

THE LINDSAEOID FERNS OF THE OLD WORLD V. THE SMALLER PACIFIC ISLANDS

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INTRODUCTION

The present paper is the third regional revision of the Old World Lindsaeoid ferns. The second (the fourth in the entire series on the Old World Lindsaeoids) will be published as vol. II, 1 part 3 of *Flora Malesiana*; it is awaiting publication as the present paper goes to the press. Species fully described there and extending into the area covered by the present revision are not dealt with at length again, in order to avoid redundancy.

The present treatment deals with the species of Micronesia, Melanesia, and Polynesia, or, more precisely, the smaller Pacific Islands from the Palau Islands, the Marianas, and the Bismarck Archipelago in the West to Hawaii and the Marquesas in the East. The Volcano and Bonin Islands will be treated with Japan, to which country they were recently returned; the Admiralty Islands are included in *Flora Malesiana*; New Zealand will be dealt with together with Australia; New Caledonia was the subject of a separate publication (Kramer 1967); no Lindsaeoid ferns have so far been found on the Tuamotus, Pitcairn, Easter Island, and other islands in the extreme East of Polynesia, nor on any atoll islands.

BIBLIOGRAPHY

The number of literature citations with the synonymy in the taxonomic part of this paper is quite limited. Many of the older works on ferns or on the whole vascular flora of islands in the Pacific contain notes on species from the group under discussion, but the identifications were so uncertain that there is hardly any need to cite them. Reports in the literature of specimens not seen by the writer are ignored for the same reason, except in the single case of one very distinctive species (*Lindsaea walkerae*).

Modern, comprehensive, more or less critical treatments of ferns or the entire vascular flora of Pacific islands or Archipelagos that contain notes on Lindsaeoid ferns are by Brown and Brown (Society Islands to Pitcairn, 1931), Christensen (Hawaii, 1925; Samoa, 1943), Copeland (Fiji, 1929; Society Islands, 1932), Glassman (Ponape, 1952), Hosokawa (Micronesia, 1936), Wagner and Grether (Guam, 1948), Wilder (Rarotonga, 1931), and Yuncker (Tonga, 1959). Most citations given in the following are from these papers, although it will be evident that the present author's views on the taxonomy and nomenclature of the species are very often at variance with those of the above-cited authors.

PHYTOGEOGRAPHIC NOTES

It would be rewarding to compare the distribution patterns of the Pacific Lindsaeoid ferns with those of the vascular plants in general and see how they tie in with them and

with the explanations offered for various distribution types in the Pacific. Unfortunately there is, to my knowledge, no modern phytogeographic analysis of the species of the Pacific flora as a whole, van Balgooy's paper (1960) dealing only with the distribution of phanerogamic genera. Nevertheless many ideas of a general kind about the Pacific flora have been expressed and published. Many of the modern ones may be found in the report of the Symposium on Pacific Biogeography ed. by J. L. Gressitt (1963), and in the papers cited there. If we confine ourselves to the Pacific fern flora we are again faced by the absence of a modern treatment, and also by the poor state of exploration of some parts, notably in western Melanesia. In the following the data obtained by the present author are compared with the general notes on the distribution in the more or less modern regional treatments cited above, if any. The conclusions should by no means be regarded as final, but rather as reflecting the present state of exploration and knowledge, but they may be of some use as the raw material for future evaluation of phytogeographic data on a much larger scale.

The known distribution of the Pacific Lindsaeoid ferns is charted in table I, which includes the New Caledonian ones not described in the taxonomic part of the present treatment but dealt with before (Kramer 1967). The assortment is best reviewed island group by island group.

For the **Marquesas** Brown and Brown (1931) found strong ties with the Society Islands, suggesting derivation from a common centre. In our group the Marquesas have an even poorer assortment than the Society Islands. There are no endemics in the **Society Islands**, their species being either widespread or at least more or less so in the Pacific. Two species reaching Tahiti skip many of the islands farther West and reappear only in western Melanesia. Van Balgooy (1960) called the flora of **Tonga** a depauperate version of that of Fiji. By and large the same seems to hold for the ferns, judging from Yuncker's list (1959), at least if that is interpreted in terms of supposed immigration rather than in the distribution of species peculiar to Fiji and Tonga. The same is true for the Lindsaeoids. Christensen's treatment of the ferns of **Samoa** (1943) contains few general remarks; his conclusion that Samoa is poorer than Fiji and much richer than the Society Islands is also true for the present group of ferns. None of the Lindsaeoid ferns occurring in Samoa is absent from Fiji (with one doubtful exception), but the reverse is not true. Still, the Andesite line does not seem to represent a break in the distribution of many species, the overall picture being one of gradual impoverishment from the Bismarck Archipelago eastward, as table I shows. Copeland (1929) stressed that the links of the Fijian fern flora with the West are much stronger than with the East. The same is true in the present group of ferns, although perhaps not as predominantly as stated by Copeland. He assigned all species ranging to the West *and* to the East of Fiji to the western element, assuming that they must have come from the West, which may be true but gives a bias to his figures with which he aimed to prove what he actually presupposed. The present author would be inclined to question his statement (l.c., p. 5) 'Papua and Fiji were reached and crossed by immigrants from the West; but Papua itself contributed almost nothing to this colonizing population and Fiji did not contribute much'. The **New Hebrides**, with the **Santa Cruz Islands**, are so poorly explored that very little can be said here. Several of the more widespread Pacific Lindsaeoids reach them, and more will probably be added to the list by future collecting. Surprisingly, none of the species peculiar to New Caledonia have so far been found on the New Hebrides, not even *Sphenomeris deltoidea* (New Caledonia and Santa Ysabel in the Solomons). The **Solomon Islands** are relatively rich, probably equal to parts of adjacent New Guinea comparable in size and altitude, and several species extending or otherwise restricted to New Guinea occur as far East as the Solomons. On

the other hand they have some Pacific species that do not reach New Guinea, some extending to the Bismarck Archipelago. Thorne (in Gressitt, 1.c., p. 328) included the Solomon Islands and the Bismarck Archipelago in a separate district of the Papuan Subregion, mainly on zoogeographical grounds. This is not borne out by the distribution of the Lindsaeoid ferns. The absence (or scarcity ?) of the ubiquitous *Sphenomeris chinensis*, not previously found and again not collected by the recent expeditions to the Solomons, is striking and not readily explicable. The flora of the **Bismarck Archipelago** is again so poorly known that any conclusions would be hazardous. Like the Solomon Islands, this archipelago is the western limit of some Pacific taxa. Better exploration will probably reveal the presence of Papuan species. **Micronesia** is very poor in species; most of them are otherwise Malesian. With *Sphenomeris biflora* Guam has one Japanese-Philippine species. **Hawaii** is only reached by the two most widespread gerontogean Lindsaeoids, *Sphenomeris chinensis* and *Lindsaea repens*, the latter with an endemic variety.

Endemism is relatively high, half of the species being endemic; when New Caledonia is excluded still $\frac{2}{3}$ of the species are endemic. The figure becomes higher when also infraspecific taxa are taken into account. Surprisingly few endemics are confined to a single island, even to a single archipelago, with the exception of New Caledonia. The most narrowly distributed endemic is perhaps *Tapeinidium carolinense* on Ponape.

When the endemic species are treated in terms of their affinity, it remains true that the Pacific Lindsaeoid fern flora is by and large an impoverished Malesian one. Nevertheless, Melanesia with western Polynesia is the principal distribution centre of *Lindsaea* section *Penna-arborea*, and New Caledonia is an important secondary centre for section *Schizoloma* and has the highest concentration of species of *Sphenomeris*.

ACKNOWLEDGEMENTS

My sincerest thanks are due to the Director of the Flora Malesiana project who made the present study possible, and to the Curators of the herbaria cited by the standard abbreviations in the taxonomic part, who made the material available, either by generously sending it on loan or by making it accessible to me during my visits. I wish to express my particular gratitude to Dr F. M. Jarrett, Kew, for giving me access to the very important recent collections made by A. F. Braithwaite in the Solomon Islands and for depositing a fine set of specimens from this collection in the Utrecht Herbarium. Furthermore I am indebted to the artists who made the illustrations (fig. 1, Mr E. Vysma, Leiden; the others, Miss E. M. Hupkens van der Elst, Utrecht).

LINDSAEA GROUP

A general account of the group can be found in three other papers by the present author (Kramer 1957, 1968, 1970), to which the reader is here referred.

KEY TO THE GENERA

1. Sori on 1—8 vein-ends; indusium laterally entirely or largely adnate to the lamina; ultimate divisions never dimidiate; veins free.
2. Ultimate free or nearly free divisions of a linear- or cuneate-divaricate type, with the sorus (sori) on their apical margin; paraphyses 2- or 3-celled, not usually found; spores monolete or trilete.
 1. *Sphenomeris*
 2. Ultimate free divisions not of a linear- or cuneate-divaricate type, subtire to pinnatifid; sori on the lateral margin of the divisions or in their lobes; pluricellular filiform paraphyses usually (always ?) present; spores monolete. 2. *Tapeinidium*
1. Sori on many vein-ends, or, if on 8 or fewer, the sides of the indusium free, or the pinnules dimidiate, or the veins anastomosing, or these characters combined; spores (with one exception) trilete.
 3. *Lindsaea*

I. SPHENOMERIS

Maxon, J. Wash. Ac. Sc. 3 (1913) 144, *nom. cons.* — For bibliography, synonymy, and description, see Fl. Mal. (gen. 1).

KEY TO THE SPECIES

1. Rhizome 5 mm or more in diam., with an internal sclerotic strand; spores trilete; sori of larger segments on (2—)4—8 vein-ends, occupying their whole apical margin.
 2. Divisions of the highest order of lanceolate outline (the penultimate ones) almost entirely deeply dissected into cuneate segments, sometimes twice dissected, their apices caudate-acuminate; rhizome scales to 7 mm long, to 20-seriate at the base 1. *Sph. retusa*
 2. Divisions of the highest order of lanceolate outline (penultimate or ultimate ones) only at the base with a few broadly cuneate, free or almost free segments and a shallowly incised apical portion, or the whole division only shallowly incised; apices of these divisions acute to shortly acuminate; rhizome scales to 4 mm long, to 4-seriate at the base 2. *Sph. deltoidea*
1. Rhizome 2—4 mm in diam., with a lindsaeoid protostele; spores monolete; sori of larger segments on 1—2(—4) vein-ends, often not occupying their whole apical margin.
 3. Scales to 5—6-seriate at the gradually widened base; sori uni- or binerval; larger free ultimate divisions ca. 2 mm wide; lamina subcoriaceous or coriaceous, usually bipinnate + pinnatifid or tripinnate + crenate 3. *Sph. biflora*
 3. Scales 1—3-seriate (or to 4-seriate at the abruptly broadened base); sori 1—3(—4)-nerval; larger free ultimate divisions of variable width; lamina herbaceous to subcoriaceous, or in narrow forms firmer, in full-grown plants bipinnate + bipinnatifid, tripinnate + pinnatifid, or more dissected. 4. *Sph. chinensis*

1. *Sphenomeris retusa* (Cav.) Maxon, J. Wash. Ac. Sc. 3 (1913) 144. — *Davallia retusa* Cavanilles, Descr. (1802) 278.

For further synonymy and description see Fl. Mal. (gen. 1, sp. 1).

Distribution: Philippines and Celebes eastward to New Guinea and western Melanesia. A specimen in herb. B labelled 'Isle of Pines, New Hebrides', *McGillivray s.n.*, possibly, a specimen in P said to have come from New Caledonia probably mislabelled. Incorrectly reported from Guam by Merrill (Philip. J. Sc. Bot. 9, 1914, 45), as already noted by Wagner & Grether (see under *Sph. biflora*).

Melanesian specimens seen:

BISMARCK ARCHIPELAGO. New Hannover: *Naumann s.n.* (B). — New Ireland: *K. & L. Rechinger 3619* (W). — New Britain: *Blackwood 325* (K); *Goodby s.n.* (MICH); *Herre 195* (BISH).

SOLOMON IS. Guadalcanal: *Milne 582* (K); *Whitmore BSIP 2772* (K, L); *Braithwaite R.S.S. 4120* (K). — San Cristóbal: *Milne 523* (K); *McGillivray s.n.* (BM). — Santa Ysabel: *Braithwaite R.S.S. 4593* (U). — Isl.?: *C. Moore s.n.* (B, Z); *Milne s.n.* (B).

2. *Sphenomeris deltoidea* (C. Chr.) Copeland, Un. Cal. Publ. Bot. 14 (1929) 366; Stone & Lane, Bot. Not. 112 (1959) 373; Kramer, Acta Bot. Neerl. 15 (1967) 567, fig. 3 B. — *Lindsaea deltoidea* C. Christensen, Ind. Fil. (1906) 393.

For further synonymy and description see Kramer (1967).

Distribution: New Caledonia, western Melanesia; specimens said to have come from the New Hebrides perhaps mislabelled; the occurrence there is not unlikely, but there are no modern collections.

BISMARCK ARCHIPELAGO. New Ireland: ?*Turner (sic) s.n.* (B, loc. corr.?).

SOLOMON IS. Santa Ysabel: *Braithwaite R.S.S. 4511, 4587* (U); *Webber s.n.* (BM); Horara Islet, *Stone 2518* (U).

3. *Sphenomeris biflora* (Kaulfuss) Tagawa, J. Jap. Bot. 33 (1958) 203; Kramer, Blumea 15 (1968) 573. — *Davallia biflora* Kaulfuss, Enum. (1824) 221. — *Odontosoria chinensis* auct.

non (L.) J. Smith: Hosokawa, Trans. Nat. Hist. Soc. Form. 26 (1936) 115. — *Odontosoria retusa auct. non* (Cav.) J. Smith: Hosokawa, l.c. — *S. chusana auct. non* (L.) Copel.; Wagner & Grether, Occ. Pap. Bish. Mus. 19 (1948) 70.

For further synonymy and description see Fl. Mal. (gen. 1, sp. 2).

Distribution: Southern Japan, Bonin and Volcano Is, SE. coast of China, Taiwan, Philippines (Luzon and Batanes Is).

MARIANAS. Alamagan: *Hosokawa 7916* (Pic-Ser.) — Guam: *Rodin 520, 521* (US), 749 (K, US); *Guerrero s.n.* (BRI); *R. L. Steere 152* (US); *Grether 3437* (US), *s.n.* (BISH); *G. C. Moore 393* (US); *Wagner 3741* (MICH, US); *Guam Exp. Station 122* (B, K, L, US); *Safford & Seale 1051* (US); *Mertens s.n.* (W); *Stone 1713* (BISH, U); *Moran 4387* (E, MICH, US); *Nelson 262* (BO).

4. *Sphenomeris chinensis* (L.) Maxon, J. Wash. Ac. Sc. 3 (1913) 144; Un. Cal. Publ. Bot. 12 (1924) 31; Yuncker, Bull. Bish. Mus. 220 (1959) 30; Kramer, Blumea 15 (1968) 572. — *Trichomanes chinense* L., Sp. Pl. 2 (1753) 1099. — *Odontosoria chinensis* (L.) J. Smith, Bot. Voy. Herald (1857) 430; C. Christensen, Bull. Bish. Mus. 25 (1925) 12; Brown & Brown, Bull. Bish. Mus. 89 (1931) 50. — *Adiantum chusanum* L., Sp. Pl. 2 (1753) 1095. — *S. chusana* (L.) Copeland, Bull. Bish. Mus. 59 (1929) 69; Wilder, Bull. Bish. Mus. 86 (1931) 13; Copeland, Bull. Bish. Mus. 93 (1932) 54.

For further synonymy and description see Kramer (1967) and Fl. Mal. (gen. 1, sp. 3).

Distribution: Tropical and subtropical parts of the Old World.

The great majority of the Pacific specimens belong to var. *chinensis* (see Fl. Mal. l.c.). Of these, the following selected collections may be cited:

PALAU IS. *Takamatsu 1722* (BISH, MICH); *Kraemer s.n.* (B).

MARIANAS. Saipan: *Gibbon 1163* (B); *Fritz s.n.* (B).

NEW HEBRIDES. Aneityum: *Kajewski 891* (GH, K, US).

NEW CALEDONIA. See Kramer (1967).

Fiji. Viti Levu: *St. John 18250* (K, MICH); *Parks 20097* (GH, K, MICH, US), 20508 (MICH, US); *A. C. Smith 4704* (A, BISH, BRI, K, US), 6034 (A, BISH, BRI, K, L, SING, US). — Kandavu: *A. C. Smith 39* (GH, K, US). — Ngau: *Milne 254* (K). — Ovalau: *Milne 5a, 64* (K).

TONGA IS. Eua: *Yuncker 15565* (BISH, U, US). — Kao: *Yuncker 15932* (US).

COOK IS. Rarotonga: *Parks & Parks 22236* (GH, K, MICH, US); *Wilder 1126* (BISH).

MARQUESAS. Hivaooa: *Jones 1615, 1682* (BISH).

HAWAII. Kauai: *St. John c.s. 11000* (BISH); *Heller 2328* (BO, K); *Hitchcock 15270, 15544* (US); *Faurie 97* (MICH). — Oahu: numerous coll., e.g. *Topping 3222* (BRI, GH, MICH); *Bartsch 38* (GH, US); *Curran 183* (MICH); *Fosberg 9260* (MICH); *Yuncker 3192* (US). — Molokai: *Forbes 422 M* (BISH); *Hitchcock 15047* (US). — Lanai: *Forbes 124 L* (BISH); *Hitchcock 14664* (US). — Maui: *Wawra 1807* (W); *Forbes 1262 M* (BISH); *Hitchcock 14895* (US). — Hawaii: *K. & L. Rechinger 2017, 2031* (W); *Degener H 196, 1535* (GH); *Faurie 169* (MICH); *Forbes 533* (BISH); *Hitchcock 14566, 14580* (US).

