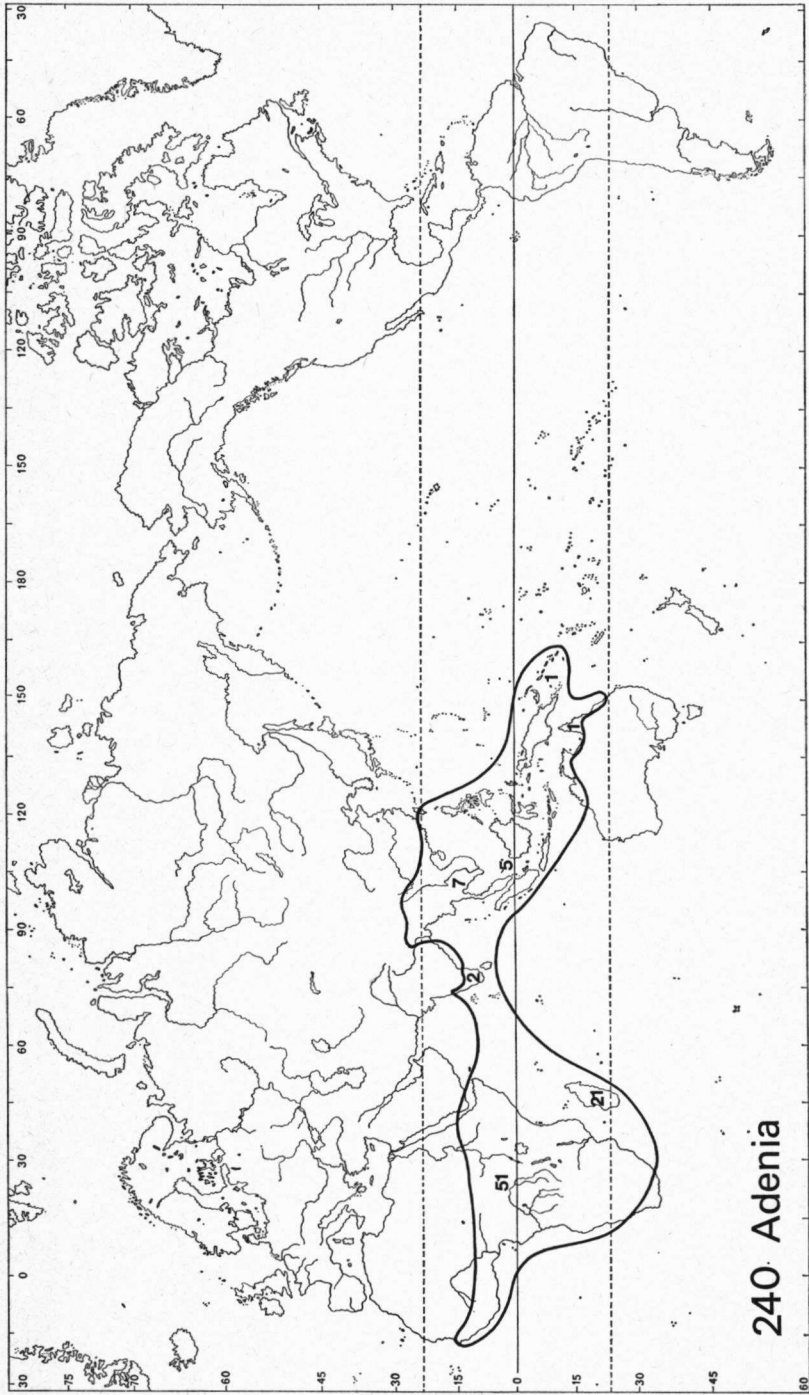
**Habitat and ecology:** Occurring in a wide range of habitats, in Africa varying from almost desert conditions to savannas, and (rain) forest; in Indo-Australia in everwet and monsoon forest (e.g. *A. heterophylla*), up to 1500(—2000) m.

Pollination is apparently effected by insects, as the anthers in many spp. remain in the flower tube during anthesis, e.g. in the narrow flask-shaped flowers as found in sect. *Erythrocarpus*.

**Dispersal:** Fruits are mostly capsular, in a few cases (Africa) dry berries. In the Indo-Australian spp. the capsules are bright red, the 3 valves opening at maturity and showing the blackish seeds which are largely enclosed in whitish juicy arils, pendent from long whitish fleshy funicles. According to Ridley (1930) these arils and funicles are eaten by birds. The fruits of several African *Adenias* are known to be deadly poisonous to man and cattle, but of some species the pulpy arils are reported as edible.

