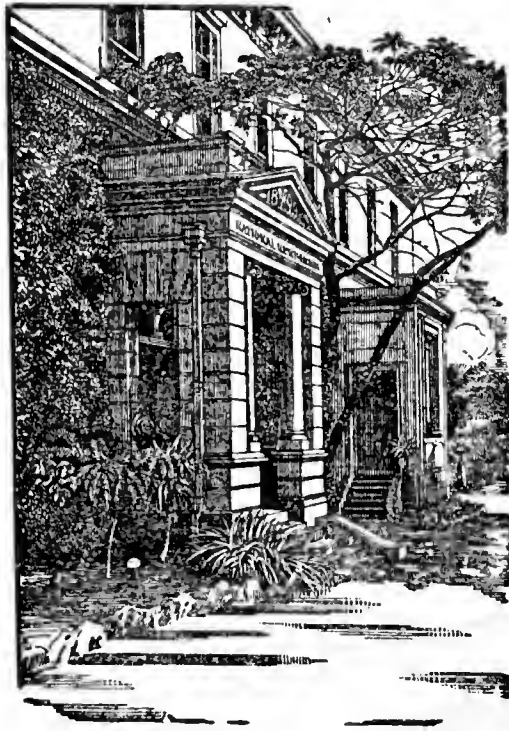


NEW SOUTH WALES  
DEPARTMENT OF AGRICULTURE

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CONTRIBUTIONS  
FROM THE  
NEW SOUTH WALES  
NATIONAL HERBARIUM



*Flora Series: No. 201*

1963

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# CONSPECTUS OF FAMILIES OF VASCULAR PLANTS REPRESENTED IN THE FLORA OF NEW SOUTH WALES

(The account of each family, or consecutive group of families as issued, will appear with separate pagination; the names of those families that have been published to date are in italics.)

## GYMNOSPERMAE

- |                        |                       |
|------------------------|-----------------------|
| 1 <i>Zamiaceae</i>     | 4 <i>Pinaceae</i>     |
| 2 <i>Podocarpaceae</i> | 5 <i>Cupressaceae</i> |
| 3 <i>Araucariaceae</i> |                       |

## ANGIOSPERMAE—MONOCOTYLEDONES

- |                             |   |
|-----------------------------|---|
| 6 <i>Typhaceae</i>          | 28 <i>Eriocaulaceae</i>                             |
| 7 <i>Sparganiaceae</i>      | 29 <i>Commelinaceae</i>                             |
| 8 <i>Pandanaceae</i>        | 30 <i>Pontederiaceae</i>                            |
| 9 <i>Potamogetonaceae</i>   | 31 <i>Philydraceae</i>                              |
| 10 <i>Ruppiaceae</i>        | 32 <i>Juncaceae</i>                                 |
| 11 <i>Zannichelliaceae</i>  | 33 <i>Liliaceae</i>                                 |
| 12 <i>Najadaceae</i>        | 34 <i>Xanthorrhoeaceae</i>                          |
| 13 <i>Zosteraceae</i>       | 35 <i>Agavaceae</i>                                 |
| 14 <i>Aponogetonaceae</i>   | 36 <i>Philesiaceae</i>                              |
| 15 <i>Posidoniaceae</i>     | 37 <i>Smilacaceae</i>                               |
| 16 <i>Juncaginaceae</i>     | 38 <i>Haemodoraceae</i>                             |
| 17 <i>Alismatiaceae</i>     | 39 <i>Amaryllidaceae</i>                            |
| 18 <i>Hydrocharitaceae</i>  | 40 <i>Hypoxidaceae</i>                              |
| 19 <i>Gramineae, Part I</i> | 41 <i>Alstroemeriaceae</i>                          |
| 20 <i>Cyperaceae</i>        | 42 <i>Dioscoreaceae</i>                             |
| 21 <i>Palmae</i>            | 43 <i>Petermanniaceae</i>                           |
| 22 <i>Araceae</i>           | 44 <i>Iridaceae</i>                                 |
| 23 <i>Lemnaceae</i>         | 45 <i>Zingiberaceae</i>                             |
| 24 <i>Flagellariaceae</i>   | 46 <i>Cannaceae</i>                                 |
| 25 <i>Restionaceae</i>      | 47 <i>Burmanniaceae</i>                             |
| 26 <i>Centrolepidaceae</i>  | 48 <i>Orchidaceae</i> . See <i>H.M.R. Rupp: The</i> |
| 27 <i>Xyridaceae</i>        | <i>Orchids of New South Wales. 1943.</i>            |

## ANGIOSPERMAE—DICOTYLEDONES

- |                            |                            |
|----------------------------|----------------------------|
| 49 <i>Casuarinaceae</i>    | 71 <i>Portulacaceae</i>    |
| 50 <i>Piperaceae</i>       | 72 <i>Basellaceae</i>      |
| 51 <i>Salicaceae</i>       | 73 <i>Caryophyllaceae</i>  |
| 52 <i>Fagaceae</i>         | 74 <i>Nymphaeaceae</i>     |
| 53 <i>Ulmaceae</i>         | 75 <i>Cabombaceae</i>      |
| 54 <i>Moraceae</i>         | 76 <i>Ceratophyllaceae</i> |
| 55 <i>Cannabiaceae</i>     | 77 <i>Ranunculaceae</i>    |
| 56 <i>Urticaceae</i>       | 78 <i>Berberidaceae</i>    |
| 57 <i>Proteaceae</i>       | 79 <i>Menispermaceae</i>   |
| 58 <i>Loranthaceae</i>     | 80 <i>Winteraceae</i>      |
| 59 <i>Santalaceae</i>      | 81 <i>Annonaceae</i>       |
| 60 <i>Oleaceae</i>         | 82 <i>Eupomatiaceae</i>    |
| 61 <i>Aristolochiaceae</i> | 83 <i>Trimeniaceae</i>     |
| 62 <i>Polygonaceae</i>     | 84 <i>Monimiaceae</i>      |
| 63 <i>Chenopodiaceae</i>   | 85 <i>Lauraceae</i>        |
| 64 <i>Dysphaniaceae</i>    | 86 <i>Cassythaceae</i>     |
| 65 <i>Amaranthaceae</i>    | 87 <i>Papaveraceae</i>     |
| 66 <i>Nyctaginaceae</i>    | 88 <i>Fumariaceae</i>      |
| 67 <i>Phytolaccaceae</i>   | 89 <i>Cruciferae</i>       |
| 68 <i>Gyrostemonaceae</i>  | 90 <i>Capparidaceae</i>    |
| 69 <i>Molluginaceae</i>    | 91 <i>Resedaceae</i>       |
| 70 <i>Aizoaceae</i>        | 92 <i>Droseraceae</i>      |

(Continued on inside back cover)

NEW SOUTH WALES  
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# FLORA OF NEW SOUTH WALES

by

VARIOUS BOTANISTS

Produced under the Direction of

R. H. ANDERSON

Director and Chief Botanist,  
National Herbarium of New South Wales

## **Pteridophyta of South Eastern Australia**

by

MARY D. TINDALE

No. 201 HYMENOPHYLLACEAE



## 201. HYMENOPHYLLACEAE

Small epiphytic or terrestrial ferns mostly found in rainforests under very moist conditions. *Rhizome* long-creeping or short and thick, often slender or filiform, protostelic, clothed with hairs, sometimes without roots. *Stipes* unwinged or frequently winged almost to the base, mostly filiform or slender, glabrous or hairy. *Lamina* simple, bifid, palmatifid, 1-pinnate to pinnately decomposed, usually 1 cell thick except the veins, membranous, almost transparent, lacking stomata. *Pinnae* with plain or pitted walls, glabrous or clothed with simple to elaborately branched hairs. *Ultimate segments* small, mostly 1-veined. *Veins* free, except in a few cases. *False veins* (if present) composed of rows of thickened cells which are not part of the vascular system. *Sori* marginal, terminal on the pinnules or on short lateral lobes. *Involucre* (indusium) bivalvate, tubular or obovate, the lips often much dilated. *Receptacle* columnar, included to long-exserted, bristle-like in the *Trichomanes*-group. *Sporangia* spherical to compressed, very shortly stalked or sessile, clustered along the receptacle, basipetal or maturing at the same time, the annulus complete, oblique or almost transverse, without definite stomial cells, opening by an obliquely lateral slit. *Spores* 32 to 420 in each spore, tetrahedral to globose, trilete, without a perispore, thin-walled, scabrate, granulate or subgranulate to papillate. *Gametophyte* ribbon-like and branching, thallose or filamentous, monoecious or rarely dioecious, green, mostly with the lateral cell-walls pitted, bearing discontinuous marginal cushions (in the *Hymenophyllum*-group) or discontinuous archegoniophores (in the *Trichomanes*-group); germination rapid, of the 3-celled type (in the *Hymenophyllum*-group) or the 4-celled type (in the *Trichomanes*-group) or rarely of a more complex type (in several species of *Hymenophyllum* subgen. *Mecodiium*); rhizoids occurring on the margin of the prothallus, usually branching and with thick brown walls; gemmae highly specialized and abundant; antheridia each with a 1-celled stalk, no funnel-shaped basal cell and no definite cap-cell, large and complex in the *Hymenophyllum*-group but smaller and simpler in the *Trichomanes*-group; archegonia typically leptosporangiate, with a long, straight neck in the *Hymenophyllum*-group, the neck shorter (usually 4-cells long) in the *Trichomanes*-group.

E. B. Copeland studied the Hymenophyllaceae in great detail, including his earlier work in monographs of *Trichomanes* sens. lat. and *Hymenophyllum* sens. lat. which were published respectively in Phil. Journ. Sci. LI (1933) 119-280, and Phil. Journ. Sci. LXIV (1937) 1-177. Later he proposed a new system of classification of this family in Phil. Journ. Sci. LXVII (1938) 1-110, recognizing 33 genera, and basing his revision partly on the earlier work by Presl and van den Bosch. Prantl, in *Die Hymenophyllaceen* (1875), also outlined a scheme of classification for this family. The usual practice has been to place the 600 to 650 species into two large genera, namely *Hymenophyllum* and *Trichomanes*, although some botanists have also recognized *Cardiomanes* (a monotypic genus from New Zealand with strong affinities to the *Hymenophyllum*-group of genera) and *Serpyllopsis* (a South American genus). However, *Microtrichomanes*, a group of about 10 species with reduced fronds, is the problem genus in the Hymenophyllaceae, as it stands half-way between the old comprehensive genera *Hymenophyllum* and *Trichomanes*. Although the involucre of *Microtrichomanes* is obovate (or rarely campanulate) as in the *Trichomanes*-group of genera, the teeth and bristle-like hairs of some species as well as the shape of the involucre (excluding the lips) suggest *Sphaerocionium*, especially *S. lyallii* (Hook. f.) Copel., as indicated by Copeland.

It is clear to anyone studying the Hymenophyllaceae that the genera of the *Trichomanes*-group in Copeland's classification are more sharply defined than those of the *Hymenophyllum*-group. Copeland himself remarked on this fact in Phil.

Journ. Sci. LXIV (1937) 5, stating that he had much greater trouble in the demarcation of natural groups in *Hymenophyllum* sens. lat. Of the *Hymenophyllum*-group of genera occurring in south-eastern Australia, *Apteropteris* and *Sphaerocionium* are sufficiently distinct but *Mecodium*, *Meringium* and *Craspedophyllum* are, in my opinion, linked with *Hymenophyllum* sensu Copeland in *Genera Filicum* (1948), so that I have treated them as subgenera of *Hymenophyllum*, as Copeland did in an earlier paper in Phil. Journ. Sci. LXIV (1937). *Hymenophyllum* is joined to *Meringium* by several dwarf species, viz. *H. pumilum* C. Moore (New South Wales), *H. pumilio* Ros. (New Caledonia) and *H. minimum* Rich. (New Zealand). It is difficult to ascertain by the degree of dissection of the involucre in which subgenus the 3 latter species with very reduced fronds should be placed. Also there is a small group of species in subgenus *Meringium* in which the laminal segments are almost entire, although they are serrated in most of the 60 species. Similarly, I have treated *Mecodium* as a subgenus of *Hymenophyllum*, since the line between them is difficult to draw. In this subgenus the segments of the lamina are entire except for 3 aberrant species (*H. thuidium* Harrington, *H. reinwardtii* van den Bosch and *H. samoense* Bak.), the last-mentioned species being found in tropical Queensland. *Craspedophyllum* has more claim to generic rank but the position is complicated by the possible relationship of the 2 Australian and New Zealand species to 2 species from South-eastern Asia. *Hymenophyllum* subgenus *Meringium* has some features which occur in the *Trichomanes*-group of genera, namely the elongated receptacles and the involucre which are partly valvate but tubular at the base. The cell-walls of the lamina are characterized by coarse-bordered pits in many species of subgenus *Meringium*, these being very similar to those of *Selenodesmium*.

Copeland considered such features as a toothed laminal margin, stellate pubescence and supplementary wings on the rhachis as being advanced in the *Hymenophyllum*-group. He believed that the following were primitive characters in the *Trichomanes*-group:—filiform rhizome, absence of false veins and absence of any specialized thickening on the cell-walls of the lamina. He pointed out that all members of the *Hymenophyllum*-group are characterized by the first two features.

Macroscopic features which are important in differentiating genera and species of the Hymenophyllaceae are as follows:—erect or creeping rhizome, winged or unwinged stipe and main rhachis, the type of hairs (stellate, forked or simple), the entire, crisped or toothed margin of the lamina, the shape and margin of the involucre, the included or long-exserted receptacle and the presence or absence of false and marginal veins.

An important microscopic character of the Hymenophyllaceae is the thickening and pitting of the cell-walls. Elaborate drawings of these features may be seen in van den Bosch's *Hymen. Javan.* (1861) and in Copeland's monographs on *Trichomanes* and *Hymenophyllum*. Some are figured in this paper, e.g. No. 201, Pl. IV and VI.

The spores of the Hymenophyllaceae are trilete and tetrahedral, subtriangular or sometimes spherical, the spore coat being mostly thin and scabrate, subgranulate to granulate or papillate. The spores and young gametophytes within the spore coat are green due to numerous chloroplasts, being reminiscent of the spores of the Grammitidaceae. The Osmundaceae are also characterized by green spores but they are globose and have a smooth proximal region. The spores of the New Zealand species of the Hymenophyllaceae were treated in great detail by Harris in N.Z. D.S.I.R. Bull. 116 (1955) 73, plates 3 and 4. He observed that the spores of the *Trichomanes*-group in New Zealand with 2 exceptions were small (l.c. 73). On the whole the spores of the latter group are not as large as those of the *Hymenophyllum*-group in the Australian species.



As has been pointed out by a number of authors, the vegetative features of the Hymenophyllaceae are highly developed but the sori and sporangia are comparatively primitive as in the Gleicheniaceae. Although the sori are marginal in the Hymenophyllaceae instead of superficial as in the Gleicheniaceae, the sporangia of the filmy ferns have a complete, oblique or almost transverse annulus but without a definite stomium as in the higher ferns.

Most of the Hymenophyllaceae are found in the rainforests of the tropics but others occur in the subtropical and moist temperate zones especially of the southern hemisphere, although only 2 species extend to Great Britain. Some species extend to southern Chile, the South Island of New Zealand and to Tasmania. Many of the Hymenophyllaceae are widely distributed especially *Vandenboschia* which Copeland has suggested, in *Genera Filicum* (1947) 37, is the most primitive genus of the *Trichomanes*-group. There are 2 species of *Vandenboschia* in tropical Queensland but none occur in south-eastern Australia.

The Hymenophyllaceae are well represented in Australia by 44 species of which 32 occur in the dense tropical rainforests of north-eastern Queensland. However, the filmy ferns are relatively common in the subtropical and temperate rainforests of south-eastern Australia where 18 species occur in moist shady situations, either as epiphytes on the trunks of trees and tree-ferns and on old logs, or (especially *Hymenophyllum cupressiforme* Labill.) growing on wet rocks in matted patches with mosses and hepatics. A few species, e.g. *Hymenophyllum bivalve* (Forst. f.) Sw. and *Selenodesmium* spp., sometimes occur as terrestrial plants amongst mosses on the rainforest floor especially near creeks.

The lamina (other than the veins) of the Hymenophyllaceae is rarely more than one layer of cells in thickness, exceptions being *Hymenophyllum australe* Willd., *H. dilatatum* (Forst. f.) Sw. and *H. demissum* (Forst. f.) Sw. which are natives of Australia and/or New Zealand. The thin delicate fronds soon curl up in dry periods or if they are exposed to strong sunlight for a prolonged length of time. The shrivelled fronds of *Hymenophyllum cupressiforme*, which is probably the commonest filmy fern in New South Wales, are often seen on rocks at the edge of rainforests. This species is able to withstand short periods of drought and the laminae uncurl during the next rainy spell. The very thin, translucent lamina of the members of this family is unusual amongst the vascular plants. Unlike the epiphytes belonging to the Polypodiaceae and Davalliaceae, the Hymenophyllaceae appear to have no special methods of protection nor means of water storage in their rhizomes, roots or leaves. However, many filmy ferns (e.g. *Hymenophyllum marginatum* Hook. et Grev., of south-eastern Australia) occur in the mist regions on wet rocks or near waterfalls, so that the fronds are subjected to almost continually moist conditions.

There is considerable overlap in the species occurring in south-eastern Australia (especially south of Gosford, N.S.W.) and in New Zealand. The following species are found in both regions:—*Hymenophyllum flabellatum* Labill., *H. australe* Willd., *H. bivalve* (Forst. f.) Sw., *Polyphlebium venosum* (R. Br.) Copel., *Hymenophyllum peltatum* (Poir.) Desv., *H. rarum* R. Br., *Sphaerocionium lyallii* (Hook. f.) Copel., *Apteropteris malingii* (Hook.) Copel. and *Selenodesmium elongatum* (A. Cunn.) Copel. The first 4 species extend to the subtropical rainforests of the North Coast of New South Wales and to Lamington National Park, south-eastern Queensland, whereas *H. peltatum* extends to the Bellenger River, N.S.W. *S. lyallii* and *H. rarum* have not been recorded north of the Blue Mountains, N.S.W., whereas *A. malingii* is confined to Western Tasmania but *S. elongatum* ranges from the North Coast of New South Wales to north-eastern Queensland. However, other species with a more tropical distribution do extend to south-eastern Queensland and the

North Coast of New South Wales, e.g. *Microtrichomanes vitiense* (Bak.) Copel., *Cephalomanes atrovirens* Presl, *Gonocormus saxifragoides* (Pr.) van den Bosch, *Macroglena caudata* (Brack.) Copel. and probably \**Microgonium tahitense* (Nadeaud) Tindale. These species extend to either the Pacific Islands and/or Asia but do not occur in New Zealand. Of the filmy ferns found in north-eastern Queensland a few are endemic e.g. *Crepidomanes majorae* (Watts) N. A. Wakef., †*Crepidomanes walleri* (Watts) Tindale, *Hymenophyllum gracilescens* Domin and *H. kerianum* Watts but others extend to Malaysia and the Pacific Islands.

Cytologists have made chromosome counts of only a comparatively small number of the 600 to 650 species relegated to the Hymenophyllaceae. Certainly further counts would throw considerable light on the validity of Copeland's genera. The cytological work on this family, cited in the text, has been mainly accomplished by Manton & Sledge, Mehra & Gurdip Singh, and Brownlie. There is a certain amount of overlap between members of this family occurring in New Zealand and in Eastern Australia, so that Brownlie's counts for these species have been cited in the appropriate places. A few new counts for Australian species by the author have been added.

1. Involucre distinctly bivalvate. Receptacle included or shortly exerted beyond the lips of the involucre in all the species from south-eastern Australia.
  2. Stellate or forked hairs (also some simple bristle-like hairs) present on the lamina or its margin.
    3. Typical lamina replaced by parenchyma prolonged into long papillae ..... *Apteropteris* 1.
    - 3.\* Typical lamina present ..... *Sphaerocionium* 2.
  - 2.\* Stellate or forked hairs absent on the lamina and its margin.
  4. Involucre without a definite tube, divided to or nearly to the base. Margin of the lamina entire or toothed.
    5. Margin of the lamina entire in the species from south-eastern Australia.
      6. Lamina with a black margin, minute, simple or once to thrice forked. Old cell-walls wavy-thickened ..... *Hymenophyllum* subgen. *Craspedophyllum* 4B.
      - 6.\* Lamina without a black margin, pinnately divided. Cell-walls typically thin ..... *Hymenophyllum* subgen. *Mecodium* 4C.
    - 5.\* Margin of the lamina toothed. Cell-walls straight or slightly wavy ..... *Hymenophyllum* subgen. *Hymenophyllum* 4A.
  - 4.\* Involucre with a definite tube, bivalvate in the upper portion. Margin of the lamina toothed in the species from south-eastern Australia. Cell-walls usually thick and coarsely pitted ..... *Hymenophyllum* subgen. *Meringium* 4D.
- 1.\* Involucre tubular or obconic, the mouth entire or slightly 2-lipped, truncate or dilated. Receptacle long-exserted (except in *Microtrichomanes* and *Crepidomanes walleri*).

\* Footnote: *Microgonium tahitense* (Nadeaud) Tindale comb. nov. (BASIONYM, *Trichomanes tahitense* Nadeaud, Énum. des Plantes Indigènes de l'île de Tahiti (1877) 18.)

† Footnote: *Crepidomanes walleri* (Watts) Tindale comb. nov. (BASIONYM, *Trichomanes walleri* Watts in Proc. Linn. Soc. XXXIX, 1914 (1915) pl. lxxxvi, f. 3 a-d).

7. Rhizome long-creeping, 1.5 mm. or less in diam. Fronds mostly remote on the rhizome. Lamina soft.
8. Stellate or forked hairs present on the margin of the lamina and its veins in the only species from south-eastern Australia ..... *Sphaerocionium* 2.
- 8.\* Stellate or forked hairs absent on the margin of the lamina and its veins in the species from south-eastern Australia.
9. False veins present in the lamina.
10. Fronds simple or lobed ..... *Microgonium* 5.
- 10.\* Fronds pinnate ..... *Crepidomanes* 6.
- 9.\* False veins absent in the lamina.
11. Fronds palmate, flabellate to orbicular with a deeply incised margin. Axes sometimes proliferous ..... *Gonocormus* 7.
- 11.\* Fronds never palmate, flabellate nor orbicular with a deeply incised margin in the species from south-eastern Australia. Axes never proliferous.
12. Fronds simple or dichotomous. Segments of the lamina 1-veined or in simple fronds with the costa only .....  
..... *Microtrichomanes* 3.
- 12.\* Fronds pinnatifid to decompose. Segments of the lamina 1-veined or pinnately veined.
13. Segments of the lamina with pinnate veins .... *Polyphlebium* 8.
- 13.\* Segments of the lamina 1-veined ..... *Macroglena* 9.
- 7.\* Rhizome erect or oblique, tufted or very shortly creeping, stout, 1 cm. or more in diam. Fronds clustered on the rhizome. Lamina harsh or firm in texture.
14. Fronds 1-pinnate. Cell-walls of the lamina relatively thin and wavy .....  
..... *Cephalomanes* 10.
- 14.\* Fronds decompose. Cell-walls of the lamina thick and coarsely pitted, straight or wavy ..... *Selenodesmium* 11.

## I. THE GROUP OF SPHAEROCIONIUM

In this group 3 genera are considered to form a closely allied group, viz. *Apteropteris*, *Sphaerocionium* and *Microtrichomanes*. The fronds of *Apteropteris* have a stellate pubescence similar to those of *Sphaerocionium* but the anatomy of the lamina is more elaborate. *Microtrichomanes* with its shallow sori is obviously closely related to *Sphaerocionium*, since the gap between *Sphaerocionium lyallii* (Hook. f.) Copel. and *Microtrichomanes palmatifidum* (K. Müll.) Copel. is very narrow. The usually obconic involucre of *S. lyallii* is very similar to several species of *Microtrichomanes* (see page 7). The only species of *Microtrichomanes* occurring in south-eastern Australia, viz. *M. vitiense* (Bak.) Copel., is less morphologically similar to *Sphaerocionium* than most species of the former genus. *Leptocionium*, a monotypic genus from southern Chile, would also belong in this group.

### 1. APTEROPTERIS Copel.

*Apteropteris* Copel. in Phil. Journ. Sci. LXVII (1938) 34; Copel., Gen. Fil. (1947) 34.

*Hymenophyllum* Sm. subgen. *Apteropteris* Copel. in Phil. Journ. Sci. LXIV (1937) 176.

This is a monotypic genus found in Tasmania and New Zealand. TYPE OF GENUS: *Apteropteris malingii* (Hook.) Copel., (BASIONYM: *Trichomanes malingii* Hook.).

*Apteropteris malingii* (Hook.) Copel. in Phil. Journ. Sci. LXVII (1938) 35, pl. 1; Wakefield, Ferns Vict. & Tas. (1955) 4, fig. 9, 5. *Habitat* epiphytic and forming matted patches on the trunks and branches of *Banksia* and *Arthrotaxis* in temperate rainforests. *Rhizome* long-creeping, branched, smooth, brown, glossy, non-glaucous, cylindrical, filiform, wiry, pilose with stalked, stellate, ferruginous hairs. *Stipes* unwinged, filiform, 4 to 40 mm. long, distant on the rhizome, cylindrical, wiry, brown, smooth, clothed near the base with a tuft of stalked, stellate, ferruginous hairs and sparsely clothed on the middle and upper portions with similar hairs. *Fronde*s including the stipes 2 to 20 cm. long. *Lamina* decompound, 1.2 to 8 cm. long and 0.7 to 2 cm. broad, very absorbent, grey or rusty-brown due to a dense tomentum of stellate trichomes each with 5 to 7 arms; instead of an ordinary lamina the parenchyma cells are prolonged into long narrow papillae containing chlorophyll and separated by air-spaces, the bases of the stellate hairs extending from the sclerenchyma up between the papillae. *Primary pinnae* 0.5 to 1.5 cm. long, 0.5 to 1 cm. broad, the lower pairs ovate-rhomboidal, the upper more or less flabellate. *Secondary segments* cuneate or flabellate, deeply divided. *Ultimate segments* linear (12: 1 or more), terete, the apex obtuse. *Sori* indusiate, terminal on the segments. *Involucre* about 0.7 to 1 mm. long, orbicular-cupuliform, densely clothed with matted, stellate hairs, 2-valved to about two-thirds of the length, the valves denticulate at the apex. *Receptacle* included or slightly extruded, cylindrical. *Sporangia* compressed, slightly turbinate, sessile or almost so, the annulus composed of 14 to 18 indurated cells and about 8 thin-walled cells. *Spores* globose-tetrahedral to globose, trilete, subgranulate, 37 to 51  $\mu$   $\times$  37 to 51  $\mu$ .

DISTRIBUTION: Australia (Tasmania) and New Zealand (North and South Islands).

LECTOTYPE: On the mountains between Blind Bay and Massacre Bay, New Zealand, Christopher Maling (K, examined). ISOTYPE? Golden Bay Ranges, Nelson, New Zealand, C. Maling (K, examined); Hooker considered this was possibly the same locality as that in which the lectotype was collected. This specimen consists of a single frond. SYNTYPE: On the mountain range between Blind and Massacre Bay, Brunner (K, examined). I have chosen as lectotype the specimen which approximates most closely to the illustration and description by W. J. Hooker in Gard. Ferns (1862) pl. 64; also it was collected by Maling after whom the species was named. As in the plate, this specimen has a rhizome, whereas it is lacking in both of the other collections.

TASMANIA: WEST COAST: Mt. Roland, Sutton 1.1911 (NSW P1236); Cradle Mountain, Sutton 1.1911 (NSW P4966); ditto, Rodway 12.1915 (NSW P8277); ditto, Perrin 8.1932 (NSW P1237); ditto, 3,500 ft. alt., abundant on trunks of *Arthrotaxis selaginoides* in forest of the latter, Johnson 1.1949 (NSW P5615); Waldheim Forest, Cradle Valley, Ellis 5.1962 (NSW P8390); Macquarie Harbour, on *Arthrotaxis selaginoides*, Rodway 4.1906 (NSW P1238).

ABSOLUTE SYNONYMS: *Trichomanes malingii* Hook., Garden Ferns (1862) pl. 64. *Hymenophyllum malingii* (Hook.) Mett., Hymen. (1864) 423, pl. 1, f. 32; Rodway, Tasm. Fl. (1903) 290; Copeland in Phil. Journ. Sci. LXIV (1937) 176.

*Apteropteris malingii* is found in Western Tasmania at Cradle Mountain and near Queenstown in areas of very high rainfall. It is an epiphyte on the bark of *Arthrotaxis selaginoides* Don, *A. cupressoides* Don and *Banksia* sp. According to Crookes in New Zealand Ferns (1952?) 93, this rare mountain fern is chiefly found in New Zealand on the dead or dying trunks of *Librocedrus bidwillii*.

As explained by Holloway in Trans. & Proc. N.Z. Inst. LIV (1923) 597, the structure of the lamina in *Apteropteris* is unique, as the narrow papillae containing chlorophyll take the place of the ordinary mesophyll. The lamina absorbs water from the atmosphere like a sponge but evaporation is very slow.

Copeland suggested that *Apteropteris* is a derivative of *Sphaerocionium*, as indicated by the presence of stellate hairs on the fronds of both genera, although the anatomy of the lamina is very different.

2. **SPHAEROCIONIUM** Presl

*Sphaerocionium* Presl, Hymen. (1843) 125; Copel. in Phil. Journ. Sci. LXVII (1938) 28; Copel., Gen. Fil. (1947) 34.

*Dermatophlebium* Presl, Epim. Bot. (1849-52) 258; Copel. in Phil. Journ. Sci. LXVII (1938) 28.

*Hymenophyllum* Sm. subgen. *Sphaerocionium* (Presl) Copel. in Phil. Journ. Sci. LXIV (1937) 164.

Small epiphytic ferns with long-creeping, filamentous rhizomes. *Stipes* filiform, sometimes winged especially near the apex. *Fronds* flabellately or pinnately compound, clothed with branched, basally forked, stellate, bistellate or simple hairs on the axes, involucre and the margins of the lamina as well as on the surface of the lamina in other species; chromatophores minute and numerous; cell-walls thin. *Veins* free, with accessory wings not in the plane of the frond in some non-Australian species. *Involucre*s rounded, 2-valved, usually cleft almost to the base, rarely obconic with an immersed tube (i.e. in *S. lyallii*). *Receptacle* shortly columnar, not projecting beyond the involucre. *Sporangia* sessile to very shortly stalked, more or less turbinate, the annulus broad, oblique to almost transverse. *Spores* globose to tetrahedral-globose, trilete, greenish.

TYPE OF GENUS: *Sphaerocionium hirsutum* (Sw.) Presl (BASIONYM: *Hymenophyllum hirsutum* Sw.), of Cuba, Mexico to Chile. See Copeland, Genera Filicum (1947) 34.

This is a genus of about 63 species, although only 11 of them are found in the Old World. The majority of *Sphaerocionium* spp. (about 51 species) are confined to the rainforests of tropical America where they usually grow as epiphytes in the higher mountains. Only one species, viz. *S. lyallii* (Hook. f.) Copel., has been recorded from Australia, where it occurs on the Central Coast and Tablelands of New South Wales.

So far the only chromosome count in *Sphaerocionium* is on one of the New Zealand species, viz. *S. ferrugineum* (Colla) Copel., for which Brownlie recorded  $n = 36$  in Trans. Roy. Soc. N.Z. LXXXV (1958) 213.

As indicated by Copeland in Phil. Journ. Sci. LXVII (1938) 29, the simple hairs of *Sphaerocionium* are always bristle-like and non-septate above the base or basal cell, as opposed to those species placed in *Hymenophyllum* subgen. *Meringium* in which the simple hairs each consist of a row of cells. *Microtrichomanes*, a small genus to which *Sphaerocionium* is closely related, includes species with simple setae as well as some glabrous species which are unlike typical members of the genus *Sphaerocionium* (e.g. *Microtrichomanes francii* (Christ) Copel.). In Phil. Journ. Sci. LXVII (1938) 36, Copeland pointed out that the gap between *S. lyallii* and *Microtrichomanes palmatifidum* (K. Müll.) Copel. is very narrow. Amongst other features in common, both species are characterized by dark cells at the bases of the simple or branched hairs occurring on the laminal margin. The obconic involucre of *M. parvulum* (Poir.) Copel. are very similar to those of *S. lyallii* in shape and margin but hairs are absent. The flabellate form of the lamina in *S. lyallii* resembles that of several species of *Microtrichomanes* including *M. palmatifidum*. However *Sphaerocionium* is essentially characterized by branched hairs usually with a stalk cell, although a few simple hairs may also occur on the fronds. Future evidence may indicate that these 2 genera should be united under *Sphaerocionium*.

