Art. VIII.—*The Vegetation and Flora of Lord Howe Island.*

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Plates X–XVI.

Contents

I GENERAL

Situated in a tract of ocean which bounds three biological regions of the globe, and on a submarine ridge connecting two of these, Lord Howe Island is at once of intense interest to the biologist. This island, remarkable not only for its biological productions but also on account of its geological structure, lies about 430 km. eastward of the Australian Continent, in S. lat. 31° 32′. Yet in the character of its animal and plant life it presents a striking contrast to that of Australia, though, owing to the proximity of the continent and consequent occasional accidental means of transport, certain features of the continental life are stamped on that of the island. Fundamentally, however, there is a wide difference.

The present paper is based mainly on collections, notes, and photographs obtained during a short stay on the island in 1913. I left Sydney on the 1st November in the "Makambo," and after a fine passage Lord Howe Island was sighted on the afternoon of the 3rd, the two mountains, Gower and Lidgbird, being visible at a distance of over forty miles Being dark when we arrived, anchor was cast outside the reef on the western side of the island, but by the kindness of Mr R. S. Bell, who was then residing there, I was rowed ashore through an opening in the reef and landed on the beach near Mrs Nicholl's residence, which I made my headquarters Altogether I remained fifteen days on the island, and, despite some bad weather, spent practically the whole time in investigating the flora I visited most parts of the island, from the Northern Hills to the western base of Mount Gower Four days were spent on the mountains, where, in company with Mr Bell, I camped in Erskine Valley Twice from this camp I ascended Mount Gower, once with Mr Bell and his assistant and once by

myself. On the 17th November the "Malaita," returning from the New Hebrides, called at Lord Howe Island, and I embarked with my collections, and after a tempestuous voyage of two days arrived at Sydney.

Altogether I have admitted as vascular plants indigenous to Lord Howe Island 209 species. The difference, sixteen species, between this and Hemsley's list published twenty years ago is mainly due to the investigations of Maiden and Watts. I have added only one name, *Kyllinga monocephala*, and this species may have been recently introduced. Several species about which there is some suspicion of their having been recorded in error are retained because I have no good reason for omitting them, while there is evidence of the presence on the island of two or three species of woody plants not included in my list on account of insufficient material for determination.

I have taken some trouble to give the names of the species in accordance with the rules of botanical nomenclature adopted at the Vienna Congress of 1905. This has involved several changes from the names commonly in use. In the systematic part of the paper, therefore, I have in all cases quoted the original reference. Following this I have given the principal references to works where some information is to be found regarding Lord Howe Island specimens, and also the earliest reference recording the species in Lord Howe Island under each name to which it has been referred. "Habitat" is used in an ecological sense, and is to be distinguished from "distribution," used only to mean geographical range.

My thanks for assistance in the production of this paper are due—in the collection of specimens, to Mr. R. S. Bell, who, by giving me the benefit of his wide knowledge of Lord Howe Island and acting as guide on several of my excursions, made possible the amount of work I was able to do during my stay on the island; in the identification of my specimens, to the Rev. W. W. Watts and Mr C. H Cheel, of Sydney, and Mr. T. F. Cheeseman, F L S, F Z S, of Auckland; and to the Board of Governors of the New Zealand Institute and the Council of the Philosophical Institute of Canterbury, for grants of money, by the former out of the Hutton Memorial Research Fund, to help defray expenses To Dr. L. Cockayne, F.R.S., of Wellington, I am indebted for many valuable suggestions.

PHYSIOGRAPHY.

Lord Howe Island is evidently but a fragment of a once more extensive area, sheer cliffs of 800 m. showing sections of horizontal lava-flows, testifying to a vast amount of denudation. The island is roughly crescent-shaped, the convexity facing west. The extreme length is 9·6 km., and greatest breadth 2·8 km; the total area is about 13 sq. km.

Considered according to its geological structure, which determines the physical features, Lord Howe Island may be divided for purposes of description into (*a*) two contiguous and much-denuded mountain masses forming the southern end, with a low-lying portion stretching from their base in a northerly direction and consisting of (*b*) three groups of volcanic hills connected by (*c*) flat ground of marine origin. Across the bay on the west side of the island a detached portion of the limestone formation of which the flat ground is composed forms a reef uncovered at low water.

