

A Systematic Account of the Plants collected in New Caledonia and the Isle of Pines by Mr. R. H. Compton, M.A., in 1914.—PART II. Gymnosperms and Cryptogams. By Prof. COMPTON and others. (Communicated by Dr. A. B. RENDLE, F.R.S., Sec.L.S.)

(PLATES 26, 27.)

[Read 4th March, 1920.]

## GYMNOSPERMS.

By R. H. COMPTON.

THE Gnetales and Ginkgoales are absent from New Caledonia. The Cycadales are represented by a single species, which occurs only in the littoral zone, and is of wide distribution throughout the Indo-Malay region and Polynesia.

The Coniferales, on the other hand, are developed to a quite exceptional degree, members of all the sub-families except the Phyllocladoideæ, Abietæ, and Taxodiæ being present. The Araucariæ include five native species of *Araucaria* (§ Eutaeta) and three of *Agathis*. The Podocarpeæ are represented by four species of *Dacrydium*, eight or nine of *Podocarpus*, and one of *Acmopyle*. The range of the Taxæ is now extended to New Caledonia by the new genus *Austrotaxus*. The Cupresseæ include a *Libocedrus*, a *Callitris* (with a variety), and the new genus *Callitropsis*.

In all, my collection comprises 26 or 27 native Conifers. Guillaumin (1911) catalogues 28 distinct species, some of which, however, are doubtful; but if we accept his list as accurate, and add to it the three species here recorded for the first time we reach a total of 31 species, an altogether exceptional number for so small an area as New Caledonia.

Another remarkable feature of the Coniferous flora is that apparently the whole of it is endemic\*. The degree of endemism in the whole Phanerogamic flora is exceedingly high, but the Conifers show it to the utmost, owing, apparently, to the imperfection of their means of seed-distribution. The isolation of the island from continental land-masses is very great, and has apparently existed since a remote epoch; so that the Conifer population has undergone prolonged independent evolution. The impression that one derives from a consideration of the flora is that New Caledonia is the

\* The flora of the New Hebrides is very imperfectly known, or exceptions might be found to this statement. *Araucaria Cookii*, which occurs in the New Hebrides, is not certainly native there. The non-endemic species in Guillaumin's (1911) list are open to suspicion of error; and my own collection includes none but endemic species (save the planted *Araucaria Bidwillii*).

remains of an area on which, prior to its isolation by subsidence, the Podocarpeæ and Araucariæ attained a great development, and which, in fact, became an important centre for the evolution and distribution of Conifers on their migration northwards from the Antarctic Continent. The relationships of the Podocarpeæ and *Agathis*, on the one hand, are with New Zealand; and this line of migration is carried on into the New Hebrides, New Guinea, Fiji, Malaya, and India. In *Araucaria* and *Callitris*, on the other hand, we have links with Eastern Australia and Norfolk Island. *Austrotaxus* is the most southerly representative of the Taxeæ, whose centre of distribution is further north, and which were probably evolved subsequently to the northward migration of the Podocarpeæ. New Caledonia is the station of one species of *Libocedrus* in its distribution around the shores of the Pacific Ocean.

The New Caledonian Conifers belong to a number of different ecological types, and are found growing in a great variety of situations. They are, however, developed in the greatest abundance in the montane forest on serpentine rocks above 3000 feet altitude, where they are present to such a degree that one may speak of Conifer forest, though Angiospermic trees and shrubs are also present. To this formation belong four Conifers of superficially similar appearance, all being trees with irregular crowns and *Taxus*-like leaves—viz., *Dacrydium taxoides*, *Acmopyle Pancheri*, *Podocarpus minor*, and *P. ferruginoides*. Here also are found *Callitris sulcata* var. *alpina*, *Libocedrus austro-caledonica*, *Podocarpus usta*, *P. gnidioides* var. *cespitosa*, *P. longefoliolata*, and *Dacrydium lycopodioides*, while *Araucaria Balanœ* forms a conspicuous feature of many mountain summits by projecting high above the general level of the forest. Generally speaking, none of these Conifers can be called well-grown trees; their trunks are dwarfed, stunted, twisted, and gnarled, and their branches show signs of struggle with the severe climatic conditions and the competition of epiphytic mosses and lichens. The impression given is that they have survived on the mountain summits, owing to their qualities of stubborn resistance to unfavourable conditions rather than to any special suitability to those conditions.

This montane Conifer forest is evidently of the same type as that found on the summits in New Guinea, Fiji, Borneo\*, etc., though made up of different floristic elements. It is impossible to resist the impression that these Conifer-capped mountain-tops are islands in an Angiospermic sea, originally continuous but now isolated by subsidence and by the deep

\* The lower limit of the Conifer forest in New Guinea and Borneo is at a considerably higher altitude than in New Caledonia—this being clearly related to climatic conditions due to latitude.

dissection of exposed land-surfaces through weathering. In New Caledonia, for one reason and another, erosion has had the result of cutting up the island into a number of more or less isolated massifs, separated by deep valleys—there being no mountain chain of any great extent with a continuous surface above 3000 feet. The montane Conifer islets therefore form a kind of archipelago, of which none can be fairly called the mainland. There even appears to be a certain amount of endemism within this archipelago. For instance, *Libocedrus austrocaledonica* has hitherto been collected only on the Mont Humboldt-Nekando massif, though it seems probable that further exploration will disclose new situations for this and for other species of apparently restricted areas.

While this Conifer forest is best developed on the serpentine, other hard rocks also carry a similar, though less striking, association. On the gneiss of the Panié-Ignambi range in the north of the island the dominant trees above 3000 ft. are Angiosperms, and Conifers are for the most part thinly developed, though local societies (e. g., of *Dacrydium taxoides*) may be found.

The lowland Conifers also furnish examples of restricted distribution, though for less obvious geographical reasons than in the case of the montane species. For instance, *Callitris sulcata* is copiously present in the valley of the River Comboui, and practically absent elsewhere; and the new genus *Callitropsis* was only met with in one restricted locality on the banks of the R. du Carénage.

For the most part, however, the more lowland forms have a wide distribution in the island, explicable by the present or recent continuity of suitable habitats. Thus *Araucaria Cookii* is found all round the coasts, though most abundant in the south; *Agathis lanceolata* occurs in all the lowland serpentine forests in the south; *Agathis Moorei* and *Austrotaxus spicata* occur throughout the forests of moderate altitude in the north; *Podocarpus nove-caledoniæ* is a constant element of the salicifoliate riverside association in the serpentine districts; *Dacrydium Balanœ* and *Podocarpus Vieillardii* occur, though sparsely, in widely separated lowland localities; *Agathis ovata* and *Dacrydium araucarioides* are frequent in the serpentine scrub wherever this is developed at moderate heights.

With two exceptions the New Caledonian Conifers do not form forests in which a single species is dominant over wide areas. The exceptions are the "Comboui Pine" (*Callitris sulcata*), which forms pure light forest in the Comboui Valley, and the "Columnar Pine" (*Araucaria Cookii*), which grows in dense forests on the Isle of Pines and the neighbouring coral and shingle islets. A remarkable landscape feature is produced by the presence on the most exposed and arid serpentine crests of a thin sprinkling of Araucarias,

which are the only trees present, the rest of the vegetation being low xerophilous scrub. In this way we find *Araucaria Muelleri* on the summit of Mont Koghi and on the mountains bordering the Plaine des Lacs, *A. Rulei* on the bare crests of the Presqu'île Bogota and other serpentine hills near Canala and Nakety, and *A. montana* on the summit of Taom and elsewhere.

## CYCADALES.

### CYCADACEÆ.

CYCAS sp. Bay of Prony; littoral zone; serpentine. Estuary of River Néra, near Bourail; littoral zone. Île Mouac; littoral zone. 868, 2284. I am unable to determine to which species, *C. circinalis* L. or *C. Rumphii* Miq., these gatherings belong, though I incline towards the latter. The two species are undoubtedly very closely allied, and the confusion existing between them is largely due to the imperfection of herbarium material and the considerable variation of essential parts on one and the same plant.

## CONIFERALES.

### TAXACEÆ.

PODOCARPUS.—All five of Pilger's sections of this genus are represented. The species belong to a variety of ecological types and occur in widely distinct habitats. The total number of species occurring in New Caledonia may be taken as not less than eight or nine.

P. (§ Stachycarpus) FERRUGINOIDES R. H. Compton, sp. nov. *Arbor* 10–15 m. alta irregulariter ramosa; *truncus* erectus validus cortici rugosa indutus; *ramuli* subdorsiventrals; *folia* in sicco ferruginea spiraliter inserta plus minusve uno planitie expansa non petiolata e basi angusto decurrente erecto-patentia coriacea glabra oblonga 10–15 mm. long. 3 mm. lat. obtusa sed minute apiculata, costa media haud conspicua; *flores masculi* mihi ignoti; *flores feminei* omnes cœtanei; *ramulus ovuliferus* axillaris brevis tenuis 5–8 mm. long. basin versus squamis minutis triangularibus dense tectus; in parte distale ramuli squamulæ sensim majores lineares 3–5 mm. long. haud 1 mm. lat. obtusæ plus minusve recurvatæ glaucæ foliis parvis similes; folium lineare supremum unicum carpidium formans; *ovulum* ovoideum glaucum obtuse apiculatum; *semen* rotundato-ovoideum non apiculatum 12–14 mm. longum glaucum, testa duplici exteriori carnosâ interiori lignosa.

Nekando; coniferous forest; above 3000 ft.; serpentine. 1073, 2029. Differs from the New Zealand *P. ferruginea* in the shorter and relatively broader oblong leaves whose mid-ribs are scarcely evident, in the elongated linear bracts on the distal part of the seed-pedicel, and in the more nearly spherical seed without apiculus when mature. Pilger (in Engler's 'Pflanzenreich,' iv. 5, p. 67) refers to a specimen collected by Lecard, in the Paris Herbarium, as being *P. ferruginea* D. Don, a species otherwise known only from New Zealand. I have not seen this specimen, and cannot therefore say whether it is rightly so-called or whether it should not rather belong to *P. ferruginoides*. Guillaumin does not mention *P. ferruginea* in his catalogue.

PODOCARPUS (§ *Dacrycarpus*) *VEILLARDII* Parl. River Comboui; stream-side; serpentine alluvium; 50 ft. 2227. I saw this tree in one locality only, on the banks of a small tributary of the river, near its mouth, where it was sparingly present. Here it was a tree of 40 ft. of a narrow asymmetrical habit of growth. The leaves are remarkably dimorphic; "juvenile" forms with dorsiventrally flattened branchlets suggestive of *Sequoia sempervirens* being borne on mature trees along with "mature" foliage which recalled *Sequoia gigantea*; reproductive organs are borne on the branches of the latter type alone. This dimorphism upsets Pilger's clavis to the species of his § *Dacrycarpus* (*l.c.*, p. 56): it is at least as marked a feature in *P. Vieillardii* as in *P. imbricata*.

P. (§ *Microcarpus*) *USTA* Brongn. & Gris. Ignambi; high forest; gneiss; 3500 ft. 1545. This curious plant was seen on one occasion only, and then in very small quantity.

P. (§ *Nageia*) *MINOR* Parl. Mt. Mou; coniferous forest; serpentine; 3500 ft. Ignambi; coniferous forest; gneiss; 3500 ft. 607, 1524, 1587. Balansa's notes, as quoted by Brongniart and Gris and copied by Pilger, refer to *P. minor* as a shrub of about 1 m. in height. My specimens, however, which match the type (Vieillard 1275) perfectly, were collected from trees of 40-50 ft. in height. The name *P. minor* is therefore something of a misnomer. The tree is a frequent constituent of the conifer forest above 3000 ft. all over New Caledonia. The wood has a sweet resinous scent, and the ripe seeds are bright red.

P. (§ *Eupodocarpus*) *NOVÆ-CALEDONIÆ* Vieill. ex Brongn. & Gris. Rivers Dumbéa, Comboui, Carénage, etc.; abundant along river-banks in serpentine districts at low altitudes. 402, 419, 2017, 2169. This shrub is characteristic of serpentine riversides, where it is associated with other narrow-leaved

shrubs. It never exceeds a few feet in height, a rare habit in *Eupodocarpus*. The young leaves are glaucous, becoming dark green when older. The ripe seed-receptacle is bright scarlet or purple, soft, translucent, and sweet to the taste.

*PODOCARPUS LONGEFOLIOLATA* Pilger. Mt. Mou; summit forest; serpentine; 3500 ft. 501.

*P. GNIDIODES* Carr. var. *CÆSPITOSA* Carr. Mt. Dore; among rocks in serpentine scrub; 1200 ft. Comboui mountains; in scrubby coniferous forest; serpentine; 3500 ft. 678, 2189.

Carrière's original description refers to *P. gnidioides* as a tree of 12-15 m. in height: he separates the var. *cæspitosa* on the ground of its small shrubby stature, remarking that he would not be surprised if this were merely a habitat form. My notes refer entirely to a shrub of 3-5 ft., and Schlechter also describes his specimens as coming from small shrubs. The typical *P. gnidioides* was described in the absence of reproductive organs, though those of var. *cæspitosa* are well known. Until the strobili of the arboreal plant have been collected, it will be impossible to decide as to its relationship with the var. *cæspitosa*.

*PODOCARPUS* sp. indet. Mt. Canala; transitional forest on schists; 1500 ft. 1273. A narrow tree of about 25 ft., with oblong-lanceolate dark green shining leaves, 8-9 cm. long by 1.5 cm. broad; the midrib conspicuous. Sterile branches alone were collected, which I have been unable to match.

*PODOCARPUS* sp. indet. Plaine des Lacs; serpentine hillsides; 1000 ft.; rare. 271. A small tree of the § *Eupodocarpus*: unfortunately only ovules were collected.

*ACMOPYLE PANCHERI* Pilger. Mt. Mou; abundant in coniferous forest near summit; serpentine; 3500 ft. 485. A tree of 30-40 ft. occurring in the mixed coniferous forest of certain serpentine mountains above 3000 ft., along with *Podocarpus minor*, *P. ferruginoides*, *Dacrydium lycopodioides*, *D. taxoides*, and *Libocedrus austrocaledonica*. From the *Podocarpus* spp. and *Dacrydium taxoides* it is difficult to distinguish in the field without some experience, in the absence of female reproductive shoots. Nearly ripe seeds were found in March. The genus is monotypic and confined to New Caledonia.

**DACRYDIUM.**—Four species occur in New Caledonia, all being of widely distinct type and occurring in a variety of situations.

*DACRYDIUM ARAUCARIOIDES* Brongn. & Gris. Plaine des Lacs ; abundant on moderate slopes 800–1500 ft. ; serpentine ; Presqu'île Bogota ; Comboui mountains, etc. 320. This remarkable endemic *Dacrydium* is characteristic of serpentine rocks all over the island, occurring in dry arid localities and not entering the forest. A singular feature, apparently not previously recorded, is the fact that the whole apex of the female shoot becomes purple and fleshy on maturity, as in *Podocarpus* spp. and *Microcachrys* : this does not occur, as far as is known, in any other *Dacrydium*, though in *D. cupressinum* the epimatium becomes somewhat fleshy. *D. araucarioides* comes up fairly readily from seed in its native localities, where there is always a fair amount of bare soil. The young plants have a distinct juvenile form, with linear pinoid erecto-patent leaves reaching 1 cm. in length. Growth is slow in the arid conditions, and the mature tree rarely exceeds 20 ft. in height, having a sparse candelabrum form.

*D. LYCOPODIODES* Brongn. & Gris. Mt. Mou ; coniferous forest ; serpentine ; 3500 ft. 622. A tree of 30–40 ft., with a slender and graceful habit. The juvenile form (No. 622*a*) is very distinct, having filiform erecto-patent leaves about 1 cm. long.

