

THE MICROSOROID FERNS (POLYPODIACEAE)

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SUMMARY

Three genera are recognised, *Leptochilus*, *Microsorium*, and *Podosorus*. *Lepisorus* probably also belongs here, but is left out because this work started as a precursor for Flora Malesiana, and most *Lepisorus* species occur outside the Malesian area. The following genera, recognised by Bosman (1991), are reduced: *Colysis* (to *Leptochilus*), *Neocheiropteris* and *Phymatosorus* (to *Microsorium*). Many new combinations have been made. *Microsorium hainanense* is newly described and an evaluation is given of the main characters important for recognising species, viz. the venation and the arrangement of the sori.

INTRODUCTION

The microsoroid ferns form a group of closely related genera around the genus *Microsorium*. They are separated from other Polypodiaceae by the combination of (partly) clathrate rhizome scales and anastomosing, reticulate venation. These characters also occur in *Lepisorus*. The latter genus always has the young sori covered with peltate scales and the sori in a single row parallel to the costa. A few species of *Microsorium* also have the young sori covered with peltate scales, but generally (with the exception of some collections) the sori in more than one (irregular) row parallel to the costa. The last character also occurs in other species of *Microsorium* which do not have peltate scales. For more details about the history of this group and relations with other genera, see Bosman (1991). The present work started to finish the work done by Bosman for her thesis: A monograph of the fern genus *Microsorium* (1991). When she started she had the intention to cover all microsoroid Polypodiaceae, but lack of time forced her to confine herself to what she considered as *Microsorium*, and two or three species of the other genera she recognised. In due time I discovered that one important character she used, the dromy of the venation, was misinterpreted by her in some species, and therefore, at least for *Phymatosorus*, could not be used. Contrary to the plate in her work (l.c.: 38, pl. 1) where *Phymatosorus alatus* is shown to have a catadromous venation, she states in the text on p. 29, and in the description of *Phymatosorus*, that this species would have anadromous venation. The plate, a photograph, gives a good picture of the situation. For *Phymatosorus biseriatus* the situation is similar. This is one of the reasons why I reduced *Phymatosorus* to *Microsorium*. Moreover, when identifying collections not seen by Bosman, after careful study of

1) The author is greatly indebted to Zhang Xian-Chun (P), who helped him during his fieldwork in China with the taxonomy of Chinese species.

the many herbarium collections in Chinese herbaria, and after field study in China, I concluded that it was impossible to separate *Leptochilus buergerianus*, *L. subhemionitideus*, *Neocheiropteris ningpoensis*, and *N. superficialis*. All four belong to one species, which belongs to *Microsorium*, thus the right name is *M. superficiale*.

VENATION, POSITION AND INNERVATION OF SORI
and discussion of systematic position of the species of *Microsorium*

Terminology used for the venation

In groups with varying degrees of dissection, the description of the venation is a constant source of confusion. Therefore I give here the terms used in this work, and for all the Polypodiaceae in Flora Malesiana (in brackets the terms that are often used elsewhere):

Rachis: The continuation of the stipe, in a pinnate or pinnatifid frond.

Costa: The main vein of the lamina in a simple leaf or of a lamina segment in a divided leaf, running from base to apex between the margins.

Veins (primary veins, lateral veins): The veins running from the costa to the margins

Connecting veins (secondary veins): The veins connecting the primary veins.

Veinlets (tertiary veins): The veins branching from the connecting veins, be they simple, forked, or anastomosing.

Free veinlets: The ultimate, free branches of the venation pattern. They can be recurrent, excurrent, or without preference.

Venation in the microsoroids

Despite the terminology, which coins the terms vein and connective vein, the venation of the microsoroids essentially has no (lateral) veins. In the ontogeny of the venation first free veins are formed laterally on the costa, curved downwards and upwards. These free veins connect into costal areoles which can be of different size. Generally, on these areoles again free veins are formed, also curved downwards and upwards, and in most species also connecting into areoles. These areoles can be (nearly) exactly superposed on the costal areoles, or more or less alternating with them. It is also possible that outside each costal areole several small areoles are formed. Often, the size of the costal areoles is more or less constant for a species, but it may vary, thus in one species small costal areoles as well as larger ones may exist. Although in many species the dromy is rather constant, it is (almost) never totally constant for a species or an individual. Because of the ontogeny of the venation I consider the dromy as not important taxonomically for delimitation of genera.

In the microsoroids the following types of venation are recognised (the terminology is the same as explained in the previous paragraph, but one must keep in mind that the veins are composed of the parts of the areoles that run more or less from the costa to the margin, the connective veins of the parts that run more or less parallel with the costa).

Venation of sterile and non-dimorphous fertile fronds. Species in **bold face** belong to more than one type.

Type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to the veins.

Type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles.

Type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein.

Type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins like in type 1.

Type 5a: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. The areoles outside the large main areoles conspicuously smaller.

Type 5b: as type 5a, but the areoles smaller, mostly the areoles outside the main areoles smaller, but not very much so.

Type 5a and 5b may merge in each other, often depending on the width of the leaf or leaf-segment.

Type 1 and 4 sometimes merge in each other in the same species. The same is true for type 1 and 5, although generally species with type 5 are constant for this character.

Type 2 occurs in the vegetative leaves of some of the dimorphous species of *Lep-tochilus* and in the fertile leaves of species of that genus with one coenosorus or a line of sori between, and parallel to, two veins.

Type 1 or 4, or type 1 and 4, are found in the following species: 4. *L. decurrens* (also type 2), 5. *L. digitatus* (also type 2), 6. *L. ellipticus* (also type 2), 7. *L. hemio-nitideus*, 8. *L. macrophyllus* (also type 2); 1. *M. alatum*, 3. *M. biseriatum*, 5. *M. commutatum* (also type 3), 6. *M. congregatifolium*, 7. *M. pustulatum* (with type 5b in its fertile leaves), 9. *M. ensatum*, 10. *M. fortunei* (also type 2), 12. *M. hetero-carpum*, 14. *M. insigne*, 15. *M. lastii*, 17. *M. leandrianum*, 22. *M. maximum*, 23. *M. membranaceum*, 25. *M. monstrosum*, 28. *M. palmatopedatum*, 29. *M. pappei*, 35. *M. punctatum*, 39. *M. sarawakense*, 42. *M. sopusense*, 43. *M. spectrum*, 44. *M. steerei*, 45. *M. superficiale* (also type 2), and 48. *M. zippelii*. *Microsorium ensatum*, *M. palmatopedatum*, and *M. superficiale* also share clathrate, peltate paraphyses.

Type 2 is found in 2. *L. axillaris*, 3. *L. cantoniensis*, 4. *L. decurrens* (also type 1), 5. *L. digitatus* (also type 1), 6. *L. ellipticus* (also type 1 and 4), 9. *L. minor* (also type 5), 10. *M. fortunei* (also type 4), 26. *M. normale* (also type 3), 45. *M. superficiale* (also type 1). *Microsorium normale* and *M. superficiale* also share clathrate, peltate paraphyses.

Type 3 is found in 5. *M. commutatum*, 11. *M. hainanense*, 24. *M. membranifo-lium*, 26. *M. normale* (also type 2), 30. *M. papuanum*, 31. *M. parksii*, 33. *M. pow-*

ellii, 37. *M. rubidum*, 39. *M. sarawakense* (also type 4), 41. *M. scolopendria* (here the main type, but due to irregularities also types 1, 2, and 5 may occur).

Type 5a is found in 1. *L. amplus*, 9. *L. minor* (also type 2), 4. *M. cinctum*, 8. *M. egregium*, 18. *M. linguiforme*, 19. *M. longissimum*, 34. *M. pteropus*, 36. *M. rampans*, and 38. *M. samarense*.

Type 5b is found in 27. *M. novaezealandiae*, 33. *M. pentaphyllum*, 40. *M. scandens*, 2. *M. aurantiacum*, and in 47. *M. vieillardii*.

16. *M. latilobatum* and 47. *M. varians* have a type between 5a and 5b.

Position and innervation of sori

In the microsorioid ferns the position and innervation of sori is of taxonomic importance. The sori can be separate, often a few confluent, or acrostichoid. The latter condition is found in *Leptochilus*, where in the broader fertile leaves a coenosorus is found on a nerve between, and parallel to, two veins. Sometimes this coenosorus becomes an acrostichoid patch between two veins. The coenosorus can break up into a row of often elongated sori. If the sori become less elongated they are not longer situated on one vein. In very dimorphous leaves the fertile leaves become very narrow and linear, and the sori are in two acrostichoid rows in the margin of these leaves. Apart from *Leptochilus* the latter condition is also found in *M. latilobatum* and *M. varians*.

In the other species of *Microsorium* the sori are separate. The following conditions occur:

1) The sori are irregularly scattered on the leaf surface. Only one innervation type, the sori are innervated by (smaller) veinlets. Species 4. *M. cinctum*, 6. *M. congregatifolium*, 8. *M. egregium*, 12. *M. heterocarpum*, 13. *M. heterolobum*, 14. *M. insigne* (also 2), 15. *M. lastii*, 17. *M. leandrianum*, 18. *M. linguiforme*, 19. *M. longissimum*, 22. *M. maximum*, 23. *M. membranaceum*, 25. *M. monstrosum*, 32. *M. pentaphyllum*, 34. *M. pteropus*, 35. *M. punctatum*, 36. *M. rampans*, 38. *M. samarense*, 42. *M. sopuense*, 43. *M. spectrum*, and 44. *M. steerei*.

2) The sori are irregularly scattered on the leaf surface or in two irregular rows between each pair of veins. They are predominantly placed on connective veins. Species 14. *M. insigne* (also 1), 45. *M. superficiale*, and 48. *M. zippelii*.

3) The sori are placed in two regular rows between each pair of veins and placed on veinlets branching from the connective veins, but the sori closest to the costa may be placed on the first connective vein. Species 1. *M. alatum*, 3. *M. biseriatum*, 5. *M. commutatum* (also 4).

4) The sori are placed in a row between a pair of veins, one (or rarely two) sori in an areole or on the connective vein bordering an areole. The sori are placed on distinct soral veins branching from the connective, or on the connective. The sorus closest to the costa is innervated by the first connective vein or a branch thereof. Species 5. *M. commutatum* (also 3), 9. *M. ensatum* (also 5), 26. *M. normale* (also 7), 29. *M. pappei* (also 7), 39. *M. sarawakense*, 33. *M. powellii* (also 5), and 41. *M. scolopendria* (also 5); *M. ensatum* and *M. normale* also share clathrate, peltate paraphyses.

5) The sori are placed in one row parallel and close to the costa, each sorus in the costal areole, on its connective vein, or just outside it. Innervation by a distinct soral vein or the connective vein, generally on a crossing of veins. Species 7. *M. pustul-*

latum, 9. *M. ensatum* (also 4), 10. *M. fortunei* (also 7), 11. *M. hainanense*, 20. *M. lucidum*, 24. *M. membranifolium*, 27. *M. novaezealandiae* (also 6), 28. *M. palmatopedatum*, 30. *M. papuanum*, 31. *M. parksii*, 33. *M. powellii* (also 4), 37. *M. rubidum*, and 41. *M. scolopendria* (also 4).

6) The sori are placed close to the margin just outside each primary costal areole. Innervation by the connective vein or just outside the connective vein on a crossing of veins. Species 27. *M. novaezealandiae* (also 5), 40. *M. scandens*, 2. *M. aurantiacum* (the sori on the connective vein), and 47. *M. vieillardii*.

7) The sori are placed separate in one irregular row parallel and close to the costa outside the costal areole and between two branches of each lateral vein. Innervation by a special soral vein or on the crossing of a soral vein and a connective vein. Species 10. *M. fortunei* (also 5), 26. *M. normale* (also 4), and 29. *M. pappei* (also 4).

Using the characters of venation and sori together, a few rather well defined groups can be recognised in *Microsorium*. Other characters fit less well, but some, like incision of the leaves, can be used very well for some of the groups. Divided means pinnately, or rarely pedately, dissected (pinnate or pinnatifid etc.)

Group 1 — Venation type 1 and 4 with sori type 1 generally is found in species recognised by Bosman as *Microsorium*: 6. *M. congregatifolium*, 12. *M. heterocarpum*, 15. *M. lastii*, 17. *M. leandrianum*, 23. *M. membranaceum*, 25. *M. monstrosum*, 35. *M. punctatum*, 42. *M. sopenense*, 43. *M. spectrum*, and 44. *M. steerei*.

To this group of species also belongs 14. *M. insigne*, placed by Bosman in *Colysis* because of the catadromous venation. This species also may have sori type 2. In the rhizome always sclerenchyma is found. The sclerenchyma may be present as scattered strands (from 8 to more than 100) only, sclerenchyma sheaths around the vascular bundles, or a combination of both. The leaves are simple except in *M. spectrum*.

Group 2 — Venation type 5a or 5b together with sori type 1: 4. *M. cinctum*, 8. *M. egregium*, 18. *M. linguiforme*, 19. *M. longissimum*, 32. *M. pentaphyllum*, 34. *M. pteropus*, 36. *M. rampans*, and 38. *M. samarense*. These species are treated in *Microsorium* by Bosman, except *M. pteropus*, which was considered a *Colysis* by her because of the catadromous venation. It sometimes has the sori in approximately one row between the veins, and therefore forms a transition to *Leptochilus*. To me this is a very homogeneous group of species, except for *M. pteropus*. In the rhizome always sclerenchyma is found except in *M. pteropus*. This feature brings the latter species not closer to *Leptochilus* (*Colysis* in Bosman, 1991), because that genus always has sclerenchyma in the rhizome. The sclerenchyma is present only as sheaths around the vascular bundles. The leaves are divided except in *M. linguiforme*, *M. longissimum*, and *M. samarense*.

Group 3 — Venation type 1 and/or 4 together with sori type 3 forms a small group of closely related species: 1. *M. alatum*, 3. *M. biseriatum*, and part of 5. *M. commutatum*. These species were treated as *Phymatosorus* by Bosman, but I see no close relation. Sclerenchyma is always present and may be present as scattered strands (from 50 to more than 100) only, or as sclerenchyma sheaths around the vascular bundles. The leaves are divided.

Group 4 — Venation type 3 together with sori type 4 and/or 5 occurs further in 5. *M. commutatum*, 11. *M. hainanense*, 24. *M. membranifolium*, 30. *M. papuanum*, 31. *M. parksii*, 33. *M. powellii*, 37. *M. rubidum*, and 41. *M. scolopendria* (also sori type 5). This is a group of closely related species, all belonging to *Phymatosorus* according to Bosman. Sclerenchyma is always present and may be present as scattered strands (from 10 to more than 200) only, or as sclerenchyma sheaths around the vascular bundles, or both. The leaves are divided.

Group 5 — Venation type 5b together with sori type 6 occurs in 2. *M. aurantiacum*, 27. *M. novaezealandiae* (also sori type 5), 40. *M. scandens*, and 47. *M. vieillardii*. This is a group of closely related species, most of them considered as *Phymatosorus* by Bosman, but they form definitely a separate group. Sclerenchyma present only as circumvascular sheaths except in *M. aurantiacum* where also 5–15 scattered strands are found. This group is most related to group 4 and differs in the absence of a narrow primary costal areole. The leaves are divided.

Group 6 — A group of two species, 16. *M. latilobatum*, and 46. *M. varians* possess venation type 5, the fertile leaves are very narrow, and acrostichoid. In *M. latilobatum* no sclerenchyma is found, in *M. varians* only circumvascular sheaths are present. The leaves are divided. In the acrostichoid fertile leaves this group comes close to *Leptochilus*.

The rest of the species (Group 7 and 8) do not belong to a well defined group, often they possess different venation and/or sori types. They were placed in *Leptochilus* or *Neocheiropteris* by Bosman (1991).

Group 7 — The combination of venation type 1 (and/or 4) with sori type 2 is found in 45. *M. superficiale* (which also may have venation type 2), and 48. *M. zippelii* (with *M. superficiale* placed by Bosman in *Neocheiropteris*). The combination of venation type 2 and sori type 2 is found in 45. *M. superficiale* (also venation type 1 or 4, placed by Bosman in *Leptochilus* and *Neocheiropteris*). 45. *M. superficiale* and 48. *M. zippelii* form a separate group. Sclerenchyma in the rhizome is present as only (up to more than 100) bundle sheaths or both as bundle sheaths and scattered strands. The leaves are simple.

Group 8 — The following species also form a separate group, probably related to group 4 and 5. The arrangement and innervation of the sori is much the same, only often more irregular. 7. *M. pustulatum* is probably closely related to one of these groups (or both). The venation is more type 1 than 4, and could be derived from the venation type 3 by widening of the costal areole. Further belong here 9. *M. ensatum*, 10. *M. fortunei*, 26. *M. normale*, and 28. *M. palmatopedatum*. The last species has no sclerenchyma in the rhizome, in *M. pustulatum* only circumvascular bundle sheaths are present, in *M. ensatum* and *M. fortunei* only (30–50) scattered strands of sclerenchyma and in *M. normale* only circumvascular sheaths or also less than 20 scattered strands are found. Simple as well as divided leaves. *Microsorium ensatum*, *M. fortunei*, *M. normale* and *M. palmatopedatum* also share clathrate, peltate paraphyses.

Venation type 1 and 4 combined with sori type 4 is found in 9. *M. ensatum*, in which species also sori type 5 is found. Further in 29. *M. pappei*, together with sori type 7. Finally, this combination is found in 39. *M. sarawakense*, in which species also venation type 2 is found. All three species belong to *Neocheiropteris* in Bosman (1991).

Venation type 1 and 4, combined with sori type 5 occurs in 7. *M. pustulatum*, by Bosman placed in *Phymatosorus*. This also is found in 9. *M. ensatum* (see above), and 10. *M. fortunei*, in which variable species also venation type 2 and sori type 7 is found. According to Bosman this is *Neocheiropteris*. Finally 28. *M. palmatopedatum* shows this combination.

Venation type 2 or 3, together with sori type 4 or 7, occurs in 26. *M. normale*, placed in *Leptochilus* by Bosman.

LITERATURE

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- Mitsuta, S. 1984. Studies in the venation and systematics of Polypodiaceae. *Mem. Fac. Sc., Kyoto Univ. Ser. Biol.* 9: 133–155.

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KEY TO THE GENERA

- 1a. Sori acrostichoid, a simple coenosorus in one line between two veins, or one row of sori in one line between two veins **Leptochilus** (p. 274)
- b. Sori separate or, if acrostichoid, on pinnate fertile leaves with linear pinnae (2 species from Madagascar) 2
- 2a. Sori on the leaf surface, sometimes deeply sunken **Microsorium** (p. 294)
- b. Sori stipitate on slender stalks, excurrent veins, on the lamina margin **Podosorus** (p. 373)

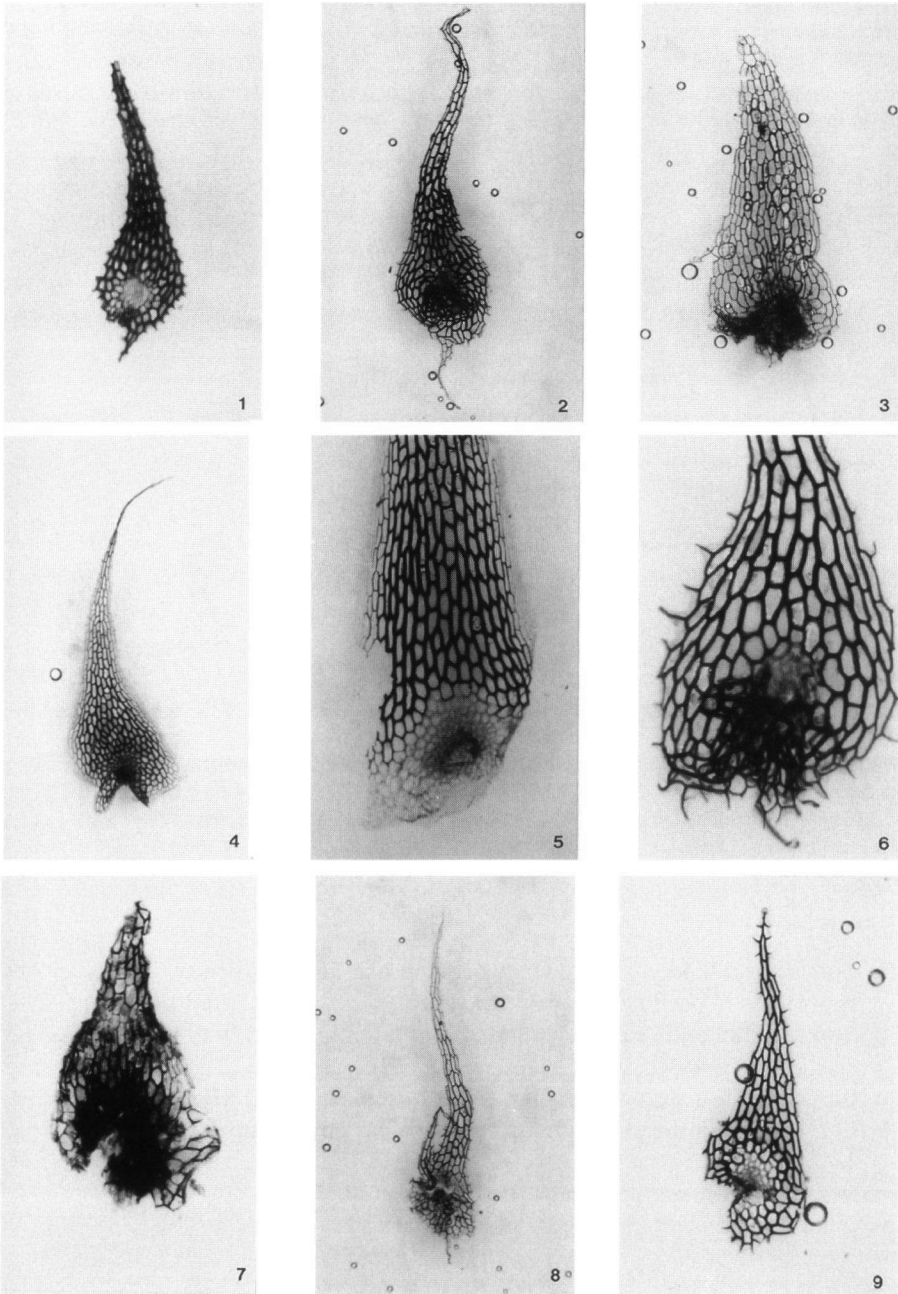


Plate 1. Rhizome scales. — 1: *Leptochilus axillaris* (Mann s. n., L 908.286-355); $\times 28$. — 2: *L. decurrens* (de Wilde 18526); $\times 12$. — 3: *L. ellipticus* (Hara et al. 6304935); $\times 10$. — 4: *L. macrophyllus* var. *macrophyllus* (de Wilde 13671); $\times 10$. — 5: *Ibid.* (Surbeck 1089); $\times 25$. — 6: *Ibid.* (Suzuki s. n., L 181224); $\times 20$. — 7: *L. macrophyllus* var. *fluviatilis* (Kostermans 9517); $\times 25$. — 8: *L. macrophyllus* var. *pedunculatus* (Maxwell 75-545); $\times 18$. — 9: *L. minor* (Sledge 909); $\times 16$.

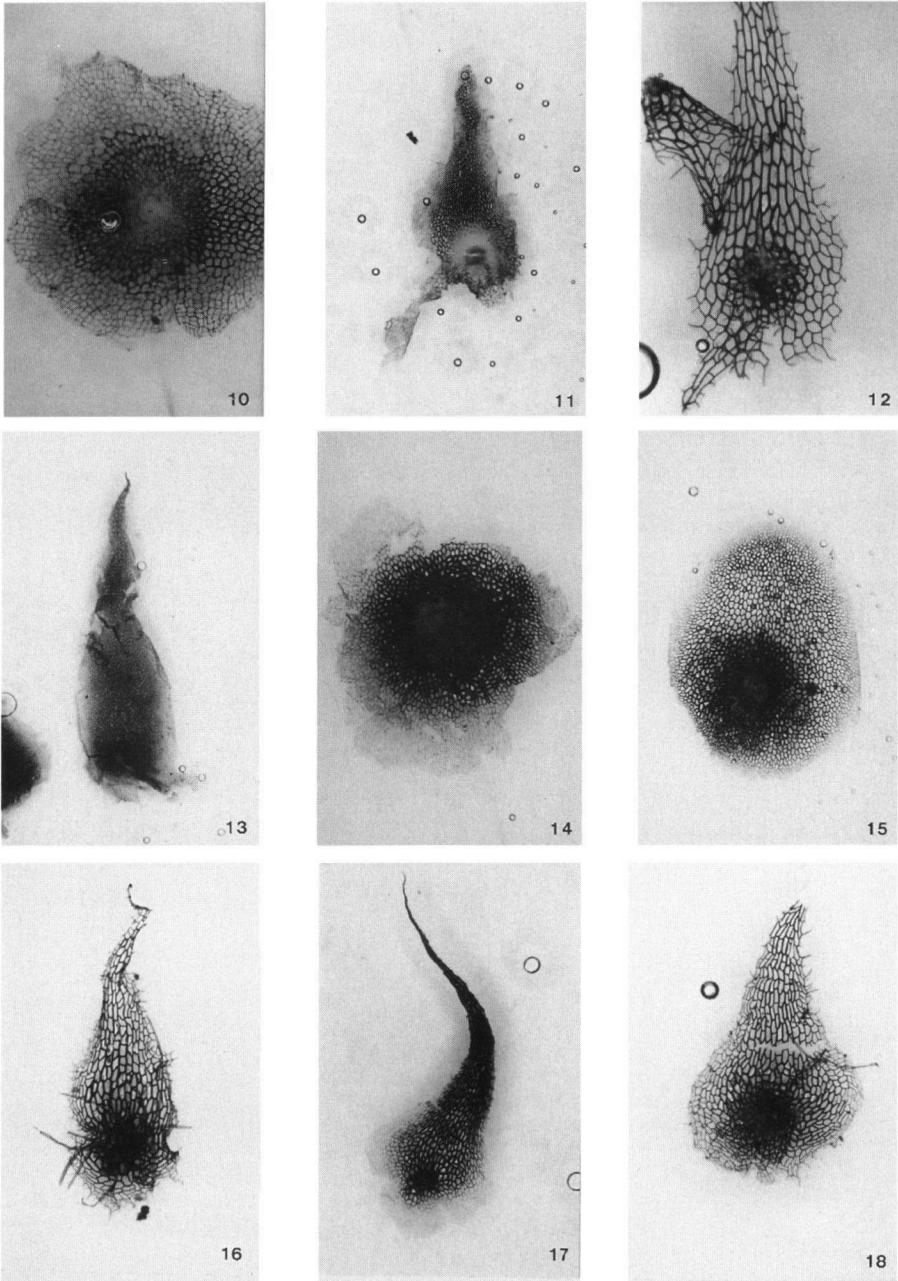


Plate 2. Rhizome scales. — 10: *Microsorum alatum* (A. C. Smith 8843); $\times 12$. — 11: *M. alatum* (A. C. Smith 8843); $\times 12$. — 12: *M. superficiale* (Henry 5450); $\times 25$. — 13: *M. cinctum* (Jermy 8111); $\times 6$. — 14: *M. commutatum* (Morley 14); $\times 16$. — 15: *M. commutatum* (Meijer 9657); $\times 5$. — 16: *M. congregatifolium* (Dransfield 3371); $\times 12$. — 17: *M. pustulatum* (van Zanten 1312); $\times 10$. — 18: *M. ensatum* (von Siebold s. n., L 908.300-537); $\times 12$.

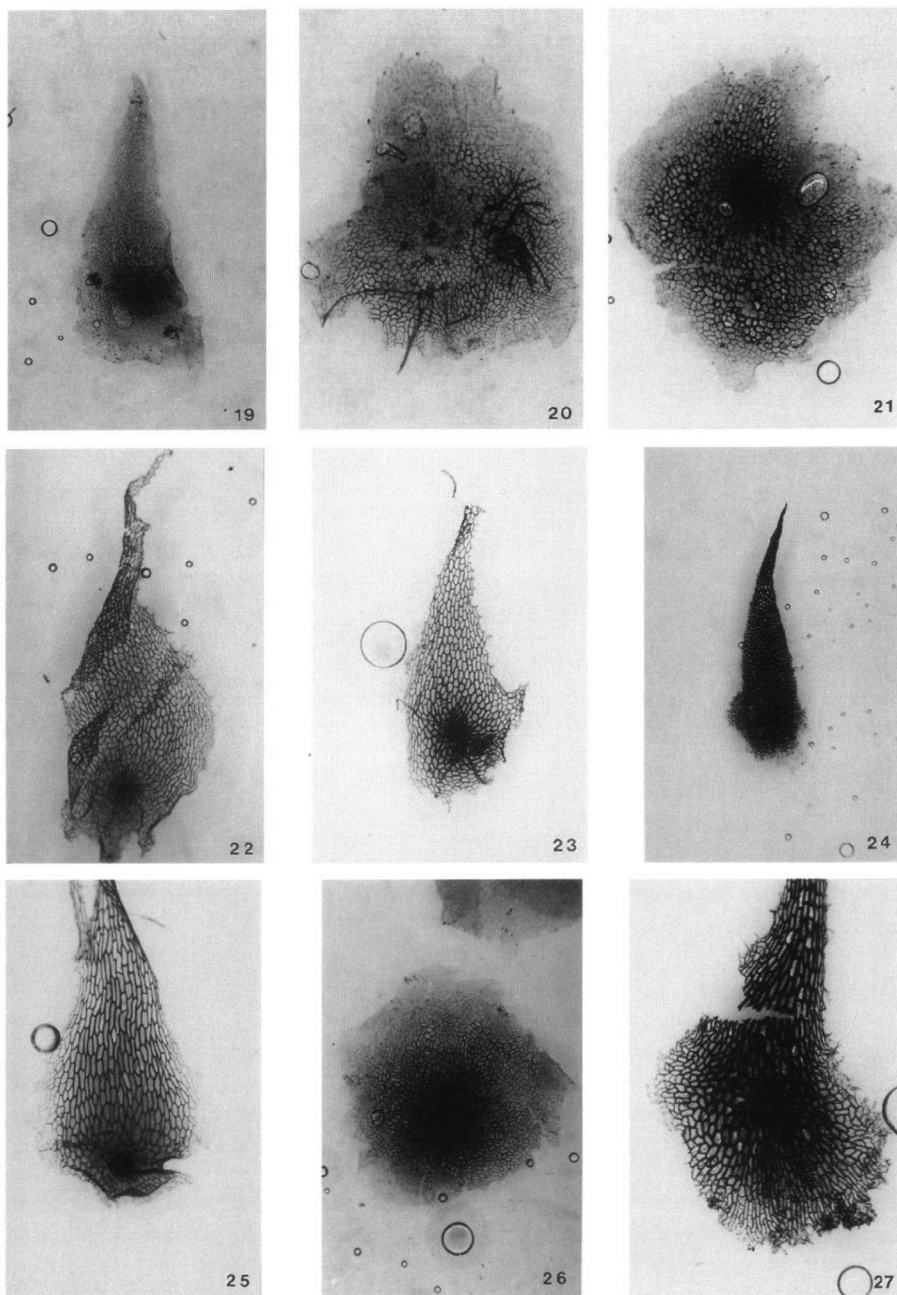


Plate 3. Rhizome scales. — 19: *Microsorium fortunei* (Kramer et al. 7613); $\times 6$. — 20: *M. hainanense* (Nootboom 5611); $\times 10$. — 21: *M. hainanense* (Nootboom 5611); $\times 10$. — 22: *M. heterocarpum* (de Wilde 13501); $\times 12$. — 23: *M. heterolobum* (Jacobs 7358); $\times 10$. — 24: *M. latilobatum* (Franc 656); $\times 6$. — 25: *M. linguiforme* (S 21673); $\times 8$. — 26: *M. lucidum* (Steward & Cheo 160); $\times 6$. — 27: *M. maximum* (Moore 299); $\times 12$.

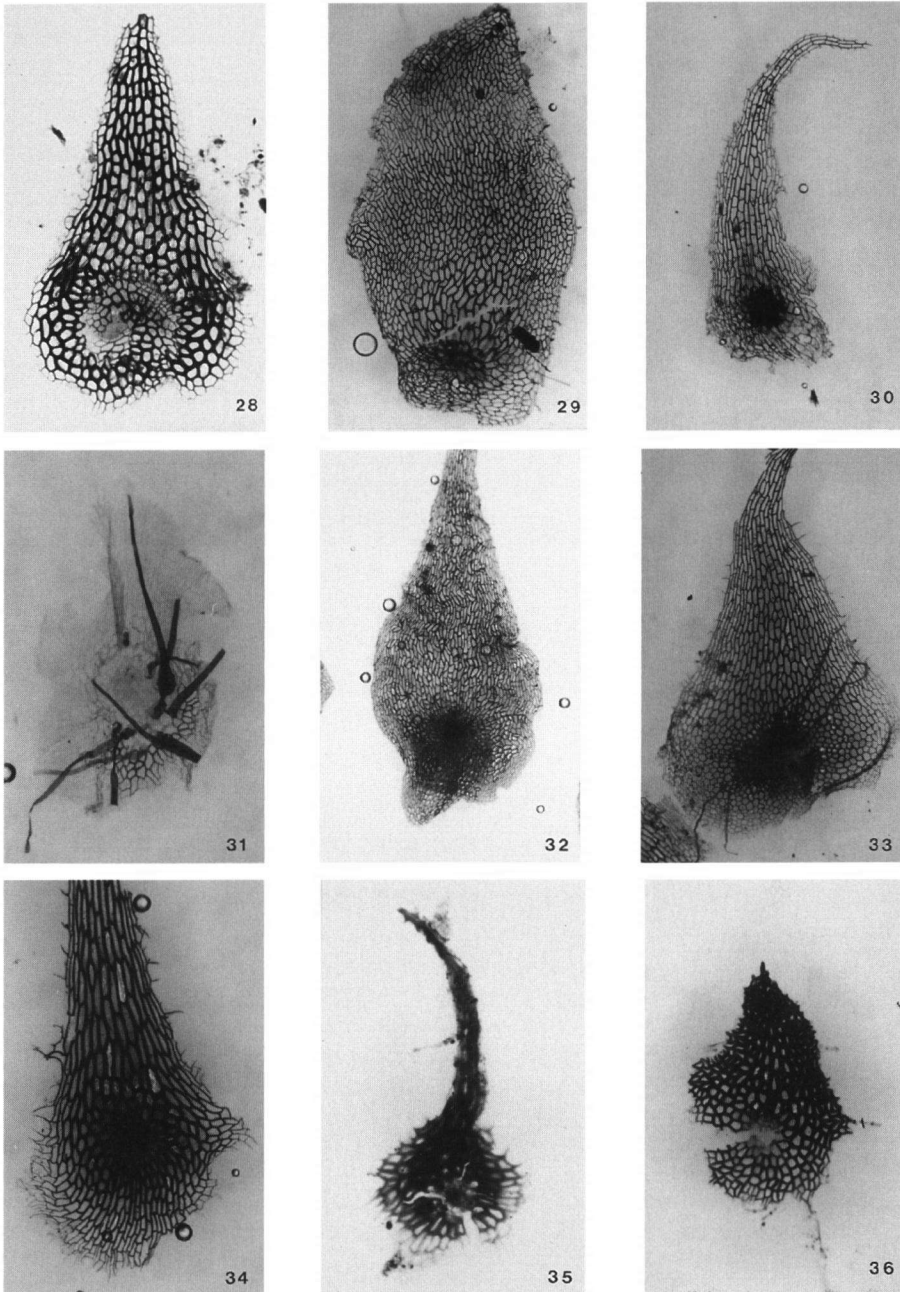


Plate 4. Rhizome scales. — 28: *Microsorium membranaceum* (Larsen et al. 2314); $\times 20$. — 29: *M. membranifolium* (van Beusekom 742); $\times 23$. — 30: *M. monstrosum* (Elmer 9029); $\times 12$. — 31: *M. normale* (Geesink 7965); $\times 20$. — 32: *M. novaezealandiae* (Sledge 176); $\times 6$. — 33: *M. palmatopedatum* (Maire s. n., Yunnan); $\times 15$. — 34: *M. pappei* (Stolz 917); $\times 20$. — 35: *M. papuanum* (Docters van Leeuwen 9053); $\times 30$. — 36: *M. papuanum* (Hoogland et al. 11931); $\times 30$.

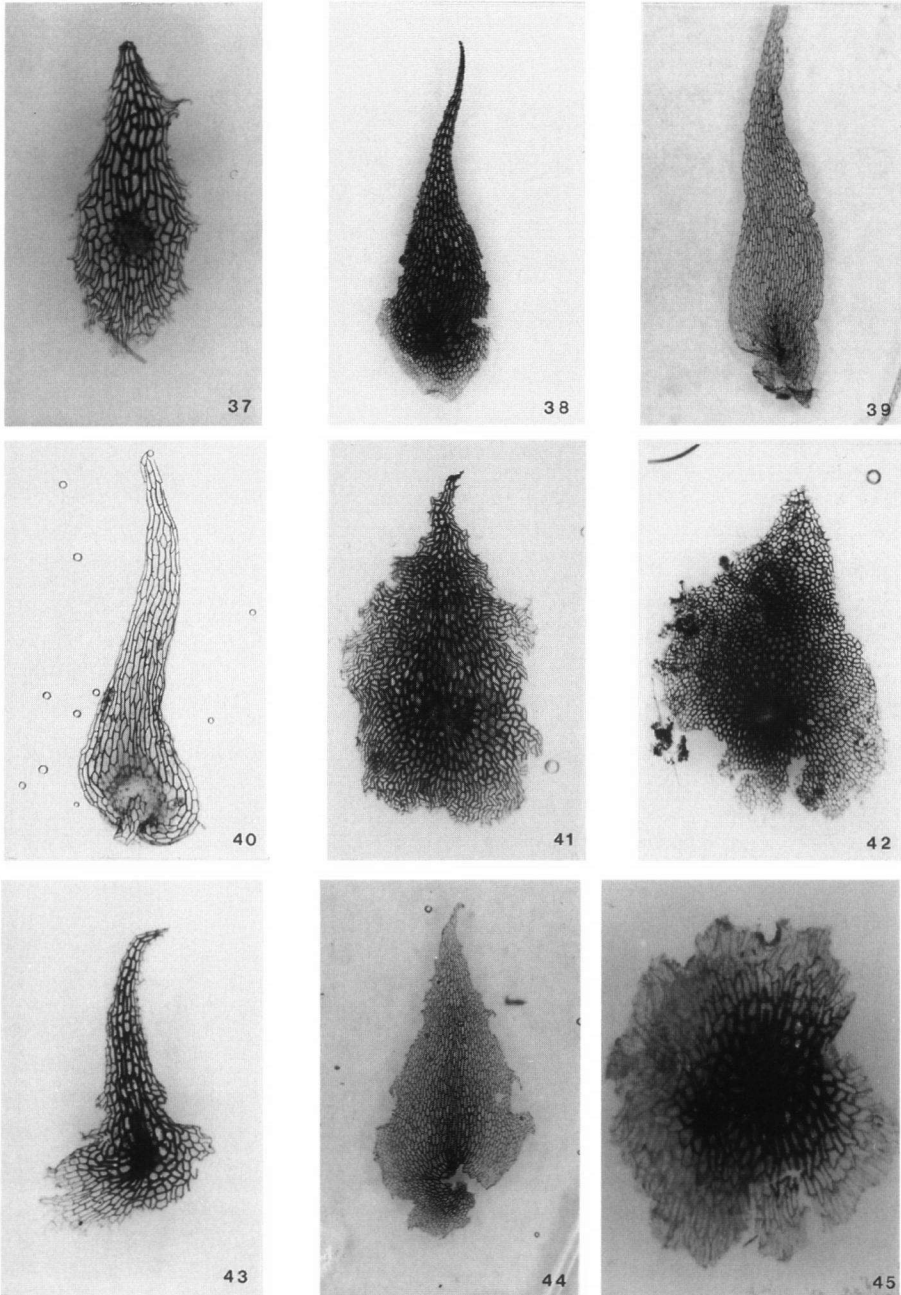


Plate 5. Rhizome scales. — 37: *Microsorium papuanum* (Kato B-3884); $\times 30$. — 38: *M. parksii* (van Balgooy 1913); $\times 11$. — 39: *M. powellii* (Braithwaite 2397); $\times 5$. — 40: *M. pteropus* (Tagawa T. 1090); $\times 12$. — 41: *M. punctatum* (Mousset 25); $\times 12$. — 42: *M. punctatum* (Floyd & Womersley 5974); $\times 10$. — 43: *M. rampans* (Pleyte 373); $\times 17$. — 44: *M. rubidum* (Mann s. n., L 908.301-611); $\times 12$. — 45: *M. sarawakense* (Clemens 27349); $\times 35$.

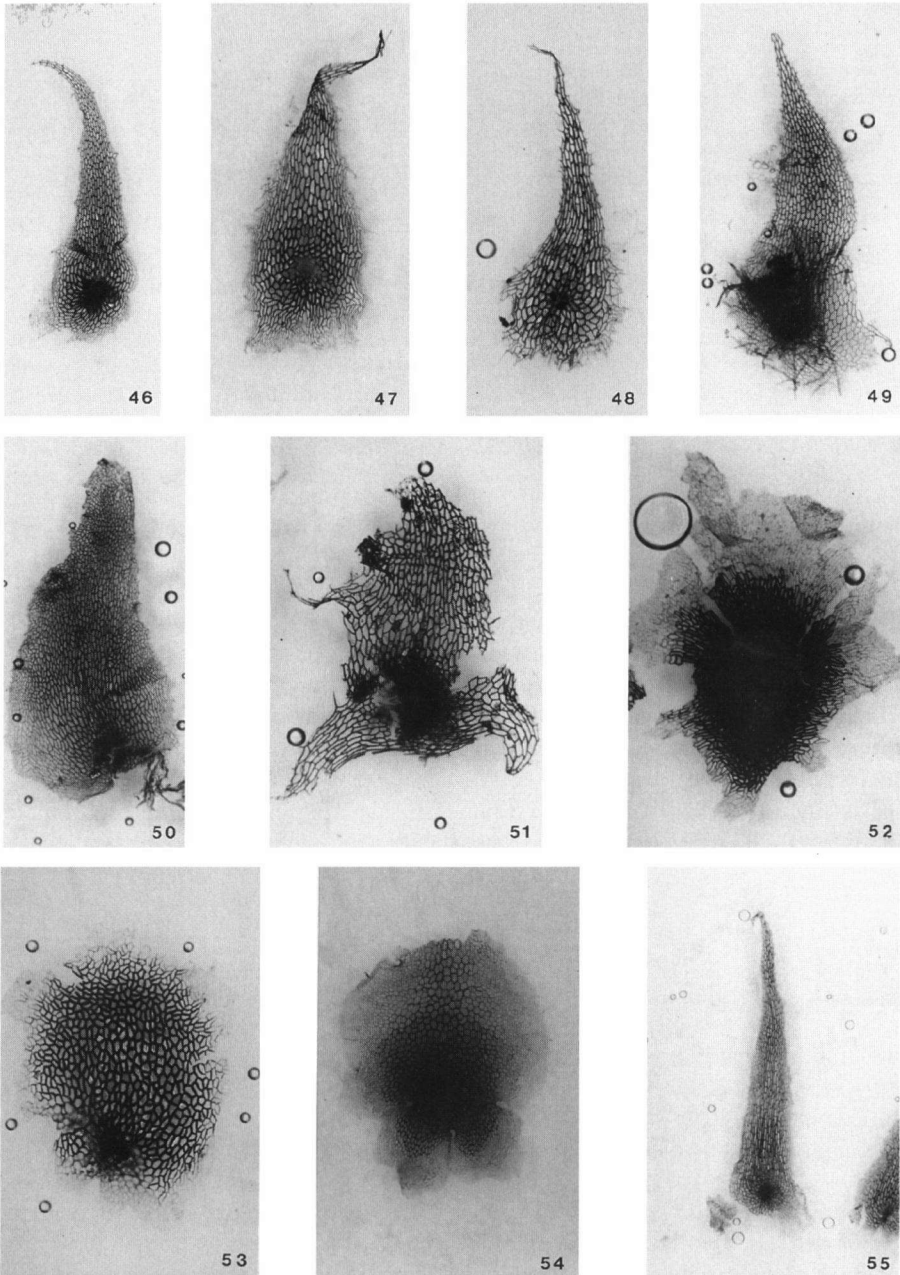


Plate 6. Rhizome scales. — 46: *Microsorium scandens* (L 952.84-288); $\times 6$. — 47: *M. scolopendria* (Charoenpol 4068); $\times 10$. — 48: *M. scolopendria* (Hedge 885); $\times 10$. — 49: *M. superficiale* (Mousset 667); $\times 9$. — 50: *M. superficiale* (Rock 7714); $\times 10$. — 51: *M. superficiale* (Tagawa 2899); $\times 12$. — 52: *M. commutatum* (Vaupel 40); $\times 12$. — 53: *M. varians* (Baumann et al. 54441); $\times 12$. — 54: *M. vieillardii* (Bamps 6124); $\times 6$. — 55: *M. zippelii* (de Wilde 18526); $\times 5$.

LEPTOCHILUS

- Leptochilus* Kaulf., Enum. Filic. (1824) 147. — Type: *Leptochilus axillaris* Kaulf.
Grammitis Hook. & Grev., Icon. Filic. (1827) t. 6. — *Grammitis* sect. *Diagramma* Blume, Enum. Pl. Javae (1828) 118, p.p. — *Selliguea* Blume, Enum. Pl. Javae (1828) addenda p. 118, p.p. — Type: *Grammitis macrophylla* Blume.
Dendroglossa C. Presl, Epim. Bot. (1849) 149. — Copel., Gen. Fil. (1947) 199. — Type: *Dendroglossa normalis* C. Presl.
Anapausia C. Presl, Epim. Bot. (1851) 185. — *Paraleptochilus* Copel., Gen. Fil. (1947) 198. — Type: *Leptochilus decurrens* Blume.
Colysis C. Presl, Epim. Bot. (1851) 146, p.p. — Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 313, p.p. — Copel., Gen. Fil. (1947) 198, p.p. — Type: *Colysis hemionitidea* C. Presl.
Gymnogramma sect. *Selliguea* Hook., Sp. Fil. 5 (1864) 161, p.p. — Type: *Grammitis macrophylla* Blume.
Myuropteris C. Chr., Dansk Bot. Ark. 6 (1929) 73, pl. 9 f. 1, 2; pl. 10 f. 3. — Type: *Myuropteris cordata* C. Chr.
Nistarika B. K. Nayar, Fern Gaz. 13 (1985) 33. — Type: *Nistarika bahupunctika* B. K. Nayar et al.

Rhizome not white waxy, creeping, with peltate or pseudopeltate clathrate or sub-clathrate scales, roots present but absent in *L. axillaris*. Leaf dimorphous or not, simple or pinnatifid. Venation types 1, 2, 4, and in *L. amplus* 5, occur. In the broader fertile leaves a coenosorus is found on a nerve between, and parallel to, two veins. Sometimes this coenosorus becomes an acrostichoid patch between two veins. The coenosorus can break up into a row of often elongated sori. In very dimorphous leaves the fertile leaves become very narrow and linear, and the sori are in two acrostichoid rows in the margin of these leaves (the latter condition is also found in *Microsorium latilobatum* and *M. varians* which differ from *Leptochilus* in the fertile leaves always being pinnate).