There is an aberrant form in southern Polynesia, well described by Brown & Brown (l.c.) who reported all of its important characters. It is most typically developed in Tahiti. Its segments are very narrow, often uninerval, with long, narrow sori, the indusium about twice as broad (along the vein) as long (at right angles to it) and ending in a pointed lobe that often exceeds the margin of the leaf-segment. The spores are rather large, between 52 and 62 μ long. The collections from Samoa, Rapa, the Austral Islands, and some from the Marquesas show the same overall features, but less pronouncedly; their spores are, however, smaller, up to 50 μ (to 55 μ in some specimens from the Austral Is). Although the form looks rather distinct, especially the Tanitian specimens, it is not sufficiently clear-cut to be treated as a variety; I do not know of any name published for it. The matter should be studied in the field, preferably with the help of cytotoxic methods. I failed to find any differences in the rhizome scales. It may be that *Sph. chinensis* began

differentiating in the above-named islands, and then typical var. *chinensis* arrived again from elsewhere, obscuring the characters of the incipient local form, but that is pure conjecture.

The following, more or less typical specimens of this form may be cited:

SAMOA. Savaii: *Christophersen & Hume 2049* (BO, US), *2069* (BISH, BM, BO, K); *Vaupel 431* (B, HBG). — 'Olosina' (Olosega?): *Reinecke 178* (B, BO, K, US).

SOCIETY IS. Tahiti: *Setchell & Parks 271* (B, GH, US, W); *Grant 3542* (US), *4188* (BISH); *Banks s.n.* (BM); *Quayle 217* (BISH, US); *Tilden 1009* (BISH); *Jelinek 183* (B, W). — Raiatea: *Grant 5230* (BISH); *Moore 73* (BISH); *Bennett 9* (B). — Borabora: *Grant 4977* (BISH). — Tahaa: *St. John 17349* (BISH, K).

MARQUESAS. Nukuhiva: *Brown & Brown X* (BISH, BO, K), *475* (BO, US). — Hivaooa: *Christian s.n.* (K).

AUSTRAL IS. Rapa: *Quayle 305* (BISH, BO). — Raivaevae: *St. John 16174* (BISH, MICH), *16177* (BRI, MICH). — Rurutu: *St. John 16667* (US), *16779* (BISH, BO, K, MICH).

It is significant that *Sph. chinensis*, by far the most widespread species in the genus, reaches such remote Pacific islands as the Marquesas, the Austral Islands, and Hawaii, where it is the only or almost the only Lindsaeoid fern. Strangely enough it has not been found on Guam (where it is replaced by *Sph. biflora*), in the Bismarck Archipelago and the Solomon Is, where it may certainly be expected, nor in Queensland.

2. TAPEINIDIUM

(Presl) C. Christensen, Ind. Fil. (1906) 631; Kramer, *Blumea* 15 (1968) 545.

For bibliography, synonymy, and description, see Kramer, l.c. and Fl. Mal. (gen. 2).

KEY TO THE SPECIES

1. Lamina simply pinnate.
 2. Lamina with a conform terminal pinna 5. **T. melanesicum**
 2. Apex of lamina pinnatifid, with gradually reduced, confluent upper pinnae. 4. **T. carolinense**
1. Lamina more dissected.
 3. Texture herbaceous; margin bordering the apical sorus of a segment denticulate 1. **T. denhamii**
 3. Texture chartaceous to coriaceous; segments without apical sorus and not denticulate.
 4. Larger segments pinnatifid, each lobe with a sorus overtopped by part of the lobe.
 2. **T. amboynense**
 4. Larger segments (except in the basal pinnae) crenate, each lobe with a terminal or subterminal sorus 3. **T. novoguineense**

I. Tapeinidium denhamii (Hooker) C. Christensen, Ind. Fil. (1906) 631. — *Davallia denhamii* Hooker, 2nd Cent. Ferns (1860) pl. 47. — *T. tenue* Copeland, Bull. Bish. Mus. 59 (1929) 69; Kramer, *Blumea* 15 (1968) 548; not *Microlepia tenuis* Brackenridge, U.S. Expl. Exped. (1854) 236 (*Saccoloma spec.*).

For further synonymy see Kramer (l.c.); for description see Fl. Mal. (gen. 2, sp. 1).

Distribution: Admiralty Is, Melanesia.

BISMARCK ARCHIPELAGO. New Hannover: *Naumann 127* (B). — New Ireland: *McGillivray s.n.* (B); *Turner s.n.* (B); *Schlechter 13781* (B, BM, BO, K, P).

SOLOMON IS. San Cristóbal: *Braithwaite R.S.S. 4254* (U); *Brass 3025* (BRI, GH, L, MICH, type of *T. tenuis* Copel.). — Santa Ysabel: *Brass 3335* (BISH, BO, GH, L, MICH, P). — Guadalcanal: *E. S. Brown 2438* (BM); *Braithwaite R.S.S. 4054, 4111* (U). — Malaita: *Whitmore BSIP 3902* (K). — Isl.?: *Waterhouse 280* (K); *Cornins (?) 13* (K).

NEW HEBRIDES. Banks Is: *J. Palmer 13* (K). — Aneityum: '*Cuming*' (*McGillivray?*) 22 (B); *Kajewski 894* (BISH, BO, GH, K, US); *Morrison 63* (US), *s.n.* (K, US); *Milne 313* (K), *s.n.* (B, BM); *McGillivray 22* (B, BM, K, P, U), 904 (K), *s.n.* (B, BM, K).

Fiji. Viti Levu: *Parks 20010* (BISH, BM, GH, K, MICH, US), *20307a* (MICH); *McKee 2837* (US);

Graeffe 164 (P); *Gillespie 13230* (MICH); *Milne 116* (K, type). — Vanua Levu: *A. C. Smith 1836* (BISH, BM, GH, K, US). — Ovalau: *Prince s.n.* (GH). — Isl.?: ('Louvoui') *Prince s.n.* (GH, US); *Seemann s.n.* (K), 754 (BM, GH, K); *Cairns s.n.* (K); *Horne 703* (GH, K).

Specimens labelled 'New Caledonia' and 'Isle of Pines' are presumably from the New Hebrides.

2. *Tapeinidium amboynense* (Hooker) C. Christensen, *Ind. Fil.* (1906) 631; Hosokawa, *Trans. Nat. Hist. Soc. Form.* 26 (1936) 126; Kramer, *Blumea* 15 (1968) 549. — *Davallia amboynensis* Hooker, *Spec. Fil.* 1 (1845) 178, pl. 56 C. — *T. amplum* Copeland, *Occ. Pap. Bish. Mus.* 15 (1939) 82, fig. 3.

For further synonymy see Kramer (l.c.); for description see *Fl. Mal.* (gen. 2, sp. 3).

Distribution: Celebes to western New Guinea; Micronesia.

PALAU Is. *Kanehira 2099* (US); *Kanehira & Hatusima 4620, 5076* (GH); *Takamatsu 1572* (BISH, K, MICH, US, type of *T. amplum* Copel.), 1610 (BISH, BO, K, MICH, U); *Kraemer s.n.* (B); *Hosokawa 7162* (BISH).

3. *Tapeinidium novoguineense* Kramer, *Blumea* 15 (1968) 550.

For description see *Fl. Mal.* (gen. 2, sp. 4).

Distribution: New Guinea. Since the species was described the following Melanesian collection was received:

SOLOMON Is. Guadalcanal: *Braithwaite R.S.S. 4789* (U).

4. *Tapeinidium carolinense* Kramer, *Blumea* 15 (1968) 555. — *T. pinnatum auct. non* (Cav.) C. Christensen: Hosokawa, *Trans. Nat. Hist. Soc. Form.* 26 (1936) 125; Glassman, *Bull. Bish. Mus.* 209 (1952) 50. — **Fig. 2.**

When this species was originally described, only a brief differential diagnosis was given. It is therefore more extensively described here.

Rhizome rather short-creeping, 2–3 mm in diam.; scales castaneous, very narrowly triangular and very long-acuminate, throughout with elongate cells, *ca.* 10-seriate at the base, with a very long uni- to triseriate apex, to 5 mm long. *Leaves* rather close; petioles stramineous, *ca.* 15–30 cm long, $\frac{1}{2}$ to about as long as the lamina, abaxially upward gradually sharply bi-angular, scarcely or not sulcate. Lamina simply pinnate, ovate, *ca.* 15–30 cm long, with *ca.* 20–25 pinnae to a side, without a conform terminal pinna; rachis like the upper part of the petiole, shallowly sulcate. Pinnae laxly ascending or the basal ones spreading, coriaceous, olivaceous when dry, narrowly lanceolate, subsessile, unequally cuneate at the base, acute or shortly acuminate, the larger ones 6–15 cm long, 5–7 mm wide; upper pinnae gradually reduced, confluent into a pinnatifid leaf-apex; basal pinnae usually a little shortened. Margin sharply serrate, or if fertile often obtusely so, the teeth 1–2 mm, rarely bifid, rarely on lower pinnae a tooth more strongly separated and almost lobe-like. Costa stramineous, abaxially elevated, obtuse; veins immersed, not evident, very oblique, not close, once, rarely twice, forked, the ends strongly connivent or joined by the receptacle. *Sori* most often single under but at least in part in the lobes, binerval or uninerval, rarely two uninerval ones together in a basal lobe; indusium pale to brownish, \pm pouch-shaped, often with irregularly protracted edge, $\frac{1}{3}$ –1 mm long, $\frac{1}{3}$ – $\frac{2}{3}$ mm wide, not reaching the edge of its lobe by a distance equal to its width or a little less, but usually closer to the sinus. *Spores* brownish, shortly ellipsoidal, smooth, *ca.* 25 by 20 μ .

Distribution: Ponape.

Ecology: Terrestrial in moist forest; alt. not noted.

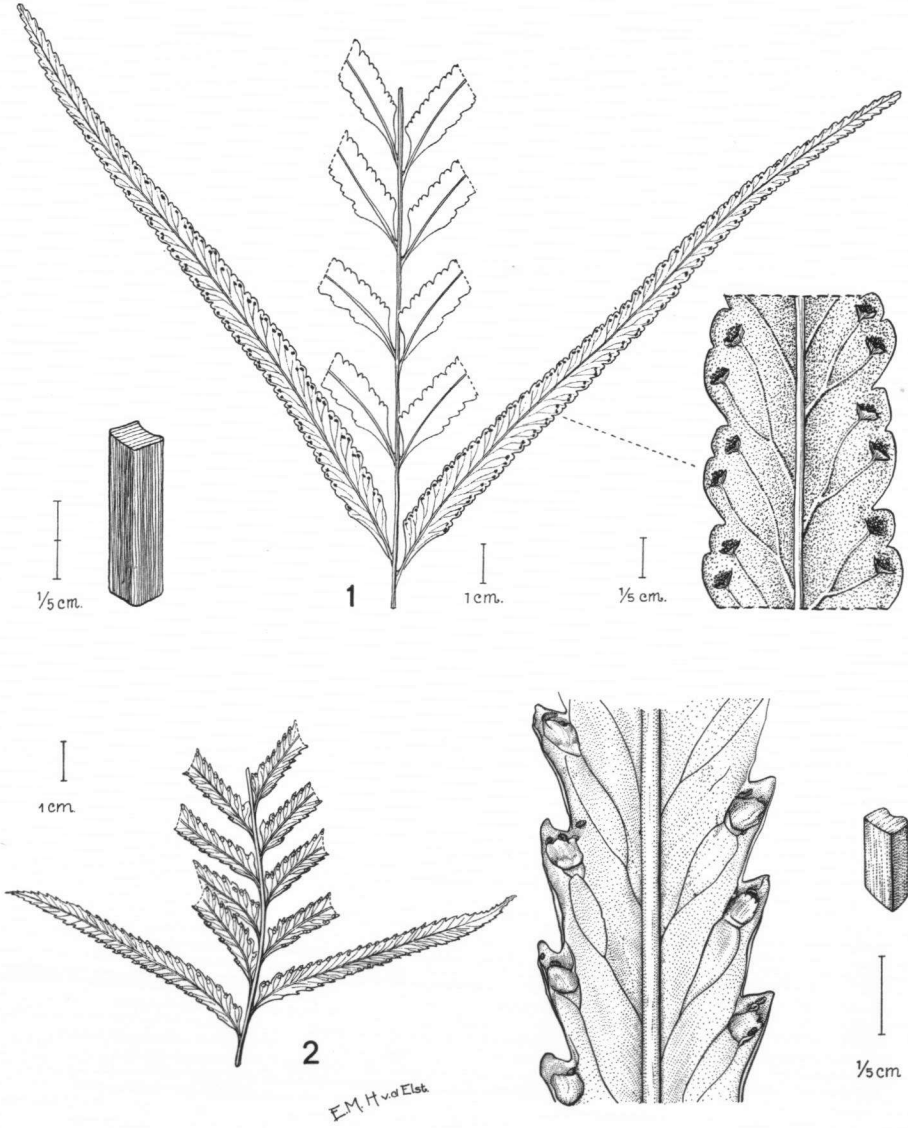


Fig. 1. *Tapeinidium melanesicum* (A. C. Smith 6451, L). — Fig. 2. *Tapeinidium carolinense* (Stone 5384, U).

CAROLINES. Ponape: *Finsch 29* (B); *Glassman 2384* (BISH); *Hosokawa 5616* (BISH); *Kanehira 795* (BISH), *1549* (BISH, K), *1615* (US, 2 sh., type); *Ledermann 13456* (B, BISH, K), *13678*, *13800a* (B, K); *Stone 5384* (U); *Takamatsu 954* (BISH, BO, MICH, US).

5. *Tapeinidium melanesicum* Kramer, *Blumea* 15 (1968) 555. — *T. pinnatum* auct. non (Cav.) C. Christensen: *Copeland, Bull. Bish. Mus.* 59 (1929) 69. — **Fig. 1.**

For the same reason as in *T. carolinense* this species is here described more at length.

Rhizome short-creeping, 2—4 mm in diam.; scales dark castaneous, narrowly ovate to narrowly triangular, acuminate, to 4-seriate at the base, the greater part uni- or biseriate, to 1½ mm long. *Leaves* clustered; petioles 10—40 cm long, ¼—1 × as long as the lamina, medium to purplish brown, sometimes mottled, abaxially terete or at the apex shortly and obtusely bi-angular, not sulcate, the edges concolorous. Lamina oblong, simply pinnate, ca. 20—40 cm long, with (5—) 10—15 (—25) pinnae to a side and a conform terminal one; rachis stramineous to dark brown, abaxially rounded to obtusely bi-angular. Pinnae ascending, not close, coriaceous, olivaceous to brown when dry, very narrowly lanceolate, 10—25 cm long, 6—15 mm wide, subsessile, unequally cuneate at the base, acute or shortly acuminate, shallowly and regularly crenate or bicrenate, with strongly ascending lobes to 1 mm high but often smaller; a few upper pinnae somewhat reduced, the terminal pinna conform but comparatively small, sometimes more deeply crenate or rarely slightly lobed at the base or slightly connected with the uppermost lateral pinna; rarely a few basal pinnae somewhat reduced. Costa stramineous to brownish, abaxially elevated, obtuse; veins slightly prominulous, evident, not very close, very oblique, once or sometimes twice forked. *Sori* single or paired under and mostly slightly extending into the lobes, or in the apical part of the pinna in the lobes, uninerval or very occasionally binerval. Indusium pale to brown, often slightly lobed, pouch-shaped to semi-elliptic, ¾ mm wide, ¾—2 mm long, not much reflexed at maturity, not reaching the margin by (usually) less than its width. *Spores* brownish, subellipsoid, smooth, ca. 30 by 24 µ.

Distribution: Melanesia.

Ecology: Terrestrial in forests, at lower altitude, to 900 m.

NEW HEBRIDES. Isl.?: *Palmer 32* (K).

SANTA CRUZ Is. Vanikoro: *Ch. Moore 25* (K).

SOLOMON Is. Santa Ysabel: *Herre 149* (BISH); *Stone 2512* (BISH, U, US, type); *Le Guillou s.n.* (P). — San Cristóbal: *Brass 3031* (BISH, BO, BRI, GH, L, MICH); *Braithwaite R.S.S. 4233* (U). — New Georgia Group: *Whitmore & Grubb BSIP 1965* (L). — Kolombangara: *Braithwaite R.S.S. 4346* (U). — Shortland Is: *Guppy 13* (BM). — Faro Is: *Guppy 14* (BM). — Isl.?: *Hadley 50* (BISH, US); *Comins 126* (B); *Waterhouse 257* (K).

Fiji. Viti Levu: *Milne 310* (K); *Nielsen 219* (US); *McKee 2839* (BM, U, US); *Degener 15146* (BISH, GH, K, MICH); *Livingston s.n.* (US); *Gillespie 2013* (BISH, MICH); *Greenwood 1815* (GH, K); *Parham 89* (BM); *Parks 20011*, *20906* (BISH); *Meebold 16613* (BISH). — Vanua Levu: *Degener & Ordóñez 14067* (BISH, GH, K, MICH, US); *A. C. Smith 6451* (A, BISH, BRI, K, L, US). — Ovalau: *Milne 57* (K). — Isl.?: *Horne 536* (GH, K); *Seemann 755* (BM, GH, K, P); *Harvey s.n.* (B, BM, K); *Turnbull s.n.* (K).

Vern. name: 'kiresi' (Bugotu; rec. by Stone).

3. LINDSAEA

Dryander in J. E. Smith, *Mém. Ac. Turin* 5 (1793) 401; *Trans. Linn. Soc.* 3 (1797) 39.

For bibliography, synonymy, and description, see *Fl. Mal.* (gen. 4).

For the terminology employed, see Kramer (1957) and *Fl. Mal.* The term 'pinnule' is always used for a free ultimate division, regardless of the degree of dissection of the lamina.