*D. TAXOIDES* Brongn. & Gris. Ignaubi ; high forest ; gneiss ; 3000 ft. 1571. My gatherings were from trees of 50 ft. Brongniart and Gris quote Pancher to the effect that *D. taxoides* is a shrub of about 3 m. in height. I do not doubt, however, that my specimens belong to this species, whose mature stature is thus seen to vary widely.

*D. BALANSÆ* Brongn. & Gris. River Comboui ; lowland forest of river-side ; serpentine ; 50 ft. 2015. I saw this tree on one occasion only, and was then unable to find reproductive branches.

#### AUSTROTAXUS Compton, gen. nov. (Pl. 26.)

*Arbor* foliosa non resinosa. *Tracheides* marginato-punctati non spiraliter crassati. *Ramuli fertiles* axillares. *Ovulum* singulare terminale orthotropum integumento unico. *Semen* in arillo carnosio undique inclusum. *Strobilus masculus* spicatus bracteatus : stamina peltata in bractearum axillis : microspora haud alata. Genus adhuc monotypicum.

*A. SPICATA* Compton, sp. nov. *Arbor* dense foliosa 15–25 m. alta. *Truncus* cortice griseo rugoso tectus copiose ramosus. *Folia* in ramulis spiraliter sessilia anguste lineari-lanceolata circa 10–15 cm. long. 6–8 mm. lat. saturate viridia glabra integra acuta marginibus leviter revolutis ; costa media inferne prominens superne sulculo notata. *Ramuli ovuliferi* in

foliorum vel bractearum axillis, basin versus ramorum juvenilium orti, basi diametro circa 2 mm., bracteis multis minutis imbricatis appressis late orbicularibus concavis auriculatis crassis, basalibus minoribus, dense spiraliter tecti. *Ovulum* terminale rectum 2- raro 3-carinatum, hora fecunditatis circa 12-16 mm. long. 7-9 mm. lat. ovoideum vel ellipsoideum; *integumento* unico externe lignoso interne carnoso micropyllo bilabiato apiculato; *arillo* semen fere includente carnoso, ore stricto ovale vel rotundo micropylum circumdato. [Semen maturum non visum.] *Ramuli masculi* in eodem situ ac femini orti singuli spicati circa 15 mm. long., bracteis 12-15, 4 vel 5 basalibus minoribus appressis, superioribus late deltoideis acutis erecto-patentibus 2 mm. long. basi subcrassis. *Stamina* peltata, 1-5 in bracteæ cujusque axillo, microsporangiiis 2-4 intus insipientibus, microsporis haud alatis.

Mt. Canala; moist forest on steep slopes; schists; 2000 ft. Ignambi; high forest; gneiss; 2500 ft., etc. 1155.

A large tree with a dense bushy crown of dark green foliage, when well grown; somewhat frequent on the schist and gneiss rocks of the northern half of the island, where it enters into the composition of intermediate and high forest between about 1000 and 3000 ft. In its general habit of growth and in its leaves it closely resembles a *Podocarpus*. The female shoot shows marked affinities with *Taxus* in the orthotropous ovule enclosed in a fleshy aril and borne singly at the apex of a short bracteate axillary peduncle: to this genus it also approximates in many structural details. The male strobilus, however, while clearly Taxoidean, differs sharply from that of other known genera in its spicate form (to which I have called attention in the specific name). The peltate stamens are similar to those of *Taxus*, but are borne in the axils of the bracts of an extended spicate strobilus. The pitted tracheids of the wood are devoid of spiral thickenings (characteristic of *Taxus*).

With the exception of *Taxus baccata* var. *Wallichiana*, which crosses the equator in the East Indies, this is the only known Taxoidean native in the southern hemisphere.

It is remarkable that *Austrotaxus* should have hitherto been overlooked by collectors, as it is by no means infrequent nor inconspicuous.

## PINACEÆ.

**ARAUCARIA.**—Guillaumin catalogues eight species, some of doubtful validity, in New Caledonia. My collection includes five, viz., *A. Balansæ*, *A. Cookii*, *A. Rulei*, *A. montana*, and *A. Muelleri*; of these Brongniart and Gris have given an excellent comparative account (Bull. Soc. Bot. France, xviii. p. 130, 1871). The other species recorded, viz., *A. excelsa* (a doubtful record

by Forster), *A. intermedia*, and *A. Ravenii*, I am not acquainted with, neither in the field nor in herbaria. *A. Goldieana*, mentioned in the Index Kewensis as New Caledonian, is of doubtful horticultural origin (see T. Moore, in *Flora & Pom.* 1877, p. 39). *A. Bidwillii* has been successfully planted in the Isle of Pines.

*ARAUCARIA BALANSÆ* Brongn. & Gris. Mt. Mou; summit; 3500 ft.; serpentine. Plaine des Lacs; forest in gully; serpentine; 1000 ft. Nekando; forest in gully; serpentine; 2000 ft., etc. 286. The smallest-leaved of any of the New Caledonian Araucarias; in general aspect much like *A. Cookii*, but has a different habitat, being found on the summits of lofty serpentine mountains and in elevated forests in their gullies, where it protrudes conspicuously above the general level of the canopy. As in other *Araucaria* spp. several juvenile forms exist, with leaves longer and narrower than those of the mature shoots.

*A. COOKII* R. Brown. Île Porc-Épic; littoral zone and sub-littoral; serpentine; etc., etc. 923. This celebrated tree attains its greatest abundance in the south of the island and on the Isle of Pines and adjoining islets. It is typically a tree of the sub-littoral zone, but grows also on the seaward slopes of serpentine hills up to an altitude of a few hundred feet, as in the Port Boisé District, on Cap Bocage, and elsewhere: it is planted inland by the natives as an ornament to their villages. The remarkable aspect of the rocky islets sparsely clothed with this slender "pin colonnaire" is expressed in the name, twice used, of the Île Porc-Épic. Even more singular are the tiny coral and sand islets around the Isle of Pines, which, though only a few feet above high-tide mark, are densely covered with forests of this tree—the result being almost to justify the Forsters' suggestion that the islets were composed of basaltic columns. The timber is being ruthlessly exploited, and this unique tree is going the way of other natural beauties under the touch of civilization.

*A. MONTANA* Brongn. & Gris (ex descr.). Taom; serpentine; mountain summit, 3590 ft. 2345. Closely resembles *A. Rulei* in general appearance and in the situations in which it grows, but differs from that species in the size and shape of its leaves and in various other points.

*A. RULEI* F. Muell. Presqu'île Bogota; abundant on arid serpentine plateau; 2000 ft. 1314. A conspicuous object on the serpentine hills in the neighbourhood of Canala. It inhabits the most arid situations, where it is exposed to the full force of every wind and to the periodical cyclones. It gives a remarkable *cachet* to the landscape, whose bright red soil is otherwise scantily covered with low scrub and occasional small trees of *Dacrydium*

*araucarioides*. In the size and shape of its foliage it is intermediate between its close relatives, *A. montana* and *A. Muelleri*.

ARAUCARIA MUELLERI Brongn. & Gris. Plaine des Lacs ; summit of bare serpentine hills ; 1500 ft. Mt. Koghi ; summit ; 3540 ft. ; serpentine. 289, 748. This species, distinguished from *A. Rulei* by the larger size of its leaves, was met with in two localities only, both in the southern serpentine district, where, like *A. Rulei* and *A. montana* further north, it occupies the crests of serpentine mountains, otherwise covered only with scrub. No cones were found.

A. BIDWILLII Hook. Vao, Isle of Pines ; planted. 2274. The bunyabunya, native of Australia.

AGATHIS.—The nomenclature of the New Caledonian species is inextricably confused. There appear to be three species, for which I adopt the nomenclature of Pancher (in Sebert, Not. Bois. Nouv. Caléd. p. 169, 1874) as being less involved in ambiguities and inconsistencies than any other method of treatment.

Two species, *A. lanceolata* and *A. Moorei*, are typically forest trees. *A. lanceolata* is a magnificent species with a massive trunk often rising to a height of 50 ft. before branching ; its bark is reddish brown, smooth, and scales off in thin flakes ; its leaves are large, ovate-lanceolate with an acute apex, and not glaucous ; its mature female cone is broadly elliptical. This is the tree characteristic of high forest on serpentine, below 1000 ft. altitude, throughout the southern half of New Caledonia. Its wood is valuable, and is being exploited in various places, notably at the Baie des Pirogues ; it also produces immense quantities of resin. *A. Moorei* is a markedly smaller tree, whose trunk never attains the height or diameter of *A. lanceolata* ; its leaves are much smaller and are narrowly elliptical ; its mature female cone is globose or obovate, often almost pear-shaped, and is distinctly smaller than that of *A. lanceolata*. It is also a forest-tree, but has a different habitat, occurring on the schistose and gneiss rocks of the northern half of the country, typically at 1000–2000 ft. altitude.

The third species, *A. ovata*, never enters into the composition of forests. It is an inhabitant of the arid exposed serpentine ridges and slopes in the south of the island, usually in solitude, rarely forming a small local society, from sea-level to about 1500 ft. altitude. It seldom exceeds 30 ft. in height ; its trunk is covered by a rough greyish bark, which is deeply creviced—quite unlike that of *A. lanceolata*. The leaves are variable, much more coriaceous than in the two woodland species, glaucous below, especially when young, oblong-elliptical, not acute. The female cones are elliptical and smaller than those of *A. lanceolata*.

AGATHIS OVATA Warburg. Hills by Riv. Ngoye; serpentine; 500 ft. Slopes bordering Plaine des Lacs; serpentine; 1000 ft. Hills near Kuakué; serpentine; 1000 ft., etc. 968.

The origin of the specific name is in Gordon's 'Pinetum,' Supplement, p. 28, 1862, where *Dammara ovata* C. Moore is described simply as "a kind with small roundish leaves, found in New Caledonia."

The so-called type-specimen in the Lindley Herbarium at Cambridge is certainly not the one referred to by Moore, but is *A. lanceolata* Pancher.

Pancher takes up the name *ovata* for a tree which is identical with my 968; this is clear from his description, and from a specimen in Herb. Mus. Brit. labelled *Dammara ovata* Lindl., apparently in Pancher's handwriting. I agree with Pancher in thinking that this must have been the species on which Moore founded the specific name *ovata*, despite the Lindley specimen. This name has also been adopted by Schlechter for his Nos. 15130 and 15131 from the Ngoye hills, 150 m. alt.

A. LANCEOLATA Pancher. Plaine des Lacs; forest in gullies; serpentine; 800 ft. Mt. Koghi; valley forest; serpentine; 1000 ft. R. Ngoye; forest by riverside; serpentine; 300 ft., etc. 335. This species is represented in English herbaria by a considerable number of specimens under a variety of names. It appears to be the *Dammara ovata* C. Moore of Gordon's 'Pinetum,' ed. III. p. 112, 1880, and the specimen in the Herb. Lindley at Cambridge, sub nom. *D. ovata*, according to my view, is this species.

A. MOOREI Warburg. Mt. Panié; forest; gneiss; 1500 ft. Mont Canala; forest; schists; 1500 ft. There is apparently no confusion in the nomenclature of this species, whose narrow lanceolate leaves sufficiently distinguish it from other species. I saw isolated trees on Mont Canala, but it was more plentifully developed on Mont Panié forming small groves in the forest. It is apparently absent from serpentine soils and is confined to the northern half of New Caledonia.

CALLITRIS SULCATA Schlechter [= *Frenela sulcata* Parl.; *Frenela Balansae* Brongn. & Gris]. Valley of R. Comboui; locally dominant, forming extensive light woods; serpentine; 50-1000 ft. 2013. A fine symmetrical tree of about 40 ft., usually with an erect smooth trunk and a conical form. The wood is camphor-scented, and is very hard and durable. The great abundance of this tree in the Comboui Valley (it is locally known as the "sapin de Comboui") is most striking, as it appears to be completely absent from the next river-valley, that of the R. Ngoye, with which it is contiguous near the mouth. It has, however, been recorded from the banks of the R. Dumbéa, near Koé, by Balansa.

The juvenile state is remarkably distinct. Instead of the casuarinoid trimerous ultimate branchlets, the young shoots bear free leaves in whorls of 3-4, the leaves being linear, decurrent, dorsally carinate, apiculate, 2 cm. long, 1 mm. broad: they gradually diminish in length on later-produced branches and so pass into the mature, almost completely adnate, cupressoid type of leaf.

This species was described first by Parlatores, as *Frenela sulcata*, from material in the Hooker Herbarium (now in Herb. Kew.); Brongniart and Gris, who apparently did not see Parlatores's specimen, described as *Frenela Balansæ* a plant distributed as Balansa 182, an example of which is also in the Kew Herbarium. This plant is also distributed as Balansa 2506.

The other *Frenela* imperfectly described by Parlatores (DC. Prodr. xvi. 2, p. 447) as *F. subumbellata* from a plant in the Hooker collection, is the juvenile form of *Callitris sulcata*. Parlatores's two types are mounted on the same sheet in the Kew Herbarium, labelled "Moore 5," and there is no doubt that they are identical.

*CALLITRIS SULCATA* var. *ALPINA*, R. H. Compton, var. nov. Varietas a typo differt statura minore, habitu candelabriforme, ramulis confertis, et internodiis brevioribus 2-3 mm. longis.

Nekando; abundant in Conifer forest, locally dominant on rocky places; serpentine; 3500 ft. 2026. This may be merely a habitat form, as it differs from typical *C. sulcata* in points of degree only, such as might be produced by the greater exposure in which it grows. I think, however, that it should probably be regarded as distinct, on account of the discrete areas which the two plants inhabit: *C. sulcata* being a lowland valley-dweller, not found, in my experience, above 1000 ft.: while the var. *alpina* is found on the same soil only at altitudes above 3000 ft.,—the intervening two thousand feet being apparently unsuited either to the type or the variety. My plant matches Schlechter's 15179 (sub nom. *C. Balansæ*), which also comes from the Ngoye Mountains at 1000 m. altitude.

*CALLITROPSIS*, R. H. Compton, gen. nov. (Pl. 27.)

*Arbor* monœcia. *Folia* verticillis tetrameris libra non adnata. *Flores femineæ* ex squamis 8 duobus verticillis similibus constructi; squamæ angustæ, appendiculum dorsalem conspicuam ferentes, haud lignosæ; columella centralis adest; *ovula* orthotropa circa 8. *Semina* 1-4 vix alata; embryo 2 cotyledonibus. *Flores masculi* strobiliformes, ex pluribus verticillis tetrameris constructi. Genus adhuc monotypicum.

*C. ARAUCARIOIDES* R. H. Compton, sp. nov. *Arbor* usque 10 m. alta, forma conica, trunco erecto, cortice griseo, omnibus partibus resinosa.

*Rami* horizontales. *Ramuli* cylindracei fastigiati irregulariter furcati cum foliis 6–8 mm. lati. *Folia* verticillata tetramera ordinibus 8 erecto-patentia imbricata rigida incurvata basi lata sessilia non decurrentia externe carinata, interne plana, 5–7 mm. long. 2–2.5 mm. lat. acuta margine minute ciliato. *Strobili masculi* in ramulis longis terminales ovoidei 10–12 mm. long. 5–6 mm. lat., verticillis sporophyllum tetrameris circa 8; sporophyllia foliis similia, sed basi latiora, maxima 5 mm. long. 3 mm. lat., dense imbricati, basi sporangia sessilia ferentes. *Flores feminei* in ramulis brevibus lateralibus terminales late ovoidei, verticillis tetrameris 2; squamæ exteriores non concurrentes, interiores confertæ angustæ crassæ interne carinatæ 1 cm. long. prope apicem appendiculam conspicuam patentem 5 mm. long. ferentes. *Columella* parva centralis conica adest. *Ovula* squamis cincta circa 8, quorum 1–4 semina fiunt, altera inchoata manentia. *Semina* 2–3-angulata, pæne alata. *Embryo* duobus cotyledonibus. In maturitatem squamæ feminæ inter se separant, speciem involueris formantes, ex qua semina effugiunt. *Ramuli juveniles* foliis longioribus patentioribusque.