Distribution — South, East, and Southeast Asia (from Middle China and Japan southwards), Malesia, Australia (N Queensland), and Solomon Islands.

KEY TO THE SPECIES

In this key an anatomical character is used, the cross section of the rhizome, a character easy to observe. After making a cut with a sharp knife, a hand lens is enough.

- 1a. Lamina pinnatifid, pedately dissected, or basal part pinnate, apical part pinnatifid 2
 b. Lamina simple, or simple but (irregularly) lobed 4
 2a. Lamina pedately dissected, about circular, longest lobes widest below middle ..
 **5. *L. digitatus***
 b. Lamina pinnatifid or basal part pinnate, apical part pinnatifid, elliptic or ovate,
 longest lobes widest about middle..... 3
 3a. Rhizome with only scattered strands of sclerenchyma, scales pseudopeltate, slightly spreading, lamina base truncate or truncate-angustate **6. *L. ellipticus***
 b. Rhizome with only circumvascular sheaths, scales peltate, distinctly spreading,
 lamina base narrowly angustate, the stipe winged for a considerable part
 **1. *L. amplus***

- 4a. Sori acrostichoid 5
 b. Sori separate, or connate in one line between the veins 8
- 5a. Roots absent or rare, root hairs on the rhizome, rhizome with only circumvascular sheaths, scales peltate **2. L. axillaris**
 b. Roots densely or sparsely set, rhizome with only scattered strands of sclerenchyma, or with circumvascular sheaths and scattered strands of sclerenchyma, or without sclerenchyma or circumvascular sheaths, scales pseudopeltate . . . 6
- 6a. Leaves often deltoid, scales ovate or triangular, roots sparsely set, phyllopodia obscure **3. L. cantoniensis**
 b. Leaves (narrowly) elliptic or ovate, scales narrowly ovate or triangular, roots densely set, phyllopodia more or less distinct 7
- 7a. Lamina narrowly elliptic or narrowly obovate, stipe 0.5–1 mm diam., veins more or less immersed and vague, a prominent basicopic (or sometimes acroscopic) connecting vein dichotomously branching off near costa . **9. L. minor**
 b. Lamina ovate or narrowly ovate, stipe 1.2–1.7 mm diam., veins prominent and distinct, no prominent connecting basicopic vein branching off near the costa **4. L. decurrens**
- 8a. Lamina simple but (irregularly) lobed **10. L. x hemitomus**
 b. Lamina simple 9
- 9a. Sori separate 10
 b. Sori connate in one line between the veins **8. L. macrophyllus**
- 10a. Rhizome with circumvascular sheaths and scattered strands of sclerenchyma, sori on the whole surface of the lamina **8. L. macrophyllus**
 b. Rhizome with only scattered strands of sclerenchyma, sori absent from the basal parts **6. L. hemionitideus**

KEY TO THE SPECIES IN MALESIA

- 1a. Lamina pinnatifid or basal part pinnate, apical part pinnatifid . **6. L. ellipticus**
 b. Lamina simple or simple but (irregularly) lobed 2
- 2a. Lamina simple but (irregularly) lobed **10. L. x hemitomus**
 b. Lamina simple 3
- 3a. Sori acrostichoid 4
 b. Sori separate or connate in one line between the veins . . . **8. L. macrophyllus**
- 4a. Roots absent or rare, root hairs on the rhizome, scales peltate, connecting veins catadromous, smaller veins prominent and distinct **2. L. axillaris**
 b. Roots densely set, scales pseudopeltate, connecting veins anadromous, smaller veins more or less immersed and vague 5
- 5a. Prominent basicopic (or sometimes acroscopic) connecting vein dichotomously branching off near the costa, lamina narrowly elliptic or narrowly obovate, stipe 0.5 to 1 mm diam., veins more or less immersed and vague . **9. L. minor**
 b. No prominent connecting basicopic vein branching off near the costa, lamina ovate, or narrowly ovate, stipe 1.2 to 1.7 mm diam., veins prominent and distinct **4. L. decurrens**

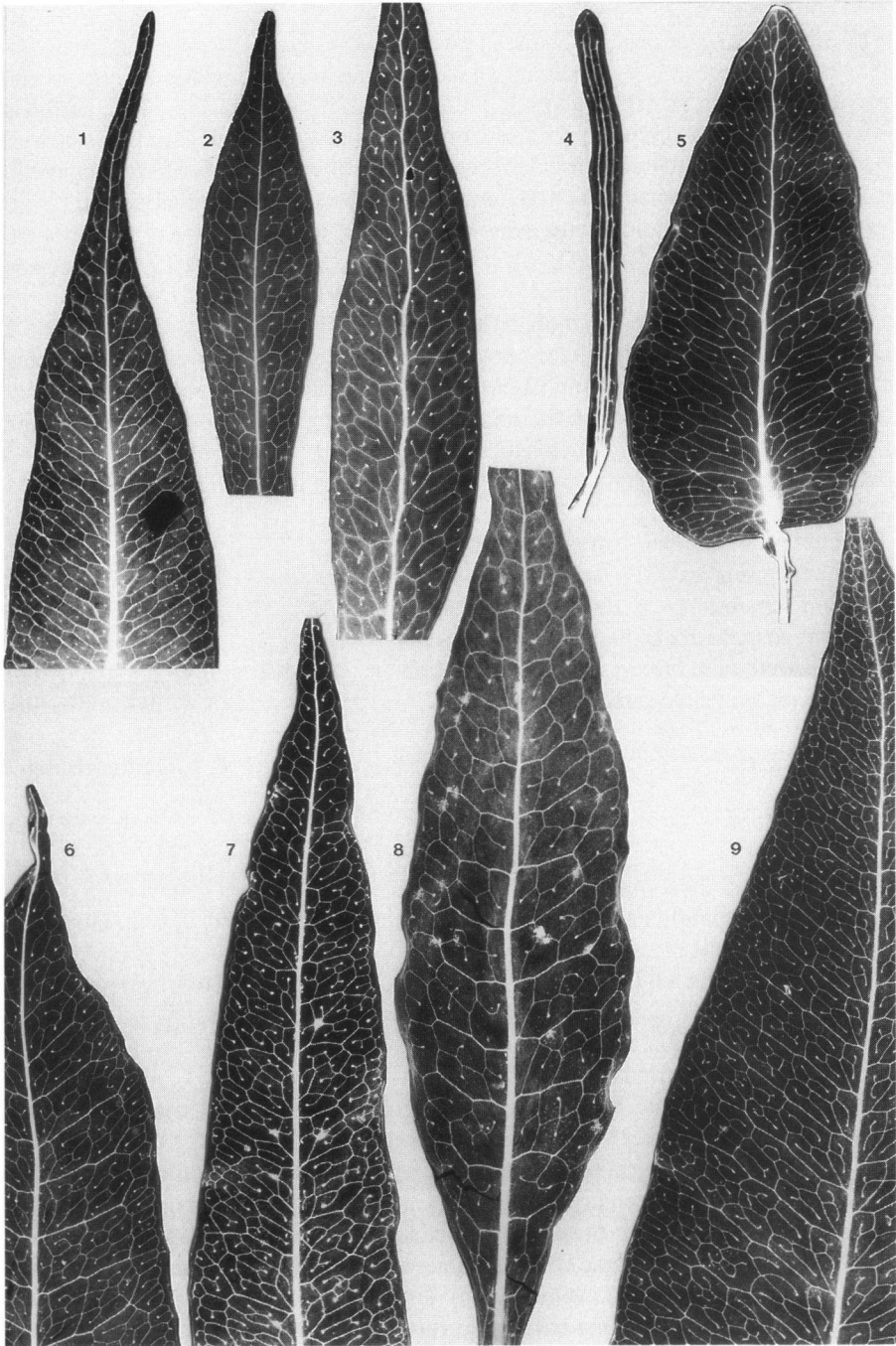


Plate 7. Venation. — 1: *Leptochilus amplus* (Brass 19900). — 2: *Ibid.* (van Balgooy 1503). — 3: *L. axillaris* (Zollinger 2219A). — 4: *L. cantoniensis* (Lau 3321). — 6: *L. decurrens* (Cavalerie 3395). — 7: *Ibid.* (Cavalerie 4176). — 8: *Ibid.* (Posthumus 3468). — 9: *L. digitatus* (Poilane 5281). — All $\times 0.5$.

1. *Leptochilus amplus* (F. Muell.) Noot., *comb. nov.* — Plate 7: 1, 2

Grammitis ampla F. Muell. ex Benth., Fl. Austr. 7 (1878) 777. — *Colysis ampla* Copel., Gen. Fil. (1947) 199; S.B. Andrews, Ferns of Queensland (1990) 269. — *Polypodium amplum* (F. Muell.) Domin, Bibl. Bot. 85 (1913) 182, incl. var. — Type: *F. von Mueller* (K), Australia, Queensland, Daintree River and Rockingham Bay.

Gymnogramma sayeri Baker & F. Muell., J. Bot. 25 (1887) 163. — *Grammitis sayeri* F. Muell., Sec. Syst. Census Austral. Pl. 1, vasc. (1889) 234. — *Polypodium selliguea* var. *sayeri* Domin, Bibl. Bot. 85 (1913) 182. — *Colysis sayeri* Copel., Gen. Fil. 6 (1947) 199; S.B. Andrews, Ferns of Queensland (1990) 270. — Type: *Sayer & Davidson* (K), Australia, Queensland, Mt Bellenden Ker.

Gymnogramma baileyi Baker, Kew Bull (1892) 86. — *Colysis baileyi* Ching, Sunyatsenia 5 (1940) 261. — Type: *Colonial Botanist 12/91* (n.v.).

Rhizome 1.8–6 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 14–18, the roots densely set. Scales peltate, densely set or apically densely set, otherwise about sparsely set, distinctly spreading, narrowly ovate or triangular, 2–5 mm long, 1–2 mm broad, margin denticulate, clathrate, or subclathrate, central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 15–25 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina pinnatifid (rarely simple), base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, the undersurface without acicular hairs. Lamina of dissected leaf elliptic to ovate, 22–60 cm long, 14–30 cm broad, widest below the middle to about the middle, 0.5–2 cm wide between the lobes at place of longest lobes, index 1.5–2; stipe present, 1–8 cm long, 1–4 mm diam.; lobes 2–9 at each side, longest lobes widest about middle, at position 2–4 from base, 7–17 cm long, 1–4 cm broad, index 5–10; the apical lobe longer than the upper lateral lobes, 10–18 cm long, 1.5–4.5 cm broad, widest about or below the middle. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins prominent and distinct, 5–6 mm apart, zigzag, dichotomously branched near the margin or about the middle, connecting veins 1–3 between adjacent veins, anadromous, smaller veins prominent and distinct, free veinlets simple or once forked. *Sori* connate, one coenosorus between each pair of veins, superficial or slightly immersed, on the whole surface of the lamina (usually).

Distribution — Australia (N Queensland).

Habitat & Ecology — Epiphyte low on trees, rhizome climbing vertically, sometimes an erect ground fern with rhizome creeping over rocks, rare to very common in dry to very wet rain forest. Altitude 60–1600 m.

Note — The present species forms a connection with the group of species in *Microsorium* that belonged to *Phymatosorus*. In some collections the coenosori become shorter to the extent that they are nearly circular. As the sori form the only difference between *Leptochilus amplus* and *Microsorium scandens*, except that the latter is larger and has broader lobes, it appears that the two genera here merge. I suspect that the collections with nearly circular sori are of hybrid origin. They generally are larger and coarser than *M. scandens*, but are intermediate in appearance between the two species.

2. *Leptochilus axillaris* (Cav.) Kaulf. — Plate 1: 2; 7: 3

Leptochilus axillaris (Cav.) Kaulf., Companion Bot. Mag. (1824) 147; Blume, Enum. Pl. Javæ (1828) 205; Copel., Fern Fl. Philipp. (1960) 488. — *Acrostichum axillare* Cav., Analecta Hist. Nat. 1 (1799) 101; Descr. Pl. (1801) nr. 582; Sw., Syn. Fil. (1806) 11, 16. — *Gymnopteris axillaris* var. *axillaris* Bedd., Handb. Ferns Brit. Ind. (1883) 430. — Type: *Née* (n.v.).

Leptochilus platyphyllus Copel., Philipp. J. Sci. 37 (1928) 340. — Type: *Hancock 61* (K, PE), Sumatra.

Rhizome 1.5–3.5 mm wide, dorso-ventrally flattened, not white waxy, bearing scales and hairs, with only circumvascular sheaths, vascular bundles 7–15, roots absent or rare (only in the young, terrestrial parts), root hairs on the rhizome. Scales peltate, sparsely set, distinctly spreading, narrowly ovate or triangular, 0.5–2 mm long, 0.1–0.2 mm broad, margin denticulate, clathrate or subclathrate. Phyllopodia more or less distinct, 3–80 mm apart. *Leaf* strongly dimorphous, thin-herbaceous. Lamina simple, narrowly elliptic or narrowly ovate, 9–36 cm long, 1.1–6.5 cm broad, index 3–10, the base narrowly angustate and the stipe winged for a considerable part to cuneate-angustate, cuneate, or even cordate and auriculate, margin entire, undersurface without acicular hairs; 2–9 cm long, 0.9–1.5 mm diam. Lamina of fertile leaves simple, linear, 15–30 cm long, 0.1–0.5 cm broad; stipe present, 2–7 cm long. Venation type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles. Veins prominent and distinct, 7–10 mm apart, zigzag, connecting veins 2–4 between adjacent veins, catadromous, smaller veins prominent and distinct, free veinlets simple or once forked. *Sori* acrostichoid.

Distribution — Continental Asia: India (Assam: Manipur); Bangladesh; Burma (Tenasserim); N Thailand (Chiengrai, Chiengmai). In Malesia: Sumatra (Sumatera Utara, Medan; Sumatera Barat, Kerinci); Peninsular Malaysia (Perak); Java (in the mountains); Lesser Sunda Islands (Bali, Flores); Borneo: Kalimantan Selatan; Philippines (Luzon, Laguna Prov., Banago; Mindanao, Lake Lanao, Mt Katanglad); Papua New Guinea (Morobe Prov.).

Habitat & Ecology — Epiphyte, often on foot of trees or up to 6 m high, rarely epilithic. Generally in the mountains up to 2100 m altitude, rarely also in lowland.

3. *Leptochilus cantoniensis* (Baker) Ching — Plate 7: 4

Leptochilus cantoniensis (Baker) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 343. — *Gymnogramma cantoniense* Baker in Hook. & Baker, Icon. Pl. (1887) t. 1685. — *Polypodium cantoniense* C. Chr., Index Filic. (1906) 515. — *Christiopteris cantoniensis* H. Christ, J. Bot. (Morot) 21 (1908) 273. — *Campium cantoniense* Ching, Sinensia 1 (1930) 54. — *Dendroglossa cantoniensis* Copel., Gen. Fil. (1947) 199. — Type: *Ford* (n.v.).

Drymoglossum cordatum H. Christ, Notul. Syst. (Paris) 1 (1911) 375. — *Myuropteris cordata* C. Chr., Dansk Bot. Ark. 6 (1929) 73, pl. 9 f. 1, 2; pl. 10 f. 3. — *Leptochilus cordatus* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 343. — Type: *Cadière 158* (P), Annam, Bao-Long.

Campium dilatatum Copel., Philipp. J. Sci. 37 (1928) 347, pl. 4, 2. — Type: *E. Smith 1446* (UC), Hainan.

Rhizome 1–2 mm wide, rounded, not white waxy, with only scattered strands of sclerenchyma, sclerenchyma strands 10–50, roots sparsely set. Scales pseudopel-

tate, densely set, slightly spreading, ovate or triangular, 1.5–2.5 mm long, 0.5–1 mm broad, margin entire or denticulate, apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region bearing multiseptate hairs at least when young. Phyllopodia obscure. *Leaf* strongly dimorphous, thin-herbaceous to herbaceous. Lamina simple, ovate to deltoid, 2–7 cm long, 1.5–4 cm broad, index 1.6–2, base truncate to truncate-angustate to cordate, auriculate, margin entire, apex rounded, undersurface without acicular hairs; stipe present, 1–11 cm long, 0.5–1 mm diam. Lamina of fertile leaves simple, linear, 1.5–15 cm long, 0.1–0.5 cm broad; stipe present, 12–30 cm long. Venation type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles. Veins more or less immersed and vague, 1–2 mm apart, zigzag, dichotomously branched near the margin, connecting veins 2 or 3 between adjacent veins, smaller veins more or less immersed and vague, marginal vein absent. *Sori* in acrostichoid patches or fully acrostichoid; paraphyses simple uniseriate hairs with glandular top cells.

Distribution — China (Guangdong, North River; Hainan); Vietnam (Annam).

Ecology — Generally on rocks along streams and in springs on steep sandy slopes.

4. *Leptochilus decurrens* Blume — Plate 1: 2; 7: 6–8

Leptochilus decurrens Blume, Enum. Pl. Javae (1828) 206; C. Chr., Contr. U.S. Natl. Herb. 26 (1931) 325; Holtum, Revis. Fl. Malaya 2, 2nd ed. (1966) 164; W.C. Shieh et al., Fl. Taiwan 1, 2nd ed. (1994) 494. — *Anapausia decurrens* C. Presl, Epim. Bot. (1851) 186; Copel., Fern Fl. Philipp. (1960) 488. — *Acrostichum variabile* Hook., Sp. Fil. 5 (1864) 277. — *Gymnopteris variabilis* Bedd. in Hook., Fl. Brit. India (1868) t. 272. — *Campium decurrens* Copel., Philipp. J. Sci. 37 (1928) 351. — *Paraleptochilus decurrens* Copel., Gen. Fil. (1947) 198, t. 7. — *Coly-sis decurrens* (Blume) Manickam & Irudayaraj, Taxon 46 (1997) 267. — Type: *Blume* (L 908. 286-396), Java.

Leptochilus hilocarpus Fée, Mém. Foug. 2. Hist. Acrost. (1845) 87, t. 48 f. 1. — Type: *Gaudichaud, voy. de la Bonite* (P).

Leptochilus lanceolatus Fée, Mém. Foug. 2. Hist. Acrost. (1845) 87, pl. 47 f. 1; Nakaike, Enum. Pterid. Jap. Filic. (1975) 339. — *Dendroglossa lanceolata* Fée, Mém. Foug. 5. Gen. Filic. (1852) 81, excl. syn. — *Gymnopteris feei* T. Moore, Index Fil. (1857) XXIX. — *Acrostichum lanceolatum* Hook., Sp. Fil. 5 (1864) 276, non L. 1753. — *Pleopeltis feei* Alderw., Malayan Ferns Suppl. 1 (1917) 405. — *Campium lanceolatum* Copel., Philipp. J. Sci. 37 (1928) 348, pl. 5, 2. — Syntypes: *Hügel 1348, Perrotet* (n.v.).

Gymnopteris feei var. *pinnatifida* Bedd., Ferns S. India (1864) 71, t. 211. — *Acrostichum variabile* var. *laciniatum* Hook., Sp. Fil. 5 (1864) 277. — *Campium laciniatum* Copel., Philipp. J. Sci. 37 (1928) 354, pl. 5, 1 & pl. 7. — *Leptochilus laciniatus* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 344, excl. syn. *Gymnopteris feei* var. *triloba*. — Type: *Gardner (Thwaites CP) 1318* (K), Ceylon.

Leptochilus thwaitesianus Fée, Mém. Foug. 10 (1865) 7. — Type: *Gardner (Thwaites CP) 1316* (K, L, P), Ceylon.

Leptochilus zeylanicus Fée, Mém. Foug. 10 (1865) 8. — *Dendroglossa zeylanica* Copel., Gen. Fil. (1947) 199. — Type: *Gardner (Thwaites CP) 1317* (K, L, P), Ceylon.

Gymnopteris feei forma *anomala* Bedd., Ferns Brit. India (1868) t. 274. — Type: Bedd. (l.c.) t. 274.

Gymnopteris feei var. *triloba* Bedd., Ferns Brit. India (1868) t. 273. — Type: Bedd. (l.c.) t. 273.

Acrostichum listeri Baker, J. Linn. Soc. Bot. 25 (1890) 361. — Type: *Lister* (K), Christmas I.

Leptochilus trifidus Alderw., Bull. Dép. Agr. Ind. Néerl. 18 (1908) 26. — Type: Hort. Bog. (BO), cult.

- Leptochilus laciniatus* var. *simplex* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 344. — Type: Clarke 45389 (lecto K; iso P), Assam, Khasia.
- Colysis poilanei* C. Chr. & Tardieu, Notul. Syst. (Paris) 8 (1939) 201; Fl. Indo-Chine 7, 2 (1941) 491, t. 58 f. 3, 4. — Type: Poilane 5373 (P; iso BM), Annam.
- Colysis evrardii* Tardieu, Bull. Soc. Bot. France 87 (1941) 372, t. 2 f. 3, 4. — Type: Evrard 2250 (BM), Annam, Dalat.
- Colysis diversifolia* Zhu Wei-ming, Acta Bot. Yunn. 1 (1979) 93. — Type: W. M. Zhu 8425 (iso, KUN). See note.
- Colysis* × *beddomei* Manickam & Irudayaraj, Taxon 46 (1997) 267. — Type: Beddome 667 (K). See note.

Rhizome 2.5–3 mm wide, dorso-ventrally flattened, not white waxy, with only scattered strands of sclerenchyma (rarely also in c. 6 bundle sheaths), the sclerenchyma strands 20–100, roots densely set. Scales pseudopeltate (sometimes peltate), densely set, slightly spreading, narrowly ovate or triangular, 2–5 mm long, 0.3–1 mm broad, margin denticulate, clathrate or subclathrate, cells longitudinally rectangular (towards the apex), central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 1–7 mm apart. *Leaf* strongly dimorphous, thin-herbaceous to herbaceous. Lamina simple, narrowly ovate to ovate (to narrowly obovate), 10–50 cm long, 2.5–11 cm broad, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–18 cm long, 1.2–1.7 mm diam. Lamina of fertile leaves simple, linear to narrowly ovate to ovate, 0.1–1 cm broad; stipe present, 14–50 cm long. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles. Veins prominent and distinct, 5–12 mm apart, more or less straight or zigzag, dichotomously branched near the margin or below the middle, connecting veins 3–8 between adjacent veins, anadromous, the smaller veins more or less immersed and vague, free veinlets simple to once forked. *Sori* acrostichoid, on the whole surface of the lamina.

Distribution — Continental Asia: China (Yunnan, Guizhou); India; Sri Lanka; Sikkim; Upper Burma; Thailand; Vietnam (Annam; Tonkin: Bien Hoa, Dalat). Indian Ocean: Christmas Island. In Malesia: Sumatra (Aceh, Tapanuli), Peninsular Malaysia (Pahang, Cameron's Highlands), Java, Lesser Sunda Islands (Bali, Flores); Borneo: Brunei, Sabah (Sandakan, Belait Distr.), Kalimantan Timor (Pladjoe); Philippines (Mindanao, Zamboanga); Sulawesi (SW: G. Bonthain; C: Roroka Timbu); Papua New Guinea (Milne Bay Prov.).

Habitat & Ecology — Terrestrial, low climbing and epilithic, sometimes an erect ground fern with underground rhizome creeping on rocky bank, steep slope in montane rain forest, hill evergreen forest, moss forest. Often reported on rocks in stream. Altitude 150–2500 m, mostly on higher altitudes (in Java only 1000–1500 m).

Note — This species is very variable especially in the leafbase which can be decurrent and not leaving a stipe, or a (long) stipe is present. The same variation occurs in *L. minor*, which may be a small form of this species, and *L. macrophyllus*. Possibly polyploids occur, but this needs further investigation. Small leaves generally have a

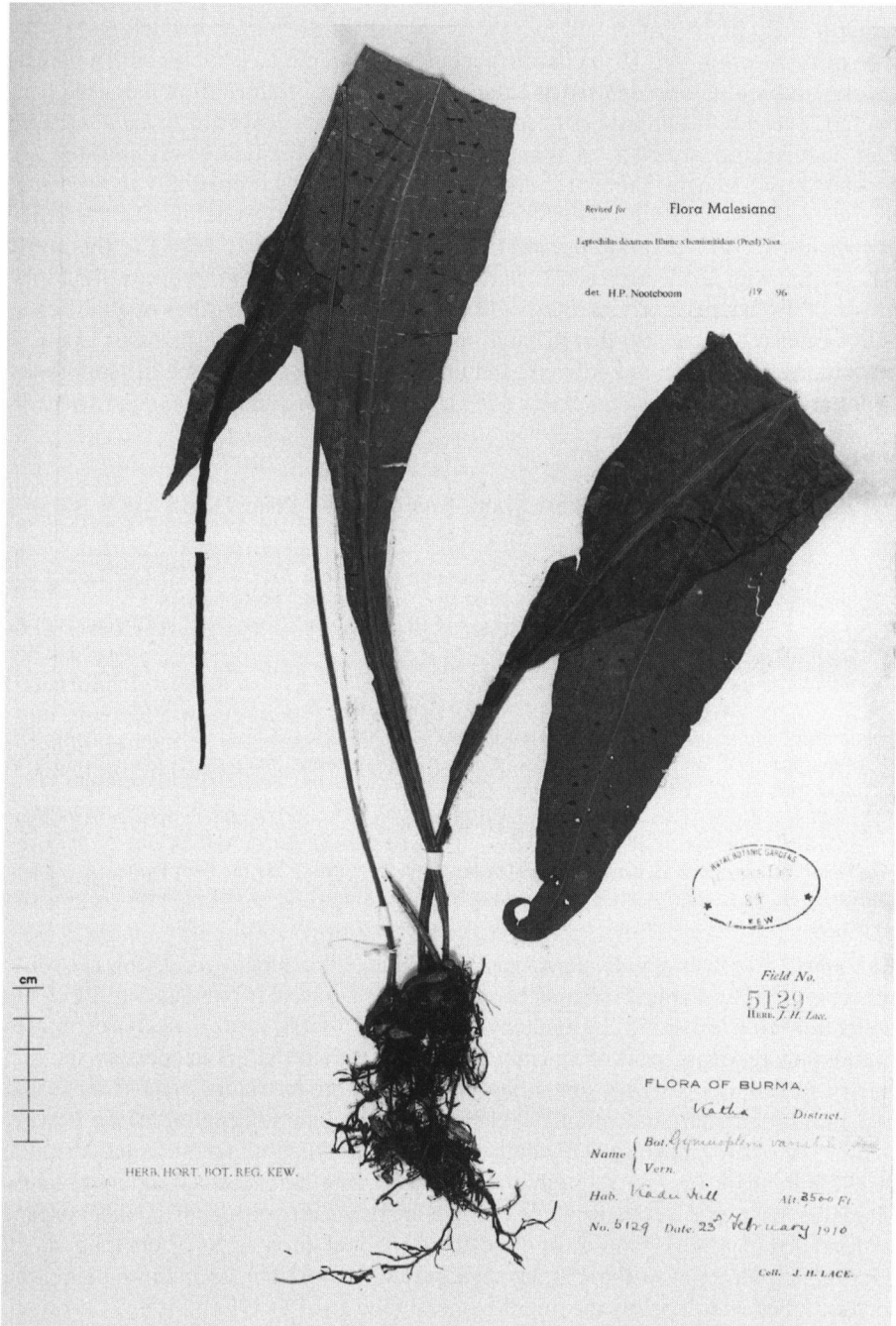


Fig. 1. ?*Leptochilus decurrens* Blume × *L. hemionitideus* (C. Presl) Noot. (J.H. Lace 5129). One plant with the fertile leaves of two species.

venation with the veins forked near the costa; this venation may occur apically in larger leaves. In Sri Lanka and India a lacinate form is found to which part of the type of *L. thwaitesianus* (*L. laciniatus*) belongs; this might be a hybrid with a pinnate species and could be recognised as a variety. In some collections from India and Burma fertile leaves of this species occur together with fertile leaves of *L. hemionitideus* (Fig. 1). Ching identified them as an intrageneric hybrid because he assigned the two species to two genera. I do not think it is a real hybrid, but apparently the genes of the two species occur together in one plant. I have them provisionally also identified as hybrids. *Colysis diversifolia* and *Colysis* × *beddomei* both belong to this form. Also forms with fertile leaves of *L. macrophyllus* var. *pedunculatus* occur. An explanation of this strange phenomenon could be that in the group the genes of all the characters involved occur, but that in each 'species' the characters of the other 'species' are suppressed. For an unknown reason in certain parts of a rhizome the suppressor genes are switched off. *Leptochilus trifidus* probably is a hybrid between *L. decurrens* and *L. macrophyllus*.

5. *Leptochilus digitatus* (Baker) Noot., *comb. nov.* — Plate 7: 9

Gymnogramma digitata Baker, J. Bot. (1890) 267. — *Polypodium digitatum* C. Chr., Index Filic. (1906) 522. — *Colysis digitata* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 328; Icon. Filic. Sin. 4 (1937) pl. 198. — Type: *Balansa 102* (K; iso L), Tonkin, Dong Dan.

Polypodium podopterum H. Christ, J. Bot. (Morot) 19 (1905) 125. — Type: *Cadière 148* (BM, P), Annam.

Polypodium ampelideum H. Christ, J. Bot. (Morot) 19 (1905) 78; Merr., Lingnan Sci J. 5 (1927) 17. — Type: *Cadière 45* (P; iso BM), Annam, Quang Binh.

Polypodium annamense H. Christ, J. Bot. (Morot) 19 (1905) 77; C. Chr., Index Filic. (1906) 508; Merr., Lingnan Sci J. 5 (1927) 16. — *Colysis digitata* forma *annamensis* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 328. — Type: *Cadière 45 bis* (n.v.).

Polypodium cadieri H. Christ, J. Bot. (Morot) 19 (1905) 76. — *Colysis digitata* forma *cadieri* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 329. — Type: *Cadière 52* (BM), Annam.

[*Selliguea finlaysoniana* H. Christ, J. Bot. (Morot), sér. 2, 1 (1908) 239, nomen: *Wallich.*]

Colysis triphylla Ching & Chu H. Wang, Acta Phytotax. Sin. 8 (1959) 170. — Type: *Tia-lo Shan Exped. 2234* (n.v.), Hainan.

Rhizome 2.5–3.4 mm wide, dorso-ventrally flattened or about cylindrical, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 5 (only in the collection *McClure 8552*), sclerenchyma strands 15–100, roots densely set. Scales pseudopeltate, densely set or apically densely set, otherwise about sparsely set, distinctly spreading or slightly spreading, narrowly ovate or triangular, 2–7 mm long, 1–2 mm broad, margin denticulate, clathrate or subclathrate, central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 5–100 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina pedately dissected, base cuneate-angustate to cuneate, margin entire or undulate, undersurface without acicular hairs. Lamina of dissected leaf about circular, 8–18 cm long, 8–26 cm broad, widest below the middle; stipe present, 10–42 cm long, 2 mm diam.; the longest lobes widest below the middle. Apical lobe 10–18 cm long, 1.5–4 cm broad, widest about or below the middle. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 2: connecting veins forming more or less a row of

about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles (in fertile leaves). Veins more or less immersed and vague or prominent and distinct, 4–5 mm apart, more or less straight or zigzag, dichotomously branched near the margin, connecting veins 2 or 3 between adjacent veins, anadromous, smaller veins more or less immersed and vague, connectives often part of a veinlet parallel to veins, free veinlets simple or once forked. *Sori* connate, one coenosorus between each pair of veins, superficial or slightly immersed, on the whole surface of the lamina.

Distribution — China (Yunnan, Guangxi, Hongkong, Guizhou, Hainan); Vietnam (Annam).

Habitat & Ecology — On stones at streamside (once recorded); 50–1400 m altitude.

Note — Rarely some or all the fertile leaves with very narrow linear lobes. Rarely simple leaves occur.

6. *Leptochilus ellipticus* (Thunb.) Noot., *comb. nov.* — Plate 1: 3; 8: 11, 14

Polypodium ellipticum Thunb., Fl. Jap. (1784) 335; C. Chr., Acta Horti Gothob. 1 (1924) 104; Chin & Hu, Icon. Filic. Sin. 1 (1930) pl. 45; Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 20, pl. 6; Wu et al., Bull. Fan Mem. Inst. Biol. 3 (1932) 320, pl. 151. — *Selliguea elliptica* Bedd., Ferns Brit. India (1870) Index; H. Christ, Bull. Soc. Bot. France 54, Mém. 1 (1905) 21; Bull. Acad. Int. Géogr. Bot. (1909) 178. — *Colysis elliptica* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 333; Copel., Fern Fl. Philipp. (1960) 491; E.H. Walker, Fl. Okinawa & Ryukyu (1976) 117. — Type: *Thunberg* (n.v.).

Hemionitis pothifolia D. Don, Prodr. Fl. Nepal. (1825) 13. — *Selliguea pothifolia* J. Sm., J. Bot. 3 (1841) 399. — *Colysis pothifolia* C. Presl, Epim. Bot. (1851) 148; W.C. Shieh et al., Fl. Taiwan 1, 2nd ed. (1994) 475. — *Colysis elliptica* var. *pothifolia* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 334. — Type: *Buchanan Hamilton* (BM), Narainhetty Nepalensium.

Grammitis decurrens Hook. & Grev., Icon. Filic. (1827) t. 6. — *Selliguea decurrens* C. Presl, Tent. Pterid. (1836) 216; Hook., J. Bot. (Hooker) (1857) 358; Bedd., Ferns Brit. India (1866) t. 150. — Type: *Wallich* 5 (K; iso BM, L, P), Nepal.

Gymnogramma longisora Baker, J. Bot. (1890) 267. — *Polypodium longisorum* C. Chr., Index Filic. (1906) 541; Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 19, pl. 3. — *Colysis longisora* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 331. — Type: *Balansa* 1980 (n.v.).

Gymnogramma pentaphylla Baker, Kew Bull. (1898) 233. — *Polypodium pentaphyllum* H. Christ, Bull. Acad. Int. Géogr. Bot. (1906) 248 (non Baker, 1891). — *Polypodium ellipticum* var. *pentaphyllum* C. Chr., Index Filic. (1906) 524. — *Polypodium mediosorum* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 19, pl. 4. — *Colysis pentaphylla* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 332; Icon. Filic. Sin. 4 (1937) Pl. 199. — Type: *Henry* 9033 (K; iso BM, P), China, Yunnan, Mengtze.

Selliguea elliptica var. *flagellaris* H. Christ, Bull. Herb. Boissier 7 (1899) 6. — *Polypodium flexilobum* H. Christ, Bull. Acad. Int. Géogr. Bot. (1904) 107. — *Colysis flexiloba* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 330. — Type: *Henry* 10769A (K), China, Yunnan.

Polypodium ellipticum var. *undulato-repandum* H. Christ, Bull. Acad. Int. Géogr. Bot. (1904) 107; Contr. U.S. Natl. Herb. 26 (1931) 324. — Type: *Esquirol* 2586 (n.v.).

Polypodium boisii H. Christ, J. Bot. (Morot) 19 (1905) 75. — *Colysis boisii* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 329. — Syntypes: *Cadière* 123 bis, 142 (n.v.).

[*Selliguea cochlearis* H. Christ, Bull. Acad. Int. Géogr. Bot. (1907) 142, non Reinw.] — *Polypodium mon-changense* C. Chr., Index Filic. Suppl. (1913) 60. — Type: *Esquirol* 577 (n.v.).

- Selliguea coraiensis* H. Christ, Feddes Repert. Spec. Nov. Regni Veg. 5 (1908) 11; Bull. Acad. Int. Géogr. Bot. (1909) 178. — *Polypodium faurianum* Nakai, Fl. Kor. 2 (1911) 316; Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 18, pl. 2. — *Polypodium neoellipticum* Koidz., Bot. Mag. Tokyo 43 (1929) 388. — Type: *Faurie 68* (P; iso BM), Corea, Quelpart I.
- Polypodium ellipticum* var. *parvum* Bonaparte, Notes Ptérid. 14 (1924) 157. — Type: *Sallet* (BM), Annam, Massif de Bah-na.
- Polypodium dissimiliatum* Bonaparte, Notes Ptérid. 14 (1924) 155. — *Colysis dissimiliata* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 330. — Type: *Eberhardt 5097* (BM), Ton kin, Chapa.
- Polypodium flexilobum* var. *undulato-crenatum* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 20. — *Colysis flexiloba* var. *undulato-repanda* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 331. — Type: *Esquirol 2586* (n.v.).
- Polypodium ellipticum* var. *furcans* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 21. — *Colysis elliptica* var. *pothifolia* forma *furcans* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 335. — Type: *Matthew 548* (n.v.).
- Polypodium morsei* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 17, pl. 1. — *Colysis morsei* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 330; Icon. Filic. Sin. 4 (1937) pl. 200. — Type: *Morse 62* (K; iso PE), China, Kwangsi, Lungchow.
- Polypodium flavescens* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 22, pl. 8. — Type: *Cavalerie 7701* (K, P), China, Kweichow, Gan-chouen.
- Polypodium latilobum* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 21, pl. 7. — *Colysis latiloba* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 330. — Type: *Clarke 42105* (K), Sikkim, Munipur.
- Polypodium ellipticum* forma *brevis* Wu et al., Bull. Fan Mem. Inst. Biol. 3 (1932) pl. 152. — Type: *Sin 3616* (n.v.).
- Colysis longipes* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 332. — Type: *Tso & Chun 43797* (PE), China, Hainan.
- Colysis sanjiangensis* H. G. Zhou & Hua Li, Acta Bot. Yunn. 15 (1993) 254. — Type: *Zhou Hougao 1778* (GXAC; iso PYU), China, Guangxi, Sanjiang Xian.

Rhizome 2–6 mm wide, dorso-ventrally flattened, not white waxy, with only scattered strands of sclerenchyma (rarely also c. 5 very weak circumvascular sheaths, very rarely no strands), sclerenchyma strands (0–)15–100, roots densely set. Scales pseudopeltate, densely set or apically densely set, otherwise more or less sparsely set, slightly spreading, (narrowly) ovate or triangular, 2.5–4 mm long, 0.5–1 mm broad, margin denticulate, clathrate or subclathrate, central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 0.8–4 cm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina pinnatifid or basal part pinnate, apical part pinnatifid (sometimes basal leaflets with petiolule), base truncate or truncate-angustate, undersurface without acicular hairs. Lamina of dissected leaf ovate, 12–60 cm long, 12–50 cm broad, widest below the middle, 0.2–1.2 cm wide between the lobes at place of longest lobes, index 1–2; stipe present, 5–56 cm long, 1.2–6.2 mm diam.; lobes 2–12 at each side, the longest lobes widest about the middle, at position 1–2(–4) from base, 8.5–26 cm long, 0.8–4.5 cm broad, index 7–20; apical lobe longer than upper lateral lobes, 8–23 cm long, 1–2.6 cm broad, widest about the middle. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins or type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branch-

ing off at or near the costa, the costal areole bordered by several smaller areoles (in fertile leaves). Veins more or less immersed and vague or prominent and distinct, 4–9 mm apart, zigzag, dichotomously branched near the margin, connecting veins 2 or 3 between adjacent veins, anadromous, smaller veins more or less immersed and vague or prominent and distinct, free veinlets simple or once forked. *Sori* connate, one coenosorus between each pair of veins.

Chromosome number — $2x = 72$ [M. Kato, Bot. Mag. Tokyo 105 (1992) 112].

Distribution — Continental and East Asia: China (Yunnan, Sichuan, Guizhou, Guangxi, Hubei, Hunan, Guangdong, Hong Kong, Hainan, Jiangxi, Anhui, Fujian, Zhejiang; Taiwan); Korea (Quelpart I.); Japan (Kyushu, Honshu, Ryukyu); India (Assam); Nepal; Sikkim; Burma; N Thailand; Vietnam, Annam. In Malesia: Philippines (Luzon, Leyte, Mindanao, Samar).

Habitat & Ecology — Terrestrial, rhizome creeping underground, sometimes at the base of trees, in hill evergreen forest, common in shady places. Altitude 450–2500 m.

7. *Leptochilus hemionitideus* (Wall. ex Mett.) Noot., *comb. nov.*

Selliguea hemionitidea C. Presl, Tent. Pterid. (1836) 216, t. 9 f. 17, nomen. — *Drynaria hemionitidea* J. Sm., J. Bot. (Hooker) 4 (1842) 61, nomen. — *Colysis hemionitidea* C. Presl, Epim. Bot. (1849) 147, nomen; Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 320; Icon. Filic. Sin. 4 (1937) pl. 195; Copel., Fern Fl. Philipp. (1960) 489; W.C. Shieh et al., Fl. Taiwan 1, 2nd ed. (1994) 475. — *Polypodium hemionitideum* [Wall., Cat. (1828) nr 284, nomen;] Mett., Farngett. (1856) 112; H. Christ, Bull. Acad. Int. Géogr. Bot. (1901) 205; J. Bot. (Morot) 19 (1905) 21; Takeda, Notes Roy. Bot. Gard. Edinb. 8 (1915) 308. — *Pleopeltis hemionitidea* T. Moore, Index Fil. (1862) 346; Bedd., Ferns Brit. India (1866) t. 182. — *Microsorium hemionitideum* Copel., Univ. Calif. Publ. Bot. 16 (1929) 112. — Type: *Wallich 284* (K, L, P), Nepal.

Polypodium ensatosessilifrons Hayata, Icon. Pl. Formos. 5 (1915) 312. — *Microsorium ensatosessilifrons* Itô, J. Jap. Bot. 11 (1935) 96. — Type: *Mori 5111* (n.v.).

Rhizome 2–4 mm wide, dorso-ventrally flattened, not white waxy, with only scattered strands of sclerenchyma, sclerenchyma strands (5–)20–100, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, slightly spreading, narrowly ovate or triangular, 2–4 mm long, 0.7–1.2 mm broad, margin denticulate, clathrate or subclathrate, central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 4–6 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple, narrowly ovate to narrowly obovate, 28–60 cm long, 3– 8.5 cm broad, index 4–12, base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acute or acuminate, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–7 cm long, 1.6–3 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins (contrary to other *Leptochilus* species in fertile leaves not or only slightly different). Veins prominent and distinct, (6–)7.6–14 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 4–7 between adjacent veins, anadromous, smaller veins prominent and distinct, free veinlets simple or once forked, the

number of secondary order areoles between two veins generally 2–4. *Sori* separate, one row of sori in one line close together between each pair of veins (often 2 or 3 connate), round or elongate, superficial or slightly immersed, absent from the basal parts for 0.3–0.5 of total length of lamina, 1–4(–7) per veinlet.

Distribution — China (Yunnan, Guizhou, Guangdong, Hongkong, Anhui, Fujian; Taiwan); Japan (Kyushu, Ryukyu); India (Darjeeling, Assam, Kerala, Orissa); Nepal; Sikkim; Bhutan; Thailand

Habitat & Ecology — Terrestrial on stones in stream, in dry evergreen forest, on wet ground in streambed in dense forest, locally common. Altitude 700–2000 m.

Note — This species is closely related to *L. macrophyllus* and differs mainly in the separate sori which are absent on the lamina base, and in the larger distance between the veins. Collections of *L. macrophyllus* with interrupted coenosori are easily misidentified as *L. hemionitideus* but usually have more sori in a row. Because of this some Malesian collections were misidentified but *L. hemionitideus* does not occur in Malesia.

8. *Leptochilus macrophyllus* (Blume) Noot., *comb. nov.*

For synonymy of the varieties, see there.

Grammitis macrophylla Blume, Enum. Pl. Javae (1828) 119. — *Polypodium macrophyllum* Reinw. in Hornsch., Syll. Pl. Nov. 2 (1828) acc. to C. Chr., Ind. Fil. but not found there; C. Chr., Acta Horti Gothob. 1 (1924) 104. — *Selliguea macrophylla* Blume, Fl. Javae. Filic. (1830) 127, t. LIII. — *Colysis macrophylla* C. Presl, Epim. Bot. (1849) 147; Holttum, Revis. Fl. Malaya 2, 2nd ed. (1966) 160; Copel., Fern Fl. Philipp. (1960) 490. — *Pleopeltis macrophylla* Alderw., Malayan Ferns Suppl. 1 (1917) 404. — Type: Blume (L 908.308-220), Java, Bantam.

Polypodium spathulaefolium Blume, Enum. Pl. Javae (1828) 134; Fl. Javae. Filic. (1847) 171, t. 78A. — Type: Blume (L 908.286-601), Java.

Polypodium spurium Mett. in Miq., Ann. Mus. Bot. Lugd.-Bat. 2 (1866) 226. — *Gymnogramma spurium* Hook. & Baker, Syn. Fil. (1868) 388. — *Pleopeltis spuria* Alderw., Malayan Ferns Suppl. 1 (1917) 405. — *Colysis spuria* Ching, Sunyatsenia 5 (1940) 261. — Type: Forsten 17 (L), Celebes.

Polypodium regulare Mett. in Miq., Ann. Mus. Bot. Lugd.-Bat. 2 (1866) 225. — *Gymnogramma regulare* Hook. & Baker, Syn. Fil. (1868) 388. — *Pleopeltis regularis* Alderw., Malayan Ferns Suppl. 1 (1917) 403. — *Colysis regulare* Ching, Sunyatsenia 5 (1940) 261. — Type: Korthals 20 (L), Borneo.

Selliguea campyloneuroides Bedd., Handb. Ferns Brit. India Suppl. (1882) 101. — *Polypodium campyloneuroides* Baker, J. Linn. Soc. Bot. 20 (1883) 229. — *Polypodium hosei* C. Chr., Index Filic. (1906) 534. — *Pleopeltis hosei* Alderw., Malayan Ferns Suppl. 1 (1917) 403. — Type: Hose 127 (P), Borneo, Sarawak.

Gymnogramma acuminata Baker, J. Bot. (1888) 326 (non Kaulf., 1824). — *Polypodium interruptum* C. Chr., Index Filic. (1906) 535. — *Pleopeltis interrupta* Alderw., Malayan Ferns Suppl. 1 (1917) 403. — *Colysis acuminata* Holttum, Revis. Fl. Malaya (1955) 162, f. 73. — Type: Hose 238 (K; iso BM), Borneo, Sarawak.

Polypodium bolsteri Copel., Philipp. J. Sci. 1, Suppl. (1906) 257, pl. 4a. — *Pleopeltis bolsteri* Alderw., Malayan Ferns Suppl. 1 (1917) 408. — *Colysis bolsteri* Copel., Fern Fl. Philipp. 3 (1960) 489. — Type: Bolster, April 1906 (n.v.).

Polypodium linealifolium Rosenst., Nova Guinea 8, Bot. (1912) 728. — *Pleopeltis linealifolium* Alderw., Malayan Ferns (1917) 405. — Type: von Römer 27 (BO), New Guinea.

Polypodium loxogrammoides Copel., Philipp. J. Sci., Bot. 7 (1912) 65. — *Pleopeltis loxogrammoides* Alderw., Malayan Ferns Suppl. 1 (1917) 405. — *Colysis loxogrammoides* M.G. Price, Contr. Univ. Michigan Herb. 16 (1987) 193. — Type: S 17 (n.v.), Borneo, Sarawak, Limbang.