**Sources:** H. Harms in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 470—484, 488—494; H. N. Ridley, Dispersal (1930) 425; W. J. J. O. de Wilde, Meded. Landb. Hogesch. Wageningen 71—18 (1971) 1—281, maps; Ibid., Fl. Mal. I, 7 (1972) 417—431.

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241. *Hollrungia* K. Sch.

**Name:** *Hollrungia* K. Sch., Bot. Jahrb. 9 (1888) 212.

**Family:** *Passifloraceae*.

**Taxonomy:** This monotypic genus was originally erroneously described as having a single, consolidated style and stigma, due to the young stage of the flower buds studied. Mature flowers have 3 distinct styles (van Steenis, 1966). The flowers are polygamous, and apparently often dioecious, which causes some dimorphism in the flowers, as these have partly either reduced stamens or a reduced pistil.

*Hollrungia* is related to the monotypic genus *Tetrapathaea* from New Zealand, which differs by 4-merous flowers, and the absence of a separate inner corona. It is also related to *Passiflora*, but this latter genus differs among other characters by a different position of the stamens (on a long androgynophore), and by globose or capitate stigmas; in *Hollrungia* the androgynophore is rather short, and the stigmas are lobed-papillate.

**Distribution:** The single species *H. aurantioides* K. Sch. occurs in E. Malesia: Moluccas (Ternate), New Guinea, New Britain, New Ireland, Misima I., Solomon Is. (Bougainville, Shortland, Ronongo, New Georgia, Santa Ysabel, Santa Ana, Rennell).

**Habit:** Large lianas, up to 45 m long.

**Habitat and ecology:** Primary and secondary rain forest, locally common; up to 1700 m. Cross-pollination is probably effected by insects.

**Dispersal:** The greenish-yellow fruit is a dry, coriaceous berry, or it is woody (capsular) and possibly only opening when decaying, inside it is  $\pm$  fleshy. It is not known whether the seeds (fruits) are eaten by birds or other animals.

**Sources:** C. G. G. J. van Steenis, Acta Bot. Neerl. 15 (1966) 40—44; W. J. J. O. de Wilde, Fl. Mal. I, 7 (1972) 431—434, map.

242. *Tetrapathaea* (DC.) Reichb.

**Name:** *Tetrapathaea* (DC.) Reichb., Consp. (1828) 132; DC., Mém. Soc. Phys. Genève 1 (1822) 435 (as a section of *Passiflora*).

**Family:** *Passifloraceae*.

**Taxonomy:** This monotypic genus is often included in *Passiflora* as a section (DC., 1822, 1828), or recently also as a subgenus (Green, 1972). The single species, *T. tetrandra* (Banks & Sol. ex DC.) Cheesem. (*T. australis* Raoul) is distinguished from *Passiflora* species among other characters by the dioecious, 4-merous flowers, by a different insertion of the stamens (short androphore), and a different structure of anthers and stigmas (de Wilde, 1974).