The southern, or mountain, portion of the island consists of Mount Gower (865 m.) and Mount Lidgbird (763 m), connected by a ridge which dips to 380 m. at its lowest point. Mount Gower is flat-topped, and on three sides presents to the sea perpendicular cliffs, access to the summit being

gained only by the northern ridge leading to Mount Lidgbird The eastern face is a sheer drop from summit to sea-level. The summit plateau is about 500 m. long by 300 m. wide, and slopes gently from east to west. Its surface is traversed by two small valleys. Mount Lidgbird is more pyramidal in shape. Its sides lead up by a series of huge cliffs and steep declivities to a short narrow ridge at the summit.

Splendid opportunities for observing the structure of the mountains are afforded by their sides, which are for the most part sheer cliffs. Both are composed of nearly horizontal beds of lava, which viewed from the sea to the west are seen to incline very slightly in a northerly direction The present mountains are, therefore, but fragments of a large volcano whose crater was probably to the south.

The low volcanic hills lying to the north of the mountains fall into three groups: (*a.*) The Northern Hills form a short ridge with a perpendicular face to the sea and a gentler slope inland (*b.*) Transit Hill stands alone in the centre: its east slope reaches the sea; the remaining sides are surrounded by limestone beds (*c*) Intermediate Hill abuts against the precipitous northern face of Mount Lidgbird, and has clearly been thrown up after the mountain masses had been denuded almost to their present state. It thus affords striking proof of a long period of time having elapsed between the eruptive outbursts producing the mountains and those forming the low hills. Except the Northern Hills, which are most exposed to westerly seas, the volcanic hills are but little denuded by marine action This is perhaps further evidence of their being much younger than the mountains

The flat ground connecting the volcanic hills, together with the reef across West Bay, are formed of stratified limestone beds of marine origin They contain marine shells, bones of *Meiolania*, and shells of *Placostylus* The latter are probably collections of dead shells embedded in superficial rain-water deposits, or odd shells which have found their way to the sea and there become entombed. I found numbers of these shells on the rocks between tide-marks, many of them utilized by hermit crabs

The soils of Lord Howe Island are of two kinds: firstly, that on limestone rock, which is loose, sandy, and dry; secondly, that on volcanic ground, which is darker in colour and contains a good deal of moisture and humus A sample from the summit of Mount Gower taken in November, 1913, during showery weather contained water to the extent of 68 per cent of its weight In a sample from Transit Hill collected in fine weather the water-content was 32 per cent of the total weight

Climate.

Situated on the northern limits of the region of prevailing westerly winds and in a tract of ocean over 400 km to the eastward of Australia, Lord Howe Island enjoys a climate distinctly insular in character—that is, there is no great range in temperature, and the rainfall is ample, averaging 1,818 mm per annum But the frequent high winds probably account for a comparatively low relative humidity, as shown in the annexed tables The meteorological station is situated on the flat limestone ground between Transit Hill and the Northern Hills, and about 3 m. above sea-level. The observations on which my figures are based were taken by Mr G. M. Kirby, to whom I am indebted for his kindness in allowing me to inspect his record, but I am entirely responsible for the figures as they appear

here corrected and tabulated. I chose a period of one year, beginning in the winter (1st July), as it shows a complete growing season, and may thus be compared with a calendar-year period in the Northern Hemisphere.

Table 1 shows the weather month by month. Table 2 shows the length and character of each kind of weather, classed by wind-direction, and brings out some interesting points, the chief of which are noted below.

Atmospheric pressure varies regularly with the direction of the wind, being highest in south-east and east weather, and lowest in north-west and west weather. The highest reading recorded was 774·4 mm., on the 9th June, 1912; wind east: the lowest, 750·3 mm., on the 16th September, 1911; wind north-west.