- Pleopeltis selligueoides* Alderw., Bull. Jard. Bot. Buitenzorg II, 23 (1916) 18. — Type: *Brooks 256/s* (BO; iso L, P), Sumatra, Bengkulu, Lebong Tandai.
- Polypodium polysorum* Brause, Bot. Jahrb. Syst. 56 (1920) 203. — Type: *Ledermann 10159* (n.v.) Also cited: *Ledermann 12865* (BM), New Guinea, Sepik.
- Pleopeltis pseudoloxogramma* Alderw., Bull. Jard. Bot. Buitenzorg III, 5 (1922) 218. — *Selliguea pseudoloxograma* Ching, Sunyatsenia 5 (1940) 260. — Type: *Kornassi 1373* (BO; iso L), Moluccas, Ceram.
- Selliguea membranacea* var. *fluminalis* Ridl., J. Malayan Branch Roy. Asiat. Soc. 4 (1926) 89. — *Colysis acuminata* var. *fluminalis* Hennipman in Steenis, Rheophytes of the World (1981) 157; M. Kato, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 15 (1991) 103. — Type: *Curtis* (iso K), Langkawi, foot of Mt Raya.
- [*Colysis acuminata* var. *angustata* Holttum, Revis. Fl. Malaya 2, 2nd ed. (1966) 163, nomen inval.]

Rhizome 1.2–8 mm wide, dorso-ventrally flattened, not white waxy, with only scattered strands of sclerenchyma, with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 5–20, sclerenchyma strands 5–150, roots densely or sparsely set. Scales pseudopeltate, densely set or apically so, slightly spreading, ovate or narrowly ovate or triangular, 1.2–7 mm long, 0.3–2 mm broad, margin entire or denticulate, apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 1–20 mm apart. *Leaf* dimorphous or not, thin-herbaceous, herbaceous or subcoriaceous. Lamina simple, elliptic, ovate, or obovate or narrowly so, 11–60 cm long, 2–13 cm broad, index 3–15, base truncate-angustate or narrowly angustate and the stipe winged for a considerable part, or cuneate-angustate, margin entire or undulate, apex acuminate, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–20 cm long, 0.7–5 mm diam. Lamina of fertile leaves from linear to the same as sterile leaves, 4–25 cm long, 0.3–5 cm broad; stipe present, 2–46 cm long. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching of at or near the costa, the costal areole bordered by several smaller areoles, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins more or less immersed and vague or prominent and distinct, 3–7.5 mm apart, more or less straight or zigzag, dichotomously branched near the margin, connecting veins 2–6 between adjacent secondary veins, anadromous, smaller veins more or less immersed and vague or prominent and distinct, free veinlets simple or once forked, number of secondary order areoles between two veins generally 1 or 2. *Sori* connate or separate, one row of sori in one line close together between each pair of veins, superficial or slightly immersed, on the whole surface of the lamina; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Outside Malesia: China, Japan, Korea, India (incl. Himalayan States and Sri Lanka), Burma, Thailand, Vietnam and Pacific Islands. In Malesia: Sumatra, Peninsular Malaysia, or Java, Lesser Sunda Islands, Borneo, Philippines, Sulawesi, Moluccas, New Guinea.

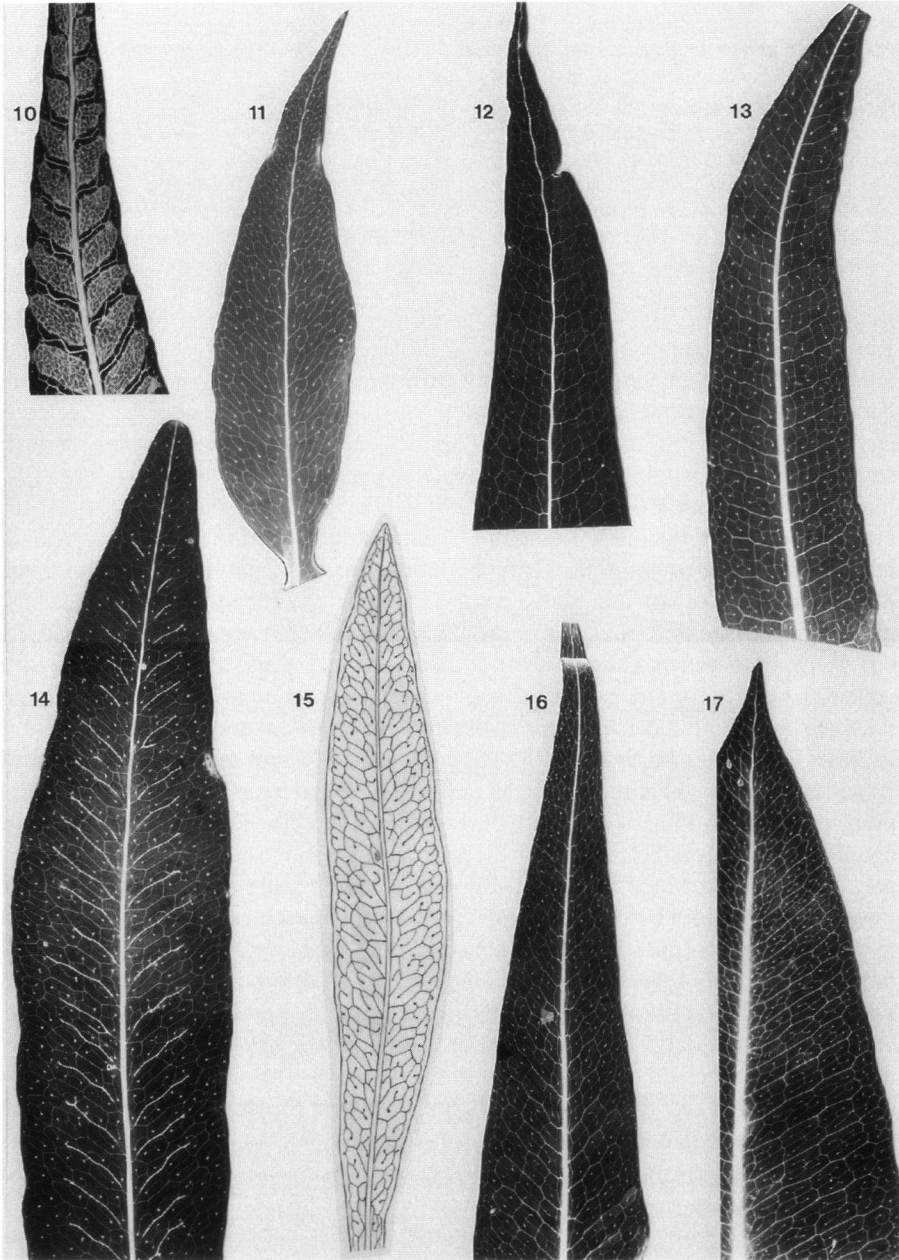


Plate 8. Venation. — 10: *Leptochilus macrophyllus* var. *pedunculatus* (van Beusekom & Phengklai 202). — 11: *L. ellipticus* (Tagawa 2594). — 12: *L. macrophyllus* var. *macrophyllus* (Grashoff 33). — 13: *L. macrophyllus* var. *pedunculatus* (Evrard 1921). — 14: *L. ellipticus* (Hennipman 3391). — 15: *L. minor* (van Beusekom 396). — 16: *L. macrophyllus* var. *fluviatilis* (Elmer 21843). — 17: *L. macrophyllus* var. *wrightii* (Eberhardt 9192). — All about $\times 0.5$.

KEY TO THE VARIETIES

- 1a. Leaf not or slightly dimorphous 2
 b. Leaf strongly dimorphous 3
 2a. Rhizome with only scattered strands of sclerenchyma **d. var. wrightii**
 b. Rhizome with circumvascular sheaths and scattered strands of sclerenchyma ..
 **a. var. macrophyllus**
 3a. Rhizome with only circumvascular sheaths **b. var. fluviatilis**
 b. Rhizome with only scattered strands of sclerenchyma, or with circumvascular
 sheaths and scattered strands of sclerenchyma 4
 4a. Rhizome with only scattered strands of sclerenchyma, scales 0.5–0.8 mm broad
 **c. var. pedunculatus**
 b. Rhizome with circumvascular sheaths and scattered strands of sclerenchyma, the
 scales 1–2 mm broad **a. var. macrophyllus**

a. var. macrophyllus — Plate 1: 4–6; 8: 12

Rhizome 1.6–8 mm wide, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 5–20, sclerenchyma strands 20–100, roots densely set. Scales 2–7 mm long, (1–)1.5–2 mm broad, margin entire or rarely denticulate. *Leaf* dimorphous or not (in some forms the fertile leaves smaller and/or narrower than the sterile leaves), thin-herbaceous to subcoriaceous. Lamina 14–60 cm long, 4–13 cm broad, index 3–15, base truncate-angustate or narrowly angustate, the stipe winged for a considerable part or cuneate-angustate, margin entire or undulate; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–20 cm long (often longer in fertile leaves), 0.8–5 mm diam. Stipe present in fertile leaves, 2–46 cm long. Veins more or less immersed and vague or prominent and distinct, 4–7.5 mm apart, connecting veins (2–)3–6 between adjacent veins. *Sori* connate or separate, one row of sori in one line close together between each pair of veins, (4–)5–20 per veinlet (in plants where the coenosori are interrupted).

Distribution — China (Quangdong, Yunnan); Japan (Ryukyu); Peninsular Thailand; Pacific Ocean: Solomon Islands. In Malesia: Sumatra; Peninsular Malaysia (Kedah, Pahang, Selangor, Johore, Langkawi Is.); Java; Lesser Sunda Islands (Bali, Flores); Borneo; Philippines; Sulawesi; Moluccas (Halmahera, Buru, Ceram); New Guinea.

Habitat & Ecology — Terrestrial and on rocks by streams to low epiphyte on small trees, rarely in open land, usually in wet places. From low altitude up to 1800 m.

Uses — Dried over fire and eaten instead of salt (Papua New Guinea, Mt Hagen).

Note — *Polypodium linealifolium* Rosenst. is close to var. *fluviatilis*

b. var. fluviatilis (Lauterb.) Noot., *comb. nov.* — Plate 1: 7; 8: 16

Polypodium fluviatile Lauterb., Bot. Jahrb. Syst. 44 (1910) 507. — *Pleopeltis fluviatilis* Alderw., Malayan Ferns Suppl. 1 (1917) 403. — *Colysis fluviatilis* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 319; Steenis, Rheophytes of the World (1981) 157; M. Kato, J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 15 (1991) 104. — Type: *Winkler 2830* (BM, K, L), East Borneo.

Rhizome 1.2–3 mm wide, with only circumvascular sheaths, vascular bundles 5–10, roots densely or sparsely set. Scales 1.2–2 mm long, 0.3–0.8 mm broad, margin

entire (or minutely denticulate). *Leaf* strongly dimorphous, thin-herbaceous. Lamina narrowly elliptic to narrowly ovate, 11–22 cm long, 2–4 cm broad, the base cuneate-angustate, underside sometimes with acicular hairs; stipe present, 1.5–13 cm long, 0.7–1.4 mm diam. Lamina of fertile leaves simple, linear to narrowly elliptic, 12–25 cm long, 0.3–1.3 cm broad; stipe present, 17–40 cm long. Venation type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins 3–6 mm apart, connecting veins 3–5 between adjacent veins, anadromous. *Sori* connate.

Distribution — Borneo: Sarawak, Sabah, Kalimantan Timor; Philippines (Luzon, Los Baños; Samar), Sulu Archipelago (Parang, Tawi Tawi); New Guinea.

Habitat & Ecology — On rocks in and by streams, often submerged; at low altitudes.

Note — This variety does not differ much from some other dimorphic forms of *L. macrophyllus*. It is a rheophyte and the rhizome lacks sclerenchyma strands. Possibly *Polypodium linealifolium* belongs here.

c. var. pedunculatus (Hook. & Grev.) Noot., *comb. nov.* — Plate 1: 8; 8: 10, 13

[*Grammitis hamiltoniana* Wall., Cat. (1828) 9, nomen.] — *Ceterach pedunculatum* Hook. & Grev., Icon. Filic. (1829) t. 5. — *Selliguea hamiltoniana* C. Presl, Tent. Pterid. (1836) 216; Bedd., Ferns Brit. India (1867) t. 239; H. Christ, Bull. Soc. Bot. France 52, Mém. 1 (1905) 21. — *Selliguea pedunculata* C. Presl, Epim. Bot. (1851) 146. — *Gymnogramma hamiltoniana* Hook., Sp. Fil. 5 (1864) 161; Hook. & Baker, Syn. Fil. (1868) 389. — *Polypodium pedunculatum* Salomon, Nomencl. Gefässkrypt. (1883) 312. — *Pleopeltis pedunculata* Alderw., Malayan Ferns Suppl. 1 (1917) 405. — *Colysis pedunculata* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 321; Holttum, Revis. Fl. Malaya 2, 2nd ed. (1966) 160. — Type: *Wallich 9* (K), India, Sylhet.

Grammitis membranacea Blume, Enum. Pl. Javae (1828) 118. — *Selliguea membranacea* Blume, Fl. Javae. Filic. (1830) 123, t. 52 f. 2; Mett., Farn. (1856) 111. — *Colysis membranacea* C. Presl, Epim. Bot. (1849) 147; Copel., Fern Fl. Philipp. (1960) 490; Y.X. Lin, Acta Phytotax. Sin. 31 (1993) 476. — *Polypodium selliguae* Mett., Farn. (1856) 111. — *Pleopeltis selliguae* Alderw., Malayan Ferns Suppl. 1 (1917) 403. — *Colysis selliguae* Ching, Sunyatsenia 5 (1940) 261. — Type: *Blume* (L 908.286-58), Java, Salak

Leptochilus ovatus Copel., Philipp. J. Sci., Bot. 9 (1914) 229. — *Campium ovatum* Copel., Philipp. J. Sci. 37 (1928) 354, pl. 6. — Type: *Brooks 155* (BM, P), Sumatra, Bengkulu.

Colysis wui Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 322; Icon. Filic. Sin. 4 (1937) pl. 194. — *Polypodium wui* C. Chr., Bull. Dept. Biol. Sun Yatsen Univ. 13 (1933) 17. — Type: *Sin & Wang 513* (n.v.).

Rhizome 2–5 mm wide, with only scattered strands of sclerenchyma, sclerenchyma strands (5–)50–150, roots densely set or sparsely set. Scales 3–4 mm long, 0.5–0.8 mm broad, margin denticulate, apex acute. *Leaf* strongly dimorphous, herbaceous. Lamina 14–34 cm long, 2–10 cm broad, base cuneate-angustate to narrowly angustate, the stipe winged for a considerable part; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–12 cm long, 1.6–2 mm diam. Lamina of fertile leaves ovate, deltoid, elliptic or narrowly elliptic, 4–24 cm long, 1–5 cm broad; stipe 13–45 cm long. Veins prominent and distinct, dichotomously branched near the margin. *Sori* connate (rarely in acrostichoid patches between the veins), on the whole surface of the lamina.

Distribution — Continental Asia: China (Guangxi); India (Darjeeling, Assam); Burma; Thailand; Vietnam (Annam). In Malesia: Sumatra (Aceh, Benkulu); Peninsular Peninsula (Perak, Kelantan, Pahang, Selangor, Langkawi Is.); W Java (Gedeh-Pangrango).

Habitat & Ecology — Epiphytic and epilithic, on boulders by stream, along coast in Peninsular Thailand. Altitude 0–1500 m.

d. var. wrightii (Hook. & Baker) Noot., *comb. nov.* — Plate 8: 17

Gymnogramma wrightii Hook. & Baker, Syn. Fil. (1867) 388; Hook., Sp. Fil. 5 (1899) 160, t. 303. — *Selliguea wrightii* J. Sm., Hist. Fil. (1875) 102. — *Polypodium wrightii* Mett. in Engl. & Prantl, Nat. Pflanzenfam. 1, 4 (1899) 316. — *Colysis wrightii* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 324; Icon. Filic. Sin. 4 (1937) pl. 196; E.H. Walker, Fl. Okinawa & Ryukyu (1976) 117; Nakato, J. Jap. Bot. 65 (1990) 204; W.C. Shieh et al., Fl. Taiwan 1, 2nd ed. (1994) 477. — Type: *C. Wilford* (n.v.).

Gymnogramma henryi Baker, J. Bot. (1887) 171. — *Gymnogramma macrophylla* auct.: Baker, J. Bot. (1888) 230 (non Hook.). — *Selliguea henryi* H. Christ, Bull. Herb. Boissier 6 (1898) 879; Bull. Soc. Bot. France 52, Mem. 1 (1905) 25. — *Polypodium henryi* C. Chr., Index Filic. (1906) 532. — *Colysis henryi* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 325. — Type: *Henry 2114* (K; iso P), China, Nanto.

Selliguea leveillei H. Christ, Bull. Acad. Int. Géogr. Bot. (1906) 236. — *Polypodium leveillei* C. Chr., Index Filic. Suppl. (1913) 60; Ching & Hu, Icon. Filic. Sin. (1930) t. 46. — *Colysis leveillei* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 323. — Type: *Cavalerie 1916* (n.v.).

Polypodium kusukusene Hayata, Icon. Pl. Formos. 5 (1915) 320, f. 131. — Type: *Hayata & Sasaki* (according to Ching).

Polypodium leveillei forma *major* C. Chr. in Wu, Bull. Fan Mem. Inst. Biol. 3 (1932) 312, pl. 147. — *Colysis leveillei* forma *major* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 324. — Type: *Sin & Wang 1510* (n.v.).

Polypodium leveillei forma *angustata* C. Chr. in Wu, Bull. Fan Mem. Inst. Biol. 3 (1932) 310, pl. 146. — *Colysis leveillei* forma *angustata* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 324. — Type: *Sin & Wang 6A* (n.v.).

Colysis bonii Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 322; Tardieu & C. Chr., Fl. Indo-Chine 7, 2 (1941) 492. — Type: *Bon 2395* (BM, P), Tonkin.

Colysis hokouensis Ching, Bull. Fan Mem. Inst. Biol. N.S. 1 (1949) 284. — Type: *Yu T.T. 1044* (n.v.).

Colysis intermedia Ching & Chu H. Wang, Acta Phytotax. Sin. 8 (1959) 170. — Type: *Western Hainan Exped. 236* (n.v.), Hainan.

Colysis saxicola H.G. Zhou & Hua Li, Acta Bot. Yunn. 15 (1993) 253. — Type: *Zhou Hougao 2605* (GXAC; iso PYU), China, Guangxi, Napo Xian, Nonghua.

Rhizome 1.2–5 mm wide, with only scattered strands of sclerenchyma, sclerenchyma strands (5–)20–150. Scales 2–5 mm long, 0.5–1 mm broad, margin denticulate. *Leaf* not or slightly dimorphous (in some forms the fertile leaves smaller and/or narrower than sterile leaves), thin-herbaceous to subcoriaceous. Lamina 14–60 cm long, 4–13 cm broad, index 3–15, base truncate-angustate or narrowly angustate, the stipe winged for a considerable part or cuneate-angustate; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–20 cm long (often longer in fertile leaves), 0.8–5 mm diam. Veins more or less immersed and vague or prominent and distinct, 4–7.5 mm apart. *Sori* connate.

Chromosome number — $2n = 74, 75$ (Nakato, 1990: 204).

Distribution — China (Yunnan, Sichuan, Guizhou, Guangxi, Guangdong, Hongkong, Hainan, Fujian, Zhejiang; Taiwan); Korea (Quelpart I.); Japan (Kyushu, Ryukyu); Vietnam (Annam, Nhatrang & Tonkin).

Habitat & Ecology — Terrestrial and epiphytic, often in wet and shadowy places. Altitude 150–1000 m.

Note — Intermediates between this taxon and *L. decurrens*, with partly acrostichoid fertile leaves, occur, for instance *Garrett 659* from northern Thailand.

9. *Leptochilus minor* Fée — Plate 1: 9; 8: 15

Leptochilus minor Fée, Mém. Foug. 2. Hist. Acrost. (1845) 87, pl. 25 f. 3. — [*Gymnopteris normalis* J. Sm., J. Bot. (Hooker) 3 (1841) 403, nomen.] — [*Dendroglossa normalis* C. Presl, Epim. Bot. (1851) 149; Fée, Mém. Foug. 5. Gen. Filic. (1852) 81, nomen illeg.] — *Acrostichum minus* Mett., Fil. Hort. Bot. Lips. (1856) 20; Hook., Sp. Fil. 5 (1864) 277. — *Gymnopteris minus* Hook., Sec. Cent. Ferns (1861) under t. 78, but excl. the plate; plate 86 belongs here! — *Acrostichum lanceolatum* var. *normale* Hook., Sp. Fil. 5 (1864) 277. — *Campium minus* Copel., Philipp. J. Sci. 37 (1928) 345, pl. 4 f. 1. — *Dendroglossa minor* Copel., Gen. Fil. (1947) 199; Fern Fl. Philipp. (1960) 491. — *Colysis minor* M.G. Price, Kalikasan 3 (1974) 176. — Type: *Cuming 326* (K, P), Philippines, Samar.

Leptochilus linnaeanus Fée, Mém. Foug. 2. Hist. Acrost. (1845) 87, pl. 47 f. 2, excl. syn. — *Acrostichum linnaeanus* Hook., Sec. Cent. Ferns (1860) t. 26. — *Campium linnaeanum* Copel., Philipp. J. Sci. 37 (1928) 343, pl. 3. — Type: *Zollinger 1441* (n.v.).

Leptochilus minutulus Fée, Mém. Foug. 10 (1865) 8. — *Campium minutulum* Copel., Philipp. J. Sci. 37 (1928) 346. — *Dendroglossa minutula* Copel., Gen. Fil. (1947) 199. — Type: *Hooker & Thomson* (K), India, Khasia.

Acrostichum wallii Baker, J. Bot. 10 (1872) 146. — *Campium wallii* Copel., Philipp. J. Sci. 37 (1928) 348. — *Dendroglossa wallii* Copel., Gen. Fil. (1947) 200. — Type: *Wall* (K; iso BO), Ceylon.

Gymnopteris metallicum Bedd., Ferns Brit. India Suppl. (1876) 26, t. 390. — *Campium metallicum* Copel., Philipp. J. Sci. 37 (1928) 347. — Type: *Beddome* (K), Ceylon.

Leptochilus rizalianus H. Christ, Bull. Herb. Boissier 2 (1906) 1004. — Type: *Loher* (n.v.), Rizal, April, 1906.

Nistarika bahupunctika B. K. Nayar et al., Fern Gaz. 13 (1985) 33. — Type: *Geeverghese & Nayar CU 29263* (CAL), cultivated.

Rhizome 1.5–2.2 mm wide, dorso-ventrally flattened, not white waxy, with only scattered strands of sclerenchyma, with circumvascular sheaths and scattered strands of sclerenchyma, or without sclerenchyma, vascular bundles 4–10, sclerenchyma strands 0–50, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, slightly spreading, narrowly ovate or triangular, 1.2–3 mm long, 0.2–0.75 mm broad, margin denticulate, apex acute, clathrate or subclathrate, cells longitudinally rectangular (towards the apex), central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 3–10 mm apart. *Leaf* strongly dimorphous, herbaceous. Lamina simple, narrowly elliptic to narrowly obovate, 1.7–42 cm long, 0.6–2.3(–2.5) cm broad, index 4–20, base cuneate-angustate, margin entire, apex rounded (rarely acute), undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–3 cm long, 0.5–1 mm diam. Lamina of fertile leaves simple, linear to narrowly ovate, 0.1–0.4 cm broad; stipe present, 1–32 cm long. Venation type 2: connecting veins forming more or less a row of about equally sized areoles

between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles, or type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins or type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins. Veins more or less immersed and vague, 2–10 mm apart, zigzag, dichotomously branched about to below the middle, connecting veins 1–2(–3) between adjacent veins, anadromous, smaller veins more or less immersed and vague, free veinlets simple or once forked. *Sori* acrostichoid.

Distribution — Continental Asia: India; Sri Lanka; Vietnam (Annam, Nhatrang); Thailand (Khanchanaburi). In Malesia: Sumatra; Borneo: Sabah; Kalimantan Timor (Sangkuliran); Philippines (Luzon, Mindanao, Samar); Central Sulawesi (Sopu Valley).

Habitat & Ecology — Terrestrial, often on rocks in stream along water level, rarely epiphytic. Altitude 100–1200 m.

Note — See the note under *L. decurrens*. The larger forms of the present species merge into *L. decurrens*. *Leptochilus minor* may be a reduced form of the latter species. Some forms possess a metallic blue tint when alive but in dry state this is not shown. This metallic tint might be induced by the rheophytic habitat.

10. *Leptochilus x hemitomus* (Hance) Noot., *comb. nov.*

Polypodium hemitomum Hance, J. Bot. (1883) 269; C. Chr., Index Filic. (1906) 532. — *Colysis hemitoma* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 326; Icon. Filic. Sin. 4 (1937) pl. 197. — Type: *Henry 22104* (BM), China.

Polypodium ellipticum var. *simplicifrons* H. Christ, Bull. Herb. Boissier II, 2 (1902) 832. — *Colysis simplicifrons* Tagawa, J. Jap. Bot. 25 (1950) 114. — Type: *Faurie 4987* (n.v.).

Polypodium cavaleri Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 13 (1914) 134. — Type: *Cavalerie 4008* (n.v.).

Polypodium wrightii var. *lobatum* Rosenst., Hedwigia 56 (1916) 347. — *Polypodium shintenense* Hayata, Icon. Pl. Formos. 8 (1919) 154, f. 85, 86. — *Colysis x shintenensis* H. Itô, J. Jap. Bot. 11 (1935) 90; Lellinger, Amer. Fern J. 58 (1968) 155; E. H. Walker, Fl. Okinawa & Ryukyu (1976) 118; W. C. Shieh et al., Fl. Taiwan 1, 2nd ed. (1994) 477. — Type: *Shinton* (n.v.).

Colysis elliptica var. *pothifolia* forma *simplex* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 335. — Type: *Matthew 70* (K), Hongkong.

Colysis wrightii var. *lacerata* Nakai, Bull. Nat. Sc. Mus. Tokyo 27 (1950) 24. — Type: *Nakai* (TNS), Japan.

Rhizome 1.6–8 mm wide, dorso-ventrally flattened, not white waxy, roots densely set. Scales pseudopeltate, densely set or apically densely set, otherwise more or less sparsely set, slightly spreading, 2–7 mm long, 1.5–2 mm broad, margin denticulate, clathrate or subclathrate, central region bearing multiseptate hairs at least when young or glabrous. Phyllopodia more or less distinct, 1–20 mm apart. *Leaf* not or slightly dimorphous or strongly dimorphous (in some forms the fertile leaves smaller and/or narrower than sterile leaves), thin-herbaceous. Lamina simple but (irregularly) lobed, elliptic to ovate to obovate, 14–60 cm long, 4–13 cm broad, index 3–6, base truncate-angustate or narrowly angustate, the stipe winged for a considerable part or cu-

neate-angustate, margin entire to undulate, apex acuminate, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–20 cm long (often longer in fertile leaves), 1–5 mm diam. Stipe present, 2–46 cm long. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles (in fertile leaves). Veins more or less immersed and vague or prominent and distinct, 4–7 mm apart, more or less straight or zigzag, dichotomously branched near the margin, connecting veins 3–6 between adjacent veins, anadromous, the smaller veins more or less immersed and vague or prominent and distinct, in fertile leaves often a rather prominent veinlet between a pair of veins, free veinlets simple or once forked. *Sori* connate, one coenosorus between each pair of veins, superficial or slightly immersed, on the whole surface of the lamina.

Distribution — East Asia: China (Guangdong, Hongkong, Jiangxi); Japan (Kyushu, Ryukyu); Vietnam (Tonkin). In Malesia: Borneo: Kalimantan Timor (W of Tarakan); Central Sulawesi (Sopu Valley).

Note — This species is a hybrid between *C. macrophyllus* and, possibly, *C. elliptica*. It shows hybrid irregularity in blade outline. The plants have less sporangia and more paraphyses than the parent species. Few of the sporangia develop fully, and those that do fail to produce spores and do not dehisce in a normal manner (Lellinger, 1968). This taxon merges into *L. macrophyllus* var. *wrightii*.

MICROSORUM

Microsorium Link, Hort. Berol. 2 (1833) 110; Copel., Fern Fl. Philipp. (1960) 476; Bosman, A monograph of the fern genus *Microsorium* (Polypodiaceae). Leiden Bot. Ser. 14 (1991) 69. — Type: *Microsorium irregulare* Link [= *M. punctatum* (L.) Copel.].

Phymatodes C. Presl, Tent. Pterid. (1836) 195, nom. illeg. p.p. excl. type.

[*Cheiropteris* H. Christ, Bull. Herb. Boissier 6 (1898) 876, nomen illeg.] — *Neocheiropteris* H. Christ, Bull. Soc. Bot. France (Mém.) 52 (1905) 21; Copel., Fern Fl. Philipp. (1960) 464. — Type: *Neocheiropteris palmatopedata* H. Christ.

Dendroconche Copel., Philipp. J. Sci., Bot. 6 (1911) 91. — Type: *Dendroconche anabellae* H. O. Forbes = *Microsorium linguiforme* (Mett.) Copel.

Neolepisorus Ching, Bull. Fan Mem. Inst. Biol. 10 (1940) 11. — Type: *Neolepisorus ensatus* Ching.

Phymatosorus Pic. Serm., Webbia 28 (1973) 457. — Type: *Phymatosorus scolopendria* Pic. Serm.

Tricholepidium Ching, Acta Phytotax. Geobot. 29 (1978) 41. — Type: *Polypodium normale* Don.

Lepidomicrosorium Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 12 (1983) 1. — Type: *Lepidomicrosorium subhastatum* Ching & Shing.

Rhizome white waxy or not, creeping, with peltate or pseudopeltate clathrate or subclathrate scales, roots present. *Leaf* dimorphous or not, simple or pinnatifid; all venation types occur in this genus. The *sori* can be arranged in many different ways and are always separate: not in one or two rows between each pair of veins and not in one row parallel to the costa, scattered on the surface and sometimes forming 2–8 irregu-

lar rows between the veins, often some connate, elongate on veinlets, or one row of sori, each one (or two) per areole between each pair of veins, or one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin or close to the margin, or in two (irregular) rows between each pair of veins or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein or in one row parallel to the costa just outside the costal areole or on the connecting vein, close to the costa. The paraphyses are generally uniseriate, but in *M. membranifolium* and *M. rubidum* they are biseriate. In some species they are peltate and clathrate, like the paraphyses in *Lepisorus*

Distribution — Middle and South Africa, islands in the Indian Ocean, South, East and Southeast Asia (from Middle China and Japan southwards), Malesia, East Australia, Pacific Islands including New Caledonia, New Zealand.

Note— *Microsorium* is closely related to *Leptochilus*, the only difference being in the arrangement of the sori. Also *Lepisorus* is very similar and could be reduced to this genus; it is only different from its most closely related species in *Microsorium*, like *M. ensatum*, in the arrangement of the sori, but not always.

KEY TO THE SPECIES

In this key an anatomical character is used, the cross section of the rhizome, a character easy to observe. After making a cut with a sharp knife, a hand lens is enough.

- 1a. Sori acrostichoid 2
- b. Sori separate 3
- 2a. Scales circular or elliptic, appressed, often with eroded margins, rhizome with only circumvascular sheaths, longest lobes widest below middle, index of lobes 8 to 20 **46. *M. varians***
- b. Scales ovate or narrowly ovate or triangular, distinctly or slightly spreading, rhizome without sclerenchyma or circumvascular sheaths, the longest lobes widest above middle, index of lobes 3 to 6 **16. *M. latilobatum***
- 3a. Lamina pinnate (except sometimes the very apex)..... 4
- b. Lamina simple, pinnatifid, pedately dissected, basal part pinnate, apical part pinnatifid, or bipinnatifid 5
- 4a. Scales circular or elliptic, often with eroded margins, rhizome with only scattered strands of sclerenchyma, lobes 7 to 20 at each side, connecting veins anadromous **20. *M. lucidum***
- b. Scales ovate or narrowly ovate or triangular, rhizome with only circumvascular sheaths, lobes 4 or 5 at each side, connecting veins catadromous **4. *M. cinctum***
- 5a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. If only fertile leaves present and sori in one row parallel to the margin try also lead 24 6
- b. Connecting veins forming a row of about equally sized areoles between two adjacent veins (sometimes the costal areole very small) and no prominent veinlet

- situated parallel to veins, sometimes each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles, or connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein
- 24
- 6a. Rhizome white waxy under the scales 7
- b. Rhizome not white waxy 14
- 7a. Scales 0.2–0.5 mm long, 0.2–0.3 mm broad **2. *M. aurantiacum***
- b. Scales 2–12 mm long, 0.5–4 mm broad 8
- 8a. One row of sori, each one (or two) per areole between each pair of veins
- **41. *M. scolopendria***
- b. One sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, or one sorus just outside each primary costal areole, close to the margin 9
- 9a. Sori on distinct soral veins (except the main soral vein a crossing of smaller veins) 10
- b. Sori solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein 11
- 10a. Scales 0.6–1.4 mm broad, peltate, rhizome with circumvascular sheaths and scattered strands of sclerenchyma **41. *M. scolopendria***
- b. Scales 2.5–3.5 mm broad, pseudopeltate, rhizome with only circumvascular sheaths **27. *M. novaezealandiae***
- 11a. One sorus just outside each primary costal areole, close to the margin 12
- b. One sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin (but in *M. pustulatum* sometimes close to the margin!) 13
- 12a. Rhizome 5–8 mm wide, scales 3–4 mm broad, veins more or less immersed and vague. — New Caledonia **47. *M. vieillardii***
- b. Rhizome 1–3 mm wide, scales 0.5–1.5 mm broad, veins prominent and distinct. — Australia & New Zealand **40. *M. scandens***
- 13a. Smaller veins more or less immersed and vague, rhizome with circumvascular sheaths and scattered strands of sclerenchyma, connecting veins catadromous. — Africa, Asia, Pacific Islands, Australia (Queensland) **41. *M. scolopendria***
- b. Smaller veins prominent and distinct, the rhizome with only circumvascular sheaths, connecting veins anadromous. — Australia & New Zealand **7. *M. pustulatum***
- 14a. Lamina pinnatifid or bipinnatifid 15
- b. Lamina simple 19
- 15a. One sorus just outside each primary costal areole, close to the margin, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein. — Australia, or New Zealand ... **40. *M. scandens***
- b. Sori not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, or some connate, elongate on veinlets, mostly irregularly scattered on the smallest veinlets. — Continental Asia and Malesia 16

- 16a. Connecting veins anadromous, roots densely set, scales slightly spreading, sori absent in marginal areoles, generally absent from costal areoles **34. *M. pteropus***
- b. Connecting veins catadromous, roots sparsely set, scales appressed, sori present in marginal areoles, generally present in costal areoles 17
- 17a. Longest lobes widest about or above middle, 5–6 cm broad, lamina undersurface with acicular hairs, smaller veins prominent and distinct **8. *M. egregium***
- b. Longest lobes widest at base or below middle, 0.5–2.5 cm broad, lamina undersurface without acicular hairs, smaller veins more or less immersed and vague 18
- 18a. Lamina of dissected leaf ovate or about circular, veins prominent and distinct. — Malesia: New Guinea **36. *M. rampans***
- b. Lamina of dissected leaf obovate or narrowly obovate, veins more or less immersed and vague. — Malesia: Philippines **32. *M. pentaphyllum***
- 19a. One sorus just outside each primary costal areole, close to the margin, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein. — Australia & New Zealand **40. *M. scandens***
- b. Sori not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, mostly irregularly scattered on the smallest veinlets. — Continental Asia, Malesia, and Pacific Islands 20
- 20a. Lamina undersurface with acicular hairs 21
- b. Lamina undersurface without acicular hairs 22
- 21a. Lamina base truncate, leaf herbaceous or subcoriaceous, veins immersed and distinct **38. *M. samarense***
- b. Lamina base narrowly angustate, the stipe winged for a considerable part, leaf thin-herbaceous, veins prominent and distinct **19. *M. longissimum***
- 22a. Connecting veins anadromous, sori generally absent from costal areoles **34. *M. pteropus***
- b. Connecting veins catadromous, sori generally present in costal areoles 23
- 23a. Stipe 0.5–1.5 mm diam., smaller veins more or less immersed and vague ... **36. *M. rampans***
- b. Stipe 3–5 mm diam., smaller veins prominent and distinct **18. *M. linguiforme***
- 24a. One row of sori, each one (or two) per areole between each pair of veins, or one sorus in, or just outside, each primary costal areole, or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein. 25
- b. Sori not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, or in two (irregular) rows between each pair of veins 43
- 25a. Sori deeply sunken, visible as protrusions on the upper surface. 26
- b. Sori superficial or slightly immersed. 32
- 26a. Rhizome not white waxy. 27
- b. Rhizome white waxy under the scales. 29
- 27a. Lamina simple, scales 2 mm long, veins more or less immersed and vague, connecting veins anadromous, sori 1.5–2 mm diam. **21. *M. malabaricum***

- b. Lamina pinnatifid, scales 3–8 mm long, veins prominent and distinct, connecting veins catadromous, sori 3–8 mm diam. 28
- 28a. Rhizome with only circumvascular sheaths, leaf herbaceous, lamina margin entire, apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate **37. *M. rubidum***
- b. Rhizome with only scattered strands of sclerenchyma, leaf membranaceous, lamina margin undulate, apex of lobes long acuminate **24. *M. membranifolium***
- 29a. Scales 0.5–1.3 mm long, leaf thin-herbaceous or membranaceous **30. *M. papuanum***
- b. Scales 2–7 mm long, leaf herbaceous or subcoriaceous 30
- 30a. Scales circular or elliptic, pseudopeltate, often with eroded margins, rhizome with only scattered strands of sclerenchyma **11. *M. hainanense***
- b. Scales ovate, narrowly ovate, or triangular, peltate, rhizome with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma 31
- 31a. Smaller veins more or less immersed and vague, rhizome with circumvascular sheaths and scattered strands of sclerenchyma, leaf herbaceous, the connecting veins catadromous. — Africa, Asia, Pacific Islands, Australia (Queensland) **41. *M. scolopendria***
- b. Smaller veins prominent and distinct, rhizome with only circumvascular sheaths, leaf subcoriaceous, connecting veins anadromous. — Australia & New Zealand **7. *M. pustulatum***
- 32a. Scales circular or elliptic, often with eroded margins, clathrate except for the hyaline marginal region 33
- b. Scales ovate or narrowly ovate or triangular, clathrate or subclathrate 35
- 33a. Scales 0.8–1.2 mm long, central region glabrous, lamina base cuneate-angustate, veins more or less immersed and vague **39. *M. sarawakense***
- b. Scales 1.5–6 mm long, central region bearing multiseptate hairs at least when young, lamina base narrowly angustate, the stipe winged for a considerable part, veins prominent and distinct 34
- 34a. Lamina simple **26. *M. normale***
- b. Lamina pinnatifid **5. *M. commutatum***
- 35a. Lamina pedately dissected, sori elongate **28. *M. palmatopedatum***
- b. Lamina simple or pinnatifid, or basal part pinnate, apical part pinnatifid, or simple but (irregularly) lobed, sori round 36
- 36a. Lamina pinnatifid or basal part pinnate, apical part pinnatifid 37
- b. Lamina simple or simple but (irregularly) lobed 40
- 37a. Apical lobe (of sterile leaf!) 2.5–4.5 cm broad, index of lobes 3–4, connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins. — Australia & New Zealand **7. *M. pustulatum***
- b. Apical lobe 0.9–1.8 cm broad, index of lobes 8–15, connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. — Malesia & Pacific Islands 38

- 38a. Apical lobe widest below middle, rhizome with only circumvascular sheaths, scales margin entire, sori solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein . . . **31. *M. parksii***
- b. Apical lobe widest about middle, rhizome with only scattered strands of sclerenchyma, scales margin denticulate, sori on distinct soral veins (except the main soral vein a crossing of smaller veins) **39**
- 39a. Scales peltate, appressed or slightly spreading, 2–16 lobes at each side of leaf. — Malesia: New Guinea **49. *M. sibomense***
- b. Scales pseudopeltate or basifixed, distinctly spreading, 15–33 lobes at each side of leaf. — Malesia: Moluccas, New Guinea; Pacific Islands **33. *M. powellii***
- 40a. Sori on distinct soral veins (except the main soral vein a crossing of smaller veins). — Africa **29. *M. pappei***
- b. Sori predominantly on connective veins, or solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein. — Continental Asia, Malesia, Australia, New Zealand **41**
- 41a. Rhizome white waxy under the scales, with only circumvascular sheaths, scales peltate. — Australia, New Zealand **7. *M. pustulatum***
- b. Rhizome not white waxy, with only scattered strands of sclerenchyma, or without sclerenchyma or circumvascular sheaths, scales pseudopeltate. — Continental Asia and Malesia **42**
- 42a. Lamina base narrowly angustate, the stipe winged for a considerable part, scales central region glabrous, veins more or less immersed and vague, sori generally absent from costal areoles **10. *M. fortunei***
- b. Lamina base truncate-angustate or cuneate-angustate, scales central region bearing multiseptate hairs at least when young, veins prominent and distinct, sori generally present in costal areoles **9. *M. ensatum***
- 43a. Sori in two (irregular) rows between each pair of veins **44**
- b. Sori not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins **48**
- 44a. Scales circular or elliptic, often with eroded margins, vascular bundles 20–34 **45**
- b. Scales ovate or narrowly ovate or triangular, vascular bundles 6 to 17 **46**
- 45a. Sori 1.6–3 mm diam., rhizome with only scattered strands of sclerenchyma, connecting veins 2 to 4 between adjacent secondary veins **5. *M. commutatum***
- b. Sori 1 mm diam., rhizome with circumvascular sheaths and scattered strands of sclerenchyma, connecting veins 7 between adjacent secondary veins **3. *M. biseriatum***
- 46a. Lamina pinnatifid. — Pacific Islands **1. *M. alatum***
- b. Lamina simple. — Continental Asia or Malesia **47**
- 47a. Roots densely set, rhizome about cylindrical, sclerenchyma strands 50–110, sori 1 (or 2) per veinlet **48. *M. zippelii***
- b. Roots sparsely set, rhizome dorso-ventrally flattened, sclerenchyma strands 0–15, sori 2–4 per veinlet **45. *M. supeficiale***
- 48a. Connecting veins anadromous **49**
- b. Connecting veins catadromous **50**

- 49a. Lamina base cuneate-angustate, rhizome with only scattered strands of sclerenchyma, with circumvascular sheaths and scattered strands of sclerenchyma, or without sclerenchyma or circumvascular sheaths. — Africa . . . **29. M. pappei**
- b. Lamina base narrowly angustate, the stipe winged for a considerable part, rhizome with only circumvascular sheaths. — Continental Asia and Malesia **14. M. insigne**
- 50a. Sori deeply sunken, visible as protrusions on the upper surface, predominantly innervated on veinlets, 3–4 mm diam. **22. M. maximum**
- b. Sori superficial or slightly immersed, mostly irregularly scattered on the smallest veinlets, or predominantly on connective veins, 0.5–2.5 mm diam. 51
- 51a. Rhizome white waxy under the scales 52
- b. Rhizome not white waxy 53
- 52a. Stipe 0.5–1.5 mm diam., scales distinctly spreading **44. M. steerei**
- b. Stipe 3–8 mm diam., scales appressed, or slightly spreading **35. M. punctatum**
- 53a. Sori predominantly on connective veins **45. M. superficiale**
- b. Sori mostly irregularly scattered on the smallest veinlets 54
- 54a. Lamina base truncate, truncate-angustate, cuneate-angustate, cuneate, or cordate, auriculate 55
- b. Lamina base narrowly angustate, the stipe winged for a considerable part . . . 58
- 55a. Lamina base cordate, auriculate, rhizome with circumvascular sheaths and scattered strands of sclerenchyma, scales densely set. — Pacific Islands **43. M. spectrum**
- b. Lamina base truncate, truncate-angustate, cuneate-angustate, or cuneate, the rhizome with only scattered strands of sclerenchyma or with only circumvascular sheaths, scales apically densely set, otherwise about sparsely set. — Malesia or Madagascar 56
- 56a. Rhizome 4–9 mm wide, vascular bundles 16–21, leaf herbaceous, lamina base truncate or cuneate **6. M. congregatifolium**
- b. Rhizome 1–3 mm wide, vascular bundles 8–13, leaf thin-herbaceous, or membranaceous, lamina base truncate-angustate, or cuneate-angustate 57
- 57a. Lamina linear, rhizome with only circumvascular sheaths, scales peltate, lamina 60–75 cm long, lamina index 20–40, sori 15–30 per sq. cm. — Malesia **42. M. sopusense**
- b. Lamina ovate or narrowly ovate, rhizome with only scattered strands of sclerenchyma, scales pseudopeltate, lamina 10–35 cm long, lamina index 2.5–4.5, sori 3–6 per sq. cm. — Madagascar **15. M. lastii**
- 58a. Scales peltate **42. M. sopusense**
- b. Scales pseudopeltate 59
- 59a. Veins more or less immersed and vague, the rhizome with only circumvascular sheaths, roots sparsely set, veins zigzag **13. M. heterolobum**
- b. Veins prominent and distinct, rhizome with only scattered strands of sclerenchyma or with circumvascular sheaths and scattered strands of sclerenchyma, roots densely set, veins more or less straight 60
- 60a. Lamina apex acute, sori generally absent from costal areoles. — Madagascar **17. M. leandrianum**

- b. Lamina apex acuminate, sori generally present in costal areoles. — Continental Asia and Malesia 61
- 61a. Scales appressed, sclerenchyma strands 8–15, leaf thin-herbaceous **12. M. heterocarpum**
- b. Scales distinctly spreading or slightly spreading, sclerenchyma strands 50–100, leaf membranaceous or herbaceous 62
- 62a. Leaf herbaceous, rhizome with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 7–11, scales densely set, smaller veins more or less immersed and vague. — Malesia **25. M. monstrosum**
- b. Leaf membranaceous, rhizome with only scattered strands of sclerenchyma, vascular bundles 18–23, scales apically densely set, otherwise about sparsely set, smaller veins prominent and distinct. — Continental Asia **23. M. membranaceum**

KEY TO THE SPECIES OF CHINA

- 1a. Sori (irregularly) scattered on the leaf surface or in two (irregular) rows between each pair of veins 2
- b. Sori in one row, each one (or two) per areole between each pair of veins, or one in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein 8
- 2a. Rhizome white waxy under the scales 3
- b. Rhizome not white waxy 4
- 3a. Stipe 0.5–1.5 mm diam., scales distinctly spreading **44. M. steerei**
- b. Stipe 3–8 mm diam., scales appressed, or slightly spreading **35. M. punctatum**
- 4a. Connecting veins anadromous 5
- b. Connecting veins catadromous 6
- 5a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; costal areole, if present, formed by smaller veins **34. M. pteropus**
- b. Connecting veins forming a row of about equally sized areoles between two adjacent veins, or the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins **14. M. insigne**
- 6a. Sori mostly irregularly scattered on the smallest veinlets, rhizome with only scattered strands of sclerenchyma **23. M. membranaceum**
- b. Sori predominantly on connective veins, the rhizome with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma, or with circumvascular sheaths, sclerenchyma strands situated dorsally of the vascular cylinder 7
- 7a. Sori 1 (or 2) per veinlet, sclerenchyma strands 50–100, rhizome about cylindrical, roots densely set **48. M. zippelii**