Morton in his critical revision of "The American Species of *Hymenophyllum* section *Sphaerocionium*" in *Contrib. U.S. Nat. Herb.* XXIX (1947) 142, divided this group into 2 subsections viz. subsect. *ciliata* and subsect. *lanata*. In the former subsection the hairs are borne only on the margins of the lamina and the veins, whereas in the latter they are also found on the surface of the lamina. The Australian and New Zealand species *S. lyallii* would be placed in subsect. *ciliata* according to this scheme.

***Sphaerocionium lyallii* (Hook. f.) Copel.** in *Phil. Journ. Sci.* LXVII (1938) 33; Crookes & Dobbie, *New Zealand Ferns*, ed. 5 (1952?) 89, 90 (photograph).

*Habitat* epiphytic or rupestral, forming matted patches on trees and rocks in subtropical rainforests, usually between 1,200 and 3,500 ft. altitude in New South Wales. *Rhizome* long-creeping, branched, black or very dark brown, slightly glossy, filiform, about 0.1 to 0.2 mm. in diam., sparsely pilose with light red-brown, simple hairs (composed of 2 to 4 cells) or clothed with once forked hairs. *Stipes* not winged, 0.1 to 2.5 cm. long, filiform, about 0.1 mm. or less broad, distantly spaced on the rhizome, black or very dark brown, slightly glossy, clothed at the base with a tuft of long, pale ferruginous hairs and sparsely pilose towards the middle and apex with easily abraded, light ferruginous, simple or once or twice forked hairs. *Fronds* not dimorphic. *Lamina* divided flabellately or digitately almost to the base of the frond into dichotomous segments, very rarely simple, very membranous, pellucid, pale green when fresh, brown when dried, 3 to 16 mm. long, 3 to 16 mm. broad, deltoid or broadly obovate (6: 5) to very broadly obovate (6: 6), rounded (6: 5) to almost orbicular (6: 6) or sometimes once forked in small fronds, the internal cell-walls slightly wavy-thickened. *Ultimate segments* 1 to 16, sessile, opposite, plane, ascending, oblong (2: 1) to cultrate (10: 1), 1.5 to 10 mm. long, 1 to 1.5 mm. broad, the surface glabrous, the apex rounded, truncate or emarginate, the margin bearing small persistent teeth with fugacious, reddish, simple or more usually once or twice forked hairs (the apical cell of each branch bent) or occasionally with basally forked hairs. *Veins* free, dichotomous, black or very dark brown, glabrous or with a few, forked, reddish hairs. *Sori* indusiate, marginal, solitary or very rarely in pairs at the apex of the ultimate segments, deeply sunken in the lamina. *Involucre* 1 to 1.5 mm. long, 0.8 to 2.5 mm. broad, valvate, obcordate or cuneate-obconical, green; sometimes 2-lipped, the mouth not dilated nor with a specialized border; apex retuse, erose or toothed, each tooth bearing a reddish, forked or basally forked hair. *Receptacle* included, cylindrical. *Sporangia* few, sessile, compressed, slightly turbinate; annulus very broad, almost transverse, composed of 16 to 19 indurated cells and ca. 9 thin-walled cells, dehiscing obliquely laterally. *Spores* subtetrahedral to globose, trilete, finely granulate, green, equat. diam. 24.38 to 39.75  $\mu$   $\times$  polar diam. 22.5 to 37.5  $\mu$ . (No. 201, Pl. I.)

**DISTRIBUTION:** New Zealand and Australia (New South Wales, mainly in the Blue Mountains and the ranges of the lower Central Coast).

**HOLOTYPE:** Thomson's Sound, South West Coast, Middle Island, New Zealand, on trees, D. Lyall 3.1851 (K), examined.

**NEW SOUTH WALES:** Blue Mountains, Betche 8.1895 (NSW P593); Kings Tableland, Forsyth 2.1903 (NSW P2212); Wentworth Falls, in deep gullies, Betche 8.1895 (NSW P1860); ditto, Forsyth, probably about 1900 (NSW P2110); ditto, Chapman 12.1909 (SYD); Katoomba, Forsyth 12.1899 (NSW P2113); Bulli, Kirton (NSW P2207); Minnamurra Falls, about 3 miles W of Jamberoo, 1,200 ft. alt., in rainforest, in deep ravine above creek on boulder, in the mist region, Judd 5.1954 (NSW P6791); above Minnamurra Falls, 2,200 ft. alt., on old trees of *Ceratopetalum apetalum*, Judd 5.1955 (NSW P7161); pass above Kiama, Moore 2.1890 (NSW P2111, P2112); ditto, Harwood 4.1895 (NSW P2206); Brogher's Creek, Kangaroo Valley, Bäuerlein 8.1880 (NSW P2960); Mt. Cambewarra, Watts 10.1907 (NSW P2211, P1859).

ABSOLUTE SYNONYMS: *Hymenophyllum lyallii* Hook. f., Fl. N.Z. II (1854) 16. *Trichomanes lyallii* (Hook. f.) Hook. in Hook. & Bak., Syn. Fil. (1867) 77; Copel. in Phil. Journ. Sci. LI (1933) 163, pl. 7, f. 7, pl. 11 f. 4.

EQUIVALENT SYNONYMS: *Trichomanes calvescens* van den Bosh, Ned. Kruid. Arch. V (1863) 199; Hook. & Bak., Syn. Fil. (1868) 77, HOLOTYPE BY MONOTYPY: New South Wales, Vicary 1836-7 (K), examined. This specimen was labelled *T. calvescens* n.sp. by van den Bosh. *Trichomanes digitatum* Sw. var. *calvescens* (v.d. Bosh) Domin in Bibl. Bot. LXXXV (1913) 13; Maiden & Betehe, Census N.S.W. Pl. (1916) 1; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 113. I do not consider that Bentham implied this combination in Fl. Austr. VII (1878) 702, as was suggested by Maiden and Betehe, although this transfer was made by Domin in Bibl. Bot. LXXXV (1913) 13. HOLOTYPE: the same as for *T. calvescens*.

This species was misidentified as *Trichomanes digitatum* auctt. non Sw. in Benth., Fl. Austr. VII (1878) 702 and Moore & Betehe, Fl. N.S.W. (1893) 503. For many years in New South Wales *Microtrichomanes digitatum* (Sw.) Copel. (syn. *Trichomanes digitatum* Sw.) was confused with *Sphaerocionium lyallii* but *M. digitatum* may be distinguished from the latter by the unbranched, bristle-like hairs on the margins of the lamina and by the simple, ferruginous hairs on the rhizomes. *Hymenophyllum cattlettii* (*cattletti*) C. Moore et Betehe, Handb. Fl. N.S.W. (1893) 503, nom. illegit., was published in synonymy under *T. digitatum* but I have examined a specimen so-labelled by Moore at the Kew Herbarium. This material, which was collected in the Illawarra by C. Moore and received at Kew in September 1890, agrees well with Australian specimens of *S. lyallii*.

On the whole the fronds of the New Zealand specimens of *S. lyallii* are more robust, the involucre slightly larger and more retuse, also the hairs on the lamina and involucre are usually more complex. In the material from New Zealand twice forked and stellate hairs are much more common on the fronds than in the New South Wales specimens. The number of ultimate segments of the fronds is usually greater in the New Zealand material, i.e. 18 to 26 instead of 1 to 16. However, a specimen from the D.S.I.R., Wellington, New Zealand, collected at the Waitakere Ranges, North Auckland, by Carse No. 2165 in January, 1919, is very similar to Australian material of this species. It has from 10 to 20 ultimate segments on each frond. The involucre are folded back but are usually straight or almost so, instead of being retuse, also simple hairs are found on the apices of the involucre. Material collected on the eastern side of the Waitakere Range by Crookes in March 1962 (NSW P8441) approximates closely to the Australian material but NSW P8440 obtained in the same locality by Crookes & Tindale in January, 1962, although characterized by few laminal segments, i.e. 5 to 14, has very large sori which are up to 3 mm. broad.

The hairs on the margins of the laminas in the holotype of *S. lyallii* are forked, twice forked, basally forked, stellate or rarely simple. The retuse involucre have an apical row of mainly forked hairs, also there are 14 to 25 ultimate segments in the fronds. On the other hand the holotype of *Trichomanes calvescens* van den Bosh is typical of the Australian material, the hairs on the fronds and involucre being either simple (consisting of 2 to 4 cells in length) or rarely once forked. Some of the involucre on this specimen are retuse.

When discussing the development of the gametophyte in New Zealand material of *S. lyallii*, Atkinson, in Phytomorphology X (1960) 32, mentioned that the "second wall in the spore is suppressed as well as one or two divisions in the arms" but this condition occurs infrequently.

### 3. MICROTRICHOMANES (Mett.) Copel.

*Micro-trichomanes* Mett., Hymen. (1864) 413, as a Group of *Trichomanes*. *Microtrichomanes* (Mett.) Prantl, Hymen. (1875) 51, as a Sect. of *Gonocornus*; Copel. in Phil. Journ. Sci. LI (1933) 153, as a Group of *Trichomanes*; C. Chr., Ind. Fil., Suppl. 3 (1934) 187, as a subgenus of *Trichomanes*; Copel. in Phil. Journ. Sci. LXVII (1938) 35, as a genus, also Copel., Gen. Fil. (1947) 34, and Fern Fl. Phil. I (1958) 55.

Small, fragile epiphytes. *Rhizome* filiform, creeping. *Stipes* widely spaced on the rhizome, not winged throughout. *Axes* winged. *Lamina* usually dichotomous, sometimes simple by reduction, mostly brownish, false veins absent, without veinlets except the costae of the segments, the margin not specialized but

often bearing cilia or setae, the cell-walls thin. *Sori* terminal on the longer segments of the lamina. *Involucre* usually obconic or rarely campanulate, entire, winged to the apex. *Receptacle* mostly shortly exserted, slender. *Sporangia* large, almost spherical. *Spores* tetrahedral to almost globose, trilete, green. *Gametophyte* 3-celled *Hymenophyllum*-type.

TYPE OF GENUS: *Microtrichomanes digitatum* (Sw.) Copel., based on *Trichomanes digitatum* Sw., of Mauritius, Borneo, Java, the Philippines, Malaya and perhaps Samoa.

According to Copeland this is a small genus of about 10 species occurring in the Southern Hemisphere. He asserted that *Microtrichomanes* was derived from *Sphaerocionium* by reduction of the lamina. The involucre of the latter genus is mostly valvate instead of obconic or rarely campanulate as in *Microtrichomanes*, also the laminal hairs in *Sphaerocionium* are almost always branched not simple. However, the brownish lamina, the hairs and teeth in some species and the shape of the involucre (excluding the lips) of *Microtrichomanes* indicate relationship with *Sphaerocionium*. The short lips of the involucre and the shortly extruded receptacle denote affinities with the *Trichomanes*-group of genera but *Microtrichomanes* is clearly intermediate between this group and *Hymenophyllum* sens. lat. There is only one species of *Microtrichomanes* in south-eastern Australia.

*Microtrichomanes vitiense* (Bak.) Copel. in Phil. Journ. Sci. LXVII (1938) 37; Copel. in Journ. Arn. Arb. XXX (1949) 433.

*Habitat* in tropical or subtropical rainforests forming densely matted patches on trees and logs. *Rhizome* elongated, filiform, long-creeping, branched, densely clothed with brown, linear, unbranched hairs each composed of a single row of cells. *Stipes* winged towards the apex or not winged, 1 to 2 mm. long, densely tomentose with similar hairs to those on the rhizome. *Lamina* simple or once forked, membranous, translucent, glistening, mostly yellowish-green, narrow oblong (3:1) to oblong (2:1) or somewhat elliptical (2:1), 2 to 11 mm. long including the stipes, 1.5 to 4 mm. broad; margin entire or obscurely sinuate, somewhat crisped in dried specimens; apex emarginate, rounded or truncate; base tapering gradually or abruptly; one-veined unless the frond is forked, no lateral veins present; costa black and clothed especially near the apex with a few, appressed, oblong, rather bulbous, opaque or reddish hairs 1 to 3 cells long and with red joints between the cells; cell-walls of the lamina very thin and hyaline, the contents aggregated densely against all the lateral walls except those of the margin. *Sori* indusiate, terminal, 1 to 2, deeply sunken in the apex of the fronds or its lobes. *Involucre* somewhat broadly trumpet-shaped, urceolate-oblong, clothed especially towards the base with hairs of the same type as on the costa; rim scarcely dilated but folded in dried specimens or sometimes reflexed, entire or slightly fluted, obscurely 2-lipped, equal to the breadth of the lobe. *Receptacle* oblong, scarcely or not exserted, rarely long-extruded. *Sporangia* subsessile, almost spherical, with an oblique annulus of 14 to 19 indurated cells and 2 or 3 thin-walled cells. *Spores* tetrahedral to globose, trilete, green, granulate, equat. diam. 33.75 to 37.5 $\mu$   $\times$  polar diam. 30 to 33.75 $\mu$ . (No. 201, Pl. V, f. 1.)

DISTRIBUTION: Fiji, New Caledonia and Eastern Australia (Queensland to the North Coast of New South Wales).

HOLOTYPE: Fiji, Milne (K), examined.

QUEENSLAND: Herberton, Evelyn Scrub, R. F. Waller 9.1909 (NSW P2116); near Tully Falls, Watts 7-8.1913 (NSW P3783, P3767); Yandina, Simmonds 3.1891 (BRI); Maroochy



River, Bailey 10.1874 (BRI); Brisbane, Bancroft 3.1894 (NSW P2118); Brisbane River, Bailey 3.1873 (K); Three Mile Scrub, Brisbane, on stems of trees, Bailey (BRI); Brookfield, near Brisbane, Bailey 12.1888 (BRI); Running Creek, Lamington Glen, epiphytic on *Ficus stephanocarpa* in rainforest on the edge of a creek, Goy & Smith No. 20, 10.1937 (BRI).

NEW SOUTH WALES: Foot of Mt. Lindsay, Forsyth 9.1900 (NSW P2114); Richmond River, Mueller, received 9.1879 and 10.1881 (K); Richmond River, Watts 5.1899 (NSW P3766) and 1906 (NSW P3768); Binnaburra Road, Richmond River, on a tree, Watts 5.1899 (NSW P3762); North Creek Road, Watts 4.1899 (NSW P3763); Uralba, Richmond River, Watts 1898 (NSW P3787); Teven, Richmond River, Watts 4.1900 (NSW P1141); Marshall's Falls, Alstonville, Bäuerlen 5.1891 (NSW P1857, P1858); Maxwell's Scrub, Pearce's Creek, Richmond River, Watts 9.1896 (NSW P3765).

ABSOLUTE SYNONYM: *Trichomanes vitiense* Bak. in Journ. Linn. Soc. Bot. IX (1866) 338, t. 8D; F. Muell., Fragm. Phyt. Austr. VIII (1873) 32; Benth., Fl. Austr. VII (1878) 701; F. M. Bail., Lith. Ferns Queensl. (1892) t. 21; Moore & Betche, Handb. Fl. N.S.W. (1893) 503; F. M. Bail., Queensl. Fl. (1902) 1941; Domin in Bibl. Bot. LXXXV (1913) 10, t. 3, f. 3; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Copel., Ferns of Fiji, B.P. Bish. Mus. Bull. No. 59 (1929) 24; Copel. in Phil. Journ. Sci. LI (1933) 157, pl. 9, f. 1-2; C. Chr., Ind. Fil., Suppl. 2 (1934) 193; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114.

The holotype of *M. vitiense* was collected in Fiji by Milne but there is insufficient difference between the Australian and Fijian material for them to be regarded as 2 species. The holotype is characterized by a relatively narrow involucre tube but so have several specimens from New South Wales, e.g. NSW P3765 (collected at Maxwell's Scrub, Richmond River) which was matched with the type. No differences were noted in the internal or marginal cell-walls of the Fijian and the Australian material. The somewhat bulbous hairs which occur at the base of the involucre and also along the midrib of the lamina especially near the apex, are similar in the Fijian and Australian specimens. These hairs are usually 1 to 3 cells in length, mostly appressed, with rounded apices and opaque or more usually reddish with dark red walls. The holotype has dark green fronds, as is also the case in NSW P2118 which was collected at Brisbane by Bancroft in March 1894, but other specimens have very light yellowish-green fronds, e.g. NSW P318 which was collected at Viti Levu, Fiji by Degener No. 14607. The fronds are bilobed in the material from Viti Levu and also in some Australian specimens but several collections have simple fronds only. The fronds of Degener No. 14607 from Viti Levu are larger than those of most of the fronds in the holotype, also the rim of the involucre is more pronounced and expanded. However similar involucre are found in the following Australian specimens:—Richmond River, New South Wales ex Herb. F. Muell. (K) and Brisbane, Bancroft 3.1894 (NSW P2118).

I consider that *Trichomanes powellii* Bak. should be kept as a distinct species, since the fronds range from simple to eight times forked, the "cuff" of the involucre is proportionally broader, also the involucre is usually separate from the apex of the frond and projects beyond it. The rim is incipiently 2-lipped and the receptacle included or shortly excluded as in Rechanger No. 3379, collected at Upolu in Samoa in August, 1905 (K). However Christensen in Bish. Mus. Bull. No. 177 (1943) 13, stated that the involucre in *T. powellii* is "cyathiform-obconic with a rather deeply 2-lipped mouth, the lips entire, round, large, spreading or subreflexed at maturity." The fawn or reddish hairs on the midrib and involucre bases are alike in *M. vitiense* and *T. powellii*, also the structure of the internal and marginal cells is similar. The reflexed involucre lips in *M. vitiense* are narrower and the whole plant is much smaller i.e. 0.2 to 1.1 cm. long instead of 1 to 1.8 cm. long as in *T. powellii*. At the Kew Herbarium I examined the holotype of *T. powellii* which was collected in Samoa by the Rev. T. Powell and was received by Baker in May, 1866.

*Microtrichomanes vitiense* is closely allied to *Microgonium motleyi* van den Bosch which differs from the former in having lateral veinlets from the costa and deeply cordate sterile fronds also the greater part of the involucre tube projecting beyond the lamina. *M. motleyi* was first recorded from north-eastern Queensland by Domin in Bibl. Bot. LXXXV (1913) 9, but it is also found in the Philippines, Malaya, Ceylon, Borneo, Java and New Guinea if this species is construed in the broad sense to include *Trichomanes beccarianum* Cesati. *M. motleyi* has false veinlets (in addition to true veinlets) in its laminae but they are absent in *Microtrichomanes vitiense* where the costa is the only vein.

Amongst specimens sent to me recently by Dr. H. Hürlimann was a collection of *M. vitiense* from New Caledonia, obtained by Baumann in April, 1951, on the summit crest of l'Oua Tilou, 1,000 to 1,100 m. (Expédition botanique en Nouvelle Calédonie 1950-52, Mission Franco-Suisse No. 12420). This appears to be the first record of *M. vitiense* from New Caledonia.

## II. THE GROUP OF HYMENOPHYLLUM

In south-eastern Australia the *Hymenophyllum*-group is considered to consist of a single large genus viz. *Hymenophyllum* with 4 subgenera represented in this region. The latter are as follows:—

- A. Subgenus *Hymenophyllum* (3 species in south-eastern Australia).
- B. Subgenus *Craspedophyllum* (1 species in this region).
- C. Subgenus *Mecodium* (3 species in this region).
- D. Subgenus *Meringium* (1 species in this region).

The relationship of these subgenera is discussed on page 2.

## 4A. HYMENOPHYLLUM Sm. SUBGENUS HYMENOPHYLLUM

*Hymenophyllum* Sm. subgen. *Euhymenophyllum* sensu Copel. in Phil. Journ. Sci. LXIV (1937) 77.

Copeland later considered this group of species to be of generic rank, i.e. *Hymenophyllum* sens. strict. in Phil. Journ. Sci. LXVII (1938) 37, and in *Genera Filicum* (1947) 34.

Small, matted, epiphytic or terrestrial ferns. *Rhizome* creeping, narrow. *Lamina* pinnately decomposed, the margins of the segments minutely denticulate or spinulose-dentate, the teeth falcate or straight, glabrous; cell-walls pitted, scarcely or not differentiated. *Sori* terminal on the ultimate segments or close to the main rhachis on short branchlets (1 to 3 in a row) on the upper side of each secondary rhachis. *Involucre* divided to the middle or to the base into 2 lips which are toothed or smooth. *Receptacle* included or very slightly exserted. *Sporangia* large, sessile. *Spores* tetrahedral to almost globose, trilete, papillate to granulate.

TYPE OF SUBGENUS: *Hymenophyllum tunbridgense* (L.) Sm. (BASIONYM: *Trichomanes tunbridgense* L.).

In the restricted sense this is a subgenus of about 25 species principally occurring in the temperate parts of the world. Very few species extend to the tropics but a number occur in Japan, Norway, Scotland, New Zealand, Chile, South Africa and the Antarctic Islands. Four species are represented in Eastern Australia, the commonest being *H. cupressiforme* Labill. which occurs in subtropical and temperate rainforests from south-eastern Queensland to Tasmania. *H. peltatum* (Poir.) Desv. is found at comparatively high elevations in New South Wales and Victoria as well as in the mountains of Tasmania and along the rivers of the latter State near sea level in mixed *Nothofagus* forest. *Hymenophyllum gracilescens* Domin is found in the tropical, mountain rainforests of north-eastern Queensland.

Chromosome counts have been made for a number of species of subgen. *Hymenophyllum*, the base numbers being 9, 11 and 13. Manton recorded counts of  $n = 13$  for *H. tunbridgense* (L.) Sm. and  $n = 18$  for *H. wilsonii* Hook. (as *H. unilaterale* Bory) in "Problems of Cytology and Evolution in the Pteridophyta" (1950) 272-4, fig. 274 a and b. Brownlie has made counts for 2 members of this group, viz.  $n = 11$  for material of *H. peltatum* collected in New Zealand and  $n = 22$  for *H. revolutum* Col. (endemic to New Zealand). These were published in Trans.

Roy. Soc. N.Z. LXXXV (1958) 213. The author obtained a count of  $2n = 22$  for Tasmanian material of *H. peltatum* and  $n = ca. 24$  for specimens of *H. cupressiforme* Labill. collected in New South Wales (NSW P8425).

There are 3 species of *Hymenophyllum* sens. strict. in south-eastern Australia.

1. Sori terminal on the ultimate segments of the lamina, borne at the apex of the frond ..... *H. pumilum* 1.
- 1.\* Sori borne on short, specialized, lateral branches of the primary pinnae usually on the acroscopic side.
  2. Involucre entire, narrowly ovate to broadly ovate or broadly oblong, dark brown in the older stages, the apex obtuse or often pointed. Sori usually 2 or 3 in a row on short lateral branches on the upper surface of the primary pinnae, sometimes solitary. Primary pinnae branching on the upper side only .. *H. peltatum* 2.
  - 2.\* Involucre toothed, undulate or sometimes almost entire, suborbicular or depressed, transversely ovate with a short, cuneate tube, green in the older stages, the apex broadly rounded. Sori usually solitary on short, lateral branches on the upper surface of the primary pinnae, rarely up to 6 and extending to the lower surface. Primary pinnae branched on both sides ..... *H. cupressiforme* 3.

**1. *Hymenophyllum pumilum* C. Moore** in Hook. & Bak., Syn. Fil. (1874) 464; Benth., Fl. Austr. VII (1878) 706; Moore & Betche, Handb. Fl. N.S.W. (1893) 504; C. Chr., Ind. Fil. (1905) 366; Domin in Bibl. Bot. LXXXV (1913) 25; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114; Copel. in Phil. Journ. Sci. LXIV (1937) 91 (excluding *H. moorei* Bak. which also comprises pl. 45 f. 1-3); l.c. LXVII (1938) 39, 44.

*Habitat* epiphytic in subtropical rainforest in the mountains, occurring in densely matted patches. *Rhizome* long-creeping, branched, very dark brown or black, about 0.1 mm. in diam., sparsely clothed with a few, dark red-brown, simple hairs consisting of a single row of cylindrical cells. *Stipes* not winged except for an almost imperceptible wing towards the apex, 4 to 17 mm. long, filiform, distant, very dark brown or black, wiry, minutely scabrous, glabrous except for a few, basal hairs of the same type as on the rhizome. *Rhachis* broadly winged or rarely terete and not winged between the lowest pairs of primary pinnae, zig-zagged, black, glabrous or with an occasional, red-brown, linear or oblong, unbranched hair consisting of a single row of cells. *Lamina* flabellately pinnate-pinnatifid, membranous, pellucid, brownish-green when dried, irregular in outline, very broadly ovate or somewhat rhomboidal, 0.7 to 1.8 cm. long and 0.5 to 1.5 cm. broad, not dimorphic, glabrous, the internal cell-walls thick and pitted. *Primary pinnae* flabellately divided at the base into 2 to 4 segments, the upper usually simple. *Ultimate segments* mostly narrowly oblong (3:1) to broadly oblong (3:2), 2 to 9 mm. long, 1.3 to 2 mm. broad, the apex rounded or more rarely truncate or emarginate, the margin spinulose-dentate, the teeth distant, often dark brown or black, consisting of about 3 cells on a broad base. *Veins* black, forked once in each segment, not reaching the margin, clothed with an occasional, dark red, simple hair consisting of 3 to 7 cells. *Sori* indusiate, terminal on the ultimate segments at the apex of the fronds, 1 to 2 per frond, free, projecting beyond the segments, not immersed, up to twice as broad as the ultimate segments but always broader than the latter. *Involucre* 1.5 to 2 mm. long, 0.9 to 1.5 mm. broad, valvate, divided to the middle or almost to the base into 2 lips, rounded or oblong, greenish-brown, glabrous; apex broadly rounded with a minutely spinulose-dentate margin, the teeth small, obtuse and irregular in size, not occurring on the sides of the involucre; base cuneate; marginal row of cells elongated but scarcely specialized. *Receptacle* thickened towards the base, included.

DISTRIBUTION: New South Wales, Australia (mainly the Blue Mountains and the pass above Kiama).

HOLOTYPE: Mill Creek, Mt. Tomah, N.S.W., C. Moore, received 6.1871 (K), labelled "*Hymenophyllum pumilum* Moore" in his own handwriting.

NEW SOUTH WALES: Mill Gully, Mt. Tomah, Carron (NSW P1907); Mt. Tomah (spelled Thomar), Blue Mountains (K), labelled by C. Moore; Sydney, Blue Mountains, 1837, ex Herb. T. Moore (K), ("Sydney" covered a wide area at that period); the pass above Kiama, C. Moore 2.1890 (NSW P7182).

In Moore's original description of *H. pumilum* the margin of the involucre is said to be entire but the valves of the holotype were found to be minutely spinulose-dentate on examination with a lens.

According to Copeland in Phil. Journ. Sci. LXIV (1937) 91, *Hymenophyllum moorei* Bak. of Lord Howe Island, is a synonym of *H. pumilum*. However, after an examination of a number of specimens from Mt. Gower and Mt. Lidgbird, Lord Howe Island, as well as the types of both species at the Kew Herbarium in 1950, I consider that they are distinct species since the involucre of *H. moorei* is larger, i.e. 2 to 3 mm. long and 1.5 to 2 mm. broad, also the apex of the involucre is more deeply toothed, i.e. fimbriate or sometimes with hooked teeth. These teeth rarely occur on the sides of the involucre. The sori of *H. moorei* are rarely terminal but mostly lateral, stalked and sunken between 2 segments. The hairs of the rhizome and the laminal teeth of these 2 species are similar, although these teeth are longer in *H. moorei*. In Pacific Science XIV (1960) 244, Brownlie also maintains these 2 species as distinct after examining the holotypes of both taxa.

Another closely allied, dwarf species is *Hymenophyllum minimum* A. Rich. (syn. *Meringium minimum* (A. Rich.) Copel.) which is found in New Zealand and the Auckland Islands. It has small, flabellately divided fronds and very large, terminal, stalked involucre with hooked teeth or fimbriae along the margin and on the back of the valves. There are also spinulose teeth on the margin of the lamina.

2. *Hymenophyllum peltatum* (Poir.) Desv., Prodr. (1827) 333; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114; Copel. in Phil. Journ. Sci LXIV (1937) 78, pl. 37; l.c. LXVII (1938) 38; Dobbie & Crookes, New Zealand Ferns, ed. 5 (1952) 98, 99 (photo); N. A. Wakefield, Ferns of Victoria and Tasmania (1955) 6, 4 f. 6.

*Habitat* epiphytic on trees or fallen logs of *Nothofagus cunninghamii* and *Atherosperma moschatum* or growing on rock faces or sometimes on granite or dolerite boulders, from sea level to 5,300 ft. alt., sometimes in mixed *Nothofagus* forest along rivers. *Rhizome* filiform, wiry, long-creeping, much branched, ca. 0.2 mm. in diam., clothed with brown, undivided hairs which are 2 to 4 cells long. *Stipes* filiform, wiry, widely spaced on the rhizome, 0.6 to 6 cm. long, ca. 0.2 mm. in diam., with an almost imperceptible wing towards the apex. *Main rhachis* with a narrow wing which broadens towards the apex, zig-zagged, glabrous. *Fronds* 1.5 to 17 cm. (usually 3 to 8 cm.) long including the stipe. *Lamina* 1-pinnate-pinnatifid to 2-pinnate-pinnatifid, membranous when young, herbaceous in the older stages, dark green, narrowly elliptical (4:1) to elliptical (2:1), lanceolate (3:1), cultrate (6:1) to linear (12:1), 1.5 to 10 cm. long, 0.5 to 1.8 cm. broad; the laminal cells ornamented, the cell-walls pitted. *Secondary rhachis* with an occasional simple hair. *Primary pinnae* alternate towards the base and opposite near the apex or usually alternate throughout, unilateral, digitately pinnatifid. *Ultimate segments* 3 to 6 mm. long, 0.5 to 1 mm. broad, cultrate (6:1) to narrowly oblong (3:1), developed on the upper side of the primary pinnae, the apex obtuse or truncate, the margin spinulose-dentate. *Veins* free, forked but undivided in each ultimate segment, not reaching the margin. *Sori* numerous, usually occurring towards the apex of each frond, 1 to 3 borne on the upper basiscopic side of the

secondary rhachises, each borne on a stalk up to 1 mm. long. *Involucre* narrowly ovate to broadly ovate or broadly oblong, 0.5 to 1 mm. broad, 1 to 1.8 mm. long, often pointed, dark brown and woody in the old condition but green in the early stages, divided to the middle or below the middle into 2 entire valves, cuneate at the base. *Receptacle* included. *Sporangia* sessile, slightly turbinate, with an oblique annulus composed of 18 to 24 indurated cells and about 6 thin-walled cells. *Spores* subtriangular, trilete, with long narrow laesurae, finely papillate, equat. diam.  $43.13$  to  $50.63\mu$   $\times$  polar diam.  $37.5$  to  $41.25\mu$ .

DISTRIBUTION: Mascarene Islands, Tristan da Cunha?, New Zealand, Australia (New South Wales, Victoria and Tasmania) and South Africa.

HOLOTYPE: Île de France (Mauritius), Bory de Saint-Vincent (P), examined.

NEW SOUTH WALES: Head of Bellenger River, 4,500 ft. alt., on trees and rocks, Herb. Mueller (MEL); Barrington Tops, Coast Range, Boorman 1.1916 (NSW P1234, P1905, P2906); Thredbo River, Mt. Kosciusko, Maiden & Forsyth 1.1899 (NSW P1232); Thredbo River Gorge, Mt. Kosciusko, on rock face in gully, not common, 5,300 ft. alt., Johnson & Constable 1.1951 (NSW P7213).