Temperature, judged by both season and direction of wind, varies in a regular manner. The maximum temperature recorded was 30° C., on the 8th February, 1912; the minimum, 6·1° C., on the 30th August, 1911.

Rainfall is distributed fairly evenly throughout the year, though the average for the winter months is higher than that of the summer months. The average annual rainfall for twelve years is 1,818 mm., on 196 days. During the period selected for analysis, out of a total of 1,265 mm., 779 mm., or over 60 per cent., fell during northerly weather. This result, as well as others noted in this section, agrees closely with that recorded for Sunday Island (Oliver, *Trans. N.Z. Inst.*, vol. 42, 1910, p. 125). The two islands are situated in nearly the same latitude, and their climates are similar in most respects. In the Kermadecs, however, the rainfall and relative humidity are apparently higher than they are at Lord Howe Island, which differences may result from the greater distance of the Kermadecs from the Australian Continent.

Relative humidity varies in accordance with the direction of the wind. Northerly winds bring the most humid conditions, southerly winds the least. On only three days the air was recorded as saturated, while on twenty-one more the degree of relative humidity was above 90: the lowest record was 49 per cent., on the 31st January, 1912; direction of wind south-east.

TABLE 1.

	Barometer	Temperature C°.			Rainfall.		Relative Humidity.	Cloud.	Wind.
	Mm	Min.	Max	Mean.	Days	Mm	Per Cent.	0–10.	Direction.
1911.									
July ..	762	13·1	17·9	15·5	21	192	79	6·4	S.W., S.E.
August .	764	12·0	17·4	14·7	22	97	75	5·9	S.E.
September .	762	13·6	20·2	16·9	8	154	75	7·1	S.W.
October	764	14·4	21·5	17·9	11	132	66	5·7	S.W.
November ..	762	16·8	23·8	20·3	8	91	73	5·6	N.W., S.W.
December	757	19·2	26·1	22·6	6	17	73	6·4	N.W.
1912									
January .	760	18·8	25·5	22·2	10	83	65	6·2	S.E.
February	762	19 2	26 1	22·6	5	83	66	6·2	S.E.
March .	761	18·3	25·3	21·8	14	73	62	7·0	S.E.
April .	762	17·2	23·4	20·3	14	102	71	7·5	S.W.
May ..	764	14·1	20·5	17·3	20	113	71	6·4	S.E.
June ..	766	14·3	19·2	16·7	15	128	72	6·3	S.
Averages ..	762	15·9	22·2	19·1	154	1,265	71	6·4	

TABLE 2.

	Barometer	Temperature C°			Rainfall		Relative Humidity	Cloud	Wind
	Mm	Min	Max	Mean	Days	Mm	Per Cent	0–10	Days
South-east ..	764	15·3	21 9	18·6	23	44	67	6·0	71
East	765	16 2	22·6	19 4	12	75	70	6·6	28
North-east .	764	15·7	22 5	19·1	17	136	71	5·8	39
North.. ..	761	18·0	23 2	20 6	20	317	77	8·2	30
North-west ..	760	18·6	24·2	21·4	21	326	77	7 4	46
West	760	14·3	22·5	18·4	13	165	77	7 3	22
South-west ..	761	15·0	21·8	18·4	34	157	69	5·7	80
South	762	15·2	21·7	18·5	14	45	70	5 7	50

ANIMALS.

Before the advent of man on Lord Howe Island the only animals that had any effect on the plant formations were two species of burrowing-petrels (*Puffinus carneipes* and *Pterodroma melanopus*). In talus slopes near the sea these birds make their burrows each year, completely overturning the soil and replenishing it with a rich manure; but whether or not this process is essential to bringing forth the edaphic conditions which result in the tussock-sedge and herbaceous-plant formations there found is difficult to say.

The large herbivorous animals introduced by man have had an important effect on the forest formations. This is dealt with below under the heading "Introduced elements."

ANATOMICAL STRUCTURE.