KEY TO THE SPECIES¹⁾

1. Rhizome short-creeeping (less often somewhat long-creeeping), nearly always terrestrial, the stèle almost or quite radial (subgenus *LINDSAEA*).
2. Lamina bipinnate or more strongly dissected, without conform terminal pinna, the primary pinnae upward gradually of simpler structure and passing into the leaf-apex.
 3. Veins free; sori on one, very rarely on two vein-ends 1. *L. moorei*
 3. Veins at least partly anastomosing; sori plurinerval 2. *L. ensifolia*
2. Lamina simply pinnate (but the pinnules may be incised) or, if bipinnate, with a distinct, conform terminal pinna.
 4. Veins free.
 5. Pinnules not dimidiate, basally articulate 13. *L. gueriniana*
 5. Pinnules not dimidiate, non-articulate 12. *L. walkerae*
 5. Pinnules dimidiate, non-articulate.
 6. Lamina simply pinnate, the pinnules subentire to deeply incised.
 7. Rachis abaxially rounded; spores monoletè 11. *L. odorata*
 7. Rachis abaxially bi-angular; spores triletè.
 8. Larger pinnules incised to $\frac{1}{3}$ of their width, often less 14. *L. lucida*
 8. Larger pinnules incised far beyond $\frac{2}{3}$ 15. *L. lapeyrousii*
 6. Lamina bipinnate; pinnules incised.
 9. Lower (primary) pinnae reduced; pinnules incised to the middle or less; sori on 1—4, mostly on 2 veins 4. *L. kingii*
 9. Lower (primary) pinnae not reduced; most pinnules incised considerably beyond the middle; the sori on 1, rarely on 2 veins 3. *L. tetragona*
 4. Veins at least in part reticulate.
 10. Pinnules not dimidiate 2. *L. ensifolia*
 10. Pinnules dimidiate.
 11. Sorus on the outer margin in most or all pinnules continuous with the outermost sorus of the upper margin 10. *L. cultrata*
 11. Sorus (sori) on the outer margin distinct, or no distinct outer margin of the pinnules developed.
 12. At least the larger, inner lobes of the pinnules truncate, with straight or concave outer margin.
 13. Indusium almost or quite reaching the margin, $\frac{1}{4}$ — $\frac{1}{3}$ mm wide, or, if wider, the incisions of the pinnules not reaching to the level of the receptacle.
 14. Most incisions of the pinnules not reaching to the level of the receptacle, some reaching up to it; pinnules narrowed from base to apex, usually medium or yellowish green when dry 7. *L. pacifica*
 14. Most or all incisions of the pinnules reaching about twice as far as the distance from receptacle to margin.
 15. Veins often forming more than one series of areoles, if not, the lamina usually plurijugate-bipinnate; petioles pale; pinnules apically rounded, or, if \pm truncate, over 1½ cm long 9. *L. propinqua*
 15. Veins forming a single series of areoles; lamina simply pinnate or paucijugate-bipinnate; petioles dark; pinnules apically \pm truncate, less than 1½ cm long 5. *L. obtusa*²⁾
 13. Indusium falling short of the margin by a distance equal to or up to twice as great as its width, $\frac{1}{3}$ mm wide or usually wider.
 16. Lamina usually brownish or olivaceous when dry; lobes of pinnules hardly divergent, \pm contiguous; lamina simply pinnate or paucijugate-bipinnate.
 5. *L. obtusa*
 16. Lamina medium or dark green when dry; lobes of pinnules divergent, not contiguous; lamina often plurijugate-bipinnate 6. *L. harveyi*

¹⁾ Several species only known from Malesia were recently collected in western Melanesia. As more Malesian species may be expected to extend to this area, and perhaps also to western Micronesia, for these regions the key in *Flora Malesiana* should also be consulted.

²⁾ This form of *L. obtusa*, with submarginal sori, apically subtruncate pinnules, and dark petiole, is rather different from the typical form but is connected with it by intermediates. So far it has not been found East of the Admiralty Islands and New Guinea but it may occur in the Bismarck Archipelago and the Solomon Islands.

12. Lobes of pinnules with convex outer margin.
17. Indusium almost or quite reaching the margin; at least the longer sori concave on the inner, convex on the outer side 8. *L. lobata*
17. Indusium not reaching the margin, falling short of it by a distance equal to its width or more, straight on the inner side 6. *L. harveyi*
1. Rhizome long-creeping, epiphytic (rarely epilithic, exceptionally terrestrial), the stele strongly dorsiventral (subgenus ODONTOLOMA).
18. Lamina bipinnate 17. *L. rigida*
18. Lamina simply pinnate.
19. No upper pinnules reduced; leaf-apex consisting of a large, rhombic or flabellate, free or almost free terminal pinnule (fig. 10) 21. *L. jarrettiana*
19. Few to many upper pinnules reduced, the leaf-apex narrow, lobed.
20. Venation partly or entirely reticulate.
21. Indusium reaching the margin or very nearly so.
22. Major pinnules ca. 20—25 to a side, their deepest incisions reaching down to $\frac{1}{3}$; larger pinnules 2— almost $2\frac{1}{2} \times$ as long as wide 20. *L. chrysolepis*
22. Major pinnules ca. 30—45 to a side, their deepest incisions going down to the middle; larger pinnules $3 \times$ as long as wide 19. *L. salomonis*
21. Indusium not reaching the margin by a distance equal to its width or more.
23. Pinnules 12—15 mm long, 3—5 mm wide, \pm evenly narrowed from base to apex, incised to $\frac{1}{3}$ or less often some incisions going down to the middle; rhizome eventually almost scaleless, polished 22. *L. pickeringii*
23. Pinnules larger, or, if 15 mm or less long, more shallowly incised and not evenly narrowed; rhizome persistently scaly or not, but scarcely lustrous. 18. *L. pulchra*
20. Veins free.
24. Rhizome 2—3 mm in diam.; larger pinnules mostly over 15 mm long. 16. *L. repens*
24. Rhizome up to (but mostly less than) 1 mm in diam.
25. Pinnules up to $2 \times$ as long as wide.
26. Upper pinnules gradually and strongly reduced, several to many denticuliform ones below the terminal segment which has several to many lobes. 24.1. *L. pulchella* var. *blanda*
26. Upper pinnules abruptly reduced, few or none denticuliform, the terminal segment with (0—)1—3 lobes (fig. 8) 23. *L. vitiensis*
25. Pinnules $2\frac{1}{2}$ —4 \times as long as wide.
27. Pinnules $2\frac{1}{2}$ —3 \times as long as wide, scarcely narrowed to the broadly rounded apex, incised to less than $\frac{1}{3}$ of their width 24.2. *L. pulchella* var. *falcata*
27. Pinnules $2\frac{1}{2}$ —4 \times as long as wide, almost evenly narrowed from the base to the subacute apex, incised to $\frac{1}{3}$ or even up to the middle. 22. *L. pickeringii*
27. Pinnules $2\frac{1}{2}$ —3 \times as long as wide, narrowed from base to apex, incised to less than $\frac{1}{3}$ of their width. 16. 1. *L. repens* var. *delicatula*

Subgenus LINDSAEA

Section Davalliastrum

(Fournier) Kramer, Acta Bot. Neerl. 15 (1967) 568.

1. *Lindsaea moorei* (Hooker) Fournier, Ann. Sc. Nat. V, 18 (1873) 336; Kramer, Acta Bot. Neerl. 15 (1967) 569, fig. 1 B, with further synonymy and description.

When the account of the Lindsaeoid ferns of New Caledonia was written (Kramer, l.c.) this species was regarded as endemic, as there was only an old specimen from Fiji that might have been mislabelled. Since that time a collection turned up that can scarcely be mislabelled, and the species may be regarded as indigenous also in Fiji, although it is apparently very much rarer there than in New Caledonia. It was already reported from Fiji by Luerssen (1871); the specimen cited by him, *Seemann 830*, was not seen by the writer.

Fiji. Viti Levu: Mt Korumbamba, *Meebold 16579* (BISH). — Isl.: *MacLeay s.n.* (K).

Section **Schizoloma**

(Gaud.) Kramer, Acta Bot. Neerl. 15 (1967) 571.

2. **Lindsaea ensifolia** Swartz, Schrad. J. Bot. 1800² (1801) 77; Wagner & Grether, Occ. Pap. Bish. Mus. 19 (1948) 73, fig. 9; Copeland, J. Arn. Arb. 30 (1949) 440; Glassman, Bull. Bish. Mus. 209 (1952) 48; Ito, Bot. Mag. Tokyo 67 (1954) 218. — *Schizoloma ensifolium* (Sw.) J. Smith, Hook, J. Bot. 3 (1841) 414; Copeland, Bull. Bish. Mus. 59 (1929) 73; Hosokawa, Trans. Nat. Hist. Soc. Form. 26 (1936) 118; C. Christensen, Bull. Bish. Mus. 177 (1943) 45; Yuncker, Bull. Bish. Mus. 220 (1959) 30.

For synonymy and description see Fl. Mal. (sp. 8).

Two subspecies in the Pacific.

a. ssp. **ensifolia**.

Upper pinnae not or scarcely reduced, the terminal pinna free, conform.

This subspecies reaches its eastern limit in our area, where it is of limited distribution; there are some intermediates with the second subspecies.

PALAU IS. *Ledermann 14535* (B, K), *14281* (B, K).

MARIANAS. Guam: *Grether 3821* (BISH, US), *3435* (MICH); *McGregor 408* (MICH, US). — Saipan: *Finsch s.n.* (B).

BISMARCK ARCHIPELAGO. New Ireland: *coll.?* (BM).

SOLOMON IS. Guadalcanal: *Womersley BSIP 1013* (L, LAE).

b. ssp. **agatii** (Brackenridge) Kramer, Acta Bot. Neerl. 15 (1967) 579.

Upper pinnae gradually reduced, some confluent with the basally lobed terminal pinna; lamina sometimes subbipinnate.

Mainly inhabiting the Pacific, this subspecies just reaches eastern Malesia.

PALAU IS. *Hosokawa 7021* (BISH).

MARIANAS. Guam: *Grether 3727* (US); *Moore 73* (US); *Safford & Seale 1058* (US); *Stone 4187* (U); *Rodin 531* (US).

CAROLINES. Truk: *Hosokawa 8304, 8388* (BISH). — Yap: *Volkens 394* (BM, US). — Ponape: *Finsch 40, 56* (B); *Hosokawa 9568* (BISH, Pic-Ser); *Ledermann 13662a* (B, K), *13557* (BISH, K); *Takamatsu 980* (BO, K, MICH).

SOLOMON IS. Guadalcanal: *Womersley BSIP 1013* (K). — Santa Ysabel: *Braithwaite R.S.S. 4519, 4599* (U). — Isl.?: *Comins 348* (K).

NEW HEBRIDES. Ancityum: *Veitch s.n.* (K); *Morrison s.n.* (K).

WALLIS IS. Uvea: *Graeffe 11* (BM, W).

FIJI. Rotuma: *St. John 19252* (BISH, BRI, L, US). — Moala: *A. C. Smith 1357* (BM, GH, K, MICH, US). — Vanua Levu: *A. C. Smith 6741* (A, BISH, BRI, K, L, US); *Degener & Ordonez 14071* (GH, MICH), *14138* (BISH, GH, K, MICH, US). — Viti Levu: *Parks 20009* (B, BM, BRI, GH, K, MICH, US, W), *20705* (MICH, SING); *A. C. Smith 4601* (A, BISH, BRI, K, L, US); *Gillespie 4136* (MICH). — Ovalau: *Graeffe s.n.* (US). — Isl.?: *Seemann 763* (B, BM, GH, K); *U.S. Expl. Exped. s.n.* (K, isotype).

SAMOA. Savaii: *Vaupel 274* (B, HBG, US, W); *Rechinger 1715* (US, W); *Christophersen 681* (BISH, BO); *Graeffe 244* (BM).

TONGA. Eua: *Yuncker 15450* (BISH, U, US). — Kao: *Yuncker 15913* (BISH, US). — Vava'u: *Crosby 279* (K); *Yuncker 16072* (BISH, U, US).

Tropical Australia, New Caledonia, New Guinea, etc.

The following intermediates between the two subspecies may be cited:

MARIANAS. Guam: *Conover 549* (BISH, US); *Stone 4213* (U); *Haenke s.n.* (W).

PALAU IS. *Ledermann 14503a* (B).

CAROLINES. Yap: *Volkens 394* (B).

Section **Temnolindsaea**

Kramer, *Acta Bot. Neerl.* 6 (1957) 176; *Blumea* 15 (1968) 559.

3. *Lindsaea tetragona* Kramer, *Blumea* 15 (1968) 564. — *L. tenuifolia* auct. non Blume: Copeland, *Bull. Bish. Mus.* 59 (1929) 73; C. Christensen, *Bull. Bish. Mus.* 177 (1943) 43.

In the Pacific only var. *tetragona*, which occurs otherwise in Celebes, the Moluccas, Mindanao, the Louisiades, and very doubtfully in New Caledonia. See *Fl. Mal.* (sp. 12).

SOLOMON IS. Guadalcanal: *Whitmore BSIP 3814* (K, L). — Bougainville: *Waterhouse 231* (K); *Guppy 10* (BM). — San Cristóbal: *Brass 3009* (BRI, GH, MICH); *Braithwaite R.S.S. 4255* (U). — Choiseul: *Whitmore BSIP 5279* (K). — New Georgia (prob.): *Officers of H.M.S. 'Penguin'* (K).

Fiji. Viti Levu: *Graeffe 542* (P); *Gillespie 2287* (BISH, MICH). — Vanua Levu: *Degener & Ordonez 14069* (GH, MICH). — Isl.?: *Cairns s.n.* (K); *Horne s.n.* (K).

SAMOA. Tutuila: *Graeffe s.n.* (HBG). — Savaii: *Rechinger 4492* (W); *Reinecke 726* (P). — Upolu: *Rechinger 960* (BM, K, W); *Safford 933* (GH). — Isl.?: *Powell s.n.* (BM, GH, K, P, Pic-Ser, W); *U.S. Expl. Exped. 4* (GH, P).

SOCIETY IS. Tahiti: *Lépine 57, s.n.* (P); *Nadeaud s.n.* (P); *Vesco*¹ *s.n.* (P).

4. *Lindsaea kingii* Copeland, *Philip, J. Sc.* 6 (1911) 83.

For a description see *Fl. Mal.* (sp. 9). Until recently only known from the Moluccas, New Guinea and neighbouring islands, and the Admiralty Is. Recently collected in Melanesia:

SOLOMON IS. San Cristóbal: *Braithwaite R.S.S. 4304* (U).

Section **Synaplebiium**

(J. Smith) Diels in E. & P., *Nat. Pfl. Fam.* 1⁴ (1902) 221; Kramer, *Blumea* 15 (1968) 559.

5. *Lindsaea obtusa* J. Smith in Hooker, *Sp. Fil.* 1 (1846) 224. — *L. ambigens* Cesati, *Rendic. Ac. Nap.* 16 (1877) 25; Hosokawa, *Trans. Nat. Hist. Soc. Form.* 26 (1936) 117. — *L. decomposita* auct. non Willdenow, in part, of most authors as to West Pacific plants.

For a description see *Fl. Mal.* (sp. 18). This widespread, variable, and probably still too broadly circumscribed species is mainly distributed in Malasia and occurs only in the western Pacific. In most parts of the Pacific it is replaced by the next species from which it is not quite sharply distinct; the two may be regional forms of one species, see Kramer (1967, p. 583). As most species of the present section are very close to each other, *L. obtusa* and *L. harveyi* are left here as distinct species.

MARIANAS. Alamagan: *Hosokawa 7925* (BISH, US).

PALAU Is. *Teters 12* (HBG, P).

CAROLINES. Ponape: *Ledermann 13316a* (B, BISH, K), *13675* (B, K); *Glassman 2369* (BISH); *Kanehira 1648* (US). — Kusaie: *Takamatsu 538* (BISH).

BISMARCK ARCHIPELAGO. New Britain: *Floyd 6536* (LAE); *Schlechter 13771* (B, BO, K); *Walker T 10228, 10234, 10235, 10237, 10238* (BM). — New Ireland: *Peckel 42* (B); *Schlechter 13786* (B, BO, K, US).

SOLOMON IS. Malaita: *Stone 2455* (BISH, U). — Kolombangara: *Braithwaite R.S.S. 4413* (U). — Santa Ysabel: *Braithwaite R.S.S. 4560* (U; juv., doubtful). — San Cristóbal: *Brass 3144* (A, BRI, MICH).

Admiralty Is, New Caledonia, Malasia, etc.

¹ In spite of the presence of a rather large series of collections in the Paris herbarium labelled 'Vesco' I could hardly find any reference to a collector of this name. He is mentioned in Urban's 'Geschichte des königlichen Botanischen Museums Berlin-Dahlem' (1916) and in Drake del Castillo's 'Flore de la Polynésie française' (1893), in both places without initials. I am not sure that a collector of this name ever existed. I am indebted to Dr F. R. Fosberg, Washington, D.C., for advice on this matter.

6. *Lindsaea harveyi* Carruthers *ex* Seemann, Fl. Vit. (1873) 338; Kramer, Acta Bot. Neerl. 15 (1967) 583. Lectotype: *Harvey s.n.*, Fiji (K; dupl. in BM). — *L. decomposita auct. non* Willd.: Copeland, Bull. Bish. Mus. 59 (1929) 72; C. Christensen, Bull. Bish. Mus. 177 (1943) 43/44 (f. 1 and 3); Yuncker, Bull. Bish. Mus. 184 (1945) 19; Ito, Bot. Mag. Tokyo 67 (1954) 218; Yuncker, Bull. Bish. Mus. 220 (1959) 31; and probably of other authors, at least in part.