- b. Sori 2–4 per veinlet, sclerenchyma stands 0–15, rhizome dorso-ventrally flattened, roots sparsely set **45. M. superficiale**
- 8a. Lamina pinnate (except sometimes the very apex) **20. M. lucidum**
 - b. Lamina simple, pinnatifid, or pedately dissected 9
- 9a. Lamina pedately dissected **28. M. palmatopedatum**
 - b. Lamina simple or pinnatifid..... 10
- 10a. Lamina pinnatifid 11
 - b. Lamina simple, or simple but (irregularly) lobed 14
- 11a. Rhizome not white waxy, paraphyses biseriate non-clathrate 12
 - b. Rhizome white waxy under the scales, paraphyses simple uniseriate hairs with glandular topcells 13
- 12a. Leaf herbaceous, rhizome dorso-ventrally flattened, rhizome with only circumvascular sheaths, lamina margin entire, apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate **37. M. rubidum**
 - b. Leaf membranaceous, rhizome about cylindrical, or rounded, rhizome with only scattered strands of sclerenchyma, lamina margin undulate, apex of lobes long acuminate **24. M. membranifolium**
- 13a. Scales (narrowly) ovate or triangular, peltate, the rhizome with circumvascular sheaths and scattered strands of sclerenchyma **41. M. scolopendria**
 - b. Scales circular or elliptic, often with eroded margins, pseudopeltate, rhizome with only scattered strands of sclerenchyma **11. M. hainanense**
- 14a. Rhizome white waxy under the scales, sori deeply sunken, visible as protrusions on the upper surface **41. M. scolopendria**
 - b. Rhizome not white waxy, sori superficial or slightly immersed 15
- 15a. Scales circular or elliptic, often with eroded margins, peltate, rhizome with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma, smaller veins prominent and distinct **26. M. normale**
 - b. Scales (narrowly) ovate or triangular, pseudopeltate, rhizome with only scattered strands of sclerenchyma, or without sclerenchyma or circumvascular sheaths, smaller veins more or less immersed and vague 16
- 16a. Lamina base narrowly angustate, the stipe winged for a considerable part, roots sparsely set, scales central region glabrous, veins more or less immersed and vague **10. M. fortunei**
 - b. Lamina base truncate-angustate or cuneate-angustate, roots densely set, scales central region bearing multiseptate hairs at least when young, veins prominent and distinct **9. M. ensatum**

KEY TO THE SPECIES OF JAPAN

- 1a. Sori deeply sunken, visible as protrusions on the upper surface 2
- b. Sori superficial or slightly immersed 3
- 2a. Rhizome white waxy under the scales, with circumvascular sheaths and scattered strands of sclerenchyma, scales peltate, lamina base cuneate-angustate or cuneate **41. M. scolopendria**

- b. Rhizome not white waxy, with only circumvascular sheaths, scales pseudopeltate, lamina base narrowly angustate, stipe winged for a considerable part, apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate **37. *M. rubidum***
- 3a. Sori in one row, each one (or two) per areole between each pair of veins, or one in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, rhizome with only scattered strands of sclerenchyma, or without sclerenchyma or circumvascular sheaths **9. *M. ensatum***
- b. Sori (irregularly) scattered on the leaf surface or in two (irregular) rows between each pair of veins, rhizome with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma, or with circumvascular sheaths, sclerenchyma strands situated dorsally of the vascular cylinder **4**
- 4a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; costal areole, if present, formed by smaller veins **34. *M. pteropus***
- b. Venation of sterile and non-dimorphous fertile fronds different, connecting veins forming a row of areoles between two adjacent veins **5**
- 5a. Connecting veins catadromous, rhizome bearing scales and hairs, roots sparsely set, scales densely set **45. *M. superficiale***
- b. Connecting veins anadromous, rhizome bearing only scales, roots densely set, scales apically densely set, otherwise about sparsely set **14. *M. insigne***

KEY TO THE SPECIES OF INDIA (INCL. HIMALAYAN STATES AND SRI LANKA)

- 1a. Lamina pinnate **20. *M. lucidum***
- b. Lamina simple or pinnatifid. **2**
- 2a. One row of sori, each one (or two) per areole between each pair of veins, or sori in one (irregular) row parallel to the costa **3**
- b. Sori irregularly scattered on the leaf surface **9**
- 3a. Rhizome white waxy under the scales **4**
- b. Rhizome not white waxy **5**
- 4a. Scales (narrowly) ovate or triangular, peltate, 0.6–1.4 mm broad, rhizome with circumvascular sheaths and scattered strands of sclerenchyma **41. *M. scolopendria***
- b. Scales circular or elliptic, pseudopeltate, 2.5–4 mm broad, often with eroded margins, rhizome with only scattered strands of sclerenchyma **11. *M. hainanense***
- 5a. Lamina pinnatifid **6**
- b. Lamina simple, rarely irregularly lobed **7**
- 6a. Apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate, rhizome dorso-ventrally flattened, with only circumvascular sheaths, leaf herbaceous, lamina margin entire **37. *M. rubidum***
- b. Apex of lobes long acuminate, rhizome about cylindrical or rounded, with only scattered strands of sclerenchyma, leaf membranaceous, lamina margin undulate **24. *M. membranifolium***

- 7a. Scales (narrowly) ovate or triangular, connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or sometimes the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins **9. M. ensatum**
- b. Scales circular or elliptic, often with eroded margins, connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, and thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles or connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles 8
- 8a. Sori superficial or slightly immersed, scales peltate, lamina linear, lamina base narrowly angustate, the stipe winged for a considerable part, veins prominent and distinct, one row of sori, each one (or two) per areole between each pair of veins, or sori in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein **26. M. normale**
- b. Sori deeply sunken, visible as protrusions on the upper surface, scales pseudopeltate, lamina narrowly elliptic or narrowly ovate, lamina base cuneate-angustate, or cuneate, veins more or less immersed and vague, one sorus in, or just outside, each primary costal areole **21. M. malabaricum**
- 9a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing 10
- b. Connecting veins forming a row of about equally sized areoles between two adjacent veins, sometimes the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins 11
- 10a. Connecting veins anadromous, rhizome without sclerenchyma or circumvascular sheaths, scales densely set **34. M. pteropus**
- b. Connecting veins catadromous, rhizome with only circumvascular sheaths, the scales apically densely set, otherwise about sparsely set **18. M. linguiforme**
- 11a. Connecting veins anadromous, leaf thin-herbaceous **14. M. insigne**
- b. Connecting veins catadromous, leaf membranaceous, or herbaceous, or subcoriaceous 12
- 12a. Rhizome white waxy under the scales **35. M. punctatum**
- b. Rhizome not white waxy 13
- 13a. Sori mostly irregularly scattered on the smallest veinlets, the rhizome with only scattered strands of sclerenchyma, scales apically densely set, otherwise about sparsely set, leaf membranaceous **23. M. membranaceum**
- b. Sori predominantly on connective veins, the rhizome with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma, or with circumvascular sheaths, sclerenchyma strands situated dorsally of the vascular cylinder, scales densely set, leaf herbaceous, or subcoriaceous . . . 14

- 14a. Sori 1 (or 2) per veinlet, sclerenchyma strands 50–100, rhizome about cylindrical, roots densely set **48. *M. zippelii***
 b. Sori 2–4 per veinlet, sclerenchyma stands 0–15, rhizome dorso-ventrally flattened, roots sparsely set **45. *M. superficiale***

KEY TO THE SPECIES OF BURMA

- 1a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins, rhizome without sclerenchyma or circumvascular sheaths **34. *M. pteropus***
 b. Connecting veins forming a row of about equally sized areoles between two adjacent veins (sometimes the costal areole much smaller) or connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles, rhizome with strands of sclerenchyma, and/or circumvascular sheaths **2**
- 2a. Scales circular or elliptic, often with eroded margins, peltate, one row of sori, each one (or two) per areole between each pair of veins, or sori in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein **26. *M. normale***
 b. Scales (narrowly) ovate or triangular, pseudopeltate, sori irregularly scattered on the leaf surface, or in one (irregular) row parallel to the costa or in two (irregular) rows between each pair of veins **3**
- 3a. Rhizome white waxy under the scales **35. *M. punctatum***
 b. Rhizome not white waxy **4**
- 4a. Sori deeply sunken, visible as protrusions on the upper surface, one sorus in, or just outside, each primary costal areole, sori 3–8 mm diam. . . **37. *M. rubidum***
 b. Sori superficial or slightly immersed, scattered on the leaf surface or in two (irregular) rows between each pair of veins, sori 0.5–2.5 mm diam. **5**
- 5a. Connecting veins anadromous **14. *M. insigne***
 b. Connecting veins catadromous **6**
- 6a. Sori predominantly on connective veins, 2–4 per veinlet, leaf herbaceous or subcoriaceous, stipe 0.5–2 mm diam. **45. *M. superficiale***
 b. Sori mostly irregularly scattered on the smallest veinlets, 1 per veinlet, leaf membranaceous, stipe 3–5 mm diam. **23. *M. membranaceum***

KEY TO THE SPECIES OF THAILAND

- 1a. One row of sori, each one (or two) per areole between each pair of veins, or one (irregular) row parallel to the costa, sori on distinct soral veins (except the main soral vein a crossing of smaller veins), or solitary on a connective vein or on the crossing of a vein and a connective vein . . **2**
 b. Sori scattered on the leaf surface **5**
- 2a. Lamina simple **26. *M. normale***
 b. Lamina pinnatifid, or pinnate **3**

- 3a. Lamina pinnate **20. M. lucidum**
 b. Lamina pinnatifid 4
- 4a. Apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate, rhizome dorso-ventrally flattened, with only circumvascular sheaths, leaf herbaceous, lamina margin entire **37. M. rubidum**
 b. Apex of lobes long acuminate, rhizome about cylindrical, or rounded, rhizome with only scattered strands of sclerenchyma, leaf membranaceous, lamina margin undulate **24. M. membranifolium**
- 5a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins, rhizome without sclerenchyma or circumvascular sheaths **34. M. pteropus**
 b. Connecting veins forming a row of about equally sized areoles between two adjacent veins, sometimes the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins, rhizome with only scattered strands of sclerenchyma, with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma 6
- 6a. Connecting veins anadromous **14. M. insigne**
 b. Connecting veins catadromous 7
- 7a. Rhizome white waxy under the scales, with only scattered strands of sclerenchyma **35. M. punctatum**
 b. Rhizome not white waxy, with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma 8
- 8a. Sori mostly irregularly scattered on the smallest veinlets, scales apically densely set, otherwise about sparsely set, leaf thin-herbaceous . **12. M. heterocarpum**
 b. Sori predominantly on connective veins, scales densely set, leaf herbaceous or subcoriaceous 9
- 9a. Sori 1 (or 2) per veinlet, sclerenchyma strands 50–100, rhizome about cylindrical, roots densely set **48. M. zippellii**
 b. Sori 2–4 per veinlet, sclerenchyma strands 0–15, rhizome dorso-ventrally flattened, roots sparsely set **45. M. superficiale**

KEY TO THE SPECIES OF VIETNAM

- 1a. Lamina pinnatifid, or pinnate 2
 b. Lamina simple 6
- 2a. Lamina pinnate (except sometimes the very top) **20. M. lucidum**
 b. Lamina pinnatifid 3
- 3a. Sori scattered on the leaf surface, superficial or slightly immersed, mostly irregularly scattered on the smallest veinlets or predominantly on connective veins, 0.5–1.5 mm diam. **14. M. insigne**
 b. Sori in a row parallel to the costa, deeply sunken, visible as protrusions on the upper surface, on distinct soral veins (except the main soral vein a crossing of smaller veins), or solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 2–8 mm diam. 4

- 4a. Rhizome white waxy under the scales, scales broadest at middle, veins more or less immersed and vague, connecting veins anadromous . . . **11. M. hainanense**
- b. Rhizome not white waxy, scales broadest below middle, veins prominent and distinct, connecting veins catadromous **5**
- 5a. Apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate, rhizome dorso-ventrally flattened, with only circumvascular sheaths, leaf herbaceous, lamina margin entire **37. M. rubidum**
- b. Apex of lobes long acuminate, rhizome about cylindrical, or rounded, with only scattered strands of sclerenchyma, leaf membranaceous, lamina margin undulate **24. M. membranifolium**
- 6a. Rhizome white waxy under the scales **7**
- b. Rhizome not white waxy **8**
- 7a. Stipe 0.5–1.5 mm diam., scales distinctly spreading **44. M. steerei**
- b. Stipe 3–8 mm diam., scales appressed or slightly spreading **35. M. punctatum**
- 8a. One row of sori, each one (or two) per areole between each pair of veins, or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole sori on distinct soral veins (except the main soral vein a crossing of smaller veins), or solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein **9**
- b. Sori irregularly scattered on the leaf surface or in two (irregular) rows between each pair of veins, mostly irregularly scattered on the smallest veinlets, or predominantly on connective veins **10**
- 9a. Scales circular or elliptic, often with eroded margins, peltate, apically densely set, otherwise about sparsely set, rhizome with only circumvascular sheaths or with circumvascular sheaths and scattered strands of sclerenchyma, veins prominent and distinct **26. M. normale**
- b. Scales ovate or triangular, pseudopeltate, densely set, rhizome with only scattered strands of sclerenchyma, veins more or less immersed and vague **10. M. fortunei**
- 10a. Connecting veins catadromous, roots sparsely set, scales densely set, leaf herbaceous or subcoriaceous **45. M. superficiale**
- b. Connecting veins anadromous, roots densely set, the scales apically densely set, otherwise about sparsely set, leaf thin-herbaceous **14. M. insigne**

KEY TO THE SPECIES OF MALESIA

- 1a. Lamina pinnate (except sometimes the very apex) **2**
- b. Lamina simple or (irregularly) lobed, pinnatifid, basal part pinnate, apical part pinnatifid, or bipinnatifid **3**
- 2a. Lobes 7–20 at each side, scales circular or elliptic, often with eroded margins, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin **20. M. lucidum**
- b. Lobes 4 or 5 at each side, scales (narrowly) ovate or triangular, sori scattered on the leaf surface **4. M. cinctum**
- 3a. Sori deeply sunken, visible as protrusions on the upper surface **4**
- b. Sori superficial or slightly immersed **8**

- 4a. Longest lobes 0.3–0.5 cm broad, scales 0.2–0.3 mm broad, one sorus just outside each primary costal areole, close to the margin . . . **2. M. aurantiacum**
- b. Longest lobes 0.7–7 cm broad, the scales 0.5–3.5 mm broad, one row of sori, each one (or two) per areole between each pair of veins, or one sorus in, or just outside, each primary costal areole, generally close to the costa, at most half-way to the margin 5
- 5a. Rhizome not white waxy, with only scattered strands of sclerenchyma or with only circumvascular sheaths, scales pseudopeltate 6
- b. Rhizome white waxy under the scales, with circumvascular sheaths and scattered strands of sclerenchyma, scales peltate. 7
- 6a. Lamina margin entire, rhizome dorso-ventrally flattened, with only circumvascular sheaths, leaf herbaceous, apex of the lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate **37. M. rubidum**
- b. Lamina margin undulate, rhizome about terete, with only scattered strands of sclerenchyma, leaf membranaceous, apex of lobes long acuminate **24. M. membranifolium**
- 7a. Scales 2–7 mm long, cells longitudinally rectangular, leaf herbaceous **41. M. scolopendria**
- b. Scales 0.5–1.3 mm long, cells small, more or less isodiametric, leaf thin-herbaceous or membranaceous **30. M. papuanum**
- 8a. One row of sori, each one (or two) per areole between each pair of veins, or one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, or in two (irregular) rows between each pair of veins, or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein . . . 9
- b. Sori scattered on the leaf surface 18
- 9a. Lamina pinnatifid, or basal part pinnate, apical part pinnatifid 10
- b. Lamina simple, rarely (irregularly) lobed 13
- 10a. Scales circular or elliptic, often with eroded but entire margins, roots densely set, lamina base narrowly angustate, stipe winged for a considerable part . . . 11
- b. Scales narrowly ovate or triangular, margin denticulate, roots sparsely set, lamina base cuneate-angustate or cuneate. 12
- 11a. Lamina pinnatifid, rhizome with only scattered strands of sclerenchyma, leaf index 1.5–2, connecting veins 2–4 between adjacent secondary veins, sori 1.6–3 mm diam. **5. M. commutatum**
- b. Lamina basal part pinnate, apical part pinnatifid, rhizome with circumvascular sheaths and scattered strands of sclerenchyma, leaf index 1.3, connecting veins 7 between adjacent secondary veins, sori 1 mm diam. **3. M. biseriatum**
- 12a. Scales peltate, appressed or slightly spreading, leaf with 2–16 lobes at each side **49. M. sibomense**
- b. Scales pseudopeltate or basifixed, distinctly spreading, leaf with 15–33 lobes at each side **33. M. powellii**
- 13a. Scales circular or elliptic, often with eroded margins, scales peltate 14
- b. Scales (narrowly) ovate or triangular, pseudopeltate. 15
- 14a. Lamina elliptic, index 2.5–5, base cuneate-angustate, scales 0.8–1.2 mm long **29. M. sarawakense**

- b. Lamina linear, index 10–20, base narrowly angustate, the stipe winged for a considerable part, scales 1.5–2.5 mm long **26. *M. normale***
- 15a. Connecting veins catadromous, sori in two (irregular) rows between each pair of veins 16
- b. Connecting veins anadromous, one row of sori, each one (or two) per areole between each pair of veins, or one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein 17
- 16a. Roots densely set, rhizome about cylindrical, sclerenchyma strands 50–110, sori 1 (or 2) per veinlet **48. *M. zippelii***
- b. Roots sparsely set, rhizome dorso-ventrally flattened, the sclerenchyma strands 0–15, sori 2–4 per veinlet **45. *M. superficiale***
- 17a. Lamina base narrowly angustate, the stipe winged for a considerable part, roots sparsely set, scales central region glabrous, veins more or less immersed and vague. — Peninsular Malaysia **10. *M. fortunei***
- b. Lamina base truncate-angustate or cuneate-angustate, roots densely set, scales central region bearing multiseptate hairs at least when young, veins prominent and distinct. — Philippines **9. *M. ensatum***
- 18a. Connecting veins anadromous 19
- b. Connecting veins catadromous 20
- 19a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins, rhizome without sclerenchyma or circumvascular sheaths, sori on the whole surface of the lamina **34. *M. pteropus***
- b. Connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, sometimes the first connecting vein forming one row of small primary costal areoles parallel to the costa, rhizome with only circumvascular sheaths, sori absent from the basal parts **14. *M. insigne***
- 20a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins 21
- b. Connecting veins forming a row of about equally sized areoles between two adjacent veins, sometimes the first connecting vein forming one row of small primary costal areoles parallel to the costa, sometimes each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching of at or near the costa 27
- 21a. Lamina pinnatifid or bipinnatifid 22
- b. Lamina simple 24
- 22a. Longest lobes 5–6 cm broad, lamina undersurface with acicular hairs, longest lobes widest about or above middle, smaller veins prominent and distinct **8. *M. egregium***

- b. Longest lobes 0.5–2.5 cm broad, lamina undersurface without acicular hairs, longest lobes widest below middle, smaller veins more or less immersed and vague 23
- 23a. Lamina of dissected leaf ovate or \pm circular. — New Guinea **36. *M. rampans***
- b. Lamina of dissected leaf obovate or narrowly obovate. — Philippines **32. *M. pentaphyllum***
- 24a. Lamina undersurface without acicular hairs 25
- b. Lamina undersurface with acicular hairs 26
- 25a. Smaller veins more or less immersed and vague, the roots sparsely set, scales densely set, clathrate or subclathrate, leaf thin-herbaceous . . **36. *M. rampans***
- b. Smaller veins prominent and distinct, roots densely set, scales apically densely set, otherwise about sparsely set, clathrate except the hyaline marginal region, leaf herbaceous **18. *M. linguiforme***
- 26a. Veins immersed and distinct, leaf herbaceous or subcoriaceous, lamina base truncate **38. *M. samarense***
- b. Veins prominent and distinct, leaf thin-herbaceous, lamina base narrowly angustate, the stipe winged for a considerable part **19. *M. longissimum***
- 27a. Rhizome white waxy under the scales, with only scattered strands of sclerenchyma **35. *M. punctatum***
- b. Rhizome not white waxy, with only circumvascular sheaths, or with circumvascular sheaths and scattered strands of sclerenchyma 28
- 28a. Sori predominantly on connective veins **45. *M. superficiale***
- b. Sori mostly irregularly scattered on the smallest veinlets 29
- 29a. Scales peltate **42. *M. sopuense***
- b. Scales pseudopeltate 30
- 30a. Lamina base truncate or cuneate, vascular bundles 16–21 **6. *M. congregatifolium***
- b. Lamina base narrowly angustate, the stipe winged for a considerable part, vascular bundles 7–12 31
- 31a. Scales appressed, apically densely set, otherwise about sparsely set, leaf thin-herbaceous **12. *M. heterocarpum***
- b. Scales distinctly or slightly spreading, scales densely set, leaf herbaceous 32
- 32a. Veins prominent and distinct, more or less straight, rhizome about terete, with circumvascular sheaths and scattered strands of sclerenchyma, roots densely set **25. *M. monstrosum***
- b. Veins more or less immersed and vague, zigzag, rhizome dorso-ventrally flattened, rhizome with only circumvascular sheaths, roots sparsely set **13. *M. heterolobum***

KEY TO THE SPECIES OF AUSTRALIA

- 1a. Sori scattered on the leaf surface **35. *M. punctatum***
- b. One row of sori, each one (or two) per areole between each pair of veins, or in one row parallel to the costa 2
- 2a. One row of sori, each one (or two) per areole between each pair of veins **41. *M. scolopendria***

- b. One sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, or close to the margin 3
- 3a. One sorus just outside each primary costal areole, close to the margin 4
 - b. One sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin 5
- 4a. Connecting veins catadromous, scales distinctly spreading, leaf thin-herbaceous, lamina base narrowly angustate, the stipe winged for a considerable part, or cuneate-angustate, sori 1–2.5 mm diam. **40. M. scandens**
 - b. Connecting veins anadromous, scales appressed, leaf subcoriaceous, lamina base cuneate, sori 3–5 mm diam. **7. M. pustulatum**
- 5a. Rhizome not white waxy, with only scattered strands of sclerenchyma, scales pseudopeltate, cells small, more or less isodiametric, leaf membranaceous, lamina margin undulate **24. M. membranifolium**
 - b. Rhizome white waxy under the scales, with only circumvascular sheaths or with circumvascular sheaths and scattered strands of sclerenchyma, scales peltate, cells longitudinally rectangular, leaf herbaceous or subcoriaceous, lamina margin entire or sinuate 6
- 6a. Connecting veins catadromous, rhizome with circumvascular sheaths and scattered strands of sclerenchyma, scales margin denticulate, leaf herbaceous, smaller veins more or less immersed and vague **41. M. scolopendria**
 - b. Connecting veins anadromous, rhizome with only circumvascular sheaths, scales margin entire, leaf subcoriaceous, smaller veins prominent and distinct **7. M. pustulatum**

KEY TO THE SPECIES OF NEW ZEALAND, NEW CALEDONIA, AND PACIFIC

- 1a. Sori acrostichoid 2
 - b. Sori separate 3
- 2a. Scales appressed, circular or elliptic, often with eroded margins, rhizome with only circumvascular sheaths, longest lobes widest below middle, index of lobes 8–20 **46. M. varians**
 - b. Scales distinctly or slightly spreading, ovate, narrowly ovate or triangular, the rhizome without sclerenchyma or circumvascular sheaths, longest lobes widest above middle, index of lobes 3–6 **16. M. latilobatum**
- 3a. Sori scattered on the leaf surface or in two (irregular) rows between each pair of veins 4
 - b. One row of sori, each one (or two) per areole between each pair of veins, or in one row parallel to the costa 9
- 4a. Connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins, rhizome with only circumvascular sheaths **18. M. linguiforme**
 - b. Connecting veins forming a row of about equally sized areoles between two adjacent veins or forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile

- monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein, or forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins, rhizome with only scattered strands of sclerenchyma or with circumvascular sheaths and scattered strands of sclerenchyma 5
- 5a. Sori in two (irregular) rows between each pair of veins 6
- b. Sori scattered on the leaf surface 7
- 6a. Scales circular or elliptic, often with eroded margins, peltate, sori 1.6–3 mm in diameter **5. *M. commutatum***
- b. Scales ovate or triangular, pseudopeltate, sori 0.5–1.5 mm in diameter **1. *M. alatum***
- 7a. Sori deeply sunken, visible as protrusions on the upper surface, predominantly innervated on veinlets, 3–4 mm diam., scales peltate, connecting veins 2 or 3 between adjacent secondary veins **22. *M. maximum***
- b. Sori superficial or slightly immersed, mostly irregularly scattered on the smallest veinlets, 0.5–2.5 mm diam., scales pseudopeltate, connecting veins 4–10 between adjacent secondary veins 8
- 8a. Rhizome not white waxy under scales, dorso-ventrally flattened, with circumvascular sheaths and scattered strands of sclerenchyma **43. *M. spectrum***
- b. Rhizome white waxy under scales, about cylindrical, with only scattered strands of sclerenchyma **35. *M. punctatum***
- 9a. One row of sori, each one (or two) per areole between each pair of veins . . 10
- b. Sori in a row parallel to the costa 11
- 10a. Rhizome white waxy under the scales, with circumvascular sheaths and scattered strands of sclerenchyma, scales ovate, narrowly ovate, or triangular, margin denticulate, lamina base cuneate-angustate or cuneate, smaller veins more or less immersed and vague, sori deeply sunken, visible as protrusions on the upper surface **41. *M. scolopendria***
- b. Rhizome not white waxy, with only scattered strands of sclerenchyma, scales circular or elliptic, often with eroded entire margins, lamina base narrowly angustate, the stipe winged for a considerable part, smaller veins prominent and distinct, sori superficial or slightly immersed **5. *M. commutatum***
- 11a. Scales 0.5–1.3 mm long **30. *M. papuanum***
- b. Scales 2–13 mm long 12
- 12a. Scales pseudopeltate or basifixed 13
- b. Scales peltate 16
- 13a. Sori deeply sunken, visible as protrusions on upper surface, scale cells small, more or less isodiametric, the paraphyses biseriate non-clathrate 14
- b. Sori superficial or slightly immersed, scale cells longitudinally rectangular, the paraphyses simple uniseriate hairs with glandular top cells 15
- 14a. Apex of lobes rounded or acute, sometimes shortly acuminate, rarely longer acuminate, rhizome dorso-ventrally flattened, rhizome with only circumvascular sheaths, leaf herbaceous, lamina margin entire **37. *M. rubidum***
- b. Apex of lobes long acuminate, rhizome about cylindrical or rounded, rhizome with only scattered strands of sclerenchyma, leaf membranaceous, lamina margin undulate **24. *M. membranifolium***

- 15a. Rhizome not white waxy, with only scattered strands of sclerenchyma, connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein, veins prominent and distinct. — Pacific Isl. **33. *M. powellii***
- b. Rhizome white waxy under the scales, with only circumvascular sheaths, connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins, veins more or less immersed and vague. — New Zealand **27. *M. novaezealandiae***
- 16a. One sorus just outside each primary costal areole, close to the margin 17
- b. One sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin 18
- 17a. Scales 3–4 mm broad, rhizome 5–8 mm wide, scales ovate or triangular. — New Caledonia **47. *M. vieillardii***
- b. Scales 0.5–1.5 mm broad, rhizome 1–3 mm wide, scales narrowly ovate or triangular. — New Zealand **40. *M. scandens***
- 18a. Rhizome with circumvascular sheaths and scattered strands of sclerenchyma, scales margin denticulate **41. *M. scolopendria***
- b. Rhizome with only circumvascular sheaths, scales margin entire 19
- 19a. Connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein, veins more or less immersed and vague, connecting veins catadromous. — Pacific Islands **31. *M. parksii***
- b. Connecting veins forming a row of about equally sized areoles between two adjacent veins or forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins, leaf subcoriaceous, veins prominent and distinct, connecting veins anadromous. — New Zealand **7. *M. pustulatum***

KEY TO THE SPECIES OF THE INDIAN OCEAN, MADAGASCAR, AND AFRICA

- 1a. Sori deeply sunken, visible as protrusions on the upper surface 2
- b. Sori superficial or slightly immersed 3
- 2a. Rhizome white waxy under the scales, with circumvascular sheaths and scattered strands of sclerenchyma, scales peltate, lamina base cuneate-angustate, or cuneate **41. *M. scolopendria***
- b. Rhizome not white waxy, with only circumvascular sheaths, scales pseudopeltate, lamina base narrowly angustate, the stipe winged for a considerable part **37. *M. rubidum***
- 3a. Connecting veins anadromous, veins dichotomously branched more or less in the middle or below the middle, sori on distinct soral veins (except the main soral vein a crossing of smaller veins) **29. *M. pappei***

- b. Connecting veins catadromous, veins dichotomously branched near the margin, sori mostly irregularly scattered on the smallest veinlets 4
- 4a. Rhizome white waxy under the scales, leaf herbaceous, or subcoriaceous 35. **M. punctatum**
- b. Rhizome not white waxy, leaf membranaceous 5
- 5a. Lamina base narrowly angustate, the stipe winged for a considerable part, sclerenchyma strands 25–50 17. **M. leandrianum**
- b. Lamina base truncate-angustate, sclerenchyma strands 50–100 . . . 15. **M. lastii**

1. *Microsorium alatum* (Brack.) Copel. — Plate 2: 10, 11; 9: 18

Microsorium alatum (Brack.) Copel., Gen. Fil. (1947) 196; Brownlie, Nova Hedwigia Beih. 55 (1977) 378. — *Drynaria alata* Brack., U.S. Expl. Exp., Filic. 16 (1854) 48, t. 6, f. 1. — *Phymatodes alata* Seem., Bonplandia '1861' (1861) 261. — *Pleopeltis alata* T. Moore, Index Filic. (1862) 344. — *Polypodium alatum* Hook., Sp. Fil. (1864) 85, nom. illeg., non L. (1753). — *Polypodium wilkesii* C. Chr., Index Filic. (1906) 247, 547. — [*Microsorium wilkesii* Ching, Bull. Fan Mem. Inst. Biol. 10 (1941) 239, nom. illeg.] — *Phymatosorus alatus* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 125. — Type: *Brackenridge* 12 (US), Fiji Is., Ovalau.

Rhizome 6–10 mm wide, about cylindrical, not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 11–17, sclerenchyma strands 50–100, roots densely set. Scales pseudopeltate, densely set, appressed, ovate or triangular, (1.5–)3–5 mm long, (1–)2–3 mm broad, margin entire, apex acute or rounded, clathrate except the hyaline marginal region (and the central region which is opaque), cells longitudinally rectangular (towards the apex), central region glabrous. Phyllopodia more or less distinct, 3–16 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous to membranaceous. Lamina pinnatifid, base narrowly angustate, the stipe winged for a considerable part, margin sinuate-dentate, apex acuminate, under-surface without acicular hairs. Lamina of dissected leaf deltoid to elliptic, 40–70 cm long, 30–50 cm broad, widest below to about the middle, 0.5–3 cm wide between the lobes at place of longest lobes, index 1–2; stipe present, (10–)30–55 cm long; lobes (2–)5–8(–11) at each side, longest lobes widest about to below the middle, at position (1 or) 2 from base, 16–27 cm long, 1.5–3 cm broad, index 3.5–11. Apical lobe conform to upper lateral lobes (but widest below the middle). Venation type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 5–6 mm apart, more or less straight (or slightly zigzag), dichotomously branched near the margin, connecting veins 3–5 between adjacent secondary veins (interconnected by some quaternary veins), catadromous, smaller veins prominent and distinct, forming a net of lesser areoles within the primary areoles, but not in the costal areole, free veinlets simple to once or twice forked. *Sori* separate, in two (irregular) rows between each pair of veins (rarely in part confluent), round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0–0.75 of total length of lamina, predominantly innervated on veinlets (occasionally in part on connecting veins, especially the sori closest to the costa), 5–15 per sq. cm, 2 per quaternary vein, 0.5–1.5 mm diam., absent in marginal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Pacific: Fiji Islands, Viti Levu, Nagau, Ovalau.

Habitat & Ecology — Epiphyte. Altitude 100–450 m.

2. *Microsorum aurantiacum* Noot. — Plate 9: 19

Microsorum aurantiacum Noot., Blumea 41 (1996) 17. — Type: *Schlechter 17532* (B), Kaiser Wilhelm Island.

Rhizome 1–1.5 mm wide, rounded, white waxy under the scales (flaky), with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 10–15, sclerenchyma strands 5–15, roots sparsely set. Scales peltate, sparsely set, appressed, narrowly ovate or triangular or circular or elliptic, often with eroded margins, 0.2–0.5 mm long, 0.2–0.3 mm broad, clathrate or subclathrate, cells longitudinally rectangular, central region glabrous. Phyllopodia more or less distinct, 50–120 mm apart. *Leaf* not or slightly dimorphous, herbaceous. Lamina pinnatifid, base cuneate or cuneate-angustate, margin entire or undulate, the undersurface without acicular hairs. Lamina of dissected leaf about circular, 7–12 cm long, 8–20 cm broad, 0.3–0.5 cm wide between the lobes at place of longest lobes; stipe present, 3–8 cm long, 0.8–1 mm diam.; lobes 2–4 at each side, longest lobes widest at base, at position 1 from base, 4–13 cm long, 0.3–0.5 cm broad, index 10–20, apex acute. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins more or less immersed and vague, smaller veins more or less immersed and vague. *Sori* separate, one sorus just outside each primary costal areole, close to the margin, round, deeply sunken, visible as protrusions on the upper surface, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 1.5 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Papua New Guinea (Morobe Prov.). Only one collection.

3. *Microsorum biseriatum* (Bosman) Noot., *comb. nov.*

Phymatosorus biseriatus Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 127. — Type: *Croft 1870* (L), New Ireland, W slopes Mt Tumbumpo.

Rhizome 7–8 mm wide, dorso-ventrally flattened, not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 21–34, sclerenchyma strands 50–100, roots densely set. Scales peltate or pseudopeltate, densely set, appressed, circular or elliptic, often with eroded margins, 3.5–5.5 mm long, 3–4 mm broad, margin entire, apex rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region glabrous. Phyllopodia more or less distinct, 25–50 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina basal part pinnate, apical part pinnatifid, base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, undersurface without acicular hairs. Lamina of dissected leaf deltoid to ovate, 80–100 cm long, 60–70 cm broad, 1.5–2.5 cm wide between the lobes at place of the longest lobes, widest below the middle, index 1.3; stipe present, 30–100 cm long, 7–9 mm diam.;

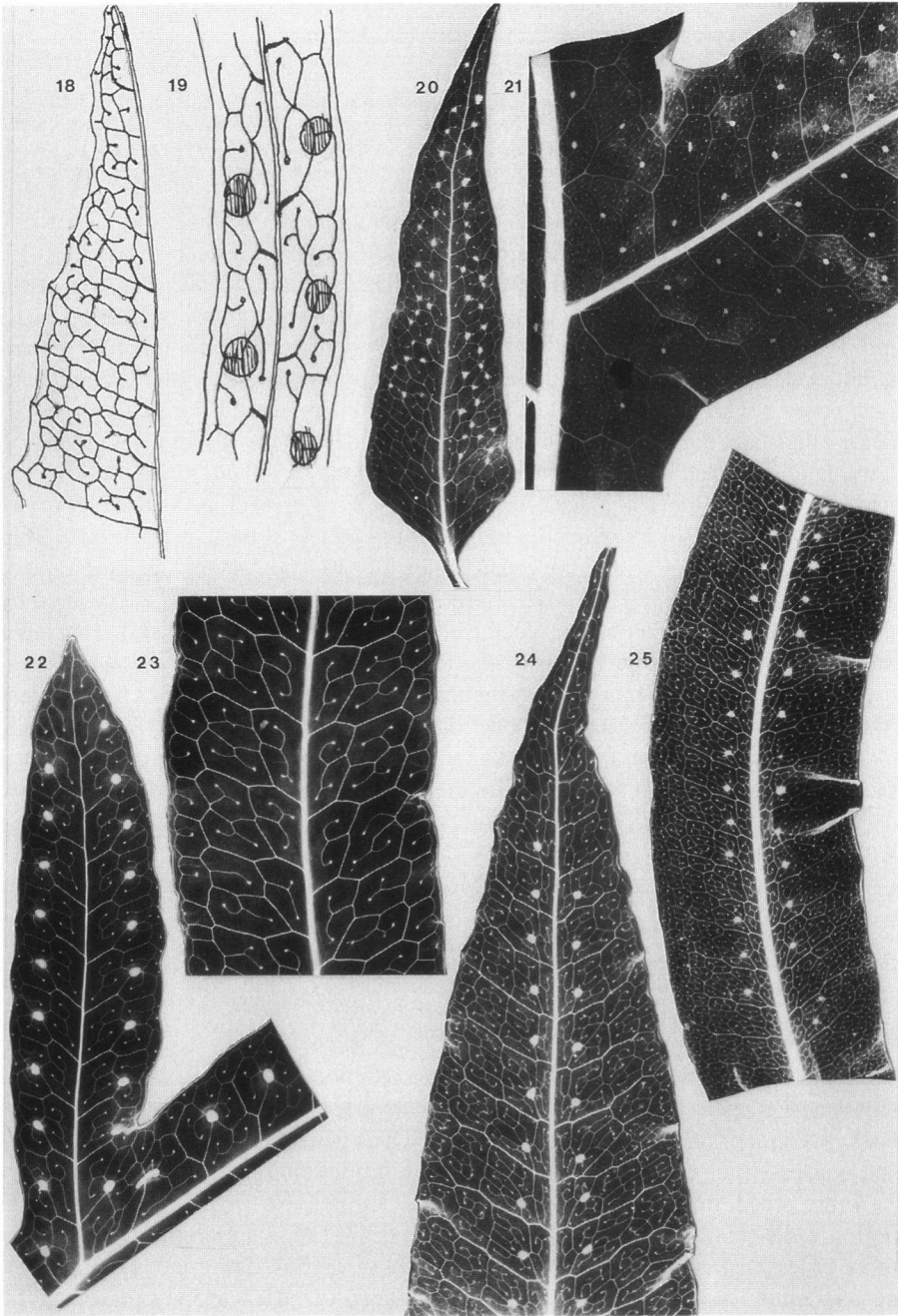


Plate 9. Venation. — 18: *Microsorium alatum* (A. C. Smith 9001). — 19: *M. aurantiacum* (Schlechter 17532). — 20: *M. superficiale* (Cavalerie 853). — 21: *M. commutatum* (LAE 61152). — 22 & 23: *M. pustulatum* (Varekamp 64). — 24: *M. ensatum* (Henry 10078). — 25: *M. fortunei* (Gaudichaud 30). All about $\times 0.5$.

lobes 11–12 at each side, longest lobes widest about the middle, at position 3 from base, 30–40 cm long, 4–6 cm broad, index 6. Apical lobe longer than upper lateral lobes (widest at base). Venation type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 7–10 mm apart, more or less straight (or slightly zigzag), dichotomously branched near the margin, connecting veins 7 between adjacent secondary veins (interconnected by some quaternary veins), catadromous, smaller veins prominent and distinct, forming a network of secondary areoles in the primary areoles, but not in the costal areole, free veinlets simple to once forked. *Sori* separate, in two (irregular) rows between each pair of veins, round, superficial or slightly immersed, on the whole surface of the lamina, or not on lower 2 or 3 pairs of lobes, predominantly innervated on veinlets (occasionally in part on connecting veins, especially the sori closest to the costa), 5–8 per sq. cm, 1 per quaternary vein, 1 mm diam., absent in marginal areoles, generally absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — New Guinea, Bismarck Archipelago, New Ireland (Mt Tumbumpo).

Habitat & Ecology — In stunted forests on ridges and upper slopes, the rhizome creeping underground. Altitude 1000 m.

4. *Microsorium cinctum* Bosman — Plate 2: 13

Microsorium cinctum Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 76, f. 12. — Type: *Jermy 8111* (L; iso BM, K), New Guinea, West Sepik, Bewani Mts, Kilifas.

Rhizome 4.5–7 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 11–15, roots sparsely set. Scales pseudopeltate, densely set or apically densely set, otherwise more or less sparsely set, appressed or distinctly spreading, ovate or narrowly ovate or triangular, 3.5–8 mm long, 1.5–2.5 mm broad, margin entire, apex acute, clathrate except the hyaline marginal region, central region glabrous. Phyllopodia more or less distinct, 3–15 mm apart (or more). *Leaf* not or slightly dimorphous, herbaceous. Lamina basal part pinnate, apical part pinnatifid or pinnate, margin entire, apex acuminate, undersurface without acicular hairs. Lamina of dissected leaf 35–40 cm long, 30–35 cm broad, widest below or about the middle, index 1–1.5; stipe present, 10–25 cm long, 1–3 mm diam.; lobes 4 or 5 at each side, longest lobes widest about or below the middle, at position 2 from base, 15–25 cm long, 3.5–6 cm broad, index 4–4.5. Apical lobe conform to upper lateral lobes, widest about or below the middle. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins prominent and distinct (except the smallest), 7–13(–17) mm apart, more or less straight, dichotomously branched about the middle to near the margin, catadromous, smaller veins more or less immersed and vague, variously anastomosing within the main areoles, free veinlets simple to once or twice forked. *Sori* diameter unknown (mature sori absent), separate, not in one or two rows between each pair of

veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 15–25 per sq. cm, present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells (3-celled, one observation), the paraphyses 3-celled, sporangium annulus 20-celled, indurated cells 14.

Distribution — New Guinea (West Sepik, Bewani Mts and Idenburg River).

Habitat & Ecology — Primary forest; shady places; a low epiphyte. Altitude 300–850 m.

5. *Microsorium commutatum* (Blume) Copel. — Plate 2: 14, 15; 6: 52; 9: 21

Microsorium commutatum (Blume) Copel., Gen. Fil. (1947) 196; Fern Fl. Philipp. (1960) 480. — *Polypodium commutatum* Blume, Enum. Pl. Javae (1828) addenda; Fl. Javae. Filic. (1829) 165, t. 73. — *Phymatosorus commutatus* Pic.Serm., Webbia 28 (1973) 459. — Type: *Blume s. n.* (L 908.300-170), Java.

Polypodium affine Blume, Enum. Pl. Javae (1828) 126. — *Colysis affine* J.Sm., Hist. Fil. (1875) 101. — Type: *Blume* (L 908.300-171), Java.

[*Drynaria acuminata* Brack., U.S. Expl. Exp. 16, Filic. (1854) 47, non *Drynaria acuminata* Brack., l.c. p. 42.] — *Drynaria sylvatica* Brack., U.S. Expl. Exp. 16, Filic. (1854) 343. — [*Polypodium sylvaticum* Mett. in Fenzl, Reise Novara 41 (1870) 215, non Schkuhr (1806).] — *Microsorium sylvaticum* Copel., Gen. Fil. (1947) 196. — Type: *U.S. Expl. Exp.*(US) Pacific, Island of Savaii, Samoan Group.

Polypodium vitiense Baker, J. Bot. 17 (1879) 298. — [*Polypodium euryphyllum* E.D. Br., Bernice P. Bishop Mus. Bull. 89 (1931) 90, non C. Chr. (1906).] — *Microsorium vitiense* Copel., Occas. Pap. Bernice P. Bishop Mus. 14 (1938) 73; Brownlie, Nova Hedwigia Beih. 55 (1977) 379. — Type: *Horne 950* (n.v.).

[*Polypodium sumatranum* Baker, Ann. Bot. (London) 8 (1894) 131, non *Polypodium sumatranum* Baker (1880).] — *Polypodium sundense* C. Chr., Index Filic. (1906) 568. — Type: *Hancock 39* (K), Sumatra, Bengkulu.

Polypodium phanerophlebium Copel., Philipp. J. Sci. 1, Suppl. (1906) 163, t. 24. — *Microsorium phanerophlebium* Copel., Gen. Fil. (1947) 196; Fern Fl. Philipp. (1960) 479. — Type: *Copeland 1550* (fragment in BM), Philippines, Mindanao.

Polypodium flaccidum H. Christ, Philipp. J. Sci. 2, Bot. (1907) 178. — *Pleopeltis flaccida* Alderw., Malayan Ferns Suppl. (1917) 393. — Type: *BS 1087 (Ramos)* (BO, K, P), Philippines, Rizal, Bosoboso.

Polypodium euryphyllum var. *marquesense* E.D. Br., Bernice P. Bishop Mus. Bull. 89 (1931) 90, non C. Chr. (1906). — Type: *Jones 1795* (n.v.).

Polypodium euryphyllum var. *hendersoniana* E.D. Br., Bernice P. Bishop Mus. Bull. 89 (1931) 91. — Type: *Quayle 389* (n.v.).

Polypodium euryphyllum var. *rapense* E.D. Br., Bernice P. Bishop Mus. Bull. 89 (1931) 91. — Type: *Rapa* (n.v.), Nukumaala, alt. 60 m. 21 Sept. 1921.

[*Polypodium expansum* Baker, J. Bot. (Hooker) 5 (1876) 12, non Poiret (1804).] — *Polypodium societense* J.W. Moore, Bernice P. Bishop Mus. Bull. 102 (1933) 9. — Type: *Whitmee 137* (BM), Samoa.

Rhizome 2–11 mm wide, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 20–25, sclerenchyma strands 50–100, roots densely set. Scales peltate (rarely some pseudopeltate), densely set or apically densely set and otherwise more or less sparsely set (but older scales fallen), appressed, circular or elliptic, often with eroded margins, 2–6 mm long, 1–3.5 mm broad, margin entire (but eroded,

the hyaline margin soon falling), apex rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, the central region bearing multiseptate hairs at least when young. Phyllopodia more or less distinct, 0.3–3 cm apart. *Leaf* not or slightly dimorphous, membranaceous. Lamina pinnatifid, base narrowly angustate, the stipe winged for a considerable part, undersurface without acicular hairs. Lamina of dissected leaf ovate, 27–90(–120) cm long, 14–50(–60) cm broad, widest below the middle, 1–4.5 cm wide between the lobes at place of longest lobes (in basal part sometimes narrower), index 1.5–2; stipe present, 4–40 cm long, 3–8.5 mm diam.; lobes 3–19 at each side, longest lobes widest at base to widest about the middle, at position 4–8 from base, 7–30(–35) cm long, 1.4–4(–5.5) cm broad, index 5–10. Apical lobe longer than upper lateral lobes, 3–12 cm long, 1–4 cm broad, widest at base or just above base. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 4–8 mm apart, more or less straight or zigzag, connecting veins 2–4 between adjacent secondary veins, anadromous or catadromous, smaller veins prominent and distinct, smaller veins forming little areoles within the bigger ones, but not in the costal areole, free veinlets simple to once forked. *Sori* separate, one row of sori, each one (or two) per areole between each pair of veins or in two (irregular) rows between each pair of veins, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0–0.5 of total length of lamina, predominantly innervated on veinlets or distinct soral veins (except the main soral vein a crossing of smaller veins), 1.6–3 mm diam., generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Sumatra; West and Central Java; Borneo: Sabah, Sarawak, Kalimantan Timor, Kalimantan Selatan; Philippines (Luzon, Mindanao, Negros); Sulawesi; New Guinea (including New Ireland); Pacific: Solomon Islands, Fiji, Hawaii.