An anatomical examination of the leaves of the leading forest-trees of physiognomic importance in Lord Howe Island shows that the main features of their structure are due to systematic affinity. But as the

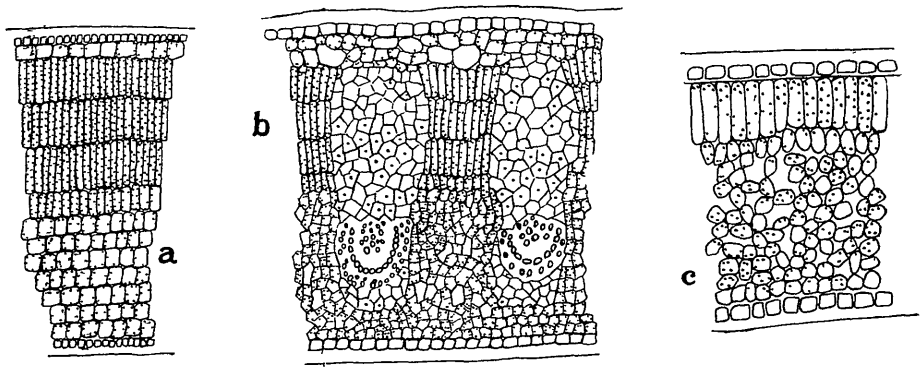


FIG. 1.—*a, Acicalyptus Fullagari; b, Metrosideros nervulosa; c, Hemicycha australasica.*

habitat determines the relative proportions in which the species are represented, the result is somewhat the same as though the main peculiarities in the structure were due to the direct adaptation of the species to the

habitat, and thus the effect of the habitat is shown by the minute structure of the leaf, though probably only the specific differences in the endemic species are due to the direct effect of the environment.

Briefly, the chief features presented by the leaves of the principal forest-trees are (1) the presence in most species of a cuticle, (2) the frequent occurrence of water-tissue consisting of two or three layers of large cells

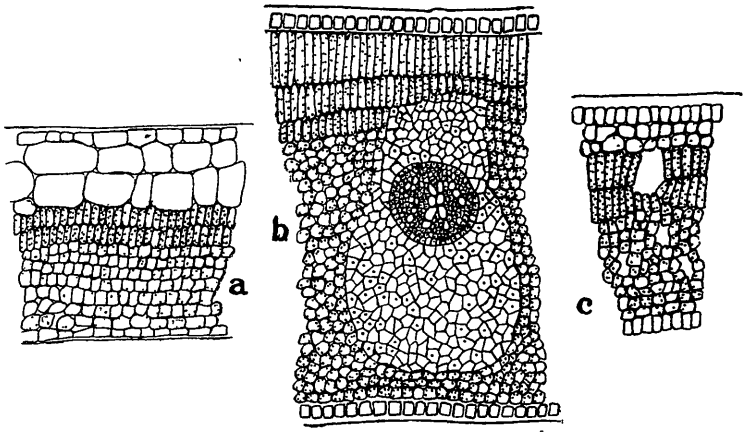


FIG. 2 —*a, Coprosma putida ; b, Baloghia lucida ; c, Cryptocarya Gregsoni.*

beneath the upper epidermis, and (3) the dorsiventral arrangement of the tissue of the mesophyll, the chief exceptions being *Drimys howeana* and *Randia stipulosa.*

So far as one can judge from the leaf-structure, most of the trees of Lord Howe Island have devices for conserving water. This is perhaps

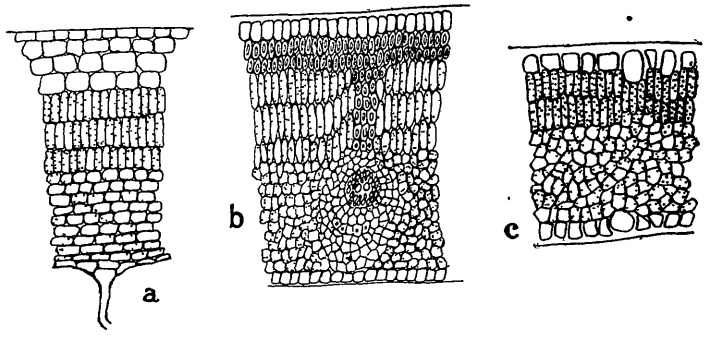


FIG. 3 —*a, Negria rhabdothamnoides ; b, Dracophyllum Fitzgeraldi ; c, Rapanea platystigma.*

necessary on account of the frequent winds, which must have a considerable desiccating effect on the foliage.