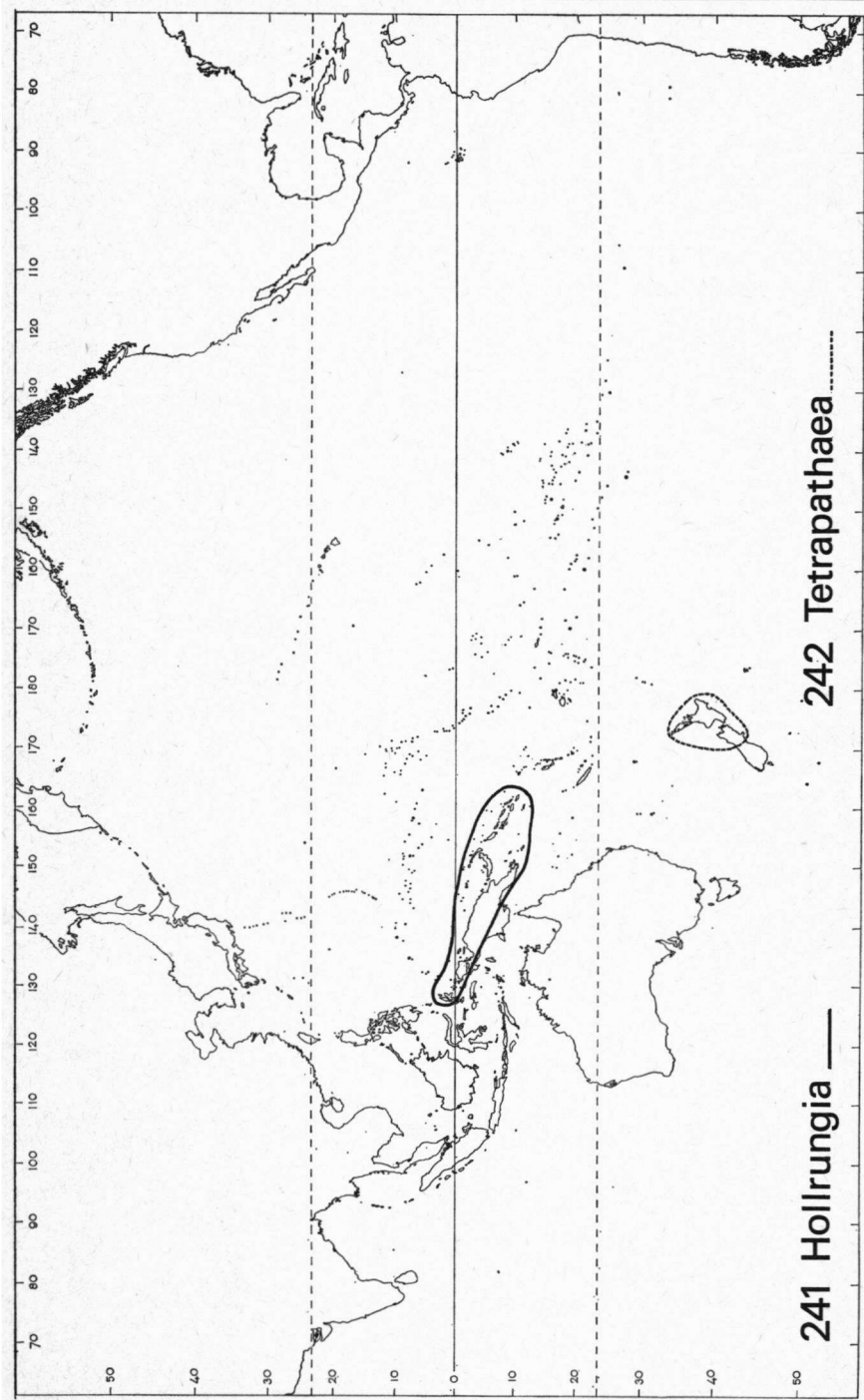
**Habit:** Tall woody climbers, with axillary tendrils.

**Habitat and ecology:** Lowland forest; forest edges. The flowers are dioecious, and pollination is probably brought about by insects.

**Dispersal:** The fruits are berry-like, leathery, orange at maturity; the seeds are enveloped by a juicy aril. Ridley (1930) reports that the fruit is eaten by pigeons.

**Sources:** A. P. de Candolle, Prod. 3 (1828) 323; H. Harms in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 507; H. N. Ridley, Dispersal (1930) 501; H. H. Allan, Fl. New Zeal. 1 (1961) 318, 319; P. S. Green, Kew Bull. 26 (1972) 553, 554; W. J. J. O. de Wilde, Blumea 22 (1974) 44.

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243. *Passiflora* L.

**Name:** *Passiflora* L., Sp. Pl. (1753) 955.

**Family:** *Passifloraceae*.

**Synonyms:** *Disemma* Labill.; for other synonyms see Harms (1925), Killip (1938), Hutchinson (1967), and de Wilde (1972).

**Taxonomy and distribution:** A genus of about 370 spp., of which c. 350 in the New World, and c. 20 in Indo-Australia and the West Pacific; it is absent from Africa, Madagascar and the Mascarene Is., Harms (1925) recognized 21 sections, of which 4 in Indo-Australia. For the New World Killip (1938) recognized 22 subgenera, and many sections and series. For the Indo-Australian region de Wilde (1972, 1972-bis) accepts only one section: *Decaloba*. In this section are recognized:

Group I (includes Harms' sect. *Decaloba* subsect. *Polyanthea*, sect. *Octandranthus* and sect. *Anomopanthus*): 16 spp., comprising all Asian—Malesian spp., (Himalayas and China to the Moluccas, and *P. leschenaultii* DC. in S. India).

Group II (includes sect. *Decaloba* subsect. *Decaloba*; formerly known under the generic name *Disemma*): 3 spp. in E. New Guinea, E. Australia and the West Pacific; *P. aurantia* Forst. f. reaches East to Samoa, Tonga and Niue I.

Group III (sect. *Hollrungella* with Harms): 1 sp., *P. hollrungii* K. Sch. in E. New Guinea. *P. foetida* L. and *P. suberosa* L. are of American origin but are now pantropical. Several other species are wide-spread through cultivation for their fruits or as ornamentals.

**Habit:** Small (herbaceous) climbers to tall lianas (in South America rarely shrubs or trees), provided with axillary tendrils.