R. du Carénage; riverside on serpentine rocks; 800 ft. 379. This new species should undoubtedly be placed in the *Actinostrobinæ*, in near relationship with *Callitris*. Within that genus its affinity is closest with *C. Macleayana* from East Australia, the sole member of the section *Octoclinis*, which also shows prevailing tetramery. There can be little doubt (at least to those who agree with the disintegration of the genus *Callitris* in the wider sense into the genera *Tetraclinis*, *Widdringtonia*, and *Callitris* sensu strictiore) that this new plant differs sufficiently from the rather homogeneous species of *Callitris* (sens. strict.) to deserve separate generic rank. The habit of growth of the tree is strikingly araucarioid, and so are the small, stiff, free, imbricate leaves. The arrangement of the leaves in very regular alternating whorls of four, thus producing eight conspicuous vertical rows of leaves on the twig, is a striking and unique feature. The tetramerous arrangement of the leaves is prolonged without break into the terminal male and female cones. The female strobili are very distinct from those of *Callitris* spp. The eight scales are arranged in two whorls, the members of the inner whorl meeting in the centre, and those of the outer whorl covering the external gaps; the scales themselves are erect and slender, the inner ones being thickened at the apex where they come into contact among themselves. Subapically each scale bears a leaf-like spreading appendage. When the cone is mature the eight scales separate from one another, forming a kind of cup-like involucre from which the ripe seeds are scattered. The ovules are about eight in number, arranged around a small central columella; the ripe seed is scarcely winged and contains a dicotyledonous embryo.

*Callitropsis araucarioides* was met with in a single limited locality, where it was first noticed by my companion, the late Paul Denys Montague. It was growing freely on the serpentine rocks by the side of the R. du Carénage, bordering on the Plaine des Lacs, at an altitude of about 800 ft. It apparently belongs to the serpentine scrub formation, in the same way as does *Dacrydium araucarioides*, to which it bears some resemblance.

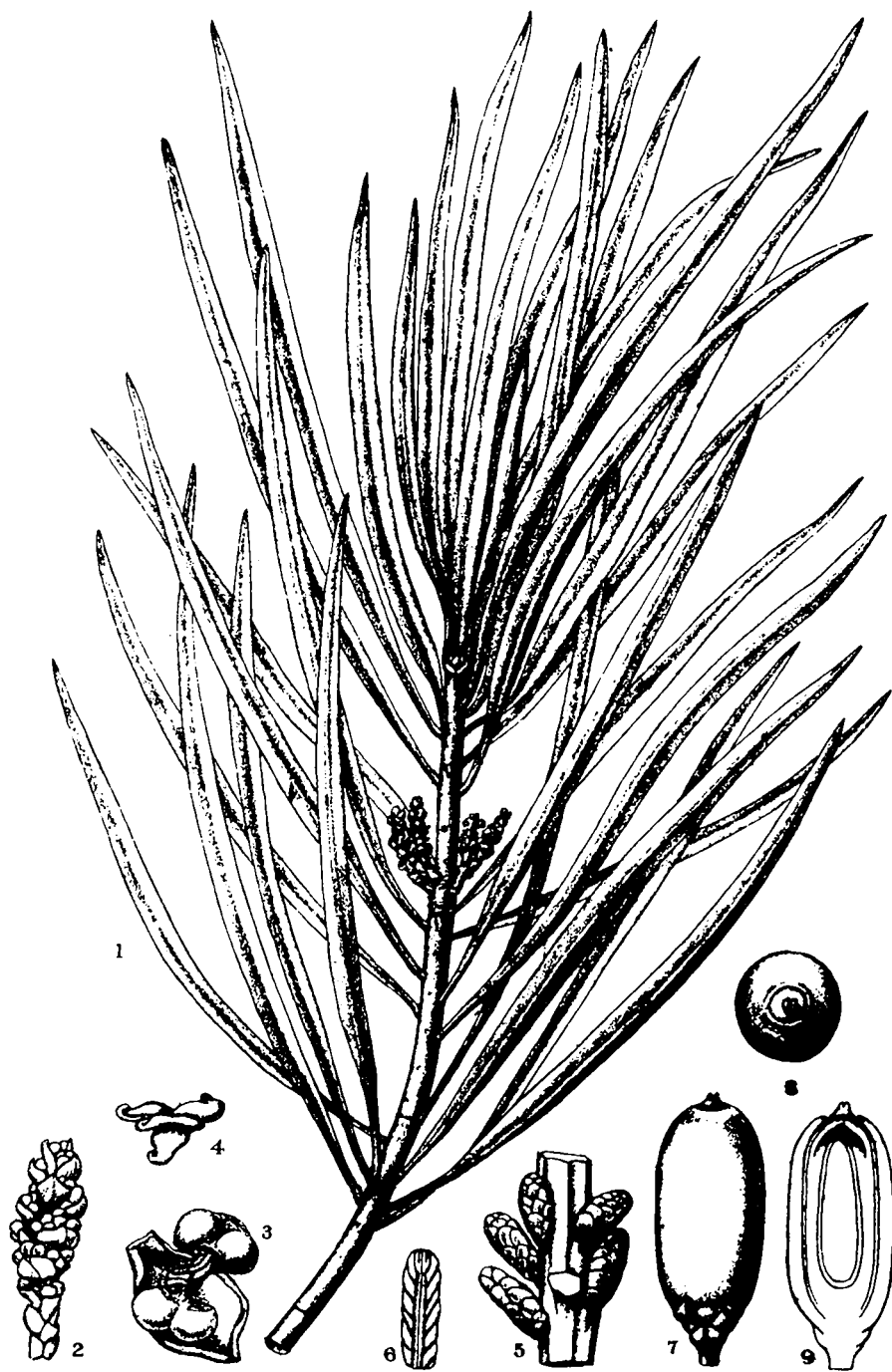
*LIBOCEDRUS AUSTROCALEDONICA* Brongn. & Gris. Nekando; in coniferous forest above 3500 ft.; serpentine. 1072, 2020. This is the only species of *Libocedrus* recorded for New Caledonia, and has only been collected so far from the Nekando-Mont Humboldt massif, where it grows in mixed coniferous forest at altitudes above 3500 ft., though never in luxuriance. It is a small symmetrical tree, never growing to more than 20 ft. in height, and of a spare habit. The male cones are now described for the first time:—

*Strobili masculi* singulariter ramulos ultimos terminantes, breve ovato-oblongi, in sectione transverso quadranguli, 5–6 mm. long. 2 mm. lat. *Squamæ* decussatæ 16–24, quisque basi rotundato, limbo late triangulare pauce carinato, margine stricte membranoso integro, apice acuta, superne basin versus sporangia gerentes.

#### EXPLANATION OF PLATES 26, 27.

**PLATE 26.** *Austrotaxus spicata* Compton. 1. Branch bearing male cones, nat. size. 2. Microstrobilus before dehiscence of anthers,  $\times 2$ . 3. Bract bearing two stamens seen from above,  $\times 10$ . 4. Stamen after dehiscence,  $\times 10$ . 5. Portion of twig bearing ovuliferous shoots,  $\times 2$ . 6. Longitudinal section of an older ovuliferous shoot, showing protruding micropyle at apex,  $\times 2$ . 7. Full-grown seed, side view,  $\times 2$ . 8. Seed in apical view,  $\times 2$ . 9. Seed in longitudinal section,  $\times 2$ .

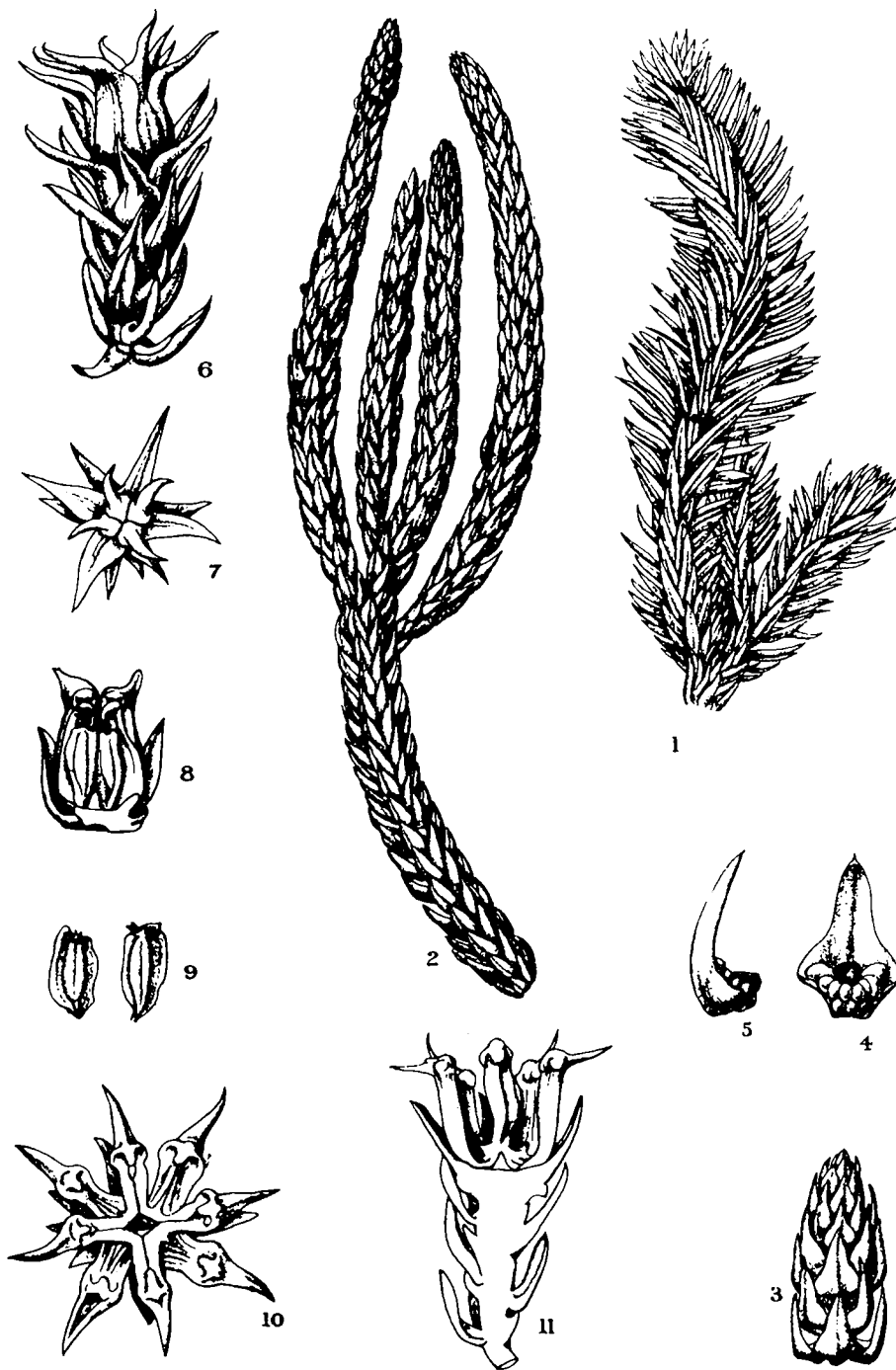
**PLATE 27.** *Callitropsis araucarioides* Compton. 1, 2. Branches showing juvenile and mature foliage respectively, nat. size. 3. Microstrobilus,  $\times 2$ . 4, 5. Bract bearing pollen-sacs, seen from below and from the side respectively,  $\times 4$ . 6. Tip of leafy shoot bearing a full-grown megastrobilus,  $\times 2$ . 7. The same seen from above,  $\times 2$ . 8. Megastrobilus in median longitudinal section, showing seeds and columella,  $\times 2$ . 9. Seeds,  $\times 2$ . 10. Megastrobilus after opening and scattering seeds,  $\times 2$ . 11. The same in median longitudinal section,  $\times 2$ .



M. M. Page & P. Highley del.  
P. Highley lith.

C. Hodges & Son, imp.

AUSTROTAXUS SPICATA.



M.M. Page & P. Highley del.  
P. Highley lith.

C. Hodges & Son, imp.

CALLITROPSIS ARAUCARIOIDES.

## PTERIDOPHYTA.

By R. H. COMPTON.

All the main groups of Vascular Cryptogams are represented in New Caledonia, except the Isoetales,—Ferns and Lycopods being present in a remarkable degree. Fournier ("Filices Novæ-Caledoniæ: Enumeratio Monographica" in Ann. Sci. Nat. Bot. 5<sup>e</sup> ser. xviii. 253, 1873) recorded no fewer than 259 species of Ferns from the Archipelago. Some of these records are doubtful; but, on the other hand, a number of new species has been added since 1873, through the collections of Le Rat, Fournier, and others. An estimate of about 250 species of Ferns would, I think, approximate to the truth. It appears probable that further collections will not add largely to this total; though it must be remembered that a large part of the country, and that apparently of the most interesting character, is so far botanically unexplored. My own collections, which include 149 Ferns and 26 other Vascular Cryptogams, contain few novelties in comparison with the wealth of new material obtained among the Phanerogams: 7 new species, 8 new varieties, and 7 new forms being all that have resulted. The fact that the New Caledonian Pteridophyta are so much better known than the Flowering Plants is largely due to the greater ease with which they can be collected in good condition for preservation and study.

The degree of endemism which obtains among the New Caledonian Pteridophyta is noteworthy, but is small in comparison with that of the Phanerogamic flora. Of the 44 genera of Ferns represented in my collection, only one, *Stromatopteris*, is endemic; and of the 142 species of Ferns and 25 species of Fern Allies, 56 and 9 respectively are endemic, giving a total percentage endemism of 39. Of Fournier's 259 species of Ferns 86 were endemic, this being about 33 per cent.

As Fournier and Diels have pointed out, the endemic species include both primitive types, of which *Stromatopteris* is the most remarkable, and also groups of species produced by local evolution in the isolation of insular life: of these latter the genera *Lomaria* and *Lindsaya* and the *Trichomanes* of the *T. dentatum* alliance are noteworthy examples. The Pteridophyta, just as do other groups, point clearly on the one hand to the antiquity of the New Caledonian land-surface, and on the other to its prolonged isolation from neighbouring land-masses.

The endemic species are very unequally distributed among the genera: some large genera (e.g., *Hymenophyllum*, *Lindsaya*, *Lomaria*, *Selaginella*) are almost entirely represented by endemic species, while other related genera (e.g., *Trichomanes*, *Davallia*, *Lycopodium*) show a low degree of endemism.

The general relationships of the New Caledonian Pteridophytes are with the floras of the surrounding land-masses—more especially with the East Australian and Malayan regions. The species fall into two main groups: firstly, those with geographical connections with temperate Australia, Tasmania, New Zealand, Norfolk, and Lord Howe Islands; and, secondly, those with connections with the tropical Malay, Australian, and Polynesian areas. The second group markedly preponderates\*. The Pteridophyta play a very large part in the vegetation of the island. Great areas of the serpentine districts are densely covered with *Pteridium aquilinum* var. *esculentum*, *Gleichenia linearis*, or *G. circinata*. In open situations the schist rocks of the centre and north are frequently clothed with *Lycopodium cernuum*. In the forest on all soils Vascular Cryptogams are a constant and abundant feature: homogeneous associations dominated by single species are frequent, from local groups of arborescent ferns in the tree layer, and groves of *Marattias*, *Leptopteris Wilkesiana*, *Selaginella megastachya*, *S. hordeiformis*, etc., in the undergrowth, to the dense covering of filmy ferns, such as *Trichomanes album* and *T. saxifragoides*, on rocks and trunks. Ferns occur in greater or less abundance in every main kind of ecological position, from mangrove-swamp to rock-crevice and from the sun-scorched hillside to the constantly saturated conditions of the cloud-forest.