VICTORIA: Wotan Creek,  $\frac{1}{2}$  mile below Cleve Colc Hut, southern face of Mt. Bogong (ca. 5,800 ft.), on sheltered damp rock faces, not uncommon, Willis 1.1947 (MEL); Mt. Bogong, 6,500 ft. alt., Tadgell 2.1923 (MEL); Bogong and Fainter High Plains, 5,500-6,000 ft. alt., Tadgell 2.1923 (MEL); head of Catherine River, Mt. Speculation, Barry Mts., 5,300 ft. alt., in rocky gulches, uncommon, Willis 1.1945 (MEL); head of Tyers River, near Mt. Mueller, Baw Baw Plateau, amongst granite boulders at ca. 4,500 ft. alt., Willis 3.1951 (MEL); head of Taggerty River, Lake Mountain, Singleton 9.1943 (MEL); head of Taggerty River, near Marysville, at about 4,000 ft., Singleton 4.1943 (MEL); Cumberland Creek, Woods Pt. Rd., Marysville, on rocks and fallen logs in bed of creek, Singleton 4.1943 (MEL).

TASMANIA: NORTH: Mt. Barrow, 2,400 ft. alt. on trunks of *Nothofagus cunninghamii*, Tindale 12.1954 (NSW P6998); ditto, 2,700 ft. alt., on fallen logs of *N. cunninghamii*, Burns 6.1962 (NSW P8389); ditto, 3,300 ft. alt., on fallen logs of *N. cunninghamii*, in deep shade, eastern aspect, Burns 6.1962 (NSW P8388); head of Quamby's Bluff, Meander River, Stuart 1.1849 (MEL). NORTH-WEST: Cradle Mountain, Sutton 1.1911 (MEL); Henty River, Queenstown to Zechan, in mixed *Nothofagus* forest, Vickery 1.1949 (NSW P4990); Franklin River (Lycell Highway), in mixed *Nothofagus* forest, Johnson 1.1949 (NSW P4992, P4991); The Acheron (Rivulet, a tributary of the Jane River before it joins the Franklin River), Gunn No. 1511, 2.1845 (NSW P5066). EAST: South Esk River, Herb. Mueller (MEL); South Esk, shady creeks amongst moss, No. 492 (MEL); St. Patrick's River, Gunn No. 1511, 4.1845 (NSW P5064). SOUTH-EAST: Uxbridge, Rodway (HO 5042); near the junction of the Huon and Picton Rivers, epiphytic on a fallen tree in river brush, Whaithe No. 2170, 1.1962 (NSW P8361); Picton River, Johnston (MEL); Lady's Bay, near South Port, Stuart No. 1533, 4.1856 (MEL); South Port, Stuart No. 1533, 4.1856 (MEL). SOUTH-WEST: Port Davey Track, Mt. Mueller, on mossy log in myrtle forest, 2,500 ft. alt., Olsen 1.1941 (HO 5043); Mt. Mueller, near tributary of the Weld River, Olsen 1.1941 (HO 5048).

ABSOLUTE SYNONYM: *Trichomanes peltatum* Poir. in Lam., Encyc. VIII (1808) 76.

EQUIVALENT SYNONYMS: *Hymenophyllum unilaterale* Willd., Sp. Pl. V (1810) 521, ISOTYPE: Île de Mascareigne, an X, à Willdenow sous le no. 117 (P), examined. *Hymenophyllum meyeri* Presl, Hymen. (1843?) 50, ISOTYPE?: Capite bonae spei (Cape of Good Hope), Drège (L 910.28 . . . . 46).

*H. peltatum* was omitted in Moore & Betche, Handb. Fl. N.S.W. (1893) and Maiden, & Betche, Census N.S.W. Pl. (1916), being recorded from the Australian mainland for the first time by Watts in Proc. Linn. Soc. XLI (1916) 381.

The specimens of *H. peltatum* from the mainland do not differ morphologically from those collected in the State of Tasmania. Specimens from the latter island (e.g. NSW P4990 and P6998) have pitted laminal cell walls just as in the material from Barrington Tops, N.S.W. (e.g. NSW P1234) and the Thredbo River Gorge (e.g. NSW P7213).

In New South Wales this species is uncommon, being restricted to the head of the Bellenger River, the Barrington Tops district and the Southern Alps where it occurs at high altitudes.

*H. peltatum* is more common in Tasmania where it is found on the mountainsides in *Nothofagus cunninghamii* forest as well as in mixed *Nothofagus* forest occurring along rivers. The latter forest consists of *N. cunninghamii*, *Atherosperma*, *Anopteris*, *Eucryphia* and *Anodopetalum*. *H. peltatum* occurs mainly on fallen logs of *N. cunninghamii* but occasionally on living trees of this species. It also occurs on the mossy boles of *Atherosperma moschatum* and on rock faces especially in Victoria, being found on some of the higher mountains listed above, as well as on Mt. Ellery, East Gippsland, where it was collected by Willis on steep granitic slopes at about 3,600 ft. alt. in December, 1951 (MEL). In addition to the localities cited above, *H. peltatum* was collected at the head of the Royston River by Willis in 1943.

A chromosome count of  $2n = 22$  was obtained by the author from material collected at Mt. Barrow, near Launceston, Tasmania, by T. Burns in June, 1962 (NSW P8388), (No. 201, Plate VII). I wish to thank Mr. Burns for sending these plants, also Dr. Barbara Briggs who checked the count and Mr. J. Peacock who photographed the cell. Brownlie published a chromosome count of  $n = 11$  for material of *H. peltatum* collected in New Zealand (see Trans. Roy. Soc. N.Z. LXXXV (1958) 213). The material from New Zealand which I have examined is morphologically very similar to Australian specimens of this species.

The primary pinnae of the 3 Mascarene Island specimens of *H. peltatum* which were kindly sent on loan by the Director, Muséum d'Histoire Naturelle, Paris, are more closely spaced than in the Australian and New Zealand material, also 6 to 8 lobes are quite common on the primary pinnae in material collected in the Mascarene Islands, whereas 2 to 4 or rarely 6 lobes are found in the Australian and New Zealand specimens. There appears to be no difference in the setting, spacing or type of teeth on the fronds.

Dr. E. A. Schelpe very kindly sent me a specimen of *H. peltatum* which he collected on Table Mountain, Cape Peninsula, South Africa, in April, 1954 (Schelpe No. 4652). This material is a good match for Australian specimens of this species.

*Hymenophyllum wilsonii* Hook. is a closely allied species which was formerly included in *H. peltatum* by a number of authors, but the chromosome number is  $2n = 36$  (see Clapham, Tutin & Warburg, Fl. Brit. Isles (1952) 17). *H. wilsonii* occurs in Great Britain, Ireland, France, Norway and Macaronesia.

**3. *Hymenophyllum cupressiforme* Labill.**, Nov. Holl. Pl. Sp. II (1806) 102, t. 250, f. 2; Copel. in Phil. Journ. Sci. LXIV (1937) 91; Wakefield in Vict. Nat. LVIII (1941) 110; Wakefield, Ferns of Victoria and Tasmania (1955) 6, 4 f. 5, 7 photo.

*Habitat* in mountain and coastal gullies, mostly in subtropical rainforests but also in *Nothofagus cunninghamii* and *N. moorei* temperate rainforests, rarely in rocky gullies dominated by dry sclerophyll forests, usually forming large, matted patches on moist rock faces near creeks or waterfalls, under dripping rock ledges or in shaded recesses of sandstone cliffs, more uncommonly in mine-shafts or epiphytic on trees or trunks of *Todea barbara*, occurring in sandstone, granitic, basaltic or limestone country. *Rhizome* filiform, wiry, long-creeping, extensively branched, dark brown, 0.1 to 0.3 mm. in diam., sparsely ferruginous-tomentose on some of the younger parts. *Stipes* distant, 0.6 to 3.5 cm. long, 0.1 to 0.3 mm. broad near the middle, dark brown, glabrous, dull or slightly glossy, smooth, almost imperceptibly winged near the apex or sometimes for  $\frac{2}{3}$  of the length of the stipe or rarely almost to the base (e.g. NSW P2047), clothed at the base with a few, dark reddish, 3- or 4-celled, unbranched hairs. *Main rachis* with a very narrow, entire or toothed wing which becomes almost imperceptible near the base, dull, smooth, glabrous or sometimes bearing a few, undivided, 5- or 6-celled hairs with dark red septae. *Fronds* 2 to 9 cm. long including the stipes, often decurved, dark green, erect. *Lamina* 1.5 to 6.2 cm. long, 1.5 to 2.5 cm. broad, 2-pinnate-pinnatifid, usually elliptical-oblong, the apex rounded or subacute, tapering towards the base, the lowest 2 or 3 pairs of primary pinnae often half as long as the middle pinnae. *Primary pinnae* with a short winged pedicel except in the basal pairs where the pedicel is unwinged, flabellate-rhomboidal, alternate, remote to slightly crowded, usually

branched on the upper side but lobes do occur on the lower side, the apex broadly rounded. *Secondary pinnae* sessile, simple or bifid, finger-like. *Ultimate segments* 1.5 to 5 mm. long, 0.5 to 1 mm. broad, cultrate (6: 1) to narrowly oblong (3: 1), the margin with straight or rarely curved teeth, the apex toothed and truncate or sometimes obtuse. *Veins* free, with a branch in each lobe, not reaching the apex of each ultimate segment, glabrous. *Sori* indusiate, marginal, each borne on a short, lateral segment, sometimes with a basiscopic subtending segment, usually solitary but up to 6 on a primary pinna in rare cases, mostly borne close to the main rhachis on the acroscopic side of the secondary rhachises but occasionally on the basiscopic side too, occurring in the upper part of the lamina, sunken or free. *Involucre* 1 to 1.5 mm. long, 1.3 to 2 mm. broad at maturity, obovate, 2-valved, with a short tube, the valves suborbicular, divided down to the cuneate base, much wider than the ultimate segments, persistent, green, the margin almost entire to erose or denticulate, glabrous or rarely with a few, fawn, clavate hairs near the base of the involucre. *Receptacle* included or slightly exerted at maturity, club-shaped, up to 0.8 mm. broad at the apex. *Sporangia* subsessile, numerous (often about 40), bright orange-red when mature, the cluster of sporangia up to 1.8 mm. in diam., each sporangium turbinate, the obliquely horizontal annulus composed of 17 to 19 indurated cells and 7 to 9 thin-walled cells. *Spores* subtriangular to globose, trilete, greenish, subgranulate, with long narrow laesurae, equat. diam. 41.25 to 52.5 $\mu$   $\times$  polar diam. 27.5 to 48.75 $\mu$ . (No. 201, Pl. II, f. 4.)

**DISTRIBUTION:** Australia (south-eastern Queensland, New South Wales, Victoria and Tasmania).

**HOLOTYPE:** Nova Hollandia et Terra Diemen, Herb. Webbianum, ex Herb. Labillardière (FLOR), examined. Labillardière's original description in his handwriting is affixed to this specimen. The valves of the involucre are denticulate at the broadly rounded apices but the sides of the lobes are entire. NSW P1170 collected at Launceston, South Esk, Tasmania, by Lucas in May, 1924, is a good match for the holotype.

**QUEENSLAND:** Lamington National Park, Elabana Falls track, alt. ca. 2,800 ft., on rock in rainforest, Smith & Tindale 8.1956 (NSW P7458); Lamington National Park, in rainforest near the head of Tooloona Creek, alt. ca. 3,400 ft., epiphytic fern, Smith No. 10912, 3.1960 (NSW P8411); Binna Burra, Lamington National Park, Floyd 5.1961 (Forestry Office, Coll's Harbour).

**NEW SOUTH WALES:** **N. TABLELANDS:** Point Lookout, in *Nothofagus moorei* association, Davis 7.1956 (NSW P8355); ditto, 5,000 ft. alt., on rocks with mosses, Davis 7.1956 (NSW P7754). **NORTH COAST:** Mt. Warning, about 2,000 ft. alt., Rodway No. 10886, 10.1939 (specimen sent to Kew No. 2979) (NSW P8415); Dorrigo, Boorman 3.1909 (NSW P2073); The Dome, Dorrigo, in subtropical rainforest on rocks, Tindale 4.1944 (NSW P1605, P1988); The Rapids, Ellenborough River, Watts 4.1915 (NSW P1105); Hell's Delight, Barrington, Fraser & Vickery 1.1934 (NSW P8416). **CENTRAL WESTERN SLOPES:** Munghorn Hill, Mudgee-Wollar Rd., alt. 1,875 ft., on a moist rock-face, rocky gully in dry sclerophyll forest, sandstone, Johnson & Constable 8.1950 (NSW P6284). **CENTRAL TABLELANDS:** Natural Bridge Creek, Mt. Cameron, on rock in bushy gully, Constable 12.1948 (NSW P5307; U; BM; L); Bowen's Creek, Bilpin-Mt. Irvine, alt. 1,850 ft., thickly growing on moist rock face in rainforest gully, basalt, Tindale & Constable 3.1952 (NSW P2047; US; K); Waterfall Creek, Mt. Wilson, alt. 3,000 ft., on a rock in rainforest, basalt, Melville & Tindale 4.1953 (NSW P6404); Waterfall Gully, Mt. Wilson, growing on tree in rainforest, Melville & Tindale 4.1953 (NSW P6406; L; US); Happy Valley, Mt. Wilson, Watts 12.1914 (NSW P1117); Grose Valley, Watts 8.1914 (NSW P1114); Tomah Creek, Mt. Tomah, in rainforest, Ingram 5.1956 (NSW P7470); Mill Creek, Mt. Tomah, on rocks, Ingram 9.1956 (NSW P8419); South Kurrajong, Stephenson 7.1892 (NSW P2076); Mt. Victoria, Watts 8.1914 (NSW P1106); Erskine Creek, Kings Tableland, 18 miles SE of Wentworth Falls, frequent on rocks in rainforest gully, Constable 5.1956 (NSW P7413); Horseshoe Falls, Blackheath, on flat rock, sandstone, Constable 1.1949 (NSW P5814); Govett's Leap, Blackheath, 3,200 ft. alt., on moist rocks at bottom of falls, Constable 3.1957 (NSW P7890); Wentworth Falls, on moist rock face, sandstone, Constable 10.1948 (NSW P5640); Valley of the Waters, Watts 12.1914 (NSW P1108-9); Victor Falls, Hazelbrook, alt. 1,750 ft., on damp rocks, sandstone country, Constable 3.1949 (NSW P5604); Hazelbrook, Maiden 5.1905 (NSW P2079); The Lake, Hazelbrook, 2,000 ft. alt., on moist rocks near as

waterfall, sandstone, Constable 3.1949 (NSW P6247; US; K; BM); head of Linden Creek, Linden, 1,900 ft. alt., on moist rocks in creek, frequent, sandstone, Constable 1.1954 (NSW P6725; UC; KYO); Springwood, alt. 750 ft., on sloping rock in gully, sandstone country, Constable 2.1949 (NSW P5605); ditto, Watts 12.1914 (NSW P1113); Springwood South, on rock face in creek, sandstone country, Constable 2.1949 (NSW P5603); Mittagong, Dixon 1882 (MEL); Belmore Falls, near Robertson, Rodway No. 10870, 10.1932? (NSW P8418). CENTRAL COAST: Newport, Watts 8.1915 (NSW P1110, P2074); Narrabeen, on rocks on top of a waterfall, Mair & Tindale 5.1949 (NSW P5594); junction of Rocky Creek and Middle Harbour, 3 miles E of Pymble, alt. 10 ft., on moist sandstone rock face in gully, Johnson 10.1960 (NSW P8403); Port Jackson, Siegert 1884 (MEL); Newtown, Collie 1882 (MEL); Lucas Heights, near Menai, in gully near creek in shaded situation on rocks, Mair 3.1955 (NSW P8404); National Park, Boorman 7.1904 (NSW P2081); ditto, on rocks beside creek near rainforest, Tindale 2.1944 (NSW P43); near Waterfall, National Park, Rodway 7.1933 (specimen sent to Kew No. 1147) (NSW P8412); Loddon Falls, W of Bulli Pass, on rock face on W side of falls, Evans 5.1961 (NSW P8405; MEL); Austinmer, Rodway 4.1934 (specimen sent to Kew No. 1387) (NSW P8409); Mt. Kembla, Fletcher 11.1891 (NSW P1168, P1116); Minnamurra Falls, 3 miles W of Jambroo, 1,200 ft. alt., in rainforest on boulder, in mist region, Judd 5.1954 (NSW P6789); ditto, on face of boulder in creek near the falls, Tindale 4.1953 (NSW P6688); ditto, frequent on moist rocks, in dense rainforest near the falls, alt. 100 ft., Constable 2.1959 (NSW P8306); Woodhill near Berry, on sandstone boulder, on top of range, 1,000 ft. alt., Rodway No. 10878, 4.1930 (NSW P8406); summit of Cambewarra Range, on rock, 1,500 ft. alt., Rodway No. 10875, 6.1929 (NSW P8407); Cambewarra Mt., Nowra, Boorman 2.1910 (NSW P2075); Paradise Gully, Kangaroo Valley, on a boulder in a shady creek, Rodway No. 10877, 1.1939 (NSW P8408); Bomaderry Creek, sea level, on a sandstone boulder, Rodway No. 10874, 10.1930 (specimen sent to Kew No. 105) (NSW P8402). SOUTH COAST: The Falls, Nowra, Watts 5.1903 (NSW P1112); summit of Pigeon House Mountain, near Milton, in cracks of sandstone cliffs, Rodway No. 10880, 11.1932? (NSW P8420); Bateman's Bay, Boorman 6.1906 (NSW P2072); NE slopes of Mt. Dromedary, Central Tilba, 1,400 ft. alt., abundant on rock face in rainforest, Constable 9.1953 (NSW P7143); near Mt. Dromedary, Reader 1880 (MEL); Twofold Bay, White 1881 (MEL); Disaster Bay, Green Cape, Rodway (NSW P8421); Murrica River (ca. W of Disaster Bay), in rainforest gully on rocks, alt. 15 m., with *Psychomnion aciculare*, Constable 10.1954 (NSW P7899). SOUTHERN TABLELANDS: Sugar Loaf Mountain, Braidwood, Bäucrlen 8.1898 (NSW P2083).

VICTORIA: Snowy Creek, Ovens River, NE Victoria, McCann 1881 (MEL); Buffalo Ranges, on moist shaded rocks, as well as on stems of *Todea barbara*, Mueller 3.1853 (MEL); Dandongadale Falls, Mt. Cobblers Plateau, at about 4,000 ft. alt., on dripping rock ledges, Willis 1.1945 (MEL); near Mt. Ellery, Merrah 1887 (MEL); Cape Howe, Walter (MEL); between Bemm and Coombinbah Rivers, E Gippsland, Sayer 1887 (MEL); near Lakes Entrance, fern tree gully, on decaying logs of lilly pilli, 100 ft. alt., Stirling 5.1882 (MEL); Acheron Way, between Marysville and Warburton, at about 3,000 ft. alt., Tadgell (MEL); Blacks' Spur, Fernshaw, Walter 4.1872 (MEL); Warburton, Watts 1.1919 (NSW P1126); Mt. Juliet, (near Burgoyne), Sullivan 3.1872 (MEL); Walhalla, Herb. Mueller (MEL); Clematis Gully, Kallista, Singleton 1943 (MEL); near the head of Hardy's Gully, Kallista, Dandenong Ranges, Willis 1935 (MEL); Dandenong Ranges, on tree-fern stems, Mueller 1.1853 (MEL); Mt. Dandenong, Cowle (MEL); Olinda Creek (cascades), Dandenong Range, Singleton 5.1943 (MEL); Mirboo North, Howitt No. 963 (MEL); Art.aur's Scat, Mornington Peninsula, Baldry 9.1883 (MEL); Sealers Cove, on stems of fern trees (MEL); Creswick, in mine shafts, uncommon, Willis 11.1931 (MEL); Stony Rises, W of Colac, Singleton 8.1944 (MEL); Apollo Bay, Marriner? (MEL); Apollo Bay, Mueller (MEL); Mt. Cole, probably the granitic fern gullies at Middle Creek Falls, Green (MEL); Mackey's Peak, at Hall's Gap, Grampians, in damp shaded recesses on sandstone cliffs, at ca. 1,850 ft. alt., Willis 10.1959 (MEL); Darlot's Creek, near Portland, Allitt (MEL).

TASMANIA: NORTH-EAST: Notley Fern Gorge, near Launceston, 800 ft. alt., epiphytic on tree trunk in rainforest gully, Gordon limestone, Tindale 12.1954 (NSW P7077); Distillery Creek, near Launceston, common, Gunn No. 1510 (NSW P1815); ditto, Hannaford 1.1862 (MEL); Launceston, South Esk, Lucas 5.1924 (NSW P1170), agrees well with the holotype; Mt. Barrow, Dorset, Rupp 1.1922 (NSW P5063); Mt. Victoria, head of Ringarooma River, Glover 1883 (MEL); St. Patrick's River, Gunn No. 1510, 4.1845 (NSW P5062). SOUTH-EAST: Derwent (River), Brown Iter Austr. No. 100, 1802-05 (MEL);  $\frac{1}{2}$  mile below Riveaux Falls, Huon River, growing with *Ctenopteris heterophylla*, epiphyte on fallen tree trunk in river bush, Whaithe 1.1962 (NSW P8422).

EQUIVALENT SYNONYM: *Hymenophyllum antarcticum* Presl, Hymen. (1843) 50, t. XIIA; Copel. in Phil. Journ. Sci. LXIV (1937) 81, pl. 40, SYNTYPES: Synops. Filicum, N. Hollandia, Sieber No. 134 (E), examined; Nov. Hollandia, Sieber, Synops. Filicum No. 134 (L 908, 282 . . . 203) (L), examined, according to a note by Copeland part of this specimen was drawn by Borbe for plate 40 in Phil. Journ. Sci. LXIV (1937); ditto (W), examined.



*Hymenophyllum tunbridgense* auct. non (L.) Sm. has been misapplied to *H. cupressiforme* by the following authors:—R. Br., Prodr. Fl. N. Holl. (1810) 159; Benth., Fl. Austr. VII (1878) 706; F. M. Bail., Syn. Queensl. Fl. (1883) 688; F. M. Bail., Lith. Ferns Queensl. (1892) 30, middle illustration; Moore & Betehe, Handb. Fl. N.S.W. (1893) 504; F. M. Bail., Queensl. Fl. VI (1902) 1946; Rodway, Tasm. Fl. (1903) 290; Ewart, Fl. Viet. (1931) 32; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114.

I have been unable to retain *Hymenophyllum antarcticum* Presl as a distinct species, since it is connected to *H. cupressiforme* by a series of intermediates. The illustration of *H. antarcticum* in Presl's Hymen. (1843) t. XIIA shows an almost entire involucre which is characteristic of the syntypes. Typical *H. antarcticum* represents the long, narrow form with comparatively short, lower primary pinnae and an involucre which is nearly entire. There is every variation from the latter type of involucre, e.g. NSW P8405 from Loddon Falls, N.S.W., to those with a markedly toothed margin, e.g. N.S.W. P7458 from Lamington National Park, Queensland; SE of Tenterfield, Stuart 11, 1874 (MEL) and  $\frac{1}{2}$  mile below Riveaux Falls, Tasmania (NSW P8422). The last-mentioned specimen is a particularly robust form of *H. cupressiforme*, the fronds being up to 9 cm. in length including the stipes. However, this species is usually characterized by short, broad fronds from 2 to 6 cm. long including the stipes. In some cases very depauperate specimens bear sori, e.g. Grass Tree Hill, Tasmania, 1,200 ft. alt., on wet sandstone, prostrate, collected by Long in September, 1931 (HO).

*H. cupressiforme* is by far the commonest member of the Hymenophyllaceae in south-eastern Australia where it is found on moist rock-faces in most of the subtropical and temperate rainforests on the coast and tablelands. It is less commonly epiphytic on the trunks of trees or *Todea barbara*. In the Munghorn-Wollar district of the Western Slopes, N.S.W., *H. cupressiforme* is found in rocky gullies in dry sclerophyll forests but this is unusual, as it is essentially a rainforest species, although it is comparatively hardy. This species does not extend to Central or North Queensland.

*H. revolutum* Colenso is closely related to *H. cupressiforme* but the fronds of the former species are paler green, more pellucid and more delicate than those of the latter species, also the involucre of *H. revolutum* are almost always more sharply toothed than in the other species. In *H. revolutum* the marginal teeth of the laminal segments are often falcate although some are straight, whereas in *H. cupressiforme* they are mostly straight. The main rachis of *H. revolutum* is only winged towards the apex and the stipe is unwinged, whereas the main rachis is always winged to the base in *H. cupressiforme* and part of the stipe at least is bordered by a very narrow wing. The former species is endemic to New Zealand whereas the latter is restricted to south-eastern Australia.

#### 4B. HYMENOPHYLLUM Sm. SUBGENUS CRASPEDOPHYLLUM (Presl) Copel.

*Hymenophyllum* Sm. sect. *Craspedophyllum* Presl, Hymen. (1843) 125; subgen. *Craspedophyllum* (Presl) Copel. in Phil. Journ. Sci. LXIV (1937) 163. *Craspedophyllum* (Presl) Copel. in Phil. Journ. Sci. LXVII (1938) 27; Copel., Gen. Fil. (1947) 33.

*Pachyloma* van den Bosch, Eerste Bijdrage (1861) 318, non DC. (1828).

Tiny mat-forming ferns. *Rhizome* long-creeping, filamentous. *Lamina* 0.4 to 3.5 cm. long, either simple or once to thrice forked, the marginal cells usually black, the margin glabrous, entire or toothed. *Sori* terminal. *Involucre* 2-valved, cleft to the base, oval or orbicular, sometimes with a short tube, green or blackish-brown, with a border of black cells. *Receptacle* included, cylindrical. *Spores* tetrahedral-globose to globose.

TYPE OF GENUS: *Hymenophyllum marginatum* Hook. et Grev. of Australia (Queensland, New South Wales and Tasmania).

There are 2 species in this subgenus of *Hymenophyllum*, the other species being *H. armstrongii* Bak. which is confined to New Zealand. In Trans. N.Z. Inst.

LIV (1923) 592, J. E. Holloway pointed out that *Hymenophyllum cheesemanii* Bak. was not worthy of specific rank, since the thickening of the margin had not proved a reliable distinction. Giesenhagen in *Die Hymenophyllaceen*, in *Flora LXXIII* (1890) 441, suggested that the marginal thickening of the lamina kept the margin flat and thus protected it from tearing or curling. Another 2 species which may belong in this subgenus are *Hymenophyllum johorensis* Holttum (Malaya, Borneo and the Philippines) and *H. reductum* Copel. (the Philippines). Both *H. marginatum* and *H. armstrongii* have a 2-valved, oval or orbicular involucre which is cleft to the base and sometimes has a very short tube, whereas the illustrations of *H. johorensis* and *H. reductum* in *Phil. Journ. Sci.* LXIV (1937) pl. 19-20, show the involucre to be of the *Meringium*-type, i.e. with a hollow, conical tube at the base. According to Copeland (l.c. 52) the dark colour in the involucre of *H. johorensis* spreads along the whole margin from the hair-bearing teeth and, when the sporangia are mature, the margin of the lips of the involucre is dark to a depth of usually 4 cells. In *Ferns of Malaya* (1954) 80, Holttum has pointed out that the margins of the laminae in *H. armstrongii*, *H. johorensis* and *H. reductum* are characterized by stiff marginal hairs consisting of 2 or 3 elongated cells. However, these hairs are absent in *H. marginatum*. Holttum suggested that the 3 former species belong to a much reduced group related to *Meringium*. In his latest paper on this family, Copeland in *Fern Flora Philippines I* (1958) 64, referred both *H. johorensis* and *H. reductum* to *Meringium* but said that their affinities are uncertain and that they may both be better regarded as *Microtrichomanes*. Cytological evidence may later throw some light on this problem.

***Hymenophyllum marginatum* Hook. et Grev.**, *l.c. Fil. I* (1827) t. 34; Benth., *Fl. Austr. VII* (1878) 705; Moore & Betche, *Handb. Fl. N.S.W.* (1893) 504; Rodway, *Tasm. Fl.* (1903) 290; C. Chr., *Ind. Fil.* (1905) 364; Maiden & Betche, *Census N.S.W. Pl.* (1916) 1; Melvaine in *Proc. Linn. Soc. N.S.W.* LXI (1936) 114; Copel. in *Phil. Journ. Sci.* LXIV (1937) 163, pl. 89.

*Habitat* in subtropical and temperate rainforests as well as in horizontal scrub, often near creeks or waterfalls, forming matted patches on rocks, logs or wet cliff-faces. *Rhizome* long-creeping, branched, smooth, black or very dark brown, glossy, non-glaucous, cylindrical, filiform, wiry, sparsely pilose with a few, simple, linear (12: 1 or more), red or brown hairs. *Stipes* very narrowly winged at the apex, filiform, 0.3 to 8 mm. long, distant on the rhizome, cylindrical, wiry, black or very dark brown, glossy, smooth, clothed near the base with a tuft of simple, linear (12: 1 or more), red hairs and near the middle and apex with red tubular hairs. *Lamina* simple, once or more rarely twice or thrice forked, thin, light green when dried, darker when fresh, linear (12: 1 or more) to narrowly oblong (3: 1), 4 to 35 mm. long, 1 to 2.5 mm. broad, glabrous, the older internal cells with wavy-thickened walls; margin entire, undulate, glabrous, never toothed, composed of 1 or 2 rows of glossy, black, obliquely-placed cells; apex of the sterile lobes rounded, truncate or emarginate but more or less constricted in the fertile lobes; base gradually tapering into the stipes. *Midrib* black, glossy, without lateral branchlets except into the lobes, clothed with a few, reddish, tubular hairs each of which has a short, globose, basal cell. *Sori* indusiate, marginal, solitary at the apex of the frond or its lobes. *Involucre* 0.8 to 1.5 mm. long, orbicular or oval, valvate to the base or sometimes with a very short tube, the cell-walls much pitted, light green, always with a marginal band of black, glossy, obliquely-placed cells, the border usually 2 or 3 cells wide; margin entire, glabrous; base constricted, often clothed with similar hairs to those on the midrib. *Receptacle* included, cylindrical. *Sporangia* about 6 to 10, compressed, orbicular, slightly turbinate, sessile or almost so; annulus almost transverse, composed of about 18 to 20 indurated cells and several thin-walled

cells, dehiscing by a long lateral slit; stomium not a definite group of cells. Spores tetrahedral-globose to globose, trilete, white (later green), coarsely granulate to subpapillate, equat. diam. 32·81 to 56·25 $\mu$   $\times$  polar diam. 30 to 46·88 $\mu$ .

**DISTRIBUTION:** Australia (south-eastern Queensland, New South Wales (mainly in the Blue Mountains) and Tasmania). There is no record of this fern occurring in Victoria. In Proc. Linn. Soc. N.S.W. VIII (1884) 469, there is a note mentioning the collection of this species at Milton, South Coast, N.S.W., by W. Bäuerlen in 1884. This was probably the first record of *H. marginatum* being collected in New South Wales since Fraser's original specimens were obtained.

**HOLOTYPE BY MONOTYPY:** Hooker and Greville in Ic. Fil. I (1827) t. 34, cited the type locality as "in Nova Hollandia, prope Port Jackson, inter Muscos, Fraser". There is a specimen in the Kew Herbarium labelled "among mosses, N. Holland, Fraser" which must represent Hooker and Greville's holotype (examined). Hooker labelled this specimen *Hymenophyllum marginatum* Hook. et Grev., whereas the *isotype* in the Herbarium of the Botanic Gardens, Edinburgh "Nova Hollandia, Fraser 1825" was not determined by Hooker. Another *ISOTYPE* is "Port Jackson, Fraser (NSW P2089)".

**QUEENSLAND:** Moreton District, Mt. Barney, mostly growing on boulders and forming with mosses a dense mat-like cover; collected along creeks from the saddle between North and East Peaks to the main Barney Gorge, alt. ca. 2,500 ft., Smith 6.1940 (BRI 27055); Mt. Lindsay, alt. about 4,000 ft., small fern on very wet cliff faces near the summit, Everist No. 1123, 6.1935 (BRI 27054).