Rhizome short-creeping, $1\frac{1}{2}$ — $3\frac{1}{2}$ mm in diam.; scales reddish brown, very narrowly triangular, to *ca.* 4-seriate with a rather short uniseriate apex but some almost or quite uniseriate throughout, to $1\frac{1}{2}$ mm long. *Leaves* clustered; petioles stramineous or darker at the base, occasionally quite reddish brown, stout in large leaves, abaxially at least above obtusely to sharply bi-angular, the face convex or flat, rarely sulcate, *ca.* 30—50 cm long, roughly equaling the lamina. Lamina bipinnate or sometimes subtripinnate, *ca.* 25—50 cm long, occasionally simply pinnate and fertile, then shorter and with shorter petiole; pinnae 1—5(—9) to a side and a conform terminal one. Primary rachis stramineous to pale brown, abaxially bi-angular, usually not or only above or only shallowly sulcate. Pinnae distinctly ascending, sometimes all subopposite, their width apart to subcontiguous, *ca.* 15—20 cm long, 2— $3\frac{1}{2}$ cm wide, acuminate; secondary rachises stramineous, abaxially with a short subterete portion at the base, otherwise, with a gradual transition, bi-angular and sulcate. Pinnules herbaceous or chartaceous, usually dark green when dry (rarely brown or olivaceous as in *L. obtusa*), *ca.* 20—30 to a side, half their width apart to contiguous, slightly but distinctly ascending; larger pinnules subrectangular, subtrapeziform, or shortly $\frac{1}{2}$ -elliptic, little or not narrowed from the base to the narrowed-rounded to broadly rounded apex, a distinct outer margin scarcely developed, 2 — $2\frac{1}{2}$ \times as long as wide; basal anterior pinnule large, flabellate, nearly symmetric; upper pinnules reduced, usually rather abruptly so, only a few so strongly as to be denticuliform and connected with the narrow, lanceolate-lobed terminal segment. Upper margin straight or more often outward increasingly convex; upper/outer margin incised, with 4—6 incisions 1—2 mm deep and reaching well beyond (2 — 3 \times the distance from the margin) the level of the receptacle, the outer incisions increasingly oblique; sinus acute; sides of the incisions distinctly divergent (more so than in *L. obtusa*), the lobes usually $1\frac{1}{2}$ —2 mm long, with straight or slightly convex sides and shallowly convex, or in the innermost almost straight, entire outer margin. Veins immersed, \pm evident, regularly anastomosing, forming one and not rarely an incomplete second series of areoles *ca.* 1 mm wide. *Sori* one per lobe, 1—2 mm long, on 2—4(—6) vein-ends, with straight or sometimes, in outer sori, concave base; indusium pale brown, thin, subentire, scarcely narrowed at the sides, 0.3—0.4 mm wide, falling short of the margin by an equal to twice as great distance, bulging to \pm concealed at maturity. *Spores* medium brown, trilete, nearly smooth, *ca.* 25 μ .

Distribution: See below; also New Caledonia.

Ecology: Terrestrial, or occasionally on tree trunks, in forests, to *ca.* 1000 m, mostly between 100 and 700 m.

Selected citations covering the whole range:

BISMARCK ARCHIPELAGO. New Ireland: *McGillivray s.n.* (GH); *Turner s.n.* (B).

SOLOMON IS. Guadalcanal: *Braithwaite R.S.S.* 4753 (U).

NEW HEBRIDES. Banks Is: *Palmer 29* (K). — *Aneityum: Milne 328* (K); *Morrison s.n.* (K, US).

Fiji. Vanua Levu: *Degener & Ordenez 13837* (BISH, GH, K, MICH, US), *14139* (BISH, GH, K, MICH).

— Ngau: *Milne 192a*, *258* (K). — Viti Levu: *Gillespie 2634* (BISH, MICH); *Graeffe 6* (W); *A. C. Smith 4707* (A, BISH, K, US). — Ovalau: *Graeffe 85* (HBG); *Prince s.n.* (GH). — Kandavu: *A. C. Smith 79* (B, BISH, GH, K, US). — Isl.: *Seemann 764* (BM, GH, P, paratypes); *Harvey s.n.* (BM, K, type); *Horne 526* (GH).

SAMOA. Savaii: *Christophersen 879* (BISH); *Vaupel 334* (B, P); *Rechinger 3709, 4497* (W). — Upolu: *McKee 2874* (BISH, BM, L, U, US); *Rechinger 978* (US), *977, 1496* (W); *Safford 38, 961* (US); *Reinecke 64e* (B, BO, US). — Tutuila: *Christophersen & Hume 1828* (BISH p.p., BO, K, US). — Tau: *Yuncker 9259* (BISH, MICH). — Olosega: *Garber 1945* (BISH, K). — Isl.?: *U.S. Expl. Exped. 3* (US); *Whitmee 227* (BM, GH, K).

TONGA. Eua: *Parks 16233* (BISH, GH, US); *Hürlimann 221* (Z).

Notes. Most specimens from Fiji have comparatively short pinnules. Small plants of *L. harveyi* cannot distinguished with certainty from *L. obtusa*; also among well-developed ones there are some intermediates, as stated under *L. obtusa*. *L. pacifica* is quite distinct, having narrower, more shallowly incised pinnules and much more strongly reduced upper pinnules.

5. *Lindsaea pacifica* Kramer, nom. nov. — *L. seemannii* Carruthers ex Seemann, Fl. Vit. (1873) 338, non J. Smith, Bot. Voy. Herald (1854) 239 (*spec. neotrop.*). Lectotype: *Seemann 764*, Fiji (K; dupl. in B, BM, P). — *L. decomposita* auct. non Willd.: C. Christensen, Bull. Bish. Mus. 177 (1943) 43 (form 2); and of other authors, at least in part. — Fig. 5.

Rhizome short-creeping, 2—2½ mm in diam.; scales reddish brown, narrowly triangular, to ca. 7-seriate at the base but usually narrower, with a short uniseriate apex, to 1½ mm long. *Leaves* clustered; petioles stramineous, or light brown with age, abaxially convex, rounded or obtusely bi-angular, rarely sharply bi-angular near the apex, ca. 25—40 cm long, about equaling to 1½ × as long as the lamina. Lamina ca. 26—30 cm long, herbaceous, mostly medium or dark green when dry, oblong, bipinnate, with 3—6 pinnae to a side and a conform terminal one; primary rachis stramineous, abaxially subterete at the base, bi-angular but little sulcate above, or less often bi-angular or subterete throughout. Pinnae 2 to several cm apart but often subcontiguous by being rather strongly ascending, sessile or subsessile, linear, ca. 15—20 cm long, 15—30, usually 20—25 mm wide, the upper ones usually not much shortened, the terminal often largest; pinnae strongly tapering to the subcaudate apex, shortly narrowed at the base. Secondary rachises stramineous, abaxially bi-angular but scarcely sulcate above the rounded base. Pinnules ca. 25—35 to a side, spreading or little ascending, occasionally weakly falcately decurved, mostly less than their width apart to subcontiguous, ¼-elliptic or less often subtrapezoidal, (7—)8—12 mm long, (3—)3½—5 mm wide, mostly over twice and less than 3 × as long as wide, the lower margin straight or nearly so, the upper outward increasingly convex, most pinnules narrowed from the base to the rounded or subacute apex, a distinct outer margin scarcely developed; inner margin often touching the rachis. Upper/outer margin with 1—3 very shallow and oblique incisions to ½ mm deep often not reaching the level of the receptacle, rarely subentire but the sori mostly still interrupted. A few basal pinnules reduced, cuneate-flabellate; upper pinnules very gradually and strongly reduced, the uppermost ones minute, denticuliform, several confluent with the narrow, lobed, caudiform pinna-apex. Veins immersed, not evident, regularly anastomosing (except sometimes in sterile pinnules), forming a series of areoles 1—1½ mm wide. *Sori* interrupted, rarely continuous, on 2—6(—10) vein-ends; indusium delicate, subentire, greenish to brownish, narrowed at the ends, ¼—½ (in some Fijian specimens ½—¾) mm wide, falling short of the margin by ½—1 × its width (or rarely almost reaching it). *Spores* rather pale brown, trilete, smooth, ca. 25 μ.

Distribution: See below.

Ecology: Terrestrial in moist forests, from sea level to 1200 m; often said to be locally common.

Selected citations covering the whole range:

SOLOMON IS. Bougainville: *Schodde* (& *Craven*) 3816 (L); *Craven* (& *Schodde*) 168 (L); *Heyligers* 1081 (L). — Faro Is, Bougainville Straits: *Guppy* 298 (BM; a small form). — Guadalcanal: *Kajewski* 2667 (BISH, BRI, GH); *Braithwaite* R.S.S. 4034 (U). — Malaita: *Whitmore* BSIP 3904 (K, L). — Kolombangara: *Braithwaite* R.S.S. 4345 (U).

SANTA CRUZ IS. Vanikoro: *Kajewski* 544 (GH, K).

NEW HEBRIDES. Vanua Lava: *Kajewski* 458 (B, BISH, BO, BRI, GH, K). — Banks Is: *Palmer* 20 (K). — Aneityum: *McGillivray* 905 (K), *s.n.* (BM, P, prob. paratypes).

Fiji. Ovalau: *Graeffe* 37 (HBG), 113 (B, BM, P, U); *Horne* 5 (K). — Taveuni: *A. C. Smith* 789 (B, BISH, BM, GH, K, P, US). — Viti Levu: *Parks* 20012 (BISH), 20133 (BISH, MICH, P), 20817 (BISH, GH, K, MICH, US), 20844 (MICH); *Milne* 328 (K). — Isl.?: *Seemann* 764 (B, BM, K, P, lectotype).

SAMOA. Upolu: *Rechinger* 1550 (W); *Christophersen* 271 (BISH, BO); *Reinecke* 64c (B). — Olosega: *Garber* 1050 (BISH, BO, US). — Tao: *Garber* 742 (BISH, BO); *Yuncker* 9257 (BISH, MICH). — Tutuila: *Christophersen* & *Hume* 1828 p.p. (BISH); *Christophersen* 3514 (BISH). — Savaii: *Christophersen* & *Hume* 2011 (BISH, BO, K); *Sledge* 1725 (K).

SOCIETY IS. Tahiti: *Nadeaud* *s.n.* (P, U); *Collie* *s.n.* (BM); *Lépine* 41 (P, U).

Notes. For differences between *L. pacifica* and *L. harveyi*, see under the latter. The affinities of *L. pacifica* in the section are not clear.

8. *Lindsaea lobata* Poirlet in Lamarck, *Encycl. Suppl.* 3 (1813) 448. — *L. davallioides* Blume, *En. Pl. Jav.* (1828) 218; Hosokawa, *Trans. Nat. Hist. Soc. Form.* 26 (1936) 117; Glassman, *Bull. Bish. Mus.* 209 (1952) 47. — *L. decomposita* *auct. non* Willd.; Glassman, *l.c.*

For further synonymy and description see *Fl. Mal.* (sp. 21). The Micronesian specimens cited below belong to this Malesian species, although they are aberrant in some characters. The lamina is light green and translucent when dry; the pinnules have somewhat narrowed lobes and are comparatively large, 12 by 4 to 14 by 5 mm, but fall within the range of variability of typical *L. lobata*. There is some resemblance to the smaller forms of *L. propinqua*, but the pinnule lobes are rounded and more divergent, with convex sori. This is probably a regional subspecies or variety, but with the small number of collections at hand I prefer to leave it unnamed.

CAROLINES. Truk: *Hosokawa* 8278 (BISH, US), 8465 (BISH); *Kraemer* 9 (B). — Ponape: *Takamatsu* 599 (BISH, K, MICH, US); *Finsch* 15 (B); *Hosokawa* 5864 (BISH); *Krause* *s.n.* (HBG). — Kusaie: *Takamatsu* 575 (BISH, MICH); *Hosokawa* 6265 (BISH, L); *Glassman* 2691 (BISH).

9. *Lindsaea propinqua* Hooker, *Nightingale's Oceanic Sketches* (1835) 130; *Sp. Fil.* 1 (1846) 223, pl. 66 B; Ballard, *Pac. Sc. Io* (1956) 268. — *Synaphlebium propinquum* (Hooker) Fée, *Gen. Fil.* (1852) 109. — *Schizoloma propinquum* (Hooker) Moore, *Ind. Fil.* (1857) 35. — Type: *Nightingale* *s.n.*, Samoa (K). — Fig. 3, 4.

L. raiateensis J. W. Moore, *Bull. Bish. Mus.* 102 (1933) 8. — Type: *J. W. Moore* 541, S. of Uturoa, Raiatea, Society Is (BISH; dupl. in U).

L. eximia Copeland, *Occ. Pap. Bish. Mus.* 14 (1938) 65, pl. 17. — Type: *St. John* 17158, Huahine, Society Is (BISH; dupl. in MICH, US).

? *Synaphlebium urvillei* Fée, *Gen. Fil.* (1852) 110. — Type: *d'Urville* *s.n.*, 'O-Wahu, Archip. Carolin.' (dupl. ?? in B); see also at the end of this paper.

L. decomposita *auct. non* Willd.: Wilder, *Bull. Bish. Mus.* 86 (1931) 12; Brown & Brown, *Bull. Bish. Mus.* 89 (1931) 52, pl. 9; Copeland, *Bull. Bish. Mus.* 93 (1932) 55.

Rhizome rather short-creeping, 2 mm in diam.; scales on older parts of the rhizome dark castaneous, ± rigid, narrowly triangular, with a short uniseriate apical portion, to 10-seriate at the base, up to 3 mm long. *Leaves* rather close to clustered; petioles stramineous or pale brown, with darker base, adaxially channelled, abaxially terete or obtusely, less often acutely, bi-angular, (10—) 18—60 cm long, ($\frac{1}{2}$ —) 1—1 $\frac{1}{2}$ × as long as the lamina. Lamina medium to dark green when dry, herbaceous to chartaceous, 20—40 cm long,



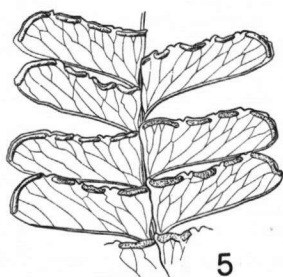
3

1 cm.

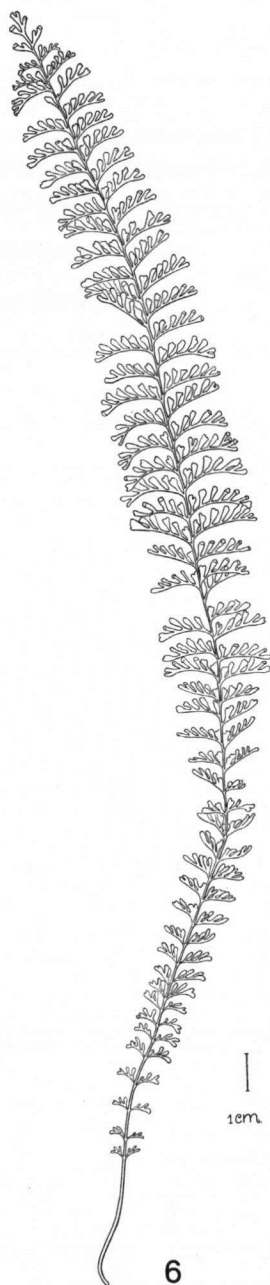


4

1 cm.



5



6

1 cm.

Fig. 3. *Lindsaea propinqua* (Grant 5159, BISH). — Fig. 4. *idem* (St. John & Fosberg 17029, BISH). — Fig. 5. *Lindsaea pacifica* (Kajewski 2667, GH). — Fig. 6. *Lindsaea lapeyrousii* ssp. *fijiensis* (Prince s.n., GH).

bipinnate, with 2—4(—8) pinnae to a side and a conform terminal one; primary rachis stramineous, abaxially rounded to sharply bi-angular. Pinnae sessile, ascending, subcontiguous or in large leaves remote and to 6 cm apart, narrowly lanceolate, 10—12 cm long, 2½—5½ cm wide, the basal pair usually not the longest, the terminal often the largest. Secondary rachises abaxially bi-angular or sulcate, the extreme base rounded. Pinnules ca. 8—27 to a side, subcontiguous or in large leaves their width apart, spreading or a little ascending, trapezoidal, ¼-elliptic, or often rhombic, 10—30 mm long, 4—10 mm wide, slightly over 2 to 3 × as long as wide, very little narrowed to the apex; upper margin straight, lower margin straight or convex towards the apex, outer margin convex and very shortly rounded into the upper and lower, or straight and joining the upper under an acute and the lower under an obtuse angle, the antico-apical point then sometimes shortly and acutely protracted. Upper margin with 2 or 3 distant, oblique, acute incisions up to 1 mm deep, the outer one usually also with one incision; lobes with straight or scarcely convex outer margin, crenate if sterile. Upper pinnules in larger forms very little reduced, the terminal pinnule asymmetrically lanceolate, free or nearly so, large, 2—3 cm long; in smaller forms the upper pinnules more gradually reduced, the uppermost a few mm long, the terminal segment small and narrow, yet nearly free. Veins immersed, quite evident, copiously anastomosing, forming a series of areoles and not rarely a second, incomplete one 1—1½ mm wide. Sori interrupted by the incisions of the margin, usually on 2—4 vein-ends, straight or the outer ones convex; indusium pale brownish, entire, narrowed at the ends, ¼—½ mm wide, about equaling the margin, bulging at maturity. Spores pale brown, trilete, smooth, ca. 20—24 μ.

Distribution: See below.

Ecology: Terrestrial in forests, 300—700 m.

FIJI. Viti Levu: *Livingston s.n.* (US). — Isl.?: *U.S. Expl. Exped. 4* (US).

SAMOA. Isl.?: *T. Nightingale s.n.* (K, type; loc. correct?).

COOK IS. Rarotonga: *Wilder 1127* (BISH); *Parks 22296* (BISH, MICH, US); *Chalmers s.n.* (BM); *Cheeseman 746* (K).

SOCIETY IS. Huahine: *St. John 1758* (BISH, MICH, US, type of *L. eximia* Copel.). — Tahaa: *Grant 5159* (BISH). — Raiatea: *J. W. Moore 541* (BISH, U, type of *L. raiateensis*). — Tahiti: *Collie s.n.* (BM); *Vesco*¹⁾ *s.n.* (P, U); *St. John & Fosberg 17029* (BISH, MICH); *McDaniels 1544* (BISH, BO); *Grant 3890* (BISH, K, P, US); *Nadeaud s.n.* (P); *Lépine 41* (P).

MARQUESAS. Nukuhiva: *Brown & Brown 525* (BISH). — Hivaoa: *Christian s.n.* (K); *Mumford & Adamson 369, 370* (BISH). — Ua Pou: *Quayle 1152* (BISH). — Isl.?: *Henry 31* (P).