Little support is given by the Pteridophyta to Schlechter's view (in Engl. Bot. Jahrb. xxxvi. 8) that New Caledonia can be divided into two floristic regions, north and south—the north having relationships with the Malayan flora, and the south with the floras of E. Australia and New Zealand. The four Malayan species of Ferns, mentioned by Diels (*op. cit.* xxxix. 4) as being collected by Schlechter in the north of the island only, were all found by me in Schlechter's "Sudbezirk" also; *Nephrolepis cordifolia* on Mt. Mou, *Davallia alpina* near the Ngoye River, *Pteris incisa* by the Ermitage Stream, and *Ophioglossum pendulum* in the forests of Mt. Canala. In the genus *Lycopodium*, on the other hand, as Pritzel (*loc. cit.* 13) points out, the primitive forest epiphytes reach their southern limit in the north of New Caledonia, while the subtropical Australian element is represented in the south. My collections, on the whole, support this conclusion, though *L. squarrosum* var. *pacificum* was found in the south on Mt. Humboldt; the newly recorded *L. varium*, previously known in Australia, Tasmania, New Zealand, and the Auckland Islands, was found on Mt. Koghi in the south. On the whole, in considering the Pteridophyta as well as other groups, the impression I have derived is that the local distribution of plants on the surface of New Caledonia (an area which there is every reason to believe has remained in isolation from a remote period) is primarily a matter of edaphic and climatic conditions, and that the apparent

\* See Christ, 'Geographie der Farne,' p. 234 (Jena, 1910).

division into a northern "Malayan" region and a southern "Australian" region is mainly a result of the fact that climate and soil favour the preponderance of tropical forest in the north and of a more subtropical scrub vegetation in the south; so that "Malayan" species, on the whole, find themselves more at home in the "Nordbezirk" and "Australian" species in the "Sudbezirk."

## FILICALES.

### HYMENOPHYLLACEÆ.

*HYMENOPHYLLUM CRISPATUM* Wall. var. *MINUS* Hook. Ignambi; creeping on rocks near stream; gneiss; 300 ft. 1597. North India, Malaya, Australia, New Zealand, Antarctic Islands.

*H. DEPLANCHEI* Mett. Ignambi; frequent creeping over rocks and trunks; 2500-4200 ft. 1553.

*H. DIMIDIATUM* Mett. Mt. Mou; on tree-trunks in cloud-forest; 3700 ft. 482.

*H. LE RATHI* Rosenstock. Ignambi; on tree-trunks in moist forest; 3800 ft. 1651.

*H. MNIOIDES* Baker, forma *AMPLIOR* R. H. Compton, form. nov. Ignambi; on bark of forest trees; 300 ft. 1634, 1831. Deplanche 1 (summit of Mt. Mou, 1260 m., on the trees). Balansa 2702 (Mt. Mou, 1150 m.; mossy trunks).

Baker incorrectly describes Deplanche's plants as having "segments all quite simple"; some, but not all, of Deplanche's specimens in Herb. Kew. have some of the lower pinnæ forked into two equal parts. In my specimens many of the lower pinnæ are dichotomous; moreover, the fronds, which are larger than in Deplanche's or Balansa's gatherings, are light green, whereas Baker describes the fronds as being dark brown. It seems proper to name this form distinctively, the type of the species being regarded as the small brownish under-developed plant with simple lower pinnæ to which Baker's description applies.

*H. ROLANDI-PRINCIPIS* Rosenstock (ex descript.). Mt. Panié; creeping over rocks and trunks in forest; 4000 ft. 1822.

Franc's original plants, the subject of Rosenstock's description, were gathered in the same district—"in monte Tao, 700 m. alt." They were sterile, but Rosenstock described them as a species of *Hymenophyllum*. This

now proves to have been correct, my specimens having a few typical sori, described below:— . . . sori e pinnæ latere versus rhachidem solitatem oriundis, ellipticis, 2-2.5 mm. long. 1-1.5 mm. lat., horum labiis duobus equalibus, dimidio superiore apertis, minute denticulatis, receptaculo incluso.

*HYMENOPHYLLUM SUBOBTUSUM* Rosenstock (ex descript.). Ignambi; creeping over trunks in moist forest; 4000 ft.; rare. 1598. Franc's original specimens were collected in a neighbouring locality—"in monte Tao, 800 m. alt. 1421."

*TRICHOMANES ALBUM* Blume. Mt. Mou; on tree-trunks in cloud-forest; 3700 ft. 481. The New Caledonian plant occurs only at high altitudes. I put my gatherings into this species rather than in *T. pallidum* Blume, because of the cuneate-lanceolate pinnæ; *T. pallidum* is described as having cuneate-oblong pinnæ. Hooker and Baker reduce both species to one, *T. pallidum*.

Blume, who habitually mentions a montane habitat, states that his *T. pallidum* grows "in Javæ sylvis primævis," while *T. album* "crescit in Javæ montibus excelsis." It is probable that *T. album* would grow at a higher altitude in Java than in New Caledonia. Tropical Asia, Polynesia.

*T. BAUERIANUM* Endl. Mt. Panié; terrestrial in high forest; gneiss; 4000 ft. 1820. Malaya, Australia, Polynesia.

*T. BIPUNCTATUM* Poir. Ermitage Stream; 300 ft. Mt. Canala; near stream in forest; 1000 ft. Mt. Arago; creeping on earth among rocks by forest stream; 1000 ft. 181, 1163, 1429. Japan, Formosa, tropical Asia and Australia, Polynesia, S. and W. Africa.

*T. CUNEATUM* Christ. Mt. Mou; on tree-trunks in cloud-forest; 3800 ft. 644a. My specimens agree with Christ's description and figure, except that the frond is generally not truly dichotomous.

Christ's specimens come from "the top of Mt. Mou on rotten bark, very rare." Rosenstock's *Fil. Nov. Cal.* 51 is this species, collected by Franc on Mt. Mou at 1200 m. Thus, as in the case of *T. Francii* (which this species resembles in some respects), Mt. Mou is the only locality known at present.

*T. DENTATUM* van den Bosch. Mt. Arago; in damp stream-bed in forest; schists; 1000 ft. 1445. Polynesia.

*T. DIGITATUM* Swartz. Ignambi; on tree-trunks in cloud-forest; 3800 ft. 1650. Not hitherto from New Caledonia. The fronds are sparsely setose along the margins; occasional setæ are also present along the veins and along the margin of the involucre—a connecting-link with the var. *palmati-*

*fidum* C. Mueller. The fronds are rather small, reaching about 1.5 cm. in length including the stipe. Mascarene Islands, tropical Asia, New South Wales.

*TRICHOMANES ELONGATUM* Cunn. Mt. Mou; terrestrial; high forest; serpentine; 3800 ft. 496. Schlechter's 14796 from the Yahoué Mountains, sub nom. *T. dentatum*, is this species. New Zealand.

*T. FERRUGINEUM* van den Bosch. Presqu'île Bogota; frequent in scrubby *Spermolepis* woods on serpentine; 1000 ft. 1342. Curious little plants whose crown of coriaceous leaves is lifted off the ground, sometimes to the height of a foot, by a cylindrical meshwork of stiff black roots.

*T. FLAVO-FUSCUM* van den Bosch. Mt. Canala; high forest, climbing on tree-trunks; 3000 ft. Mt. Arago; high forest, climbing on trunks; 1000 ft. Ignambi; high forest, frequent on trunks; 3000-4000 ft. 1410, 1556. Prince Roland Bonaparte (in Sarasin and Roux, Nova Caledonia, Botan. i. 35) makes this a variety of *T. caudatum*, following Mettenius. It seems distinct enough to deserve specific rank.

*T. FRANCHI* Christ. Mt. Mou; on tree-trunks in cloud-forest; 3800 ft. 614. The present is the only known locality. The plants described and figured by Christ, and Rosenstock's *Fil. Nov. Cal.* 14 (coll. Franc), all came from the summit of Mt. Mou.

*T. MAXIMUM* Blume. Mt. Canala; high forest; 2500 ft. 1217. Malaya, Polynesia, Queensland.

*T. PELTATUM* Baker. Ermitage Stream; clinging to tree-trunks in moist forest near stream; 300 ft. 800. Polynesia.

*T. PUMILUM* van den Bosch. Mt. Panié; under rocks in moist forest; gneiss; 1500 ft. 1784.

*T. SAXIFRAGOIDES* Presl. Ermitage Stream; 300 ft. Ignambi; stream-side forest, forming large soft mats over gneiss boulders, interwoven with bryophytes; 1000 ft. 182, 1044, 1850. Java, Philippines, Melanesia, Fiji.

*T. TRICHOPHYLLUM* T. Moore. Ignambi; high forest; terrestrial in shelter of large gneiss boulders; 3000 ft. 1618. Borneo.

*T. VIEILLARDII* van den Bosch. Mt. Canala; on vertical rock-surface in forest-stream; schists; 2500 ft. 1209, 1535.

New Caledonian gatherings of this species are very uniform. I agree with van den Bosch and Fournier in regarding it as a distinct species, though Hooker and Baker unite it with *T. pyxidiferum* L.

## CYATHEACEÆ.

*DICKSONIA DEPLANCHEI* Vieill. Mt. Mou; summit forest; serpentine; 3800 ft. 497.

*D. STRAMINEA* Labill. Mt. Mou; high forest; serpentine; 2000 ft. Mt. Arago; forest margin; mica schists; 1000 ft. 465, 1453. Polynesia.

*D. THYRSOPTEROIDES* Mett. Mt. Canala; forest margin; schists; rare; 1500 ft. Mt. Arago; edge of high forest; schists; occasional; 1000 ft. 1134, 1411.

*CYATHEA ALBIFRONS* Vieill. var. *LATA* Compton, var. nov. Varietas pinnulis oblongis obtusis 4–5 mm. lat. ad 12 mm. long., margine integro non crenato, soris utrinque usque ad 6, pinnæ fertilis parte distale  $\frac{1}{3}$  vel  $\frac{2}{3}$  sine soris.

Mt. Mou; high forest in gully; serpentine; 1500 ft. 464.

Differs from typical *C. albifrons* (as described by Fournier and in Hooker and Baker's 'Synopsis,' and as represented by specimens collected by Pancher, and by Schlechter 14841) in the broader ultimate pinnules, whose margins are entire and not crenate; and in the fewer sori, the distal part of the pinnules being without them.

*C. NEOCALEDONICA* Compton, sp. nov. *Arbor* trunco robusto usque 3 m. attingente. *Frons* horizontaliter expansa circa 1 m. long.; *stipes* rigidus, basi ramentis longis brunneis vestitus; *rhachides* omnium dilute brunnei teretes pube brevi brunnea vestiti; *lamina* tripinnata late elliptica; *pinnæ primariæ* erecto-patentes utrinque circa 6 alternatæ usque 20 cm. × 5 cm. attingentes; *pinnæ secundariæ* erecto-patentes utrinque circa 15 3–3.5 cm. long. 1.0–1.3 cm. lat.; *pinnulæ ultimæ* patentés in basi lato sessiles oblongæ obtusæ obscure crenulatæ coriaceæ lucentes in sicco atro-brunnæ costa media non prominente excepta glabræ squamoso-pilosæ, marginibus paullo revolutis, usque 9 × 3 mm.; *sori* submarginales, 4–7 globosi; *indusium* membranaceum pellucidum nullo colore fucatum ad apicem in lobos pannosos dehiscens; *sporangia* numerosa; *placenta* sphaerica.

Ignambi; high forest; gneiss; 4000 ft. 1563.

Approaches nearest to *C. aneitense* from the New Hebrides, but differs in the shorter pinnules, broader ultimate segments, blunter apices, the shape of the frond, the erecto-patent pinnæ, the colour of the rhachis, etc. It is remarkable among tree-ferns for the relatively small, ungraceful, and coarse-textured fronds, which make it a singular associate of the arborescent filmy *Leptopteris Wilkesiana*, with which it grows in abundance in the summit cloud-forest of Ignambi.

*CYATHEA VIEILLARDII* Mett. Mt. Arago; margin of high forest; schists; 2000 ft. 1452. Rosenstock's *Fil. Nov. Cal.* 39 (coll. Franc on Mt. Dzumac), sub nom. *C. albifrons* (in Herb. Mus. Brit.), is this species.

*ALSOPHILA DECURRENS* Hook. Mt. Mou; in high forest; serpentine; above 3000 ft. 565. Polynesia.

*A. NOVÆ-CALEDONIÆ* Mett. Mt. Arago; high forest and along streams; schists; 1000 ft. Also at Mt. Canala. 1443. The only common *Cyatheaceous* fern in these schist forests; trunk sometimes 60 ft. high.

### POLYPODIACEÆ.

*DRYOPTERIS OBLIQUATA* O. Kuntze. Ermitage Stream; high forest, near the water-side; cretaceous; 200 ft. 204.

*D. PARASITICA* O. Kuntze. Île Porc-Épic (E. Coast), abundant in forest; serpentine; 200 ft. 920. Tropical and sub-tropical, New Zealand, etc.

*D. RECEDENS* O. Kuntze. Tonghoué Mts.; sheltered hillsides in *Melaleuca* association below 1500 ft.; cretaceous. 172. More hairy than in typical *D. recedens* and rather resembling *D. velutinum* in this respect: from the latter species, however, it differs in having smaller rammenta extending several inches up the stipe. Southern India, Ceylon, Philippines.

*D. SUBSERICEA* O. Kuntze. Mt. Arago; very abundant in moist high forest; schists; 1000 ft. 1444. Also at Mt. Canala.

*D. VIEILLARDII* O. Kuntze. Ignambi; very abundant in high forest above 3000 ft.; gneiss. 1672.

*ASPIDIUM KANAKORUM* C. Chr. Mt. Canala; locally abundant in high forest; schists; 1500 ft. 1253.

*A. SINUATUM* Labill. Mt. Mou; streamside; serpentine; 800 ft. 446. Schlechter's 14902 and 15327 *a*, both sub nom. *Nephrodium dissectum*, are examples of this species.

*DEPARIA MOOREI* Hook. Paompai; high forest; shales; 100 ft. 1863.

*POLYSTICHUM ARISTATUM* Presl. Tonghoué Mts.; in hillside Niaouli association, below 1500 ft.; cretaceous. 173. Schlechter's exs. 14830 is labelled incorrectly *P. cristatum*. Japan, China, India, Malaya, Polynesia, Natal.

*LEPTOCHILUS CUSPIDATUS* C. Chr. Couliné, near Nékété; high forest, climbing on rocks; schists; 1000 ft. Paompai; locally abundant in high

forest; shortly creeping over rocks or in shallow earth; 50–500 ft. 1281, 1910. Asia, tropical Australia, Polynesia, Seychelles.

*LEPTOCHILUS VARIANS* Fourn. Mt. Canala; 2500–3000 ft.; the rhizome clinging to trunks by roots and by twining; high forest. 1123, 1219.

*DIPTERIS CONJUGATA* Reinw. Mt. Koghi; sheltered part of Niaouli-*Gleichenia* association; serpentine; 1000 ft. Also on Mt. Canala; Niaouli association; schists; 1000–2000 ft.; and Mt. Panié; Niaouli association; gneiss; 1000 ft.; apparently spreading along tracks and in clearings. April. 750. Asia, tropical Polynesia.

*NEPHROLEPIS CORDIFOLIA* Presl. Mt. Mou; high forest about 1500 ft.; serpentine; common. Mt. Canala; high forest; 2000 ft.; abundant on stones and dead logs; schists. Ignambi; high forest; on rocks and trunks; gneiss; 1000–3500 ft. 434, 1227, 1677. Tropics, Japan, New Zealand.

*SACCOLOMA MOLUCCANUM* Mett. Ermitage Stream; high forest near stream; serpentine; 300 ft.; uncommon. Mt. Arago; high forest; very abundant; schists; 1500 ft. 200, 1433. Malaya, Polynesia.

*DAVALLIA ALPINA* Blume. Ngoye; on trunks by stream-side in high forest; 1500 ft. 104f. Malaya, Polynesia.