**NEW SOUTH WALES:** Valley of the Waters, Blue Mountains, on the face of wet boulders, Watts 9.1912 (NSW P2087, P2900, P2905; MEL; BRI); National Pass, Wentworth Falls, Watts 9.1912 (NSW P2088, P2902); foot of Wentworth Falls, Watts 12.1914 (NSW P2903); Horseshoe Falls, Blackheath, alt. 2,150 ft., growing on vertical rock face near the falls, sandstone formation, in rainforest, Constable 1.1949 (NSW P5815; K; BM; U; US; UC; L; MO; LIL); ditto, in spray under a cliff, NE of the falls, on rocks, Watts 1.1911 (NSW P2904, P1910); ditto, Watts 6.1911 (NSW P2901); Minnamurra Falls Reserve, about 3 miles W of Jambacrow, on a rock face in a deep crevice, very close to a watercourse, ca. 2,000 ft. alt., Judd 10.1958 (NSW P8147); Cambewarra, Bäuerlen (BRI); near Shoalhaven, Bäuerlen 8.1884 (MEL); Broger's Creek, on moist rocks, Bäuerlen 1884 (MEL).

**TASMANIA:** WEST: Cradle Mountain, Rodway No. 10894, 12.1915 (NSW P8276); Wanderer River, West Coast, Rodway 7.1907 (NSW P2090); Port Davey, Melaleuca Inlet, Celery Top Islands' Bay, matted creeping fern, 1 inch high, on mossy log in horizontal scrub, sea level, Olsen 12.1940 (HO H1281), fertile fronds very constricted at the apex; Celery Top Island, third island from Narrows in Bathurst Harbour, Port Davey, sea level, Davis No. 1411, 3.1954 (MEL); Queen's River, tributary of the King River, West Coast of Tasmania, on trunks of *Banksia marginata*, Moore 1884 (MEL); West Coast, near the Huxley Ranges, Moore 1884 (MEL).

**ABSOLUTE SYNONYMS:** *Craspedophyllum marginatum* (Hook. et Grev.) Copel. in Phil. Journ. Sci. LXVII (1938) 27; Copel., Gen. Fil. (1947) 33; N. A. Wakefield, Ferns of Victoria and Tasmania (1955) 4 f. 2, 5. *Pachyloma marginatum* (Hook. et Grev.) v.d. Bosch in Versl. Akad. Wet. Amsterdam XI (1861) 318.

In south-eastern Queensland *H. marginatum* has been collected at 2,500 ft. altitude on basalt rocks at Mt. Barney in the cloud zone where there would be a considerable amount of moisture. It has also been obtained at 4,000 ft. altitude on Mt. Lindsay which is on the border between New South Wales and Queensland. In New South Wales this species is mainly found at elevations of 2,000 ft. and over in the subtropical rainforests of the Blue Mountains and the Minnamurra-Cambewarra district (near the junction of the Central and South Coast). There are no records of this species being collected in Victoria but it is found at Cradle Mountain, NW Tasmania, and in the horizontal scrub on the West Coast of Tasmania in the very high rainfall area. According to Wakefield in Ferns of Victoria and Tasmania (1955) 5, *H. marginatum* has also been recorded near the Lune River in south-eastern Tasmania.

#### 4C. HYMENOPHYLLUM Sm. SUBGENUS MECODIUM (Presl ex Copel.) Copel.

*Hymenophyllum* Sm. subgenus *Mecodium* (Presl ex Copel.) Copel. in Phil. Journ. Sci. LXIV (1937) 93. *Mecodium* Presl, Epim. Bot. (1851) 258, nomen;

Copel. in Phil. Journ. Sci. LXVII (1938) 17; Copel., Gen. Fil. (1947) 33; Atkinson in Phytomorphology X (1960) 26-36.

*Diplophyllum* van den Bosch, Eerste Bijlage (1861) 322, non *Diplophyllum* Lehm.

Epiphytic or rupestral ferns. *Rhizome* slender, creeping or very rarely short and stout. *Fronde* pinnately compound, the margin entire and glabrous or in 3 species toothed, the cell-walls mostly thin. *Involucre* deeply 2-lobed and divided to the base, valvate, without a definite tube. *Receptacle* included. *Sporangia* often spherical. *Spores* tetrahedral to globose, trilete, the exine thin-walled, papillate, granulate or scabrate, often large, sometimes up to  $90\mu$  in diam. *Gametophyte* green and ribbon-like, the spore germinating within the sporangium first by forming 2 cells with a cross wall, later into 3 cells due to a second wall which meets the first at the centre of the spore, so that a triangular plate is formed, a cell being cut off at the tip of each of the 3 arms, or in 2 New Zealand species (i.e. *Hymenophyllum scabrum* A. Rich. and *H. sanguinolentum* (Forst. f.) Sw.) secondary walls parallel to the first are formed thus making a 6-celled spherical plate in the unopened spore.

TYPE OF SUBGENUS: *Hymenophyllum sanguinolentum* (Forst. f.) Sw. (BASIONYM: *Trichomanes sanguinolentum* Forst. f.), endemic to New Zealand.

This is a subgenus of about 100 species many of which occur in the Southern Hemisphere. Thirteen species are represented in New Zealand, whereas 8 species occur in the tropical, subtropical and temperate rainforests of Australia, 3 of these species extend to Tasmania.

All the Australian species of subgen. *Mecodium* are characterized by a lamina with an entire margin except *Hymenophyllum samoense* Bak. (Samoa, Fiji to N.E. Queensland). In the latter species the margin is obscurely serrulate in some parts but mostly entire. *H. samoense* belongs to a small aberrant group of the subgenus *Mecodium* in which there is a toothed lamina, although otherwise it appears to be a typical member of this subgenus.

In Trans. Roy. Soc. N.Z. LXXXII (1954) 665, Brownlie recorded chromosome counts of  $n = 36$  for New Zealand material of *Hymenophyllum rarum* R. Br. (as *Mecodium rarum* (R. Br.) Copel.) and *H. villosum* Col. (as *Mecodium villosum* (Col.) Copel.). Later, in Trans. Roy. Soc. N.Z. LXXXV (1958) 213, he also recorded counts of  $n = 36$  for the following species collected in New Zealand, viz. *H. dilatatum* (Forst. f.) Sw. (as *Mecodium dilatatum* (Forst. f.) Copel.), *H. scabrum* A. Rich. (as *M. scabrum* (A. Rich.) Copel.) and *H. demissum* (Forst. f.) Sw. (as *M. demissum* (Forst. f.) Copel.), as well as  $n = 72$  for *H. sanguinolentum* (as *M. sanguinolentum* (Forst. f.) Presl) l.c. 215. Later, in Trans. Roy. Soc. N.Z. I (1961) 1 and 2, Brownlie obtained a count of  $n = 36$  on larger specimens of the last-mentioned species from a different locality in New Zealand. This is an interesting example of polyploidy within a species. In this paper he also recorded counts of  $n = 36$  for 2 other New Zealand species of this subgenus, viz. *H. pulcherrimum* Col. (as *Mecodium pulcherrimum* (Col.) Copel.) and *H. flexuosum* A. Cunn. (as *Mecodium flexuosum* (A. Cunn.) Copel.). A count of  $n = 36$  was recorded by Manton & Sledge in Phil. Trans. Roy. Soc. Lond., Ser. B., Biol. Sci. CCXXXVIII (1954) 144, for material of *H. flabellatum* Labill. collected in New South Wales. Manton & Sledge (l.c. 144) made a chromosome count of  $2n = 72$  (unpaired) for *H. javanicum* Spreng. which extends from Malaya and New Caledonia to North Queensland.

Although  $n = 36$  is very prevalent amongst the Australian and New Zealand species of the subgenus *Mecodium*, other numbers have been counted in material from India, Ceylon and Malaya. In "Cytology of Hymenophyllaceae" in Journ. Genetics LV (1957) 380, a count of  $n = 21$  was made by Mehra and Gurdip Singh for material of *Hymenophyllum exsertum* Wall. ex Hook. collected at Darjeeling, India. This number was also recorded by Manton & Sledge in 1954, l.c. 136, for specimens of this species collected in Ceylon. The latter cytologists also obtained a count of  $n = 21$  for Malayan material of *H. serrulatum* (Pr.) C. Chr. (l.c. 136). Mehra and Gurdip Singh cited a count of  $n = 27$  for specimens of the polymorphic species *Hymenophyllum polyanthos* Sw., collected at Darjeeling, whereas Manton & Sledge recorded  $n = 28$  for material of this species forwarded from Ceylon. According to Manton & Sledge this also gave clear proof of a monoploid number as low as 7 existing in this genus.

*Hymenophyllum whitei* Goy, *H. walleri* Maiden et Beteche, *H. javanicum*, *H. samoense* and *H. contiguum* (D. A. Smith) Tindale\* are found in the tropical rainforests of north-eastern Queensland, whereas *H. australe* Willd. and *H. flabellatum* Labill. range from south-eastern Queensland to Tasmania and *H. rarum* from the Blue Mountains of New South Wales to Tasmania, the 3 latter species being found in both subtropical and temperate rainforests. However *H. dilatatum* which is common in New Zealand has been deleted from the list of Australian species, because the records are very doubtful.

1. Stipe and the lower part of the main rachis not winged. Sori slightly immersed at the base. Fronds 2- or 3-pinnate-pinnatifid ..... *H. flabellatum* 1.
- 1.\* Main rachis winged, the wing usually continuous down the stipe.
  2. Sori free, terminal on the ultimate segments, often in pairs. Stipe broadly alate with a crisped or flat wing. Fronds 1- to 3-pinnate-pinnatifid .... *H. australe* 2.
  - 2.\* Sori immersed in the apices of the ultimate segments. Stipe with a short flat wing or unwinged. Fronds 1-pinnate-pinnatifid or rarely 2-pinnate-pinnatifid ..... *H. rarum* 3.

**1. *Hymenophyllum flabellatum* Labill.**, N. Holl. Pl. Sp. II (1806) 101, pl. 250; Hook. fil., Fl. Tasm. II (1858) 134; Benth., Fl. Austr. VII (1878) 705; F. M. Bail., Syn. Queensl. Fl. (1883) 688; F. M. Bail., Lith. Ferns Queensl. (1892) t. 30; Moore & Beteche, Handb. Fl. N.S.W. (1893) 504; F. M. Bail., Queensl. Fl. VI (1902) 1946; Rodway, Tasm. Fl. (1903) 290; Maiden & Beteche, Census N.S.W. Pl. (1916) 1; Ewart, Fl. Vict. (1931) 32; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114; Copeland in Phil. Journ. Sci. LXIV (1937) 125, pl. 62.

*Habitat* in subtropical and temperate rainforests, usually in mountain gullies, growing in large matted patches on rocks or as an epiphyte on trees, logs and tree-ferns. *Rhizome* long-creeping, wiry, light brown, 0.3 to 0.8 mm. in diam., usually extensively branched and more or less clothed especially at the nodes with woolly, pale ferruginous, unbranched hairs several cells in length. *Stipes* filiform or slender, not winged, slightly glossy or dull, dark brown, 1 to 15 cm. long, 0.2 to 0.5 mm. in diam., glabrescent except for a tuft of woolly hairs at the base. *Main rachis* sparsely clothed with a few, woolly hairs, winged near the apex of the frond. *Fronds* 5 to 35 cm. long including the stipes, pendulous or the small fronds erect. *Lamina* 2- or 3-pinnate-pinnatifid, pale green or yellowish-green, membranous or

\* *Footnote: Hymenophyllum contiguum* (D. A. Smith) Tindale comb. nov. (BASIONYM, *Mecodium contiguum* D. A. Smith in North Queensland Naturalist XIV, No. 80 (1946) 4, 5 (photo)).

herbaceous, glabrous or with a few, silky hairs, cultrate (6:1), narrowly lanceolate (6:1) to narrowly ovate (2:1) or elliptical (2:1), in the dwarfed fronds often deltoid, ovate (3:2) to orbicular (6:6), 4 to 20 cm. long, 1.2 to 5 cm. broad; marginal cell-walls thin, the internal cell-walls wavy. *Primary pinnae* flabellate or rhomboidal-ovate, deflexed at the apex, acuminate or often produced into a caudate tip, the 2 or 3 lowest pairs of pinnae distant but the upper pairs overlapping. *Lower secondary pinnae* pseudoflabellate, euneate at the base. *Ultimate segments* flat, 1 to 8 mm. long, 0.5 to 1 mm. broad, cultrate (6:1), narrowly oblong (3:1) to oblong (2:1), the margin entire, the apex obtuse or retuse. *Veins* free, dichotomous, not reaching the margin, often forked near the apex, glabrous. *Sori* indusiate, numerous, 0.5 to 1.5 mm. broad, terminal on the short lateral segments, on all parts of the lamina, slightly immersed at the base. *Involucre* firm, divided to the wing into 2 semiorbicular or conical, entire valves. *Receptacle* included, long and slender. *Sporangia* sessile or subsessile, turbinate, the annulus consisting of about 19 or 20 indurated cells and about 8 thin-walled cells. *Spores* tetrahedral to globose, trilete (the laesurae being long ridges), white or greenish, scabrate, equat. diam. 35-63 to 45 $\mu$   $\times$  polar diam. 30 to 41.25 $\mu$ . (No. 201, Pl. III.)

**DISTRIBUTION:** Australia (south-eastern Queensland, New South Wales, Victoria and Tasmania), New Zealand, Tahiti, Samoa, Lord Auckland Islands and possibly Fiji.

**HOLOTYPE:** Nova Hollandia et Terra Diemen, ex Herb. Labillardière, Herb. Webbianum (FI), examined. Labillardière's original description is affixed to this specimen. The fronds of the holotype are rather small, i.e. 3 to 10 cm. long (excluding the stipes) and 2 to 4.2 cm. broad. The outer row of laminal cells are not particularly thickened. NSW P1165 is a good match for the holotype except that the rachises of the former specimen are more pubescent.

**QUEENSLAND:** Roberts Plateau, Lamington National Park, epiphytic on tree trunks in rainforest, fronds very thin, pale green, Smith & Goy No. 73, 1.1938 (BRI); ditto, Shirley (BRI); Lamington National Park, epiphytic on *Nothofagus moorei* between Bethongabel and Mt. Wanunga, alt. ca. 3,800 ft., fronds pendulous, Smith No. 10932, 3.1960 (BRI 25783).

**NEW SOUTH WALES:** Head of the Bellenger River, Moore (NSW P2061); William's River, Fraser & Vickery 1.1934 (NSW P2057); Barrington Tops, brush of *Nothofagus* zone, Fraser & Vickery 1.1934 (SYD); Mt. Wilson, Blue Mountains, in rainforest on old log, basalt, Tindale & Constable 3.1952 (NSW P2039; K; BM; UC; MO; US; U); Waterfall Gully, Mt. Wilson, alt. 3,000 ft., pendulous from a rock ledge near the falls, in rainforest, basalt, Melville & Tindale 4.1953 (NSW P6399); Happy Valley, Mt. Wilson, Watts 12.1914 (NSW P1160); Mt. Wilson, Brough 7.1926 (SYD); bottom of Govett's Leap, Blackheath, Watts 4.1903 (NSW P1161); Blackheath, Vickery 9.1936 (NSW P2058); Lawson, Watts 4.1903 (NSW P1162); Wentworth Falls, on damp rocks, Major 4.1933 (SYD); Leura Falls, Stephenson (NSW P2062); Katoomba, Forsyth 12.1899 (NSW P1854); Minnamurra Falls, 3 miles W of Jamberoo, 1,200 ft. alt., in rainforest on boulder, in mist region, Judd 5.1954 (NSW P6788; UC); Broughton Creek, Bäuerlen 7.1888 (NSW P2065); Clyde River, Moore (NSW P1855); Sugar Loaf Mountain, Boorman 1.1915 (NSW P2063); ditto, Bäuerlen 8.1898 (NSW P2052);  $\frac{1}{2}$  mile NE Trig., Mt. Dromedary, Central Tilba, 2,000 ft. alt., plentiful on tree-fern trunks in rainforest, Constable 9.1953 (NSW P6643; UC; BM); Mt. Dromedary, Tilba Tilba, on trunk of *Dicksonia antarctica*, high on a mountainside, alt. 1,800 ft., Johnson & Constable 9.1960 (NSW P8188; K; BM; L; BRI; US; A; U; MO; LIL).

**VICTORIA:** Blacks Spur, Deane 1.1900 (NSW P2059); Acheron Way, treefern gully, Melvaine 1.1935 (NSW P1272) and 1.1935 (SYD); Fern-tree Gully, near Melbourne, Nisbet (NSW P5061); Kallista, Dandenong Range, in *Eucalyptus regnans-Dicksonia-Cyathea* forest, 1,200 ft. alt., epiphyte, rhizome filiform, creeping, fronds light green, Blake No. 7315, 1.1935 (BRI); Dandenong Ranges, E of Melbourne, pendulous from the branch of a tree in scrub along creek, Smith M97, 11.1943 (BRI); Lorne, Watts 11.1919 (NSW P1163); Otway Range, Williamson 12.1903 (NSW P2054).

**TASMANIA:** NORTH-WEST: Rosbery, Johnson 1.1949 (NSW P5302); Mt. Bischoff, Waller No. A14, 1903 (NSW P2053); Strahan, Vickery 1.1949 (NSW P5303). NORTH-EAST: Notley Fern Gorge, near Launceston, on a tree, in a rainforest gully, Gordon limestone, Tindale 12.1954 (NSW P7079); Mt. Barrow, Co. Dorset, Rupp 1.1922 (NSW P610); Moorina to St. Helens, on a tree-fern in beech forest, Ford 9.1950 (NSW P2846); St. Mary's Pass, Gunn No.

1514, 2.1846 (NSW P1772). SOUTH-EAST: Cascades Creek, Rupp 9.1920 (NSW P5060); Cascade Gully, Hobart, Lucas 5.1924 (NSW P1165); Eaglehawk Neck, Lucas 11.1924 (NSW P1164); Geeveston, Lucas 1.1901 (NSW P2055); Newdegate Caves, Hastings River, epiphytic on heavily shaded tree trunk in creek bed, Whaité No. 2210, 1.1961 (NSW P8174); without specific locality, Milligan (HO H1275).

ABSOLUTE SYNONYM: *Mecodium flabellatum* (Labill.) Copel. in Phil. Journ. Sci. LXVII (1938) 21; Wakefield in Vict. Nat. LVIII (1941) 108; Dobbie & Crookes, New Zealand Ferns (1952) 82, 83 (photograph).

EQUIVALENT SYNONYM: *Hymenophyllum nitens* R. Br., Prodr. N. Holl. (1810) 159; Hook. & Grev., Ic. Fil. II (1830-1) t. 197, LECTOTYPE: Derwent (Tasmania), R. Brown No. 98, Iter Austr., 1802-05 (BM), examined. ISOTYPES (K; E), examined. SYNTYPES: Van Diemen's Land, D. Nelson (BM), examined, and Van Diemen's Island, R. Brown (K).

This is a comparatively hardy but very variable species, as plants growing in well-sheltered situations in rainforest have narrow, attenuated fronds, whereas those from more exposed locations have shorter, more compact laminae.

*H. flabellatum* has a wide distribution in south-eastern Australia, New Zealand and Polynesia. In Australia it ranges from the mountains of south-eastern Queensland to Tasmania. It is relatively common in the subtropical rainforests of Lamington National Park, Queensland, as well as in the Blue Mountains and the South Coast of New South Wales. It is also found in the *Nothofagus moorei* temperate rainforests of the McPherson Range on the border of Queensland and New South Wales as well as those on the Upper Williams River, N.S.W. In addition it is widespread in the *Nothofagus cunninghamii* temperate rainforests of Victoria and Tasmania. This fern occurs at elevations from near sea-level (especially in Tasmania) to 3,800 ft., but it usually favours mountain gullies above 1,800 ft. The slender rhizomes with their delicate, pendulous fronds often wind for a yard or more up the trunks of *Cyathea* spp. or along rainforest trees or logs.

A chromosome count of  $n = 36$  for *Hymenophyllum flabellatum* was recorded by Manton & Sledge in Phil. Trans. Roy. Soc. Lond., Ser. B, Biol. Sci. CCXXXVIII (1954) 144. This count was made on material collected at Waterfall Creek, Mt. Wilson, Blue Mountains, N.S.W., by R. Melville No. 3773 and M. Tindale in April, 1953. In Trans. Roy. Soc. N.Z. LXXXII (1954) 665-6, Brownlie also recorded  $n = 36$  for material of this species collected in New Zealand.

2. *Hymenophyllum australe* Willd., Sp. Pl. V (1810) 527; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Ewart, Fl. Vict. (1931) 32; Melvaine in Proc. Linn. Soc. N.S.W., LXI (1936) 114; Copel. in Phil. Journ. Sci. LXIV (1937) 158, pl. 85.

*Habitat* in subtropical and temperate rainforests as well as in wet sclerophyll forests, rupestral or epiphytic, mostly growing on rocks in matted patches amongst mosses or sometimes on the trunks of trees or tree-ferns. *Rhizome* wiry, brown, long-creeping, branched, 0.1 to 1 mm. in diam., clothed with a few, pale ferruginous hairs. *Stipes* wiry, brown, 1.2 to 10.5 cm. long, 0.3 to 1 mm. broad, almost glabrous with a few, pale ferruginous hairs near the base, winged almost to the base, with the wing plane or slightly crisped. *Main rhachis* with a comparatively broad, plane or slightly crisped wing 1 to 3 mm. wide. *Lamina* 1- to 3-pinnate-pinnatifid, membranous, pale green when young, later dark green, erect or deflexed at the apex, narrowly lanceolate (6:1) to broadly ovate (6:5) or very narrowly elliptical (6:1) to elliptical (2:1), 2.5 to 14 cm. long and 1 to 5 cm. broad, the cell-walls obscurely pitted. *Primary pinnae* rhomboidal, 2 to 5 cm. long, spreading, often deflexed at the apex, deeply pinnatifid; lower 1 or 2 pairs often slightly shorter than the middle pinnae. *Secondary pinnae* again pinnatifid or irregularly forked. *Ultimate segments* flat or rarely slightly crisped, cultrate (6:1), the apex obcordate or truncate, the margin reinforced, i.e. two cells thick in some places. *Veins* conspicuous, simple or forked, not reaching the apex in the ultimate segments. *Sori* marginal, numerous, 2 sori often on closely proximal lobes, not sunken, terminal and solitary on the segments which are rarely constricted below the sori. *Involucre*

orbicular, ovate to broadly ovate, mostly broader than the ultimate segments, divided to or almost to the base into 2 valves each with an entire or slightly erose margin and an acute, broadly rounded, erose or obcordate apex. *Receptacle* enclosed in the early stages, club-shaped. *Sporangia* sessile, almost spherical or slightly turbinate, the annulus large, composed of 21 to 27 indurated cells and about 9 or 10 thin-walled cells, the dehiscence being obliquely lateral. *Spores* tetrahedral to almost globose, trilete, greenish, minutely scabrate, equat. diam. 27.5 to 37.5 $\mu$   $\times$  polar diam. 20.63 to 37.5 $\mu$ .

**DISTRIBUTION:** New Zealand and Australia (Queensland, New South Wales, Victoria and Tasmania).

**HOLOTYPE:** Nova Hollandia, Labillardière (Herb. Willdenow No. 20232), (B), two photographs examined.

**QUEENSLAND:** Nerang, Schneider (BR1); Springbrook, on rocks, White 1.1916 (BR1); McPherson Range, Tryon (BR1).

**NEW SOUTH WALES:** Whian Whian State Forest, ca. WNW of Byron Bay, alt. 2,050 ft., frequent on moist rocks in rainforest gully, basalt, Constable 1.1953 (NSW P6481); Upper William's River, Colyer 8.1932 (NSW P1270); Gosford, Deane 10.1888 (NSW P3894); Happy Valley, Mt. Wilson, Watts & Boorman 5.1915 (NSW P2069, P3838, P3835); ditto, alt. 3,200 ft., basalt, growing in a damp cave, Constable 12.1948 (NSW P5642); Mermaid's Cave Road, Blackheath, Stephenson (NSW P2066); The Canyon, Blackheath, Melvaine 4.1935 (NSW P1268); Valley of the Waters, Watts & Watts 12.1914 (NSW P3841); ditto, alt. 1,700 ft., on damp rocks in creek, sandstone country, Constable 2.1949 (NSW P5648); Hippocrene Falls, Rocky Creek, Valley of the Waters, 1,400 ft. alt., sandstone country, Constable 2.1948 (NSW P5649); Britannia Falls, Wentworth Falls, 1,650 ft. alt., on damp rocks in creek, sandstone country, Constable 2.1949 (NSW P5651); below Vera Falls, Valley of the Waters, Watts 9.1912 (NSW P3836); Lawson, Watts 4.1903 (NSW P3837); Mt. Kembla, Fletcher 11.1891 (NSW P1169); Cambewarra, Bäuerlen, 8.1886 (NSW P2800); Conjola, Heron 9.1899 (NSW P2068).

**VICTORIA:** Acheron Way, Melvaine 1.1935 (NSW P1269); Dandenong Ranges, Walter 1.1881 (NSW P2067); Kallista, Dandenong Range, in *Eucalyptus regnans-Dicksonia-Cyathea* forest, 1,200 ft. alt., epiphyte, fronds dark green, Blake No. 7314, 1.1935 (BR1); Cement Creek, Dandenong Range, in *Eucalyptus regnans-Nothofagus* forest, amongst moss, fronds light to dark green, 2,200 ft. alt., Blake No. 7247, 1.1935 (BR1); Dandenong Ranges, 20 miles E of Melbourne, Herb. Mueller (MEL); Lorne, Watts, 1919 (NSW P3832 and P1167).

**TASMANIA:** NORTH-EAST: Mt. Barrow, Co. Dorset, Rupp 1.1922 (NSW P6792); Notley Fern Gorge, near Launceston, 800 ft. alt., in rainforest gully, epiphytic on a tree, Gordon limestone, Tindale 12.1954 (NSW P7078); ranges near Scottsdale, Lucas 5.1924 (NSW P3892); St. Patrick's River, Gunn No. 1513, 10.1845 (NSW P1763). NORTH AND WEST: Hellyer Gorge, Davis 1.1937 (NSW P5920); Waratah, Lucas 12.1924 (NSW P3833); Gordon River, on tree trunks, in dense rainforest, alt. about 30 ft., Johnson 1.1949 (NSW P5618); The Acheron, Gunn No. 1513, 2.1845 (NSW P1890). SOUTH-EAST: Cascades Creek, Rupp 9.1920 (NSW P4938); Myrtle Gully, on rocks and fallen trees, Beadle 1.1935 (NSW P1271); Eaglehawk Neck, Lucas 11.1924 (NSW P3834); Geeveston, Lucas 1.1901 (NSW P606); Mt. Wellington, 2,000 ft. alt., Rodway 9.1913 (HO 5053).

**ABSOLUTE SYNONYMS:** *Sphaerocionium australe* (Willd.) Presl, Hymen. (1843) 35. *Mecodium australe* (Willd.) Copel. in Phil. Journ. Sci. LXVII (1938) 24; Wakefield in Vict. Nat. LVIII (1941) 10; Wakefield, Ferns of Victoria & Tasmania (1955) 4 f. 4, 5, photograph opposite 15.

**EQUIVALENT SYNONYMS:** *Hymenophyllum atrovirens* Col. in Tasm. Journ. Nat. Sci. II (1844) 186, HOLOTYPE: Waikare Lake, New Zealand, Colenso 12.1841 (WELT), not examined; ISOTYPE (K), examined. *Hymenophyllum intricatum* van den Bosch in Ned. Kruid. Arch. V, 3 (1863) 168, HOLOTYPE: Van Diemen's Land (i.e. Tasmania), ad rupes juxta fl. St. Patrick, Gunn (L910, 38 . . . 102), (L), examined. *Mecodium atrovirens* (Col.) Copel. in Phil. Journ. Sci. LXXIII (1940) 457.

This species was misidentified as *Hymenophyllum javanicum* auctt. non Spreng., in Benth., Fl. Austr. VII (1878) 705; Moore & Betche, Handb. Fl. N.S.W. (1893) 504; Rodway, Tasm. Fl. (1903) 290.



Two photographs of the holotype of *Hymenophyllum australe* were kindly forwarded to me by the courtesy of the Director of the Berlin-Dahlem Herbarium, Germany. There are 2 species represented on this sheet, i.e. a specimen of *H. australe* and 2 fronds of *H. rarum*. Willdenow's original description referred to the involucre as being ovate, emarginate at the apex and obtusely bidentate which features are characteristic of the fern traditionally known as *H. australe*. However the involucre of *H. rarum* are entire and acute or rounded at the apex but never bidentate. According to van den Bosch's note on the type sheet, the material of *H. australe* is sterile but presumably Willdenow examined at least one other specimen. Sori are present on the material of *H. rarum* mounted on the type sheet of *H. australe*.

There has been a good deal of controversy about whether *H. atrovirens* of New Zealand is identical with *H. australe* collected in Australia. A specimen of the former collected at Lake Ada, Milford Sound, New Zealand, is very similar to NSW P2066 from Mermaid's Cave, Blackheath, N.S.W.

*H. australe* is closely related to *H. flexuosum* A. Cunn. which is a New Zealand species with more rounded involucre and very crisped wings on the stipes and rhachises. In all the specimens of *H. flexuosum* which I have examined, there is a border of cells one row thick on the stipes and rhachises, whereas in *H. australe* this border is sometimes composed of 2 cells in part of the lamina. A chromosome count of  $n = 36$  was recorded for *H. flexuosum* by Brownlie in Trans. Roy. Soc. N.Z. 1 (1961) 1, 2.

In *H. javanicum* Spreng. which has frequently been confused with *H. australe*, the border of the lamina is one cell thick and is composed of oblique (instead of vertical) cells, at least in the New Caledonian specimens which I have examined. The segments of the lamina are very crisped and the apex of the oblong involucre is lacerated, e.g. in McKee No. 2499 and Vieillard No. 2286. Manton & Sledge made a count of  $2n = 72$  (unpaired) for material of *H. javanicum* collected in Ceylon (see Phil. Trans. Roy. Soc. Lond., Ser. B, Biol. Sci. CCXXXVIII (1954) 144). On the other hand Mehra & Gurdip Singh published a count of  $2n = 108$  from material of *H. javanicum* collected at Darjeeling (see Journ. Genetics LV (1957) 391).

*H. australe* is a fairly common species in south-eastern Australia especially in the subtropical rainforests of the Blue Mountains, N.S.W., as well as in the *Nothofagus cunninghamii* temperate rainforests of Victoria and Tasmania. It sometimes grows with *H. flabellatum* and *Polyphlebium venosum* on tree trunks.

Plants of *H. australe* are usually characterized by a plane wing on the stipes and rhachises. Amongst the specimens cited above, only one collection (viz. NSW P3832) from Lorne, Victoria, has a markedly crisped wing but in NSW P5618 from the Gordon River, Tasmania, the wing is slightly crisped.