The cuticle is especially thick in *Ficus columnaris, Acicalyptus Fullagari,* and *Hemicyclia australasica,* three of the dominant trees in high forest. There is also a thick cuticle in *Metrosideros nervulosa* and *Baloghia lucida,* two shrubs widely separated systematically, but agreeing in this particular

as well as in the presence in the leaf-lamina of close parallel veins with large sheaths of sclerenchyma. In a few species the cuticle is little developed or wanting. This is the case with the two species with undifferentiated mesophyll, *Randia stipulosa* and *Drimys howeana.*

Hypoderm consisting of one to three rows of cells between the upper epidermis and the palisade tissue is developed in a great many of the dominant trees. There is a single row of small cells in *Acicalyptus Fullagari* and *Notelaea quadristaminea,* but in the coastal *Ochrosia elliptica* the cells are very large. A two-layered hypoderm is present in *Metrosideros nervulosa Coprosma putida, Coprosma prisca,* and *Cryptocarya Gregsoni.* In *Ficus columnaris* the lower two rows of a three-layered epidermis perhaps function as water-tissue. The hypoderm consists of three rows of cells in *Lagunaria Patersoni, Negria rhabdothamnoides* and *Olearia Mooneyi*

The mesophyll is not clearly differentiated into palisade and spongy parenchyma in *Randia stipulosa* and *Drimys howeana.* There is but a single row of palisade cells in *Hemicyclia australasica* and *Notelaea quadristaminea,* but in both cases the cells are large In all other plants examined the palisade tissue was well developed, being near the upper surface in those species having no hypoderm, and near the centre of the leaf in those in which a subepidermal aqueous tissue is present. Sclerenchymatous tissue is a feature of the leaves of *Dracophyllum Fitzgeraldi, Baloghia lucida,* and *Metrosideros nervulosa.* In all these the leaf-lamina is characterized by the presence of close parallel veins, which consist of vascular bundles ensheathed in sclerenchyma, extending almost across the mesophyll. In *Dracophyllum* there is as well a layer of sclerenchyma two cells deep beneath the upper epidermis.

Classification of Plant Formations.

Normal conditions of climate and soil on Lord Howe Island favour the growth of temperate rain forest about 20 m. in height Exposure to constant wind, as on the sea-coast and on the summits of the mountains, causes forest to pass gradually into scrub But in the former salt spray and in the latter high relative humidity determines the floristic and ecological character of the scrub. Changes in soil give rise to meadow formations. On damp ground a sedge meadow is found, on sandy sea-shore are grasses and herbaceous plants which tolerate salt spray, and in an exposed gap meadow and scrub intermix. Limited time permitted only a cursory examination of the principal plant formations on Lord Howe Island. These will be described under the headings just indicated, while their chief characters and determining factors are expressed in synoptical form below. This scheme, however, makes no provision for the vegetation on cliffs, which constitute such a conspicuous feature in the landscape of Lord Howe Island. But the vegetation there found does not constitute a single formation · it is rather a mixture of formations which have spread from the surrounding area according as exposure, holding-surface, or supply of moisture permits Thus, when moist soil has collected, shrubs appear; but where there is not sufficient room for shrubs there will be a collection of herbaceous plants and ferns Similarly, the course of a stream over the cliffs is marked by the abundance of the large tussocks *Gahnia* and *Cladium,* and dry rocky places support *Asplenium nidus,* and on the rock-faces lichens.

II. PLANT FORMATIONS OF LORD HOWE ISLAND.

Synopsis of Formations and Associations.

SERIES I.—WOODY-PLANT FORMATIONS (CLIMATIC).