Habitat & Ecology — Mainly terrestrial, sometimes a low epiphyte, often in open places, sunny or in half-shade; generally recorded from (coral) limestone, once from ultrabasic, also in grassland. Altitude 0–2000 m.

Vernacular name—Poror (Mendi lang., New Guinea).

6. *Microsorium congregatifolium* (Alderw.) Holttum — Plate 2: 16

Microsorium congregatifolium (Alderw.) Holttum, Revis. Fl. Malaya 2 (1954) 178; Bosman, Monogr.

Microsorium, Leiden Bot. Ser. 14 (1991) 79, f. 13. — [*Microsorium congregatum* Copel., Gen. Fil. (1947) 197, nom. illeg.] — *Pleopeltis congregatifolia* Alderw., Bull. Jard. Bot. Buitenzorg III, 2 (1920) 166. — *Polypodium congregatifolium* C. Chr., Index Filic. Suppl. 3 (1934) 146, non Alderw. (1924). — Lectotype: Lörzing 5532 (BO; iso L, UC, US), Sumatra, Deli, Sibolangit.

Polypodium punctatum subsp. *mindanense* H. Christ, Bull. Herb. Boissier 2 (1906) 994. — *Polypodium punctatum* var. *mindanense* Alderw., Malayan Ferns (1909) 654. — *Microsorium mindanense* Copel., Fern Fl. Philipp. (1960) 486. — Type: *Copeland 1741* (P), Philippines, San Ramon, Mindanao.

Rhizome 4–9 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 16–21, roots densely set (forming a thick mat). Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, slightly spreading, ovate or triangular, 1–5 mm long, 0.3–2 mm broad, margin dentate, apex acute, clathrate or subclathrate, central region bearing multiseptate hairs at least when young. Phyllopodia obscure, 2–9 mm apart. *Leaf* not or slightly dimorphous, herbaceous. Lamina simple, narrowly elliptic to narrowly obovate to linear, 65–85 cm long, 4–7.5 cm broad, index 11–16, base cuneate to truncate, margin entire, apex acute to acuminate, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, up to 2 cm long, 3.5–7 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 9–18 mm apart, more or less straight or zigzag, dichotomously branched near the margin, connecting veins 4–7 between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague or prominent and distinct, variously anastomosing, free veinlets simple or once forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, superficial or slightly immersed, absent from the basal parts for 0.5–0.7 of total length of lamina, mostly irregularly scattered on the smallest veinlets (occasionally in part on tertiary veins), 5–15(–20) per sq. cm, 1 or 2 per veinlet, 1–1.5 mm diam., present or absent in marginal areoles, generally present or absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells, paraphyses 3–8-celled, sporangium annulus 19–21-celled, indurated cells 13–15.

Distribution — Sumatra; Peninsular Malaysia (Perak); Borneo: Sabah, Sarawak; Philippines (Luzon, Panay, Mindanao). See Bosman (l.c.: 78, f. 13).

Habitat & Ecology — Usually a low epiphyte, sometimes epilithic near streams in valleys, humid places, usually in dense shade. Altitude 30–1600 m.

7. *Microsorium pustulatum* (G. Forst.) Copel. — Plate 2: 17; 9: 22

Microsorium pustulatum (G. Forst.) Copel., Gen. Fil. (1947) 196; M.F. Large, J.E. Braggins & P.S. Green, Kew Bull. 47 (1992) 126. — *Polypodium pustulatum* G. Forst., Fl. Ins. Austr. (1786) 81; Cheeseman, Manual New Zealand Fl. (1925) 81. — *Phymatosorus pustulatus* M.F. Large, J.E. Braggins & P.S. Green, New Zeal. J. Bot. 30 (1992) 207. — Lectotype (see Large et al.): Forster 274 (BM; other material: GOET), New Zealand.

Microsorium diversifolium Copel., Univ. Calif. Publ. Bot. 16 (1929) 114; S.B. Andrews, Ferns of Queensland (1990) 279. — *Polypodium diversifolium* Willd., Spec. Pl. 5 (1810) 166, based on *P. scandens* Labill., Nov. Holl. Pl. 2 (1806) 91, t. 240, non G. Forst. (1786); Cheeseman, Manual New Zealand Fl. (1925) 82. — *Polypodium billardieri* R.Br., Prodr. (1810) 147, based on *P. scandens* Labill., non G. Forst. (1786). — *Phymatodes billardieri* C. Presl, Tent. Pterid. (1836) 196. — *Phymatosorus diversifolius* Pic. Serm., Webbia 28 (1973) 459. — Type: *Labillardière s.n.* (FI; iso L, numbered 150), Tasmania.

Rhizome 1.6–6 mm wide, white waxy under the scales, with only circumvascular sheaths, vascular bundles 8–15, roots densely or sparsely set. Scales peltate, dense-

ly set, appressed (but tip spreading), ovate or narrowly ovate or triangular, 2.7–4 mm long, 0.8–2 mm broad (the broader scales in Australia), margin entire (sometimes minutely denticulate towards apex), apex acute, clathrate or subclathrate, cells longitudinally rectangular (towards the apex), central region glabrous. Phyllopodia more or less distinct. *Leaf* strongly dimorphous or not or slightly dimorphous, subcoriaceous. Lamina simple or pinnatifid or basal part pinnate, apical part pinnatifid, narrowly elliptic to narrowly ovate, 4–28 cm long, 1–5 cm broad, index 3–7, base cuneate, margin entire to sinuate, undersurface without acicular hairs; stipe present, 1–10 cm long, 0.7–1.2 mm diam. Lamina of dissected leaf ovate, 15–50 cm long, 7.5–24 cm broad, widest below or about the middle, 2–3 cm wide between the lobes at place of longest lobes (in fertile leaves generally narrow, in sterile leaves 1–3), index 1–3; stipe present, 1.5–35 cm long, 1.6–3 mm diam.; lobes 1–12 at each side (usually strap-shaped, rather straight), longest lobes widest about middle, at position 1–5 from base, 2.5–13 cm long, 1.5–4 cm broad, index 3–4, apex acute to short acuminate. Apical lobe longer than upper lateral lobes, 6–15 cm long, 2.5–4.5 cm broad, widest at or just above base to widest below middle. Lamina of fertile leaves simple or pinnatifid or basal part pinnate, apical part pinnatifid, narrowly ovate to narrowly elliptic, 7–50 cm long, 3–24 cm broad, lobes 1–12 at each side (generally more than in sterile leaves), linear, longest lobe 2.5–20 cm long, broadest lobe 0.7–2.3 cm broad (rarely broader as in sterile leaves), apical lobe linear; stipe present, 2.5–35 cm long. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (in fertile pinnae). Veins prominent and distinct, 4–7 mm apart, \pm straight, dichotomously branched near margin, connecting veins 2 between adjacent secondary veins, anadromous, smaller veins prominent and distinct, forming small secondary marginal areoles, free veinlets simple or once forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, often close to the costa, at most halfway to the margin, round, superficial or slightly immersed or deeply sunken, visible as protrusions on upper surface, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 3–5 mm diam.

Distribution — Australia (SE Queensland, New South Wales, Lord Howe I., Norfolk Is., Victoria, and Tasmania), New Zealand.

Habitat & Ecology — Terrestrial or epilithic to low epiphyte, mostly reported from limestone, in rain forest. Altitude 120–1000 m.

Note — *Microsorium pustulatum* has long been a mysterious name because of the resemblance, in absence of the rhizome, to *M. scandens*. Large et al. have solved the case by studying the spores.

8. *Microsorium egregium* (Brause) Bosman

Microsorium egregium (Brause) Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 80. — *Polypodium egregium* Brause, Bot. Jahrb. Syst. 56 (1920) 199. — Type: *Ledermann 7542* (BM, S), New Guinea, 'Kaiserin Augusta Fluss'.

Rhizome 3–8 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 8–14, roots sparsely set. Scales peltate or pseudo-peltate, densely set or apically densely set, otherwise more or less sparsely set, appressed, ovate or narrowly ovate or triangular, 0.5–2 mm long, 0.5–2 mm broad, margin entire or dentate, apex acute (but often broken), clathrate or subclathrate or clathrate except the hyaline marginal region, central region glabrous. Phyllopodia more or less distinct, 5–10 mm apart. *Leaf* not or slightly dimorphous, herbaceous. Lamina pinnatifid, base truncate-angustate or narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, undersurface with acicular hairs. Lamina of dissected leaf 45–70 cm long, 25–60 cm broad, widest below or about the middle or above the middle, 0.2–4 cm wide between the lobes at place of longest lobes, index 1.5–2; stipe present, 0.5–22 cm long, up to 4 mm diam.; lobes 1–5 at each side, longest lobes widest about to above the middle, at position 1, 2, or 3 from base, 10–40 cm long, 5–6 cm broad, index 2.2–6, apex long acuminate. Apical lobe longer than upper lateral lobes, widest below the middle. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins prominent and distinct, 9–20 mm apart, more or less straight, dichotomously branched near the margin, catadromous, smaller veins prominent and distinct, variously anastomosing within the main and marginal areoles, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 10–15 per sq. cm, 1–1.5 mm diameter, present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 3-celled (or occasionally with a 1-celled subapical acicular branch), sporangium annulus 19–21-celled, indurated cells 13 or 14.

Distribution — Moluccas (Bacan, Mt Sibela; Halmahera); Papua New Guinea (Sepik Prov.).

Habitat & Ecology — Epiphyte in primary forest. Altitude 20–40 m in Papua New Guinea, 950 m in Bacan.

9. *Microsorium ensatum* (Thunb.) H. Itô — Plate 2: 18; 9: 24

Microsorium ensatum (Thunb.) H. Itô, J. Jap. Bot. 11 (1935) 96. — *Polypodium ensatum* Thunb., Trans. Linn. Soc. London 2 (1794) 341; H. Christ, Bull. Acad. Int. Géogr. Bot. 11 (1902) 210. — *Pleopeltis ensata* T. Moore, Index Filic. (1862) 346. — *Neocheiropteris ensata* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 109; Nakaike, Enum. Pterid. Jap. Filic. (1975) 345; E. H. Walker, Fl. Okinawa & Ryukyu (1976) 118. — *Neolepisorus ensatus* Ching, Bull. Fan Mem. Inst. Biol. 10 (1940) 14. — Type: *Thunberg* (n.v.).
 [*Polypodium ovatum* Wall. ex Hook. & Grev., Icon. Filic. (1827) t. 41, non Burman (1768).] — *Pleopeltis ovata* Bedd., Ferns Brit. India (1866) t. 157. — *Polypodium phyllomanes* H. Christ, Bull. Acad. Int. Géogr. Bot. 11 (1902) 210, nom. nov., incl. var. — *Neocheiropteris phyllomanes* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 110; Icon. Filic. Sin. 2 (1934) pl. 89; Copel., Fern Fl. Philipp. (1960) 464. — *Neolepisorus phyllomanes* Ching, Bull. Fan Mem. Inst. Biol. 10 (1940) 14. — *Neolepisorus ovatus* Ching, Acta Phytotax. Sin. 9 (1964) 99; Ching & Shing,

- Acta Phytotax. Sin. 21 (1983) 268. — *Microsorium ovatum* N.C. Nair et al., Bull. Bot. Surv. India 11 (1969) 432. — Type: *Wallich 276* (K), N India, Chundaghiri.
- Polypodium deltoideum* Baker, Lond. J. Bot. (1880) 230. — Type: *Henry 3279* (K), China, Ichang.
- Polypodium oligolepis* Baker, Kew Bull. (1898) 231. — Type: *Henry 9896* (K).
- Polypodium rosthornii* Diels, Bot. Jahrb. Syst. 29 (1901) 205. — Type: *Rosthorn 118f* (B, n.v.), China.
- Neolepisorus truncatus* Ching & P.S. Wang, Acta Phytotax. Sin. 21 (1981) 220. — Type: *P. S. Wang 2018* (n.v.), China.
- Neolepisorus minor* W.M. Chu, Acta Bot. Yunnan. 1 (1979) 94, pl. 2. — Type: *W.M. Chu 8228* (HGUY), China.
- Neolepisorus lancifolius* Ching & K.H. Shing, Acta Phytotax. Sin. 21 (1983) 271. — Type: *S. P. Lian et al. 32522* (PE), China.
- Neolepisorus dengii* Ching & P.S. Wang, Acta Phytotax. Sin. 21 (1983) 272. — Type: *S.W. Deng 90002* (PE), China.
- Neolepisorus emeiensis* Ching & K.H. Shing, Acta Phytotax. Sin. 21 (1983) 271. — Type: *W. C. Wang 1836* (n.v.), China.
- Neolepisorus tsaii* Ching & K.H. Shing, Acta Phytotax. Sin. 21 (1983) 273. — Type: *H.T. Tsai 51503* (PE; iso NY, P), China, Yunnan.
- Neolepisorus sinensis* Ching, Acta Phytotax. Sin. 21 (1983) 274. — Type: *K.H. Shing & K.Y. Lang 983* (PE), China, Sichuan.
- Neolepisorus tenuipes* K.H. Shing, Acta Phytotax. Sin. 21 (1983) 274. — Type: *K.M. Feng 13207* (KUN), China, Yunnan, Marlipo.
- Microsorium ovalifolium* Chin & S.K. Wu, Fl. Xizangica 1 (1983) 327.— Type: *Qinghai-Xizang Complex Exp. 333* (PE), China., Tibet.
- Neolepisorus crenatus* S.F. Wu in Wang Wentsai, Keys Vascular Plants Wuling Mountains (1995) 573. — Type: *S.F. Wu 5282* (iso PE), China, Wuling.
- Neolepisorus cuneatus* S.F. Wu in Wang Wentsai, Keys Vascular Plants Wuling. Mountains (1995) 577. — Type: *Exp. Wulingshan 4115* (PE), China, Wuling.
- Aspidium singaporianum* auct. non Hook. & Grev.: Warb., Monsunia 1 (1900) 75. — *Warburg s. n.* (?), 'Mittel China, Futschau'.

Rhizome 2–4 mm wide, slightly dorsoventrally flattened, not white waxy, with only scattered strands of sclerenchyma or without sclerenchyma or circumvascular sheaths (sometimes brownish circumvascular sheaths present), the vascular bundles 10–20, sclerenchyma strands 30–50, roots densely set. Scales pseudopeltate (but scales on stipe and lamina peltate), densely set or apically densely set, otherwise more or less sparsely set, appressed or distinctly spreading, ovate or narrowly ovate or triangular, 1.5–3 mm long, 1–1.5 mm broad, the margin denticulate or dentate, apex acute, clathrate or subclathrate, cells longitudinally rectangular (towards the apex), central region bearing multiseptate hairs at least when young. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, herbaceous or subcoriaceous. Lamina simple, sometimes irregularly lobed, pinnatifid or bipinnatifid, (narrowly) elliptic or ovate, narrowly obovate, or deltoid, 13–52 cm long, 3–12 cm broad, index 2.5–8, base truncate-angustate or cuneate-angustate, margin entire or sinuate, apex acute or acuminate (often with obtuse tip), undersurface without acicular hairs; stipe present, 7–45 cm long, 1–4 mm diam. Lamina of dissected leaf elliptic or ovate; stipe present, 7–45 cm long, 1–4 mm diam.; lobes 1–5 at each side, longest lobes widest about the middle, at position 1–3 from base, 12–18 cm long, 1.2–2.5 cm broad, index 7–10, apex acute (often with blunt tip). Apical lobe longer than upper lateral lobes. Venation type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between

two veins, or type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins. Veins prominent and distinct (sometimes rather obscure in the pinnatifid leaves), 7–17 mm apart, more or less straight (in broader leaves), connecting veins 1–8 between adjacent secondary veins, anadromous, smaller veins more or less immersed and vague, forming secondary areoles, free veinlets simple or once or twice forked. *Sori* 2.5–5 mm diam., separate, one row of sori, each one (or two) per areole between each pair of veins or one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin (rarely some connate), round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, predominantly on connective veins or solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, absent in marginal areoles, generally present in costal areoles; paraphyses clathrate and peltate.

Distribution — India (Assam), Nepal, Burma (Chin Hills), China (Yunnan, Sichuan, Guizhou, Hubei, Guangdong, Jiangxi, Anhui, Fujian, Zhejiang; Taiwan), Japan (Honshu, Kyushu, Ryukyu). In Malesia: Philippines (Mountain Prov., Mt Data).

Habitat & Ecology — Terrestrial on sandy silt soil or on rocky slopes in wooded ravine, also in rocky swamp. Altitude 400–2850 m.

Note — This species is probably a hybrid between a species of *Lepisorus* and a true *Microsorium* species. In several collections the number of spores is very small, and the leaves are often irregularly incised.

10. *Microsorium fortunei* (T. Moore) Ching — Plate 3: 19; 9: 25

Microsorium fortunei (T. Moore) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 304; E. H. Walker, Fl. Okinawa & Ryukyu (1976) 113. — *Drynaria fortunei* T. Moore, Ann. Bot. (Koenig & Sims) (1855) 708. — *Lepisorus fortunei* Kuo, Taiwania 30 (1985) 68. — Type: *Fortune* (BM, L), China.

Polypodium chinense Mett. in Kuhn, Linnaea (1868) 270. — Type: *de Grijs in herb. Hance 6786* (BM), China, Fujian.

Polypodium normale var. *polysorum* Baker, J. Bot. (1875) 202. — Type: *Sherre s.n.* (1873) (n.v., according to Ching, 1933).

Polypodium austrosinicum C. Chr., Index Filic. (1906) 512. — *Microsorium henryi* Kuo, Taiwania 30 (1985) 42, 67. — Type: *Henry 9780* (K, NY, P), China, Yunnan.

Phymatodes takedae Nakai, Bot. Mag. Tokyo 43 (1929) 2. — *Microsorium takedae* H. Itô, J. Jap. Bot. 11 (1935) 97. — Type: *Yamamoto* (n.v.).

Microsorium excelsum Ching & S. K. Wu, Fl. Xizangica 1 (1983) 327. — Type: *Qinghai-Xizang Complex Exp. 861* (PE), China, Tibet.

Rhizome 2–5 mm wide, not white waxy, with only scattered strands of sclerenchyma, sclerenchyma strands 10–100, roots sparsely set. Scales pseudopeltate, densely set, appressed, ovate or triangular, 2.5–5 mm long, 1.5–2 mm broad, margin entire or denticulate (basal margin often eroded), apex acute (but often broken), clathrate or subclathrate (but hyaline margin at base), cells longitudinally rectangular (towards the apex), central region glabrous. Phyllopodia more or less distinct. Leaf not or slightly dimorphous, herbaceous. Lamina simple, narrowly elliptic to linear, 24–90 cm long, 2–6 cm broad, index 8–15, base narrowly angustate, the stipe winged for a considerable part, margin undulate, apex acute or acuminate, undersurface without acicular

hairs; stipe present, 0.5–22 cm long, 1.5–3.8 mm diam. Venation type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins more or less immersed and vague, 7–12 mm apart, zigzag, dichotomously branched below the middle, connecting veins 2–5 between adjacent secondary veins, anadromous, the smaller veins more or less immersed and vague, venation often rather irregular, free veinlets simple or once forked. *Sori* separate, in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein to one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 1.5–3.5 mm diam., absent in marginal areoles, generally absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — China (Yunnan, Sichuan, Guizhou, Guangxi, Hubei, Sichuan, Hunan, Anhui, Zhejiang), Vietnam (Tonkin). In Malesia: Peninsular Malaysia (Perak, G. Batu Puteh).

Habitat & Ecology — No records. Altitude 400–2500 m.

11. *Microsorium hainanense* Noot., *spec. nov.* — Plate 3: 20, 21

Rhizoma 4–7 mm lata, ceracea, textura filis sclerenchymatibus 50–150 squamis appressis pseudopeltatis circularibus ad ovalibus 2.5 ad 5 mm longis. Lamina pinnatifida 12–40 cm longa 10–35 cm lata secus rhachim 1.5–3 cm lata stipite 6–30 cm longo utroque latere lobis 1–9, 5–20 cm longis 3–4 cm latis nervatura areolis soris depressis separatisque unoseriatum ad costam parallelibus. — Typus: *Nootboom & Ye 5611* (L), China, Hainan, Jianfenglin, 1900 m alt.

Rhizome 4–7 mm wide, rounded, white waxy under the scales, with only scattered strands of sclerenchyma, vascular bundles 15–25, sclerenchyma strands 50–150. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed, circular or elliptic, often with eroded margins (when young with marginal glands), 2.5–5 mm long, 2.5–4 mm broad, apex rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region bearing multiseptate hairs at least when young. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, subcoriaceous. Lamina pinnatifid, base cuneate or cuneate-angustate, margin entire, undersurface without acicular hairs. Lamina of dissected leaf 12–40 cm long, 10–35 cm broad, 1.5–3 cm wide between the lobes at place of longest lobes; stipe present, 6–30 cm long, 0.8–3 mm diam.; lobes 1–9 at each side, longest lobes widest about the middle, at position 2 or 3 from base, 5–20 cm long, 1.3–2.5 cm broad, index 4–10, apex rounded or acute. Apical lobe longer than upper lateral lobes, 8–25 cm long, 3–4 cm broad, widest about the middle. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal

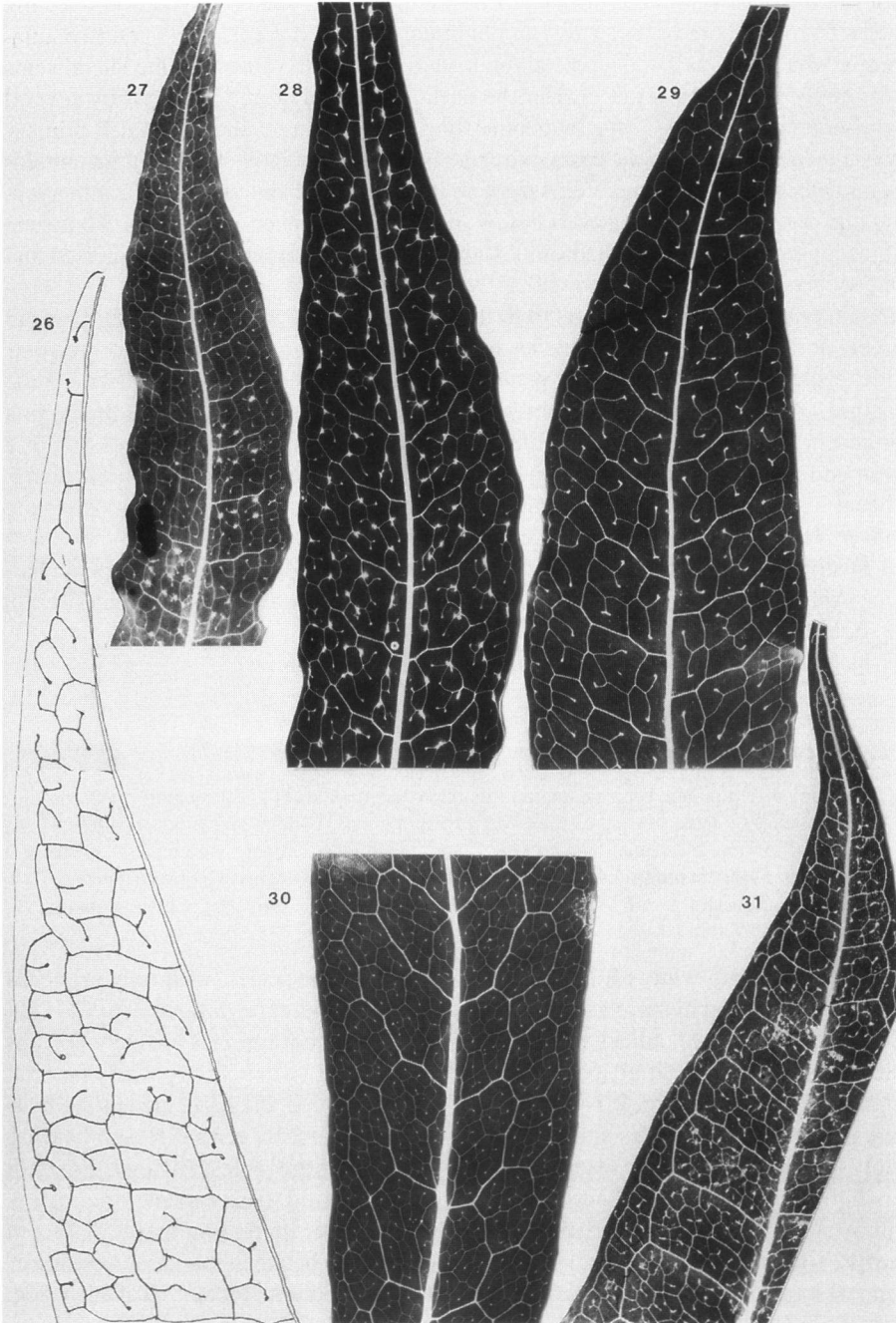


Plate 10. Venation. — 26: *Microsorium heterocarpum* (Iwatsuki T. 1009). — 27: *M. heterolobum* (BS 37774). — 28 & 29: *M. insigne* (Körnicke 16110a). — 30: *M. latilobatum* (Le Rat 74). — 31: *M. longissimum* (Brooks s. n.). All about $\times 0.5$.

areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins more or less immersed and vague, 8–11 mm apart, dichotomously branched near the margin, anadromous, smaller veins more or less immersed and vague, free veinlets simple or once forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, deeply sunken, visible as protrusions on the upper surface, on distinct soral veins (except the main soral vein a crossing of smaller veins), 2–4 mm diam., absent in marginal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — India (Tamil Nadu, Tirunelveli Hills), Vietnam (Annam & Tonkin), China (Hainan).

Habitat & Ecology — Terrestrial on steep rocky slope at roadside, on rocks, or epiphyte in forest. Altitude 300–1900 m.

12. *Microsorium heterocarpum* (Blume) Ching — Plate 3: 22; 10: 26

Microsorium heterocarpum (Blume) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 295; Copel., Fern Fl. Philipp. (1960) 485; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 83. — *Polypodium heterocarpum* Blume, Fl. Javæ. Filic. (1829) 167, t. 75. — *Pleopeltis heterocarpa* T. Moore, Index Filic. (1857) lxxviii. — Type: *Blume* (L), Java, Randja Gedeh.

Polypodium zollingerianum Kunze, Bot. Zeit. (Berlin) 6 (1846) 422. — Type: *Zollinger 1499* (BO, Z), Java, Tjipatat.

Nephrodium pteropodum Baker, J. Bot. 26 (1888) 325. — *Aspidium pteropus* Diels in Engl., Nat. Pflanzenfam. 1, 4 (1899) 183. — Type: *Hose 232* (K), West Borneo.

Polypodium scortechinii Baker, Ann. Bot. (London) 5 (1891) 477. — *Pleopeltis scortechinii* Bedd., Suppl. Ferns Brit. India (1892) 95. — Type: *Scortechini 216* (K), Perak.

Campylogramma lancifolia Alderw., Bull. Jard. Bot. Buitenzorg II, 23 (1916) 7, t. 1. — Type: *Rachmat 165* (BO), Mt Boesoe, Celebes.

Rhizome 2–6 mm wide, dorso-ventrally flattened or about cylindrical, not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 9–12, sclerenchyma strands 8–15, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed, ovate or narrowly ovate or triangular, 1.5–4 mm long, 0.5–2 mm broad, margin denticulate or dentate, apex acute, clathrate or subclathrate, the central region glabrous. Phyllopodia more or less distinct, 2–11 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple, narrowly ovate to narrowly elliptic to narrowly obovate to linear, 20–70 cm long (in fertile leaves 20–50), 3.5–15 cm broad, index 4–8, base narrowly angustate, the stipe winged for a considerable part, margin entire or sinuate, apex acuminate, undersurface without acicular hairs; stipe present, 1.5–25 cm long (0.5–45 in fertile leaves), 2–4 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 6–10 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 6–10 between adjacent secondary veins, catadromous, smaller veins more or

less immersed and vague or prominent and distinct, variously anastomosing, free veinlets simple or once forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets (occasionally in part on tertiary veins, often forming 4–8 irregular rows parallel to each vein), 10–30 per sq. cm, 2 per veinlet, 1 mm diam., 2–5 mm long, present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2- or 3-celled, sporangium annulus 18–21-celled, indurated cells 12–14.

Distribution — Peninsular Thailand. In Malesia: Peninsular Malaysia, Sumatra, Java, Lesser Sunda Islands (Flores), Borneo, Philippines (Luzon, Mindanao), Sulawesi, Moluccas (Seram).

Habitat & Ecology — Epilithic, epiphytic, or terrestrial in primary rain forest, often slopes; shady and wet places. Altitude 50–2200 m.

13. *Microsorium heterolobum* (C. Chr.) Copel. — Plate 3: 23; 10: 27

Microsorium heterolobum (C. Chr.) Copel., Gen. Fil. (1947) 196; Fern Fl. Philipp. (1960) 485; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 84, f. 15. — [*Polypodium anomalum* H. Christ, Bull. Herb. Boissier 6 (1898) 201, t. 3, f. 3, nom. illeg.] — *Polypodium heterolobum* C. Chr., Index Filic. (1906) 532. — Type: *Loher s. n.* (P; iso K), Philippines, Mt Data.

Rhizome 1.5–4 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 9 or 10, roots sparsely set. Scales pseudopeltate, densely set, distinctly spreading, ovate or narrowly ovate or triangular, 2–5 mm long, 0.5–1.5 mm broad, margin denticulate, apex acute, clathrate or subclathrate, the central region bearing multiseptate hairs at least when young or the central region glabrous. Phyllopodia more or less distinct, 5–35 mm apart. *Leaf* not or slightly dimorphic, herbaceous. Lamina simple or simple but (irregularly) lobed, narrowly elliptic to narrowly ovate to linear, 10–30 cm long, 1.5–3 cm broad (excluding the narrowly triangular lobes which are up to 9 cm long and 1 cm broad), index 6.5–15, base narrowly angustate, the stipe winged for a considerable part, margin sinuate, apex acute to acuminate, undersurface without acicular hairs; stipe present, 2–15 cm long, 0.5–1.5 mm diam. Lamina of dissected leaf 10–30 cm long, 3–20 cm broad, 0.7–1.5 cm wide between the lobes at place of longest lobes; stipe present, 2–15 cm long, up to 1.5 mm diam., 9 cm long, 1 cm broad. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins more or less immersed and vague, 5–12 mm apart, zigzag, dichotomously branched near the margin, connecting veins 2–4 between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague, variously anastomosing, free veinlets simple or once forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on

the whole surface of the lamina or absent from the basal parts for 0.5 of total length of lamina, mostly irregularly scattered on the smallest veinlets (in part 2 per connective vein, forming 2 irregular rows parallel to each vein), 5–20 per sq. cm, 1–2 mm diam., 2.5–4 mm long, present or absent in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2–4-celled, sporangium annulus 19- or 20-celled, indurated cells 13 or 14.

Distribution — Philippines (Luzon). See Bosman (l.c.: 84, f. 15).

Habitat & Ecology — Epiphyte in primary forest. Altitude 2250–2700 m.

Note — Probably a hybrid, see Bosman (l.c.).

14. *Microsorium insigne* (Blume) Copel. — Plate 10: 28

- Microsorium insigne* (Blume) Copel., Univ. Calif. Publ. Bot. 16 (1929) 112; Fern Fl. Philipp. (1960) 481. — *Polypodium insigne* Blume, Enum. Pl. Javae (1828) 127. — *Pleopeltis insignis* Bedd., Ferns Brit. India (1866) t. 214. — *Colysis insignis* J.Sm., Hist. Fil. (1875) 101; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 108. — Lectotype: *Zippelius s.n.* (L), Java. *Polypodium diffundens* Kunze, Bot. Zeit. (Berlin) 4 (1846) 422. — Type: *Zollinger 1299* (P, Z), Java. *Drynaria decurrens* Brack., U.S. Expl. Exp., Filic. 16 (1854) 48. — *Pleopeltis decurrens* T. Moore, Index Filic. (1862) 345. — *Microsorium decurrens* Copel., Fern. Fl. Philipp. 3 (1960) 481. — Type: *Brackenridge 11* (US; iso K), Philippines, Luzon, mountains near Los Baños. [*Polypodium dilatatum* Wall., Cat. (1829) 295, nomen; Hook., Sp. Fil. 5 (1864) 85, non Hoffmann (1795).] — *Pleopeltis dilatata* Bedd., Ferns Brit. India 1 (1866) t. 122. — *Colysis dilatata* J.Sm., Hist. Fil. (1874) 101. — *Polypodium europhyllum* C.Chr., Index Filic. (1906) 525, p.p. — *Microsorium dilatatum* Sledge, Bull. Br. Mus. Nat. Hist. (Bot.) 2 (1960) 143; E.H. Walker, Fl. Okinawa & Ryukyu (1976) 113. — *Kaulinia dilatata* B. Nayar & Kaur, Companion Beddome's Handb. Ferns Brit. India (1974) 89. — Type: *Wallich 295* (K; iso US), Nepal. *Polypodium hancockii* Baker, J. Bot. 23 (1885) 106. — *Microsorium hancockii* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 309. — *Kaulinia hancockii* Nayar, Taxon 13 (1964) 47. — Type: *Hancock 100* (BM, K), Taiwan, Tamsui. *Selliguea anceps* H. Christ, Bull. Herb. Boissier 6 (1898) 879. — *Polypodium anceps* C.Chr., Index Filic. (1906) 509. — Type: *Henry 10089a* (K), China, Yunnan, Mengtze. *Polypodium dolichopterum* Copel., Philipp. J. Sci. 1, Suppl. (1906) 162. — *Pleopeltis dolichoptera* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 9. — Type: *Copeland 1717* (BM, P, S), Philippines, Mindanao, San Ramon. *Polypodium rivulare* Copel., Philipp. J. Sci. 1, Suppl. (1906) 163, non Vahl (1807). — *Pleopeltis rivularis* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 9. — Syntypes: *Copeland 1998* (B, BM, P), Philippines, Laguna, Los Baños; *Copeland 2021* (B), Batangas, Mt Malarayat. *Pleopeltis insignis* forma *aperta* Alderw., Bull. Jard. Bot. Buitenzorg II, 16 (1914) 29. — Type: *Mathew 670* (BO; iso K), Sumatra, Padang Pandjang. [*Microsorium ? palmatum* Fée, Mém. Foug. 5. Gen. Filic. (1852) 269, nom. inval., p.p. — Only for *Cuming 52*.]

Rhizome 2–11 mm wide, dorso-ventrally flattened or about cylindrical, not white waxy, bearing only scales, with only circumvascular sheaths (but in *Tagawa T 1301* only scattered sclerenchyma strands), vascular bundles 7–16, the roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed or distinctly spreading, ovate or narrowly ovate or triangular, (2–)2.5–7.5 mm long, 0.5–2.5(–3) mm broad, margin entire to denticulate (occasionally with small triangular lobes), clathrate or subclathrate, central region glabrous. Phyllopodia more or less distinct, 2.5–11 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple or pinnatifid, simple lamina narrowly ovate to narrowly obovate,

2.5–65 cm long, 0.5–6.5 cm broad, index 4–11, base narrowly angustate, the stipe winged for a considerable part, margin entire (rarely sinuate), apex acute to acuminate, undersurface without acicular hairs; stipe 0–10 cm, lamina decurrent to its base, there only two ridges left, 0.5–1.5 mm diameter (at base). Lamina of dissected leaf 8–110 cm long (the tapering base not included), 3–55 cm broad, widest below to about the middle, 0.5–5 cm wide between the lobes at place of longest lobes, index 3–8.5; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–40 cm long, 1.4–6.2 mm diam.; lobes 1–12(–14) at each side, longest lobes widest at base to widest about the middle, at position 1–3 from base, 2–27 cm long, 0.3–55 cm broad, index 3–8.5. Apical lobe conform to upper lateral lobes or shorter to longer than upper lateral lobes. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 4–13 mm apart, more or less straight or zigzag, dichotomously branched near the margin (immersed at 3/4–4/5 of lamina width), the connecting veins 1–3 between adjacent secondary veins (interconnected by some quaternary veins), anadromous (rarely catadromous), smaller veins more or less immersed and vague, variously anastomosing, free veinlets simple or once forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, absent from basal parts for 0.3–0.5 of total length of the lamina, mostly irregularly scattered on the smallest veinlets or predominantly on connective veins, 5–20(–30) per sq. cm, 2 per veinlet (if on connective veins), 0.5–1.5 mm diam., 1.5–5 mm long, present or absent in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Nepal, Sikkim, Bhutan, India (Assam), Sri Lanka, Burma, China (Yunnan, Sichuan, Guizhou, Guangxi, Guangdong, Jiangxi, Fujian; Taiwan), Thailand, Vietnam, Japan (Ryukyu Is.). In Malesia: Sumatra, Peninsular Malaysia, Java, Lesser Sunda Islands (Flores), Borneo, Philippines.

Habitat & Ecology — Usually epilithic, sometimes epiphytic in primary and secondary forest; in or along streams or falls, in undergrowth of shrubs; twice reported from caves; shady, mossy, muddy, and wet places. Altitude 50–2300 m.

15. *Microsorium lastii* (Baker) Tardieu

Microsorium lastii (Baker) Tardieu, Fam. 5 (1960) 116; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 85. — *Polypodium lastii* Baker, J. Bot. 29 (1891) 5. — *Neocheiropteris lastii* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 111. — Type: *Last s. n.* (K), Madagascar, NW, Bé Kilus Mts.

Rhizome 1.5–3 mm wide, dorso-ventrally flattened or about cylindrical, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 13, sclerenchyma strands 50–100, the roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed, 2–3 mm long, 1–1.5 mm broad, the margin entire, clathrate except the hyaline marginal region, the central region bearing

multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct, 5–15 mm apart. *Leaf* not or slightly dimorphous, membranaceous. Lamina simple, ovate to narrowly ovate, 10–35 cm long, 3–10 cm broad, the index 2.5–4.5, base truncate-angustate, the margin entire or undulate, apex acute to acuminate, the undersurface without acicular hairs; stipe present, 5–20 cm long, 1–3 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 10–17 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 4–6 between adjacent secondary veins, catadromous, smaller veins prominent and distinct, variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round or elongate, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0.25 of total length of lamina, mostly irregularly scattered on the smallest veinlets, 3–6 per sq. cm, 2 per veinlet (not on connecting veins), 1 mm diam., 2–3 mm long, absent in marginal areoles, generally absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2–4-celled, sporangium annulus 19–21-celled, indurated cells 12–14.

Distribution — Madagascar. See Bosman (l.c.: 87, f. 16).

16. *Microsorium latilobatum* Hennisman & Hett. — Plate 3: 24; 10: 30

Microsorium latilobatum Hennisman & Hett., Bot. Jahrb. Syst. 105 (1984) 6. — *Acrostichum varians* forma *major* Mett., Ann. Sci. Nat. Bot. Ser. 4, 15 (1861) 57. — *Leptochilus varians* var. *α* Fourn., Bull. Soc. Bot. France 16 (1869) 394, nomen. — Type: *Vieillard 1528* (B), New Caledonia, Poila.

Rhizome 0.5–1.5 mm wide, dorso-ventrally flattened, not white waxy, without sclerenchyma or circumvascular sheaths, roots sparsely set. Scales peltate or pseudopeltate, densely set or apically densely set, otherwise more or less sparsely set, distinctly or slightly spreading (at least around phyllopodia), ovate or narrowly ovate or triangular, 2–8 mm long, 1–2.5 mm broad, margin denticulate, apex acute, clathrate or subclathrate or clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region glabrous. Phyllopodia more or less distinct. Leaf strongly dimorphous, herbaceous or subcoriaceous. Lamina pinnatifid, margin entire, undersurface without acicular hairs. Lamina of dissected leaf 20–50 cm long, 20–40 cm broad, widest at about the middle, 0.5–3 cm wide between the lobes at the place of longest lobes, index 1–1.6; stipe present, 4–25 cm long; lobes 1–5 at each side, the longest lobes widest above the middle, 7–23 cm long, 1.8–5.5 cm broad, index 3–6, apex rounded, 15–25 cm long, 3–5 cm broad. Lamina of fertile leaves pinnatifid, 10–40 cm long, 12–45 cm broad, lobes 1–4 at each side, linear, longest lobe 3–20 cm long, broadest lobe 0.3–0.8 cm broad, apical lobe linear, 8–16 cm long, 1.3–10 mm broad; stipe present, 2.5–15 cm long. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connect-

ing vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (sometimes minor veins forming pseudo-connective veins and seemingly a row of areoles present between two veins). Veins prominent and distinct, dichotomously branched in about the middle, smaller veins prominent and distinct, free veinlets simple or once or twice forked. *Sori* acrostichoid; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — New Caledonia.

17. *Microsorium leandrianum* Tardieu

Microsorium leandrianum Tardieu, Notul. Syst. (Paris) 15 (1959) 444; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 86. — Type: *Léandri* 1900 (P), Madagascar, S of Tsiandro.

Rhizome 3–5 mm wide, dorso-ventrally flattened or about cylindrical, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 13, the sclerenchyma strands 25–50, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed or slightly spreading, 2–4 mm long, 1–2 mm broad, margin entire, clathrate except the hyaline marginal region, central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct, 5–20 mm apart. *Leaf* not or slightly dimorphous, membranaceous. Lamina simple, narrowly elliptic to narrowly ovate, 30–55 cm long, 4.5–8 cm broad, index 5–7, base narrowly angustate, the stipe winged for a considerable part, margin entire or undulate, apex acute, undersurface without acicular hairs; stipe present, 5–10 cm long, 2–4 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins. Veins prominent and distinct, 8–14 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 4 or 5 between adjacent secondary veins, catadromous, smaller veins prominent and distinct, variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round or elongate, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0.5 of total length of lamina, mostly irregularly scattered on the smallest veinlets, 4–8 per sq. cm, 2 per veinlet (not on connecting veins, in part scattered on the smallest veins), 1 mm diam., 2–5 mm long, absent in marginal areoles, generally absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2–4-celled (or occasionally with a subapical glandular branch), sporangium annulus 17–20-celled, indurated cells 11–14.

Distribution — Madagascar. See Bosman (l.c.: 87, f. 16).

18. *Microsorium linguiforme* (Mett.) Copel. — Plate 3: 25

Microsorium linguiforme (Mett.) Copel., Univ. Calif. Publ. Bot. 16 (1929) 116; Fern Fl. Philipp. (1960) 487 (*linguaeforme*); Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 88. — *Polypodium linguiforme* Mett. in Miq., Ann. Mus. Bot. Lugd.-Bat. 2 (1866) 228. — *Pleopeltis linguiforme* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 6. — Lectotype: *Zippelius* (L), New Guinea.

- Polypodium annabellae* H.O. Forbes, J. Bot. 26 (1888) 33. — *Pleopeltis annabellae* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 5. — *Dendroconche annabellae* Copel., Philipp. J. Sci. 6, Bot. (1911) 91. — Type: *Forbes* (n.v.), New Guinea, Owen Stanley Range, above Murray River.
- Polypodium cyclobasis* Baker, Kew Bull. (1896) 42. — Syntypes: *Kennedy* (K); *Micholitz* (K), Papua New Guinea.
- Polypodium schumannianum* Diels in K. Schum. & Lauterb., Fl. Schutzgeb. Südsee (1900) 139, t. 3C, D. — *Pleopeltis musifolium* var. *schumanniana* Rosenst., Nova Guinea 8 (1912) 729. — *Microsorium schumannianum* Copel., Gen. Fil. (1947) 196. — Type: *Hellwig 238* (n.v.), Kaiser Wilhelmsland, Sattelberg.
- Pleopeltis dendroconchoides* Alderw., Bull. Jard. Bot. Buitenzorg III, 2 (1910) 165. — Type: *Jacobson* (BO, L), Sumatra, Bt. Batoe, Banting.
- Dendroconche kingii* Copel., Univ. Calif. Publ. Bot. 12 (1931) 407. — Type: *King 387* (NSW), New Guinea.

Rhizome 1–9 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 7–15, the roots densely set (forming a thick mat). Scales peltate or pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed or slightly spreading, ovate or narrowly ovate or triangular, 3.5–10 mm long, 1–2.5 mm broad, margin denticulate or dentate, clathrate except the hyaline marginal region, the central region glabrous. Phyllopodia more or less distinct or obscure, 10–75 mm apart. *Leaf* not or slightly dimorphous (occasionally dimorphic in New Guinea), herbaceous. Lamina simple, elliptic to narrowly elliptic or ovate to narrowly ovate or obovate to narrowly obovate, 3–70 cm long, 2–17 cm broad, index 0.8–7.5, base cordate, auriculate to narrowly angustate, the stipe winged for a considerable part, margin entire, apex rounded to acuminate, undersurface without acicular hairs; stipe present, up to 12 cm long, 3–5 mm diam. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (or irregular in nearly circular fronds). Veins prominent and distinct, 7–30 mm apart, more or less straight, dichotomously branched near the margin or about the middle or below the middle, catadromous, smaller veins prominent and distinct, variously anastomosing within the main and marginal areoles, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0.7 of the total length of the lamina, mostly irregularly scattered on the smallest veinlets, 2–15 per sq. cm, usually on the free included veins, 1.5–3 mm diam., 3–5 mm long, present or absent in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 1–3-celled, sporangium annulus 20–37-celled, indurated cells 14–25.

Distribution — India (Kerala). In Malesia: Sumatra; Borneo: Sabah, Sarawak; Sulawesi; Moluccas; New Guinea; Solomon Islands; Fiji Islands.

Habitat & Ecology — Usually a low epiphyte, sometimes higher, rarely epilithic or terrestrial, in various types of primary and secondary forest; in shady and moist places. Altitude 0–1650 m.

Uses — Uncooked, salted fronds are locally eaten in New Guinea.

Vernacular names — Koiwa (Nauti, also used for *M. glossophyllum*), gwau-utu (Daga).

Note — This species is very close to *M. rampans*, and might be conspecific.