Notes. A specimen in herb. B labelled 'L. *Urvillaei* Fée v. *Synaphlebium*. *Vesco d'Urville*.' may be an isotype of *Synaphlebium urvillei* Fée. I do not know what is the island O-Wahu in the Carolines from which that species was described. On his first voyage d'Urville visited not only the Carolines but also Tahiti and Borabora and it is possible that the specimen in B was collected there. (Neither *L. propinqua*, nor any other species of section *Synaphlebium*, has ever been found on Oahu or elsewhere in the Hawaiian Islands.)

L. propinqua was often confused with *L. cultrata* (= *decomposita*), e.g. by Brown and Brown, as cited above. It is readily distinguished by its more marginal indusia and the lack of a sorus continuous around the antico-apical margin of the pinnule.

The variability in size and dissection of the foliage of *L. propinqua* is considerable. The large, paucijugate forms (type specimens of *L. propinqua* and *L. eximia*) look rather different from the plurijugate ones with smaller pinnules (type of *L. raiateensis*) but are

¹⁾ See note on p. 171.

connected by intermediates, and have very similar sori and rhizome scales; both forms are sympatric. I do not know whether they represent different stages of development or whether, more probably, a polyploid series is involved.

The following series of specimens is assigned to *L. propinqua* with misgivings. The sori are close to the margin, as in that species, but in outline the pinnules are more like those of *L. cultrata* and 3 × as long as wide; the leaves are amply bipinnate. Unfortunately, there are hardly any undamaged rhizome scales left on the specimens extant. Geographically the plants are not close to the main area of *L. propinqua*.

PALAU Is. *Kanehira* 281 (BISH), 2098 (K, P); *Kanehira & Hatusima* 4581 B (GH); *Takamatsu* 1208 (BISH, BO, MICH); *Ledermann* 14141, 14362 (B, K); *Stone* 1327 (BISH, U), 4884 (U).

10. *Lindsaea cultrata* (Willd.) Swartz, Syn. Fil. (1806) 119; not of other authors. — *L. decomposita* Willdenow, Sp. Pl. (1810) 425; not of other authors as to Pacific material. For further data see Fl. Mal. (sp. 23).

Two collections from the Solomon Is probably belong to this species: *Brass* 2900, San Cristóbal (BISH, BRI, GH, MICH, P), and *Braithwaite* R.S.S. 4248 (U). In the shape of their pinnules and sori there is a close resemblance to *L. cultrata*, but the upper pinnules are gradually and strongly reduced and the petiole and the base of the secondary rachises are abaxially terete. Its pinnules are much more elongate than in *L. azurea*, which may still be closely related. More material is needed before a decision can be reached.

Section *Osmolindsaea*

Kramer, *Blumea* 15 (1968) 560.

11. *Lindsaea odorata* Roxburgh, Calc. J. Nat. Hist. 4 (1844) 511; Kramer, *Blumea* 15 (1968) 560. — *L. cultrata* auct. non (Willd.) Swartz of other authors.

For synonymy and description see Fl. Mal. (sp. 33). This very widespread paleotropical species, distributed from Madagascar, Nepal, China, and Japan to New Guinea reaches the Pacific only in the:

SOLOMON Is. Bougainville: *Kajewski* 2144 (A, BISH, BRI, MICH); *Schodde (& Craven)* 3814 (L); *Craven (& Schodde)* 59 (L); *Waterhouse* 453 (K).

Section *Psammolindsaea*

Kramer, *Blumea* 15 (1968) 560.

12. *Lindsaea walkerae* Hooker, Sp. Fil. 1 (1846) 209, pl. 69 A; Ito, Bot. Mag. Tokyo 67 (1954) 219. — *Schizoloma walkerae* (Hooker) Kuhn, Chaetopt. (1882) 346; Hosokawa, Trans. Nat. Hist. Soc. Form. 26 (1936) 118.

For synonymy and description see Fl. Mal. (sp. 35). Widespread, but in most areas rare and recorded only from some scattered stations; distributed from Ceylon and Indo-China to New Guinea and Queensland; Micronesia.

PALAU Is. *Hosokawa* 6990 (L, US, Z); *Takamatsu* 1703 (BISH, GH, MICH).

CAROLINES. Yap: *Hosokawa* 8800 (BISH). — Reported from Truk and Ponape by Ito (l.c.).

Section *Isoloma*

(J. Smith) Kramer, *Blumea* 15 (1968) 560.

13. *Lindsaea gueriniana* (Gaudichaud) Desvaux, Prodr. (1827) 312. — *Isoloma guerinianum* (Gaud.) Fée, Gen. Fil. (1852) 108.

For further synonymy and description see Fl. Mal. (sp. 36). This is a Central and East Malesian species, extending from Borneo and the Philippines to New Guinea, and sparingly into the Pacific.

SOLOMON IS. Santa Ysabel: *Stone 2506* (BISH, U, US); *Braithwaite R.S.S. 4518, 4600* (U). — New Georgia: *Jacquino (?) s.n.* (P); *Braithwaite R.S.S. 4538* (U). — Isl.?: *Astrolabe Voyage 3* (P).
SOCIETY IS. Tahiti: *Vesco¹⁾ s.n.* (P).

Section *Stenolindsaea*

Kramer, *Blumea* 15 (1968) 561.

14. *Lindsaea lucida* Blume, En. Pl. Jav. (1828) 216. — *L. concinna* J. Smith, Hook. J. Bot. 3 (1841) 415; Hooker, Sp. Fil. 1 (1846) 205, pl. 61 B; Ito, Bot. Mag. Tokyo 67 (1954) 218.

This very widespread species distributed from Bhutan, S. China, and S. Japan to Malesia is represented in the Pacific by two subspecies both of which are described, with synonymy, in Fl. Mal. (sp. 42).

1. ssp. *lucida*.

Petiole 3—15 cm long, $\frac{1}{3}$ — $\frac{1}{2}$ of the length of the lamina; indusium 0.3—0.4 mm wide, at least in the inner sori almost or quite reaching the margin.

PALAU IS. *Takamatsu 1112* (BISH, MICH).

2. ssp. *brevipes* (Copeland) Kramer, *Blumea* 15 (1968) 567.

Petiole 1—2(—4) cm long, $\frac{1}{15}$ — $\frac{1}{20}$ of the length of the lamina; indusium 0.2 mm wide, more strongly intramarginal.

An East Malesian subspecies, confined to the southern Moluccas, New Guinea and neighbouring islands, and the Admiralty Is.

SOLOMON IS. Guadalcanal: *Braithwaite R.S.S. 4029* (U). — Kolombangara: *Braithwaite R.S.S. 4361* (K, U). — New Georgia: *Whitmore & Grubb BSIP 1954* (L).

15. *Lindsaea lapeyrousii* (Hooker) Baker, Syn. Fil. (1867) 106; Copeland, Bull. Bish. Mus. 59 (1929) 73; Brownlie, Pac. Sc. 15 (1961) 64. — *Davallia lapeyrousii* Hooker, 2nd Cent. Ferns (1861) pl. 56. Lectotype: *Ch. Moore s.n.*, Vanikoro ('Vaniholla or Pitt's Island') (K). — *Davallia hymenophylloides auct. non* (Bl.) Baker: Hooker, Ic. Pl. (1886) tab. 1623.

Rhizome short-creeping, 1—1½ mm in diam.; scales not seen, apparently very fugacious. *Leaves* close to clustered; petioles stramineous, quadrangular almost to the base, adaxially ± sulcate, 1—4 cm long. Lamina 22—42 cm long, 10—20 × as long as the petiole, 1¾—4½ cm wide, linear, very gradually tapering to the base, less gradually so towards the apex, widest near or somewhat above the middle, simply pinnate, with ca. 40—55 pinnules to a side; rachis stramineous, quadrangular, ± sulcate, especially adaxially.

¹⁾ See note on p. 171.

Pinnules herbaceous, dark green when dry, subcontiguous, spreading, often somewhat falcately decurved, apart from that $\frac{1}{4}$ -elliptic in outline, the larger ones 11—20 mm long, 3—6 mm wide, 3—4 × as long as wide; lower pinnules very gradually and strongly reduced, the basal ones auriculiform; upper pinnules less reduced, a few confluent into a small pinnatifid leaf-apex. Pinnules deeply incised from the upper margin, the larger ones with 4—8 primary segments on the anterior side, the largest occasionally also with a few in the outer part of the posterior side. Segments ± parallel, linear, widened to the apex, joined by a narrow wing, apically weakly convex, ± erose. Veins immersed, evident, simple, or paired in the broadest segments. *Sori* on one, less often on two vein-ends, $\frac{1}{4}$ —1 $\frac{1}{2}$ mm long; indusium with straight or slightly convex base, laterally free, 0.3—0.4 mm wide, pale, subentire. *Spores* pale yellowish, trilete, smooth, 19—23 μ .

Ecology: Terrestrial (but two coll. described as epiphytic) in the shade of moist forests, ca. 30—500 m.

KEY TO THE SUBSPECIES

1. Pinnules usually 5 or 6 mm wide; segments $\frac{1}{4}$ —1 $\frac{1}{2}$ mm wide just below the sorus, connected by a wing $\frac{1}{4}$ to $\frac{1}{2}$ mm wide, cuneate but spatulately widened at the sorus, most of them once or twice deeply bifid; indusium, especially of short sori, often falling short of the margin by a distance up to equal to its width 1. ssp. *lapeyrousii*
 1. Pinnules mostly less than 5 mm wide; segments $\frac{1}{4}$ —1 $\frac{1}{2}$ mm wide just below the sorus, connected by a wing $\frac{1}{2}$ — $\frac{3}{4}$ mm wide, cuneate, gradually broadened from base to apex, simple or the basal ones shallowly, rarely deeply, bifid; indusium equaling the margin or nearly so 2. ssp. *fijiensis*

1. ssp. *lapeyrousii*. — *L. kajewskii* Copeland, J. Arn. Arb. 12 (1931) 47. Type: *Kajewski* 533, Vanikoro (GH; dupl. in K, US; MICH '523' but prob. mislabelled).

BISMARCK ARCHIPELAGO. New Hannover: *Naumann s.n.* (B, 5 sh., 1 or 2 coll.).

SANTA CRUZ Is. Vanikoro: *MacLeay s.n.* (K); *Kajewski* 533 (GH, K, MICH, US, type of *L. kajewskii*); *Ch. Moore s.n.* (K, lectotype).

2. ssp. *fijiensis* Kramer, *ssp. nov.* — Fig. 6.

Differt a ssp. *lapeyrousii* pinnulis plurimis infra 5 mm latis, segmentis sensim nec spatulatum apicem versus dilatatis, plurimis simplicibus vel basalibus leviter, rarius profundius bifidis, indusio marginem attingente vel fere attingente.

Type: *Degener & Ordóñez* 13734a, Viti Levu (MICH; dupl. in BISH, GH, K).

Fiji. Vanua Levu: *A. C. Smith* 422 (BISH), 630 (B, BISH, GH, K, P). — Viti Levu: *Parks* 20306 (B, BISH, BRI, GH, K, MICH, P, US); *Graeffe* 73 (P), *s.n.* (HBG, US); *Gillespie* 2288 (BISH, MICH); *Degener & Ordóñez* 13734a (BISH, GH, K, MICH, type of subspecies); *Milne* 109 (K), 317 (K, paratype of species). — Isl.?: *Walker s.n.* (B); *Horne s.n.* (GH, K); *Prince s.n.* (GH); *Cairns s.n.* (K).

Notes. Brownlie (1961) stated that *L. kajewskii*, described from Vanikoro, was synonymous with *L. lapeyrousii*, also described from that island, although later collections of the last-named species were all from Fiji. This is not altogether correct, as Hooker, when describing *Davallia lapeyrousii*, also cited a Milne collection from Fiji. Still, it seems best to designate the collection from Vanikoro cited by Hooker as lectotype, also because Lapeyrouse's name is associated with that island; but it must be said that Hooker's description and figure agree a little better with the Fijian form of the species.

L. lapeyrousii is a very distinctive species, evidently related to *L. lucida* (especially ssp. *brevipes*) and *L. bakeri*.

Subgenus ODONTOLOMA

(Hooker) Kramer, *Blumea* 15 (1968) 561.Section *Odontoloma*

16. *Lindsaea repens* (Bory) Thwaites, Enum. Pl. Zeyl. (1864) 388; Beddome, Ferns S. India (1864?) pl. 209. — *L. macraeana* (Hooker & Arnott) Copeland, Bull. Bish. Mus. 59 (1929) 70; Wilder, Bull. Bish. Mus. 86 (1931) 12; Copeland, Bull. Bish. Mus. 93 (1932) 54; Wagner & Grether, Occ. Pap. Bish. Mus. 19 (1948) 71; Glassman, Bull. Bish. Mus. 209 (1952) 48; Ito, Bot. Mag. Tokyo 67 (1954) 218. — *L. merrillii* auct. non Copeland: C. Christensen, Bull. Bish. Mus. 177 (1943) 42.

For further synonymy and description see Fl. Mal. (sp. 46). This species occurs with a number of \pm geographically exclusive varieties from the Mascarenes to Hawaii. The Pacific varieties can be distinguished as follows:

1. Full-grown plants with the lamina scarcely or not reduced at the base, a well-developed petiole present; sori mostly uni-, occasionally binerval; indusium not with strongly concave base; incisions of the margin reaching at the most to the level of the receptacle, mostly less deep. (*Hawaii*). **7. var. *macraeana***
1. Lamina gradually and strongly reduced at the base.
2. Rhizome delicate, less than 1 mm in diam. (*Bismarck Archip.*) **1. var. *delicatula***
2. Rhizome of full-grown plants ($1\frac{1}{2}$ —2—3 mm in diam.
3. Indusium with very concave base, subhippocrepiform; most sori uninerval and round, some binerval, crescent-shaped; margin very regularly incised to somewhat beyond the level of the receptacle; most lobes rounded; sporangia at full maturity strongly spreading to the sides. (*Melanesia*). **2. var. *sessilis***
3. Indusium with weakly concave, straight, or somewhat convex base; sori uni- to plurinerval.
4. At least the broader basal lobes of fully fertile pinnules truncate; most or all sori with straight base, plurinerval (except in incompletely fertile pinnules); most incisions not reaching the level of the receptacle. (? *Micronesia*) **3. var. *pectinata***
4. Lobes all rounded or narrowed-rounded, or, if the largest subtruncate, the great majority of the sori uni- or binerval and at least the outer incisions going considerably beyond the level of the receptacle.
5. Sori almost marginal, the indusium nearly reaching to slightly surpassing the margin; pinnules elongate, $3-4\frac{1}{2} \times$ as long as wide. (*Melanesia*; ?*Samoa*). **4. var. *cheilosora***
5. Sori distinctly intramarginal, the indusium falling short of the margin.
6. Most inner incisions of the pinnules going to the level of the receptacle or slightly beyond; lobes (except sometimes the innermost 1 or 2) rounded, narrowed from base to apex, sometimes apically erose; outer lobes very oblique; short sori often with basally somewhat concave receptacle. (*E. Melanesia, Polynesia*) **6. var. *marquesensis***
6. Many inner incisions going considerably beyond the level of the receptacle; at least the broader lobes ligulate, scarcely narrowed to the shallowly rounded or truncate, not rarely also emarginate or sinuate-erose outer margin; short sori with the receptacle not basally concave; binerval sori transversely elongate; outer lobes usually not very oblique (*Micronesia, W. Melanesia*) **5. var. *lingulata***

1. var. *delicatula* (Christ) Kramer, *Blumea* 15 (1968) 569. — *Davallia delicatula* Christ, Verh. Naturf. Ges. Basel 11 (1895) 224, pl. 3 f. 1—3.

For further synonymy and description see Fl. Mal. (sp. 46, 2).

This sago palm epiphyte, known from a few collections from Celebes, New Guinea, and the Admiralty Islands, was also once collected in western Melanesia:

BISMARCK ARCHIPELAGO. New Ireland: *Peekel 1005* (B).

2. var. *sessilis* (Copeland) Kramer, *Blumea* 15 (1968) 568. — *L. sessilis* Copeland, Philip. J. Sc. 6 (1911) Bot. 82; *ibid.* 60 (1936) 115.

For further synonymy and description see Fl. Mal. (sp. 46, 1).

Distribution: Palawan and Sabah to New Guinea and the Admiralty Is.

SOLOMON IS. Bougainville: *Kajewski* 1961 (A, BISH, BO, L, MICH, SING); *Rechinger* 4786 (W); *Waterhouse* 142, 156, 247 (K); *Schodde (& Craven)* 3589, 3885 (L); *Craven (& Schodde)* 124, 435 (L); *Guppy* 12 (BM). — Shortland I.: *Guppy* 11 (BM). — Guadalcanal: *Kajewski* 2662 (BISH, BO, BRI, GH, L, MICH); *Milne* 587 (K); *Brown* 2509 (BM); *Braithwaite* R.S.S. 4058 (K), 4095 (U). — Kolombangara: *Whitmore & Grubb* BSIP 2134 (K, L); *Braithwaite* R.S.S. 4448 (U). — San Cristóbal: *Brass* 2783 (BISH, BRI, GH, L, MICH); *Braithwaite* R.S.S. 4246 (U). — Choiseul: *Whitmore* BSIP 5663 (K, L). — Wagina I. (off Choiseul): *Whitmore* BSIP 6168 (K, L).

SANTA CRUZ IS. Vanikoro: *Moore* 27 (K); *Kajewski* 505 (GH, K, US).

FIJI. Viti Levu: *Milne* 311 (K).

SAMOA. Savaii: *Whitmee* 229 (GH, K). — Tau: *Powell* 156 (K).

3. var. **pectinata** (Blume) Mettenius ex Kuhn, *Miq. Ann. Mus. Bot. Lugd.-Bat.* 4 (1869) 277.

For further synonymy and description see Fl. Mal. (sp. 46, 3).

The following, incompletely fertile and therefore somewhat doubtful specimens may belong to this variety:

PALAU IS. *Ledermann* 14302 (B, K); *Kanehira* 2112 (K, US); *Kraemer* s.n. (B).

4. var. **cheilosora** Kramer, *var. nov.* — Fig. 12.

Exstat pinnulis elongatis, 3—4½-plo longioribus quam latis; soris fere marginalibus, indusio marginem subattingente vel paulo superante.