1. *Forest.*

Habitat: From sea-level to 600 m. Climatic conditions normal; well-drained soil. Structure: Trees 8–20 m. tall, palms, pandani, and tree-ferns; lianes abundant; undergrowth of shrubs, ferns, and herbaceous plants. Associations: Lowland high forest—*Ficus columnaris, Howea Forsteriana;* upland high forest—*Acicalyptus Fullagari, Howea Belmoreana;* lowland low forest—*Hemicyclia australasica, Howea Forsteriana;* mountain low forest—*Notelaea quadristaminea, Hedyscepe canterburyana, Pandanus Forsteri.*

2. *Moss Forest.*

Habitat: Mountain summits above 600 m. Constant wind, with frequent rain and fog. Structure: Shrubs, palms, and tree-ferns, 3–4 m. tall; dense undergrowth of shrubs and ferns; epiphytes abundant, ferns, lichens, and mosses. Association: *Dracophyllum Fitzgeraldi, Clinostigma Mooreanum, Cyathea brevipinna.*

3. *Scrub.*

Habitat: Edge of forest along sea-coast, and on exposed ridges. Constant wind bearing along the coast salt spray. Structure: Shrubs 1–2 m. tall; few trailing and herbaceous plants. Associations: Coastal scrub—*Ochrosia elliptica, Lagunaria Patersoni, Myoporum insulare, Melileuca ericifolia, Cassinia tenuifolia;* hill scrub—*Dodonaea viscosa, Hemicyclia australasica, Rapanea platystigma.*

SERIES II.—HERBACEOUS-PLANT FORMATIONS (EDAPHIC).

4. *Low Succulent Plants (Halophytes).*

Habitat: Coastal rocks and sand within reach of salt spray. Structure: Herbaceous plants 15–20 cm. tall, with succulent leaves and stems, erect or trailing. Associations: On slopes facing sea—*Lobelia anceps, Mesembryanthemum aequilaterale;* on rocks near high-water mark—*Salicornia australis.*

5. *Sand-binders.*

Habitat: Sand-dunes along coast, also sandy exposed headland. Structure: Trailing sand-binding plants, with some herbaceous plants. Association: *Spinifex hirsutus, Ipomaea pes-caprae, Wedelia uniflora.*

6. *Rushes.*

Habitat: Exposed (usually sandy) places near coast. Frequent wind bearing salt spray. Structure: Close growth of erect rushes and grasses with trailing-plants Associations: Sandy flat—*Scirpus nodosus, Spinifex hirsutus, Poa caespitosa;* gap in coastal hills—*Scirpus nodosus, Poa caespitosa, Phragmites communis, Ipomaea palmata.*

7. *Tussock Sedges.*

Habitat: Talus slopes facing sea. Structure: Close growth of large tussocks. Association: *Mariscus haematodes.*

8. *Herbaceous Plants*

Habitat: Damp ground and dry places not occupied by forest. Structure: Herbaceous plants, grasses, and sedges, about ½ m. tall. Associations: On damp ground—*Kyllinga monocephala;* on dry ground—*Poa caespitosa.*

Series III.—Marine Formations.

9. *Mangrove.*

Habitat: Muddy shores between tide-marks. Structure: Shrubs (*Avicennia* with pneumatophores to roots). Association: *Avicennia officinalis, Aegiceras corniculatum.*

Description of Formations and Associations.

1 Forest

What may be described as a temperate evergreen rain forest, 15–20 m. high, occupies the whole of Lord Howe Island except where it is inhibited by adverse climatic conditions or by edaphic influences As already stated, along the coast steady wind carrying salt spray causes the forest gradually to pass into scrub, which dwindles to nothing along the actual shore. Similarly, on exposed ridges the trees are reduced to shrubs, and also on the mountain-tops, where a constantly humid atmosphere and high wind prevail, the trees are dwarfed. In all these situations the associations alter by the disappearance of certain characteristic forest-trees and the appearance of species which are able to tolerate the more severe weather These changes probably indicate differences in ecology of the plants, and the formations are therefore here classed separately but in the same series.