**3. *Hymenophyllum rarum* R. Br., Prodr. Fl. N. Holl. (1810) 159; Benth., Fl. Austr. VII (1878) 705; Moore & Betche, Handb. Fl. N.S.W. (1893) 504; Rodway, Tasm. Fl. (1903) 290; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Ewart, Fl. Vict. (1931) 32; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114.**

*Habitat* subtropical and temperate rainforests, pendulous, forming large, matted patches on rocks, tree-ferns (*Dicksonia antarctica*) and trees (especially *Nothofagus cunninghamii* and *Tristania laurina*), often in rocky gorges. *Rhizome* long-creeping, much branched, wiry, black or very dark brown, glossy, cylindrical, 0.1 to 0.2 mm. in diam., sparsely clothed with hairs which are red-brown, simple and septate. *Stipes* unwinged or sometimes with a very narrow wing almost to the base of the stipes, 0.5 to 5 cm. long, 0.1 to 0.4 mm. broad, wiry, filiform, distant or often proximal, black or very dark brown, dull or slightly glossy, smooth, glabrous except for a few, red-brown, septate, simple hairs at the base. *Main rhachis* usually alate throughout its length with a minute, plane wing. *Fronds* 1-pinnate-pinnatifid or rarely 2-pinnate-pinnatifid, 2 to 14 cm. long including the stipes, with a peculiar odour. *Lamina* 1.5 to 10.5 cm. long, 1 to 2.5 cm. broad, glabrous, pale green when fresh, dark green when dried, membranous, flaccid, irregularly and very narrowly elliptical (6: 1) or broadly oblong (3: 2), the internal cells wavy-thickened especially the lamina. *Primary pinnae* 5 to 20 mm. long, 1 to 9 mm. broad, widely spaced,

seldom imbricate, rarely simple, mostly 2- to 6-lobed, the lower pairs of pinnae shorter and less divided. *Secondary pinnae* simple or bifid. *Ultimate segments* flat, linear to narrowly oblong, entire, erecto-patent, 1-veined, mostly 3 to 12 mm. long, 0.5 to 1.5 mm. broad; apices obtuse or truncate. *Veins* simple, not reaching the apex of each segment. *Sori* indusiate, marginal, usually 3 to 15 per frond, mostly near the apex of the lamina, immersed in the dilated tips of the ultimate segments and bordered by conspicuous veinlets. *Involucre* 1 to 2.2 mm. long, 1 to 3 mm. broad, valvate, divided to the middle or lower into 2 lips, broadly rhomboidal, cuncate at the base; apex broadly rounded or often pointed; margin glabrous, entire or undulate, composed of rectangular cells. *Receptacle* included, very slender. *Sporangia* sessile, turbinate, the annulus composed of 16 to 26 indurated cells and 7 to 11 thin-walled cells. *Spores* subtriangular to globose, trilete, greenish, the lacunae being long, low ridges, the surface subgranulate, equat. diam.  $33.75$  to  $75\mu$   $\times$  polar diam.  $30$  to  $60\mu$  in the material from New South Wales and Victoria but  $26.25$  to  $48.75\mu$   $\times$   $26.25$  to  $37.5\mu$  in the specimens from Tasmania. (No. 201, Pl. II, f. 3.)

DISTRIBUTION: Australia (Coast and Tablelands of New South Wales, Victoria and Tasmania) as well as New Zealand, the Stewart, Chatham and Auckland Islands.

LECTOTYPE: Derwent, R. Brown No. 97, Iter Austr., 1802-05 (BM). ISOTYPES: (K; MEL). SYNTYPE: Van Diemen's Land, R. Brown (K); Van Diemen's Island, R. Brown 1804 (BM; NSW P8426).

NEW SOUTH WALES: Happy Valley, Mt. Wilson, Watts & Boorman 5.1915 (NSW P612, P1125, P1287); ditto, Watts 12.1914 (NSW P1124); pass above Kiama, Moore 2.1890 (NSW P1853; MEL); Minnamurra Falls, 3 miles W of Jamberoo, in a subtropical rainforest, growing on the face of a boulder in a ravine, 1,200 ft. alt., Judd 5.1954 (NSW P6785); ditto, on moist rocks in deep sheltered rocky gorges, Judd 7.1956 (NSW P7420); ditto, Judd 5.1955 (NSW P7165).

VICTORIA: Mt. Ellery, East Gippsland, among shaded granite boulders in wet fern gully on eastern slopes at about 3,500 ft. alt., Willis 12.1951 (MEL); Mt. Drummer, East Gippsland, fairly abundant on trunks of *Tristania* and *Dicksonia*, Wakfield 1.1939 (NSW P611); Pipeclay Creek, Orbost, Wakfield 8.1940 (NSW P1284); Cumberland Creek, near Marysville, Singleton 4.1943 (MEL); Cement Creek, 4 miles N of Warburton-Acheron Way crossing, on *Nothofagus* trunks, Swaby 1.1948 (MEL); Sealers Cove, Wilson's Promontory, F. Mueller 8.1954 (MEL); McCrae Creek, Beenak, about 12 miles NE of Gembrook, on the gnarled mossy buttresses of old myrtle beeches (*Nothofagus cunninghamii*), Willis & Bond 7.1948 (MEL); Melba Gully at the head of the Johanna River, Otway Ranges, on tree-fern butts in *Nothofagus* forest, Singleton 1.1943 (MEL); Weeaprounah, towards Cape Otway, SW of Melbourne, grows only on *Nothofagus*, Swaby 1.1932 (NSW P1297); Beech Forest, Otways, Swaby 12.1931 (MEL); Apollo Bay, Mueller (MEL); Otway Forest, Swaby 1.1931 (MEL).

TASMANIA: NORTH-WEST: Mt. Bischoff, Waller No. A13, 1903 (NSW P1285); Corinna, in rainforest, flood bank, Jackson 1.1954 (HO 5044). NORTH-EAST: head of the Don River, on trunks of tree-ferns, Rupp 1.1915 (MEL); Ranges near Scottsdale, Lucas 5.1924 (NSW P1120); Mt. Victoria, head of Ringarooma River, Glover 1883 (MEL); Mt. Barrow, Co. Dorset, Rupp 1.1922 (NSW P5638); ditto, 3,300 ft. alt., on tree-ferns in temperate rainforest, Burns 6.1962 (NSW P8435). CENTRAL: Gordon Vale Track, 1 mile from the Florentine River, epiphytic on tree trunk in beech forest, common, fronds 2-3 inches high, Whaite No. 2410, 2.1961 (NSW P8171); River Gordon, Macquarie Harbour, forest, Gunn No. 1512 (NSW P1761); west side of Lake St. Clair, growing on face of rock in *Fagus* (i.e. *Nothofagus*) forest, Gunn No. 1512, 1.1847 (NSW P1819). SOUTH-EAST: Cascade Gully, Hobart, Lucas 5.1924 (NSW P1121); Myrtle Gully, Hobart, 1,000 ft. alt., creeping plant, Olsen 9.1936 (HO H1277); Collinsvale in myrtle forest, in moist gully, on stem of tree-fern, 1,000 ft. alt., Atkinson 7.1930 (HO 5046); Newdegate Cave, Hastings River, epiphytic on fallen tree in thick scrub on limestone, Whaite No. 2208, 1.1961 (NSW P8173); Bruny Island, between Adventure Bay and Lunawanna, 1,000 ft. alt., in rainforest on Forestry Roads, climbing up tree-trunks, Phillips 2.1962 (NSW P8339).

ABSOLUTE SYNONYM: *Mecodium rarum* (R. Br.) Copel. in Phil. Journ. Sci. LXVII (1938) 21; Crookes & Dobbie, New Zealand Ferns, ed. 5 (1952?) 60, 61 (photo).

EQUIVALENT SYNONYMS: *Hymenophyllum semibivalve* Hook. et Grev., Ic. Fil. 1 (1828) t. 83. HOLOTYPE: N. Zealand, A. Menzies, labelled *Hym. asplenioides* (K), examined. Hooker & Greville stated that the specimens collected by Menzies were labelled *Hym. asplenioides*. The fronds on the sheet at Kew Herbarium are not those figured on t. 83 in Hooker & Greville's *Icones Filicum* but they belong to the same species. *Hymenophyllum imbricatum* Col. in Tasm. Journ. Nat. Sci. II (1846) 187, non Blume 1828. ISOTYPE?: A specimen at Kew Herbarium labelled by Colenso as "fol. 5. *H. imbricatum* Col. haud facile cum *H. raro conjungam*". examined. *Hymenophyllum gunnii* Bak. in Hook. & Bak., Syn. Fil. (1874) 463, HOLOTYPE: Van Diemen's Land, Gunn (i.e. York Town, R. C. Gunn 23.10.1844). (K), examined.

In a letter dated 16th February, 1861, written by van den Bosch from Goes, Zealand, Netherlands, to Sir William Hooker (letter No. 374, Vol. XLVIII, Correspondence from France 1858-65, Germany 1855-61, at Kew), there is the following paragraph "Among the specimens of *Hymenophyllum rarum* of your Herbarium there occurred specimens gathered by Mr. Gunn in van Diemen's Land. Believing them to be new, I determined them as *H. gunnii* n. sp. but afterwards I perceived my mistake and hold them now not different from *H. australe* W. to which belong also the specimens of Menzies in the same envelope." However, Baker published *H. gunnii* in Hooker & Baker's *Synopsis Filicum*, ed. 2 (1874) 463, attributing it to van den Bosch. NSW P1120 collected by Lucas in the Ranges near Scottsdale, Tasmania, is the best match for the holotype cited above.

Some forms of *H. rarum* have comparatively undivided fronds, e.g. NSW P1761 collected by Gunn at the Gordon River, Tasmania, and NSW P1125 obtained at Happy Valley, Mt. Wilson, N.S.W., by Watts & Boorman. In these specimens a sorus may terminate a simple primary pinna especially towards the apex of the lamina, although some fronds in both collections have more divided pinnae. Other specimens, e.g. NSW P1120 from the ranges near Scottsdale, Tasmania, have deeply lobed primary pinnae, e.g. up to 9 ultimate segments. The type collections of both *H. rarum* and *H. gunnii* represent the more divided form of this species with narrow segments.

*Hymenophyllum imbricatum* Col. is a form of *H. rarum* from New Zealand but it is characterized by very imbricate pinnae. Two syntypes were cited by Colenso, viz. 1) on edges of rocky precipices, in dry spots overhanging water, at Pataua, near Wangarei, E. Coast, 1842, and 2) on reclining timber, in woods between Wangarei and the Bay of Islands, 1840. No locality was cited on the specimen of *H. imbricatum* collected by Colenso at Kew Herbarium.

*Hymenophyllum capense* Schrad. of South Africa, is very closely allied to the New Zealand form of *H. rarum* (especially Ruahine Range, New Zealand H.1919 (BR1 28943) ) which is characterized by narrow overlapping segments and closely spaced primary pinnae. I wish to thank Dr. E. A. Schelpe for the material of *H. capense* which he so kindly forwarded.

In Trans. Roy. Soc. N.Z. LXXXII (1954) 665, Brownlie recorded a chromosome count of  $n = 36$  for material of *H. rarum* collected in New Zealand.

#### 4D. HYMENOPHYLLUM SUBGENUS MERINGIUM (Presl) Copel.

*Hymenophyllum* subgenus *Meringium* (Presl) Copel. in Phil. Journ. Sci. LXIV (1937) 14. *Meringium* Presl, Hymen. (1843) 116, as a genus; Copel. in Phil. Journ. Sci. LXVII (1938) 39; Copel., Gen. Fil. (1947) 35.

*Myrmecostylum* Presl, Hymen. (1843) 27, pl. 10A.

*Ptychophyllum* Presl, Hymen. (1843) 28, pl. 11F.

Mostly small, epiphytic ferns. *Rhizome* creeping, narrow. *Lamina* pinnately decomposed, mostly with thick, pitted cell-walls; margin minutely serrulate or rarely entire, never hairy. *Axes* alate, with a narrow wing 1 cell thick on the minor axes or on all the axes, usually hairy on the lower surface. *False veins* absent. *Involucre* tubular at the base, with 2 large lips. *Receptacle* slender and usually long-exserted (except included or slightly exserted in *Hymenophyllum bivalve*). *Sporangia* large, sessile, maturing from the top of the receptacle downwards. *Spores* tetrahedral or globosc-tetrahedral.

TYPE OF SUBGENUS: *Hymenophyllum meyenianum* (Presl) Copel. (a synonym of *Hymenophyllum serrulatum* (Presl) C. Chr.), a native of the Philippines, Sumatra, Malaya to New Guinea.

This is a comparatively large subgenus of about 60 species some of which are found in Malaysia, New Zealand and Australia but other species do occur in Formosa, Ceylon, Africa and non-tropical South America. *H. kerianum* Watts, *H. pseudotunbridgense* Watts, *H. babindae* Watts, and *H. lobbii* Moore are found in the tropical rainforests of north-eastern Queensland, whereas *H. bivalve* (Forst. f.) Sw. occurs in New South Wales and south-eastern Queensland.

Unlike the other genera and subgenera of the *Hymenophyllum*-group found in south-eastern Australia, subgenus *Meringium* is characterized by an involucre with a well-developed tube. Because of the indefinite receptacle and the form of the involucre, subgen. *Meringium* appears to be more closely related to the *Trichomanes*-group of genera.

The subgenus *Hymenophyllum* appears to be joined to subgen. *Meringium* by several dwarf species, viz. *H. pumilum* Moore (New South Wales), *H. moorei* Bak. (Lord Howe Island), *H. pumilio* Ros. (New Caledonia) and *H. minimum* A. Rich. (New Zealand). It is difficult to ascertain by the degree of dissection of the involucre in which subgenus these tiny species should be placed.

Very few chromosome counts have been made for members of subgenus *Meringium* but the base numbers so far recorded are 7, 11 and 13. Brownlie made a count of  $n = 22$  for *Hymenophyllum bivalve* (Forst. f.) Sw. (as *Meringium bivalve* (Forst. f.) Copel.) in Trans. Roy. Soc. N.Z. LXXXV (1958) 213. He also recorded  $n = 26$  for *Hymenophyllum multifidum* (Forst. f.) Sw. (syn. *Meringium multifidum* (Forst. f.) Copel.) in Trans. Roy. Soc. N.Z. LXXXII (1954) 665-6. Manton recorded a count of  $n = 21$  for *Hymenophyllum serrulatum* (Pr.) C. Chr. (syn. *Meringium meyenianum* Presl) in the Appendix to Holtum, Ferns of Malaya (1954) 623. A relationship is suggested to several members of subgen. *Hymenophyllum*, e.g. *H. peltatum* ( $n = 11$ , Brownlie), *H. revolutum* Col. ( $n = 22$ , Brownlie), *H. wilsonii* ( $n = 18$ , Manton) and *H. tunbridgense* ( $n = 13$ , Manton).

The base numbers 9, 11 and 13 have been recorded for the subgen. *Hymenophyllum* whereas the base number 9 has been consistently found in species of the subgen. *Meeodium*.

***Hymenophyllum bivalve*** (Forst. f.) Sw. in Schrad. Journ. II (1800), 1801, 99; Swartz, Syn. Fil. (1806) 146, 372; Hook., Sp. Fil. I (1846) 98, pl. 35D; C. Chr., Ind. Fil. (1905) 357; Cheeseman, Man. N.Z. Fl. (1925) 15; Copeland in Phil. Journ. Sci. LXIV (1937) 66, pl. 30, f. 4-6.

*Habitat* in temperate or subtropical rainforests either terrestrial in large matted patches, growing on boulders in ravines in mist regions or as an epiphyte on tree trunks or old logs. *Rhizome* long-creeping, wiry, branched, 0.3 to 0.8 mm. in diam., clothed sparsely especially at the nodes with hairs which are dark brown, appressed, 2 to 6 cells in length, with a pointed terminal cell and a spur at the base; rootlets densely villous. *Stipes* wingless, dark brown, dull, cylindrical, smooth or very slightly scabrous, terete, 3 to 11 cm. long, 0.2 to 0.8 mm. in diam., sparsely clothed towards the apex and base with similar hairs to those on the rhizome. *Main rhachis* dark brown, flexuose, narrowly winged throughout, glabrous or sparsely clothed with a few, weak, appressed, dark brown, unbranched hairs about 4 to 6

cells in length. *Fron*ds 8 to 35 cm. long including the stipes, pendulous in epiphytic plants. *Lamina* 3-pinnate-pinnatifid, submembranous to herbaceous, green when fresh, brown when dried, rather rigid, deltoid or lanceolate (3: 1) to very broadly ovate (6: 5), usually 5.5 to 12 cm. long, 2.5 to 7 cm. broad, rarely up to 15 cm. broad, the apex usually deflexed, acute or acuminate, the internal cell-walls smooth or crenately thickened. *Primary pinnae* with petiolules which are usually winged on the upper side, often upcurved, alternate, mostly 1.2 to 6 cm. long, 1.5 to 3 cm. broad, deltoid or ovate-lanceolate, the apex acute or obtuse. *Secondary pinnae* with winged petiolules, rhomboidal, alternate, again pinnatifid or 2-pinnatifid, the apex obtuse. *Secondary rhachises* winged throughout. *Ultimate segments* plane, cultrate (6: 1) to narrowly oblong (3: 1), the apex obtuse, the margin spinulose-dentate. *Veins* free, dichotomous, not reaching the apex of the ultimate segments, glabrous or with an occasional, red-brown, unbranched hair. *Sori* indusiate, marginal, numerous, mainly towards the apex of the frond, terminal on the short ultimate segments, immersed at the base. *Involucre* 0.8 to 1 mm. long, 0.5 to 1 mm. broad, orbicular to oval, entire, cuneate at the base, 2-valved almost to the base. *Receptacle* included or slightly exerted, conico-cylindrical. *Sporangia* turbinate, with an annulus consisting of 23 to 25 thick-walled cells and about 7 to 9 thin-walled cells. *Spores* globose-tetrahedral, trilete, minutely papillate, equat. diam. 45 to 56.25 $\mu$   $\times$  41.25 to 52.5 $\mu$ .

**DISTRIBUTION:** Australia (south-eastern Queensland and the lower Central Coast of New South Wales) and New Zealand (including Stewart and Chatham Islands).

**LECTOTYPE:** "No. 301.466, labelled *Trichomanes bivalve*, G. Forster's Herbarium" with "New Zealand" added in pencil (BM), examined. This is a good match for D. A. Goy & L. S. Smith No. 72 which was collected at Roberts' Plateau, Lamington National Park, south-eastern Queensland. I have also examined a fertile specimen of *Hymenophyllum bivalve* collected by Forster but without a specific locality (UPS) and a sterile fragment collected by Forster in the Society Islands (Herbar. Filic. Luerss. No. 10923), Kaulfuss No. 2601 (P).

**QUEENSLAND:** Roberts' Plateau, Lamington National Park, very common as an epiphyte on tree trunks but also as a terrestrial plant among moss, Goy & Smith No. 72, 1.1938 (NSW P1286; BR1); ditto, on a tree trunk, Shirley (BR1); Moreton District, Lamington National Park, alt. about 3,000 ft., common on mossy fallen tree trunks in rainforest, Goy & Smith 12.1942 (BR1); ditto, near Picnic Rock, Smith 12.1943 (BR1); Lamington National Park, Elbana Falls track, alt. ca. 2,800 ft., growing on the bases of tree trunks in rainforest, Smith & Tindale 8.1956 (NSW P7454); Lamington National Park, epiphytic on *Nothofagus moorei* between Bethongabel and Mt. Wanungra, Smith No. 10911, 3.1960 (BR1; NSW P8144).

**NEW SOUTH WALES:** Minnamurra Falls, 3 miles W of Jamberoo, 1,200 ft. alt., on the face of a boulder, in rainforest, in the mist region, Judd 5.1954 (NSW P6786); above Minnamurra Falls, on the road to Robertson, alt. 2,200 ft., in cleft of rock, in a rainforest ravine, above the stream, Judd 5.1955 (NSW P7164); Cambewarra, Bäuerlen (BR1); Brogher's Creek, near Broughton Creek (on the Shoalhaven River), Bäuerlen 7.1884 (NSW P1906).

**ABSOLUTE SYNONYMS:** *Trichomanes bivalve* Forst. f., Prodr. (1786) 84. *Sphaerocionium bivalve* (Forst. f.) Pr., Hymen. (1843) 33. *Meringium bivalve* (Forst. f.) Copel. in Phil. Journ. Sci. LXVII (1938) 44; Crookes & Dobbie. New Zealand Ferns, ed. 5 (1952) 58, 104.

**EQUIVALENT SYNONYMS:** *Hymenophyllum spathulatum* Colenso in Tasm. Journ. II (1844) 184, HOLOTYPE: on living trees, shores of Waikare Lake, W. Colenso 12.1841 (not examined). *Hymenophyllum pyriforme* v.d. Bosch in Ned. Kruid. Arch. V, 3 (1863) 173, HOLOTYPE: New Zealand, d'Urville (H. Franq.). (B), not examined.

*Hymenophyllum bivalve* is a rare species in New South Wales where it has been recorded from mountain rainforests on the lower Central Coast. Until it was collected by Judd at the Minnamurra Falls Reserve, 3 miles west of Jamberoo, N.S.W., in 1954, no specimens had been recorded from this State since Bäuerlen's collections were made seventy years previously.

This fern is found at elevations of over 1,000 ft., usually in subtropical rainforests but also extending into the *Nothofagus moorei* rainforests especially in south-eastern Queensland. This

species often occurs in mist regions particularly on boulders in ravines but otherwise it is found as an epiphyte on living trees or old logs or less frequently it is terrestrial.

The material of *H. bivalve* from New Zealand is very similar to that from eastern Australia. In Trans. Roy. Soc. N.Z. LXXXV (1958) 213, Brownlie recorded a chromosome count of  $n = 22$  for a specimen collected at North Westland, New Zealand (Brownlie No. 137).

### III. THE GROUP OF TRICHOMANES

The following 7 genera which occur in south-eastern Australia, are recognized as belonging to this group:—*Microgonium*, *Crepidomanes*, *Gonocormus*, *Polyphlebium*, *Macroglena*, *Cephalomanes* and *Selenodesmium*. They are construed here in the sense of Copeland in *Genera Filicum* (1947). All these genera are characterized by tubular or obconic involucre mostly with a truncate or trumpet-shaped mouth, although in some species of *Crepidomanes*, e.g. *C. bipunctatum* (Poir.) Copel., it is distinctly 2-lipped.

The *Trichomanes*-group of species is generally believed to have been reduced from the *Hymenophyllum*-group due to their smaller size, as well as to the absence of true roots in some of the minute species and sometimes the xylem absent or reduced to one tracheid. The false veins in *Microgonium* and *Crepidomanes* are also thought to have been reduced from true veins. The sporangia in the *Hymenophyllum*-group are large and usually almost spherical, whereas those of the *Trichomanes*-group are minute, compressed bodies.

According to Bower (*The Ferns* II (1926) 244) the prothallus of the *Trichomanes*-group of species is filamentous, branched, resembling a green Alga, with the archegonia produced at the end of short branches called archegoniophores, whereas in the *Hymenophyllum*-group the prothallus is flattened, strap-like, never cordate, with antheridia and archegonia borne together on a lateral lobe.

#### 5. MICROGONIUM Presl

*Microgonium* Presl, *Hymen.* (1843) 19, pl. 6; van den Bosch, *Hymen. Javan.* (1861) 5; Copel. in *Phil. Journ. Sci.* LXVII (1938) 61; Copel., *Gen. Fil.* (1947) 39.

*Hemiphlebiium* Presl sect. *Microgonium* Prantl, *Hymen.* (1875) 48.

Copeland in *Phil. Journ. Sci.* LI (1933) 196, treated *Hemiphlebiium* Presl as a group of *Trichomanes* L. In *Ferns of Malaya* (1954) 91, Holttum regarded *Microgonium* as a subgenus of *Trichomanes*.

Tiny, epiphytic ferns. *Rhizome* creeping, filamentous, usually without roots, densely clothed with hairs. *Fronde*s usually simple or sometimes lobed, often orbicular, suborbicular or obovate-euneate, the surface glabrous, the venation straight. *Veins* pinnate or flabellate, sometimes with an intramarginal strand. *False veinlets* (single rows of darker cells which are usually narrower than the ordinary cells of the lamina) always present. *Involucre* elongated, free or immersed, narrowly tubular to trumpet-shaped, the mouth dilated and entire or slightly 2-lipped. *Receptacle* usually exserted. *Sporangia* sessile, compressed. *Spores* tetrahedral to globose-tetrahedral, often granulate.

TYPE OF GENUS: *Microgonium cuspidatum* (Willd.) Presl (BASIONYM: *Trichomanes cuspidatum* Willd.) of the East African Islands.

This is a genus of about 12 species ranging from Africa to Tahiti, Formosa and Australia with 1 species in Central America. According to Copeland in *Genera Filicum* (1947) 40, the species of *Microgonium* might be derived from *Crepidomanes* by extreme reduction of the fronds which are mostly simple in *Microgonium* but pinnately compound in the other genus. The lamina in both genera is characterized by false veinlets or striae. Some species of *Microtrichomanes*, e.g. *M. vitiense* (Bak.) Copel., are closely related to *Microgonium* but lack the false veinlets. The plants of *Microgonium* spp. as a whole are more reduced in size than those of any other genus formerly included in *Trichomanes* sens. lat.

There are 4 species of *Microgonium* in the rainforests of tropical north-eastern Queensland but only one of them, viz. *M. tahitense*, is believed to extend to the subtropical North Coast of New South Wales. However *M. bimarginatum* v.d. B. occurs as far south as Eudlo which is about 50 miles north of Brisbane, Queensland.

A chromosome count of  $n = 34$  was made on Malayan material of *Microgonium motleyi* van den Bosch by Manton & Sledge in *Phil. Trans. Roy. Soc. Lond., Ser. B, Biol. Sci.* No. 654, CCXXXVIII (1954) 136. This tiny epiphytic species extends to the rainforests of north-eastern Queensland. I have examined the holotype of *Trichomanes sayeri* F. Muell. et Bak. which was collected by Sayer at Trinity Bay, north-eastern Queensland (BR1 32774), and consider it to be identical with *M. motleyi*.

1. Fronds sessile and peltate. Submarginal vein in the lamina absent . . . . . *M. tahitense* 1.  
 1.\* Fronds stipitate and non-peltate. Submarginal vein in the lamina present . . . . .  
 . . . . . *M. bimarginatum* 2.

**1. *Microgonium tahitense* (Nadeaud) Tindale** in *Contrib. N.S.W. Nat. Herb.* Fl. Ser. 201 (1963) 4.

*Habitat* in tropical and subtropical rainforests on tree-trunks or on dripping rocks. *Rhizome* long-creeping, wiry, about 0.2 mm. in diam., densely tomentose with almost black, unbranched hairs up to 4 cells in length. *Fronds* sessile, overlapping, almost glabrous above, clothed fairly densely with dark red to black, unbranched hairs along the abaxial surface of the veins, peltate, attached to the rhizome near the centre or towards the base of the lamina, appressed to the bark or surface upon which the plant is growing, 0.4 to 2.5 cm. in diam., oblate (4:3) to orbicular (6:6), thin, membranous, the surface wavy with concentric undulations, the margin not thickened, entire or often crose, easily torn. *Veins* numerous, radiating from the point of attachment to the rhizome, forked (sometimes several times), ending close to the margin. *False veins* present between the true veins especially towards the periphery of the lamina. *Sori* few, 1 to 3 on each frond, scattered, partly embedded in the lamina and partly exerted beyond the margin. *Involucre* tubular, elongated, coriaceous, 2 to 3 mm. long, the tube 0.4 to 0.5 mm. broad, the base cuneate, the rim much dilated, spreading, entire, slightly 2-lipped, about 0.5 to 1.0 mm. in diam. *Receptacle* slightly exerted or not exerted. *Sporangia* subsessile, compressed-turbinate, with an oblique annulus composed of 17 to 23 indurated cells and about 4 to 5 thin-walled cells. *Spores* tetrahedral to globose-tetrahedral, trilete, green, the exine granulate, equat. diam. 30 to 39.38 $\mu$   $\times$  polar diam. 24.38 to 31.88 $\mu$ . (No. 201, Pl. V, f. 3.)

**DISTRIBUTION:** Samoa, Tahiti, Fiji, Rarotonga, New Caledonia, New Hebrides, New Guinea, Amboina, Java and Australia (north-eastern Queensland probably extending to the North Coast of New South Wales).

HOLOTYPE: Vallée de Papenoo, Tahiti, Nadeaud.

QUEENSLAND: Palm Camp, Bellenden Ker, Bailey 1889 (BRI, part of 30483); Freshwater Creek, North Cairns, Bailey (NSW P2136, P3754; BRI); Trinity Bay, Bailey ex Herb. Mueller (K); Range, Trinity Bay, on trees (BRI).

ABSOLUTE SYNONYM: *Trichomanes tahitense* Nadeaud, Énum. des Plantes Indigènes de l'île de Tahiti (1873) 18.

EQUIVALENT SYNONYMS: *Trichomanes peltatum* Bak. in Journ. Linn. Soc. IX (1866) 336, t. 8 f. C, non *T. peltatum* Poir. (1808), HOLOTYPE: Samoa, Powell No. 125, 7.1864 (K), examined. *Microgonium omphalodes* Vieill. ex Fourn. in Ann. Sci. Nat., Sér. V, XVIII (1873) 255 (published in synonymy for *Trichomanes peltatum* Bak. and therefore illegitimate); Copel. in Phil. Journ. Sci. LXVII (1938) 63, HOLOTYPE: Samoa, Powell No. 125, 7.1864 (K), examined. *Trichomanes pannosum* Cesati in Rend. Ac. Napoli XVI (1877) 24, 28, HOLOTYPE: Terra dei Papuas, M. Arfak a Putat, Beccari 10.1872 (RO), examined. *Hemiplilebium peltatum* (Bak.) Luerss. in Bot. Centralbl. XI (1882) 28, based on *T. peltatum* Bak. *Trichomanes omphalodes* C. Chr., Ind. Fil. (1906) 646; Copel. in Phil. Journ. Sci. LI (1933) 203, pl. 31, f. 1-6.

Both *Trichomanes tahitense* Nadeaud and *Microgonium omphalodes* were published in 1873 but Fournier mentioned *T. tahitense* as perhaps being synonymous with *M. omphalodes*, so that Nadeaud's species must have been published first.

The specimen at Kew collected by Bailey at Trinity Bay, Queensland, agrees perfectly with Fournier's specimen of *Microgonium omphalodes* obtained at Wagap, New Caledonia. I have not examined the other New Caledonian specimen of *M. omphalodes* cited by Fournier, viz. Neoua, Depl. (Deplanche) No. 175. He also cited Samoa, Powell No. 128 (i.e. the holotype? of *Trichomanes peltatum* Bak.) and Viti and Pelew, Luerssen.

The material of *Trichomanes pannosum* Cesati which was sent on loan by courtesy of the Botanical Institute, Rome, Italy, was collected in the Arfak Mountains, New Guinea, and is typical *M. tahitense* not *Microgonium motleyi* v.d.B. as Copeland suggested in Phil. Journ. Sci. LI (1933) 202.

Although *M. tahitense* is widely distributed through Malaysia, the Pacific Islands and to Australia, this species shows remarkably little variation over its range. According to Watts on page 3 of an unpublished manuscript in the National Herbarium of New South Wales, Sydney, there was a record of this fern from the northern rivers of New South Wales. This species, as *Trichomanes omphalodes*, is listed for New South Wales by Maiden & Betche in A Census N.S.W. Plants (1916) 1, but I have not seen any material of this fern from the latter State. The only Australian specimens which I have examined, were collected in north-eastern Queensland. However, this species could be easily overlooked since it grows on the bark of trees and on rocks with the rounded, sessile, peltate fronds lying close to the surface of the substratum.

**2. *Microgonium bimarginatum* van den Bosch**, Hymen. Javan. (1861) 7; Copeland in Phil. Journ. Sci. LXVII (1938) 61.

*Habitat* in tropical and subtropical rainforests, often in gorges, growing on trees or damp rocks. *Rhizome* long-creeping, branched, 0.1 to 0.2 mm. in diam. (not including the tomentum), densely clothed with dark red, often glandular-tipped, unbranched hairs. *Stipes* comparatively distant, 0.5 to 0.9 mm. long, about 0.1 mm. in diam., dark brown or black, clothed with dark red, often glandular-tipped, unbranched hairs for most of their length. *Fronde*s 0.4 to 1.5 cm. long including the stipes. *Lamina* 0.6 to 1.3 cm. long, 0.1 to 0.8 cm. broad, thin, membranous, very variable in shape, ranging from obovate, suborbicular, elliptical, oblong to urecolate, the apex broadly rounded, truncate, bifid or lobed, the base rounded or cuneate, the margin glabrous, entire, sinuous, convoluted or irregularly lobed, with a single row of hyaline cells between the submarginal strand and the margin. *Costa* prominent, zig-zagged, clothed with a few, unbranched hairs which are usually 2 to 3 cells long. *Lateral true veins* prominent, arising from the costa and usually



terminating in the prominent submarginal strand. *False veins* numerous, free, occurring between the true veins. *Sori* few, 1 to 3 on each lamina, terminal on the apices of simple fronds or embedded in the apical lobes of more complex fronds. *Involucre* tubular, coriaceous, 1.5 to 2.5 mm. long, the tube 0.3 to 0.4 mm. broad, the rim much dilated and 1 to 1.2 mm. in diam. *Receptacle* long-exserted. *Sporangia* sessile, compressed, the oblique annulus composed of 18 to 20 indurated cells and about 4 thin-walled cells. *Spores* globose-tetrahedral or tetrahedral, greenish, the exine evenly granulate, equat. diam. 22.5 to 31.88 $\mu$   $\times$  polar diam. 18.75 to 28.13 $\mu$ . (No. 201, Pl. V, f. 2.)