Schlechter's exs. 15155, sub nom. *D. serrata* Brack. from the same district, is this species.

*D. CONTIGUA* Spreng. Mt. Canala; on tree-trunks, among mosses; 1000 ft. Ignambi; creeping over rocks in high forest; 2500 ft. 1169, 1619. Schlechter's exs. 14910 (from the Paita Mts., 1250 m.) and 15672 (from the Oubatche Mts.—i. e., the same locality as my own Ignambi gatherings) are this species, though labelled *Polypodium crassifrons*. Malaya, Polynesia.

*D. MOOREI* Hook. Plaine des Lacs; common in woods and high forest of valleys, above 800 ft.; serpentine. 365a. Fiji.

*D. PUSILLA* Mett. Mt. Panié; creeping on trunks among bryophytes. R. Ngoye; on trunks in streamside forest; 1500 ft. 1794. Matches Schlechter's 15606, sub nom. *D. alpina*. Melanesia.

*D. PYXIDATA* Cav. Mt. Mou; streamside forest, on trunks; 600 ft. 539. Australia.

*D. SOLIDA* Sw. Mt. Mou; rock-crevices and dry hillsides in Niaouli association; serpentine; 1000 ft. Kuakné; in alluvial forest, climbing

over rocks and up trees ; serpentine. Île Mouac ; abundant on ground at sea-level in Niaouli association ; schists. 515, 924, 2348. Malaya, Polynesia, Queensland.

DAVALLIA TENUIFOLIA Sw. Ignambi ; high forest, especially along tracks ; gneiss ; 2000-3500 ft. 1617. Japan, China, tropical Asia, Polynesia, Comoro and Mascarenes, Madagascar.

LINDSAYA ALUTACEA Mett. Pic la ; in rock-crevices and among sedges by stream-side, scrub area, frequent ; serpentine ; 500 ft. 863.

L. CHEIROIDES Fourn. Mt. Mou ; on ground in moist gully, Niaouli region ; 800 ft. 541.

Great confusion exists in the nomenclature of this and related species. My specimen exactly matches plants at Kew and the British Museum collected at Wagap by Vieillard (1540). Now Vieillard 1540 from Mt. Dore was Mettenius's type-specimen for the name *L. nervosa* : but Mettenius's description of his *L. nervosa* clearly refers to a different plant from mine and from the Wagap specimen. Further, Fournier quotes Balansa 2694 as *L. nervosa* along with Vieillard's 1540 from Mt. Dore ; but the Balansa 2694 which I have seen is not the same plant as Vieillard 1540 from Wagap. I therefore conclude that Vieillard's two gatherings from Wagap and Mt. Dore were united under one series-number in error, though I have not been able to see the Mt. Dore specimens. Fournier's *L. cheiroides* seems to have been identical with my plant, and this opinion is shared by Rosenstock (*Fil. Nov. Cal.* 33, coll. Franc) and by Christ (Bonati exs. 365, coll. Franc).

L. DELTOIDEA C. Chr. Ermitage Stream ; streamside forest ; serpentine ; 300 ft. 209. New Hebrides.

L. MCGILLIVRAYI Carruth. Nekando ; in *Spermolepis* forest ; serpentine ; 500 ft. 990. My specimens match McGillivray's F. 16 in Herb. Kew. The specimen in Herb. Mus. Brit. is larger and corresponds more closely with Hooker and Baker's description.

L. NEOCALEDONICA Compton, sp. nov. *Rhizoma* sub solo vigens, elongata horizontalis ramenta brunnea tenuia ferens. *Stipes* 50 cm. long. basi teres ramentis paucis instructus superne quadrangulus glaber, subrubicundus. *Frons* bipinnata : *pinnae* suboppositae subcontiguae patentes inferiores 19 × 4 cm. superiores 11 × 3 cm. : apex producta, apicem versus sensim angustior dentataque : segmentum terminale pinnulis 14 × 3 cm. instructum. *Pinnulae* contiguae breviter petiolulatae adiantiformes ovato-quadratae saturate virides tenues sed non pellucidae intermediae 15 × 10 mm. interdum 18 mm. long., margo posterior rectus vel paullo recurvatus integer : margo interior

rectus rhachi approximatus integer : margines anterior exteriorque crenulati vel paullo lobati, soris subcontinuis instructi ; venatio flabellata, sæpius dichotoma, costa media carente.

Mt. Koghi ; forest ; serpentine ; 1500 ft 791.

A large and handsome species of the alliance of *L. McGillivrayi*.

*LINDSAYA PROLONGATA* Fourn. Ignambi ; terrestrial in forest ; gneiss ; 3500-4250 ft. 1607.

I have not seen Fournier's type-specimens, viz., Balansa 1602 and F. Muell. (part) ; and Rosenstock's *Fil. Nov. Cal.* 11 is partly *L. prolongata* and partly *L. neocaledonica* (example in Herb. Mus. Brit.). My determination rests on Christ's determination of a plant collected by Franc in the forests of the Baie du Sud and distributed as Bonati 679.

*L. VIEILLARDII* Mett. Mt. Panié ; abundant in high forest ; terrestrial ; gneiss ; 1500 ft. 1829.

Var. *SERRATA* Compton, var. nov. Margo pinnæ fertilis acute irregulariter serratus ubi sorus continuus est, frons tenuior et pinnæ fertiles paullo breviores quam in typo.

Mt. Panié ; locally frequent in high forest ; gneiss ; 1500 ft. 1765.

In the type, *L. Vieillardii*, the margin of the fertile frond is only serrate where there is no sorus, or where the sorus is interrupted : in the variety *serrata* the margin is serrate whether a sorus is continuous or not.

*BLECHNUM ORIENTALE* Linn. Paompai ; by streams in Niaouli region ; shales ; 1500 ft. 1895. Tropical Asia, Australia, and Polynesia.

*LOMARIA ATTENUATA* Willd. Mt. Canala ; high forest, on rocks ; schists ; 2000 ft. 1234. South Africa and islands, New South Wales, Polynesia, Juan Fernandez, ? Chile.

Forma *MONSTROSA* Compton, form. nov. Mt. Arago ; wet forest ; rhizome climbing trunks ; 1500 ft. 1430.

A remarkable form, evidently abnormal. Baker (Syn. 70) mentions that the pinnæ of *L. attenuata* "are occasionally obliterated and we have an entire lanceolate frond like that of *L. Patersoni*." My specimen has fronds partially lobed and partially entire, thus forming a connecting-link between the extremes.

*L. CILIATA* T. Moore. Ermitage Stream ; on rocks along the water's edge ; serpentine ; 300 ft. Mt. Canala ; locally abundant in intermediate forest ; schists ; 2000 ft. 198, 1252.

*L. CONTIGUA* Fourn. Mt. Mou ; shortly climbing trunks in high forest ; 2500 ft. 571.

*LOMARIA DEPLANCHEI* Baker. Mt. Mou ; high forest ; terrestrial ; serpentine ; 2500 ft. 570. Rosenstock's *Fil. Nov. Cal.* 45, sub nom. *Blechnum opacum*, is *Lomaria Deplanchei* (collected by Franc on Mt. Mon).

*L. DIVERSIFOLIA* Baker. Mt. Panié ; abundant on ground in high forest ; gneiss ; 1500 ft. 1783.

*L. GIBBA* Labill. Mt. Koghi, Mt. Mou, Taom, etc. ; common by streams in forest areas all over New Caledonia. Shortly arborescent, the trunk reaching three or four feet in height. New Hebrides.

*L. LENORMANDI* Baker. Ignambi ; frequent in high forest ; gneiss ; 4000 ft. 1562.

Forma *APRICA* Compton, form. nov. The fronds are reduced in size and firmer in texture, closely resembling those of *L. diversifolia*, from which it differs in the tomentose rhachis.

Ignambi ; in a clearing, the type being at hand in the forest ; 4250 ft. 1562a.

I suspect that *L. diversifolia* var. *paleaceo-setosa* Rosenstock (in Fedde, Repert. x. 75, coll. Le Rat on Mt. Poindimié) is really this reduced *L. Lenormandi*, which owes its special characteristics to growth in open situations.

*L. OBTUSATA* Labill. Plaine des Lacs ; in stream-bed in forest ; serpentine ; 1000 ft. 357. New Hebrides.

*L. OPACA* Fourn. Mt. Canala ; wettest parts of high forest ; terrestrial ; schists ; 2000-3000 ft. 1231.

My specimens agree with Mettenius's original description (sub nom. *Blechnum opacum*) and match his type-specimen, Vieillard 1533. The description in Hook. & Bak. Syn. 176 (which is the first use of the combination *Lomaria opaca*) does not apply to these specimens. Rosenstock's *Fil. Nov. Cal.* 45, sub nom. *B. opacum*, has no anastomosing veins and differs from his species in other respects ; it is *L. Deplanchei* Baker. Polynesia.

*L. PROCERA* Spreng. Mt. Mou ; forest margin ; serpentine ; 3500 ft. Ignambi ; abundant in moister parts of high forest ; gneiss ; 3000 ft. 572, 1706. South Africa, Perak, ? Malaya, Polynesia, ? Tropical America, etc.

*L. VIEILLARDII* Baker. Mt. Canala ; among rocks by stream in high forest ; schists ; 1500 ft. Mt. Arago ; abundant by stream-side in high forest ; schists ; 800 ft. 1189, 1405.

Var. *SIMPLEX* Fourn. Ouendjam Forest ; abundant near stream ; shales ; 500 ft. 1990. It seems likely that this is the plant referred to by Fournier

as var. *simplex*, with simple linear fertile fronds resembling those of *Lomaria Patersoni*: I have not, however, seen his type-specimen, Palansa 1571. I maintain this variety, which seems to be locally constant. In other respects it is certainly to be related to *L. Vieillardii*, and not to *L. Patersoni*, an Australian species to which it bears a resemblance in the simple sterile and fertile fronds.

DOODIA CAUDATA R. Br. var. LINEARIS J. Sm. (pro sp.). Mt. Dore; stream-valley forest; serpentine; 800 ft. 674. Australia, New Zealand.

D. MEDIA R. Br. Mt. Mou; high forest in gully; cretaceous; 600 ft. 535. I cannot distinguish *D. Kunthiana* Gaudich., under which name the New Caledonian plants have often been recorded. Australia, New Zealand, Polynesia.

ASPLENIUM ADIANTOIDES C. Chr. Ermitage Stream; streamside forest; serpentine; 300 ft. 212. Tropical Asia, Polynesia and Australia, New Zealand, S. Africa.

Var. TRIPINNATA Compton, var. nov. Varietas frondibus tripinnatis, pinnis utrinque circa 25, basalibus longissimis. Petiola pinnarum basalium 0.7–1.0 cm., lamina 15–20 cm. long. Pinnulae obliquae, breviter petiolulatae maximae 8 × 2 cm., longe attenuatae, basi ad rhachin divisae in lobos alternatos ovato-cuneatos apice serratos.

Mt. Mou; forest in gully; cretaceous; 600 ft. 537.

Closely resembling *A. adiantoides* in texture, nervation, and hairiness; its more distant pinnules are very similar to the pinnae of the type.

A. ATTENUATUM R. Br. Mt. Mou; on steep rocks and crevices in damp gully; cretaceous; 600 ft. 538. The first record from New Caledonia. E. Australia.

A. CUNEATUM Lam. Mt. Mou; streamside forest; cretaceous; 600 ft. Ignambi; occasional; gneiss; 1500 ft. 536, 1676. Tropics.

Var. PROLIFERUM R. Bonaparte. Mt. Canala; among rocks and on trunks in moist high forest; schists; 2500 ft. 1228. From the same locality as the original specimens collected by Sarasin and Roux.

A. LASERPITIIFOLIUM Lam. Mt. Koghi; on rocks in sheltered stream-valley forest; serpentine; 1000 ft. 762. Malaya, Polynesia, tropical Australia.

A. MERTENSIANUM Kunze. Mt. Mou; on ground in high forest; serpentine; 1500 ft. Mt. Humboldt; on ground in high forest; serpentine; 500 ft. 564, 1043. Western Polynesia.

*ASPLENium NIDUS* Linn. Abundant everywhere in lowland forest, on tree-trunks and rocks, throughout New Caledonia and the Isle of Pines. Tropical Asia, Polynesia and Australia, E. Africa.

*A. NOVÆ-CALÉDONIÆ* Hook. Mt. Mou; on ground in valley-forest; 1500 ft. Kuakué; rock-crevices near river; 50 ft. Mt. Humboldt; stream-side in high forest, among stones; 1000 ft. R. Ngoye; in rock-crevices near river and along streams; 400 ft. Taom; among rocks in open scrub. All on serpentine; 1000 ft. 432, 952, 1031, 2063, 2306. The fronds vary greatly according to situation; sometimes they are long, soft, and drooping, sometimes short and stiffly erect, according as the plants are growing on the ground in moist forest conditions, or in rock-fissures in exposed situations.

*A. OBLIQUUM* Forst. Mt. Canala; on rocks in high forest; scarce; schists; 2000 ft. R. Ngoye; in *Spermolepis* forest near river; in hollows of tree-trunks; 400 ft. 1229, 2101. Australia, New Zealand, Antarctic Islands, S. Chile.

Var. *INTEGRA* R. Bonaparte (pro sub-var.). Mt. Humboldt; high forest by stream-side; serpentine; 1000 ft. 1006. Sarasin and Roux, as well as Balansa, also collected this fern on Mt. Humboldt; my notes refer to it as the common form in this district. It seems definite enough, therefore, to be regarded as a, possibly local, variety.

Prince R. Bonaparte mentions Fournier as the authority for the name *integra*. Fournier, however, merely writes: "S-var. frondibus integris v. ternatis (junius). Messiaencoué pr. montem Humboldt, 700 m. (Bal. 855)."

*A. POLYPHYLETICUM* Compton, sp. nov. *Rhizoma* copiose radicans, ramentis linearibus acuminatis fusco-brunneis indutum, primo gracile et frondes steriles inter se satis distantes gerens, deinde crassior et apice frondibus fertilibus majoribus approximatis instructum. *Frons* adulta lanceolata bipinnata circa 60 cm. long. 18 cm. lat.; *rhachis* basi copiose ramentifera alibi sparsim, fusco-brunnea; *pinnæ* 20-30-jugæ, paucæ basales mediocriter distantes, ceteræ approximatae, angulo circo 60° ex rhachi orientes plus minus apertæ arcuatæ æqualiter pinnulatæ, pinnulæ proximales apice 2-3-fidæ, distales integræ lineari-oblongæ acutæ, frondum sterilium semitranslucens, leviter crispatae, frondum fertilium subopacæ glabræ saturate viridis, quæque margine exteriori soro unico apicem vix attingente instructa.

Mt. Canala; forest, creeping over ground and climbing trunks; schists; 2000-3000 ft. Mt. Arago; moist forest, climbing on rocks and trunks; 1000 ft. 1125, 1440.

This puzzling *Asplenium* matches Vieillard 1569, which Mettenius determined as *A. nodulosum* Kaulf. forma *b*. It appears to have nothing to do with

*A. gemmiferum* var. *flexuosum* or *discolor*, and it does not agree with Rosenstock's description of *A. subflexuosum*. The fronds of my plant seem to be always bipinnate, and I can find no character to separate them from the geographically far-removed *A. nodulosum* var. *bipinnatisectum* forma *b* of Mettenius. I have described it as a distinct species on the ground of its climbing habit, its constancy of character (*A. nodulosum* is extremely variable), the translucent slightly crispate sterile fronds, and the geographical position.

ASPLENIUM PRÆMORSUM Sw. Mt. Mou; open stony hillsides in slight shelter; serpentine; 2500 ft. Mt. Humboldt; high forest; serpentine; 500–2500 ft. Frequently also in the "nests" of *A. nidus*. 577, 1042. Tropics and subtropics.