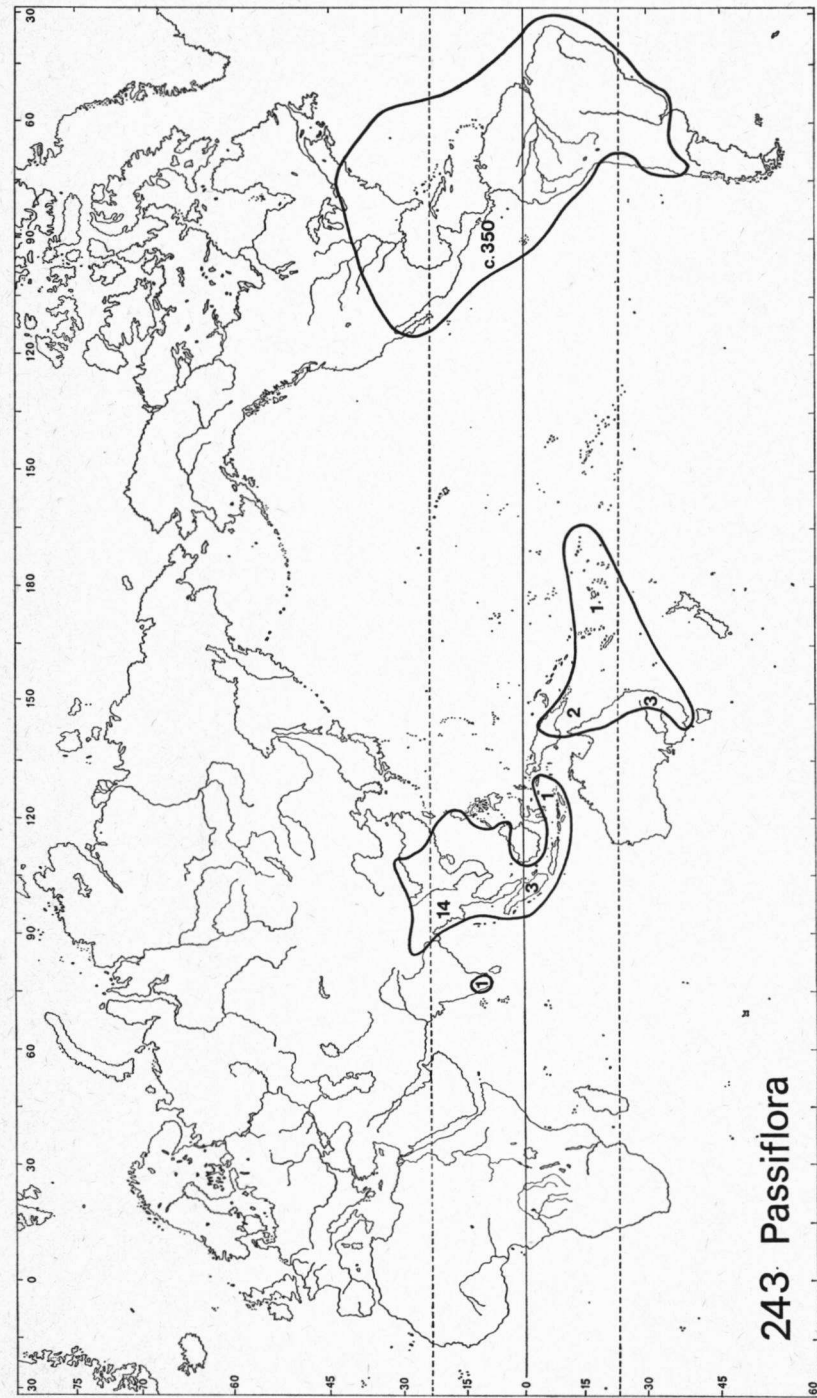
**Habitat and ecology:** Savannas, monsoon- or everwet forest; forest fringes. Some species are nitrophilous.

The flowers are hermaphroditic, protrandrous. Pollination is effected by insects (in South American species by butterflies and bumble-bees). The flowers of certain species are also visited by Kolibris.

**Dispersal:** The fruits are usually rather dry berries, with a thick coriaceous pericarp. The arillate seeds of several species are reported (Ridley, 1930) to be eaten by birds, once reported to be eaten by monkeys. The widespread *P. foetida* has edible, orange-red berry-like fruits.

**Sources:** H. Harms in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 470—507; H. N. Ridley, Dispersal (1930) 409, 481, 483, 508; E. P. Killip, Publ. Field Mus. Nat. Hist. Bot. Ser. 19 (1938) 1—613; J. Hutchinson, Gen. Fl. Pl. 2 (1967) 370; P. S. Green, Kew Bull. 26 (1972) 539—558 (maps); W. J. J. O. de Wilde, Blumea 20 (1972) 227—250 (maps); Ibid., Fl. Mal. I, 7 (1972) 407—417 (maps).

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243: *Passiflora*