Type: *Braithwaite* R.S.S. 4541, San Jorge, Solomon Is (U).

In many respects similar to var. *sessilis*. The following combination of characters is typical: Lamina 30—45 cm long, basally strongly reduced, sessile, the petiole up to 3 cm. Pinnules slightly ascending, ½—1 × their width apart, the larger ones almost parallelogram-shaped, with truncate to narrowed-rounded apex, 18—25 mm long, 4—7 mm wide, 3—4½ × as long as wide, herbaceous. Upper/outer margin crenate, the inner incisions rather regular, ¼—½ mm deep, oblique, reaching or somewhat surpassing the level of the receptacle; outer incisions increasingly deep and irregular, at the pinnule-apex to 2 mm deep, the outermost lobes longer than wide, to 2½ by 1½ mm, tongue-shaped, ± digitate-divaricate, with slightly convergent margins; outer margin of lobes broadly rounded to subtruncate, not denticulate but occasionally erose. Sori on 1 or 2, exceptionally on up to 4 vein-ends, ½—1½ mm long; receptacle laterally much exceeding its veins, straight or very slightly, only in 1 or 2 of the outermost sori sometimes more strongly concave at the base; indusium pale, often with irregular edge, rounded at the free sides, 0.3—0.4 mm wide, almost to quite reaching or even slightly surpassing the margin, usually not reflexed at maturity.

Ecology: Epiphytic at 300 m in *Casuarina* forest (type coll.).

BISMARCK ARCHIPELAGO. New Ireland: *Turner* s.n. (B).

SOLOMON IS. S. Jorge: *Braithwaite* R.S.S. 4541 (U, type).

NEW HEBRIDES. Ancityum: *McGillivray* 18 (BM, GH, P, W).

SAMOA. Upolu: coll.? (SING; loc. correct?).

This distinctive taxon may be a good species. More collections are highly desirable.

5. var. **lingulata** Kramer, *var. nov.* — Fig. 13.

Pinnulis parte basali saepe ultra receptaculum incisus, lobis latioribus ligulatis, soris basaliter haud concavis plerumque uni- vel binerviis sat distincta.

Type: *Stone 1911*, Kusaie, Caroline Is (U).

Petiole short, up to a few cm; pinnules usually rather close, not rarely contiguous; larger pinnules $\frac{1}{2}$ -elliptic to falcate-ligulate, mostly slightly ascending or spreading but often subfalcately downcurved, 16—30 mm long, 5—9 mm wide, $2\frac{1}{2}$ —3 x as long as wide, the lower edge straight or somewhat concave, rarely outward slightly convex, the upper edge outward increasingly convex, a distinct outer margin not or scarcely developed. Upper/outer margin incised, with *ca.* 10 incisions, these acute, narrow, at least some of the inner ones 1 mm deep or more and reaching twice the distance from the receptacle to the margin, some, especially outer incisions, often to 2 or even $2\frac{1}{2}$ mm deep, the outer ones more oblique; lobes ligulate, 1—2 mm wide, parallel-sided, with straight lateral edges, the outer edge shallowly convex or truncate, not rarely in addition sinuate-erose. Sori on 1 or 2, exceptionally on 3 or 4 vein-ends, $\frac{1}{2}$ — $1\frac{1}{2}$ (—3) mm long, distinctly intramarginal; receptacle straight or in short, outer sori somewhat concave; indusium greenish, entire to sinuate, 0.3—0.4 mm wide, not reaching the margin by an equal or larger (up to twice its width) distance, often strongly bulging or reflexed and \pm concealed at maturity.

Ecology: Epiphytic on trunks of palms and other trees, occasionally terrestrial, from sea level to *ca.* 400 m (few data extant).

MARIANAS. Guam: *Rodin 678* (US); *Wagner 3888* (BISH, US; atypical, doubtful).

CAROLINES. Ponape: *Krause 22* (HBG); *Hosokawa 5614* (BISH); *LeHunte s.n.* (K); *Glassman 2326* (BISH, U); *Takamatsu 1055* (BISH, MICH, US), *1065* (BISH); *Ledermann 13189* (B), *13570* (B, BISH, K); *Stone 5386* (BISH, U); *Finsch 35* (B). — Kusaie: *Hosokawa 9348* (US, also marked 'Saipan'); *Kanehira 1437* (BISH, K, US); *Takamatsu 382* (BISH, BO, MICH), *577* (BISH, K); *Stone 1911* (U, type). — Isl.?: *Kanehira 1459* (US).

SOLOMON IS. Bougainville: *Schodde (& Craven) 3667* (L). — Isl.?: *Waterhouse 45* (K).

Also in Queensland.

Note. Sterile specimens cannot be told apart with certainty from var. *sessilis*, var. *pectinata*, and var. *marquesensis*.

6. var. *marquesensis* E. Brown, Bull. Bish. Mus. 89 (1931) 51, pl. 9 (err. '*marquesense*' with the descr.). Type: *Brown 1083*, Fatuhiva, Marquesas (BISH). — *L. societatis* J. W. Moore, Bull. Bish. Mus. 102 (1933) 7. Type: *J. W. Moore 515*, Avera Valley, Raiatea, Society Is (BISH). — Fig. 14.

Scales of the rhizome to 5 mm long. Base of lamina gradually and strongly reduced, the petiole not over a few cm long. Pinnules spreading or slightly ascending, the upper margin straight or towards the apex weakly concave, the lower margin faintly but distinctly S-shaped, i.e. basally concave, apically convex, a distinct outer margin not developed, the apex narrowed-rounded to subacute. Larger pinnules ligulate, almost evenly narrowed from base to apex, 16—24(—33) mm long, 5—7 mm wide, $3\frac{1}{2}$ —4(— $4\frac{1}{2}$) x as long as wide; upper margin of fully fertile pinnules with 4—7 acute incisions, the inner ones $\frac{1}{2}$ mm deep, less often to 1 mm deep, reaching to or slightly surpassing the level of the receptacle, or shallower; outer incisions very oblique, sometimes deeper; lobes narrowed from the base to the broadly rounded, sometimes in addition erose, apex, with convex, convergent sides, only the basal 1 or 2 sometimes ligulate-subtruncate; outer lobes very oblique. Sori on 1 or 2 vein-ends, 0.4—1 mm long; short sori with basally straight or somewhat concave (much less so than in var. *sessilis*) indusium; indusium pale, entire to erose, 0.3—0.5 mm wide, narrowed at the sides, not reaching the margin by a distance equal to its width to almost reaching it, not rarely reflexed and concealed at maturity.

Ecology: Epiphytic, rarely terrestrial, in forests, 125—700 m.

FIJI. Viti Levu: *Milne 311* (K). — Vanua Levu: *A. C. Smith 514* (B, BISH, GH, K, US). — Taveuni: *A. C. Smith 802* (B, BISH, GH, K, US). — Kandavu: *A. C. Smith 144* (BISH, K, US). — Isl.?: *Prince s.n.* (GH); *Horne s.n.* (K); *Seemann 766* (B, BM, GH, K, W).

WALLIS Is. *Fasken 100* (BM); *Graeffe s.n.* (W); *coll.?* 10 (BM).

COOK Is. Rarotonga: *Parks & Parks 22029* (GH, MICH, K), *22306 p.p.* (BISH), *22538* (BISH, US); *Wilder 1097* (BISH, BO, K, US), *22253* (MICH); *Cheeseman 743* (K).

SOCIETY Is. Tahiti: *Vieillard, Lenormand (sic)* (B); *Vesco*¹⁾ *s.n.* (P); *Grant 4205* (BISH). — Raiatea: *J. W. Moore 515* (BISH, type of *L. societatis*).

MARQUESAS. Uahuka: *Jones 1683* (BISH, paratype). — Fatuhiva: *Brown & Brown 1083* (BISH, type). Also in Queensland.

Notes. Specimens from Tahiti and the Marquesas have more erose pinnule lobes than the others.

Incompletely fertile specimens cannot be identified with certainty.

The absence of this variety from Samoa is remarkable.

7. var. *macraeana* (Hooker & Arnott) Mettenius *ex* Kuhn, *Miq. Ann. Mus. Bot. Lugd.-Bat.* 4 (1869) 277; C. Christensen, *Bull. Bish. Mus.* 25 (1925) 11, *comb. superfl.* — *Davallia macraeana* Hooker & Walker-Arnott, *Bot. Beechey Voy.* 3 (1832) 108. — *Odontoloma macraeanum* (Hooker & Arnott) Brackenridge, *U.S. Expl. Exped.* 16 (1854) 226. — *Acrophorus macraeanus* (Hooker & Arnott) Carruthers *ex* Seemann, *Fl. Vit.* (1873) 336. — *Lindsaea macraeana* (Hooker & Arnott) Copeland, *Bull. Bish. Mus.* 59 (1929) 70, and of other authors, partly, or as to type only. — Type: *Macrae s.n.*, Oahu, Hawaii (K; dupl. in B, BM, GH, W). — Fig. 11.

Saccoloma sandwicensis (sic) A. Brongniart, *Voy. Venus Bot.* (1864) pl. [6]. — Type: not cited; not seen.

Petiole well-developed, 5–11 cm long (or, if sometimes shorter, the basal pinnules not so strongly reduced as to be auriculiform, exc. in juvenile plants). Pinnules shaped rather like those of var. *lingulata*, the apex mostly broadly rounded, a distinct outer margin occasionally developed; larger pinnules 14–25 mm long, 5–9 mm wide, 2½–3(–3½) × as long as wide; basal pinnules usually ½–¾ cm long, or, if smaller, the petiole well-developed. Upper/outer margin of pinnules regularly crenate, the incisions, except the outermost ones, little oblique, narrow, acute, ¼–½ mm deep, just reaching to the level of the receptacle or shallower, rarely some to ¾ mm deep and slightly exceeding the receptacle; lobes rounded, or the broader ones subtruncate. Sori single in the lobes, mostly on one, or on two connivent, vein-ends, elliptic to suborbicular, ½ mm long and somewhat less wide, or less often on two well-separated vein-ends and more elongate, distinctly intramarginal, often strongly confluent at full maturity; indusium very delicate, pale greenish, ½-elliptic, ca. 0.3 mm wide, not reaching the margin by a distance equal to its width or a little larger, soon reflexed, concealed, and seemingly wanting or shrivelled at full maturity.

Distribution: Endemic to the Hawaiian Islands. Selected citations below.

Ecology: On tree trunks, occasionally epilithic, in forests; collections with ecological data from 450–700 m.

HAWAII. Kauai: *Degener 10778* (GH, MICH); *Forbes 248 K* (BISH, GH, L); *Faurie 161* (MICH). — Oahu: *Macrae s.n.* (B, BM, GH, K, W, type); *Mann & Brigham 148* (BM, GH, US); *Fosberg 9354* (BISH, GH, MICH); *Topping 3313* (BISH, GH, US); *Degener 10769* (BRI, GH, US), *10775* (GH, L, MICH); *Bartsch 44* (GH, US); *Faurie 160* (S-PA). — Molokai: *Hitchcock 15014* (US). — Maui: *Degener 10776* (GH, US); *Forbes 441 M* (BISH, L), *1675 M* (BISH, K, US). — Hawaii: *Topping 3316* (MICH), *3320* (GH). — Isl.?: *U.S. Expl. Exped.* 3 (B, BISH, GH, US).

Not seen from Lanai and the still smaller islands; the largest series from Oahu.

¹⁾ See note on p. 171.

Vern. name: laukahi.

Notes. Var. *macraeana* is apparently most closely related to var. *lingulata*. In spite of its limited area it is rather variable. The shallowly and regularly incised pinnules with short, yet basally very little concave sori are constant characters, but the latter one is easily obscured when the sori are confluent with age.

The following, perhaps phytogeographically important specimens of *L. repens* could not be determined to variety:

SAMOA. *Betche s.n.* (B).

Fiji. *Gillespie 2551, 3030* (BISH); *Horne s.n.* (GH); *Meebold 16860* (BISH).

Section *Lindsaenium*

(Fée) Kramer, *Blumea* 15 (1968) 563.

17. *Lindsaea rigida* J. Smith in Hooker, *Sp. Fil.* 1 (1846) 217, pl. 63 A; Hosokawa, *Trans. Nat. Hist. Soc. Form.* 26 (1936) 116; Glassman, *Bull. Bish. Mus.* 209 (1952) 48; Ito, *Bot. Mag. Tokyo* 67 (1954) 218.

For synonymy and description see *Fl. Mal.* (sp. 53).

Distribution: Malay Peninsula and Philippines to Polynesia.

Pacific specimens seen:

CAROLINES. Ponape: *Takamatsu 1043* (BISH, MICH); *Ledermann 13787* (K); *Hosokawa 5934* (BISH); *Glassman 2745* (BISH).

SOLOMON IS. Guadalcanal: *Braithwaite R.S.S. 4659, 4786* (U), *4756* (U; juv., doubtful). — Santa Ysabel: *Whitmore BSIP 2397* (K, L).

NEW HEBRIDES. Isl.?: *Fraser s.n.* (P).

SOCIETY IS. Tahiti: *Grant 3740* (B, BISH, BO, US), *4400* (BISH); *McDaniels 1534* (BISH, MICH), *1619* (BISH, K); *Nadeaud s.n.* (P, several coll.).

Reported from Kusaie by Ito (l.c.). The disjunction in the Pacific is remarkable.

Section *Penna-arborea*

Kramer, *Blumea* 15 (1968) 563.

18. *Lindsaea pulchra* (Brackenridge) Carruthers *ex* Seemann, *Fl. Vit.* (1873) 337; C. Christensen, *Bull. Bish. Mus.* 177 (1943) 43. — *Synaphlebium pulchrum* Brackenridge, *U.S. Expl. Exped.* 16 (1854) 223. — Lectotype: *U.S. Expl. Exped.* 2, Sandalwood Bay (Vanua Levu?), Fiji (US; dupl. in K, P). — **Fig. 7.**

L. stolonifera Mettenius *ex* Kuhn, *Linnaea* 36 (1869) 81. — *Davallia stolonifera* (Mett. *ex* Kuhn) Baker, *Syn. Fil.* 2nd ed. (1874) 468. — Lectotype: *Turner s.n.*, New Ireland, Bismarck Archipelago (B).

L. protracta Copeland, *Bull. Bish. Mus.* 59 (1929) 14, 72, pl. 3. — Type: *Parks 20823*, Viti Levu, Fiji (nct seen).

Rhizome long-scandent, reddish brown, eventually sometimes almost scaleless but often more persistently scaly and less lustrous than in other species of the section, 1(—1½) mm in diam., sparingly branched. Scales reddish brown, narrowly triangular, long-acuminate, with a well-developed uniseriate apex, to ca. 7-seriate at the base, up to 3 mm long. *Leaves* remote, ca. 1½—5 cm apart; petiole stramineous to pale brown with darker base, or less often reddish to dark brown throughout and pale-angled, abaxially for the greater part sharply bi-angular but scarcely sulcate, ⅔—1 mm in diam., 4—17 cm long,

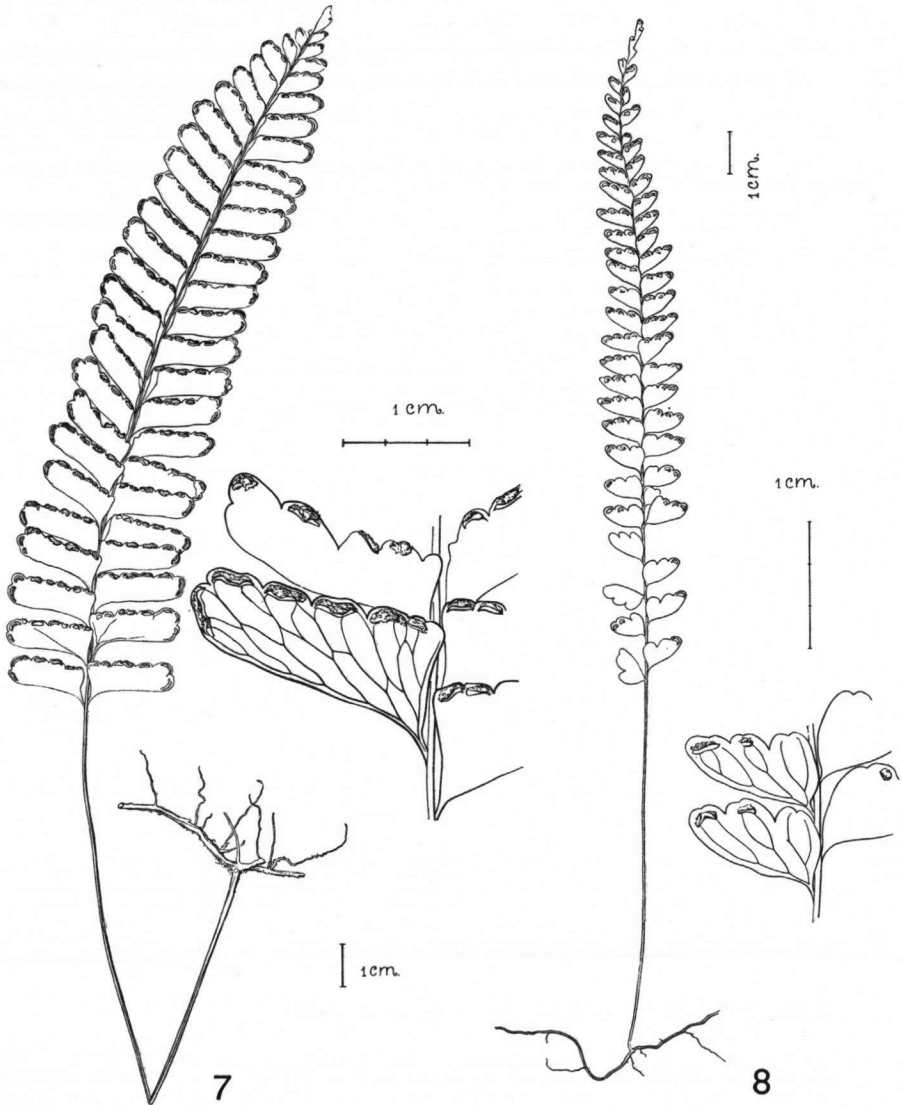


Fig. 7. *Lindsaea pulchra* (A. C. Smith 4674, A). — Fig. 8. *Lindsaea vitiensis* (A. C. Smith 4239, A).