**DISTRIBUTION:** Ceylon, Malaya, New Guinea, Fiji, Samoa and Australia (north-eastern to south-eastern Queensland).

**SYNTYPES:** 1) Ins. Ceylon, Thwaites No. 2986 (GH), an illustration of this syntype examined (see Phil. Journ. Sci. LI (1933) pl. 33, f. 1). 2) Ins. Fidchi (Fiji), Wilkes (not examined).

**QUEENSLAND:** Mossman Intake, alt. ca. 100 ft., Smith No. 3978A, 9.1948 (NSW P8276); Street's Gully, Kuranda, Watts 7.1913 (NSW P8277); Cairns district, Watts, 7.1913 (NSW P8342); near Lake Barrine, Atherton Tableland, Bailey 6.1899 (NSW P8279; BRI 32790); Harvey's Creek, 300 ft. alt., on damp rocks, in heavy forest in creek gorge, Messmer 8.1954 (NSW P6898); Frenchman's Creek, Watts 7.1913 (NSW P8278; BRI 32781); Herberton, Waller 1908 (NSW P6899); headwaters of Tully River, in rainforest on trees, Messmer 9.1954 (NSW P6948); Mt. Spec, in rainforest, Vessey 4.1962 (NSW P8361); Eumundi, Bailey & Simmonds 5.1892 (NSW P8280; BRI 32786); Eudlo Creek, Bailey 11.1891 (BRI 32785); Eudlo, Simmonds (BRI 32784).

**ABSOLUTE SYNONYM:** *Trichomanes bimarginatum* van den Bosch in Ned. Kruid. Arch. V (1861) 143; Domin in Bibl. Bot. LXXXV (1913) 11, t. 3, f. 2; Copeland in Phil. Journ. Sci. LI (1933) 208, pl. 33, f. 1-4; Holttum, Ferns of Malaya (1954) 92.

**EQUIVALENT SYNONYM:** *Trichomanes yandinense* F. M. Bail. in Proc. Linn. Soc. N.S.W. V (1881) 30; F. M. Bail., Syn. Queensl. Fl. (1883) 686, **HOLOTYPE:** Maroochie, Queensland, F. M. Bailey 7.1879 (BRI 30442), examined.

A specimen collected in Java, Batavia, G. Paniisan, O.v. Buitenzorg, ca. 700 m., by Bakhuisen van den Brink No. 6197, 12.1933 (BRI 32791) agrees well with some of the Queensland specimens with unlobed fronds. *Trichomanes yandinense* represents a form in which there are usually several lobes towards the apex of each lamina.

The most distinctive feature of *Microgonium bimarginatum* is the more or less continuous, submarginal false vein which is not present in either *M. tahitense* or *M. motleyi*. The shape of the fronds varies greatly even on the same rhizome, suborbicular and urceolate laminas occurring quite close to each other.

This species has been recorded as far south as Eudlo which is about 50 miles north of Brisbane, Queensland. This tiny epiphyte is found in dense rainforest especially in north-eastern Queensland.

*M. bimarginatum* is very closely related to *Trichomanes baileyianum* W. W. Watts which was published in Proc. Linn. Soc. N.S.W., XXXIX (1914), 1915, 758. The holotype of the latter species, which was collected at Josephine Creek, Bartle Frere, north-eastern Queensland, by Watts in July, 1913 (NSW P1766), is located in the National Herbarium, Sydney. The fronds of this type are more regularly pinnatifid than in *M. bimarginatum* but they have the characteristic submarginal vein. BRI Nos. 32787-9 and 32792 closely approximate to the holotype of *T. baileyianum*. The latter species is smaller than but may be a form of *Microgonium mindorensense* (Christ) Copel. which is found in the Philippines and the Admiralty Islands.

## 6. CREPIDOMANES Presl

*Crepidomanes* Presl, Epim. Bot. (1851) 258; Copel. in Phil. Journ. Sci. LXVII (1938) 58; Copel., Gen. Fil. (1947) 39.

*Taschneria* Presl, Epim. Bot. (1851) 258; Copel. in Phil. Journ. Sci. LI (1933) 174, as a group of *Trichomanes* L.

*Didymoglossum* Prantl, Hymen. (1875) 45, non Desv.

In the Ferns of Malaya (1954) 99, Holttum treated *Crepidomanes* as a subgenus of *Trichomanes*.

Small, epiphytic, rupestral or rarely terrestrial ferns. *Rhizome* filiform, widely creeping, clothed with hairs, mostly without roots. *Axes* usually winged. *Fronde*s pinnately decompose, pinnate or sometimes digitate, the surface glabrous or almost so. *Segments* narrow, mostly with irregularly scattered, sclerenchymatous false veins or striae and/or with a submarginal vein, the margin entire and glabrous. *Veins* free, often clothed with appressed 2- or 3-celled hairs. *Sori* axillary or placed behind one another. *Involucre* campanulate, trumpet-shaped or obconic, often broadly winged, bilabiate or in *C. christii* with an entire, dilated mouth. *Receptacle* exerted or sometimes not exerted. *Sporangia* sessile, compressed. *Spores* tetrahedral or globose-tetrahedral, trilete, greenish. *Gametophyte* filamentous, with the archegonia borne on archegoniophores, the neck of the archegonium straight and usually 4 cells long, the antheridia with a basal disk-like or wedge-shaped cell (occasionally with 2 basal cells), dehiscing by the discharging of the opercular cell.

TYPE OF GENUS: *Crepidomanes brevipes* (Presl) Copel., (syn. *Didymoglossum brevipes* Presl), the Philippines, Guam and Borneo.

There are 12 or more species most of them very variable and dwarfing is common. This genus ranges from the East African Islands to Japan, China, Queensland and Polynesia. One uncommon species *Crepidomanes walleri* (Watts) Tindale extends from the Atherton Tableland, north-eastern Queensland to Springbrook in south-eastern Queensland. There are at least 4 other species of *Crepidomanes* in the tropical rainforests of north-eastern Queensland. They are \**Crepidomanes barnardianum* (F. M. Bail.) Tindale, *C. venulosum* (Ros.) Copel., *C. majorae* (Watts) N. A. Wakef. (only known from Ravenshoe, Queensland) and *C. bipunctatum* (Poir.) Copel. However, the tropical Australian material of this genus is badly in need of revision.

*Crepidomanes* is allied to *Microgonium* which is also characterized by false veins or sclerenchymatous striae in the lamina. Copeland in Phil. Journ. Sci. LXVII (1938) 59, suggests that *Crepidomanes* is the parent genus of *Microgonium* which is composed of reduced species.

Stokey made a detailed study of the gametophyte of a member of this genus, viz. *Crepidomanes bilabiatum* (Nees et Bl.) Copel., as *Trichomanes bilabiatum* Nees et Bl., in "Reproductive Structures of the Gametophytes of *Hymenophyllum* and *Trichomanes*" in Bot. Gaz. CIX (1948) 363-380.

Chromosome counts have been made for several species of *Crepidomanes* including a count of  $n = ca. 36$  for Malayan material of *C. bipunctatum* by Manton & Sledge in Phil. Trans. Roy. Soc. London, Ser. B, Biol. Sci. No. 654, Vol. CCXXXVIII (1954) 136. Manton & Sledge (l.c. 136) also recorded a count of  $n = 36$  for material of *C. bilabiatum* collected at Hakgola, Ceylon. In both species the specimens were stated to be tetraploid. Chromosome counts on 2 Indian species of this genus were recorded by Mehra & Gurdip Singh in "Cytology of Hymenophyllaceae" in Journ. Genetics LV (1957) 391. They were as follows:—

\* Footnote: *Crepidomanes barnardianum* (F. M. Bail.) Tindale comb. nov. (BASIONYM: *Trichomanes barnardianum* F. M. Bail., Queensl. Flora Suppl. III (1890) 89).

*Crepidomanes plicatum* (v.d. Bosc) Ching  $n = 36$ ; *C. insigne* (v.d. Bosc) Fu var.  $\infty n = 36$ ; *C. insigne* var.  $\beta 2n = 108$  and *C. insigne* var.  $\gamma 2n = 72$ . According to Mehra and Gurdip Singh *C. insigne* is a species complex which requires taxonomic research.

***Crepidomanes walleri* (Watts) Tindale** in Contrib. N.S.W. Nat. Herb. Fl. Ser. 201 (1963) 9.

*Habitat* in tropical and subtropical rainforests on mossy rocks. *Rhizome* long-creeping, shortly branched, 0.1 to 0.3 mm. in diam. (not including the tomentum), densely clothed with hairs which are fine, dark brown, unbranched, septate, mostly 3 to 6 cells in length and sometimes with a small, round, glandular-tipped apex. *Stipes* not winged or very shortly winged towards the apex, 0.2 to 1 cm. long, clothed with an occasional, clavate, fawn, 2-celled hair towards the middle and apex but towards the base with similar hairs to those on the rhizome. *Main rachis* winged by the decurrent bases of the primary pinnae. *Fronde* 1 to 4 cm. in length including the stipes. *Lamina* 1-pinnate-pinnatifid to almost 2-pinnate, sometimes 1-pinnate, 0.5 to 3 cm. long, 0.8 to 1.5 cm. broad, thin, membranous, irregularly narrowly elliptical (3:1) to broadly elliptical (3:2) or very broadly ovate (6:6) to lanceolate (3:1), the apex acute or rounded, the surface glabrous except the veins. *Primary pinnae* either simple and linear to culate or  $\pm$  flabellate and irregularly 2- to 5-lobed, 5 to 10 mm. long, 0.5 to 6 mm. broad. *Secondary segments* not petiolulate, linear (10:1) to broadly oblong (3:2), the apex obtuse, truncate or emarginate, the margin entire or slightly undulate. *Veins* free, each laminal segment with a single vein which does not reach the apex, lacking a continuous vein near the margin, clothed especially on the adaxial surface with hairs which are appressed, fawn or dark brown, clavate, the large apical cell often darker. *False veins* numerous, short, flexuose, very divergent from the costa. *Sori* few, 1 to 8, embedded in the apices of short, basal, acroscopic segments of the primary pinnae. *Involucre* obconical with 2 large acutely or obtusely triangular lips, green, with false veinlets towards the apex and base. *Receptacle* not exerted or shortly exerted. *Sporangia* sessile, compressed, with an annulus composed of 15 to 19 indurated cells and 3 to 4 thin-walled cells. *Spores* tetrahedral, trilete, greenish, minutely pitted, equat. diam.  $37.5$  to  $45\mu$   $\times$  polar diam.  $31.88$  to  $37.5\mu$ .

**DISTRIBUTION:** Australia (North-eastern Queensland to the McPherson Range in south-eastern Queensland).

**HOLOTYPE:** Herberton district, Waller 1908 (NSW P1311).

**QUEENSLAND:** Evelyn Scrub, Herberton district, Waller No. A3, 11. 1908 (NSW P834r); Johnstone River, Kefford (BRI 28921; NSW P1312); Wide Bay district, Mt. Cooroy, on mossy rocks in rainforest, uncommon, Wakefield 3.1943 (BRI 28923); Eudlo, Simmonds (BRI 28919; NSW P8343); Nerang Creek, Springbrook, Schneider 7.1884 (BRI 28922).

**ABSOLUTE SYNONYM:** *Trichomanes walleri* Watts in Proc. Linn. Soc. N.S.W. XXXIX, 1914 (1915) 761, pl. lxxxvi, f. 3 a-d.

This species is closely allied to *Crepidomanes majorae* (Watts) N. A. Wakef. which has been collected only at the type locality, viz. Ravenshoe, North Queensland. However, the involucre in *C. majorae* is tubular with a scarcely dilated, non-bilabiate apex whereas it is obconical with 2 lips in *C. walleri* being very similar to that of *C. bipunctatum*. The intramarginal vein is missing in the lamina of both *C. majorae* and *C. walleri* whereas it is very prominent in *C. bipunctatum*. The latter species has much larger fronds, i.e. up to 7.5 cm. long including the stipes, than in *C. majorae* or *C. walleri* where they range from 1 to 4 cm. long. The false veinlets in *C. walleri* are much more divergent from the costa than in *C. majorae* where they are almost parallel to the midrib.

7. **GONOCORMUS** van den Bosch

*Gonocormus* van den Bosch, Hymen. Javan. (1861) 7; van den Bosch, Erste Bijdrage (1861) 321; Copel. in Phil. Journ. Sci. LXVII (1938) 56-7; Copel., Gen. Fil. (1947) 38.

Copeland in Phil. Journ. Sci. LI (1933) 143, referred to *Gonocormus* as a group of *Trichomanes* L. In Ferns of Malaya (1954) 95, Holttum treated *Gonocormus* as a subgenus of *Trichomanes* following Christensen in Ind. Fil. (1906) 634.

Small, epiphytic or rupestral ferns forming large mat-like patches. *Rhizome* filamentous, much branched, proliferous, densely clothed with unbranched hairs. *Stipes* and *rhachises* filamentous, much branched, dark, wiry, often bearing proliferous buds. *Fronds* small, flabellate or circular, dark green, glabrous or almost so, often pinnate. *Segments* narrow, with flabellate venation, false veinlets absent, the margin unthickened and incised, the apices usually emarginate or bifid, the cell-walls thin and unpitted. *Involucre* sunken in the apices of the segments, tubular, with an entire, dilated mouth. *Receptacle* extruded in the older stages. *Sporangia* compressed, the annulus almost transverse, composed of 15 to 19 indurated cells and about 3 or 4 thin-walled cells.

TYPE OF GENUS: *Gonocormus minutus* (Bl.) van den Bosch (BASIONYM: *Trichomanes minutum* Bl.), Africa to Java and Polynesia extending to Japan and Australia.

This is a small and rather distinctive genus of several poorly defined species, 2 being found in Australia. *Gonocormus saxifragoides* (Pr.) van den Bosch extends from the Atherton Tableland of north-eastern Queensland to the North Coast of New South Wales, whereas *G. minutus* occurs in the tropical rainforests of north-eastern Queensland.

In this genus the axes of the frond and the rhizome are poorly differentiated and with little distinction of function, as has been indicated by E. B. Copeland in Genera Filicum (1947) 38. Buds on the fronds may develop into new fronds or even into a rhizome. In Ferns of Malaya (1954) 95, Holttum has suggested that the members of the genus (or subgenus in his opinion) are possibly reduced relatives of *Vandenboschia*.

***Gonocormus saxifragoides* (Presl) van den Bosch**, Hymen. Jav. (1861) 9.

*Habitat* in tropical or subtropical rainforests either epiphytic on tree-trunks or more frequently growing in patches on wet rocks. *Rhizome* long-creeping, much branched, about 0.1 mm. in diam. (not including the tomentum), densely clothed with hairs which are simple, brown, often glandular-tipped and usually 3 to 6 cells in length. *Stipes* dark, wiry, 3 to 20 mm. long, about 0.1 mm. broad, densely tomentose for one-third to two-thirds of their length with similar hairs to those on the rhizome. *Fronds* 0.5 to 2.5 cm. long including the stipes, mostly simple, rarely proliferous. *Lamina* flabelliform, reniform, almost circular or ovate-euneate, dark green, fluted, channelled in the dried condition, 3 to 10 mm. long, 6 to 11 mm. broad, often deeply incised between the groups of veins but more shallowly between the ultimate lobes, the cell-walls wavy. *Segments* more or less oblong, 1 to 7 mm. long, 0.3 to 0.7 mm. broad, the medial segments usually longer than the lateral ones, the apices obtuse and emarginate or bifid. *Veins* flabellate, without false veinlets. *Sori* immersed in the apices of the segments, 1 to 6 on each frond. *Involucre* 1.5 to 2 mm. long, 0.2 to 0.3 mm. broad at the base, narrowly urceolate,

the tube elongated, the mouth broadly dilated and entire, clothed towards the base with a few, dark red or brown, glandular-tipped hairs which are 1 to rarely 6 cells in length. *Receptacle* narrow, included or shortly extruded in the later stages. *Sporangia* compressed, the annulus almost transverse, composed of 17 to 19 indurated cells and about 3 or 4 thin-walled cells, without a definite stomium, dehiscing by a lateral slit. *Spores* globose-tetrahedral or tetrahedral, greenish, finely granulate, equat. diam. 30 to 56.25 $\mu$   $\times$  polar diam. 28 to 54.38 $\mu$ .

**DISTRIBUTION:** Africa to Java and Malaya extending to Japan, Polynesia and Australia (Coast and Tablelands from north-eastern Queensland to the North Coast of New South Wales).

**HOLOTYPE:** Luzon, the Philippines, Cuming No. 256 (K), examined.

**QUEENSLAND:** Iron Range, 200 miles N of Cooktown, Flecker 4.1944 (NSW P8275); Street's Gully, Kuranda, Watts 7.1913 (NSW P2202, P3779); Frenchman's Creek, near Cairns, Watts 7.1913 (NSW P2204, P3791); Babinda Creek, 300 ft. alt., in rainforest on wet rocks, Messmer 8.1954 (NSW P6878); Babinda to Russell River, Watts 7.1913 (NSW P3781); Deeral, near Babinda, in dense rainforest on a rather steep slope, forming dense, deep green masses on rocks, about 350 ft. alt., Blake No. 14968, 7.1943 (BRI 28912; NSW P5271); between Cairns and Herberton, Wild 1891 (BRI 28900); Bartle Frere, Watts 7-8.1913 (NSW P3782; BRI 28903); Herberton, Waller 1908 (NSW P2205); Eumundi, Bailey & Simmonds 11.1894 (BRI 28907); Yandina, Bailey 3.1891 (BRI 28898); Yandina, Simmonds 3.1891 (BRI 28911; NSW P5279); Eudlo Scrubs, Bailey 11.1891 (BRI 28899); Ithaca Creek, near Brisbane, on rocks, Bailey (BRI 28906, 28910); Three Mile Scrub (Brisbane), Bailey (BRI 28918); Mt. Mistake (Lockyer Valley), Bailey (NSW P581; BRI 28908).

**NEW SOUTH WALES:** Tweed River, Forsyth, probably about 1900 (NSW P2203); ditto, Dallachy 1.1892 (NSW P1861); Brunswick River, Watts 1899 (NSW P3780); head of Teven, Richmond River, on a rosewood tree, Watts 5.1899 (NSW P3785); Marshall Falls, Alstonville, Richmond River, Bäuerlen 5.1891 (NSW P2200); Uralba, Richmond River, on trees, Watts 1898 (NSW P3788); Three Mile Scrub, Richmond River, Watts 11.1902 (NSW P3789).

**EQUIVALENT SYNONYM:** *Trichomanes saxifragoides* Presl, Hymen. (1843) 39.

Many authors referred to *Gonocormus saxifragoides* as *Trichomanes parvulum* J. Sm. non Poir. e.g. J. Sm. in Journ. Bot. III (1841) 417; Hook., Sp. Fil. I (1846) 118, pl. 39A; Benth., Fl. Austr. VII (1878) 701; Bail., Lith. Ferns Queensl. (1892) 22, top figure; Moore & Betche, Handb. Fl. N.S.W. (1893) 503; Domin in Bibl. Bot. LXXXV (1913) 11; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114, and Copeland in Phil. Journ. Sci. LI (1933) 145-6. Later, in Phil. Journ. Sci. LXVII (1938) 37 and 56, Copeland agreed with Christensen that the true *Trichomanes parvulum* is a species now known as *Hymenophyllum sibthorpioides* (Bory) Mett. This problem was discussed by Christensen in Dansk Bot. Arkiv VII (1932) 3.

According to Copeland in Fern Flora of the Philippines I (1958) 69, the small, almost non-proliferous form with circular fronds is equivalent to the original *Trichomanes saxifragoides* Presl and is produced in dry seasons, whereas the form with larger, more proliferous fronds is produced in wetter seasons. However, there appear to me to be 2 distinct species in Eastern Queensland. In *Gonocormus saxifragoides* which extends from tropical north-eastern Queensland to the subtropical North Coast of New South Wales as far south as the Richmond River, the fronds are seldom proliferous but are broader and rounder than in the other species which is confined in Australia to the rainforests of north-eastern Queensland. The latter species (i.e. *Gonocormus minutus*) is characterized by more finely divided, more delicate, mostly proliferous fronds in which there are very narrow wings on the axes and soriferous portions. I have not examined any material of *G. minutus* collected south of Babinda which is about 1,200 miles north of Brisbane, Queensland.

Material of *G. saxifragoides*, which was very kindly collected by Dr. L. J. Webb and Mr. G. J. Tracy at The Boulders, Babinda, North Queensland, and cultivated in one of the hot houses at the Royal Botanic Gardens, Sydney, has not altered in the texture of its laminae after 6 months nor has it produced any proliferous fronds. Plants of *G. minutus* collected near Mareeba, North Queensland, by Dr. H. S. McKee have also been cultivated at the Royal Botanic Gardens, Sydney. These fronds are much more delicate and translucent than in the material of *G. saxifragoides* collected at The Boulders by Webb and Tracy.

*G. saxifragoides* does not appear to have been collected in New South Wales since 1902; attempts to obtain this fern by myself and others in the rainforests of the North Coast have been unsuccessful. Mr. E. F. Constable carefully searched the Marshall Falls district, near Alstonville, and other localities in which this species was formerly recorded.

The holotype of *G. minutus* was obtained on loan by courtesy of The Director, the Rijksherbarium, Leiden, for comparison with the Australian material of *Gonocormus*. This specimen which was collected in Java by Blume, has much thinner, narrower and more diffuse laminae than in *G. saxifragoides*. Even the simple fronds of *G. minutus* (e.g. NSW P6950 collected at Harvey's Creek, north of Bellenden-Ker, North Queensland, by Messmer) have more delicate laminae than those of *G. saxifragoides*.

## 8. POLYPHLEBIUM Copel.

*Polyphlebium* Copel. in Phil. Journ. Sci. LXVII (1938) 55.

*Phlebiophyllum* van den Bosch in Versl. Akad. Wet. Amsterdam XI (1861) 321, non *Phlebiophyllum* Nees (orthographic variants).

In Phil. Journ. Sci. LI (1933) 138, Copeland treated *Polyphlebium* as a monotypic group of *Trichomanes* i.e. the group of *Phlebiophyllum*.

A monotypic genus occurring in Australia (south-eastern Queensland, New South Wales, Victoria and Tasmania), New Zealand, the Chatham, Stewart and Kermadec Islands.

TYPE OF GENUS: *Polyphlebium venosum* (R. Br.) Copel., based on *Trichomanes venosum* R. Br.

***Polyphlebium venosum* (R. Br.) Copel.** in Phil. Journ. Sci. LXVII (1938) 55; Crookes & Dobbie, New Zealand Ferns, ed. 4 (1951) 112, 113 (photo).

*Habitat* in temperate and subtropical rainforests forming densely matted patches usually on trees, logs or tree-ferns (especially *Dicksonia* spp.). *Rhizome* widely creeping, branched, very dark brown or brown, about 0.2 to 0.3 mm. in diam., very densely clothed with a tomentum of ferruginous hairs. *Stipes* not winged, 1 to 5.5 cm. long, filiform, approximate or distant on the rhizome, slightly flattened, 1-sulcate above, light brown or light red-brown when dried, green in fresh condition, dark brown at the base, wiry, dull, often minutely scabrous, slightly tomentose at the base, otherwise glabrous or with a few, short, unbranched, scattered hairs. *Rhachis* broadly winged towards the apex, wingless below, usually glabrous or very sparsely hirsute. *Lamina* pinnatifid or pinnate-pinnatifid, membranous, pellucid, pale green, very irregular in outline, elliptical (2:1) to rounded (6:5), narrowly lanceolate (6:1) to broadly ovate (6:5), narrowly oblanceolate (6:1) to broadly obovate (6:5), 2.5 to 10.5 cm. long, rarely up to 15 cm. including the stipes, 0.5 to 5.5 cm. broad, rarely 6.5 cm. broad, not dimorphic, glabrous or with a few, scattered, unbranched hairs, the internal cells of the lamina with straight walls. *Primary pinnae* petiolulate in the lower segments, broadly sessile above, 2 to 9 pairs, alternate throughout or the lower pairs opposite, falcate, linear (12:1) to cultrate (6:1), ovate (3:2), rhomboidal or flabellate, usually 0.5 to 3.5 cm. long and 0.2 to 1.5 cm. broad, the lowest 1 or 2 pairs often reduced to 1 to 3 mm. in length; apex obtuse, truncate or emarginate; margin crenate or sinuate, glabrous, not specialized. *Ultimate segments* more or less oblong except the apical segment which is usually linear (12:1 or more); apex emarginate or truncate. *Veins* reticulate, very dark brown, prominent; midrib flexuose; lateral veinlets alternate, once to several times forked in each ultimate segment or lobule; false veinlets absent. *Sori* marginal, few, 2 to 14 per frond, occurring towards the base as well

as towards the apex of the lamina, usually solitary on each primary pinna, partly sunken in a short, upper, basal lobe, but in large fronds up to 4 sori occurring on the upper and lower margins; each sorus terminal on a minor veinlet. *Involucre* 1.5 to 2 mm. long, about 0.3 to 0.5 mm. broad, tubular, green, the mouth broadly dilated, entire or very slightly 2-lipped. *Receptacle* slender, cylindrical, long-extruded, sometimes projecting 2.5 to 8 mm. beyond the rim. *Sporangia* 20 to 50 per sorus, subsessile, overlapping on the receptacle, broader towards the apex than the base, compressed, the annulus large and oblique, composed of about 16 to 19 indurated cells and ca. 3 thin-walled cells, with obliquely lateral dehiscence. *Spores* globose-tetrahedral to globose, trilete, the exine thin and subgranulate, the long laesurae with narrow, subgranular ridges, equat. diam.  $22.5$  to  $31.88\mu$   $\times$  polar diam.  $22.5$  to  $31.88\mu$ . *Gametophyte*\*: delicate and long-lived; the spore germination is a modification of the 4-celled type in which there is a delay or suppression of the formation of walls in 1 or 2 of the tips; after germination a rhizoid appears and several weeks later a filament cell develops; after 3 months another rhizoid or sometimes another filament develops; after 5 months the prothallus is a monoecious, uniseriate, branching filament of about 20 cells with 2 or 3 rhizoids; the archegonia (with 4 to 6 rows of neck cells and straight necks) are borne on the sessile or stalked archegoniophores, the small, numerous, stalked antheridia each with a simple wall and an operculum which is raised or shed; regeneration by gemmae or fragmentation; embryo with a small haustorial foot but without a primary root, the rhizoid-like hairs developing early; several embryos even in the same archegoniophore. (No. 201, Pl. IV.)

**DISTRIBUTION:** Australia (south-eastern Queensland, New South Wales, Victoria and Tasmania), New Zealand, the Chatham, Stewart and Kermadec Islands.

**HOLOTYPE:** Derwent, Ins. Van Diemen, R. Brown No. 96, 1804 (BM), examined. **ISOTYPE** (K). There is also another specimen at the Kew Herbarium labelled "Van Diemen's Island, R. Brown".

**QUEENSLAND:** Roberts Plateau, Shirley (BR1); Roberts Plateau, Lamington National Park, densely covering the trunks of *Cyathea leichhardtiana*, Smith & Goy No. 69, 1.1938 (BR1; BM); Morceton District, Lamington National Park, in antarctic beech forest (*Nothofagus*, etc.), 3,700-3,800 ft. alt., chiefly epiphytic on *Dicksonia*, Blake No. 12978, 5.1937 (BR1); ditto, alt. 3,500 ft., Smith 12.1942 (BR1); National Park, McPherson Range, White 1-2.1917 (BR1); McPherson Range, alt. 3,500 ft., White 1.1919 (NSW P586).

**NEW SOUTH WALES:** Clarence River, Wilcox 11.1875, ex Herb. Mueller (K); Happy Valley, Mt. Wilson, alt. 3,000 ft., basalt moist gully, growing on the trunk of *Dicksonia*, Constable 12.1948 (NSW P5641); ditto, Waits 12.1914 (NSW P1155); ditto, on trunks of *Dicksonia antarctica*, in rainforest, basalt, Tindale & Constable 3.1952 (NSW P2871); Waterfall Gully, Mt. Wilson, epiphytic on *Dicksonia antarctica*, at the edge of a creek, rainforest, Melville & Tindale 4.1953 (NSW P6405); Jenolan Caves, Blakely 6.1899 (NSW P2099); Katoomba, Forsyth 12.1899 (NSW P2102); Leura Glen, on a tree-fern, Watts 4.1903 (NSW P1156); Leura Falls, Watts 4.1903 (NSW P1153); ditto, Stephenson 1.1890 (NSW P2107) and 12.1890 (NSW P5645); Mittagong, Woolls (NSW P2103); Minnamurra Falls, 3 miles W of Jamberoo, 1,200 ft. alt., in rainforest, on a boulder, in the mist region, Judd 5.1954 (NSW P6787); Cambewarra Mountain Road, Watts 5.1903 (NSW P1154); Sugar Loaf Mountain, Boorman 1.1915 (NSW P2109);  $\frac{1}{2}$  mile NE of Trig., Mt. Dromedary, Central Tilba, plentiful on tree-fern trunks in rainforest, Constable 9.1953 (NSW P6640).

**VICTORIA:** Gippsland, F. Mueller, ex Herb. Hooker 1867 (K); Mt. Juliette, source of Yarra, ex Herb. Mueller 7.1877 (K); Fernshaw, Deane 6.1889 (NSW P1157); Etia's Glen, Blacks Spur, Healesville, Watts 12.1906 (NSW P1152); Dandenong Ranges, E of Melbourne, epiphytic mainly on tree-fern trunks, fronds pendulous, Smith No. M100, 11.1943 (BR1); Dandenong Ranges, Mueller 1897 (K); Gembrook, Staer 4.1911 (NSW P2100); Lorne, Watts 11.1919 (NSW P1150, P5324); Otway Ranges, Williamson 12.1903 (NSW P2104).

\* Adapted from Stone in Aust. Journ. Bot. VI (1958) 183-203.

TASMANIA: NORTH-EAST: Mt. Barrow, Co. Dorset, Rupp 1.1922 (NSW P2108); St. Patrick's River, on fern-trees, Gunn No. 1515, 4.1845 (NSW P2101). WEST COAST: Kelly's Basin, Macquarie Harbour, Milligan No. 911, received 9.1868 (K). SOUTH-EAST: National Park, Coombe No. 1794, 12.1929 (HO H1274); Russell Falls, on *Dicksonia* trunk, Johnson 1.1949 (NSW P5672); near Hobart, Le Tall, about 1896 (K); Table Mountain, Van Diemen's Island, Caley 11.1804 (BM); Fern Tree Hill, Caley 11.1804 (BM).

ABSOLUTE SYNONYM: *Trichomanes venosum* R. Br., Prodr. Fl. N. Holl. (1810) 159; Hook. & Grev., Ic. Fil. I (1828) t. 78; Benth., Fl. Austr. VII (1878) 702; F. M. Bail., Lith. Ferns Queensl. (1892) t. 23; Moore & Betche, Handb. Fl. N.S.W. (1893) 503; Rodway, Tasm. Fl. (1903) 289; C. Chr., Ind. Fil. (1906) 651; Domin, Bibl. Bot. LXXXV (1913) 14; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Ewart, Fl. Vict. (1931) 31; Copel. in Phil. Journ. Sci. LI (1933) 138; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114.

EQUIVALENT SYNONYM: *Trichomanes venustulum* (*venustula*) Colenso in Trans. & Proc. N.Z. Inst. XII (1879) 1880, 366. HOLOTYPE by monotypy, on trunks of living trees, dense shady damp forests, west slopes of Ruahine Mountain Range, head of the River Manawatu, W. Colenso 1878-9 (not examined). ISOTYPE: New Zealand, W. Colenso 9.1883, labelled *T. venustula* by Colenso (K), seen. This is a good match for NSW P2108 from Mt. Barrow, Tasmania. This form has more numerous secondary segments but does not appear to be worthy of specific rank. In some of the larger Australian specimens the sori are scattered on both edges of the pinnae.

The monotypic genus of *Polyphlebium* is probably most closely related to the group of *Vandenboschia pyxidifera* (L.) Copel. The involucre is very similar but there is no branching of the veins in the undivided segments of the lamina in the latter group.