This fern varies greatly according to its situation. In the exposed form from Mt. Mou the fronds are short, hard in texture, and less cut. The forest-form from Mt. Humboldt has long drooping fronds of softer texture, which are more deeply cut. These forms are connected by a great range of intermediates.

*A. TENERUM* Forst., var. *NEOCALEDONICA* Rosenstock. Mt. Koghi; creeping over dead logs and tree-fern trunks near stream; 1000 ft. 763. From the same locality as the type-specimen, Rosenstock 95, coll. Franc. The species occurs in S. India, Ceylon, Malaya, Seychelles, tropical Asia, Polynesia.

*A. VIEILLARDII* Mett. Tonghoué Mts.; in high forest of sheltered valleys; cretaceous; 800 ft. 174. Fiji.

DIPLAZIUM MAXIMUM C. Chr. var. *SORORIUM* Mett. (pro sp.). Mt. Canala; high forest, especially by stream-sides; schists; 1000 ft. 1170. A tree-fern with a trunk about four feet high and large thin sciaphilous leaves. China, tropical Asia, Australia, and Polynesia.

DIPLAZIOPSIS JAVANICA C. Chr. Mt. Canala; abundant in the ground-association of the moistest parts of the high forest; schists; 1500 ft. 1182. Slightly arborescent, trunk about one foot high, leaves large, thin, and sciaphilous. Associated with *Diplazium maximum* var. *sororium*, *Dicksonia straminea*, and *Leptopteris Wilkesiana* in a low tree-fern sub-association.

S. China, N. India, Malaya, Polynesia.

GYMNOGRAMME DECIPIENS Mett. Mt. Canala; on mossy rocks in high forests; schists; 2000 ft. Mt. Arago; locally abundant in high forest, especially near streams; schists; 1000 ft. Ignambi; clayey earth; locally frequent in high forest; gneiss; 3000 ft. Toninē; high forest; hornblende; 2000 ft. 1230, 1415, 1708, 1945. Western Polynesia. The Tonine specimens were frequently viviparous.

Var. *PARVA* Compton, var. nov. Minor, *fronde* strictè lanceolata, ad  $16 \times 2.5$  cm. *Pinnæ* quam in typo disjunctiores, basales segmentibus 1 vel 2 margine superiore pæne usque ad rhachin sectæ. *Sori* 1-3, longitudine vix latitudinem duplo, 1-2 mm. long.

Mt. Panié ; abundant creeping over rocks in mountain streams ; gneiss ; 1500 ft. 1781.

*GYMNOGRAMME MARGINATA* Mett. Ignambi ; local on the ground in moist forest ; gneiss ; 2000 ft. 1722.

*SYNGRAMME FRANCI* Rosenstock (ex descript.). Mt. Panié ; terrestrial and epiphytic in forest ; gneiss ; 1500 ft. 1780. The locality is the same as that in which Franc collected the type-material.

*PELLÆA FALCATA* Fée. Ermitage Stream ; among stones by waterside ; uncommon ; serpentine ; 300 ft. 214. Tropical Asia, Australia, Tasmania, New Zealand.

*CHEILANTHES SIEBERI* Kunze. Mt. Mou ; damper parts of Niaouli zone, cretaceous ; 1000 ft. Mt. Dore ; abundant on stony hillsides, scrub association ; serpentine ; 0-1000 ft. Mt. Canala ; frequent in Niaouli-*Gleichenia* association ; schists ; 1500 ft. 516, 673, 1129. Australia, New Zealand.

*ADIANTUM DIAPHANUM* Blume. Ermitage Stream ; rock-crevices near waterfall ; high forest ; serpentine ; 300 ft. 196. Tropical Asia, Polynesia, Australia, New Zealand.

*A. FULVUM* Raoul. Ermitage Stream ; common in forest near edge of stream ; serpentine ; 3000 ft. 210.

*A. HISPIDULUM* Sw. Paompai ; rocky stream-sides in forest ; shales ; 100 ft. 1911. S. India, Malaya, Polynesia, S. Africa.

*A. NOVÆ-CALEDONIÆ* Keyserling. Mt. Mou ; gully forest ; serpentine ; 1500 ft. 437.

*PTERIS ENSIFORMIS* Burm. f. Mt. Mou ; high forest ; cretaceous ; 600 ft. Île Porc-Épic (E. coast) ; among rocks in forest ; frequent ; serpentine ; 200 ft. Paompai ; dry parts of forest and in coffee plantations ; shales ; 100 ft. 623, 919, 1886. China, N. India, Malaya, Polynesia, and tropical Australia.

*P. INCISA* Thunb. var. *AURITA* Luer. Ermitage Stream ; forest margin and among rocks by stream-side ; serpentine ; 300 ft. 195. Tropics and sub-tropics, Antarctic islands.

*PTERIS RUGOSULA* Labill. Mt. Mou ; forest ; serpentine ; 3600 ft. 495. Philippines, Tahiti (?).

My plant belongs to the var. *major* Fourn. (sub *Cheilanthes rugosula* Fourn.), having the lowest pinnæ more than a foot long.

*P. VIEILLARDII* Mett. forma *FURCATA* Compton, form. nov. Ignambi ; high forest, especially where better lighted ; gneiss ; 2500–4000 ft. 1576.

The typical form of this species has three leaflets (Vieillard 1565, McGillivray F. 31, Pancher). In this new form each of the three leaflets forks once or twice, the ultimate segments being as large as those in the ordinary ternate form ; the fronds reach 60 cm. in height. It is apparently due to luxuriance in favourable conditions.

*PTERIDIUM AQUILINUM* Kuhn var. *ESCULENTA* Forst. (pro sp.). Tonghoué Mts. ; Niaouli association ; cretaceous ; 1000 ft. Abundant on nearly all soils, often dominant on serpentine hillsides, and forming a chief constituent of the undergrowth in dry Niaouli country. Australian region.

*VITTARIA ENSIFORMIS* Sw. Ignambi ; epiphytic and on the adventitious roots of climbing ferns in high forest ; gneiss ; 3000 ft. 1699. Java, Mascarenes.

*V. RIGIDA* Kaulf. Kuakué ; forest ; sea-level ; in tufts on vertical trunks. 929. Malaya, Polynesia.

*V. ZOSTERÆFOLIA* Bory. Mt. Humboldt ; high forest by stream-side ; epiphytic ; 500–1000 ft. Cap Bocage ; high forest ; epiphytic ; 50 ft. Ignambi ; high forest ; epiphytic ; 1000 ft. Paompai ; high forest ; in old "nests" of *Asplenium nidus* ; 500 ft. 1039, 1367, 1630, 1891. Mascarenes and Comoros, Malaya, Polynesia.

*ANTROPHYUM LATIPES* Kunze. Tonine ; forest ; epiphytic ; 2500 ft. 1971.

*A. PLANTAGINEUM* Kaulf. Paompai ; on vertical rocks and trunks near streams ; shales ; 100 ft. 1873. N. India, Ceylon, Malaya, Polynesia.

*A. SEMICOSTATUM* Blume (ex descriptione). Mt. Canala ; on fallen logs in moist forest ; 1000 ft. 1268. Ceylon, Malaccas, Malaya, Polynesia. The fronds are rather narrower than usual ; the midrib is evident, blackish, and reaching about halfway along the frond.

*HYMENOLEPIS OPHIOGLOSSOIDES* Kaulf. Mt. Arago ; streamside trees ; occasional ; 1000 ft. Ignambi ; streamside forest ; 1000 ft. Ouendjam Forest ; riverside ; 500 ft. Epiphytic. 1421, 1616, 1991. Madagascar, Mascarenes, tropical Asia, Australia, and Polynesia.

*POLYPODIUM BROWNII* Wickstr. Mt. Humboldt; frequently climbing over trunks in streamside forest; 1000 ft. 1034. Australia, Fiji.

*P. CUCULLATUM* Nees & Blume. Mt. Mou; on tree-trunks in cloud-forest; 3700 ft. Ignambi; on rocks by stream; gneiss; 3000 ft. 483, 1533. Ceylon, Malaya, Fiji.

My specimens apparently belong to the *f. minor* Fournier. A minute and remarkable plant; the small fertile pinnæ are folded lengthwise over the solitary sori, the sterile pinnæ being flat.

*P. DEPLANCHEI* Baker. Mt. Mou; high forest; epiphytic; 2500 ft. Ignambi; high forest; creeping on tree-trunks; 4000 ft.. 578, 1659.

*P. GLABRUM* Mett. Tonghoué Mts.; creeping over rocks by stream; cretaceous; 500 ft. Mt. Mou; climbing up trunks in forest margin and Niaouli association. 169, 447. Australia, Lord Howe and Norfolk Islands, New Zealand.

The New Caledonian material I have seen has the fronds not dimorphic, some inches long, and lacking ferruginous tomentum; in these respects it differs from *P. confluens*, to which Prince Roland Bonaparte and Schlechter refer New Caledonian gatherings.

*P. LANCEOLA* Mett. Mt. Mou; on trunks in conifer forest; 3500 ft. Ignambi; on trunks in conifer forest; 3500 ft. Ignambi; on trunks in high forest; 3500 ft. Mt. Panié; on mossy bark in forest; 1500 ft. 494, 1564, 1786.

I cannot agree with Fournier's subdivision of this species (*Selliguea lanceola* Fourn.) into three varieties—*selligueoides*, *intermedia*, and *polypodioides*; all these states can be found on the same individual, as my specimens show. Schlechter 14998, issued as *P. lanceola*, is *P. Brownii* (Herb. Mus. Brit.).

*P. LASIOSTIPES* Mett. Plaine des Lacs; stream-bed in gully forest; serpentine; 1300 ft. Comboui-Ngoye watershed; on trunks in *Casuarina* forest; 3000 ft. 299, 1004.

*P. PHYMATODES* Linn. Mt. Mou; forest-margin; cretaceous; 1000 ft. Île Mouac; maritime cliffs; schists. 466, 2390. Tropics of the Old World.

*P. PSEUDAUSTRALE* Fourn. Mt. Mou; high forest; on tree-trunks; 3500 ft. 629.

Fournier described this fern as *Grammitis pseudaustrale* in 1869; in 1873 he included it in the genus *Polypodium*. This is the *P. nanum* Vieill. (H. B. Syn. p. 507), as appears from the description and from Vieillard's specimens. As the name *P. nanum* already existed (Fée, Gen. 238, 1850-2),

the earliest tenable specific name is *pseudaustrale*; there was no need for the subsequent coining of *P. pumilio* Hieron. (under which name Rosenstock has issued *Fil. Nov. Cal. exs.* 46).

*POLYPODIUM PUNCTATUM* Sw. Paompai; on rocks by shady stream; shales; 200 ft. R. Comboui; on trunk in *Callitris* forest, near river; 400 ft. Isle of Pines; very abundant on ground in banyan forest; coral. 1881, 2197. Tropics of Old World, Polynesia.

When terrestrial the fronds are two feet long, rising vertically from the soil, and are almost covered with the minute sori; as an epiphyte they are much shorter and the sori are confined to the distal part.

*P. VIEILLARDII* Mett. Plaine des Lacs; on bases of trunks in kaori forest; 800 ft. Mt. Mou; on rocks in damp gully; cretaceous; 800 ft. Mt. Canala; in crevices of bark; high forest; 2500 ft. 397, 542, 1124.

Pancher's plant under this name in Herb. Mus. Brit. is *P. Deplanchei*.

*DRYNARIA RIGIDULA* Bedd. Tonghoué Mts., Ermitage Stream, Mt. Mou, Isle of Pines, etc.; up to 1500 ft.; epiphytic. 213. Tropical Asia, Australia, and Polynesia.

*ELAPHOGLOSSUM IGNAMBIENSE* Compton, sp. nov. Planta epiphytica. *Rhizoma* super arborum truncos breviter repens, radicibus adventitiis dense vestitum. *Frondis sterilis stipes* 2-5 cm. long. 2 mm. lat.; *lamina* oblongo-elliptica circa 15 cm. long.  $\times$  4 cm. lat. rigida coriacea opaca glabra mediocriter viridis, apice rotundato-obtusa, basi in stipite attenuata; *costa media* pallida ad apicem haud attingens; *venulae laterales* angulo 60° exgredientes, non vel simpliciter furcatae, marginem laminae attingentes. *Frons fertilis* similis, *stipes* circa 10 cm. long., lamina 10  $\times$  3.5 cm. facie inferiore margine et partibus laminae ad costam mediam approximatis exceptis, sporangiis dense vestita.

Ignambi; frequent in forest, creeping over tree-trunks; 3000-4250 ft. 1565.

Belongs to the same group as *E. conforme* Schott, *E. feejeense* Brack., and *E. Vieillardii* T. Moore, but is sufficiently distinct therefrom to merit separate treatment. I have been unable to match my specimens at Kew or the British Museum. From *E. Vieillardii* it differs in having the fertile and sterile fronds approximately equal in length (though the proportion of stipe and lamina is different), and in the distinctly thickened margin and the thicker substance of the lamina.

*E. NEOCALEDONICUM* Compton, sp. nov. *Rhizoma* breviter repens radicibus dense vestitum. *Frondes steriles* opacae saturate virides rigidae in saxis procumbentes; *stipes* 5-10 mm. long. 1 mm. diam., paucis ramentis tectus;

*lamina* e basi sensim ampliata obovata apice rotundata usque ad  $9 \times 3.5$  cm., margine recurvata, costa media usque ad 5 mm. ab apice manifesta, venæ laterales angulo acuto egredientes semel bisve furcatæ, facies superior glabra, inferior ramentorum fasciculis parvis inspersa. *Fronde*s fertiles erectæ; *stipes* usque ad 9 cm. attingens, sensim in laminam transiens, lamina oblongo-lanceolata, obtusa  $5-6 \times 1-1.7$  cm., subtus omnino sporangiis tecta.

Ignambi; abundant on gneiss boulders, along streams; 3500 ft. 1612.

Related to *E. Franci* Rosenstock, but differs chiefly therefrom in the different size and proportions of its parts.

ELAPHOGLOSSUM VIEILLARDII T. Moore. Mt. Humboldt; among logs and stones in moist forest near stream; serpentine; 1000 ft. 1030. Fiji.

### GLEICHENIACEÆ.

STROMATOPTERIS MONILIFORMIS Mett. Plaine des Lacs; frequent in clayey ferruginous soil; open *Dacrydium* association; serpentine; 800-2000 ft. Nekando; in undergrowth of *Spermolepis* forest (shade form); 300 ft. Presqu'île Bogota; serpentine scrub; 1500 ft.; etc. 313, 989.

Endemic: a monotypic genus.

For the first time the existence is recorded of a horizontal rhizome, buried in the soil to a depth of 3-4 inches, and giving off erect branches which fork repeatedly in an irregular fashion. Roots are borne sparsely on this horizontal rhizome. Hitherto the existence of horizontal rhizome and roots has been denied.

GLEICHENIA FLABELLATA R. Br. Mt. Mou; dry scrub; serpentine; 2000 ft.; damp gully by stream; cretaceous; 600 ft. Mt. Arago; dry *Melaleuca* association; occasional with *G. linearis*; schists; 2000 ft. 428, 540, 1454. Australia, Tasmania, New Zealand.

Rosenstock's *Fil. Nov. Cal.* exs. 60 is this species with elongate ligulate pinna-tips; it is issued as *G. flabellata* forma *prolifera*. This name does not appear to have been published with description, but is used by Prince Roland Bonaparte (in Sarasin and Roux, Nova Caledonia, B. i. 49). My No. 428 is this forma. 540 has some pinnæ "proliferous," others not, all on the same frond.