$\frac{1}{2}$ as long to almost equaling the lamina. Lamina very narrowly oblong to lanceolate, 10—22(—30) cm long, 2—4 $\frac{1}{2}$ (—6) cm wide, simply pinnate, with ca. 15—40 pinnules to a side, dark green or brownish when dry, herbaceous to chartaceous. Rachis like the upper part of the petiole. Pinnules spreading or a little ascending, less than their width apart to basally contiguous, or the basal ones more remote, subtrapeziform, parallelogram-shaped, asymmetrically ligulate, or elongate— $\frac{1}{4}$ -elliptic, usually little or not at all narrowed to the apex, 11—20(—25) mm long, 5—7(—8) mm wide, over 2 to almost 3 $\frac{1}{2}$ \times as long as wide; lower edge outward usually convex, a distinct outer edge developed, or less often rounded into the lower edge, rarely the pinnules subacute; upper edge straight or convex outward, with 3—5 rather oblique incisions $\frac{1}{2}$ —1 $\frac{1}{2}$ (—3) mm deep, the outer edge (if any) sometimes also with a shallow incision; lobes broadly rounded or sometimes almost truncate. Upper pinnules rather abruptly reduced, most often a few denticuliform ones confluent with the narrow, lanceolate terminal segment, occasionally hardly any denticuliform pinnules present and the terminal segment large and nearly free, or several strongly reduced ones connected with a small terminal segment. Veins immersed, evident or not, twice forked, or in smaller pinnules once forked, regularly anastomosing and forming a series of areoles ca. 1 mm wide, only the outermost veins often quite free. Sori interrupted by the incisions, one per lobe, mostly 1—2 mm long and on 3 or 4 vein-ends, sometimes only $\frac{3}{4}$ —1 mm long and on two connivent vein-ends; receptacle straight or, especially in outer sori, distinctly concave. Indusium pale, delicate, subentire, ca. 0.3—0.5 mm wide, not reaching the margin by an approximately equal distance. Spores yellowish brown, trilete, smooth, ca. 22 μ .

Ecology: Epiphytic, occasionally terrestrial, in forests, ca. 500—1100 m.

BISMARCK ARCHIPELAGO. New Ireland: *Turner s.n.* (B, lectotype of *L. stolonifera*); *McGillivray s.n.* (B, syntype of *L. stolonifera*).

SOLOMON IS. San Cristóbal: *Braithwaite R.S.S. 4283* (U; very large).

NEW HEBRIDES. Tana: *Cheesman s.n.* (BM). — *Aneityum*: '*Cuming*' (more prob. *McGillivray*) 32 (B, P, syntypes of *L. stolonifera*); *McGillivray 18* (BM, GH, W), 32 (B, BM, E, W).

Fiji. Viti Levu: *Parks 20665* (BISH, MICH, US); *Gillespie 3327* (B, BISH, MICH, US), 3953 (BISH, GH, K, US), 4029 (BISH, BO, K, MICH); *A. C. Smith 4674* (A, BISH, BRI, K, L, US). — Vanua Levu: *A. C. Smith 6479* (BISH, BRI, L, US). — Ovalau: *Graeffe s.n.* (BM, HBG), 12 (P). — Isl.?: *Horne s.n.* (BO, GH, K); *U.S. Expl. Exped. 2* (K, P, US, type).

SAMOA. Savaii: *Christophersen & Hume 2217* (BISH, BO, K). — Upolu: *Sledge 1657* (K). — Isl.?: *Powell s.n., p.p.* (K, US); *Whitmee s.n., p.p.* (BM, GH, K). — Reported from Tutuila by Brackenridge (l.c.).

Notes. The specimens from the western part of the area, especially the sole collection from the Solomon Islands, have very large, apically more strongly narrowed pinnules and may represent a geographic form for which the name *L. stolonifera* would be available.

The affinity of *L. pulchra* is with the next four species.

19. *Lindsaea salomonis* Kramer, *spec. nova*. — Fig. 16.

Rhizoma longe scandens, squamis melleis deinde deciduis vestitum. Folia petiolis 10—12 cm longis, lamina bis longiora, 21—27 cm longa, 2 $\frac{1}{2}$ —3 cm lata, unipinnata, pinnulis majoribus ca. 30—45 pro latere. Pinnulae majores ca. 15 \times 5 mm, subtrapeziformes, apice angustato-rotundatae, sicco olivaceae, herbaceae, superiores sensim et valde reductae, ad apicem confluentes. Margo anterior-exterior pinnularum incisionibus 4 obliquis acutis 1 $\frac{1}{2}$ —2 $\frac{1}{2}$ mm altis, mediam pinnulae fere attingentibus; lobi majores ca. 1 $\frac{1}{2}$ —2 mm lati, paulo angustati, apice paulo convexi. Venae reticulatae; areolae uniseriatae. Sori venis (1—)2—4 insidentes; indusium marginem attingens.

Type: *Braithwaite R.S.S. 4675*, Mt Popomanatseu, Guadalcanal, Solomon Is (U).

Rhizome long-climbing, castaneous, not very lustrous, 1—1½ mm in diam.; scales light reddish brown, very narrowly triangular, very shortly uniseriate at the apex, to ca. 18-seriate at the base, up to 4 mm long. *Leaves* distant, 2—3 cm apart, emerging at about right angles; petioles basally castaneous, shining, subterete, above gradually stramineous, dull, quadrangular, 10—12 cm long, about half as long as the lamina, almost 1 mm in diam. at the base of the lamina. Lamina linear, 21—27 cm long, 2½—3 cm wide, simply pinnate, with ca. 30—45 well-developed pinnules to a side; texture herbaceous, colour olivaceous when dry. Rachis stramineous, quadrangular, adaxially shallowly sulcate. Pinnules spreading, the upper ones slightly ascending, not contiguous, the basal ones as far apart as their width or more, the upper ones closer; larger pinnules 15 by 5 mm, subtrapeziform in outline but narrowed-rounded near the apex, a distinct outer margin not developed; pinnules in the upper ½ or ⅓ of the lamina gradually and very strongly reduced, some denticuliform ones confluent into a very narrow, lobed, caudiform leaf-apex. Basal pinnules not reduced. Upper/outer margin of larger pinnules with 4 oblique, acute incisions 1½—2½ mm deep, reaching about to the middle, the lobes divergent (as in *L. pulchella* var. *blanda*); major lobes ca. 1½—2 mm wide with slightly convergent sides and shallowly convex outer margin; innermost lobes often slightly incised, especially if sterile. Veins immersed, evident, once or twice forked, regularly anastomosing and forming a series of areoles ½—1 mm wide, free or loop-connected near the apex of sterile lobes. Sori on (1—)2—4 vein-ends, ½—2 mm long, often flanked by two small rounded protrusions of their lobe; indusium brownish, delicate, entire, with straight or weakly concave or in uninerval sori convex base, 0.3 mm wide, equaling the margin, attached at the sides, not reflexed but the sporangia protruding beyond the margin at maturity. Spores yellowish, trilete, smooth, ca. 23 μ.

Ecology: The type was epiphytic in bamboo forest at 1800 m. Only known from the type collection.

Notes. In appearance this species is about midway between *L. pulchella* var. *blanda* and *L. chrysolepis*, but in characters of the rhizome, the scales, and the sori it is much closer to the latter. It is partly named after its provenience, partly after Carl Salomon who published an important 'Nomenclator der Gefässkryptogamen' in 1883.

20. *Lindsaea chrysolepis* Kramer, *spec. nova*. — Fig. 15.

Rhizoma longe scandens, squamis auratis, deinde brunnescentibus et deciduis vestitum. Folia petiolis 2½—10 cm longis, partem sextam ad partes duas laminae aequantibus; lamina linearis, 15—22 cm longa, 2—3 cm lata, unipinnata, pinnulis majoribus ca. 20—25 pro latere. Pinnulae majores subtrapezoidales vel vulgo ¼-ellipticae, 12—14 mm longa, 5—6 mm latae, sicco olivaceae, herbaceae, superiores sensim et valde reductae, ad apicem confluentes. Margo anterior-exterior pinnularum fertiliū incisionibus sat irregularibus 3 ad 5 obliquis acutis, maximis ad 3 mm altis et partem tertiam latitudinis pinnulae attingentibus, reliquis minoribus. Venae reticulatae vel exteriores (vel omnes in pinnulis sterilibus) liberae; areolae uniseriatae. Sori venis (1—)2—4 insidentes; indusium marginem attingens vel fere attingens.

Type: *Braithwaite R.S.S. 4052*, Mt Gallego, Guadalcanal, Solomon Is (U).

Rhizome long-scandent, dark reddish brown, ca. 1—1½ mm in diam., sparingly branched, subpersistently scaly, eventually ± scaleless; scales lustrous, golden-yellow, or pale brown with age, elongate-triangular, scarcely uniseriate at the apex, ca. 16-seriate at the base, up to ca. 3 mm long. *Leaves* remote, 1—3 cm apart; petioles sharply quadrangular and ± sulcate, the base or the greater, basal part fawn-coloured, the apex stramineous, 2½—10 cm long, ¼—⅓ as long as the lamina. Lamina linear, 15—22 cm long, 2—3½ cm

wide, simply pinnate, with *ca.* 20—25 major pinnules to a side; rachis stramineous, quadrangular, sulcate. Pinnules spreading or slightly ascending, half their width apart to subcontiguous, or a few basal ones somewhat reduced and more remote; colour olivaceous when dry, texture firmly herbaceous. Larger pinnules subtrapezoidal or usually $\frac{1}{2}$ -elliptic (in shape more like those of *L. pulchella* than of *L. pulchra*), 2 to almost $2\frac{1}{2}$ × as long as wide, 10—15 mm long, 5—7 mm wide, somewhat narrowed from base to apex, both the upper and the lower margin ± straight at the base and increasingly convex outward, the apex rounded, a distinct outer margin not developed. A few basal pinnules usually slightly reduced and more remote; upper pinnules gradually and very strongly reduced, several denticuliform ones confluent with the linear, caudiform, lobate-serrate leaf-apex. Upper/outer margin of larger pinnules rather irregularly incised, if fertile with 3—5 oblique, acute incisions, the largest to 3 mm deep, reaching down to (through being oblique) *ca.* $\frac{1}{3}$ of the width of the pinnule, the others shallower. Sterile pinnules with more, ± alternately shallower and deeper incisions. Smaller lobes with convex, larger ones with almost straight lateral and outer margins. Veins immersed, evident, rather lax, twice forked, anastomosing, forming a series of areoles 1— $1\frac{1}{2}$ mm wide, or the outermost ones free (rarely all free, in sterile pinnules). *Sori* single in the lobes, usually occupying only the middle part of their outer margin, on (1—)2—4 vein-ends; indusium brownish, entire, basally straight or somewhat concave, or slightly convex in the shortest sori, $\frac{1}{2}$ — $2\frac{1}{2}$ mm long, 0.3—0.5 mm wide, the sides narrowed, adnate, the edge reaching the margin or very nearly so, bulging but not reflexed at maturity. *Spores* pale yellowish brown, trilete, smooth, *ca.* 22 μ .

Ecology: Epiphytic or epilithic in moist forests, 1000—1700 m.

SOLOMON IS. Bougainville: *Kajewski 2172* (A, BISH, BO, BRI, L, MICH, SING, paratypes). — Guadalcanal: *Braithwaite R.S.S. 4052*, Mt Gallego, on boulder on mossy forest floor, 1000 m (U, type). A smaller, scarcely fertile plant from the same locality is very probably a juvenile plant of the same species: *Braithwaite R.S.S. 4097* (U).

NEW HEBRIDES. *Ancyium: Morrison s.n.* (K, 2 coll.); *Milne 327* (K).

Notes. The *Kajewski* collection was determined before as *L. pulchra*, but the rhizome scales and submarginal sori set it apart from that species without difficulty. *L. salomonis* is the closest relative of *L. chrysolepis* but has larger leaves with more numerous, more elongate, and more deeply incised pinnules.

21. *Lindsaea jarrettiana* Kramer, *spec. nova.* — Fig. 10.

Rhizoma longe scandens, tenue, *ca.* $\frac{1}{2}$ mm diam., squamis persistentibus, melleis, apice vix uniseriatis. Folia remota; lamina 3—6 cm longa, $1\frac{1}{2}$ —2 cm lata, chartacea, unipinnata, pinnulis pro latere 2—7 et impari terminali. Pinnulae laterales dimidiatae obovatae vel subtrapezoidales, 7—9 mm longae, 4—6 mm latae, fertiles margine anteriore/exteriore incisionibus 2 vel 3, ceterum eroso-sinuato; pinnulae superiores basalibus (saltem in specimine typico plerumque sterilibus) saepe paulo majores. Pinnula terminalis libera vel fere libera, asymmetrice rhomboidea vel cuneato-flabellata, sorifera. Venae saepius unifurcatae, liberae vel in pinnula terminali leviter reticulatae. Sori venas 1—4 insidentes; indusium valde intramarginale.

Type: *Braithwaite R.S.S. 4803*, Mt Popomanatseu, Vunuvela Eama, Guadalcanal, Solomon Is (U; dupl. in K).

Rhizome long-scandent, slender, $\frac{1}{2}$ mm in diam., fawn-coloured, persistently scaly, scarcely polished; scales honey-coloured, narrowly lanceolate, very shortly uniseriate at the apex, to *ca.* 12-seriate at the base, up to 3 mm long. *Leaves* remote, $1\frac{1}{2}$ —2 cm apart

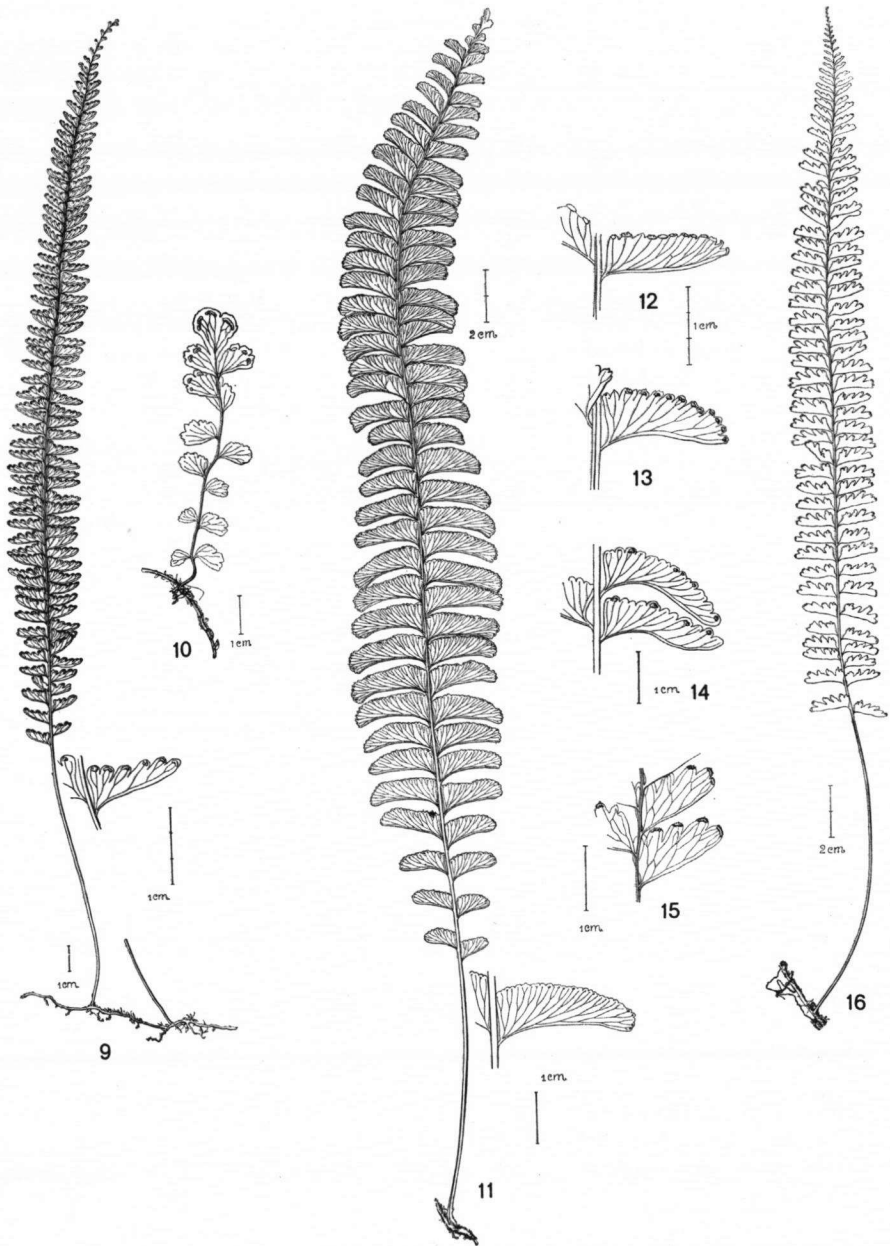


Fig. 9. *Lindsaea pickeringii* (Vaupel 339, US). — Fig. 10. *Lindsaea jarrettiana* (R.S.S. 4803, U). — Fig. 11. *Lindsaea repens* var. *macraeana* (Topping 3775, GH). — Fig. 12. *Lindsaea repens* var. *cheilosora* (McGillivray 18, P). — Fig. 13. *Lindsaea repens* var. *lingulata* (Stone 1911, U). — Fig. 14. *Lindsaea repens* var. *marquesensis* (A. C. Smith 802, GH). — Fig. 15. *Lindsaea chrysolepis* (R.S.S. 4052, U). — Fig. 16. *Lindsaea salomonis* (R.S.S. 4675, U).

issuing at an acute angle; petioles fawn-coloured, or stramineous at the apex, subterete, subquadrangular near the apex, $\frac{2}{3}$ —1 cm long, much shorter than the lamina. Lamina 3—6 cm long, $1\frac{1}{2}$ —2 cm wide, olivaceous and firmly herbaceous when dry, simply pinnate, with 2—7 pinnules to a side and a distinct terminal one; rachis stramineous, adaxially shallowly sulcate, abaxially bi-angular below, above gradually rounded to subcarinate. Pinnules subopposite or the upper ones alternate, spreading or the upper ones slightly ascending, almost their width apart, sessile, dimidiate-obovate to subtrapezoid, 7—9 mm long, 4—6 mm wide, $1\frac{1}{2}$ —2 × as long as wide; lower margin straight, upper margin irregularly gashed, in fully fertile pinnules with 2 or 3 deeper incisions (to *ca.* 1 mm, about to the level of the receptacle), the lobes with straight or convex, erose-sinuate outer margin. Upper pinnules usually slightly larger than the basal ones; terminal pinnule free or slightly connected with the uppermost lateral one, asymmetrically rhombic or cuneate-flabellate, with obtuse to broadly rounded, incised and gashed apical margin, soriferous. Veins immersed, not evident, lax, *ca.* 1 mm apart, mostly once forked, free, or slightly reticulate in the terminal pinnule. *Sori* usually absent from the basal pinnules, interrupted (often also where the incisions do not reach the level of the receptacle), on 1—4 vein-ends, the receptacle not rarely laterally surpassing its vein(s), usually basally somewhat concave; indusium pale brown, delicate, subentire to erose, narrowed at the sides, $\frac{3}{4}$ —2 mm long, strongly intramarginal, not reaching the margin by a distance 1—2 × its width, scarcely reflexed at maturity. *Spores* yellowish, trilete, smooth, *ca.* 25—28 μ .