19. *Microsorium longissimum* J.Sm. ex Fée — Plate 10: 31

Microsorium longissimum J.Sm. ex Fée, *Mém. Foug.* 5. Gen. Filic. (1852) 268, t. 20B f. 2; Copel., *Fern Fl. Philipp.* (1960) 482 — *Polypodium myriocarpum* C.Presl ex Mett., *Abh. Sencken. Naturforsch. Ges.* 2 (1856) 105, nom. nov., non *Polypodium longissimum* Blume (1828). — *Pleopeltis myriocarpa* T. Moore, *Index Filic.* (1857) lxxviii; Alderw., *Bull. Jard. Bot. Buitenzorg II*, 11 (1913) 19. — *Microsorium myriocarpum* H. Itô, *J. Jap. Bot.* 11 (1935) 97, nom. illeg. — Type: *Cuming 66* (B; iso BM, G, K, L, LE, P, PC, US, Z), Philippines, Luzon, Laguna Prov. *Drynaria longifolia* Brack., *U.S. Expl. Exp., Filic.* 16 (1854) 45. — Type: *Brackenridge US Expl. Exp. 7* (US), Philippines, Luzon, mountains near Los Baños. *Polypodium sablanianum* H. Christ, *Philipp. J. Sci.* 2, Bot. (1907) 177. — *Pleopeltis sablaniana* Alderw., *Bull. Dép. Agric. Indes Néerl.* 27 (1909) 6. — *Microsorium sablanianum* Copel., *Gen. Fil.* (1947) 196; *Fern Fl. Philipp.* (1960) 482. — Type: *Elmer 6142* (P; iso G, K, US), Philippines, Luzon, Benguet, Sablan.

Rhizome 2.5–8 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 6–16, roots densely set or sparsely set. Scales pseudopeltate, densely set, appressed or distinctly spreading, ovate or narrowly ovate or triangular, 1–4.5 mm long, 0.5–1.2 mm broad, margin denticulate, apex acute, clathrate or subclathrate, central region glabrous. Phyllopodia more or less distinct, up to 20 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple, narrowly elliptic to narrowly obovate to linear, 35–95 cm long, 1–9 cm broad, index 7.5–40, base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, undersurface with acicular hairs; stipe present, up to 7.5 cm long, 2.5–5 mm diam. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins prominent and distinct, 5–18 mm apart, more or less straight, dichotomously branched in about the middle to near the margin, catadromous, smaller veins prominent and distinct, variously anastomosing within main and marginal areoles, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 10–65 per sq. cm, irregularly scattered in the smaller anastomosing veins and free including veins, 0.5–1.5 mm diam., 1–3 mm long, present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2–4-celled (occasionally with a 1-celled subapical acicular branch), sporangium annulus 18–23-celled, indurated cells 12–16.

Distribution — Borneo: Sarawak; Philippines (many coll.).

Habitat & Ecology — Low epiphytic, rarely epilithic in primary or secondary forest. Shady places, sometimes on limestone. Altitude 30–1200 m.

Note — This species is very close to *M. samarensis*, and might be conspecific.

20. *Microsorium lucidum* (Roxb.) Copel. — Plate 3: 26; 11: 32

Microsorium lucidum (Roxb.) Copel., Gen. Fil. (1947) 196. — *Polypodium lucidum* Roxb., Calc. J. Nat. Hist. 4 (1844) 486. — *Phymatodes lucida* Tardieu & C. Chr. in Lecomte, Fl. Indo-Chine 7 (1941) 475. — *Phymatosorus lucidus* Pic. Serm., Webbia 28 (1973) 459. — Type: *Roxburg drawing 1922*, Nepal.

Polypodium cuspidatum D. Don, Prodr. Fl. Nepal. 2 (1825) 2, non *Polypodium cuspidatum* Presl (1825). — *Phymatodes cuspidata* J. Sm., Cult. Ferns (1857) 10. — *Microsorium cuspidatum* Tagawa in Hara, Fl. Eastern Himalaya (1966) 495. — Type: *Wallich 1818* (BM, K), Nepal.

Polypodium leiorhizum Wall. [Cat. (1828) 303, nomen] ex Mett., Fil. Hort. Bot. Lips. (1856) 37, t. 25 f. — *Pleopeltis leiorhiza* T. Moore, Index Filic. (1862) 346. — Type: *Wallich 303* (K, L, P).

Rhizome 10–18 mm wide, white waxy under the scales or not white waxy, with only scattered strands of sclerenchyma, sclerenchyma strands 30–100, roots sparsely set, internodia 3 cm or more. Scales peltate or pseudopeltate, densely or apically densely set and otherwise more or less sparsely set (sometimes absent in superficial rhizomes), appressed, circular or elliptic, often with eroded margins, 2–10 mm long, 2–8 mm broad, margin entire, apex rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina pinnate (except sometimes the very apex), margin entire, undersurface without acicular hairs, petioles 0–10 mm long (always present in lower leaflets). Lamina of dissected leaf elliptic, 30–60 cm long, 20–50 cm broad, widest below the middle, index 1.5–2; stipe present, 20–50 cm long, 2.6–6 mm diam.; lobes 7–20 at each side, longest lobes widest at about the middle or below the middle, at position 1–7 from base, 13–28 cm long, 1.5–3.7 cm broad, index 5–15, apex acute to long acuminate (nearly filiform). Apical lobe conform to upper lateral lobes or longer than upper lateral lobes. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins more or less immersed and vague or prominent and distinct, 5–7 mm apart, anadromous, smaller veins more or less immersed and vague or prominent and distinct, outside the primary costal areoles several rows of smaller areoles, free veinlets simple or once forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, superficial or slightly immersed or deeply sunken, visible as protrusions on the upper surface, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 2–3 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Northern India; Nepal; Sikkim; N & E Thailand; Vietnam; China (Yunnan, Guizhou, Guangxi, Guangdong). In Malesia: Peninsular Malaysia (Perak).

Habitat & Ecology — Epiphytic or epilithic on dry sandstone in dense forest. Altitude 400–1700 m.

21. *Microsorium malabaricum* (Geev. ex Nampy & Madhus.) Noot., *comb. nov.*

Phymatosorus malabaricus Geev. ex Nampy & Madhus., Fern Gaz. 14 (1994) 233. — Type: *Geevarghese CU 4073* (CALI), S India, Kanjirapuzha, Kerala.

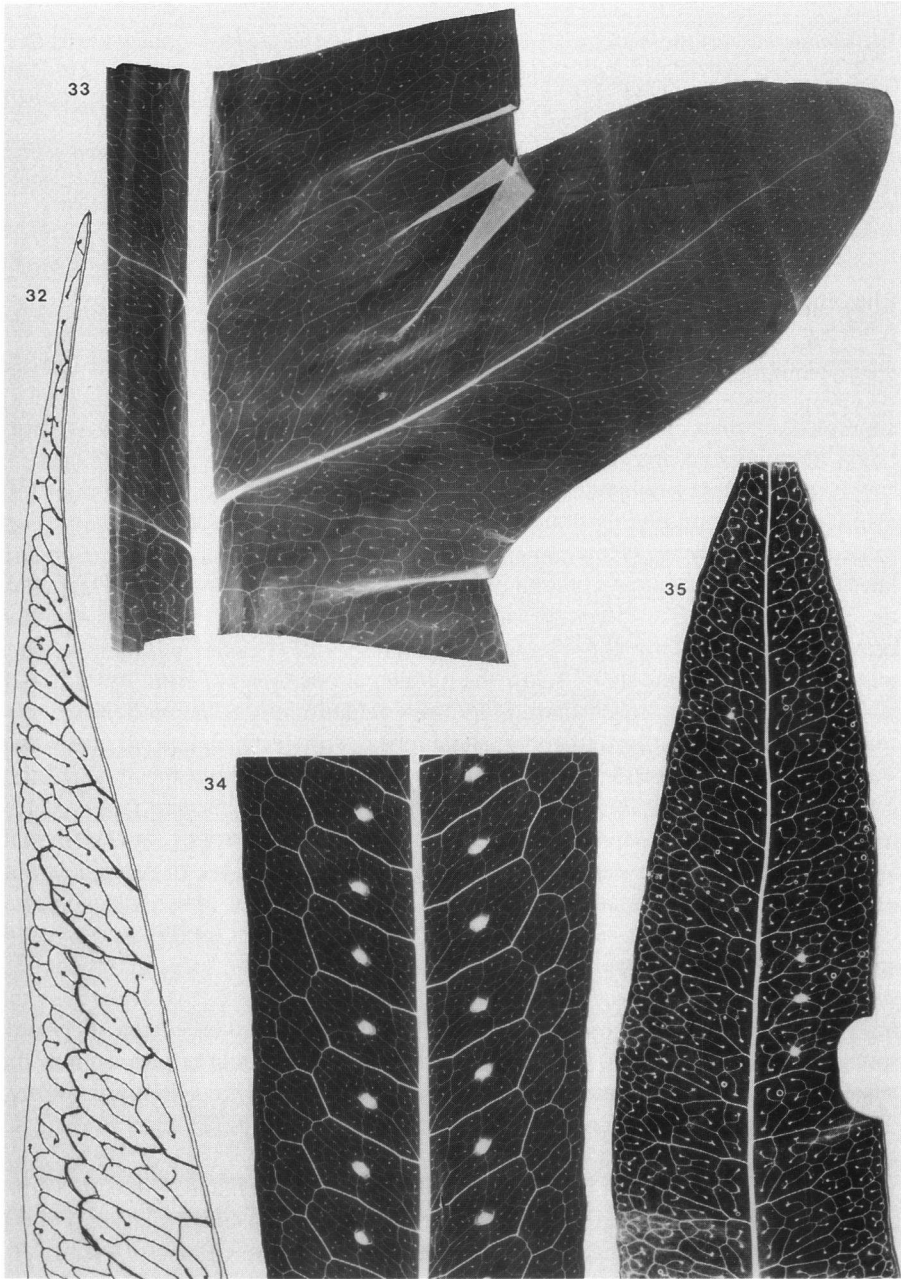


Plate 11. Venation. — 32: *Microsorium lucidum* (Tagawa et al. T. 1885). — 33: *M. maximum* (Field 299). — 34: *M. membranifolium* (Hoogland 4514). — 35: *M. normale* (Parish 176). All about $\times 0.5$.

Rhizome 3–5 mm wide, about cylindrical, not white waxy, with only scattered strands of sclerenchyma, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed, circular or elliptic, often with eroded margins (with glands on the margin), 2 mm long, 1.5–2 mm broad, margin dentate, apex rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region glabrous. Phyllopodia more or less distinct, 1–4 mm apart. *Leaf* not or slightly dimorphous, subcoriaceous (thinly). Lamina simple, narrowly ovate to narrowly elliptic, 12–15 cm long, 1.2–1.7 cm broad, index 8–11, base cuneate to cuneate-angustate, margin entire, apex acuminate; stipe present, 3 cm long, 0.5–1.5 mm diam. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins more or less immersed and vague, dichotomously branched near the margin, anadromous, the smaller veins more or less immersed and vague, free veinlets simple to once or twice forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, deeply sunken, visible as protrusions on the upper surface, absent from the basal parts, on distinct soral veins (except the main soral vein a crossing of smaller veins), 1.5–2 mm diam.; paraphyses simple uniseriate hairs with glandular topcells, paraphyses 3- or 4-celled.

Distribution — India (Kerala, Malabar).

Habitat & Ecology — Epilithic in shady forest.

22. *Microsorium maximum* (Brack.) Copel. — Plate 3: 27; 11: 33

Microsorium maximum (Brack.) Copel., Occas. Pap. Bernice P. Bishop Mus. 14 (1938) 39. — *Drynaria maxima* Brack., U.S. Expl. Exp., Filic. 16 (1854) 51, pl. 7. — *Pleopeltis maxima* T. Moore, Index Filic. (1857) lxxviii. — *Polypodium maximum* Hook., Sp. Fil. (1863) 83. — Type: US Expl. Exp. 17 (K), Tahiti.

Rhizome 6–10 mm wide, dorso-ventrally flattened, white waxy under the scales or not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 15–25, sclerenchyma strands 40–100, roots densely set or sparsely set. Scales peltate, apically densely set, otherwise more or less sparsely set, slightly spreading, ovate or narrowly ovate or triangular, 3–6 mm long and 1.5–2.2 mm broad, margin denticulate or dentate, apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region glabrous. Phyllopodia more or less distinct, 60–120 mm apart. *Leaf* not or slightly dimorphous, subcoriaceous. Lamina pinnatifid or simple but (irregularly) lobed, the undersurface without acicular hairs. Lamina of dissected leaf narrowly obovate or narrowly elliptic, 90–150 cm long, 20–40 cm broad, 4–7 cm wide between lobes at place of longest lobes; stipe present, 5–40 cm long, 4–6 mm diam.; longest lobes widest at base or widest about the middle, 6–20 cm long, 2–4 cm broad. Apical lobe longer than the upper lateral lobes, 22–37 cm long, 5–7.5 cm broad, widest at base or just above base. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins. Veins more or less immersed and vague, 7–9 mm apart, zigzag, dichotomously branched near the margin, connecting veins 2 or 3

between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague, quite dense, free veinlets simple to once forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, deeply sunken, visible as protrusions on the upper surface, predominantly innervated on veinlets (occasionally on connecting veins), 3–4 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Pacific: Society Islands.

Habitat & Ecology — Epilithic on wet rocks.

23. *Microsorium membranaceum* (D. Don) Ching — Plate 4: 28

Microsorium membranaceum (D. Don) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 309; Copel., Fern Fl. Philipp. (1960) 486; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 91.

— *Polypodium membranaceum* D. Don, Prodr. Fl. Nepal. (1825) 2. — [*Colysis membranacea* J.Sm., Cult. Ferns (1857) 11, nom. illeg.] — Type: Wallich (K; iso B), Nepal.

Polypodium hymenodes Kunze, Linnaea 23 (1850) 279/319. — Type: Kunze (B), cult. Leipzig.

Polypodium transparens C. Presl ex Ettingsh., Denkschrift Akad. Wiss. Wien 22 (1864) 95, t. 18, f. 16. — Type: Hügel 269 (W, n.v.), Himalaya.

[*Polypodium grandifolium* Wall., Cat. (1829) 282, nomen.] — *Polypodium membranaceum* var. *grandifolium* Alderw., Malayan Ferns (1909) 649. — Type: Wallich 282 (K; iso BM, M, UC, US), Nepal.

Rhizome 3–10 mm wide, dorso-ventrally flattened or about cylindrical, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 18–23, sclerenchyma strands 50–100, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, slightly spreading, ovate or triangular, 1.5–9 mm long, 1–3 mm broad, margin entire, apex acute, clathrate except the hyaline marginal region, central region bearing multiseptate hairs at least when young. Phyllopodia more or less distinct, up to 9 mm apart. *Leaf* not or slightly dimorphous, membranaceous. Lamina simple, elliptic to ovate to narrowly elliptic to narrowly ovate to linear, (5–)25–110 cm long, (1–)5–15 cm broad, index 2–11, base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, under-surface without acicular hairs; stipe present, up to 15 cm long, 3–5 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 5–15 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 4–8 between adjacent secondary veins, catadromous, smaller veins prominent and distinct, variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0.5 of total length of lamina, mostly irregularly scattered on the smallest veinlets, 3–25 per sq. cm, 1 or 2 per veinlet (not on connecting veins), 1–2 mm diam., 2.5 mm long, absent in marginal areoles, generally

present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, paraphyses 3-celled, sporangium annulus 16–21-celled, indurated cells 12–14.

Distribution — Nepal; Sikkim; Bhutan; India; Sri Lanka; Burma; China (Yunnan, Guizhou, Guangdong, Guangxi, Sichuan; Taiwan); N Thailand; Laos; N Vietnam. In Malesia: Philippines (N Luzon).

Habitat & Ecology — Epiphytic, epilithic, or terrestrial in evergreen or deciduous broad-leaved (sub)tropical forest, often in valleys or ravines. Altitude 600–2600 (–4000) m.

Note — The fronds are shed seasonally.

24. *Microsorium membranifolium* (R.Br.) Ching — Plate 4: 29; 11: 34; 13: 46

Microsorium membranifolium (R.Br.) Ching, Bull. Fan Mem. Inst. Biol. 10 (1941) 239; S.B. Andrews, Ferns of Queensland (1990) 280. — *Polypodium membranifolium* R.Br., Prodr. (1810) 147. — Type: Banks (BM), Australia, East Coast.

Polypodium plukenetii C. Presl, Reliq. Haenk. 1 (1825) 21. — Type: *Herb. Presl* (n.v.).

Polypodium nigrescens Blume, Enum. Pl. Javae (1828) 126; Fl. Javae. Filic. (1829) 161, t. 70. — *Phymatodes nigrescens* J.Sm., Ferns Brit. For. (1866) 94; Tardieu & C. Chr. in Lecomte, Fl. Indo-Chine 7 (1941) 473. — *Pleopeltis nigrescens* Bedd., Handb. Ferns Brit. India (1883) 367. — *Microsorium nigrescens* Copel., Occas. Pap. Bernice P. Bishop Mus. 14 (1938) 74. — *Phymatosorus nigrescens* Pic. Serm., Webbia 28 (1973) 459; Brownlie, Nova Hedwigia Beih. 55 (1977) 381. — Lectotype (here chosen): *Blume s.n.* (L 908.303-605), Java.

Pleopeltis temenimborensis Alderw., Bull. Jard. Bot. Buitenzorg II, 7 (1912) 23. — Type: *Gjellerup 794* (BO), West New Guinea, Temenimbor.

Polypodium ithycarpum Copel., Philipp. J. Sci. 12C (1917) 64. — *Microsorium ithycarpum* Parris, Ferns of Kinabalu (1992) 105. — Type: *Topping 1578* (iso US), Borneo, Kinabalu.

Polypodium saccatum E.J. Lowe, Ferns 2 (1858) 127, t. 59. — Type: Unknown.

Phymatodes variabilis Ching, Contr. Inst. Bot. Nat. Acad. Peiping 2 (1933) 64, pl. 3. — *Microsorium variabile* Tagawa, Acta Phytotax. Geobot. 14 (1952) 192. — *Phymatosorus variabilis* Pic. Serm., Webbia 28 (1973) 460. — Type: *Chun & Tso 43735* (PE; iso NY), China, Hainan. [*Microsorium alternifolium* auct.: Copel., Gen. Fil. (1947) 197, p.p.]

Rhizome 4–20 mm wide, about cylindrical or rounded, not white waxy, with only scattered strands of sclerenchyma, sclerenchyma strands 100–200, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, appressed, ovate or triangular or circular or elliptic, often with eroded margins, 4–8 mm long, 2.5–3.5 mm broad, margin entire, apex rounded, clathrate or subclathrate (very thin), cells small, more or less isodiametric, central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, membranaceous (often translucent). Lamina pinnatifid (rarely simple), base cuneate to narrowly angustate, the stipe winged for a considerable part, margin undulate (often wavy because of a slightly looped vein in the margin), undersurface without acicular hairs. Lamina of dissected leaf elliptic to ovate, 27–175 cm long, 36–90 cm broad, widest at about the middle, 0.6–3 cm wide between the lobes at place of longest lobes (sometimes only a narrow ridge), index 1–3; stipe present, 19–100 cm long, 2.8–10 mm diam.; lobes 2–20 at each side, longest lobes widest about the middle, at position 2–10 from base, 15–50 cm long, 2.3–7 cm broad, index 8–10, apex long acuminate. Apical lobe longer than upper lateral lobes, 12–48 cm long, 2.5–6.5 cm broad, widest about or below the

middle. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous, large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins prominent and distinct, 7–13 mm apart, more or less straight, anadromous, smaller veins prominent and distinct (the smaller areoles near the margin usually surrounded by very prominent veins), marginal vein present or absent, free veinlets simple to twice forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round (or slightly elongate), deeply sunken, visible as protrusions on upper surface, on the whole surface of the lamina or absent from the basal parts, on distinct soral veins (except the main soral vein a crossing of smaller veins), 3.2–6.5 mm diam.; paraphyses biseriate non-clathrate.

Distribution — China (Hainan); Sri Lanka (Kandy Distr., Ratnapura Distr.); India; Thailand; Cambodia; Vietnam (Annam, Nhatrang). In Malesia: Sumatra; Peninsular Malaysia (Penang, Perak, Selangor, Trengganu, Pahang, Johore, Langkawi Is.); Java; Lesser Sunda Islands (Bali, Lombok, Sumbawa); Borneo; Philippines; Sulawesi; Moluccas (Halmahera, Morotai, Ambon, Seram, Banda, Kai Is., Aru Is.); New Guinea including New Ireland. Pacific: Solomon Islands, Fiji, Society Islands, Marquesas. Australia (NE Queensland).

Habitat & Ecology — Terrestrial, epilithic or (low) epiphytic, often on limestone but also on granite, usually in wet places. Altitude 0–1700 m.

Vernacular name — Pakis tanganan (Central Java).

Note — In areas where *M. rubidum* occurs the marginal vein often is obscure or absent. *Polypodium ithycarpum* Copel. (*Microsorium ithycarpum* Parris) is a form with the nerves less prominent.

25. *Microsorium monstrosum* (Copel.) Copel. — Plate 4: 30

- Microsorium monstrosum* (Copel.) Copel., Gen. Fil. (1947) 196; Copel., Fern Fl. Philipp. (1960) 485; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 93. — *Polypodium monstrosum* Copel., Leafl. Philipp. Bot. 1 (1906) 78. — *Pleopeltis monstrosum* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 8. — Type: *Elmer 7174* (G, S), Philippines, Luzon, Mt Banahao. *Polypodium monstrosum* var. *integriore* Copel., Leafl. Philipp. Bot. 1 (1906) 78. — Type: *Copeland 1964* (P), Philippines, Luzon, Lepanto. *Polypodium monstrosum* var. *leucophlebium* Copel., Leafl. Philipp. Bot. 1 (1906) 78. — Type: *Copeland 2069* (P, SING), Philippines, Luzon, Laguna, Pagsanjan. *Polypodium suboppositum* H. Christ, Bull. Herb. Boissier 2 (1906) 995. — *Pleopeltis subopposita* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 8. — *Microsorium suboppositum* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 295. — Type: *Loher* (P), Philippines, Zambales, Pinatubo.

Rhizome 1.5–5 mm wide, about cylindrical, not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 7–11, sclerenchyma strands 50–100, the roots densely set. Scales pseudopeltate, densely set, distinctly spreading or slightly spreading, narrowly ovate or triangular, 3–7 mm long, 1–1.5 mm broad, margin entire or denticulate, apex acute, clathrate or subclathrate, central region bearing multiseptate hairs at least when young or the central region glabrous. Phyllopodia more or less distinct or obscure, 15–60 mm apart. *Leaf* not or slightly dimorphous, herbaceous. Lamina simple or simple but (irregularly) lobed, narrowly

elliptic to linear, 25–70(–90) cm long, 3–8 cm broad, index (5.5–)7.5–11(–15.5), base narrowly angustate, the stipe winged for a considerable part, margin entire or sinuate (or irregularly lobed), apex acuminate, undersurface without acicular hairs; stipe present, 0.5–15(–25) cm long, 1.5–3(–3.5) mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 7–11 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 4 or 5 between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague, variously anastomosing, free veinlets simple or once forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0.5 of total length of lamina, mostly irregularly scattered on the smallest veinlets, 15–30 per sq. cm, 1 or 2 per veinlet (not on connecting veins), 1–2 mm diameter, 1.5–3 mm long, present or absent in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2- or 3-celled, sporangium annulus 19–23-celled, indurated cells 13–17.

Distribution — Philippines (many collections).

Habitat & Ecology — Low epiphytic or epilithic in evergreen forest, in shade and mossy places. Altitude 600–1700 m.

26. *Microsorium normale* (D. Don) Ching — Plate 4: 31; 11: 35

Microsorium normale (D. Don) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 299. — *Polypodium normale* D. Don, Prodr. Fl. Nepal. (1825) 1. — *Pleopeltis normalis* T. Moore, Index Filic. (1862) 347. — *Neolepisorus normalis* Ching, Bull. Fan Mem. Inst. Biol. 10 (1940) 13. — *Neocheiropteris normalis* Tagawa, J. Jap. Bot. 27 (1952) 217; Tagawa & K. Iwatsuki, Fl. Thailand 3 (1989) 523. — *Tricholepidium normale* Ching, Acta Phytotax. Geobot. 29 (1978) 43. — Type: *Buchanan-Hamilton* (BM), Nepal.

Polypodium longifrons Wall. [Cat. (1828) 274, nomen] ex Hook. & Grev., Icon. Filic. (1831) pl. 65. — Type: *Wallich* 274 (K; iso BM, L), Nepal.

Polypodium maculosum H. Christ, Bull. Herb. Boissier 6 (1898) 872. — *Tricholepidium maculosum* Ching, Acta Phytotax. Geobot. 29 (1978) 45. — Type: *Henry 10090* (BM, K), China, Yunnan, Mengtze.

Pleopeltis subnormalis Alderw., Bull. Jard. Bot. Buitenzorg III, 12 (1920) 165. — Type: *Lörzing 5964* (L), Sumatra, Karo plateau, N of Berastagi.

Phymatodes subnormalis Nakai, Bot. Mag. Tokyo 43 (1929) 3. — *Microsorium subnormale* H. Itô, J. Jap. Bot. 11 (1935) 97. — Type: *Bando* (n.v.).

Lepisorus chapaensis C. Chr. & Tardieu, Notul. Syst. (Paris) 8 (1939) 186; Tardieu & C. Chr., Fl. Indo-Chine 7 (1941) 456. — *Tricholepidium chapaense* Ching, Acta Phytotax. Geobot. 29 (1978) 44. — Type: *Poilane 17207* (BM), Tonkin, Chapa.

Tricholepidium lanceolatum Ching & S.K. Wu, Acta Phytotax. Geobot. 29 (1978) 45. — Type: *Tibet Complex Exp. 2764* (PE), Tibet.

Tricholepidium mutense Ching, Acta Phytotax. Geobot. 29 (1978) 43. — Type: *Tibet Complex Exp. 2787* (PE), Tibet.

- Tricholepidium tibeticum* Ching & S. K. Wu, Acta Phytotax. Geobot. 29 (1978) 46. — Type: *Tibet Complex Exp. 74-5089* (PE), Tibet.
- Tricholepidium angustifolium* Ching, Acta Phytotax. Geobot. 29 (1978) 44. — Type: *H. T. Tsai 54406* (PE), China, Yunnan, Shangpa Hsien.
- Tricholepidium intermedium* Ching, Acta Phytotax. Geobot. 29 (1978) 44. — Type: *H. T. Tsai 58811* (PE), China, Yunnan, Shangpa Hsien.
- Tricholepidium pteropodium* Ching, Acta Phytotax. Geobot. 29 (1978) 43. — Type: *H. T. Tsai 56433* (PE), China, NW Yunnan.
- Tricholepidium venosum* Ching, Acta Phytotax. Geobot. 29 (1978) 45. — Type: *K. Chen 764* (PE), China, NW Yunnan.

Rhizome 2–4.5 mm wide, dorso-ventrally flattened, not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma or with only circumvascular sheaths, vascular bundles 7–16, sclerenchyma strands 0–20, the roots sparsely set. Scales peltate, apically densely set, otherwise more or less sparsely set, appressed, circular or elliptic, often with eroded margins, 1.5–2.5 mm long and 0.8–1.2 mm broad, margin entire, apex rounded, clathrate except the hyaline marginal region (margin broad and very thin), cells small, more or less isodiametric, central region bearing multiseptate hairs at least when young (hairs very long and conspicuous). Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, thin-herbaceous or membranaceous. Lamina simple, linear, 25–60 cm long, 1.8–5 cm broad, index 10–20, base narrowly angustate, the stipe winged for a considerable part, margin undulate, apex acute or acuminate (but tip sometimes blunt), undersurface without acicular hairs; stipe present, 1.5–7 cm long, 1–1.5 mm diam. Venation type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles, or type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins prominent and distinct, (5–) 7–16 mm apart, zigzag, dichotomously branched near the margin (generally), connecting veins 2–4 between adjacent secondary veins, smaller veins prominent and distinct, forming rather irregular secondary areoles, free veinlets simple or once forked. *Sori* separate, in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein or one row of sori, each one (or two) per areole between each pair of veins, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein or on distinct soral veins (except the main soral vein a crossing of smaller veins), 1 per veinlet, 1.5–4 mm diam., absent in marginal areoles, generally absent from costal areoles; paraphyses clathrate and peltate.

Distribution — China (Yunnan, Guizhou, Anhui, Guangdong, Fujian); northern India; Nepal; Sikkim; Bhutan; Burma; Thailand; Vietnam (Tonkin, Chapa). In Malaysia: Sumatra; Peninsular Malaysia (Pahang).

Habitat & Ecology — Terrestrial and low epiphyte. Altitude 400–2600 m.

Note — *Neocheiropteris sapaensis* V.N. Tu, Bot. Zhurn. 1 (1980) 584, probably belongs here.

27. *Microsorium novaezealandiae* (Baker) Copel. — Plate 4: 32; 12: 36

Microsorium novaezealandiae (Baker) Copel., Gen. Fil. (1947) 196. — *Polypodium novaezealandiae* Baker in Hook., Icon. Pl. (1886) t. 1647; Cheeseman, Manual New Zeal. Fl. (1925) 82. — *Phymatosorus novae-zealandiae* Pic.Serm., Webbia 28 (1973) 459. — Type: Cheeseman (K), New Zealand, Upper Waikato Distr., Pirongia Mt.

Rhizome 3.5–6 mm wide, white waxy under the scales, with only circumvascular sheaths, vascular bundles 6–12, roots densely set. Scales pseudopeltate, densely set, distinctly or slightly spreading, ovate or triangular, 7–12 mm long and 2.5–3.5 mm broad, margin entire, apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina pinnatifid, base cuneate to cuneate-angustate, margin entire to sinuate, undersurface without acicular hairs. Lamina of dissected leaf elliptic to narrowly elliptic or ovate to narrowly obovate, 15–120 cm long, 12–35 cm broad, widest below or about the middle, 0.2–0.6 cm wide between the lobes at place of longest lobes (towards base often only a ridge); stipe present, 15–30 cm long, 1.8–3 mm diam.; lobes 5–20 at each side, longest lobes widest about to below middle, at position 2–4 from base (?), 7–20 cm long, 9–13 cm broad, index 7–15, apex acute. Apical lobe longer than upper lateral lobes, widest at or just above the base to widest about the middle. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins more or less immersed and vague, 5–9 mm apart, catadromous, smaller veins more or less immersed and vague, included venation in primary costal areole only free veinlets, several small marginal areoles, in fertile leaves no marginal areoles, free veinlets simple or once forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin or one sorus just outside each primary costal areole, close to the margin, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, on distinct soral veins (except the main soral vein a crossing of smaller veins), 2–3 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — New Zealand.

Habitat & Ecology — Altitude 700 m, once recorded.

Note — The (lateral) vein of the vegetative lobes bends upwards and acts as a connective to the upper-next lateral vein; it encloses the primary costal areole; in fertile lobes it acts as a soral vein, and the primary areole is enclosed by lesser veins towards the margin.

28. *Microsorium palmatopedatum* (Baker) Noot., *comb. nov.* — Plate 4: 33; 12: 37

Polypodium palmatopedatum Baker, Kew Bull. (1898). — *Cheiropteris henryi* H. Christ, Bull. Herb. Boissier 6 (1898) 876; *ibid.* 7 (1899) 21. — *Neocheiropteris palmatopedata* H. Christ, Bull. Soc. Bot. France (Mém.) 1 (1905) 21; Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 106. — Type: Henry 9289 (K), China, Yunnan.

Rhizome 3–5 mm wide, not white waxy, without sclerenchyma or circumvascular sheaths, roots densely set or sparsely set. Scales apically densely set, otherwise more

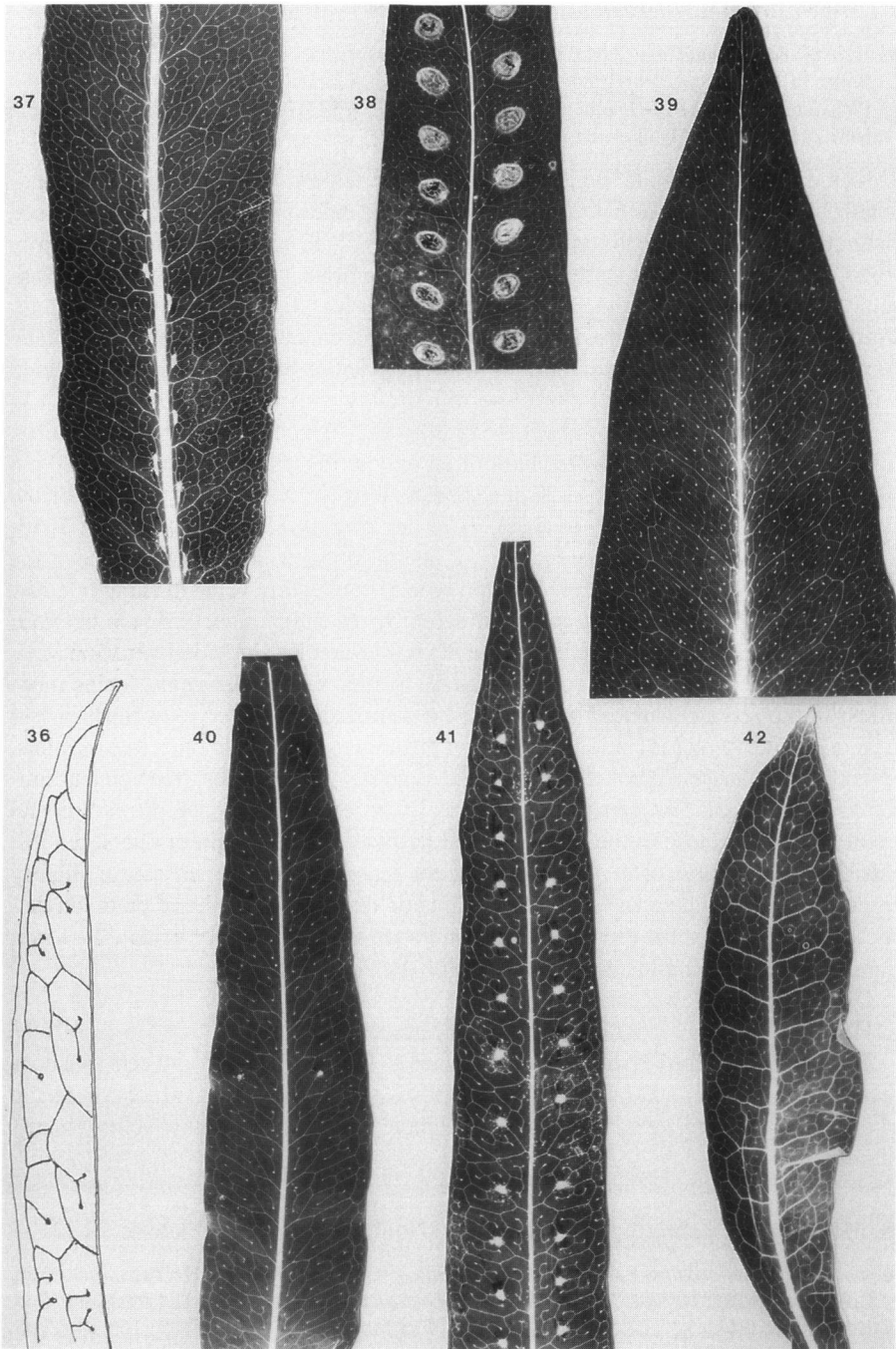


Plate 12. Venation. — 36: *Microsorium novaezealandiae* (R. O. Gardner 878). — 37: *M. palmatopedatum* (d'Alleizette 4162). — 38 & 39: *M. papuanum* (LAE 65583). — 40: *M. powellii* (Betcher 117). — 41: *M. powellii* (Vaupel 350). — 42: *M. pteropus* (Hennipman 3955). — All about $\times 0.5$

or less sparsely set, slightly spreading, ovate or triangular, 3–7 mm long, 2–3 mm broad, margin denticulate, apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region bearing multiseptate hairs at least when young. *Leaf* not or slightly dimorphous, herbaceous. Lamina pedately dissected, base cuneate, margin entire or undulate, undersurface without acicular hairs. Lamina of dissected leaf about circular, 12–30 cm long, 20–40 cm broad; stipe present, 10–40 cm long. Venation type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Dichotomously branched near the margin or below the middle. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, elongate, superficial or slightly immersed, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 3–8 mm long; paraphyses clathrate and peltate.

Distribution — China (Yunnan, Guizhou).

Habitat & Ecology — Unknown.

29. *Microsorium pappei* (Mett.) Ching — Plate 4: 34

Microsorium pappei (Mett.) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 295; Tardieu, Fl. Madag. Fam. 5 (1960) 115, t. 25. — *Polypodium pappei* Mett. in Kuhn, Filices Africanæ (1886) 150. — Type: Rawson (K), Africa, East Cape.

Rhizome 2.8–5 mm wide, white waxy under the scales or not, with only scattered strands of sclerenchyma or with circumvascular sheaths and scattered strands of sclerenchyma or without sclerenchyma or circumvascular sheaths, vascular bundles 10–20, sclerenchyma strands 20–100, roots densely or sparsely set. Scales peltate or pseudopeltate, apically densely set, otherwise more or less sparsely set, slightly spreading, narrowly ovate or triangular, 4–6 mm long, 1–1.2 mm broad, margin denticulate, apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, herbaceous. Lamina simple, narrowly elliptic, 20–45 cm long, 4.5–6 cm broad, index 4–8, base cuneate-angustate, margin entire, apex acute to acuminate, undersurface without acicular hairs; stipe present, 8–16 cm long, 1.5–2.2 mm diam. Venation type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins more or less immersed and vague or prominent and distinct, 8–10 mm apart, zigzag, dichotomously branched about or below the middle, connecting veins 3–5 between adjacent secondary veins, anadromous, smaller veins more or less immersed and vague, quite irregular, free veinlets simple or once or twice forked. *Sori* separate, one row of sori, each one (or two) per areole between each pair of veins or in one (irregular) row parallel to the costa and just outside the (obscure) costal areole and between the two branches of each lateral vein (also in other areoles towards the margin) or not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, superficial or slightly immersed, on the whole surface of the lamina, on distinct soral veins (except the main soral vein a crossing of smaller

veins) (very irregularly placed), 1.5–4 mm diam., generally absent from the costal areoles; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — East Africa from Tanzania to E South Africa.

Habitat & Ecology — Altitude 1600–2000 m.

30. *Microsorium papuanum* (Baker) Parris — Plate 4: 35, 36; 5: 37; 12: 38

Microsorium papuanum (Baker) Parris, Kew Bull. 41 (1986) 70. — *Polypodium papuanum* Baker in Becc., Malesia 3 (1886) 48. — *Pleopeltis papuanua* Alderw., Malayan Ferns Suppl. (1917) 380. — Type: *Beccari* (K), New Guinea.

Polypodium subgeminatum H. Christ in K. Schum. & Lauterb., Fl. Schutzgeb. Südsee, Nachtr. (1905) 47. — *Pleopeltis subgeminata* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 5. — *Microsorium subgeminatum* Copel., Gen. Fil. (1947) 197. — Type: *Schlechter 14482* (K), Papua New Guinea, Torricelli Mts.

Polypodium versteegii H. Christ, Nova Guinea 8 (1909) 154. — Type: *Versteeg 1555* (K, L), West New Guinea.

Polypodium soromanes H. Christ, Nova Guinea 8 (1909) 152. — Type: *Versteeg 1091* (BO, L), West New Guinea.

Polypodium cromwellii Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 10 (1912) 340. — *Microsorium cromwellii* Copel., Gen. Fil. (1947) 197. — Type: *Bamler* (P), New Guinea.

Polypodium acutifolium Brause, Bot. Jahrb. Syst. 49 (1912) 49. — *Microsorium acutifolium* Copel., Gen. Fil. (1947) 197. — Type: *Schlechter 17064* (BM, K, L), New Guinea, Kaiser Wilhelm-land.

Pleopeltis murkeleana Alderw., Bull. Jard. Bot. Buitenzorg III, 2 (1920) 166. — *Polypodium murkeleanum* C. Chr., Index Filic. Suppl. 3 (1934) 154. — Type: *Kornassi 1473* (BO), Moluccas, Seram, G. Murkele.

Microsorium sulawesiense H. Ohba, J. Jap. Bot. 49 (1974) 173. — Type: *Sohma et al. 482* (n.v.). *Phymatosorus scolopendria* auct.: Brownlie, Nova Hedwigia Beih. 55 (1977) 384, excl. syn, non Burman (1768).

Rhizome 1–3.9 mm wide, white waxy under the scales (in the only collection from Borneo not so), with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 10–20, sclerenchyma strands 10–80, roots sparsely set. Scales peltate, sparsely set, appressed, ovate or triangular to circular or elliptic, often with eroded margins, 0.5–1.3 mm long, 0.5 mm broad, the margin denticulate (in ovate scales), apex acute or rounded, clathrate or subclathrate, cells small, more or less isodiametric (in ovate scales longer towards the apex), central region glabrous. Phyllopodia more or less distinct (often on brachyblasts). *Leaf* not or slightly dimorphous, thin-herbaceous to membranaceous. Lamina simple to pinnatifid, narrowly elliptic to narrowly ovate, 10–27 cm long, 0.9–4 cm broad, index 4–8, base cuneate, margin entire, apex acute to acuminate, undersurface without acicular hairs; stipe present, 0.5–14 cm long, 0.5–1.2 mm diam. Lamina of dissected leaf 11–33 cm long, 8–22 cm broad, widest below or about the middle or above the middle, 1.2–2.2 cm wide between the lobes at the place of longest lobes, index 1–1.5; stipe present, 5–40 cm long, 1–1.8 mm diam.; lobes 1–3 at each side (the angle of upper lobes with apical lobe 40–70 degrees), longest lobes widest about the middle, 11–26 cm long, 1.2–1.8 cm broad, index 8–16. Apical lobe longer than upper lateral lobes, 9–25 cm long, 1.2–2.7 cm broad, widest about the middle. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the

first connecting vein often forming, or contributing to, a distinct soral vein. Veins more or less immersed and vague or prominent and distinct, 6–13 mm apart, catadromous (or, if a minor veinlet forms an inconspicuous costal areola, anadromous), smaller veins more or less immersed and vague or prominent and distinct, smaller veins forming a rather dense reticulation of secondary areoles, free veinlets simple or once forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin (but rarely also in other areoles), round, deeply sunken, visible as protrusions on the upper surface, on the whole surface of the lamina, on distinct soral veins (except the main soral vein a crossing of smaller veins) or solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 3.5–5 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — In Malesia: Borneo: Kalimantan Selatan, G. Besar; Sulawesi; Moluccas (Talaud, Halmahera, Ambon, NW Buru, Seram); New Guinea. In the Pacific: Admiralty Islands, Manus I.; Solomon Islands; New Hebrides (Aneityum); Fiji; Caroline Islands.

Habitat & Ecology — Terrestrial, sometimes on limestone cliffs, or epiphyte. Altitude 100–2700 m

Note — This species is closely related to, and often confused with, *M. scolopendria*. Mostly the leaves are dark brown or blackish. There are several collections intermediate with *M. scolopendria*, which usually has the leaves yellowish green. In *M. papuanum* the sori are in one row parallel to the costa, but sometimes in two rows, in *M. scolopendria* in one to several rows. Possibly there is occasional genetic contact between the two species. However, generally they grow together and behave as good species. In the Pacific shape and size of the leaves intergrade. *Polypodium soromanes* possibly is a hybrid between this species and another, unknown, species.

31. *Microsorium parksii* (Copel.) Copel. — Plate 5: 38

Microsorium parksii (Copel.) Copel., Gen. Fil. (1947) 196. — *Polypodium parksii* Copel., Bernice P. Bishop Mus. Bull. 59 (1929) 59. — *Phymatosorus parksii* Brownlie, Nova Hedwigia Beih. 55 (1977) 384. — Type: *Parks 20599* (MICH), Viti Levu.

Rhizome 4.2–7 mm wide, white waxy under the scales or not, with only circumvascular sheaths, vascular bundles 10–20, roots densely or sparsely set. Scales peltate, densely set, appressed, ovate or narrowly ovate or triangular, 2–4 mm long, 0.8–1.2 mm broad, margin entire, apex acute, clathrate or subclathrate, cells small, more or less isodiametric or cells longitudinally rectangular (often longitudinal in the apical part), central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, membranaceous or herbaceous. Lamina pinnatifid or basal part pinnate, apical part pinnatifid, base cuneate-angustate or cuneate, margin sinuate (irregularly, cartilaginous), undersurface without acicular hairs. Lamina of dissected leaf elliptic or ovate, 30–50 cm long, 24–36 cm broad, widest below the middle, 0.2–1.5 cm wide between the lobes at place of longest lobes, index 1–2; stipe present, 14–55 cm long, 2.5–4 mm diam.; lobes 8–14 at each side, longest lobes widest below to above the middle, at position 2–8 from base, 13–20 cm long, 1.2–1.8 cm broad, index 8–15, apex acute.

Apical lobe longer than upper lateral lobes, 10–15 cm long, 1.3–1.8 cm broad, widest below the middle. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins more or less immersed and vague (or slightly prominent), 4–5 mm apart, anadromous, smaller veins more or less immersed and vague, often clearly visible in transmitted light, free veinlets simple or once or twice forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 1–3 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Pacific: Fiji, Society Islands; Easter Island.

Habitat & Ecology — Altitude 400–1000 m.

32. *Microsorium pentaphyllum* (Baker) Copel.

Microsorium pentaphyllum (Baker) Copel., Gen. Fil. (1947) 196; Bosman, Monogr. *Microsorium*, Leiden Bot. Ser. 14 (1991) 95. — *Polypodium pentaphyllum* Baker, Ann. Bot. (London) 5 (1891) 478. — *Pleopeltis pentaphylla* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 9. — Type: Wallis (MICH; iso K), Philippines.

Polypodium curranii Copel., Philipp. J. Sci. 4, Bot. (1909) 114; Fern Fl. Philipp. (1960) 483. — *Pleopeltis curranii* Alderw., Malayan Ferns Suppl. (1917) 398. — *Microsorium curranii* Copel., Gen. Fil. (1947) 196. — Type: Curran FB 15728 (G, M, P, PC, U, UC, US, Z), Philippines, Benguet, Mosquito Creek.

Rhizome 2–4 mm wide, dorso-ventrally flattened (slightly), not white waxy, with only circumvascular sheaths, vascular bundles 7 or 8, the roots sparsely set. Scales pseudopeltate, densely or sparsely set, appressed, narrowly ovate or triangular, (1–) 2–5 mm long, 0.5–1 mm broad, margin denticulate, clathrate or subclathrate, central region glabrous. Phyllopodia more or less distinct or obscure, up to 15 mm apart. *Leaf* not or slightly dimorphous, herbaceous to subcoriaceous. Lamina pinnatifid or bipinnatifid (or more copiously almost dichotomously branched), base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, the undersurface without acicular hairs. Lamina of dissected leaf obovate to narrowly obovate, 20–50 cm long, 5–30 cm broad, widest above the middle, 0.5–2 cm wide between the lobes at place of longest lobes, index 1.5–4; stipe present, 1.5–8 cm long, up to 2 mm diam.; lobes 2–4 at each side, longest lobes widest at the base, at position 1 or 2 from base, 5.5–25 cm long, 0.5–1.5 cm broad, index 6–20(–60). Apical lobe shorter to longer than upper lateral lobes. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins more or less immersed and vague, 4–13 mm apart, more or less straight, dichotomously branched near the margin to about the middle or to below the middle, catadromous, smaller veins more or less immersed and vague, variously anastomos-

ing within the main and marginal areoles, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 20–45 per sq. cm, irregularly scattered on the smaller anastomosing veins and on the free veins, 0.5–1 mm diam., 1.5 mm long, present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2- or 3-celled, sporangium annulus 20–25-celled, indurated cells 14–18.