In south-eastern Australia *Polyphlebium venosum* is a fairly common epiphytic fern which usually grows on the sheltered side of the trunks of *Dicksonia antarctica* but is sometimes found on the caudices of *Cyathea australis*, *C. leichhardtiana* and *Dicksonia youngiae*. According to Stone in Aust. Journ. Bot. VI (1958) 187, the gametophytes grow more readily among the root hairs of *D. antarctica* than on the caudices of other tree-ferns. *P. venosum* ranges from the subtropical rainforests and *Nothofagus moorei* forests of the McPherson Range, south-eastern Queensland, to the temperate rainforests of Victoria and Tasmania where *Nothofagus cunninghamii* is the dominant species. In eastern New South Wales *P. venosum* is mainly found in the subtropical rainforests especially in the Blue Mountains and on the South Coast. Frequently it grows in association with *Hymenophyllum flabellatum* which has a very similar range in Australia.

There does not appear to be any difference between the specimens of *P. venosum* from New Zealand and those from Australia. In Trans. Roy. Soc. N.Z. LXXXII (1954) 665, Brownlee recorded a chromosome count of  $n = 36$  for material of this species collected in New Zealand.

## 9. MACROGLENA (Presl) Copel.

*Trichomanes* L. sect. *Macroglena* Presl in Abh. Böhm. Ges. Wiss. V, 5 (1848) 333. *Macroglena* (Presl) Copel. in Phil. Journ. Sci. LXVII (1938) 82, as a genus; Copel. in Gen. Fil. (1947) 44.

Copeland in Phil. Journ. Sci. LI (1933) 258, treated *Macroglena* as a group of *Trichomanes*, whereas Holttum in Ferns of Malaya regarded it as a subgenus of *Trichomanes*.

Small epiphytic or terrestrial ferns. *Rhizome* short, thick and erect or long-creeping, 1 to 10 mm. in diam., clothed with dark red or purplish-brown, bristle-like hairs. *Stipes* fascicled or scattered along the rhizome. *Lamina* pinnately decomposed, very finely dissected. *Ultimate segments* very narrow, 1-veined, often stiff and bristle-like, otherwise soft, the cell-walls either thickened and coarsely pitted or thin and unpitted, the cells large and usually with brownish contents appressed to the walls. *Involucre* cupuliform to almost triangular, the mouth mostly truncate and entire, otherwise slightly expanded. *Receptacle* long, exserted. *Sporangia* compressed, sessile. *Spores* globose-tetrahedral to globose.



TYPE OF GENUS: *Macroglena meifolia* (Bory) Copel. (syn. *Trichomanes meifolia* Bory), native to Madagascar, Reunion, Indonesia, Malaya to Samoa.

This genus ranges from the East African Islands to Indonesia, Polynesia, Eastern Australia and New Zealand. Its principal features are the extreme reduction of the laminal segments, the coarsely pitted cell-walls of most species and the brownish laminal cells. Some species show marked affinities with *Selenodesmium*, others with *Abrodictyum* according to Copeland.

In Eastern Australia there are 2 species of *Macroglena*, viz. *M. caudata* (Brack.) Copel., which ranges from the tropical rainforests of north-eastern Queensland to the temperate rainforests of Gippsland, Victoria, and *M. meifolia* which occurs in north-eastern Queensland. In the latter species the laminal segments are very fine and bristle-like, with only 1 or 2 rows of cells on each side of the veins. This tropical species is sometimes found totally submerged in running streams, e.g. Brass & White No. 236, collected on Thornton's Peak, Queensland, at 4,000 ft. alt. (BRI 30371).

*Macroglena caudata* (Brack.) Copel. in Phil. Journ. Sci. LXVII (1938) 84; Wakef., Ferns of Vict. & Tas. (1955) 4 f. 8, 7.

*Habitat* epiphytic on the trunks of tree-ferns (e.g. *Dicksonia* spp., *Cyathea australis* and *C. leichhardtiana*) and trees in subtropical, tropical and temperate rainforests. *Rhizome* long-creeping, dark brown, flexible but not wiry, 1 to 1.5 mm. in diam., densely clothed with linear, spreading, bristle-like, dark red-brown hairs with narrow constrictions between the cells. *Stipes* wingless except for 2 almost imperceptible ridges which are continuous throughout the length of the stipes, 1.5 to 7 cm. long, 0.3 to 0.8 mm. broad near the middle, scattered along the rhizome, usually 1 to 4 cm. apart but crowded towards the apex of the rhizome (i.e. about 1 mm. apart), slender, terete, slightly scabrous, glabrous except for a few dark red-brown, bristle-like hairs at the base. *Main rhachis* winged almost imperceptibly throughout its length. *Lamina* 2- to 3-pinnate-pinnatifid, membranous, pellucid, medium green or often brown when dried, very narrowly elliptical (6:1) to narrowly elliptical (3:1), narrowly lanceolate (6:1) to narrowly ovate (2:1) or narrowly oblong (3:1), 4 to 21 cm. long including the stipes, 1 to 4 cm. (rarely up to 6.8 cm.) broad, internal cells with thick, pitted walls, the apex erect or deflexed, often caudate. *Primary pinnae* petiolulate, 7 to 17 pairs, rather widely spaced towards the base of the frond, lanceolate, rhomboidal to flabellate, 0.5 to 4.7 cm. long, 0.5 to 1.2 cm. broad, the apex acute or caudate. *Ultimate segments* sessile, linear (12:1) to narrowly oblong (3:1) but mostly cultrate (6:1), 1 to 5 mm. long, 0.2 to 0.5 mm. broad, simple or bifid, 1-nerved, glabrous or with a few, scattered hairs, the apex obtuse, truncate or emarginate. *Veins* dark, prominent, not reaching the margin, with a few, 2- to 4-celled, sometimes glandular-tipped hairs. *Sori* indusiate, 12 to 130 per frond, 1 to 11 per primary pinna, sunken in an inner basal lobe of a secondary pinna. *Involucre* 0.5 to 1 mm. long, 0.5 to 0.8 mm. broad at the apex, usually very narrowly winged on both sides, cupuliform to almost triangular, the base cuneate, the border or mouth spreading or almost imperceptibly expanded, not reflexed, often 2-lipped, the margin entire or slightly erose or sometimes fluted. *Receptacle* extruded, projecting 1 to 1.5 mm. beyond the border. *Sporangia* subsessile, compressed, the oblique annulus composed of 16 to 21 indurated cells and 6 to 8 thin-walled cells, dehiscing by a lateral slit. *Spores* globose-tetrahedral to globose, trilete, the laesurae long, low ridges, the exine thin, subgranulate, equat. diam. 24.38 to 31.88 $\mu$   $\times$  polar diam. 24.38 to 31.88 $\mu$ . (No. 201, Pl. VI, f. 3 and 4.)

DISTRIBUTION: Tahiti, Samoa, Fiji, New Caledonia and Australia (north-eastern Queensland to Victoria).

HOLOTYPE: Tahiti, Society Islands, Wilkes (US 51176), examined.

QUEENSLAND: Herberton, Waller No. A11, 1909 (NSW P2130); Fraser Island, near the Forestry Station, epiphytic on *Dicksonia youngiae* at the edge of a creek, rhizome creeping, fronds horizontal to pendulous, Blake No. 14372, 8.1941 (BRI); Fraser Islands, Wide Bay, White 10.1921 (BRI); Eumundi, Simmonds (BRI); Buderim Mountain, White 4.1916 (BRI); NSW P2128); Wide Bay District, Montville, in rainforest on tree-fern, ca. 600 ft. alt., rhizome creeping, fronds light green, Blake No. 13836, 8.1938 (BRI); Tambourine Mountain, Simmonds 10.1909 (NSW P2127); Tallebudgera Creek, Schneider (BRI); Nerang River, Schneider (BRI); Roberts Plateau, Lamington National Park, exceedingly common on tree trunks, fronds pale green, Smith & Goy No. 70, 1.1938 (BRI; K); Binna Burra, 2,600 ft. alt., Dickson 9.1947 (NSW P5329); Lamington National Park, in rainforest, 3,500 ft. alt., Blake No. 12987, 5.1937 (BRI); Springbrook, on trunk of tree-fern, White 12.1915 (BRI); Macpherson Range, Tryon 3.1891 (BRI).

NEW SOUTH WALES: Whian Whian State Forest, WNW of Byron Bay, 2,050 ft. alt., pendulous on the trunks of tree-ferns, frequent in rocky gully, rainforest, basalt, Constable 1.1953 (NSW P6483); Tuckombil, Alstonville, Watts 11.1902 (NSW P1147, P1142); Uralba, on trunk of tree-fern, Bäuerlen No. 272, 5.1891 (NSW P1863); East Ballina, on tree-ferns, Watts No. 55, 4.1899 (NSW P1143); Three Mile Scrub, Richmond River, Watts 11.1902 (NSW P1144); Richmond River, Watts 1901 (NSW P1146); Dorrigo, Heron 4.1910 (NSW P2129); Bellenger River, Moore (NSW P2133); Port Macquarie, Moore, received 5.1867 (K); William's River, Fraser & Vickery 1.1934 (NSW P2126); Ourimbah, near Wyong, Helms 10.1904 (NSW P583); Gosford, in rainforest, Deane 10.1888 (NSW P1122); Valley of the Waters, Watts 9.1912 (NSW P1145); Illawarra, Moore (NSW P2131);  $\frac{1}{2}$  mile NE of Trig., Mt. Dromedary, Central Tilba, 2,100 ft. alt., frequent on tree-fern trunks in rainforest, Constable 9.1953 (NSW P6641).

VICTORIA: Gembrook, Lucas 11.1876 (NSW P8281).

ABSOLUTE SYNONYM: *Trichomanes caudatum* Brack., Ferns U.S. Expl. Exped. XVI (1854) 256, t. 36, f. 5; Benth., Fl. Austr. VII (1878) 703; Bail., Lith. Ferns Queensl. (1892) 28; Moore & Betche, Handb. Fl. N.S.W. (1893) 503; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Copel. in B.P. Bish. Mus. Bull. No. 93 (1932) 24; Copel. in Phil. Journ. Sci. LI (1933) 262, pl. 57, f. 3-5, pl. 58, f. 1; C. Christensen in B.P. Bish. Mus. Bull. No. 177 (1943) 18.

The Australian material is undoubtedly a geographic segregate of *M. caudata* but whether it should be treated as a subspecies or as a new species would depend on chromosome counts of *M. caudata* from Australia as well as from Tahiti, Samoa, Fiji etc. The New Caledonian material which was described by van den Bosch as *Trichomanes milnei* in Ann. Sci. Nat. IV, 15 (1861) 89, is more distinct and should probably be treated as a separate species. The holotype which was collected by Vieillard on the trunks of tree-ferns at Balade, was examined at the Muséum d'Histoire Naturelle, Paris, by the author.

An anatomical examination of transverse sections of the stipes of *M. caudata* collected in Fiji (Parks No. 20770), New Caledonia (NSW P7297) and Australia (NSW P8282) revealed only slight differences in structure. Under a single row of thick-walled epidermal cells there are 3 to 5 rows of sclerenchyma enclosing about 5 rows of collenchyma which surround the central vascular bundle.

The Australian material is characterized by smaller, often truncate, narrower involucre (i.e. 0.5 to 1 mm. long and 0.5 to 0.8 mm. broad at the apex) than in the specimens from any of the Pacific Islands. The Fijian material (which approximates most closely to the Australian) has involucre which range from 1 to 1.5 mm. long and 0.5 to 1.2 mm. broad at the apex, e.g. A. C. Smith No. 5106 (US) collected at Mba, Viti Levu, Fiji, has particularly small involucre. The involucre of the Samoan specimens are 1.2 to 2 mm. long whereas those from Tahiti range from 1 to 1.5 mm. long and 0.5 to 0.9 mm. broad. Setchell & Parks No. 538 (US) collected "on the face of the Diadem, Tahiti", in July, 1922, is characterized by very small sori which are 1 to 1.2 mm. long and 0.5 to 0.8 mm. broad at the apex. In general appearance it is similar to Eastern Australian material. The Holotype of *M. caudata* (i.e. US 51176), which was collected at Tahiti, has much larger involucre, being 1.3 to 1.5 mm. long and 0.8 to 0.9 mm. broad at the apex. In the New Caledonian material of *M. caudata*, which was described as *Trichomanes milnei* by van den Bosch in Ann. Sci. Nat., IV, 15 (1861) 89, the mouth of each involucre is more dilated than in the Australian specimens, also the involucre is much longer, i.e. 1.7 to 2 mm. in length.

The fronds of the Australian specimens tend to be smaller than in the Pacific Island material, i.e. 4 to 21 cm. long including the stipes, whereas the Fijian and Tahitian material is up to 35 cm. long.

### 10. CEPHALOMANES Presl

*Cephalomanes* Presl, Hymen. (1843) 17, pl. 5; Copel. in Phil. Journ. Sci. LXVII (1938) 66; Copel., Gen. Fil. (1947) 40. *Trichomanes* L. subgen. *Cephalomanes* (Pr.) C. Chr., Ind. Fil., Suppl. 3 (1934) 187; Holttum, Ferns of Malaya (1954) 102.

In Phil. Journ. Sci. LI (1933) 245, Copeland treated *Cephalomanes* as a group of *Trichomanes* L.

Terrestrial ferns. *Rhizome* erect, tufted, with thick roots which become stilt-like in age. *Stipes* fascicled, bearing stiff, dark red hairs when young. *Fronds* caespitose. *Lamina* 1-pinnate or rarely 1-pinnatifid, dark green, harsh, setose, polystichous, lanceolate, more or less elliptical, cultrate or oblong, the cell-walls thin and wavy, the cells large and with dark contents. *Pinnae* overlapping, unequally-sided, the upper side more or less lacerate and the lower with long, prong-like, upcurved teeth. *Veins* coarse, rib-like, forked, often clothed with bulbous, unicellular hairs. *Sori* numerous, mostly borne on the upper pinnae, terminal on the veinlets on the acroscopic side, rarely reaching the basiscopic side. *Involucre* cylindrical or rarely obconic, thick. *Receptacle* long-extruded, thick, sometimes with an enlarged apex. *Sporangia* sessile, compressed-turbinate, with a very oblique annulus. *Spores* tetrahedral or globose-tetrahedral to almost oblong, trilete, green.

TYPE OF GENUS: *Cephalomanes atrovirens* Presl, native to the Philippines, New Guinea and Australia.

This is a very distinctive genus of about 10 species ranging from Madagascar to India and Polynesia. According to Copeland in *Genera Filicum* (1947) 40, it is related to *Vandenboschia* especially to *V. auriculata*. There is only one Australian species of *Cephalomanes*, viz. *C. atrovirens* which ranges from the tropical rainforests of north-eastern Queensland to the subtropical North Coast of New South Wales.

A chromosome count of  $n = ca. 32$  was made by Manton on Malayan material of *Cephalomanes javanicum* (Bl.) v.d. Bosch (as *Trichomanes javanicum* Bl.) in the Appendix to Holttum, *Ferns of Malaya* (1954) 623.

*Cephalomanes atrovirens* Presl, Hymen. (1843) 18 t. 5; Copel. in Phil. Journ. Sci. LXVII (1938) 67.

*Habitat* terrestrial in tropical and subtropical rainforests, often on creek banks or sometimes in wet soil not far from a stream. *Rhizome* erect, tufted, the roots stick-like, woody and 1 to 1.5 mm. in diam. *Stipes* not winged, rather short, about one fifth to one eighth the length of the frond, 1 to 4.5 cm. long, fasciculate, flattened towards the apex and with 1 or 2 grooves on the upper surface, terete towards the base, brown, woody, dull, scabrous, sparsely clothed with scattered, spreading, glossy, elongated, dark red, articulated hairs. *Main rhachis* very narrowly winged except at the base, thick, woody, flattened broadly, 1-grooved and glabrous above, densely clothed on the lower surface with crisped, acute, dark red hairs of the same type as on the stipes. *Lamina* 1-pinnate, herbaceous to subcoriaceous, harsh, dark green, compact, very narrowly elliptical (6: 1) to elliptical (2: 1), cultrate (6: 1) to oblong (2: 1), 10 to 23 cm. long, 1 to 3.7 cm. broad, often very much

decurved, not dimorphic, the apex usually acute, the base mostly tapering, i.e. the lower pairs of pinnae shorter; internal cells of the lamina comparatively thin and wavy, the cells large with dark contents. *Primary pinnae* with short, winged, persistent petiolules, 20 to 45 pairs, imbricate, narrowly oblong (3:1) to oblong (2:1), 1 to 2 cm. long, 2.5 to 6 mm. broad, the apex broadly rounded or obtuse, the base very unequally-sided, the upper side truncate, the lower margin much narrowed and cut away, the acroscopic margin laciniate-dentate, the basiscopic margin with long, upcurved, prong-like laciniae on the adaxial surface. *Veins* forked, dark green, prominent, raised above the lower laminal surface, rib-like, much branched, parallel from the costa and reaching the margin, produced into short, setaceous teeth on the acroscopic margin and into long laciniae on the basiscopic margin, the surface of the veins clothed with fawn, unicellular, appressed, oblong-bulbous glandular hairs. *Sori* indusiate, marginal, 1 to 6 on the upper margin of each pinna, confined to the proximal half or each primary pinna, usually 60 to 200 on each frond, occurring throughout the lamina, free, almost wholly exerted, often subtended by a marginal tooth, narrowly winged, terminal on a minor veinlet. *Involucre* 1 to 2 mm. long, 0.5 to 0.8 mm. broad at the middle, firm, tubular, narrow and elongated, dark green or brown, clothed with small, fawn, unicellular, oblong-bulbous, appressed, glandular hairs, the small rim glabrous, slightly dilated, the base narrowly cuneate. *Receptacle* long-extruded, coarse, projecting 1 to 6 mm. beyond the mouth of the involucre, the tip mostly thickened and knob-like. *Sporangia* sessile, compressed-turbinate, the annulus very oblique, consisting of 15 to 18 indurated cells and about 3 thin-walled cells. *Spores* subtriangular to almost oblong, trilete (the laesurae broad), granulate, equat. diam. 31.88 to 39.38 $\mu$   $\times$  polar diam. 24.48 to 30 $\mu$ . (No. 201, Pl. VI, f. 5 and 6.)

**DISTRIBUTION:** The Philippines, New Guinea and Australia (north-eastern Queensland to the North Coast of New South Wales).

**HOLOTYPE:** Insulas Philippinas, Cuming No. 169 (K), examined.

**QUEENSLAND:** Cooktown Tableland, on wet rocks in rainforest near creek, Messmer 7.1952 (NSW P6379); Daintree River, Fitzalan, ex Herb. Muell. 7.1877 (K); ditto, Pentzke 1881 (NSW P4988); ditto, on wet soil in rainforests, Brass No. 2209, 2.1932 (BRI); ditto, in damp heavy soil in rainforest gullies, Messmer 7.1954 (NSW P6876); ditto, growing on rocks along creek banks close to the water, Messmer 8.1952 (NSW P2343); Black Mountain Rd.-Kuranda, on creek banks, almost in the water, in rainforest, Messmer 8.1952 (NSW P2333); Kuranda, Waller 12.1908 (NSW P2138) and 1908 (NSW P1159); in a gully at the foot of Smithfield Range, Kamerunga, near Cairns, Cowley 7.1890 (BRI); West Cairns Hills, 1,000 ft. alt., in wet rock crevices in rainforest gorge, Messmer 6.1954 (NSW P6877); Cairns, Wild 1891 (BRI); between Cairns and Herberton, Wild 1891 (BRI); Johnstone River, Kefford (BRI).

**ABSOLUTE SYNONYM:** *Trichomanes atrovirens* (Pr.) Kunze in Bot. Zeit. V (1847) 371; Copel. in Phil. Journ. Sci. LI (1933) 251, t. 52 f. 3, t. 55 f. 2; C. Chr., Ind. Fil., Suppl. 3 (1934) 187.

**EQUIVALENT SYNONYM:** *Trichomanes rhomboideum* J. Sm. in Hook. Journ. Bot. III (1841) 417, nomen nudum, **HOLOTYPE** BY **MONOTYPY:** Luzon (the Philippines), H. Cuming No. 169 (K), examined. J. Smith stated that this specimen was located at the Kew Herbarium.

This species was misidentified as *Trichomanes javanicum* auct. non Bl. by the following authors:—Benth., Fl. Austr. VII (1878) 702; F. M. Bail., Lith. Queensl. Ferns (1892) t. 24; Domin in Bibl. Bot., LXXXV (1913) 13; Maiden & Betehe, Census N.S.W. Pl. (1916) 1; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114.

The record of *Cephalomanes atrovirens* for the North Coast of New South Wales is somewhat doubtful. However, several ferns and fern-allies have been recorded for this State after intervals of 40 to 60 years, so that this species is included for completeness.

The Australian specimens of *C. atrovirens* agree well with material of this species collected in the Philippines. It is closely allied to *C. javanicum* v.d. Bosch which ranges from Burma

to Malaysia to New Guinea but is separated from the latter species by the slightly dilated (instead of truncate) involucre and the shorter stipes. In *C. atrovirens* the stipes are 1 to 4.5 cm. in length whereas they are 8 to 12 cm. long in *C. javanicum*. As indicated by Copeland in Phil. Journ. Sci. LI (1933) 251-2, *C. atrovirens* is distinguished by its "narrow, very compact fronds with very numerous, small, imbricate pinnae, dark colour and thin texture".

*C. atrovirens* belongs to the group of species in which the sori are borne on normal pinnae not in a terminal spike or panicle.

## 11. SELENODESMIUM (Prantl) Copel.

*Selenodesmium* Prantl, Hymen. (1875) 53, as a section of *Trichomanes*; Copeland in Phil. Journ. Sci. LI (1933) 232, as the group of *Trichomanes rigidum*; Holttum, Ferns of Malaya (1954) 108, as a subgenus but the combination was not made; Copeland in Phil. Journ. Sci. LXVII (1938) 80 and Gen. Fil. (1947) 42, as a genus.

Terrestrial or rarely rupestral ferns. *Rhizome* erect, tufted or shortly creeping, clothed with dark, bristle-like hairs and bearing stout roots which occasionally become stilt-like in age. *Stipes* usually more or less fascicled, not winged, elongated, clothed with dark, deciduous, bristle-like hairs which are under 2 mm. long. *Lamina* usually ovate to deltoid, finely decomposed, harsh or firm in texture without false veins or thickened margins, the cell-walls coarsely pitted, thickened and straight or wavy. *Pinnules* deeply dissected but with a broad, uncut, medial portion. *Ultimate segments* narrow. *Veins* closely parallel, then diverging into the segments. *Involucre* cylindrical, the mouth entire or slightly 2-lipped. *Receptacle* usually long-exserted. *Sporangia* sessile, small and compressed. *Spores* tetrahedral-globose to globose, trilete, scabrate.

TYPE OF GENUS: *Selenodesmium rigidum* (Sw.) Copel. (BASIONYM: *Trichomanes rigidum* Sw.), native to Jamaica.

This is a small, well-defined genus of about 10 species ranging from Formosa and India to Australia and New Zealand through Polynesia to Jamaica. It is mainly found in the tropical and subtropical parts of the world. In Australia only one species has been recorded, viz. *Selenodesmium elongatum* (A. Cunn.) Copel. which occurs in Queensland and on the North Coast of New South Wales.

The chief diagnostic characteristics of the genus are the deltoid fronds and the thick, coarsely pitted cell-walls of the lamina. This is an essentially terrestrial or rarely rupestral genus of ferns which prefer dark, shady forest gullies. Epiphytic hepatics commonly grow on the laminas of *Selenodesmium* spp.

A chromosome count of  $n = 33$  was recorded for *Selenodesmium obscurum* (Bl.) Copel. (as *Trichomanes obscurum* Bl.) by Manton & Sledge in Phil. Trans. Roy. Soc. London, Ser. B, Biol. Sci. No. 654, Vol. CCXXXVIII (1954) 136, from material collected in Ceylon. They also recorded a count of  $n = ca. 33$  for Malayan specimens of the same species, l.c. 136.

*Selenodesmium elongatum* (A. Cunn.) Copel. in Phil. Journ. Sci. LXVII (1938) 92; Dobbie & Crookes, New Zealand Ferns (1952?) 118, 119 (photo.).

*Habitat* terrestrial or sometimes rupestral in tropical or subtropical rainforests, in damp gullies along creek banks or sometimes under rock ledges. *Rhizome* short, thick, erect, oblique or very shortly creeping, 0.7 to 2 cm. high, densely clothed with

simple, septate, almost black, acute hairs which are 1 to 2 mm. long, the roots woody, prop-like and rigid. *Stipes* not winged, almost terete, with 2 insignificant longitudinal ridges, fascicled, 3.5 to 20 cm. long, 0.5 to 1 mm. broad, terete, rigid, brown or dark purplish-brown, darker on the adaxial surface, woody, smooth or slightly scabrous, glabrous or bearing a few, almost black, deciduous, fibrillose hairs near the base. *Main rachis* very narrowly winged towards the apex by the decurrent bases of the primary pinnae. *Fronde* 8 to 36 cm. long including the stipes. *Lamina* 3-pinnate or 3-pinnate-pinnatifid, thinly coriaceous, dark olive-green, rigid, lanceolate-deltoid (3: 1) to ovate-deltoid (3: 2), 5 to 14.5 cm. long, 2 to 9 cm. broad, the cell-walls very thick and pitted, not wavy, the apex acute to acuminate, either erect or deflexed. *Primary pinnae* petiolulate, opposite at the base but alternate towards the middle and apex, narrowly ovate-deltoid (2: 1) to broadly ovate-deltoid (6: 5), 1.5 to 4.5 cm. long, 1 to 2.5 cm. broad, the apex obtuse to acute, seldom acuminate. *Secondary pinnae* with unwinged petiolulcs except near the apex of each primary pinna, much dissected at the base, the uncut lamina oblanceolate; apex obtuse, subacute or broadly rounded, finely denticulate. *Ultimate segments* flat, usually oblanceolate (3: 1) to narrowly obovate (2: 1) or cultrate (6: 1), denticulate towards the apex. *Veins* prominent, almost parallel then diverging into the ultimate segments and much forked dichotomously, reaching the margin, densely clothed on the lower surface with minute, scurfy, yellowish-brown, 1- to 3-celled hairs. *Sori* 20 to 200 on each frond, 1 to 18 on each primary pinna (occurring on both margins), borne on short lobes in the axils of the tertiary segments. *Involucre* 1.5 to 2 mm. long, the middle of the tube 0.5 to 0.6 mm. broad, cylindrical, sometimes reflexed, dark olive-green or brown, free but narrowly winged on both sides throughout its length, clothed with scurfy hairs especially near the base; mouth 0.5 to 0.8 mm. broad, truncate or slightly dilated and reflexed, entire or incipiently 2-lipped; base narrowly cuneate, greatly attenuated. *Receptacle* very long-exserted, curved, projecting up to 1.5 cm. beyond the mouth of the involucre, the apex unthickened or slightly dilated. *Sporangia* sessile, compressed, the annulus obliquely transverse, composed of 15 or 16 indurated cells and about 4 thin-walled cells. *Spores* globose-tetrahedral to globose, trilete, white (later green), the laesurae simple, the exine very thin and scabrate, equat. diam. 28.25 to 31.88 $\mu$   $\times$  polar diam. 22.5 to 28.13 $\mu$ . (No. 201, Pl. VI, f. 1 and 2.)

**DISTRIBUTION:** New Zealand (North and South Islands) and Australia (North-eastern Queensland to the North Coast of New South Wales).

**HOLOTYPE:** In damp woods of Wangaroa and Hokianga No. 56, R. Cunningham, 1834 (K), examined. This specimen was collected in New Zealand.

**QUEENSLAND:** Cooktown Tableland, growing on rocks in the bed of a river, in rainforest, Messmer 7.1952 (NSW P4871); Cooktown, Harris (BRI 30339); Thornton Peak, alt. 4,000 ft., Brass & White No. 228, 9.1937 (BRI 30372); Daintree River, opposite Mission, near creek, in leaf mould in damp gully, Messmer 7.1954 (NSW P6824); ditto, in rainforest, Messmer 8.1952 (NSW P2218); Mt. Demi (4 miles SW of Mossman, 3,000 ft. alt., on wet mountain slopes, Brass No. 2082, 2.1932 (BRI 30366-7); Black Mountain Road-Kuranda, in rainforest, on creek banks, almost in water, Messmer 8.1952 (NSW P2332); Street's Gully, Kuranda, Watts 7.1913 (NSW P3759); West Cairns Range, 1,000 ft. alt., under rock ledges in rainforest gorges, Messmer 7.1954 (NSW P6875); Cairns district, Watts 7-8.1913 (NSW P2092); Cairns, Froggatt 1886-7 (NSW P1148); Atherton, McKenzie 9.1910 (NSW P2096); Atherton Scrub, Mitchell 8.1911 (NSW P2091); Bellenden Ker, Hamilton Kenny 1.1912 (BRI 30342); Malanda, tufted, oblique to erect, dark green, on banks in rainforest, 2,400 ft. alt., Blake No. 15171, 8.1943 (BRI 30369); Herberton, Waller 1908 (NSW P2095); Johnstone River, Kefford (BRI 30336); ditto, Bancroft (BRI 30340); creek on the way to Tully Falls, Watts 7-8.1913 (NSW P3758); between Cleveland Bay and Rockingham Bay, Hill Nos. 57 and 58, 1.1866 (K); Seaview Range, Tenison-Woods 1875 (NSW P2094); Paluma Range, in rainforest, Kennedy 8.1948 (NSW P4988); Dalrymple Heights, on stream bank in forest, Clemens 8-11.1947 (BRI 20187); Eumundi, Simmonds 11.1892 (K; BRI 30363-4); Yandina, Bailey 3.1891 (NSW P582); ditto, Field Naturalists 5.1891 (BRI 30355); Maroochie, Bailey 7.1879 (BRI 30337); Buderim Mountain, White 4.1916 (BRI 3;34)30

Eudlo Creek, Simmonds (BRI 30356); Pearson's Falls, Helidon, Bailey 10.1883 (BRI 30338); Nerang Creek, Schneider (BRI 30341).

NEW SOUTH WALES: Macpherson Range, Campbell 8.1901 (NSW P2093); Main Arm of the Brunswick River, near Mullumbimby, fairly common on shady creek banks in wet alluvial soil, in rainforest, Goy No. 135, 8.1936 (BRI 30365); Tintenbar, Bäuerlen 12.1896 (NSW P1856); Richmond River, Watts 1901 (NSW P3757); Clarence River (NSW P2097).

ABSOLUTE SYNONYMS: *Trichomanes elongatum* A. Cunn., Comp. Bot. Mag., II (1837) 368; Hook., Ic. Pl. (1845) t. 701; Copel. in Phil. Journ. Sci. LI (1933) 239, pl. 47, f. 1 and 2. *Trichomanes rigidum* Sw. var. *elongatum* (A. Cunn.) Hook. et Bak. in Hook. & Bak., Syn. Fil. (1873) 86; Thomson, The Ferns & Fern Allies of New Zealand (1882) 48.

EQUIVALENT SYNONYM: *Trichomanes polyodon* Col. in Trans. N.Z. Inst. XXVIII (1896) 618, ISOTYPE: New Zealand, presented by W. Colenso in 1897 (K).

This species was misidentified as *Trichomanes rigidum* Sw. in the following publications:— Benth., Fl. Austr. VII (1878) 702; Moore & Betche, Handb. Fl. N.S.W. (1893) 503; Maiden & Betche, Census N.S.W. Pl. (1916) 1; Melvaine in Proc. Linn. Soc. N.S.W. LXI (1936) 114. However, *Selenodesmium rigidum* (Sw.) Copel. (syn. *T. rigidum* Sw.) is a native of Tropical America.

Specimens such as NSW P2095 collected by Waller at Herberston, North Queensland, are a good match for material of *Selenodesmium elongatum* obtained in New Zealand, e.g. BRI 30349 from Nelson and AK 31491 from Walkers Bush, Auckland. Nevertheless, the laminas of these specimens are less finely dissected than in most Australian plants of this species. *S. elongatum* was originally described from New Zealand where it is found in both the North and South Islands on wet, shady banks from sea level to 2,500 ft. altitude according to Harris, Spores of New Zealand Pteridophyta (1955) 84.