High Forest

In this the main tier of foliage is composed of trees and palms, and is about 15 m. above the ground; but this is displaced in most places by a discontinuous tier of vegetation composed of trees, isolated or in large or small groups, nearly 20 m. tall. The undergrowth is not usually dense, and consists of young trees and palms, and, on the ground, a low growth of ferns and seedling trees. Lianes contribute considerably to the forest, their numerous rope-like stems forming regular entanglements.

High forest occurs from sea-level to about 300 m. altitude, and is generally distributed except on the Northern Hills There are two associations, one in which *Ficus columnaris* is present and gives a characteristic appearance to the forest, and the other in which it is absent and *Acacalyptus Fullagari* is the dominant tree The former occurs on Transit Hill and on the flat ground round its base, and also on Little Slope, at the western base of Mount Gower. The latter is found in Erskine Valley and on the lower slopes of Mount Lidgbird.

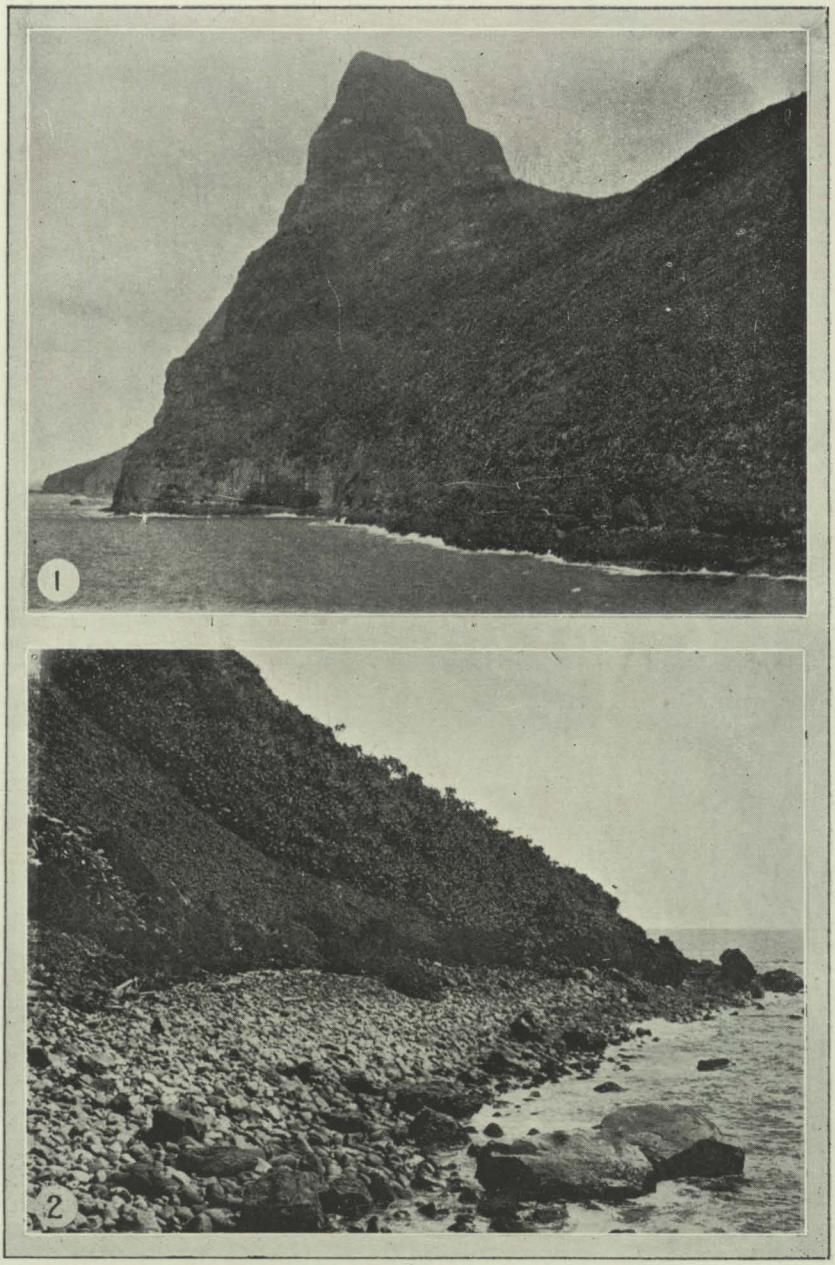
Ficus columnaris Association.