Distribution — Philippines (Luzon).

Habitat & Ecology — Epiphyte in evergreen forest. Altitude 1000–2000 m.

33. *Microsorium powellii* (Hook. & Baker) Copel. — Plate 5: 39; 12: 40, 41

Microsorium powellii (Hook. & Baker) Copel., Gen. Fil. (1947) 196. — *Polypodium powellii* Hook. & Baker, Syn. Fil. (1868) 364. — *Phymatosorus powellii* Pic.Serm., Webbia 28 (1973) 459; Sykes & Game, New Zeal. J. Bot. 34 (1996) 145. — Type: *Powell 135* (K), Samoa.

Rhizome 2–5.5 mm wide, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 15–25, sclerenchyma strands 15–50, roots sparsely set. Scales pseudopeltate or basifixed (often along a shallow ridge on the rhizome, the base hard to remove from rhizome without tearing), densely set or apically densely set, otherwise more or less sparsely set, distinctly spreading, narrowly ovate or triangular, 3–13 mm long, 2–4 mm broad, margin denticulate (sometimes only very slightly so), apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region glabrous. Phyllopodia more or less distinct, 12–45 mm (or more) apart. *Leaf* not or slightly dimorphous, membranaceous to thin-herbaceous. Lamina pinnatifid, base cuneate-angustate to cuneate, margin entire to undulate, undersurface without acicular hairs. Lamina of dissected leaf broadly ovate to ovate, 28–100 cm long, 25–45 cm broad, widest below to about the middle, 0.3–1(–2) cm wide between the lobes at place of longest lobes, index 1–3; stipe present, 23–45 cm long, 2.5–6 mm diam.; lobes 15–33 at each side, longest lobes widest about to below the middle, at position 1–4 from base, 20–35 cm long, 1–2.2 cm broad, index 8–12, apex acute to long acuminate. Apical lobe longer than upper lateral lobes, 6–15 cm long, 0.9–1.7 cm broad, widest about the middle. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins prominent and distinct (but only slightly so), 4–8 mm apart, catadromous, smaller veins more or less immersed and vague or prominent and distinct, marginal vein absent, free veinlets simple or once or twice forked. *Sori* separate, one sorus in each primary costal areole, generally close to the costa, at most halfway to the margin, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, on distinct soral veins (except the main soral vein a crossing of smaller veins), 1–3 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — In Malesia: Moluccas (Seram) and New Guinea; in the Pacific: New Hebrides, Solomon Islands, Samoa.

Habitat & Ecology — Terrestrial or epiphytic. Altitude 600–2000 m.

Note — This species is very similar to *M. sibomense* but differs in the rhizome scales and the number of pinnae.

34. *Microsorium pteropus* (Blume) Copel. — Plate 5: 40; 12: 42

Microsorium pteropus (Blume) Copel., Univ. Calif. Publ. Bot. 16 (1929) 112; Fern Fl. Philipp. (1960) 480; Steenis, Rheophytes of the World (1981) 161; M. Kato, J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15 (1991) 104. — *Polypodium pteropus* Blume, Enum. Pl. Javae (1828) 125, add. 3. — *Pleopeltis pteropus* T. Moore, Index Filic. (1857) lxxviii. — *Kaulinia pteropus* B. Nayar, Taxon 13 (1964) 67. — *Colysis pteropus* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 112. — Lectotype: *Blume* (L), Java, G. Toemba.

Polypodium tridactylum Wall. [Cat. (1829) 315, nomen] ex Hook. & Grev., Icon. Filic. (1831) t. 209. — *Phymatodes tridactyla* C. Presl, Tent. Pterid. (1836) 196. — *Drynaria tridactyla* Fée, Mém. Foug. 5. Gen. Filic. (1852) 271. — *Pleopeltis tridactyla* T. Moore, Index Filic. (1857) lxxviii. — *Colysis tridactyla* J. Sm., Hist. Fil. (1875) 101. — Type: *Wallich 315* (K; iso BM, C, K, UC, US), India, Mt Sylhet Dehlu.

Polypodium zosteriforme Wall. [Cat. (1829) 280, nomen] ex Mett., Abh. Sencken. Naturforsch. Ges. 2 (1856) 86, t. 1 f. 26. — [*Phymatodes zosteriformis* C. Presl, Tent. Pterid. (1836) 196, nom. nud.] — *Pleopeltis zosteriforme* Bedd., Ferns Brit. India 1 (1866) t. 123. — *Colysis zosteriformis* J. Sm., Hist. Fil. (1875) 100. — *Pleopeltis pteropus* var. *zosteriformis* Bedd., Handb. Ferns Brit. India (1883) 362. — *Microsorium zosteriforme* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 311. — *Kaulinia zosteriformis* B. Nayar & Kaur, Companion Beddome's Handb. Ferns Brit. India (1974) 87. — *Microsorium pteropus* var. *zosteriformis* S. Kaur & Subh. Chandra, Nomencl. Guide Bedd. Ferns S. India (1987) 49. — Type: *Wallich 280* (K; iso BM, PC, S), Nepal.

Pleopeltis pteropus-minor Bedd., Suppl. Ferns S. India (1876) 23. — *Pleopeltis pteropus* var. *minor* Bedd., Handb. Ferns Brit. India (1883) 361. — *Polypodium pteropus* var. *minor* Wu et al., Bull. Dept. Biol. Sun Yatsen Univ. 3 (1932) 298, pl. 140. — *Microsorium pteropus* var. *minor* C. Chr. & Tardieu-Blot, Notul. Syst. (Paris) 8 (1939) 194. — *Kaulinia pteropus* var. *minor* B. Nayar & Kaur, Companion Beddome's Handb. Ferns Brit. India (1974) 87. — *Microsorium pteropus* forma *minor* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 312. — Type: *Beddome s.n.* (n.v.), China, Yunnan, Mountains E of Szemao.

Polypodium raapii Alderw., Bull. Dép. Agric. Indes Néerl. 18 (1908) 23. — Type: *Raap 671* (BO), Sumatra, Batu Is.

Polypodium paucijugum Alderw., Bull. Dép. Agric. Indes Néerl. 18 (1908) 24. — *Pleopeltis paucijuga* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 8. — *Microsorium paucijugum* K. Iwatsuki & M. Kato, Acta Phytotax. Geobot. 32 (1981) 132; M. Kato et al., J. Fac. Sci. Univ. Tokyo, Sect. 3, Bot. 15 (1991) 104. — Type: *Teuscher* (BO), Borneo.

Polypodium aquaticum H. Christ, Nova Guinea 8 (1909) 153. — Type: *Versteeg 1203* (K, L), West New Guinea.

Polypodium udum H. Christ, Bull. Acad. Int. Géogr. Bot. 20 (1910) 140. — Type: *Cavalerie 3388* (BM, K, P), China, Guizhou, Lofou.

Microsorium brassii Copel., J. Arnold Arbor. 10 (1929) 181. — Type: *Brass 1153* (A), New Guinea, Upoia, Vaiala River.

[*Drynaria dubia* J. Sm., J. Bot. 3 (1841) 397, nom. nud.: *Cuming 324.*]

Rhizome 0.5–5 mm wide, dorso-ventrally flattened, not white waxy, bearing only scales, rarely with 1–3 scattered strands of sclerenchyma, usually no sclerenchyma strands, bundle sheaths collenchymatous, vascular bundles 10–14, roots densely set. Scales pseudopeltate, more or less densely set, slightly spreading, narrowly

ovate or triangular, 1.5–5 mm long, 0.4–1 mm broad, margin entire, apex acute, clathrate or subclathrate (except the opaque central region), cells longitudinally rectangular, central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct or obscure, 1.5–20 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous to membranaceous. Lamina simple or pinnatifid, narrowly elliptic, 3.5–30 cm long, 0.2–5.5 cm broad, index 5–35, base narrowly angustate, the stipe winged for a considerable part, the margin entire, apex acute to acuminate, undersurface without acicular hairs (but often densely covered with clavate hairs); stipe present, 0–12 cm long, 1–2 mm diam. Lamina of dissected leaf 15–45 cm long, 5–25 cm broad, widest at about the middle or above the middle, 0.5–3 cm wide between the lobes at place of longest lobes, index 3.5–8; stipe present, 1–28 cm long, 1–2 mm diam.; lobes 1 at each side (rarely 2, 1–5 in very small fronds), longest lobes widest about or below the middle, at position 1 from base (rarely with a small basisopic lobe), 4.5–17 cm long, 0.3–5 cm broad. Apical lobe longer than upper lateral lobes, widest below or at the base or just above the base. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (often seemingly a row of equally sized areoles within the large areoles). Veins prominent and distinct, 3–7 mm apart, more or less straight or zigzag, dichotomously branched near the margin to about the middle, connecting veins 1–6 between adjacent secondary veins, anadromous, the smaller veins more or less immersed and vague or prominent and distinct, each main areole usually including a number of smaller areoles, smaller veins variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins (sometimes in part slightly connate), round (in part elongate), superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets (often in part on connective veins, not on the free included veins), 0–20 per sq. cm, 1–2.5 mm diam., 2–7 mm long, absent in marginal areoles, generally absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells, paraphyses 2- or 3-celled, sporangium annulus 18–23-celled, indurated cells 12–17.

Distribution — Nepal; Sikkim; northern and southern India, including Andaman Is.; Burma; Japan (Iriomote I. & Ishigaki I.); China (Yunnan, Guizhou, Guangxi, Guangdong, Hainan; Taiwan); Thailand; Laos; Vietnam. In Malesia: Sumatra; Peninsular Malaysia; Java; Lesser Sunda Islands (Lombok); Borneo: Sarawak, Kalimantan Tengah, Kalimantan Timor; Philippines; Moluccas (Halmahera); New Guinea.

Habitat & Ecology — Along or in streams, often under water. Altitude usually low, but sometimes up to 1200 m.

Note — This species forms a transition between *Microsorium* and *Colysis*. Sometimes it has the sori more or less in one row between the veins. The venation consists of large areoles extending nearly to the margin at both sides of the costa, but possibly has been derived from a row of areoles between each pair of veins like in *Colysis*. A row of areoles is still included in the large areoles of *M. pteropus*.

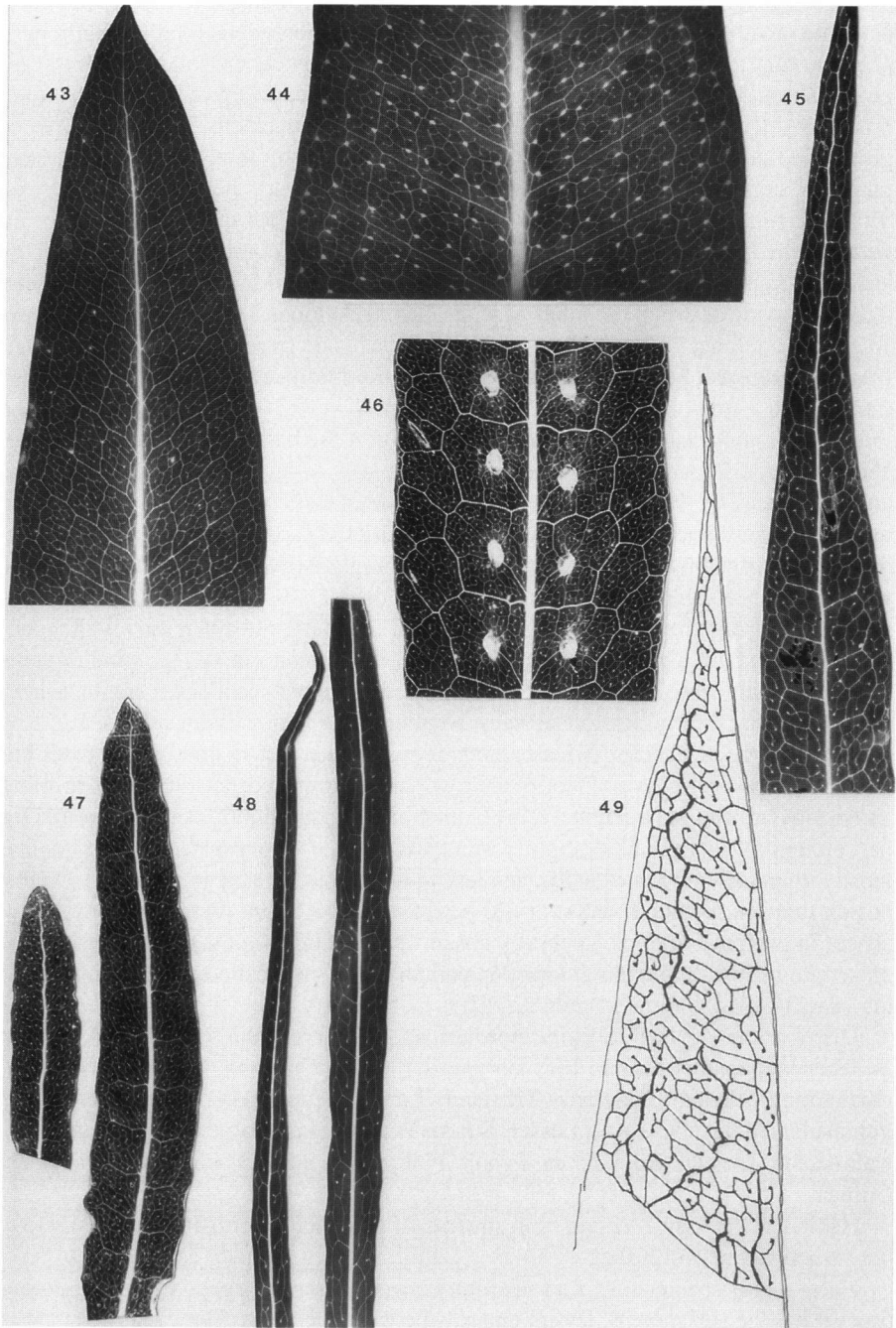


Plate 13. Venation. — 43 & 44: *Microsorium punctatum* (LAE 60249). — 45: *M. rampans* (Schlechter 16364). — 46: *M. membranifolium* (Surbeck 574). — 47: *M. rubidum* (Lörzing 15512). — 48: *M. samarensense* (Elmer 13259). — 49: *M. sarawakensis* (Raciborski s. n., L 937.232-78). All about $\times 0.5$.

35. *Microsorium punctatum* (L.) Copel. — Plate 5: 41, 42; 13: 43

- Microsorium punctatum* (L.) Copel., Univ. Calif. Publ. Bot. 16 (1929) 111; Fern Fl. Philipp. (1960) 479; S.B. Andrews, Ferns of Queensland (1990) 281 (see Andrews for the varieties and formae described for Australia); Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 97, f. 20. — *Acrostichum punctatum* L., Sp. Pl. ed. 2 (1763) 1524. — *Polypodium punctatum* Sw., J. Bot. (Schrader) 1800 (1801) 21, non Thunb. (1784). — *Polypodium lingulatum* Sw., Syn. Fil. (1806) 30. — *Phymatodes lingulata* C. Presl, Tent. Pterid. (1836) 198. — *Pleopeltis punctata* Bedd., Suppl. Ferns S. India (1876) 22. — Type: *Fothergill* (n.v., not found in LINN), China.
- [*Polypodium polycarpon* Sw., J. Bot. (Schrader) 1800 (1801) 21, nom. illeg., non Cavanilles.] — *Drynaria polycarpa* Brack., U.S. Expl. Exp., Filic. 16 (1854) 44, nom. nov. — Syntypes: *Thunberg* (n.v.), Java, *Groendal* (n.v.), Mauritius.
- Polypodium polycarpon* Cav., Descr. Pl. (1801) 246, see note in Bosman (1991: 99). — *Niphobolus polycarpus* Spr., Syst. Veg. 4 (1827) 45. — *Phymatodes polycarpa* C. Presl, Tent. Pterid. (1836) 198, t. 8, f. 19. — *Pleopeltis polycarpa* T. Moore, Index Filic. (1857) lxxviii. — *Microsorium polycarpon* Tardieu, Fl. Madag. Fam. 5 (1960) 114. — Type: *Née* (n.v.).
- Polypodium irioides* Poir., Encycl. 5 (1804) 513. — *Phymatodes irioides* C. Presl, Tent. Pterid. (1836) 196. — *Drynaria irioides* J. Sm., J. Bot. (Hooker) 3 (1841) 398. — *Microsorium irioides* Fée, Mém. Foug. 5. Gen. Filic. (1852) 268, t. 20B. — *Pleopeltis irioides* T. Moore, Index Filic. (1857) lxxviii. — *Colysis irioides* J. Sm., Hist. Fil. (1875) 101. — Type: *Commerson* (P), Mauritius.
- Polypodium crassinerve* Schumach., K. Dansk Vidensk Selsk. Afh. 4 (1827) 227. — Type: *Schumacher* 87 (C), Africa, Guinea.
- Polypodium musifolium* Blume, Enum. Pl. Javae (1828) 134. — *Pleopeltis musifolium* T. Moore, Index Filic. (1857) lxxviii. — *Drynaria musifolia* J. Sm., Cult. Ferns (1857) 14. — *Microsorium musifolium* Copel., Univ. Calif. Publ. Bot. 16 (1929) 112; Fern Fl. Philipp. (1960) 486; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 94. — Type: *Blume* (L), Java, near Buitenzorg.
- Polypodium ambiguum* Blume, Enum. Pl. Javae add. (1828) 125. — Type: *Reinwardt* (L).
- Polysorum irregulare* Link, Hort. Berol. 2 (1833) 110. — Type: *Anonymus* (n.v.), cultivated.
- Phymatodes sessilis* C. Presl, Tent. Pterid. (1836) 198. — *Polypodium sessile* Kaulf. ex Kunze, Bot. Zeit. (Berlin) 6 (1848) 116. — *Microsorium sessile* Fée, Mém. Foug. 5. Gen. Filic. (1852) 268. — *Pleopeltis sessilis* T. Moore, Index Filic. (1857) lxxviii. — Type: *Sieber* 31 (B, BM, K, PC, PR, S), Mauritius.
- Polypodium glabrum* Wall. [Cat. (1829) 281, nomen] ex Roxb., Calc. J. Nat. Hist. 4 (1844) 482, non Burman (1768). — Type: *Wallich* 281 (BR; iso BM, K), near Calcutta.
- Polypodium millisorum* Baker, J. Linn. Soc. Bot. 15 (1877) 109. — *Pleopeltis millisora* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 8. — Type: *Moseley* (BM, K), Little Kai Is.
- Polypodium superficiale* var. *australiense* F.M. Bailey, Bot. Bull. Dep. Agric. Queensl. 4 (1891) 21, t. 4. — *Microsorium superficiale* var. *australiense* S.B. Andrews, Austrobaileya 1 (1977) 12. — Type: *Wild* (n.v.), Queensland, Atherton.
- Polypodium validum* Copel. in Perkins, Fragm. Fl. Philipp. 3 (1905) 191. — *Pleopeltis valida* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 8. — *Microsorium validum* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 295; Copel., Fern Fl. Philipp. (1960) 484. — Type: *Copeland* 973 (n.v.), Philippines, Mindanao, Davao.
- Polypodium punctatum* subsp. *subirideum* H. Christ, Bull. Herb. Boissier 2 (1906) 994. — *Polypodium punctatum* var. *subirideum* Alderw., Malayan Ferns (1909) 654. — *Microsorium subirideum* Copel., Gen. Fil. (1947) 197. — Type: *Elmer* 5884 (P), Philippines, Castilla, Benguet.
- Polypodium punctatum* subsp. *subdrynariaceum* H. Christ, Bull. Herb. Boissier 2 (1906) 994. — *Polypodium punctatum* var. *subdrynariaceum* Alderw., Malayan Ferns (1909) 654. — Type: *Ridley* 8935 (P), Sreangoon, near Singapore.
- Polypodium antrophyoides* Alderw., Bull. Dép. Agric. Indes Néerl. 18 (1908) 22. — Type: *Forbes* 3119 (BM), Sumatra, Palembang.
- Polypodium irioides* var. *lobatum* forma *cristatum* F.M. Bailey, Queensl. Agr. J. 26 (1911) 199, t. 21. — Type: *Turner* (BRI, n.v.).

Polypodium neoguineense Copel., Philipp. J. Sci. 6, Bot. (1911) 89. — *Pleopeltis neoguineensis* Alderw., Malayan Ferns Suppl. 1 (1917) 390. — *Microsorium neoguineense* Copel., Gen. Fil. (1947) 196. — Type: *King 335* (BRI, n.v.), New Guinea.

Polypodium aspidistrifrons Hayata, Ic. Pl. Form. 5 (1915) 308, t. 103. — Type: *Sohma* (TI), Taiwan. *Pleopeltis megalosoroides* Alderw., Nova Guinea 14 (1924) 39. — Type: *Lam 1365* (L; iso BO), New Guinea, near Doorman River.

Microsorium glossophyllum Copel., Gen. Fil. (1947) 196; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 81. — Type: *King 388* (BM, P, BRI), Papua New Guinea, Mt Gewagewa.

Rhizome 4–8 mm wide, about cylindrical, white waxy under the scales or not white waxy (rarely), with only scattered strands of sclerenchyma, vascular bundles 11–21, sclerenchyma strands 50–100, roots densely set (forming a thick mat). Scales pseudopeltate (sometimes some peltate), densely or apically densely set, otherwise more or less sparsely set, appressed or slightly spreading, ovate or narrowly ovate or triangular, 1.5–8 mm long, 0.5–3 mm broad, margin entire to denticulate to dentate, apex acute, clathrate or subclathrate or clathrate except the hyaline marginal region (rarely), cells small, more or less isodiametric or cells longitudinally rectangular, central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct or obscure, 2–30 mm apart. *Leaf* not or slightly dimorphous, herbaceous to subcoriaceous (sometimes coriaceous). Lamina simple, narrowly elliptic to narrowly ovate to narrowly obovate to linear, 10–175 cm long, 1.5–15 cm broad, index 4–20(–25), base narrowly angustate, the stipe winged for a considerable part to cuneate-angustate or truncate to obtuse to cordate, auriculate, margin entire or undulate (occasionally irregularly lobed), apex acute to acuminate to rounded, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–12 cm long, 3–8 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins more or less immersed and vague or prominent and distinct, 6–25 mm apart, more or less straight or zigzag, dichotomously branched near the margin, connecting veins (3–)4–10 between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague or prominent and distinct, variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0–0.9 of total length of lamina, mostly irregularly scattered on the smallest veinlets (occasionally in part on tertiary veins), 5–55(–100) per sq. cm, irregularly scattered on the smaller anastomosing and free veins, 0.5–2.5 mm diam., present or absent in marginal areoles, generally present or absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells, paraphyses 2–4-celled, sporangium annulus 18–22(–25)-celled, indurated cells 12–16(–19).

Distribution — Palaeotropics and subtropics (see Bosman, l.c.: 99, f. 20).

Habitat & Ecology — Epiphytic, but also epilithic or terrestrial in various types of forest, sometimes in savannah but also in wet places in streambeds. Altitude up to 2800 m.

Uses — Warmed with alcohol and applied on arms and legs it is used for rheumatism in some areas in northern Vietnam.

Vernacular names — Teke (Timor), wassanke (Alor), saughtikel (Flores, Manggarai), eawawan (Luzon), o totofufungu (Tobeloese, Halmahera), tutuwungu (Tobaro, Halmahera), baluk (Kurte Plestok, New Guinea), kopeh-kopeh (Matapaili, New Guinea), vata-vata (Kulumo, New Guinea), Kolkel (Yoowi dial., Hagen-Chimbu), polya (Enga), koiwa (Nauti, also used for *M. linguiforme*), noature (Manki).

Note — *Microsorium glossophyllum* is a form that differs in the blackish narrow rhizome scales, but this character is variable and intermediates occur with the more brownish and broader scales. *Microsorium musifolium* is a form with broader leaves and more connecting veins, connected with *M. punctatum* with many intermediates. *Microsorium lastii*, *M. leandrianum*, *M. membranaceum*, and *M. steerii* are very close to the present species. They might be conspecific, or in part varieties.

36. *Microsorium rampans* (Baker) Parris — Plate 5: 43; 13: 45

Microsorium rampans (Baker) Parris, Kew Bull. 41 (1986) 70; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 100. — *Polypodium rampans* Baker, J. Linn. Soc. Bot. 15 (1877) 109.

— Type: *Moseley, Challenger Exp.* (K), Papua New Guinea, Admiralty Is.

Polypodium bamlerianum Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 8 (1910) 163. — *Pleopeltis bamlerianum* Alderw., Malayan Ferns Suppl. 1 (1917) 381. — *Microsorium bamlerianum* Copel., Gen. Fil. (1947) 196. — Type: *Bamler* (n.v.), New Guinea, Logaueng.

Polypodium kingii Copel., Philipp. J. Sci. 6, Bot. (1911) 89. — *Pleopeltis kingii* Alderw., Malayan Ferns Suppl. 1 (1917) 396. — *Microsorium kingii* Copel., Gen. Fil. (1947) 196. — Type: *C. King 122* (BRI, n.v.), Papua New Guinea.

Polypodium wobbense Brause, Bot. Jahrb. Syst. 49 (1912) 51. — *Pleopeltis wobbensis* Alderw., Malayan Ferns Suppl. 1 (1917) 382. — *Microsorium wobbense* Copel., Gen. Fil. (1947) 197. — Syntypes: *Schlechter 16364* (K; iso P, S, UC, US) and *17369* (BM, K, P, UC, US), both Papua New Guinea, Kaiser Wilhelmsland.

Pleopeltis myriocarpa var. *schlechteriana* Alderw., Bull. Jard. Bot. Buitenzorg II, 11 (1913) 19. — Type: *Schlechter 13920* (K, P) New Guinea, Bismarck Mts.

Polypodium tuanense Copel., Philipp. J. Sci. 9, Bot. (1914) 8. — *Pleopeltis tuanensis* Alderw., Malayan Ferns Suppl. 1 (1917) 398. — *Microsorium tuanense* Copel., Gen. Fil. (1947) 196. — Type: *C. King 384* (BM), Papua New Guinea, Mt Tuan.

Rhizome 1–4 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 7–9, roots sparsely set. Scales peltate or pseudopeltate (occasionally some), densely set, appressed, ovate or narrowly ovate or triangular or circular or elliptic, often with eroded margins, 0.5–3 mm long, 0.3–1.5 mm broad, margin entire to dentate, apex acute or rounded, clathrate or subclathrate, central region glabrous. Phyllopodia more or less distinct, up to 7 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple or pinnatifid, narrowly ovate to narrowly elliptic to linear, 15–40 cm long, 1.5–5.5 cm broad, index 4–15, base narrowly angustate, the stipe winged for a considerable part to obtuse, margin entire, apex acute or acuminate, undersurface without acicular hairs; stipe present, 0.5–15 cm long, 0.5–1.5 mm diam. Lamina of dissected leaf ovate to about circular, 20–40 cm long, 15–35 cm broad, widest below the middle, 1–3 cm wide between the lobes at place of the longest lobes, index 1–1.5; stipe present, 5–20 cm long, up to 1.5 mm diam.; lobes 1–4 at each side, longest lobes widest below the middle to widest at the

base, at position 1 or 2 from base, 7.5–20 cm long, 1.3–2.5 cm broad, index 3.5–12. Apical lobe longer than the upper lateral lobes, widest at or just above the base. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (but seemingly often one row of areoles between two veins). Veins prominent and distinct, 5–15 mm apart, more or less straight, dichotomously branched at about the middle to below the middle, catadromous, the smaller veins more or less immersed and vague, variously anastomosing within the main and marginal areoles, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 1–20 per sq. cm, irregularly scattered on the smaller anastomosing veins and on the free included veins, 1–2.5 mm diam., 2–3(–3.5) mm long, present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2–4(–5)-celled, sporangium annulus 17–23-celled, indurated cells 12–16.

Distribution — New Guinea.

Habitat & Ecology — Low epiphyte or rarely terrestrial in various types of primary and secondary forest. Shady places, often near streams. Altitude 0–1250 m.

Vernacular names — La lumu (W Nakanai), gabi (Yebora; Morobe).

Note — Occasionally most sporangia are arranged in long elongated sori along the margin of the lamina on the marginal connecting vein while only a few sori are scattered over the rest of the surface. This species is very close to *M. linguiforme*, and might be conspecific.

37. *Microsorium rubidum* (Kunze) Copel. — Plate 5: 44; 13: 47

Microsorium rubidum (Kunze) Copel., Gen. Fil. (1947) 197. — [*Drynaria rubida* J. Sm., J. Bot. (Hooker) 3 (1841) 397, nom. nud.] — *Polypodium rubidum* Kunze, Bot. Zeit. (Berlin) (1848) 117. — Type: *Cuming 241* (BM, K, L, P, US), Philippines.

Polypodium longissimum Blume, Enum. Pl. Javæ (1828) 127, non *Microsorium longissimum* Fée (1852). — *Phymatodes longissima* J. Sm., Cult. Ferns (1857) 10; Tardieu & C. Chr. in Lecomte, Fl. Indo-Chine 7 (1941) 476; E. H. Walker, Fl. Okinawa & Ryukyu (1976) 114. — *Phymatosorus longissimus* Pich. Ser., Webbia 28 (1973) 459. — Lectotype (here chosen): *Blume 35* (L), Java.

Polypodium schneideri H. Christ, Bull. Herb. Boissier 6 (1898) 835. — *Microsorium schneideri* Copel., Gen. Fil. (1947) 197; Fern Fl. Philipp. (1960) 479. — Type: *Schneider 40* (P), Sumatra. *Polypodium suisha-stagnalis* Hayata, Icon. Pl. Formos. 6 (1916) 160. — *Phymatosorus suisha-stagnalis* Pic. Serm., Webbia 28 (1973) 460. — Type: *Hayata* (n.v.).

Rhizome 4–8 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 10–20, roots densely set. Scales pseudopeltate, densely set to apically densely set, otherwise more or less sparsely set, appressed or slightly spreading, ovate or triangular, 3–6 mm long, 1.3–3 mm broad, margin entire, apex acute or rounded, clathrate or subclathrate, cells small, more or less isodiametric (in the apical part somewhat longer), central region bearing multiseptate hairs

at least when young or central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, herbaceous. Lamina pinnatifid, base narrowly angustate, the stipe winged for a considerable part, margin entire, undersurface without acicular hairs. Lamina of dissected leaf elliptic to narrowly elliptic, 30–120 cm long, 8–60 cm broad, widest below or about the middle or above the middle, 0.3–2 cm wide between the lobes at place of longest lobes, index 1.5–5; stipe present, 15–120 cm long, 3–12 mm diam.; lobes 10–40 at each side, longest lobes widest about or below the middle, at position 1–20 from base, 7–40 cm long, 0.7–3.5 cm broad, index 8–12, apex acute to rounded, sometimes shortly acuminate, rarely longer acuminate. Apical lobe longer than the upper lateral lobes, 7–19 cm long, 1.1–3.5 cm broad. Venation type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins prominent and distinct, 4–10 mm apart, more or less straight, anadromous, smaller veins more or less immersed and vague or prominent and distinct, the smaller areoles not surrounded by very prominent veins, marginal vein absent (or obscure), free veinlets simple or once or twice forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, deeply sunken, visible as protrusions on the upper surface, on the whole surface of the lamina or absent from the basal parts, on distinct soral veins (except the main soral vein a crossing of smaller veins) or solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 3–8 mm diam.; paraphyses biseriate non-clathrate.

Distribution — China (Hunan, Guangdong, Hainan; Taiwan); Japan (Ryukyu); northern India; Burma; Peninsular Thailand, Vietnam (Annam & Tonkin). In Malesia: Sumatra, Java, Philippines, northern Sulawesi & Talaud Is. In the Pacific: Admiralty Islands. In the Indian Ocean: Mauritius, Île Bourbon, Réunion.

Habitat & Ecology — Terrestrial, usually in wet places. Altitude usually low, but sometimes up to 1500 m.

Note — In absence of a rhizome not always easy to distinguish from *M. membranifolium*; possibly there are intermediates. In the Pacific, on Rapa Iti, one collection, *St. John 15302*, resembles very much the present species but deviates in the sori being close to the margin.

38. *Microsorium samarense* (J. Sm.) Bosman — Plate 13: 48

Microsorium samarense (J. Sm.) Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 102. — *Diblemma samarense* J. Sm., J. Bot. (Hooker) 3 (1841) 399. — *Taenitis samarensis* Mett., Fil. Hort. Bot. Lips. (1856) 27. — *Colysis samarensis* J. Sm., Hist. Fil. (1875) 101. — Type: *Cuming 332* (K; iso L, P, PC, Z), Philippines, Samar.

Polypodium tenuilore J. Sm. ex Mett., Abh. Sencken. Naturforsch. Ges. 2 (1856) 86. — *Colysis tenuilore* J. Sm., Hist. Fil. (1875) 101. — *Microsorium tenuilore* Copel., Fern Fl. Philipp. (1960) 483. — Type: *Cuming 287* (BM, K, L, P, PC, Z), Philippines, Mindanao.

Rhizome 1–4 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 5–10, roots sparsely set. Scales pseudopeltate,

densely set, slightly spreading, ovate or narrowly ovate or triangular, (0.5–)1–3 mm long, 0.5–1 mm broad, margin denticulate, apex acute, clathrate or subclathrate, central region glabrous. Phyllopodia obscure, up to 11 mm apart. *Leaf* not or slightly dimorphous, herbaceous to subcoriaceous. Lamina simple, linear, 25–45 cm long, 0.5–1 cm broad, index 30–65, base truncate, margin entire, apex acuminate, undersurface with acicular hairs (few); stipe present, 0.5–4.5 cm long, 0.5–1.5 mm diam. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins immersed and distinct, 5–13 mm apart, more or less straight, dichotomously branched below the middle to near the margin, catadromous, smaller veins more or less immersed and vague, variously anastomosing within the main and marginal areoles, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or some connate, elongate on veinlets, round or elongate, superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 10–60 per sq. cm, irregularly scattered on the smaller anastomosing veins, the marginal veins, and the free veins, 0.5–1.5 mm diam., 1.5–40 mm long, present in marginal areoles, generally present or absent from the costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2- or 3-celled, sporangium annulus 15–21-celled, indurated cells 9–15.

Distribution — Philippines (common in western Samar).

Habitat & Ecology — Epiphytic or epilithic in primary forest, on limestone. Altitude 150–400 m.

Note — In some fronds the elongated sori are almost all concentrated on the marginal vein. This species is very close to *M. longissimum* and might be conspecific.

39. *Microsorium sarawakense* (Baker) Ching — Plate 5: 45; 13: 49

Microsorium sarawakense (Baker) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 295; Holttum, Revis.

Fl. Malaya 2, 2nd ed. (1966) 175. — *Polypodium sarawakense* Baker, Adansonia 22 (1887) 228.

— Type: *Hose 125* (K), Borneo, Sarawak.

Polypodium forbesii Alderw., Bull. Dép. Agric. Indes Néerl. 18 (1908) 23. — Type: *Forbes 2333* (BM, BO, US), Sumatra, Dempo.

Polypodium peltatum Alderw., Malayan Ferns (1909) 632. — Type: *Scortechini* (n.v.).

Microsorium rizalense Copel., Philipp. J. Sci. 81 (1952) 42; Fern Fl. Philipp. (1960) 478. — Type: *BS 29648* (*Ramos & Edaño*) (K), Philippines, Mt Lumutan.

Rhizome 1–2 mm wide, not white waxy, with only scattered strands of sclerenchyma, roots sparsely set. Scales peltate, densely set, appressed, circular or elliptic, often with eroded margins, 0.8–1.2 mm long, 0.5–1 mm broad, margin entire (but irregular), apex rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, herbaceous or subcoriaceous. Lamina simple, elliptic, 10–18 cm long, 1.7–5 cm broad, index 2.5–5, base cuneate-angustate, margin entire, apex acuminate (acute), the undersurface without acicular hairs; stipe present, 2.5–15 cm long, 1 mm diam. Venation type 3: connecting veins forming one row of small (in

conspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins more or less immersed and vague, 6–10 mm apart, more or less straight, dichotomously branched near the margin, connecting veins 2 or 3 between adjacent secondary veins, anadromous or catadromous, smaller veins more or less immersed and vague, smaller veins forming a net of secondary areoles within the primary areoles, but not in the costal areole, therefore the venation type may be truly 3, free veinlets simple or once or twice forked. *Sori* separate, one row of sori, each one (or two) per areole between each pair of veins, round, superficial or slightly immersed, on the whole surface of the lamina, on distinct soral veins (except main soral vein a crossing of smaller veins) (occasionally in part on connecting veins), 1.2–4 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Sumatra, Peninsular Malaysia (Perak, Pahang, Negri Sembilan, Selangor), W and C Java, Borneo, Philippines (Luzon).

Habitat & Ecology — Terrestrial or low to high epiphyte, often in humid places. Altitude 500–1500 m.

40. *Microsorium scandens* (G. Forst.) Tindale — Plate 6: 46; 14: 50, 51

Microsorium scandens (G. Forst.) Tindale, Amer. Fern J. 50 (1960) 241; S.B. Andrews, Ferns of Queensland (1990) 283. — *Polypodium scandens* G. Forst., Fl. Ins. Austr. (1786) 81. — *Phymatodes scandens* C. Presl, Tent. Pterid. (1836) 196. — *Phymatosorus scandens* Pic. Serm., Webbia 28 (1973) 459. — Type: *Forster* (BM, K), Australia.

Rhizome 1–3 mm wide, white waxy under the scales or not so, with only circumvascular sheaths, vascular bundles 6–12(–14), roots densely or sparsely set. Scales peltate, densely set, distinctly spreading, narrowly ovate or triangular, 3–6 mm long, 0.5–1.5 mm broad (in New Zealand narrower than in Australia), margin entire or denticulate (towards the base), apex acute, clathrate or subclathrate, cells longitudinally rectangular (towards the apex), central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple or pinnatifid, narrowly elliptic to linear, 12–35 cm long, 1–2.5 cm broad, index 10–20, base narrowly angustate, the stipe winged for a considerable part to cuneate-angustate, margin entire, apex acute to rounded, undersurface without acicular hairs; stipe present, 2.5–9 cm long, 0.5–1 mm diam. Lamina of dissected leaf elliptic to narrowly elliptic, 20–50 cm long, 9–12 cm broad, widest at about the middle, 0.2–1.5 cm wide between the lobes at place of longest lobes, index 3–7; stipe present, 6–20 cm long, 0.8–2.8 mm diam.; lobes 1–17 at each side (usually sickle-shaped), longest lobes widest at base, at position about the middle of the leaf, 2.5–10 cm long, 0.5–1.5 cm broad, index 5–15, apex rounded to acute. Apical lobe longer than upper lateral lobes. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (included venation in primary costal areole

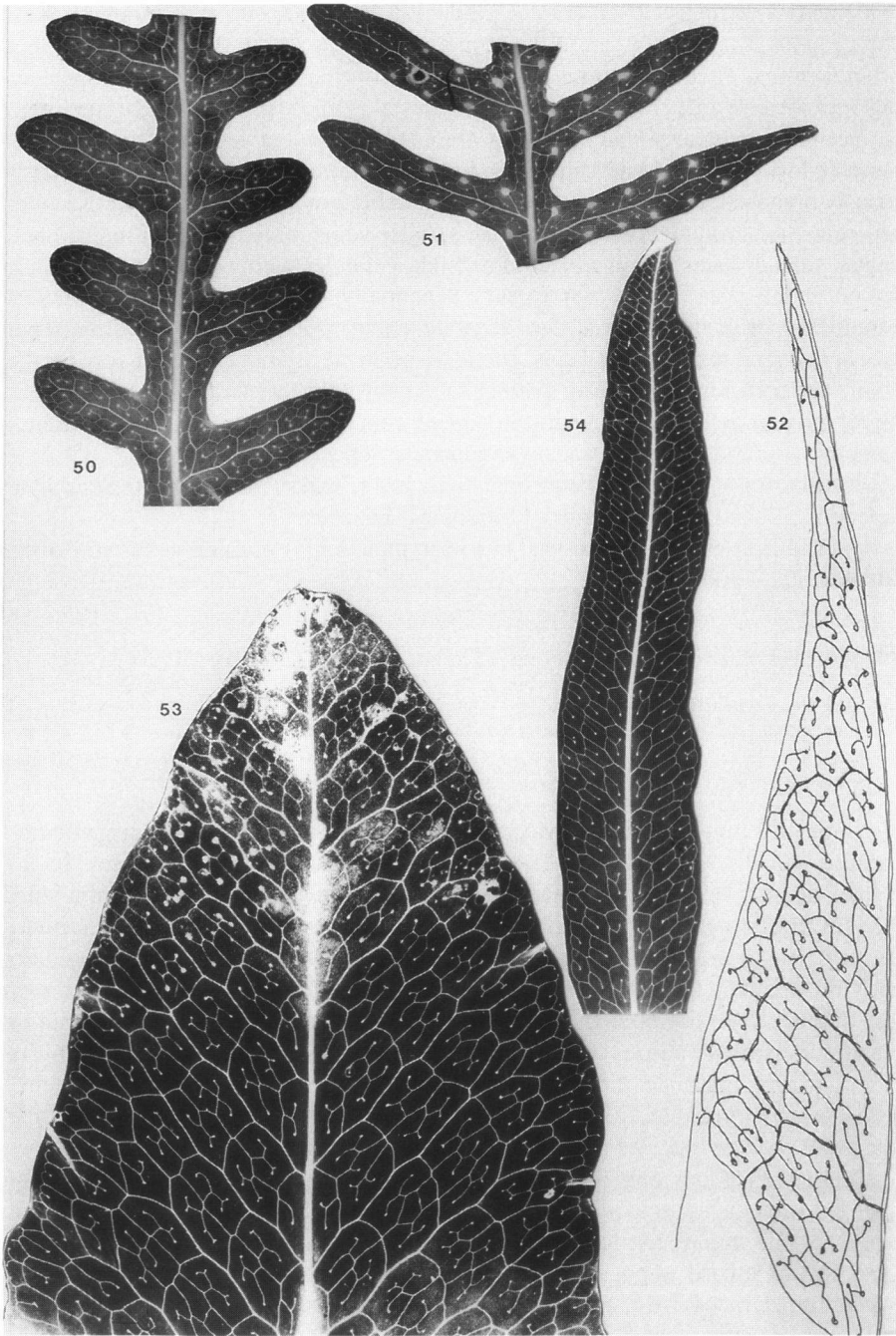


Plate 14. Venation. — 50 & 51: *Microsorium scandens* (L. S. Smith 4985). — 52: *M. scolopendria* (Wenzel 3168). — 53: *M. spectrum* (St. John et al. 10925). — 54: *M. superficiale* (Henry 9265a). All about $\times 0.5$.

only free veinlets, in simple leaves the veins forked at the costa). Veins prominent and distinct, 5–13 mm apart, catadromous, smaller veins more or less immersed and vague or prominent and distinct, free veinlets simple or once forked. *Sori* separate, one sorus just outside each primary costal areole, close to the margin, round (sometimes somewhat elongate), superficial or slightly immersed or deeply sunken, visible as protrusions on the upper surface, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein, 1–2.5 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Australia (Northern Territory?, Queensland, New South Wales, Victoria); New Zealand.

Habitat & Ecology - Epiphytic and epilithic, on trees and rocks in rain forest. Altitude 0–1000 m.

Note — See the note under *Leptochilus amplus*.

41. *Microsorium scolopendria* (Burm. f.) Copel. — Plate 6: 47, 48; 14: 52

Microsorium scolopendria (Burm. f.) Copel., Univ. Calif. Publ. Bot. 16 (1929) 112; W.C. Shieh, Fl. Taiwan 1 (1994) 504; Copel. Fern Fl. Philipp. (1960) 477. — *Polypodium scolopendria* Burm. f., Fl. Indica (1768) 232; Link, Hort. Berol. (1833) 122. — [*Polypodium phymatodes* L., Mant. Pl. (1771) 306; Blume, Enum. Pl. Javae (1828) 125, nom. illeg.] — *Phymatodes scolopendria* Ching, Contr. Inst. Bot. Nat. Acad. Peiping 2 (1933) 63; Tardieu & C. Chr. in Lecomte, Fl. Indo-Chine 7 (1941) 473; Brownlie, Fl. Nouv. Caléd. 3 (1969) 292; E. H. Walker, Fl. Okinawa & Ryukyu (1976) 114. — *Phymatosorus scolopendria* Pic.Serm., Webbia 28 (1973) 460. — Type: *Hermann* (n.v.).

Polypodium ensiformis Thunb., Prodr. Fl. Cap. 2 (1800) 172. — *Goniophlebium ensiforme* Fée, Mém. Foug. 5. Gen. Filic. (1852) 255. — *Phymatosorus ensiformis* Pic.Serm., Webbia 28 (1973) 459. — Type: *Herb. Swartz* (n.v.), according to Pichi Sermolli.

Polypodium hemionitis Cav., Descr. Pl. (1802) 248. — Type: *Née* (fragm. BM), Pacific, Marianes. *Polypodium grossum* Langsd. & Fisch., Pl. Voy. Russes Monde (1810) 9, t. 8. — *Phymatodes grossa* C. Presl, Tent. Pterid. (1836) 196. — *Phymatosorus grossus* Brownlie, Nova Hedwigia Beih. 55 (1977) 385. — *Microsorium grossum* S.B. Andrews, Ferns of Queensland (1990) 280. — *Phymatosorus grossus* Sykes & Game, New Zeal. J. Bot. 34 (1996) 144. — Type: *Langsdorff* (LE, n.v.).

Polypodium alternifolium Willd., Spec. Pl. 5 (1810) 168. — *Drynaria alternifolia* Brack., U.S. Expl. Exp., Filic. 16 (1854) 54. — *Pleopeltis alternifolia* T. Moore, Index Filic. (1862) 344. — *Microsorium alternifolium* Copel., Genera Fil. (1947) 197; Fern Fl. Philipp. (1960) 478. — Type: *Willdenow 19637* (B, n.v.).

Acrostichum obtusifolium Willd., Spec. Pl. 5 (1810) 510. — Type: *Willdenow* (B, n.v.), Fiji.

Polypodium phymatodes var. *partitum* Blume, Enum. Pl. Javae (1828) 128. — Type: *Blume* (L 908.304-22), Java, G. Parang.

Polypodium peltideum Link, Hort. Berol. 2 (1833) 94; E.J. Lowe, Ferns 2 (1858) 93, t. 42. — Type: Unknown.

Phymatodes vulgaris C. Presl, Tent. Pterid. (1836) 196. — *Drynaria vulgare* J. Sm., J. Bot. (Hooker) 3 (1841) 397. — Type: *Cuming 201* (BM, K, P), Philippines.