There is a good deal of variation in the Australian material of *S. elongatum* especially in the degree of dissection of the secondary pinnae. There is every gradation between specimens such as NSW P2095 from Herberston where the secondary pinnae are shallowly cut into short broad lobes, to NSW P6824 from the Daintree River. In the latter frond these secondary pinnae are very finely dissected into narrow segments.

*S. elongatum* differs from *S. obscurum* (Bl.) Copel. which is common in Ceylon, Malaya, Southern India, Formosa, Indonesia and New Guinea, in the usually uncurled tips of the laminal segments in the former species. This point is difficult to assess in dried specimens because of the number of badly pressed fronds but these tips are uncurled in living plants which I have examined. The fronds are much more finely dissected in *S. obscurum*, also the uncut lamina of the pinnules is mostly linear instead of oblanceolate or obovate as in *S. elongatum*. Similarly in another closely allied species viz. *S. dentatum* (v.d. Bosch) Copel., of Polynesia, it is linear to elliptical (see Copeland in Phil. Journ. Sci. LI (1933) 233), but the tips of the laminal segments are uncurled as in *S. elongatum*.

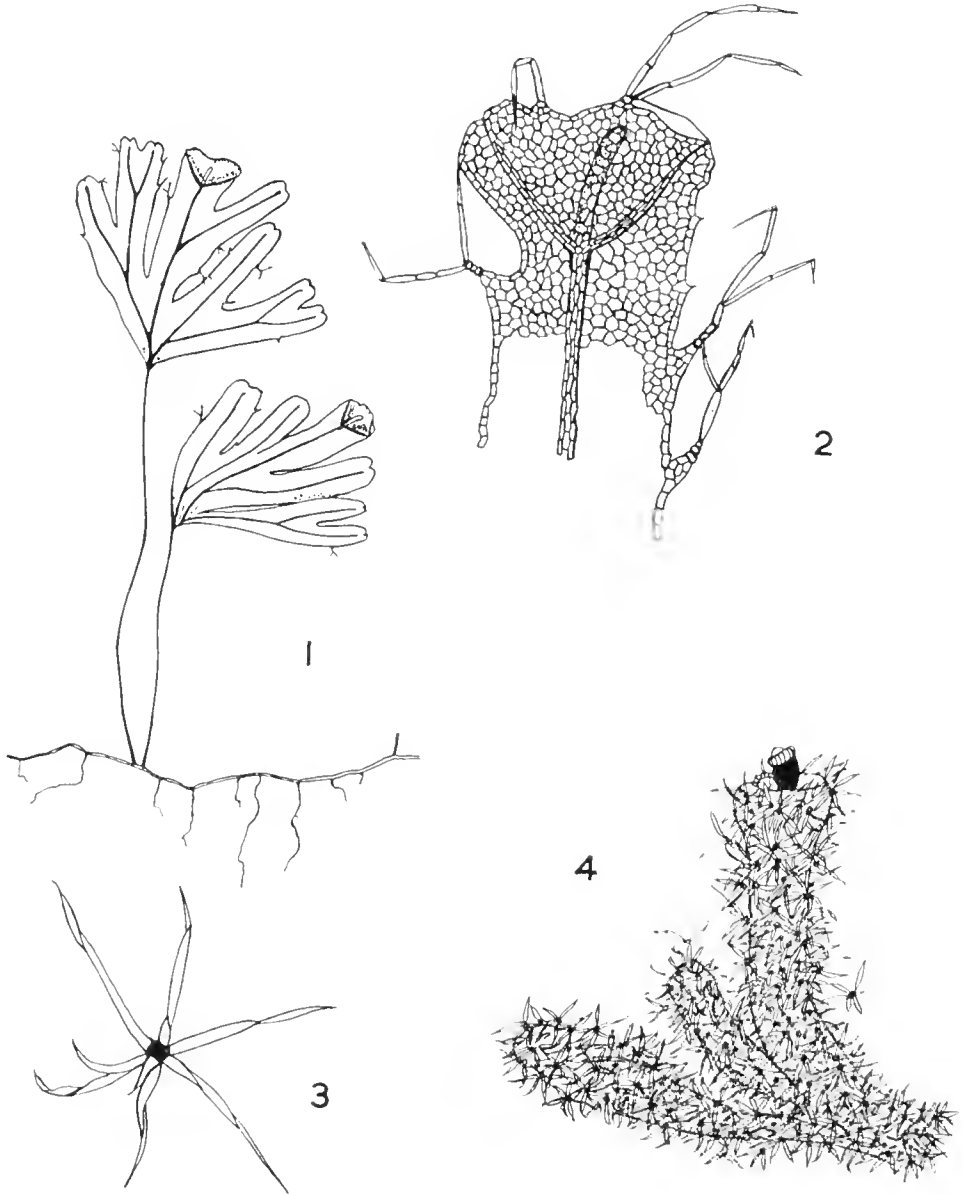
Hepatics are commonly found growing on the laminas of *S. elongatum*, e.g. *Lepidozia gottscheana* Ldgb. is epiphytic on NSW P4871 collected by Messmer on the Cooktown Tableland, North Queensland. Miss Helen Hewson, University of Sydney, kindly made the identification of this bryophyte for me.

In Eastern Australia this terrestrial (or less commonly rupestral) fern is mostly found on shady, wet creek banks in good alluvial soil. *S. elongatum* occurs from the tropical rainforests of north-eastern Queensland to the subtropical rainforests of the Far North Coast of New South Wales but it has not been recorded from *Nothofagus* forests.



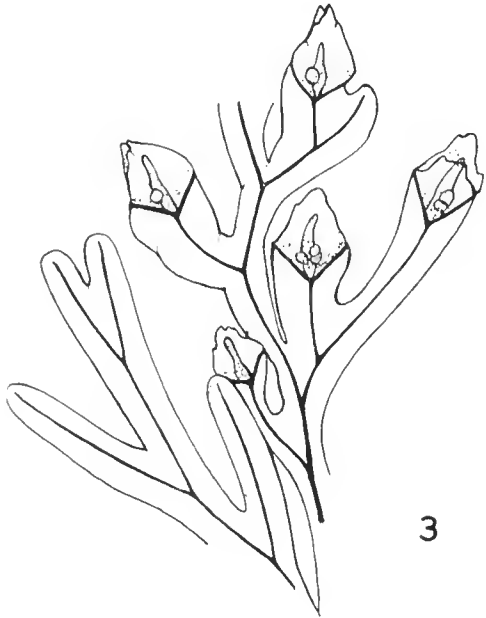
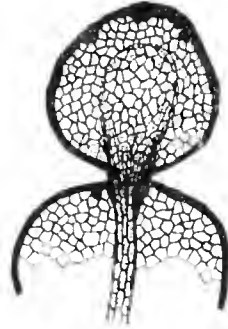
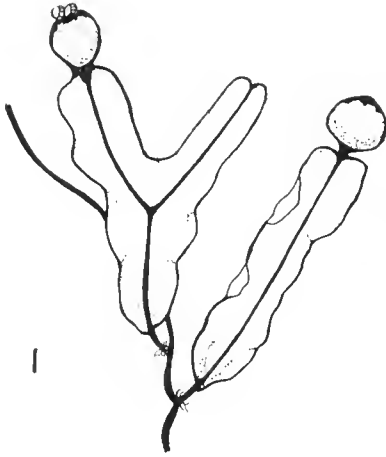






1. *Sphaeroconium lyallii*, habit study,  $\times 2\frac{2}{3}$ . 2. *S. lyallii*, sorus at apex of an ultimate segment,  $\times 18$ . 3. *Apteropsis malingii*, stellate laminal hair,  $\cdot$  ca. 100. 4. *A. malingii*, sorus on portion of primary pinna,  $\times 18$ .

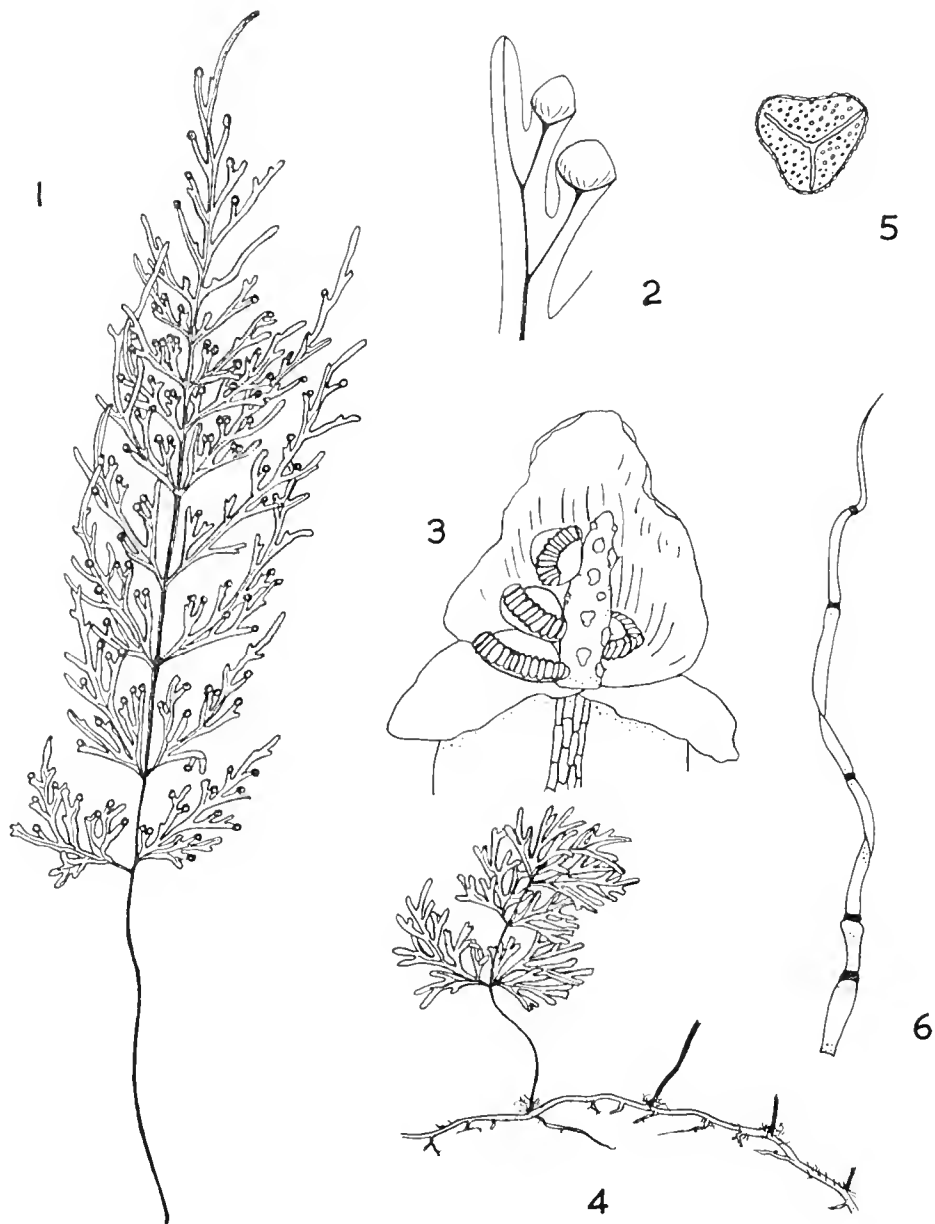




*Hymenophyllum* spp.

1. *H. marginatum*, habit study,  $\times 4\frac{1}{2}$ . 2. *H. marginatum*, sorus at apex of lamina,  $\times 15$ .  
3. *H. rarum*, portion of fertile frond,  $\times 5$ . 4. *H. cupressiforme*, portion of fertile frond,  $\times 5$ .

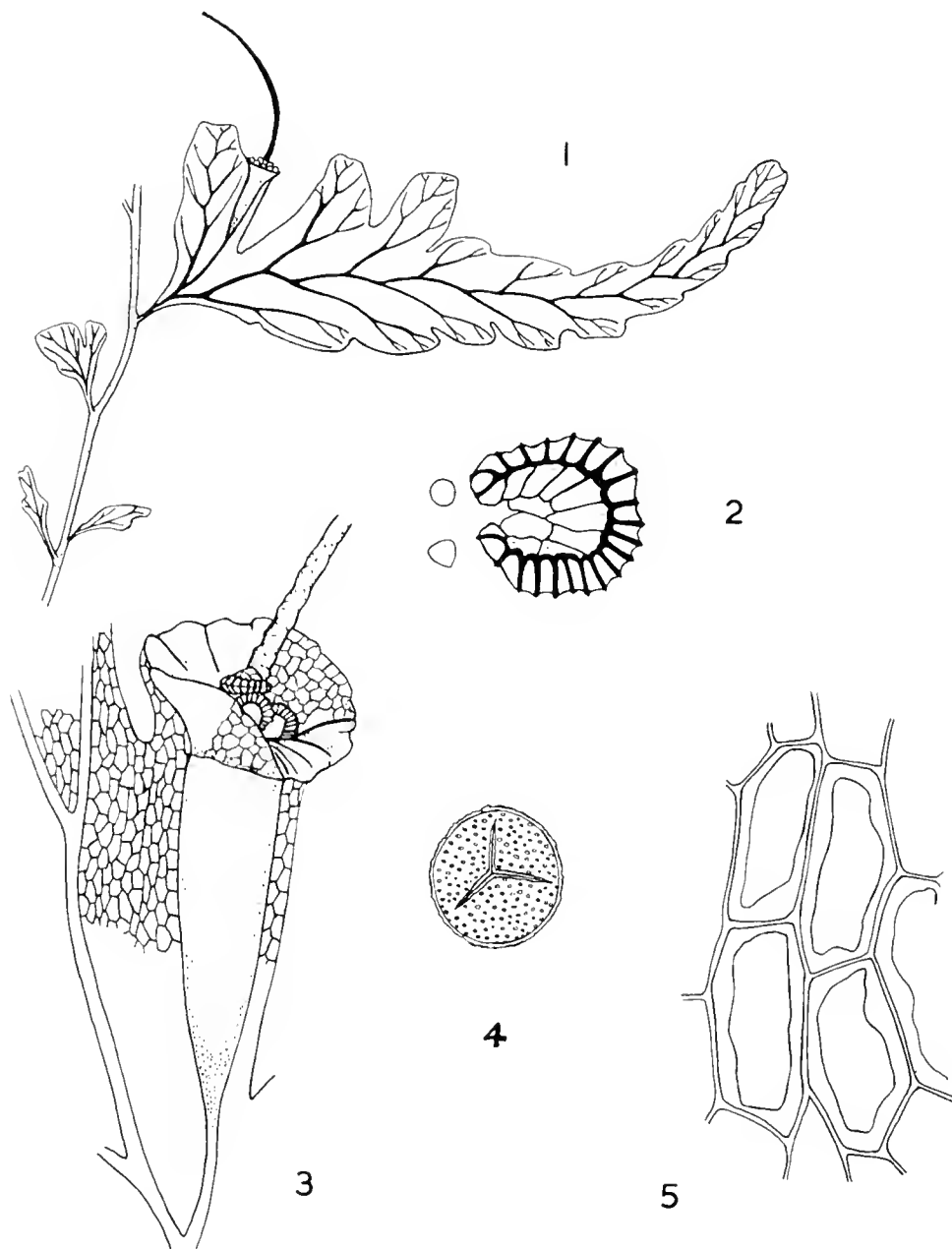




*Hymenophyllum flabellatum*

1. Large fertile frond,  $\times \frac{1}{3}$  natural size. 2. Two sori on ultimate segments,  $\times 4$ . 3. Sorus with receptacle bearing sporangia,  $\times 33$ . 4. Small sterile frond on rhizome,  $\times \frac{1}{3}$ . 5. Spore,  $\times 320$ . 6. Hair of rhizome, ca.  $\times 40$ .



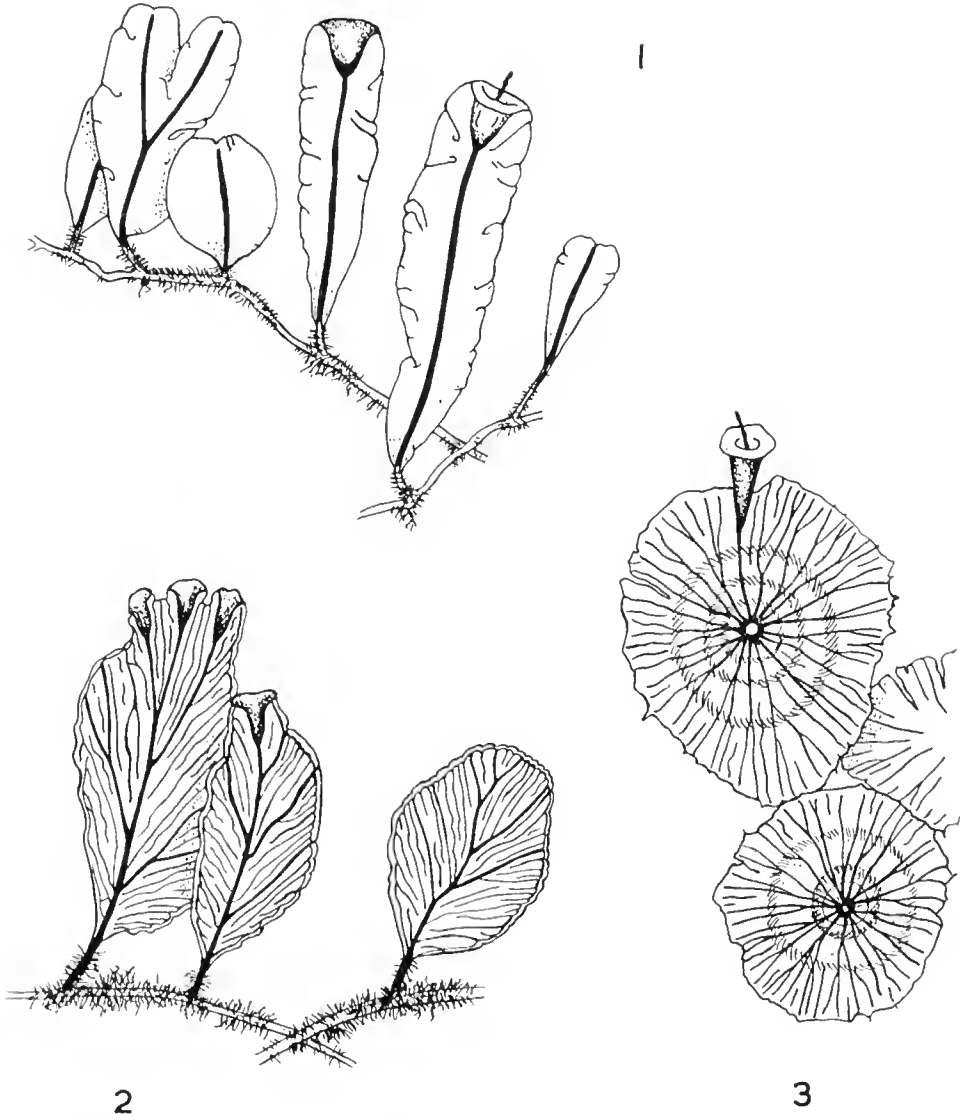


*Polyphlebium venosum*

1. Lower portion of frond with a fully developed primary pinna and several reduced pinnae,  $\times 5$ . 2. Sporangium dehiscing with 2 spores,  $\times 140$ . 3. Sorus with cylindrical involucre,  $\times 25$ . 4. Spore,  $\times 640$ . 5. Cells of lamina,  $\times 250$ .



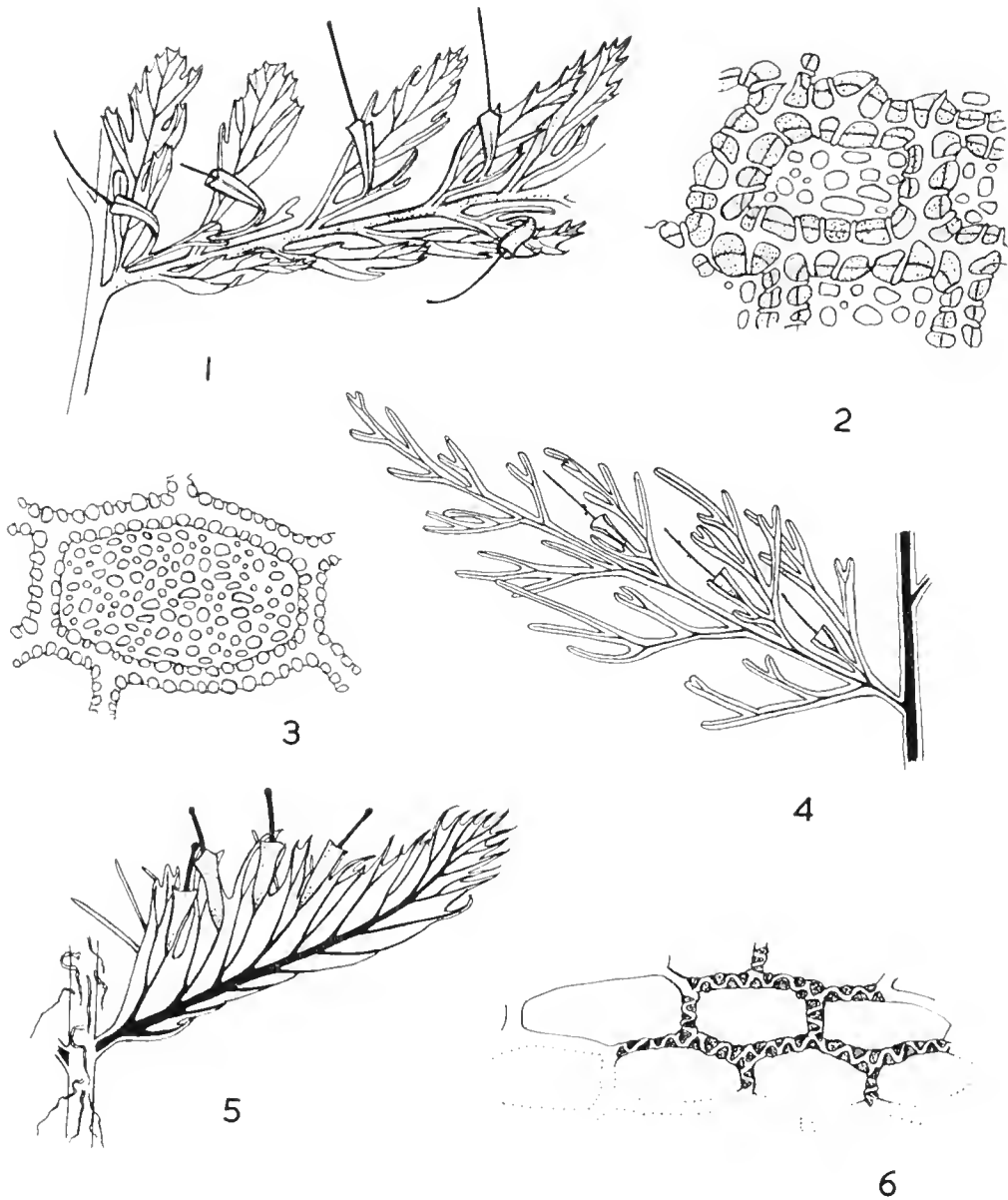




*Dwarf Species*

1. *Microtrichomanes vitifense*, habit study,  $\times 4\frac{1}{2}$ . 2. *Microgonium bimarginatum*, habit study,  $\times 4\frac{1}{2}$ . 3. *Microgonium tahitense*, habit study,  $\times 6\frac{1}{2}$ .

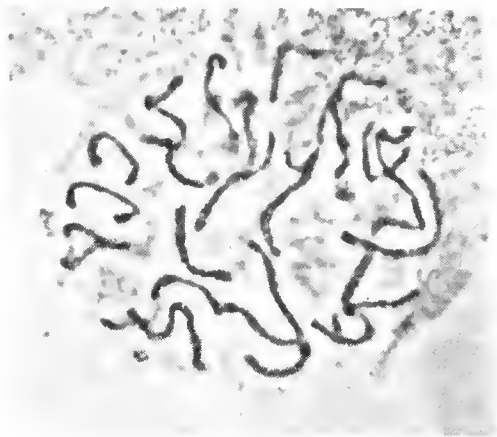




The *Trichomanes* Group

1. *Selenodesmium elongatum*, portion of a primary pinna with sori,  $\times 3\frac{1}{2}$ . 2. *S. elongatum*, cells of lamina with pitted walls,  $\times$  ca. 266. 3. *Macroglena caudata*, cells of lamina with pitted walls,  $\times$  ca. 266. 4. *M. caudata*, primary pinna with sori,  $\times 2\frac{2}{3}$ . 5. *Cephalomanes atrovirens*, primary pinna with sori,  $\times 3\frac{1}{2}$ . 6. *C. atrovirens*, cells of lamina with pitted walls,  $\times$  ca. 266.



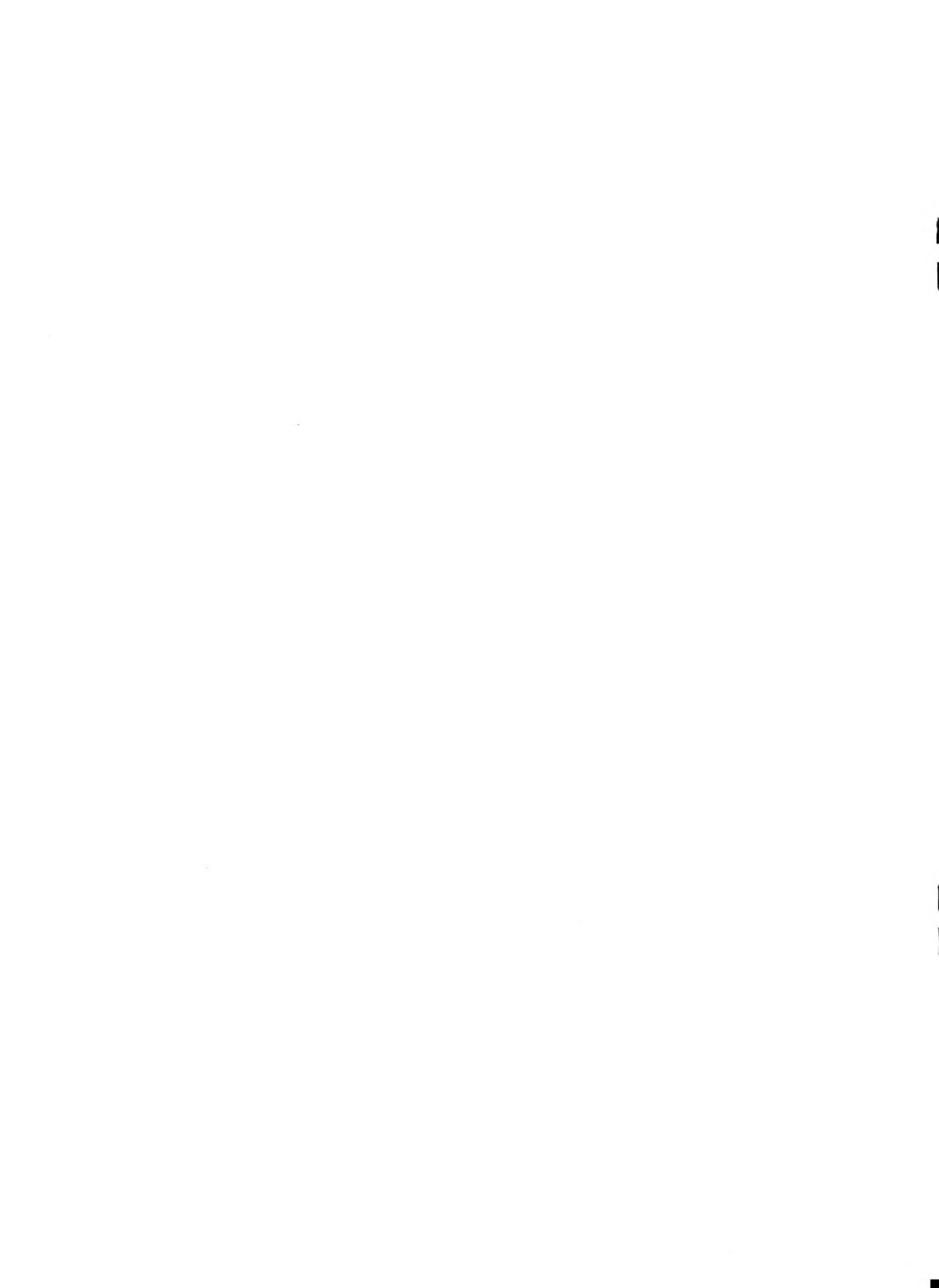


DEL. M. TINDALE



*Hymenophyllum peltatum*

Above: Mitotic chromosomes, late prophase,  $\times 900$ . Below: Diagram of the same cell,  $\times 1,800$ .



93	Crassulaceae	143	Melastomataceae
94	Escalloniaceae	144	Onagraceae
95	Pittosporaceae	145	Haloragiaceae
96	Cunoniaceae	146	Araliaceae
97	Davidsoniaceae	147	Umbelliferae
98	Rosaceae	148	Alangiaceae
99	Mimosaceae	149	Ericaceae
100	Caesalpiniaceae	150	Epacridaceae
101	<i>Papilionaceae, Part</i>	151	Myrsinaceae
102	Geraniaceae	152	Primulaceae
103	Oxalidaceae	153	Plumbaginaceae
104	Linaceae	154	Sapotaceae
105	Erythroxylaceae	155	Ebenaceae
106	Zygophyllaceae	156	Symplocaceae
107	Rutaceae	157	Oleaceae
108	Simaroubaceae	158	Loganiaceae
109	Burseraceae	159	Gentianaceae
110	Meliaceae	160	Menyanthaceae
111	Tremandraceae	161	Apocynaceae
112	Polygalaceae	162	Asclepiadaceae
113	Euphorbiaceae	163	Convolvulaceae
114	Callitrichaceae	164	Polemoniaceae
115	Anacardiaceae	165	Hydrophyllaceae
116	Aquifoliaceae	166	Boraginaceae
117	Celastraceae	167	Verbenaceae
118	Siphonodontaceae	168	Avicenniaceae
119	Hippocrateaceae	169	Labiatae
120	Stackhousiaceae	170	Solanaceae
121	Icacinaceae	171	Scrophulariaceae
122	Sapindaceae	172	Selaginaceae
123	Akaniaceae	173	Bignoniaceae
124	Rhamnaceae	174	Pedaliaceae
125	Vitaceae	175	Martyniaceae
126	Elaeocarpaceae	176	Orobanchaceae
127	Tiliaceae	177	Gesneriaceae
128	Malvaceae	178	Lentibulariaceae
129	Sterculiaceae	179	Acanthaceae
130	Dilleniaceae	180	Myoporaceae
131	Eucryphiaceae	181	Plantaginaceae
132	Hypericaceae	182	Rubiaceae
133	Elatinaceae	183	Caprifoliaceae
134	Frankeniaceae	184	Dipsacaceae
135	Violaceae	185	Cucurbitaceae
136	Flacourtiaceae	186	Campanulaceae
137	Passifloraceae	187	Lobeliaceae
138	Cactaceae	188	Goodeniaceae
139	Thymelaeaceae	189	Brunoniaceae
140	Lythraceae	190	Stylidiaceae
141	Rhizophoraceae	191	Compositae
142	Myrtaceae		

## PTERIDOPHYTA

192	Lycopodiaceae	205	Pteridaceae
193	Selaginellaceae	206	Adiantaceae
194	Isoetaceae	207	Vittariaceae
195	Psilotaceae	208	<i>Davalliaceae</i>
196	Ophioglossaceae	209	<i>Grammitidaceae</i>
197	Marattiaceae	210	<i>Polypodiaceae</i>
198	Osmundaceae	211	<i>Aspidiaceae</i>
199	Schizaceae	212	Thelypteridaceae
200	Gleicheniaceae	213	Aspleniaceae
201	<i>Hymenophyllaceae</i>	214	Blechnaceae
202	Cyatheaceae	215	Marsileaceae
203	Dicksoniaceae	216	Azollaceae
204	Lindsaeaceae	217	Salviniaceae