Ecology: 'Very occasional epiphyte on the trunk of *Dicksonia sciurus* on ridge by camp, 4400 ft.' (field notes of type collection).

Distribution: Only known from the type collection.

Notes. It is a pleasure to dedicate this interesting species to Dr Francis M. Jarrett, pteridologist of the Kew Herbarium, who made Braithwaite's collection from the Solomon Islands very promptly available to the author and whose help with the use of the Kew collection for the study of the Old World Lindsaeoid ferns in general was indispensable.

L. jarrettiana gives the impression of being a reduced species, showing permanent retention of juvenile characters up to its fertile stage. Unfortunately, it is not known whether it is an obligatory tree-fern epiphyte. It may be significant that another species in which this always seems to be the case, the Madagascan *Lindsaea odontolabia* (Baker) Kramer, *comb. nov.* [Basionym: *Davallia odontolabia* Baker, J. Bot. 22 (1884) 140; *Humboldtella odontolabia* (Baker) Tardieu-Blot], is the smallest member not only of subgenus *Odontoloma*, but of the entire genus, and is apparently a strongly reduced, not a primitive species.

The affinity of *L. jarrettiana* is somewhat doubtful. If it is true that it is a reduced species, it is feasible that the free veins (except in the terminal pinnule) are a secondary character. In that case *L. pulchra* and *L. salomonis* are probably its closest relatives.

22. *Lindsaea pickeringii* (Brackenridge) Mettenius *ex* Kuhn, *Linnaea* 36 (1869) 81; Seemann, *Fl. Vit.* (1873) 337; Copeland, *Bull. Bish. Mus.* 59 (1929) 71; C. Christensen, *Bull. Bish. Mus.* 177 (1943) 42. — *Synaphlebium pickeringii* Brackenridge, *U.S. Expl. Exped.* 16 (1854) 223, pl. 30 fig. 2. — *Schizoloma pickeringii* (Brackenridge) Moore, *Ind. Fil.* (1857) 35. — Type: *U.S. Expl. Exped.* 3, Savaii, Samoa (not seen). — **Fig. 9.**

Rhizome long-scandent, castaneous to blackish, wiry, 0.4—1.0, usually *ca.* 0.5 mm in diam., eventually scaleless and polished, or scaly near the petiole-bases, exceptionally also dorsally, sparingly branched; scales honey-coloured, elongate-ovate or lanceolate, not acuminate, hardly uniseriate at the apex, to *ca.* 11-seriate at the base, up to 2 mm long. *Leaves* remote, *ca.* 2—5 cm apart; petioles medium to reddish brown, or blackish with

age, adaxially flattened or shallowly grooved and above usually pale-margined, abaxially subterete at the base, above obtusely or more often \pm acutely bi-angular, occasionally subterete throughout, $\frac{1}{4}$ —1 mm in diam., 7—12 cm long, $\frac{1}{3}$ — $\frac{1}{2}$ as long as the lamina. Lamina 17—30 cm long, 2—3 $\frac{1}{2}$ cm wide, narrowly lanceolate, mostly dark green or brown when dry, herbaceous, simply pinnate, with ca. 20—55 pinnules to a side; rachis abaxially bi-angular and pale-margined, or subterete to terete and concolorous. Pinnules spreading or more often slightly to distinctly ascending, half their width apart to contiguous, or more remote in the basal part of the lamina, not rarely somewhat falcately upcurved, asymmetrically elongate-triangular, \pm evenly narrowed from base to apex, the larger 12—15 mm long, 3—5 mm wide, 2 $\frac{1}{2}$ —4 \times as long as wide; upper pinnules gradually reduced, a few to several denticuliform ones confluent into a narrow pinnatifid leaf-apex; one or a few basal pairs not rarely reduced beside being remote. Lower margin of pinnules straight or often convex, upper margin crenately incised, the incisions in larger fertile pinnules often 3—5, very oblique, $\frac{1}{2}$ —1 $\frac{1}{2}$ mm deep, reaching $\frac{1}{3}$ of the width of the pinnule, or the outer ones exceptionally deeper, to the middle, the incisions usually acute, narrow, the lobes broadly rounded, sterile ones often again incised; a distinct outer margin of the pinnules not developed. Veins immersed, \pm evident, simple or once forked, lax, ca. 1 mm apart, free or the inner ones with one anastomosis, rarely entirely regularly anastomosing almost to the pinnule-apex, never with more than one series of areoles. Sori on 1—3 vein-ends, up to 2 mm long, the receptacle usually distinctly concave at the base; indusium pale to greenish, 0.3—0.4 mm wide, entire, not reaching the margin by an equal or larger distance, the sides little narrowed, free, bulging but scarcely reflexed at maturity. Spores pale yellowish, trilete, smooth, 19—22 μ .

Ecology: Epiphytic or epilithic, in moist forests, ca. 500—800 m; very few data.

Fiji. Viti Levu: *Horne 815* (K). — Vanua Levu: *A. C. Smith 1990* (B, BISH, GH, K, US), *6479* (K). — Ngau: *Milne 267* (K). — Taveuni: *Weber s.n.* (B). — Isl.?: *Prince s.n.* (GH); *Seemann 765* (B, BM, GH, K); *Buchenau (?) 23* (B).

SAMOA. Savaii: *Sledge 1744* (K); *Graeffe s.n.* (HBG, US). — Upolu: *Sledge 1526, 1624* (K, U). — Isl.?: *Vaupel 339* (GH, HBG, US; Savaii?); *Powell 122* (B, K, US); *Whitmee s.n.* (BM, GH, K, p.p.).

Note. Most Fijian specimens have abaxially terete axes, the others bi-angular ones, like those from Samoa.

23. *Lindsaea vitiensis* Kramer, spec. nova. — *L. adiantoides* auct. non (Blume) Kuhn: Copeland, Bull. Bish. Mus. 59 (1929) 71. — Fig. 8.

Rhizoma longe scandens, 0.4—0.5 mm diam., squamis melleis obsitum, mox esquamosum; petioli 4—8 cm longi, obscuri et pallide-marginati, lamina multo breviores (usque ad mediam); lamina herbacea, linearis, unipinnata, pinnulis ca. 20—25 pro latere. Pinnulae majores $\frac{1}{2}$ -ellipticae, 9—12 mm longae, 3—5 mm latae, fere aequae angustatae, a margine superiore incisae, incisionibus saepe 3, obliquis, latis, saepe $\frac{1}{2}$ mm altis. Pinnulae superiores abrupte reductae, denticuliformes nullae vel paucae. Venae liberae. Sori venulis singulis vel binis insidentes; receptaculum plerumque valde concavum; indusium marginem fere attingens.

Type: *A. C. Smith 5918*, Mt Tomanivi, Mba, Viti Levu, Fiji (L; dupl. in A, BISH, BRI, K, SING, US).

Rhizome long-scandent, sparingly branched, wiry, 0.4—0.5 mm in diam., soon devoid of scales and lustrous; scales honey-coloured, narrowly lanceolate, apically very shortly uniseriate, to ca. 8-seriate at the base, up to 2 mm long. *Leaves* remote, ca. 2—4 cm apart; petioles wiry, ca. $\frac{1}{2}$ mm in diam., reddish to blackish brown, quadrangular and pale-

margined almost to the base, scarcely sulcate, 4—8 cm long, $\frac{1}{2}$ — $\frac{1}{3}$, exceptionally only $\frac{1}{2}$ the length of the lamina. Lamina linear, ca. 8—22 cm long, $1\frac{1}{2}$ — $2\frac{1}{2}$ (—3) cm wide, dark green or olivaceous when dry, herbaceous (mostly thinly), simply pinnate, with ca. 20—25(—35) pinnules to a side; rachis like the petiole but paler and upward gradually sulcate. Pinnules spreading or often somewhat ascending, the upper ones less than their width apart to contiguous, the lower ones gradually farther apart, the basal ones not rarely remote. Larger pinnules 9—12 mm long, 3—5 mm wide, 2—3 × as long as wide, $\frac{1}{4}$ -elliptic, rounded-narrowed from base to apex, or rarely asymmetrically triangular; very rarely some pinnules with a caudiform, protracted apex, to 20 mm long. Upper pinnules abruptly reduced, denticuliform ones none or very few, some reduced pinnules connected with the narrow, rhombic, lobed leaf-apex. One or a few basal pairs of pinnules slightly, rarely strongly, reduced. Upper and lower margin of pinnules straight or outward convex, inner margin often divergent from the rachis; upper margin incised, with usually 3 very oblique, broad, shallow incisions $\frac{1}{2}$ mm deep, less often to 1 mm deep, mostly reaching down to $\frac{1}{2}$, exceptionally to $\frac{1}{4}$ of the width of the pinnule, the sinus acute, the lobes broadly rounded or rarely subacute; a distinct outer margin not developed, the pinnule-apex rounded to subacute. Veins immersed, evident or not very oblique, lax, 1 mm apart, simple or once forked, free. *Sori* single in the lobes, on one or two (usually connivent) vein-ends, $\frac{1}{2}$ —1(— $1\frac{1}{2}$) mm long; receptacle, especially in outer sori, basally very concave; indusium pale, delicate, subentire to sinuate, only basally attached, semi elliptic to subhippocrepiform, 0.3—0.5 mm wide, falling short of the margin by less than its width to equating it, often, especially in short sori, strongly reflexed and \pm concealed at maturity. *Spores* pale yellowish, trilete, smooth, ca. 18—20 μ .

Ecology: Epiphytic, mostly on tree trunks, in montane forests, ca. 600—1200 m, rarely down to 100 m.

Fiji. Viti Levu: A. C. Smith 4239 (A, BISH, BRI, K, L), 5918 (A, BISH, BRI, K, L, SING, US, type); Gillespie 2366 (B, BISH, K), 2219 (BISH, K, US), 2438 (BISH, MICH), 2279 (MICH), 2630 (BISH, MICH), 2718 (B, BISH, BO); Parks 20339 (BISH, GH, K, MICH, US), 20830 (B, BISH, MICH), 20904 (MICH); St. John 18317 (K, MICH); Meebold 16858, 21935 (BISH). — *Vanua Levu*: A. C. Smith 1623 (BISH, K, US). — *Ovalau*: Graeffe s.n. (HBG, US). — *Isl.?*: Horne s.n. (BO, GH, K); Seemann 766 p.p. (K).

Notes. This form is here described as a new species with some misgivings. It bears some resemblance to *L. pulchra*, *L. pickeringii*, and especially *L. pulchella*. *L. pulchella* has much more gradually and strongly reduced upper pinnules and is geographically remote. *L. pulchra* has at least partly reticulate veins and thicker, less smooth rhizomes. *L. pickeringii* may be its closest relative; it has also more strongly reduced upper pinnules and larger, more strongly tapering, more deeply incised pinnules with often at least some anastomoses in the veins. The comparatively large series of fairly uniform specimens from an archipelago where both *L. pulchra* and *L. pickeringii* also occur, without any intermediates, induces me to treat it as a species.

24. *Lindsaea pulchella* (J. Smith) Mettenius ex Kuhn, *Linnaea* 36 (1869) 81. — *L. adiantoides* (Blume) Kuhn, *Miq. Ann. Mus. Bot. Lugd.-Bat.* 4 (1869) 278; not of J. Smith in Hooker, 1846.

For further synonymy and description see *Fl. Mal.* (sp. 60).

This widespread Malesian species is represented in the Pacific by two varieties which can be distinguished as follows:

1. Pinnules herbaceous, the larger ones 7—12 mm long, up to 2 × as long as wide, the major incisions 1—3 mm deep; petiole faces concolorous **I. var. *blanda***

1. Pinnules herbaceous to subcoriaceous, 10–16 mm long, $2\frac{1}{2}$ –3 × as long as wide; incisions to 1 (sometimes to 2) mm deep; petiole adaxially much paler than abaxially 2. var. *falcata*

1. var. *blanda* (Mettenius ex Kuhn) Kramer, *Blumea* 15 (1968) 571.

For synonymy and description see *Fl. Mal.* (sp. 60, 2).

Distribution: Sumatra and Philippines to New Guinea; Queensland; three collections from the Pacific:

BISMARCK ARCHIPELAGO. Isl.?: *Dissing, Køie & Sandermann Olsen 2334* (K).

SOLOMON Is. Kolombangara: *Braithwaite R.S.S. 4381* (U); *Whitmore & Grubb BSIP 2076* (K).

2. var. *falcata* (Brause) Kramer, *Blumea* 15 (1968) 571.

For synonymy and description see *Fl. Mal.* (sp. 60, 3).

Distribution: New Guinea; a single Pacific collection.

NEW HEBRIDES. Aneityum: *Milne (?) 57* (B).

INSUFFICIENTLY KNOWN TAXA

Lindsaea propinqua Hooker var. *simplicior* J. W. Moore, *Bull. Bish. Mus.* 102 (1933) 8.–Type: *J. W. Moore 182*, Mt Temehani, Raiatea, Society Is (BISH).

A second collection which was determined as the same by J. W. Moore is *H. St. John 17282*, also from Raiatea (BISH, MICH). This is certainly a member of section *Synaphlebum* and may very well be a depauperate form of *L. propinqua*, although the pinnules are much smaller and more rigid. The St. John collection is somewhat closer to *L. propinqua*.

Synaphlebum urvillei Fée

See under *Lindsaea propinqua*. Type not seen; a very doubtful isotype in herb. B. Judging from the description it must be close to or conspecific with *L. propinqua*.

Lindsaea spec. prob. nov.

A recent collection from the Solomon Islands probably represents an undescribed species of section *Odontoloma*. The rhizome is long-scandent, $\frac{1}{2}$ mm in diam., with a stele characteristic of the section. The leaves are very much like those of juvenile plants of *L. repens* intermediate between the deeply dissected form described as *L. hymenophylloides* Blume and the adult form with crenate pinnules; its pinnules are ca. 10 × 3 mm, dissected to the middle or $\frac{2}{3}$; but many lobes are soriferous, with small, uninerval, submarginal sori not unlike those of *L. fissa*. However, many pinnules are quite sterile and hardly any are fertile on all lobes. The possibility remains that the adult stage differs from the present collection which is therefore not described as new.

SOLOMON Is. San Cristóbal: ridge between Pagato and Warahito Rivers, on rotten tree trunk lying on forest floor; occasional; alt. 800 ft., *Braithwaite R.S.S. 4257* (K, U).

EXCLUDED

Lindsaya alexandri (Hillebrand) Hillebrand, *Fl. Haw.* (1888) 622 = *Diellia erecta* Brack. f. *alexandri* (Hillebrand) Wagner, *Un. Cal. Publ. Bot.* 26 (1952) 155.

L. erecta (Brack.) Hooker ex Baker, *Syn. Fil.* (1867) 113; non Mirbel (1803) = *Diellia erecta* Brackenridge, U.S. Expl. Exped. 16 (1854) 218; Wagner, l.c. 154.

L. falcata (Brack.) Hooker ex Baker, *Syn. Fil.* (1867) 113, non Dryander (1797) = *Diellia falcata* Brackenridge, U.S. Expl. Exped. 16 (1854) 219; Wagner, l.c. 162.

- L. knudsenii* Hillebrand, Fl. Haw. (1888) 623 = *Diellia mannii* (D.C. Eaton) Hillebrand *teste* Wagner, l.c. 158.
L. laciniata Hillebrand, l.c. 621 = *Diellia laciniata* (Hillebrand) Diels in E. & P., Nat. Pfl. Fam. I⁴ (1902) 212; Wagner, l.c. 161.
L. mannii (D.C. Eaton) Hillebrand, l.c. 624 = *Diellia mannii* (D.C. Eaton) Robinson, Bull. Torr. Bot. Cl. 39 (1912) 582; Wagner, l.c. 158.
L. pumila (Brack.) Hooker ex Baker, Syn. Fil. (1867) 112; non Klotzsch (1844) = *Diellia erecta* Brack. f. *pumila* (Brack.) Wagner, l.c. 157.
Schizoloma erecta [sic] (Brack.) Moore, Ind. Fil. (1861) 320. — See *Lindsaya erecta*.
Schizoloma falcata [sic] (Brack.) Moore, l.c. 320. — See *Lindsaya falcata*.
Schizoloma pumila [sic] (Brack.) Moore, l.c. 320. — See *Lindsaya pumila*.
Tapeinidium tenue (Brack.) Copeland, Bull. Bish. Mus. 59 (1929) 69. — See *Tapeinidium denhamii* (p. 164).

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