Polypodium excavatum Roxb., Calc. J. Nat. Hist. 4 (1844) 485. — Type: *Roxburgh* [BR, see Morton, Contr. Un. St. Nat. Herb. 38 (1974) 370], Moluccas.

Pteris lobata Roxb., Calc. J. Nat. Hist. 4 (1844) 504. — Type: *Roxburgh* [BR, n.v., see Morton, Contr. Un. St. Nat. Herb. 38 (1974) 370], Moluccas.

Polypodium longipes Kunze, Linnaea 23 (1850) 280; E.J. Lowe, Ferns 1 (1856) 75, t. 24. — Type: Unknown.

Polypodium terminale E.J. Lowe, Ferns 2 (1858) 97, t. 44. — Type: Unknown.

Microsorium pitcairnense Copel., Occas. Pap. Bernice P. Bishop Mus. 14 (1938) 74, t. 25. — *Phymatodes pitcairnense* Brownlie, Pacific Sci. 15 (1961) 300. — Type: *Fosberg & Clark 11311* (n.v.), Pitcairn.

Phymatodes banerjiana S. Pal & N. Pal, Amer. Fern J. 53 (1963) 103. — Type: *S. Pal H499158* (iso K), cultivated.

Rhizome 1.8–7 mm wide, white waxy under the scales (generally), with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 9–30, sclerenchyma strands 10–40(–100), roots densely set or sparsely set. Scales peltate (occasionally some pseudopeltate), densely set or apically densely set and otherwise more or less sparsely or sparsely set, appressed or distinctly spreading or slightly spreading, ovate or narrowly ovate or triangular (but apical part often fallen), 2–7 mm long (look especially on pseudopodia and terminal parts of rhizome), 0.6–1.4 mm broad, margin denticulate (by the extruding cell walls), apex acute, clathrate or subclathrate, cells longitudinally rectangular (in the narrow apical part), central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, herbaceous. Lamina pinnatifid or simple, elliptic to narrowly elliptic, 8–45 cm long, 2–8 cm broad, index 5–6, base typically cuneate or cuneate-angustate, margin entire, apex acute to acuminate, undersurface without acicular hairs; stipe present, 2–30 cm long, 0.8–2.3 mm diam. Lamina of dissected leaf ovate, 14–41 cm long, 9–30 cm broad, widest below or about the middle, 1–4.6 cm wide between the lobes at place of the longest lobes, index 1–1.5; stipe present, 4–55 cm long, 0.8–7.2 mm diam.; lobes 1–9 at each side (the angle of upper lobes with apical lobe 35–50 degrees), longest lobes widest about the middle or at the base, at position 1 or 2 from base, 5–20 cm long, 0.7–4 cm broad, index 5–10. Apical lobe longer than upper lateral lobes, 3–20 cm long, 0.8–5 cm broad, widest at or just above the base. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles, or type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein, or type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins (probably the basic type is 3, which develops into types 1 or 5 in broader leaves or leaf-segments while type 2 is an exception). Veins more or less immersed and vague or prominent and distinct, 4–12 mm apart, more or less straight or zigzag, dichotomously branched near the margin or about the middle, connecting veins 1–4 between adjacent secondary veins, anadromous, smaller veins more or less immersed and vague (sometimes more conspicuous), the smaller veins forming a dense reticulation of smaller areoles, free veinlets simple or once forked. *Sori* separate, one sorus in, or just outside, each primary costal areole, generally

close to the costa, at most halfway to the margin or one row of sori, each one (or two) per areole between each pair of veins, round or elongate, deeply sunken, visible as protrusions on the upper surface, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein or on distinct soral veins (except the main soral vein a crossing of smaller veins), 1–6.5 mm diam., 6.5–15 mm long; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — Tropical Africa southwards to the Cape of Good Hope; Madagascar; tropical islands in the Indian Ocean. In Continental Asia: China (Hongkong, Hainan; Taiwan); Japan (Ryu-kyu); Sri Lanka; Eastern India, including Andaman and Nicobar Islands. Throughout Malesia. Australia (Northern Territory, Queensland). In the Pacific: most tropical islands.

Habitat & Ecology — Epiphyte or ground fern in very different habitats. Altitude 0–2100 m.

Note — See the note under *M. papuanum*.

42. *Microsorium sopuense* Bosman

Microsorium sopuense Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 103, t. 22. — Type: *Hennipman 5619* (L), Sulawesi, Sopa Valley.

Rhizome 1–3 mm wide, dorso-ventrally flattened, not white waxy, with only circumvascular sheaths, vascular bundles 8–12, roots densely set. Scales peltate, apically densely set, otherwise more or less sparsely set, appressed or slightly spreading, narrowly ovate or triangular, (2–)3.5–6 mm long, 0.5–1 mm broad, margin denticulate, apex acute, clathrate or subclathrate, central region glabrous. Phyllopodia more or less distinct, up to 25 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous. Lamina simple, linear, 60–75 cm long, 2–3 cm broad, index 20–40, base narrowly angustate, the stipe winged for a considerable part or cuneate-angustate, margin entire, apex acuminate, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, up to 0.5 cm long, 1–2.5 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 6–10 mm apart, zigzag, dichotomously branched near the margin, connecting veins 3 or 4 between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague, variously anastomosing, free veinlets simple. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, superficial or slightly immersed, absent from the basal parts for 0.3–0.7 of total length of lamina, mostly irregularly scattered on the smallest veinlets, 15–30 per sq. cm, 2 per veinlet (per quaternary vein, occasionally scattered on connecting veins, in the costal areoles on the free veins), 1 mm diam., present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2- or 3-celled, sporangium annulus 18- or 19-celled, indurated cells 12 or 13.

Distribution — Central Sulawesi, very common in the Sopo valley.

Habitat & Ecology — Low epiphyte in primary rain forest near stream. Altitude 1000–1200 m.

43. *Microsorium spectrum* (Kaulf.) Copel. — Plate 14: 53

Microsorium spectrum (Kaulf.) Copel., Gen. Fil. (1947) 197; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 106. — *Polypodium spectrum* Kaulf., Enum. Filic. (1824) 94; W.F. Hillebr., Fl. Hawaiian Isl. (1888) 560, incl. vars. — *Phymatodes spectrum* C. Presl, Tent. Pterid. (1836) 197. — *Drynaria spectrum* J. Sm., J. Bot. (Hooker) 4 (1842) 61. — *Pleopeltis spectrum* T. Moore, Index Filic. (1862) 348. — Type: *De Chamisso* (PC), Hawaii.

Polypodium thouinianum Gaudich. in Freyc., Voy. Uranie (1827) 348, t. 5, f. 1. — *Drynaria thouiniana* Fée, Mém. Foug. 5. Gen. Filic. (1852) 270. — Type: *Gaudichaud* (FI, n.v.), Hawaii

Rhizome 1.5–6 mm wide, dorso-ventrally flattened, not white waxy (often with short accessory branches bearing one frond opposite the phyllopodia), with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 14 or 15, sclerenchyma strands 50–100, roots densely set. Scales pseudopeltate, densely set, appressed, ovate or triangular or circular or elliptic, often with eroded margins, 3–5 mm long, (1–)2 mm broad, margin entire (often eroded), apex rounded, clathrate except the hyaline marginal region (inner layer of thickened cell walls warty), central region glabrous. Phyllopodia more or less distinct, 30–80 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous to herbaceous. Lamina simple or pinnatifid, (broadly) ovate, 8–15 cm long, 4–7.5 cm broad, index 1.3–2, base cordate, auriculate(-angustate), margin entire or sinuate, apex acute to acuminate, undersurface without acicular hairs; stipe present, 10–20 cm long, 0.5–1 mm diam. Lamina of dissected leaf deltoid to hastate, 15–30 cm long, 15–35 cm broad, widest below the middle, 5–20 cm wide between the lobes at place of longest lobes, index 0.7–1; stipe present, 5–30 cm long, up to 3.5 mm diam.; lobes 1 at each side or 2 at each side (the first sometimes with a small lobe basiscopically), longest lobes widest at base, at position 2 or 1 from the base, 5–15 cm long, 3.5–10 cm broad, index 0.7–2(-3). Apical lobe longer than upper lateral lobes, widest at or just above base. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 4: the first connecting vein forming one row of small primary costal areoles parallel to the costa, other (sometimes irregularly shaped) larger areoles in a row between two veins. Veins prominent and distinct, 6–14(-20) mm apart, more or less straight, dichotomously branched near the margin, connecting veins 4–6 between adjacent secondary veins (interconnected by some veinlets), catadromous, smaller veins prominent and distinct, variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round (rarely slightly elongate), superficial or slightly immersed, on the whole surface of the lamina, mostly irregularly scattered on the smallest veinlets, 5–15 per sq. cm, irregularly scattered on the smaller anastomosing veins and on the free veins, 1–2 mm diam., present in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 2–5(-7)-celled, sporangium annulus 21–24(-28)-celled, indurated cells 14–16(-19).

Distribution — Hawaii Islands, common.

Habitat & Ecology — Epiphytic, epilithic, or terrestrial in diverse habitats. Altitude 180–1050 m.

44. *Microsorium steerei* (Harr.) Ching

Microsorium steerei (Harr.) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 306; Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 107. — *Polypodium steerei* Harr., J. Linn. Soc. Bot. 16 (1878) 32. — Lectotype: *Steere*, chosen by Price, Contr. Univ. Mich. Herb. (1982) 202 (MICH; iso K), Taiwan, Ape's Hill, Takow.

Polypodium tonkinense Baker, J. Bot. 28 (1890) 266. — Type: *Balansa 148* (K; iso P), Tonkin, near Quang Yen.

Polypodium playfairii Baker, Ann. Bot. (London) 5 (1891) 474. — Type: *Playfair 383* (K), Taiwan, Ape's Hill.

Rhizome 3–5 mm wide, about cylindrical, white waxy under the scales (often), with only scattered strands of sclerenchyma, vascular bundles 11–14, the sclerenchyma strands 50–100, roots densely set. Scales pseudopeltate, apically densely set, otherwise more or less sparsely set, distinctly spreading, narrowly ovate or triangular, 2.5–4(–8) mm long, 0.5–1.5 mm broad, the margin denticulate, clathrate or subclathrate, central region glabrous. Phyllopodia more or less distinct, 1–10 mm apart. *Leaf* not or slightly dimorphous, subcoriaceous. Lamina simple, narrowly elliptic to narrowly obovate to linear, 10–40 cm long, 1.5–5 cm broad, index 6–17, base narrowly angustate, the stipe winged for a considerable part, margin entire, apex acuminate, undersurface without acicular hairs; stipe present, to 7 cm long, 0.5–1.5 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins. Veins more or less immersed and vague or immersed and distinct, 7–15 mm apart, zigzag, dichotomously branched near the margin, connecting veins 3–6 between adjacent secondary veins (interconnected by some veinlets), catadromous, smaller veins more or less immersed and vague, variously anastomosing, free veinlets simple or once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0.5 of total length of lamina, mostly irregularly scattered on the smallest veinlets, 10–20 per sq. cm, 2 per veinlet, 1–2 mm diam., absent in marginal areoles, generally absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells (apical cell often large and curved), paraphyses 2- or 3-celled, sporangium annulus 19–26-celled, indurated cells 11–19.

Distribution — China (Guangxi; Taiwan); Vietnam.

Habitat & Ecology — Altitude 100–200 m.

Note — This might be a reduced form of *M. punctatum*.

45. *Microsorium superficiale* (Bedd.) Ching — Plate 2: 12; 6: 49–51; 9: 20; 14: 54

Microsorium superficiale (Bedd.) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 299. — *Polypodium superficiale* Blume, Enum. Pl. Javae (1828) 123. — *Pleopeltis superficialis* Bedd., Ferns Brit. India (1865) t. 75. — *Colysis superficialis* J. Sm., Hist. Fil. (1875) 101. — *Neocheiropteris*

- superficialis* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 121. — Type: *Blume s.n.* (L 908.288-40), Java, Bantam.
- Polypodium buergerianum* Miq., Ann. Mus. Lugd.-Bat. 3 (1867) 170. — [*Polypodium buergerianum* var. *stipitatum* Takeda, Notes Roy. Bot. Gard. Edinburgh 8 (1915) 290, nom. inval.] — *Microsorium buergerianum* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 302; E. H. Walker, Fl. Okinawa & Ryukyu (1976) 113. — *Leptochilus buergerianus* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 112. — Type: *Buerger s.n.* (L 908.298-240), Japan.
- Microsorium superficiale* var. *semilinearis* C. B. Clarke, Trans. Linn. Soc. London II, Bot. 1 (1880) 558. — Type: *Griffith* (n.v.).
- Polypodium brachylepis* Baker, Gard. Chron. 14 (1880) 494. — *Microsorium brachylepis* Nakaike, Enum. Pterid. Jap. Filic. (1981) 492. — Type: *Maries s.n.* (K), China, Kiu Kiang.
- Polypodium subhastatum* Baker, J. Bot. 27 (1889) 177. — [*Polypodium subhastatum* var. *hederaceum* Takeda, Notes Roy. Bot. Gard. Edinburgh 8 (1915) 292, nom. inval.] — *Microsorium subhastatum* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 298. — *Neocheiropteris subhastata* Tagawa, J. Jap. Bot. 27 (1952) 217. — *Lepidomicrosorium subhastatum* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 12, pl. 2. — Type: *Henry 5450* (K; iso GH), China, Hubei.
- Polypodium ningpoense* Baker, Ann. Bot. (London) 5 (1891) 474. — *Polypodium buergerianum* var. *ningpoense* Takeda, Notes Roy. Bot. Gard. Edinburgh 8 (1915) 291. — *Neocheiropteris ningpoensis* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 119. — Type: *Hancock 24* (K), China, Zhejiang.
- Pleopeltis superficialis* var. *latifrons* Bedd., J. Bot. 31 (1893) 226. — Type: *Scortechini* (n.v.).
- Polypodium nigrocinctum* H. Christ, Bull. Herb. Boissier 6 (1898) 874. — Lectotype (here chosen): *Henry 9264* (K; iso BM, NY, P, US), China, Yunnan, Mengtze.
- Polypodium subhemionitideus* H. Christ, Bull. Herb. Boissier 7 (1899) 5. — *Leptochilus subhemionitideus* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 117. — Type: *Henry 9265B* (P; iso B, K), China, Yunnan, Mengtze.
- Polypodium hederaceum* H. Christ, Bull. Acad. Int. Géogr. Bot. 11 (1902) 215. — *Lepidomicrosorium hederaceum* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 11, pl. 1. — Lectotype (here chosen): *Bodinier & Chaffanjon 2087* (P), China, Guizhou, near Kouy Yang.
- Polypodium superficiale* var. *anguinum* H. Christ, Bull. Soc. Bot. France (Mém.) 52 (1905) 16. — Type: *Faber* (P), Hongkong.
- Polypodium superficiale* var. *attenuatum* Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 13 (1914) 134. — Type: *Cavalerie 4009* (BM, K, P), China, Kuy Tcheu, Gan Chuen.
- Polypodium superficiale* var. *chinense* Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 13 (1914) 134. — Type: *Cavalerie s.n.*, Dec. 1912 (B, L, P, S, UC, US), China, Guizhou, Gan Chuen.
- Polypodium hymenodes* var. *marginale* Takeda, Notes Roy. Bot. Gard. Edinburgh 8 (1915) 288. — *Microsorium hymenodes* var. *marginale* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 301. — Lectotype (here chosen): *Henry 9265A* (K; iso P), China, Yunnan, Mengtze.
- Polypodium subhastatum* var. *longifrons* Takeda, Notes Roy. Bot. Gard. Edinburgh 8 (1915) 292. — Syntypes: *Anonymus s.n. s.d.* (K), Japan and *Takeda s.n.* (E), Japan, Mt Higanesan.
- Phymatodes masaskei* Nakai, Bot. Mag. Tokyo 43 (1929) 4. — *Polypodium masaskei* Ogata, Ic. Filic. Jap. 3 (1930) pl. 138. — *Microsorium masaskei* H. Itô, J. Jap. Bot. 11 (1935) 97. — Type: *Ogata* (Herb. Takeda Pharmac. Lab.), Bonin.
- Microsorium buergerianum* forma *laciniatum* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 303. — Type: *Faurie 208* (P; iso L), Taiwan, Bankinsin.
- ? *Microsorium ohwianum* Tagawa, J. Jap. Bot. 12 (1936) 752. — Type: *Ohwi 1774* (KYO, n.v.), Taiwan
- Lepidomicrosorium longshengense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 9. — Type: *F. N. Wei 284* (PE), China, Guangxi, Long-shen.
- Lepidomicrosorium latibasis* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 6, pl. 3, f. 3. — Type: *H & J. Li 6837* (KUN), China, Hubei, He Feng.
- Lepidomicrosorium asarifolium* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 11. — Type: *J.-F. Chen 730107* (PE), Jiangxi, Jin Gang Shan.

- Lepidomicrosorium angustifolium* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 8. — Type: K.C. Kuan & W.T. Wang 2439 (PE), China, Sichuan, Mt Emei.
- Lepidomicrosorium emeiense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 10. — Type: K.H. Shing & K.Y. Lang 1005 (PE), China, Sichuan, Mt Emei.
- Lepidomicrosorium hongchungpingense* var. *laceratum* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 9. — Type: K.H. Shing & K.Y. Lang 1084 (PE), China, Sichuan, Mt Emei.
- Lepidomicrosorium subsessile* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 6. — Type: K.H. Shing & K.Y. Lang 793 (PE), China, Sichuan, Mt Emei.
- Lepidomicrosorium hongchungpingense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 9, pl. 4, f. 3. — Type: K.H. Shing & K.Y. Lang 932 (PE), Sichuan, Mt Emei.
- Microsorium jinshoshanense* Ching & Liu, Bull. Bot. Res. 3 (1983) 12. — Type: Liu 3551 (IMC, PE), China, Sichuan, Jinfo Shan.
- Lepidomicrosorium huanense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 6, pl. 3, f. 1. — Type: L.H. Liu 15053 (PE), China, Hunan, Xin-Ninh.
- Lepidomicrosorium yiliangense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 7. — Type: Northeast Yunnan Expedition 692 (KUN), China, NE Yunnan.
- Lepidomicrosorium undulatum* Ching & Chiu ex Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 11. — Type: P.S. Chiu 4647 (PE), China, Guangxi, Long Sheng.
- Lepidomicrosorium lineare* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 5. — Type: P.S. Chiu 4824 (PE), China, Guangxi, Hua-Ping For. Res.
- Lepidomicrosorium lanceolatum* Ching & Wang, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 8. — Type: P.S. Wang 75804 (PE), China, Guizhou, An Shun.
- Microsorium tibeticum* Ching & S.K. Wu, Fl. Xizangica 1 (1983) 328. — Type: Qinghai-Xizang Complex exp. s.n., July 1974 (PE), Tibet.
- Lepidomicrosorium crenatum* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 11. — Type: R.C. Ching 88 (PE), China, Sichuan, Mt Emei.
- Lepidomicrosorium emeicola* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 7. — Type: R.C. Ching s.n., March 1956 (PE), China, Sichuan, Mt Emei.
- Lepidomicrosorium brevipes* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 13. — Type: Sichuan-Guizhou Exp. 1528 (PE), Guizhou, Zhen-yi.
- Lepidomicrosorium laojunense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 10, pl. 4, f. 4. — Type: S.K. Wu 61380 (PE), China, Yunnan, Wen Shan, Lao-jun Shan.
- Lepidomicrosorium sichuanense* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 8, pl. 4, f. 1. — Type: S.Y. Chang & Y.S. Ren 7596 (PE), China, Sichuan.
- Lepidomicrosorium suijiangense* Ching & Chu, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 13. — Type: W.M. Chu 4791 (PE), China, Yunnan, Suijiang.
- Lepidomicrosorium caudifrons* Ching & Chu ex Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 10. — Type: W.M. Chu 4973 (PE), China, Yunnan, Suijiang.
- Lepidomicrosorium microsorioides* Ching & Shing, Bot. Res. Contrib. Inst. Bot. Acad. Sin. 1 (1983) 7. — Type: W.M. Zhu 4985 (HGUY, n.v.), China, Yunnan, Suijiang.
- Microsorium rubripes* Ching & Z.Y. Liu, Bull. Bot. Res. 3 (1983) 11. — Type: Z.Y. Liu 1171 (IMC), China, Sichuan, Nanchuan, Jinfo Shan.
- Microsorium simulans* Ching & Z.Y. Liu, Bull. Bot. Res. 4 (1984) 26. — Type: Z.Y. Liu 3951 (IMC), China, Nanchuan, Jinfo Shan.
- Lepidomicrosorium nanchuanense* Ching & Z.Y. Liu, Bull. Bot. Res. 4 (1984) 27. — Type: Z.Y. Liu 4004 (IMC), China, Nanchuan, Jinfo Shan.
- Polypodium hymenodes* auct.: Takeda, Notes Roy. Bot. Gard. Edinburgh 8 (1915) 287, non Kunze (1850).
- ?*Neolepisorus microsorioides* Zhu, Acta Bot. Yunnan. 1 (1979) 96, pl. 3. — Type: W.M. Zhu 4985 (n.v.).

Rhizome 1–5 mm wide, dorso-ventrally flattened, not white waxy, bearing scales and hairs, with only circumvascular sheaths or with circumvascular sheaths and scattered

strands of sclerenchyma or with circumvascular sheaths, sclerenchyma strands situated dorsally of the vascular cylinder, vascular bundles 6–13, sclerenchyma strands 0–15, roots sparsely set. Scales pseudopeltate, densely set (more or less), appressed or distinctly spreading or slightly spreading, ovate or narrowly ovate or triangular, 1–6.5 mm long, 0.5–2.5 mm broad, margin entire or denticulate or dentate (sometimes with small triangular lobes), apex acute or rounded, clathrate or subclathrate or clathrate except the hyaline marginal region, cells longitudinally rectangular (towards apex), central region bearing multiseptate hairs at least when young or central region glabrous. Phyllopodia more or less distinct to obscure, 3–40 mm apart. *Leaf* not or slightly dimorphous. Lamina herbaceous to subcoriaceous, simple, narrowly elliptic to narrowly ovate to narrowly deltoid to linear, 3–40(–60) cm long, 0.5–6 cm broad, index 2–30, base truncate-angustate to narrowly angustate, the stipe winged for a considerable part to hastate to cuneate-angustate (occasionally narrowly angustate or with some irregular triangular lobes), margin entire to sinuate to undulate, apex acute to acuminate, undersurface without acicular hairs; stipe present or absent and lamina decurrent to its base, there only two ridges left, 0–20 cm long, 0.5–2 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 2: connecting veins forming more or less a row of about equally sized areoles between two adjacent veins, and each costal areole giving rise to two lateral veins, thus the lateral veins seemingly branching off at or near the costa, the costal areole bordered by several smaller areoles. Veins more or less immersed and vague to prominent and distinct, 3–10 mm apart, zigzag, dichotomously branched near the margin, connecting veins 1–6 between adjacent secondary veins, catadromous, smaller veins more or less immersed and vague, tertiary veins interconnected by some quaternary veins which in part sometimes form a prominent vein parallel to each secondary vein, free veinlets simple to once or twice forked. *Sori* separate, not in one or two rows between each pair of veins and not in one row parallel to the costa, sometimes forming 2–8 irregular rows between the veins or in two (irregular) rows between each pair of veins (occasionally in part confluent), round (or in part slightly elongate), superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts for 0–0.75 of total length of lamina, predominantly on connective veins, 3–15 per sq. cm, 2–4 per veinlet (occasionally on lesser veins), 1–2.5 mm diam., present or absent in marginal areoles, generally present or absent from costal areoles; paraphyses simple uniseriate hairs with glandular topcells or clathrate and peltate (sometimes in young sori).

Distribution — India (Assam, Manipur); Nepal; Burma; China (Tibet, Yunnan, Taiwan, Guizhou, Sichuan, Hunan, Hubei, Guangxi, Guangdong, Jiangxi, Fujian, Zhejiang); Thailand; Laos; Vietnam; Japan. In Malesia: Sumatra, Peninsular Malaysia, Java.

Habitat & Ecology — Primary or secondary forests. Usually low epiphytic. Altitude 400–2600 m.

Notes — From the synonymy it is clear that this is a variable species. I have seen many collections, in the (Chinese) herbaria as well as in the field (Nanchuan, Jinfo Shan) and came to the conclusion that different forms occur together in one population. On one rhizome generally the shape of the leaves is constant. As one rhizome

may bear many leaves, and the next rhizome also, but of a different shape, there seem to be two taxa. But they are merely forms belonging to one variable taxon. As also forms occur with leaves that are pinnatilobed towards the base, I presume that the genetic variability is the result of occasional hybridisation with a pinnate species.

Microsorium zippelii differs mainly in the prominent veins, and might be a variety of this species.

46. *Microsorium varians* (Mett.) Hennipman & Hett. — Plate 6: 53; 15: 55

Microsorium varians (Mett.) Hennipman & Hett., Bot. Jahrb. Syst. 105 (1984) 5. — *Acrostichum varians* Mett., Ann. Sci. Nat. Bot., sér. 4, 15 (1861) 56; 57 [forma *varians* (*normalis*)]; Baker in Hook. & Baker, Syn. Fil. ed. 2 (1874) 524. — *Leptochilus varians* E. Fourn., Bull. Soc. Bot. France 15 (1868) 394. — *Gymnopteris varians* Diels, Bot. Jahrb. Syst. 39 (1906) 7. — *Christiopteris varians* Copel., Philipp. J. Sci. 12, Bot. (1917) 333. — Type: *Vieillard 1526* p.p. (B; iso P), Poila.

Acrostichum varians forma *contracta* Mett., Ann. Sci. Nat. Bot., sér. 4, 15 (1861) 57. — Type: *Vieillard 1525* p.p. (B; iso P), Balade.

Rhizome 1–10 mm wide, dorso-ventrally flattened or rounded, not white waxy, with only circumvascular sheaths, vascular bundles 15–30. Scales pseudopeltate, densely set, appressed, circular or elliptic, often with eroded margins, 1–3.5 mm long, 0.7–2 mm broad, margin entire (often irregular), apex rounded, clathrate except the hyaline marginal region, central region glabrous. Phyllopodia more or less distinct. *Leaf* strongly dimorphous, herbaceous to subcoriaceous. Lamina pinnatifid, base cuneate, margin entire, undersurface without acicular hairs. Lamina of dissected leaf 15–40 cm long, 17–40 cm broad, widest at about the middle, 0.5–2 cm wide between the lobes at place of longest lobes, index 0.6–1.3; stipe present, 2–15 cm long; lobes 2–7 at each side, longest lobes widest below the middle, 5–25 cm long, 0.4–3.5 cm broad, index 8–20, apex acute, 3–30 cm long, 0.7–4 cm broad. Lamina of fertile leaves pinnatifid, 15–35 cm long, 12–50 cm broad, lobes 1–7 at each side, linear, longest lobe 8–24 cm long, broadest lobe 0.2–0.7 cm broad, apical lobe linear, 10–20 cm long, 0.3–0.8 mm broad; stipe present, 5–17 cm long. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins more or less immersed and vague, 6–11 mm apart, dichotomously branched below the middle, the smaller veins more or less immersed and vague, free veinlets simple or once forked. *Sori* acrostichoid; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — New Caledonia.

Habitat & Ecology — Altitude 400–1000 m.

47. *Microsorium vieillardii* (Mett.) Copel. — Plate 6: 54

Microsorium vieillardii (Mett.) Copel., Gen. Fil. (1947) 196. — *Polypodium vieillardii* Mett., Ann. Sci. Nat. Bot., sér. 4, 15 (1861) 77. — *Phymatodes vieillardii* Brownlie, Fl. Nouv. Caléd. 3 (1969) 292. — Lectotype (chosen by Brownlie, l.c.): *Vieillard 1598* (P), New Caledonia.

Polypodium lenormandii Hook. & Baker, Syn. Fil. (1874) 514. — Type: *Deplanche 1* (K), New Caledonia, Mt Mou.

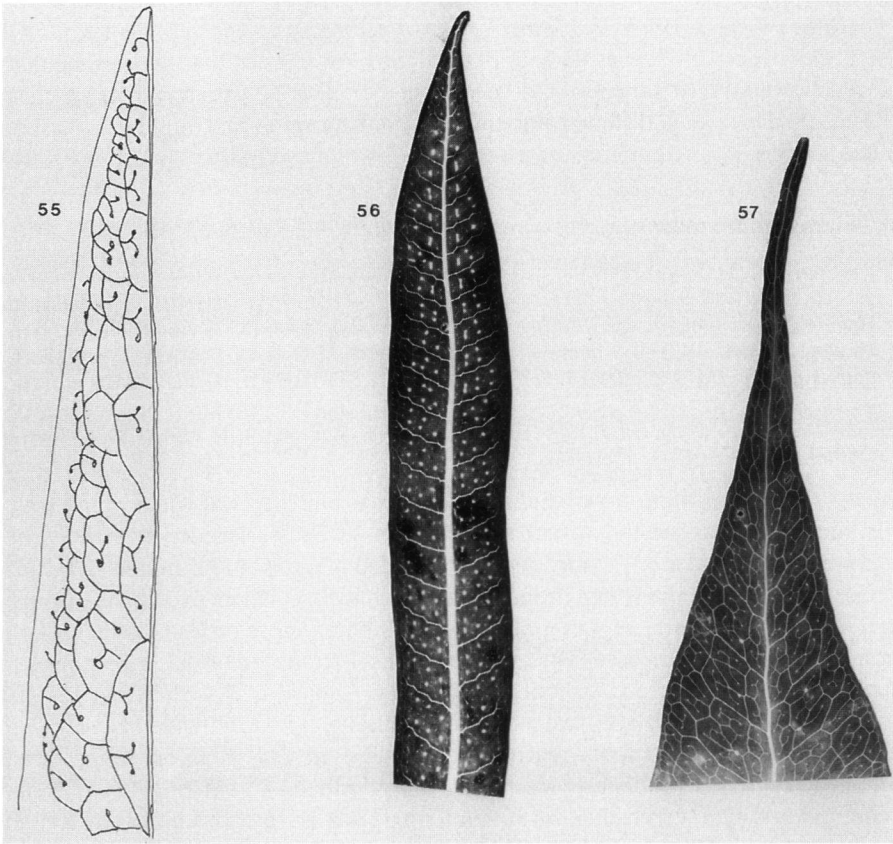


Plate 15. Venation. — 55: *Microsorium varians* (Guillaumin & Baumann 8892). — 56: *M. zippelii* (Merrill BS 7776). — 57: *M. zippelii* (Hennipman 3706). All about $\times 0.5$.

Rhizome 5–8 mm wide, white waxy under the scales, with only circumvascular sheaths, vascular bundles 10–25, roots densely or sparsely set. Scales peltate, densely set, distinctly spreading, ovate or triangular, 4–6 mm long, 3–4 mm broad, margin entire, apex acute or rounded, clathrate except the hyaline marginal region, cells small, more or less isodiametric, central region glabrous. Phyllopodia more or less distinct. *Leaf* not or slightly dimorphous, herbaceous. Lamina pinnatifid or basal part pinnate, apical part pinnatifid, base cuneate-angustate or cuneate, margin entire or sinuate (cartilaginously thickened), undersurface without acicular hairs. Lamina of dissected leaf elliptic or ovate, 30–70 cm long, 18–30 cm broad, widest below or at about the middle, 0.2–0.7 cm wide between the lobes at place of longest lobes, index 1.5–3.5; stipe present, 16–35 cm long, 2–4 mm diam.; lobes 5–25 at each side, the longest lobes widest about to below the middle, at position 1–15 from base, 12–19 cm long, 0.9–1.5 cm broad, index 10–16, apex acute. Apical lobe longer than upper lateral lobes, widest at or just above the base or widest about or below the middle.

Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation variously anastomosing; costal areole, if present, formed by smaller veins. Veins more or less immersed and vague, 4–5 mm apart, catadromous, smaller veins more or less immersed and vague, included venation in primary costal areole only free veinlets, the free veinlets simple or once forked. *Sori* separate, one sorus just outside each primary costal areole, close to the margin, round, superficial or slightly immersed or deeply sunken, visible as protrusions on the upper surface, on the whole surface of the lamina or absent from the basal parts, solitary on a connective vein or on the crossing of a vein and a connective vein, or just outside a connective vein; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — New Caledonia.

Habitat & Ecology — Altitude 250–600 m.

Note — The (lateral) vein of the vegetative lobes bends upwards and acts as a connective to the upper-next lateral vein; it encloses the primary costal areole. In fertile lobes it acts as a soral vein and the primary areole is enclosed by lesser veins towards the margin.

48. *Microsorium zippelii* (Blume) Ching — Plate 6: 55; 15: 56, 57

Microsorium zippelii (Blume) Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 308; Copel., Fern Fl. Philipp. (1960) 484. — *Neocheiropteris zippelii* Bosman, Monogr. Microsorium, Leiden Bot. Ser. 14 (1991) 123. — *Polypodium zippelii* Blume, Fl. Javae. Filic. (1829) 172, t. 80. — *Pleopeltis zippelii* T. Moore, Index Fil. (1862) 348. — *Polypodium heterocarpum* var. *zippelii* Baker in Hook. & Baker, Syn. Fil. (1868) 360. — *Colysis zippelii* J. Sm., Hist. Fil. (1875) 100. — Type: *Zippelius* (L), Java.

Polypodium oxiphyllum Kunze, Bot. Zeit. (Berlin) 6 (1848) 116. — Syntypes: *Zollinger 2029* (L), 2332 (BM, L, LE, P, PR), Java.

Polypodium luzonicum Copel., Philipp. J. Sci. 1, Suppl. (1906) 162, t. 23. — *Pleopeltis luzonica* Alderw., Bull. Dép. Agric. Indes Néerl. 27 (1909) 7. — *Microsorium luzonicum* Tagawa, Acta Phytotax. Geobot. 16 (1955) 51. — Type: *Copeland 1918* (P, S, SING, US), Philippines, Luzon, Lepanto.

[*Drynaria subfalcatata* J. Sm., J. Bot. (Hooker) 3 (1841) 397, nom. nud. — *Bathmium? subfalcatum* Fée, Mém. Foug. 5. Gen. Filic. (1852) 287, nom. nud.: *Cuming 113*.]

Rhizome 1–3(–4) mm wide, about cylindrical, not white waxy, with circumvascular sheaths and scattered strands of sclerenchyma, vascular bundles 11–17, sclerenchyma strands 50–100, roots densely set. Scales pseudopeltate, densely set, distinctly spreading, narrowly ovate or triangular, 2.5–6.5 mm long, 1–2 mm broad, margin denticulate to dentate, apex acute, clathrate or subclathrate, cells longitudinally rectangular (in apical part), central region glabrous. Phyllopodia more or less distinct, 10–70 mm apart. *Leaf* not or slightly dimorphous, herbaceous (to firm-herbaceous). Lamina simple, narrowly elliptic to narrowly obovate, 6.5–65 cm long, 1–8 cm broad, index 5.5–14, base narrowly angustate, the stipe winged for a considerable part, margin entire (occasionally sinuate), apex acuminate, undersurface without acicular hairs; stipe present, 0.8–8 cm long, 0.8–3.2 mm diam. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent

veins and no prominent veinlet situated parallel to veins. Veins prominent and distinct, 4–13 mm apart, \pm straight or zigzag, dichotomously branched near the margin, connecting veins 3–7 between adjacent secondary veins (interconnected by some quaternary veins which in part sometimes form a distinct vein parallel to each secondary vein), catadromous, smaller veins more or less immersed and vague or prominent and distinct, variously anastomosing, free veinlets simple to once or twice forked. *Sori* separate, in two (irregular) rows between each pair of veins (occasionally in part confluent), round, superficial or slightly immersed, on the whole surface of the lamina, predominantly on connective veins, 2–10 per sq. cm, 1 (or 2) per veinlet (not on smaller veins), 1.5–2 mm diam., 2–4 mm long, absent in marginal areoles, generally present in costal areoles; paraphyses simple uniseriate hairs with glandular topcells, 3- or 4-celled, sporangium annulus 20–24-celled, indurated cells 14–18.

Distribution — China (Guangdong, Hainan); India (Assam); Sikkim; Thailand. In Malesia: Sumatra; Peninsular Malaysia (Pahang); Java; Lesser Sunda Islands (Lombok, Flores, Sumbawa); Borneo: Sabah, Kinabalu; Philippines (Luzon); Sulawesi; Papua New Guinea (Morobe Prov., Huon Peninsula, Mt Rawlinson).

Habitat & Ecology — Generally a (low) epiphyte in dry or wet forest, sometimes epilithic on sandstone or limestone. Altitude 200–1700 m.

Note — This species might be a variety of *M. superficiale*.

49. *Microsorium sibomense* Copel.

Microsorium sibomense Copel., Gen. Fil. (1947) 196. — *Polypodium sibomense* Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 10 (1912) 340. — Type: *Bamler 52* (BM, K, US), New Guinea, Sibom.

Polypodium tenuinerve Copel., Philipp. J. Sci. 9, Bot. (1914) 7. — *Microsorium tenuinerve* Copel., Gen. Fil. (1947) 196. — Type: *C. King 364* (n.v.).

Rhizome 1.6–3 mm wide, not white waxy, with only scattered strands of sclerenchyma, vascular bundles 15–25, sclerenchyma strands 15–50, roots sparsely set. Scales peltate, densely or apically densely set, otherwise more or less sparsely set, appressed or slightly spreading, narrowly ovate or triangular, 3–6 mm long, 0.5–2 mm broad, margin denticulate (sometimes only very slightly), apex acute, clathrate or subclathrate, cells longitudinally rectangular, central region glabrous. Phyllopodia more or less distinct, 12–45 mm apart (or longer). *Leaf* not or slightly dimorphous, membranaceous to thin-herbaceous. Lamina pinnatifid, base cuneate-angustate to cuneate, margin entire to undulate, undersurface without acicular hairs. Lamina of dissected leaf broadly ovate to ovate, 18–70 cm long, 13–45 cm broad, widest below to about the middle, 0.3–1(–2) cm wide between the lobes at place of longest lobes, index 1–3; stipe present, 6–55 cm long, 1.5–3 mm diam.; lobes 2–16 at each side, longest lobes widest about to below the middle, at position 1–4 from base, 10–20 cm long, 0.8–2.3 cm broad, index 8–12, apex acute to long acuminate. Apical lobe longer than upper lateral lobes, 6–15 cm long, 0.9–1.7 cm broad, widest about the middle. Venation type 1: connecting veins forming a row of about equally sized areoles between two adjacent veins and no prominent veinlet situated parallel to veins, or type 3: connecting veins forming one row of small (inconspicuous) primary costal areoles parallel to the costa, bordered by one row of conspicuous large areoles; in

fertile monomorphic leaves the first connecting vein often forming, or contributing to, a distinct soral vein. Veins prominent and distinct (but only slightly), 4–8 mm apart, catadromous, smaller veins more or less immersed and vague or prominent and distinct, marginal vein absent, free veinlets simple or once or twice forked. *Sori* separate, one row of sori, each one (or two) per areole between each pair of veins or one sorus in, or just outside, each primary costal areole, generally close to the costa, at most halfway to the margin, round, superficial or slightly immersed, on the whole surface of the lamina or absent from the basal parts, on distinct soral veins (except the main soral vein a crossing of smaller veins), 1–3 mm diam.; paraphyses simple uniseriate hairs with glandular topcells.

Distribution — New Guinea, c. 15 collections.

Habitat & Ecology — Altitude 50–2400 m.

Note — This species closely resembles *M. powellii*. It differs in the peltate and appressed rhizome scales and in having less pinnae.

PODOSORUS

Podosorus Holttum, Kew Bull. 20 (1967) 455, f. 1

A remarkable monotypic genus with a simple venation that could be derived from the venation of some species of *Leptochilus* and *Microsorium*. Only one species.

Podosorus angustatus Holttum

Podosorus angustatus Holttum, Kew Bull. 20 (1967) 455, f. 1. — Type: *PNH 78332 (Gutierrez)* (K; iso L), Luzon, Sierra Madre.

Rhizome 0.8–3 mm wide, about cylindrical, not white waxy, bearing scales and hairs, with only scattered strands of sclerenchyma. Scales pseudopeltate, densely set, slightly spreading, narrowly ovate or triangular, 1.5–4 mm long, 0.2–1 mm broad, margin denticulate, apex acute, clathrate or subclathrate, central region bearing multi-septate hairs at least when young. Phyllopodia 1–10 mm apart. *Leaf* not or slightly dimorphous, thin-herbaceous: Lamina simple, narrowly elliptic to linear, 10–30 cm long, 0.4–1.1 cm broad, index 10–50, base narrowly angustate, the stipe winged for a considerable part, margin sinuate, apex slender, long acuminate or rounded (in sterile leaves), undersurface without acicular hairs; stipe present, 0.3–2 cm long, 0.5–1 mm diam. Venation type 5: connecting veins forming one row of large areoles parallel to the costa, bordered by the first connecting vein between each pair of veins and bordered by several smaller areoles; included venation few. Veins prominent and distinct, 2–4 mm apart, connecting veins 1 between adjacent secondary veins, smaller veins more or less immersed and vague, marginal vein absent, free veinlets simple or once forked. *Sori* stipitate on the leaf margin (the stalks slender, 3–4 mm long), round, stipitate on veins extending beyond the lamina margin. Paraphyses clathrate.

Distribution — Philippines (Luzon, Sierra Madre). Only one collection.

Habitat & Ecology — Along creek in Dipterocarp forest. Altitude 150 m.

Note — The venation is close to the venation of several *Microsorium* and a few *Leptochilus* species. The paraphyses are peltate and clathrate as in *Lepisorus*.

DUBIOUS SPECIES

Colysis chilangensis Ngyuen Tu, Bot. Zhurn. 65 (1980) 582. — Type: *Quy 72* (Hanoi, n.v., ?Vietnam).

Gymnogramma grandis Racib., Pteridop. Buitenzorg (1898) 72. — *Polypodium raciborskii* C. Chr., Index Filic. (1906) 558, nom. nov. — *Colysis raciborskii* Ching, Sunyatsenia 5 (1940) 261. — Type: *Raciborski* (n.v., ?L), Java, Nusa Kambangan.

Gymnogramma palmata Baker in Hook. & Baker, Syn. Fil. (1868) 389. — *Polypodium christovalense* C. Chr., Index Filic. (1906) 516, nom. nov. — *Colysis christovalensis* Ching, Sunyatsenia 5 (1940) 261. — Type: *Milne 508* (n.v., ?K), Solomon Islands.

Microsorium krayanense M. Kato et al., J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 15 (1991) 105, f. 9. — Type: *Kato et al. 10402* (TI), E Kalimantan.

Microsorium submarginale M. Kato et al., J. Fac. Sci. Univ. Tokyo, sect. 3, Bot. 15 (1991) 105, f. 8. — Type: *Kato et al. 23001* (TI; iso BO), E Kalimantan.

Phymatodes katuii Brownlie, Pacif. Sci. 25 (1971) 509. — *Phymatosorus katuii* Sykes & Game, New Zeal. J. Bot. 34 (1996) 144. — Type: *Katu 17* (CHR, n.v.), Cook Islands, Ma'uke.

This seems to be near *Microsorium membranifolium*, but with the leaves pinnate towards the base as in *M. parksii*.

Phymatosorus beddomei S.R. Ghosh, J. Econ. Bot. 6 (1985) 433. — Type: *Levinge* (CAL), Devicolum, 5 May 1883.

Polypodium macrophyllum var. *fokeniense* Copel., Philipp. J. Sci. 3, Bot. (1908) 283. — Type: *Dunn 3757* (n.v.), China.

This is either *Leptochilus wrightii* or *L. digitatus*.

Polypodium triglossum Baker, Kew Bull. (1898) 232; Hu & Ching, Ic. Filic. Sin. 1 (1930) pl. 44. — *Selliguea triglossa* H. Christ, Bull. Herb. Boissier 6 (1898) 878. — *Neocheiropteris triglossa* Ching, Bull. Fan Mem. Inst. Biol. 4 (1933) 108. — *Neolepisorus triglossus* Ching, Bull. Fan Mem. Inst. Biol. 10 (1940) 14. — Type: *Henry 9953* (K), China, Yunnan, Mi-le.

This plant, only known from a restricted area near Kunming, China, probably is a hybrid between ?*Microsorium ensatum* and a *Lepisorus* species. It is a *Lepisorus* with trifid leaves. The sori of the type consist only of scales and totally lack sporangia.

IDENTIFICATION LIST

Only specimens with an identifiable collector and collection number are listed. Numbers after the colon refer to the species numbers as given in the following list; these are **not** the numbers as used in the treatment of the three genera. (T) denotes a type specimen.

<i>Leptochilus</i>	
1	<i>L. amplus</i>
2	<i>L. axillaris</i>
3	<i>L. cantoniensis</i>
4	<i>L. decurrens</i>
5	<i>L. digitatus</i>
6	<i>L. ellipticus</i>
7	<i>L. hemionitideus</i>
8	<i>L. macrophyllus</i>
8a	var. <i>macrophyllus</i>
8b	var. <i>fluviatilis</i>
8c	var. <i>pedunculatus</i>
8d	var. <i>wrightii</i>
9	<i>L. minor</i>
10	<i>Leptochilus</i> × <i>hemitomus</i>
<i>Microsorium</i>	
11	<i>M. alatum</i>
12	<i>M. aurantiacum</i>
13	<i>M. biseriatum</i>
14	<i>M. cinctum</i>
15	<i>M. commutatum</i>
16	<i>M. congregatifolium</i>
17	<i>M. pustulatum</i>
18	<i>M. egregium</i>
19	<i>M. ensatum</i>
20	<i>M. fortunei</i>
21	<i>M. hainanense</i>
22	<i>M. heterocarpum</i>
23	<i>M. heterolobum</i>
24	<i>M. insigne</i>
25	<i>M. lastii</i>
26	<i>M. latilobatum</i>
27	<i>M. leandrianum</i>
28	<i>M. linguiforme</i>
29	<i>M. longissimum</i>
30	<i>M. lucidum</i>
31	<i>M. malabaricum</i>
32	<i>M. maximum</i>
33	<i>M. membranaceum</i>
34	<i>M. membranifolium</i>
35	<i>M. monstrosum</i>
36	<i>M. normale</i>
37	<i>M. novaezealandiae</i>
38	<i>M. palmatopedatum</i>
39	<i>M. pappei</i>
40	<i>M. papuanum</i>
41	<i>M. parksii</i>
42	<i>M. pentaphyllum</i>
43	<i>M. powellii</i>
44	<i>M. pteropus</i>
45	<i>M. punctatum</i>
46	<i>M. rampans</i>
47	<i>M. rubidum</i>
48	<i>M. samarense</i>
49	<i>M. sarawakense</i>
50	<i>M. scandens</i>
51	<i>M. scolopendria</i>
52	<i>M. sopuense</i>
53	<i>M. spectrum</i>
54	<i>M. steerei</i>
55	<i>M. superficiale</i>
56	<i>M. varians</i>
57	<i>M. vieillardii</i>
58	<i>M. zippelii</i>
59	<i>M. sibomense</i>

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