G. MONTAGUEI Compton, sp. nov. *Rhizoma* in solo repens 2 cm. diam. terete durissimum protostelicum. *Fronde*s distantes 5-6 m. long., juventute ramentis brunneis lanosis et squamosis omnimodo vestitæ; *stipes* basi erectus, 2 cm. diam., supra sensim tenuior teres durus glaber utrinque pinnae pinnato-flabelliformas distantes ferens; *pinnæ primi ordinis* expansæ, rhachi producto, pinnulas oppositas pseudo-dichotomas ferentes; *pinnulæ* ter

furcatæ; laminæ ex segmentis ultimis penultimisque angulo 70°-80° egredientes divaricatæ contiguæ in basi lato sessiles oblongæ interdum apice paullo dentatæ, 10-15×3 mm., supra lucentes subtus leviter glaucescentes margine plana, venulæ ultimæ ad rhachin furcatæ. Sori parvi superficiales 10-15-jugi, in venulis solitarii. Sporangia 3-5, cum ramentis intermixta.

Ignambi; high forest; gneiss; 3000 ft. 1727.

A member of the § Mertensia. It has the largest rhizome and frond of any known species of *Gleichenia*. The frond, which is stiffly erect at the base and arches over above, shows no climbing habit and may reach 20 ft. in length; it gives off to right and left large flabellately branched pinnæ, which spread out flat at right angles to incident light.

*G. Montaguei* appears to be closely related to *G. Cunninghami* from New Zealand, from which however it differs in the remarkable size of its rhizome and stipe which are  $\frac{3}{4}$  inch in diameter; the largest rhizome of *G. Cunninghami* I have seen (coll. Horne, Bay of Islands, New Zealand, in Herb. Mus. Brit.) is only  $\frac{1}{8}$  inch in diameter. *G. Montaguei* also appears to be related to an unnamed *Gleichenia* from the Sogeri region of New Guinea (coll. Forbes 923 in Herb. Mus. Brit.), which has a similar habit and mode of branching, and which has unusually large rhizome and stipe (though smaller than those of *G. Montaguei*). I dedicate this species to the memory of my friend Paul Denys Montague, my fellow-worker in New Caledonia.

GLEICHENIA CIRCINATA Sw. Mt. Mou; forming dense thickets above 2000 ft. in open situations; serpentine. Australia, Tasmania, New Zealand, Borneo, Malacca.

G. LINEARIS C. B. Clarke. Abundant in dry sunny situations on all rocks throughout the country. Tropical and subtropical regions; New Zealand.

### SCHIZÆACEÆ.

SCHIZÆA BIFIDA Sw. Mt. Canala; on ground in Niaouli association; schists; 1000 ft. 1250. Australia, New Zealand.

S. DICHOTOMA Sm. Plaine des Lacs; common in serpentine scrub; 1000 ft.; on ground in valley forest; serpentine (shade form); 1600 ft. Kuakué; among rocks; serpentine; sea-level. Couliné; forest; serpentine; 1000 ft. Ignambi; forest; gneiss; 3000 ft. Île Mouac; Niaouli association; schists; sea-level. 336, 354, 925, 1280, 1698, 2350. Tropical Asia, Australia and Polynésia, Madagascar, and Mascarenes.

I follow Luerssen in including *S. Forsteri* Spreng. in this very variable

species, whose differences are chiefly in luxuriance, following a considerable range of habitat.

*SCHIZÆA FISTULOSA* Labill. Presqu'île Bogota ; occasional on dead logs in humus in *Spermolepis* and *Casuarina* forest ; serpentine ; 1000 ft. Ignambi ; on ground in Niaouli association ; gneiss ; 3500 ft. 1341, 1541. Tasmania, New Zealand, antarctic America, Borneo, Madagascar.

The Bogota plant, grown in shade, is unusually tall, the frond being 18 inches in length ; there are about 30 fertile segments on each side of the spike.

*S. INTERMEDIA* Mett. River Ngoye ; streamsides in forest shade ; serpentine. 973.

Schlechter 15336, in Herb. Brit. Mus., issued as *S. intermedia*, has a broad frond and glabrous sporophylls and should probably be regarded as a variety of *S. lævigata* ; the fronds are too long for *S. plana* Fourn. *S. intermedia* Mett. has ribbon-shaped carinate fronds, 2 mm. broad, and the sporophylls are hairy.

Rosenstock's *Fil. Nov. Cal.* exs. 118 (coll. Franc), distributed as *S. lævigata*, belongs here.

*S. LÆVIGATA* Mett. Baie Ngo ; dry serpentine scrub ; 500 ft. 247.

*LYGODIUM HIANIS* Fourn. Nekandø ; conifer forest ; twining by elongated rhachis to height of 10 ft. ; serpentine ; 3500 ft. Ignambi ; high forest ; twining ; gneiss ; 3500 ft. Mt. Panié ; forest ; gneiss ; 3000 ft. 1069, 1540, 1810.

In this remarkable species certain of the fronds are dichotomous and definite in growth ; in others the rhachis goes on growing indefinitely, twining round branches of shrubs and bearing lateral dichotomous leaf-segments, some sterile, others fertile ; the elongated rhachis being evidently a sympodium. On Mt. Panié a witches' broom gall is frequently present (1810).

*L. RETICULATUM* Schkuhr. Tonghoué Mts. ; very common climbing over shrubs and trees ; cretaceous ; 500 ft. Baie Ngo ; on stream flood-plain ; serpentine ; 50 ft. Mt. Mou ; abundant in Niaouli association ; cretaceous ; 800 ft. Kuakué ; river flood-plain ; serpentine ; 50 ft. ; etc., etc. 171, 244, 445. Polynesia, Australia.

## OSMUNDACEÆ.

*LEPTOPTERIS WILKESIANA* Christ. Mt. Canala ; locally abundant in damp parts of high forest ; schists ; 2000 ft. Ignambi ; abundant in moist forest ; gneiss ; 4000 ft. 1205, 1560. New Guinea, Polynesia.

The trunk of this arborescent filmy fern sometimes reaches 10 ft. in height, frequently being bent.

### SALVINIACEÆ.

*AZOLLA* sp. indet. Mt. Mou ; stagnant pools ; 500 ft. 558.

### MARATTIACEÆ.

*ANGIOPTERIS ERECTA* Hoffm. Ermitage Stream ; streamside in high forest ; serpentine ; 600 ft. Ignambi ; locally frequent in high forest, especially in moister parts ; gneiss ; 2500 ft. 202, 1536. Tahiti, tropical Africa and Asia.

*MARATTIA ATTENUATA* Labill. Mt. Arago ; high forest ; schists ; 2000 ft. Mt. Panié ; high forest ; gneiss ; 1500 ft. 1451, 1770.

The bipinnate fronds are relatively small, being 4-5 ft. long, and the number of pinnæ is restricted, often only four being present. My specimens agree well with Labillardière's original description and drawing (Sert. Austrocal. tt. 13, 14 ; 1824).

*M. FRAXINEA* Sm. (in sens. strict. De Vriese). Ignambi ; frequent in forest ; gneiss ; 2000 ft. 1490. Tropical Asia, Africa, and Australia.

Schlechter 15052 in Herb. Mus. Brit., sub nom. *M. fraxinea*, is *Angiopteris* sp.

*M. SMITHII* Mett. Mt. Arago ; abundant here and at Mt. Canala ; moist forest ; schists ; 1000 ft. 1442. Polynesia.

The fronds are 18-20 ft. long, with a stipe as thick as a man's arm.

Forma *SOLUTA* Compton, form. nov. Ignambi ; forest ; gneiss ; 1500 ft. 1674.

An abundant form in this locality, where very favourable conditions produce luxuriant growth. The secondary pinnules show all transitions from entirety through partial pinnatifidness to a completely pinnate condition, *i. e.* the frond is bi-tripinnate. (The tripinnate condition is normal in *M. pellucida*, also recorded from New Caledonia.)

*M. TERNATA* De Vriese. Ermitage Stream ; by streamside in forest ; serpentine ; 600 ft. 201. Moulucas.

Bonati 142 *bis* (coll. Franc), issued as *M. attenuata* (det. Christ), is this species ; and so is Schlechter 15050 under the same name. *M. attenuata* is a distinct species.

## OPHIOGLOSSACEÆ.

OPHIOGLOSSUM PEDUNCULOSUM Desv. Mt. Mou; shady grassy places (old cultivation terraces); cretaceous; 800 ft. Mt. Canala; Niaouli association; schists; 1500 ft. Ignambi; open moist turf; gneiss; 2000 ft. 594, 1132, 1614. Japan, Australia, New Zealand, tropical Asia.

The Ignambi plants, 1614, are much smaller than typical *O. pedunculosum*, but they come from the same locality as Schlechter's 15540, which matches my 594 and 1132; and it seems probable that they are merely a habitat form, as they differ in no other respect, as far as I can see.

*O. PENDULUM* Linn. Mt. Canala; moist forest; epiphytic; 1500 ft. Mt. Panié; high forest; epiphytic; 1500 ft. 1185, 1773. Tropical Asia, Australia, and Polynesia.

HELMINTHOSTACHYS ZEYLANICA Hook. Mt. Mou; grassy places in shade (old native cultivation terraces); cretaceous; 800 ft. 559. Tropical Asia and Australia.

## EQUISETALES.

## EQUISETACEÆ.

EQUISETUM RAMOSISSIMUM Desv. Mt. Mou; streamsides; cretaceous; 700 ft. Mt. Canala; in mud by stream; schists; 900 ft. 440, 1162. Tropics and sub-tropics.

The New Caledonian specimens are comparatively little branched; they have, however, the typical loose leaf-sheaths of *E. ramosissimum* as collected in Aneiteum (McGillivray 60) and Fiji (Seemann 697), and differ from the closely related *E. debile* Roxb. as collected in New Guinea (Kloss), which has tight sheaths.

## LYCOPODIALES.

## LYCOPODIACEÆ.

LYCOPODIUM CARINATUM Desv. Ignambi; epiphytic in forest; 1500 ft. 1853. India, Malaya, Philippines, Formosa, Polynesia.

*L. CERNUUM* Linn. Mt. Mou; abundant in scrub; serpentine; 2500 ft. Mt. Koghi; abundant in *Melaleuca-Pteridium* association on dry hillsides above 1000 ft.; serpentine. Mt. Canala; etc. 576, 752. Tropics and sub-tropics.

*L. DENSUM* Labill. Mt. Mou; scrub; serpentine; 2500 ft. and upwards. Nekando; among shrubs in forest margin; serpentine; 3000 ft. 630, 635, 2129. Australia, Tasmania, New Zealand, Norfolk Island.

This species is remarkable in showing a kind of *Retinospora* condition. In sheltered situations the leaves are erecto-patent; in open scrub they are closely appressed to the stem. Occasionally one can find shoots bearing both kinds of foliage. It is curious to note that the aspect of the erect shoots is that of a miniature Conifer.

**LYCOPODIUM IGNAMBIENSE** Compton, sp. nov. Sectionis *Selaginis* species nova. Planta epiphytica. *Caulis* pendens spatii 4–8 cm. iterum atque iterum dichotoma viridis flexibilis tenuis gracilis 70 cm. long., basi diam. haud 1 mm. *Folia* subverticillata linearia, basalia divaricata, distalia erecto-patentia, 7–8 mm. long., basi 0.7 mm. lat., sursum sensim angustiora, costa media difficile adspectabilis, apex filiformis. *Caulis* partes sporangiferæ cum sterilibus alternantes. *Sporophylla* foliis similia, nisi basi paullo latiora, usque ad 1 mm. attingentia, sporangia vix ocludentia.

Ignambi; on rocks and trees in high forest; 2500 ft. August. 1689.

A plant of very graceful habit, the weak flexible stems causing it to be completely pendulous. With some affinity to *L. verticillatum* Linn. fil., it most nearly resembles *L. sarmentosum* Spring, native in the north of S. America. It differs from that species in the green colour of the stem, the less prominent midribs of the leaves, and the fact that the sporophyll broadens slightly beneath the sporangium.

**L. LATERALE** R. Br. Mt. Mou; open scrub association; serpentine; 2000 ft. Australia and New Zealand.

**L. MIRABILE** Willd. Mt. Canala; on trunks in forest; 1500 ft. Mt. Arago; on trunks in forest; 1000 ft. Paompai; on rocks by stream; 200 ft. Tonine; epiphytic in forest; 2000 ft. 1190, 1424, 1875, 1962. Tropics of Old World, New Zealand.

Var. **MICROBRACTEATA** Compton, var. nov. Varietas sporophyllis quam sporangia brevioribus, haud acutis.

Île Porc-Épic (East Coast); terrestrial in forest; serpentine; 100 ft. 956.

In the type of the species the sporophylls greatly exceed the sporangia in length, and are apiculate.

**L. NUTANS** Brack. Ignambi; on gneiss boulders in high forest; 1500 ft. 1678. Tahiti, Madagascar.

Forma **NANA** Compton, form. nov. Ignambi; on trees in moist forest; 300 ft. 1504.

A puzzling starved form which I believe to be *L. nutans*, agreeing with that species in the shape of its leaves and sporophylls. Its total length is

13 cm., and stem and leaves are smaller than usual. My plant matches Schlechter's 15404 from the Oubatche Mts. (of which Ignambi is one) in Herb. Mus. Brit., sub nom. *L. carinatum*: from that species, however, it differs in the leaves, which are flat and not sharply keeled.

*LYCOPodium PHYLLANTHUM* Hook. & Arn. var. *AURICULATUM* Compton, var. nov. Folia late cordata subauriculata. Ignambi; on gneiss boulders near streams in high forest; 2000–3500 ft. 1508.

Differs from the type in the broadly cordate sessile leaves, almost auricled at the base. In Herb. Kew. there is a Samoan specimen (Whitmee 169) approaching this variety; but in all other material I have had an opportunity of examining the leaves are scarcely cordate at the base. The species occurs in India, Ceylon, Malaya, and Polynesia.

*L. PHYLLANTHUM* Hook. & Arn. forma *NANA* Compton, form. nov. Ignambi; on trees in moist forest; 3000 ft. 1506. A small exposed form of this species, I believe, with stems 1–2 mm. in diameter at the base, yellowish-green leaves 7–8 mm.  $\times$  3–4 mm., set edgewise; the sterile part of the stem 10 cm. long, the strobili 8–9 cm. long.

*L. SCHLECHTERI* E. Pritzel. Mt. Mou; on rock-ledge in slight shelter; serpentine scrub; 3500 ft. Nekando; rocks in slight shelter; serpentine scrub; 3000 ft. 634a.

This species, first collected by Schlechter on the Ngoye Mts. (of which Nekando is one) at 1000 m. altitude (15174), may be merely an exposure form of *L. nutans* Brack., to which it bears a close resemblance. It differs in the erect simple stem and short recurved strobili. In the absence of good connecting-links, however, it is best to keep it provisionally as a distinct species.

*L. SERRATUM* Thunb. Ignambi; on ground in high forest; gneiss; 2000–3000 ft. 1497. Japan, China, India, Malaya, Polynesia, Mexico.

The shoots, which are terrestrial and sometimes attain a foot in height, are abundantly gemmiferous; the production of gemmæ seems to be the chief mode of propagation, and all stages in their germination were found.

*L. SQUARROSUM* Forst. var. *PACIFICUM* Compton, var. nov. Varietas strobilo a parte sterile plantæ haud dissimile.

Mt. Humboldt; on stones and trunks in moist forest; 1000 ft. Ignambi; on rocks and trunks in moist forest; 2000–3000 ft. 1026, 1026a, 1500, 1502.

The New Caledonian plants agree with those from the Pacific Ocean in general in having the strobilus less sharply distinct from the sterile portion of the stem than is the case in the Indian and Malay plants. Other

specimens belonging to this variety have been collected in New Caledonia (Vieillard 1687, Schlechter 15454), Normanby Island, Louisiade Archipelago (Mueller 127, coll. McGregor), Aneiteum, New Hebrides (McGillivray), Fiji (Seeman 704), Upolu (Graeffe), Samoa (Whitnee), Society Islands (Banks and Solander), Tahiti (Cook).

My specimens vary much according to conditions. 1502, which had a somewhat exposed position on a trunk at 3000 ft., is rather stiffly erect with dense yellowish foliage. 1026, which is of the most frequent form, grew in greater shelter at 1000 ft., and is more lax and drooping with less dense light green leaves. 1026 *a*, growing with 1026, is a starved crowded specimen of small stature, weak and drooping; and no. 1500 is a similar form.

*LYCOPodium varium* R. Br. Mt. Koghi; on trunks in forest; 1500 ft. 794. Australia, Tasmania, New Zealand, and Auckland Island.

*L. volubile* Forst. Mt. Canala; forest margin; schists; 3000 ft. Ignambi; forest margin; gneiss; 3000 ft. 1220. New Zealand, Malaya, N. Australia, Polynesia.

The strobili are about an inch in length, this being rather shorter than is typical—New Zealand plants, for instance, bearing strobili up to 3 inches long.

#### SELAGINELLACEÆ.

*SELAGINELLA HORDEIFORMIS* Baker. Mt. Koghi; frequent in forest above 500 ft.; serpentine. 792. Fiji.

This handsome species has whitish stem-leaves and a dark green expanded frond. It frequently ascends the trunks of tree-ferns to a height of 4 or 5 feet by clasping with its rhizome and by inserting rhizophores among the host's leaf-bases.

*S. JOUANI* Hieron. Ermitage Stream; in forests near waterside; serpentine; 300 ft. Mt. Mou; high forest; serpentine; 1500 ft. 211, 438.

Differs from its close ally, *S. firmuloides* Warb. in its short strobili and the short points of its sporophylls.

*S. MEGASTACHYA* Baker. Mt. Arago; locally abundant in moist forest; schists; 1000 ft. 1412.

All the specimens I have seen agree in a feature in which they differ from Baker's original description—namely, the leaves of the upper plane are cuspidate. This applies to specimens determined as *S. megastachya* by Baker himself. The original description is therefore in error.

*S. NEOCALEDONICA* Baker, Mt. Mou; high forest; serpentine (shelter form); 2500 ft. Mt. Koghi; in stony *Pteridium* association; serpentine (exposed form); above 2000 ft. 566, 739.

There is some confusion between this species and *S. usta*, from which, however, it seems to be distinct. The stem is decumbent in shelter, erect in the open, branched from near the base. The leaves are more distant, smaller and narrower than in *S. usta*, and are not all cordate. The strobili are short, about 5 mm. long. In exposed situations (739) it has a reddish-brown colour like *S. usta*, but in shelter it remains green.

*SELAGINELLA USTA* Vieill. Plaine des Lacs; on the level flood-plain; uncommon; serpentine; 800 ft. 370.

This species differs from *S. neocaledonica* in the following respects. It is erect and not decumbent. The leaves of the lower plane are closer on the main stem, and are broader and almost cordate at the base. The stem is unbranched at the base. The strobili are distinctly longer, often exceeding 1 cm. The colour is reddish, as in the exposure forms of *S. neocaledonica*. Hieronymus (in Sarasin and Roux, Nova Cal. B. i. 64) doubts whether *S. usta* and *S. neocaledonica* are not habitat forms of the same species. But the true exposure form of *S. neocaledonica* is distinct from *S. usta*.

*S. VIEILLARDII* Warb. (ex descr.). Mt. Dore; prostrate on soil in open scrub; serpentine; 800 ft. 669.

## PSILOTALES.

### PSILOTACEÆ.

*PSILOTUM TRIQUETRUM* Sw. Canala; in hollows on tree-trunks; 50 ft. Paompai; on trunks in forest; 500 ft. 1332. Tropics, Japan, New Zealand.

*TMESIPTERIS*.—My collections of this genus have been examined anatomically by Mr. Birbal Sahni at the Cambridge Botany School; and it is his opinion (in which I concur) that it is impossible to reduce all the forms to a single species. Three of Dangeard's species—namely, *Tm. Vieillardii*, *Tm. lanceolata*, and *Tm. tannensis*—should certainly be kept up; the fourth, *Tm. truncata*, is of more doubtful validity, and we have therefore combined it, as represented by my 452, with *Tm. tannensis*, of which it appears to be a growth variant.

*TMESIPTERIS LANCEOLATA* Dang. Mt. Canala; on trunks of tree-ferns in forest; 1500 ft. 1192.

This species agrees with *Tm. tannensis*, and differs from *Tm. Vieillardii* in its epiphytic pendulous habit. It is specially distinguished by its acute leaves, not at all truncate but gradually tapering into a long acumen; the substance of the leaf is rather thick, almost coriaceous, and the leaf-margin is markedly thickened.

*TMESIPTERIS TANNENSIS* Bernh. Mt. Panié; on tree-ferns in forest. Tonine; on tree-ferns in forest; 2000 ft. 1823, 1967.

My specimens vary in details, breadth of leaves, &c., but should probably be grouped together. They agree in habitat, all being found on the trunks of tree-ferns or among the rhizomes of climbing ferns at moderate altitudes. The stems are pendulous, rarely branched, flexible, more slender than in *Tm. Vieillardii*; the leaves are not recurved and are broadest in the middle; their texture is thin and the margin is not thickened. Australia, Polynesia, New Zealand.

*T. VIEILLARDII* Dang. Mt. Mou; terrestrial in high forest; serpentine; 3500 ft. 610.

This plant is certainly distinct from *Tm. tannensis*. It grows on the ground, the rhizome being a few centimetres deep in forest humus, and is confined to altitudes of above 1000 m. The stem is tall, stiffly erect, and unbranched, stouter than in *Tm. tannensis*. The leaves are multifarious, rigid, falcately recurved, and have parallel margins. It seems to be peculiar to New Caledonia.

Rosenstock's *Fil. Nov. Cal.* exs. 152, labelled *Tm. Vieillardii*, is a form of *Tm. tannensis*. Schlechter's 14940 and 15295, sub nom. *Tm. tannensis*, are *Tm. Vieillardii*.

## MUSCI.

Par I. THÉRIOT.

*CAMPYLOPUS BALANSÆANUS* Besch. Mt. Ngoye, 500–1000 m. 1007. Très abondant sur la terre, entre les rochers et les arbustes. Copieusement fructifié.

M. Fleischer (*Musci Fl. Buitenzorg*, 111) affirme, d'après un échantillon récolté par Dupuy aux environs de Nouméa, que *C. Balansæanus* Besch. est la même chose que *C. aureus* van den Bosch & Lac. Je ne partage pas cet avis; sans entrer dans le détail des différences, je me borne à signaler que dans la dernière espèce, la capsule est ovale et très régulière, alors que le *C. Balansæanus* a une capsule oblongue, toujours plus ou moins asymétrique.

*SYNODONTIA FALCATA* Broth. & Par. Mt. Koghi, 100 m.; sur troncs d'arbres dans les forêts. 743. Fructifiée.

*S. CONNIVENS* Broth. (*Dicnemon connivens* Besch.). Ignambi; sur les troncs d'arbres. 1595. Fructifiée.

*S. CUSPIDATA* Broth. (*Dicnemon cuspidatus* Besch.). Mt. Mou, 1200 m.; abondante sur les troncs dans les forêts du sommet. 613. Fructifiée.

On connaît aujourd'hui 9 espèces du genre *Synodontia*, toutes localisées en Nouvelle-Calédonie.

LEUCOBRYUM CONOCLADUM Besch. Mt. Mou, 1200 m.; dans les forêts, sur les racines des arbres. 637.

MACROMITRIUM LERATIOIDES Broth. & Par. Plaine des Lacs; sur les troncs, dans les hautes futaies. 274. Fructifié.

V. F. Brotherus compare cette espèce au *M. pacificum* Besch. Aux différences qu'il signale, il convient d'ajouter qu'ici la coiffe est nettement poilue, alors que *M. pacificum* a une coiffe nue.

Les véritables affinités de *M. leratioides* Broth. & Par. sont ailleurs: cette mousse est surtout alliée aux *M. Renauldi* Thér. et *M. gracilipes* Card. de Nouvelle-Calédonie. Les différences qui séparent ces trois espèces sont en somme assez légères, et je ne serais pas surpris si des recherches ultérieures conduisaient à les confondre en une seule et même espèce.

BRACHYMENIUM INDICUM van den Bosch. & Lac. var. CORRUGATUM Besch. Baie Ouémo; dans les bois près de la mer; abonde sur la terre. 133. Fructifié.

La variété croît en Nouvelle-Calédonie; le type à Java et Amboine.

BRYUM PANCHERI Jaeg. (*B. crassinervium* Besch.). Rivière Ngoyé, en touffes épaisses dans les fentes des rochers. 1024. Fructifié. Assez répandu.

RHIZOGONIUM NOVÆ-CALEDONIÆ Besch. Mt. Koghi, 350 m. 754. Mt. Canala, 300 m. 1141. Fructifié.

Le no. 1141 représente une forme à feuilles plus étroites et à nervure plus large.

POGONATUM CIRCINATUM Besch. Mt. Canala, très abondant sur le sol argilo-schisteux. 1164. Fructifié.

P. NEO-CALEDONICUM Besch. Mt. Canala, 800 m.; forêts; sur la terre nue, argileuse. 1140. Fructifié.

Ces deux espèces sont les seules du genre qui aient été trouvées en Nouvelle-Calédonie. La première y est assez commune; elle forme sur la terre des tapis étendus et assez compacts. La seconde semble, au contraire, vivre par brins isolés, disséminés parmi d'autres mousses, et quelquefois même au milieu des touffes de *P. circinatum*.

SPIRIDENS VIEILLARDI Schp. Mt. Canala. 1233. Ignambi. 1657. Abonde sur les troncs, et particulièrement sur les troncs de fougères arborescentes. Fructifie copieusement.

FRANCIELLA SPIRIDENOIDES Thér., in Bull. Acad. Géog. bot. (1910) 100. Ignambi; forêt au-dessus de 500 m; sur les troncs des arbres. 1656. Fructifiée.

Cette espèce, une des plus belles de la flore bryologique néo-calédonienne, a été découverte par mon correspondant et ami I. Franc, en 1910, dans les forêts du Mt. Panié, au nord de l'île. Ignambi est la deuxième localité connue.

PTYCHOMNION ACICULARE Mitt. Mt. Koghi, 1000 m.; sur troncs d'arbres morts, dans la forêt. 742.

Espèce répandue dans les îles du Pacifique et dans les terres du sud de l'Amérique méridionale.

FLORIBUNDARIA FLORIBUNDA Fleisch. var. BREVIFOLIA Ren. & Card. Paompai; abonde dans les forêts humides. 1916. En beaux fruits.

Cette variété n'était connue jusqu'ici qu'en Asie dans l'Himalaya. Le type a une aire d'expansion très étendue; il existe en Afrique, à Madagascar, dans le sud de l'Asie, au Japon, dans les îles de la Sonde et du Pacifique.

D'après Fleischer, les feuilles caulinaires de *F. floribunda*, sont dressées et appliquées sur la tige. Cependant j'ai constaté que dans la plante de Paompai, les feuilles caulinaires sont toujours étalées; cette disposition des feuilles se vérifie également sur la plante de l'Himalaya (comm. Cardot).

NECKEROPSIS LEPINEANA Fleisch. (*Neckera Lepineana* Mont.) forma GIGANTEA Fleisch. Mt. Mou; sur les vieux troncs, dans les forêts humides; 700 m. 449. Philippines, Célèbes, Java, Sumatra, etc.; îles du Pacifique; et aussi suivant Fleischer en Afrique, dans l'Usambara, à Madagascar et dans les îles voisines.

CALLICOSTELLA PAPILLATA Jaeg. (*Hookeria papillata* Mont.). Mt. Koghi; sur l'écorce d'arbres et sur les rochers près d'un ruisseau. 801 b. Bengale, îles de la Sonde, îles du Pacifique. Elle semble assez commune en Nouvelle-Calédonie.

C. PRABAKTIANA Dozy & Molk., Bryol. jav., forma. Ermitage; sur l'écorce d'arbres morts, au-dessus d'un ruisseau. 158 a. Fructifiée.

Les feuilles de cette plante ont un tissu presque hyalin, plus lâche que dans les formes habituelles de l'espèce. Je la rapporte néanmoins au *C. prabaktiana* à cause de son pédicelle court (5-6 mm.) et du tissu foliaire lisse.

Je la crois nouvelle pour l'île. Il est vrai qu'elle est citée dans les listes de doubles du général Paris; mais comme V. F. Brotherus n'en fait pas mention dans ses *Contributions à la flore de Nouvelle-Calédonie*, je suis fondé

à croire qu'elle figure par erreur dans les listes du gén. Paris, à l'exemple d'un certain nombre d'autres.

Borneo, Java.

*RHACOPILUM SPECTABILE* Reinw. & Hornsch. Mt. Mou, alt. 600 m.; forêts, sur les troncs d'arbres. 590. Fructifié.

Îles de la Sonde et Pacifique.

*THUIDIUM NUTANS* Besch. Ermitage; abondant sur les arbres, les cailloux, mais rarement fructifié. 183.

*ECTROPOTHECIUM DISTICHELLUM* Kindb. Enum. M. exot. p. 98 (*Hypnum distichellum* C. M.). Mt. Mou, alt. 350 m.; sur l'écorce des vieux troncs. 476, 477. Fructifié.

— —, forma. Même localité. 598. Forme à rameaux moins comprimés, à feuilles plus fortement falciformes. Espèce polymorphe.

*VESICULARIA APERTA* Thériot (*Hypnum apertum* Sull.). Mt. Mou, 700 m.; sur les vieux troncs, dans les forêts humides. 449. Hawaï.

J'ai nommé cette plante de Nouvelle-Calédonie *V. aperta*, à cause de ses feuilles très brièvement acuminées et de ses cellules foliaires à parois épaissies; cependant ces cellules paraissent un peu plus longues que dans le type, à en juger par les figures de Sullivant; elles sont d'autre part bourrées de grains chlorophylleux, de manière à rendre le tissu presque opaque, ce que l'on voit rarement dans le genre *Vesicularia*.

Le *V. aperta* constitue avec les *V. bryifolia* (C. Muell.) et *V. inflectens* (Brid.) un petit groupe d'espèces très affines et parfois difficiles à distinguer l'une de l'autre. Elles semblent ne différer entre elles que par la longueur des feuilles, la forme et la longueur de l'acumen, l'allongement des cellules. On sait combien ces caractères sont sujets à varier: on trouvera, par exemple, des plantes qui auront, comme dans la forme ci-dessus, les feuilles de *V. aperta* et le tissu de *V. inflectens*, ou inversement.

Il sera sage peut-être, après un examen approfondi des types, d'opérer des réductions dans ce groupe, comme aussi d'ailleurs dans d'autres groupes de ce même genre.

*V. SUBCALODICTYON* Broth. & Par., in Broth. Contrib. fl. bryol. Nouv.-Caléd. iii. 37 (1911), forma. Ermitage; sur l'écorce des arbres morts, au dessus d'un ruisseau. 158, 158 a. Fructifié.

Cette plante n'est pas absolument identique au type de l'île des Pins: elle en diffère par l'acumen des feuilles moins long et moins fin, la présence d'une double nervure bien marquée; mais elle a même taille et même port, même forme et mêmes dimensions des feuilles, même tissu foliaire. L'ensemble de

ces caractères communs suffit, je crois, à justifier mon opinion. On ne pourrait songer d'ailleurs à la rapporter au *V. calodictyon*. (C. M.) qui, d'après Brotherus, est deux fois moins robuste que *V. subcalodictyon*.

WARBURGIELLA CUPRESSINOIDES C. Muell. ex Broth. Mt. Koghi, 1000 m. ; dans les bois, sur les troncs d'arbres tombés. 745. Fructifiée. Îles Philippines ; Mindanao.

SCIADOCCLADUS SPLENDIDUS Jaeg. (*Hypnodendron splendidum* Besch.). Ignambi, 1000 m. ; sur la terre, abonde dans les forêts humides. 1596. Fructifié.

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