Transit Hill—On Transit Hill the forest, owing to its proximity to the settlement, is not overrun with goats or pigs. It has scarcely been touched by the inhabitants, and is therefore for the most part in its original state. Forest-trees of the upper tier, 20 m. tall, are so far apart that usually their heads do not meet. *Ficus columnaris* is abundant, especially on the lower levels. Higher up *Acacalyptus Fullagari* occurs as the dominant tree

Interior of lowland forest, Lord Howe Island

Face p. 102.]

Ficus columnaris, Lord Howe Island.



[*R. S. Bell, photo.*

FIG. 1.—Mount Gower, from east coast.
FIG. 2.—Western base of Mount Gower, showing *Mariscus haematodes* and palm (*Howea Forsteriana*) forest.

[*R. S. Bell, photo.*

FIG. 1.—Moss forest on summit of Mount Gower.
FIG. 2.—*Howea Belmoreana* in forest, Lord Howe Island.

Ficus forest viewed from above presents rather a striking appearance. Above the level of the mixed green foliage of the palms and trees the large rounded brown heads of the *Ficus* project. The brown colour is caused by the wind turning and exposing the underside of the leaves. In many places the forest appears to be composed solely of palms and *Ficus* trees.

What may be called the main forest tier is composed of palms, pandani, and trees about 15 m. tall. The plants are 2 m. to 3 m. apart, so that progress through the forest is easy except where the undergrowth or lianes are thick. On the lower levels, especially among the *Ficus*, the palm *Howea Forsteriana* is the dominant plant. Higher up it gives way to trees mixed with *Howea Belmoreana*. *Pandanus Forsteri* is frequent in the gullies. The forest comprises a good mixture of species of trees. *Hemicyclia australasica* and *Acronychia Baueri* are both common, and, though not the dimensions of *Ficus* or *Acicalyptus*, are fairly tall trees. Other large trees commonly found in this association are *Olea paniculata, Cryptocarya triplinervis, Guioa coriacea*, and *Lagunaria Patersoni*. The smaller trees are of slender habit, but contribute largely to the forest foliage. Those of frequent occurrence include *Drimys howeana, Randia stipulosa, Coprosma putida, Psychotria Carronis, Geniostoma petiolosum, Sophora tetraptera howinsula, Rapanea platystigma, Myoporum insulare, Dysoxylum pachyphyllum, Homolanthus populifolius, Elaeodendron curtipendulum*, and others.

Lianes are especially abundant in the forest, climbing to the tops of the highest trees, and their rope-like stems form a characteristic feature of the forest-interior. The largest of these remarkable plants are *Marsdenia rostrata, Flagellaria indica, Malaisa scandens*, and *Lyonsia reticulata*. Other common species are *Smilax australis, Jasminum simplicifolium, Clematis glycinoides*, and *Geitonoplesium cymosum*. *Arthropteris tenella* climbs up the bases of the trees.

There is an undergrowth of young palms and trees, and of the shrubs *Senecio insularis, Exocarpus homaloclada, Macropiper excelsum psittacorum, Baloghia lucida*, and *Alyxia ruscifolia*.

The ground is not thickly covered with vegetation, large spaces being bare except for dead leaves and sticks. There are low ferns, sedges, grasses, trailing herbs, and seedling trees. Of ferns, *Asplenium Milnei, Pteris comans*, and *Hypolepis tenuifolia* are the most frequent. *Carex gracilis* is abundant; while the grasses *Poa caespitosa* and *Oplismenus aemulus* are common. Trailing plants are *Commelyna cyanea, Polypodium diversifolium, Geitonoplesium cymosum*, and *Tylophora biglandulosa*.

Epiphytes are scarce, only the orchid *Dendrobium Moorei* being noted. The parasite *Korthalsella articulatum* occurs fairly frequently on *Cryptocarya triplinervis* and other trees.

Acicalyptus Fullagari Association.

Erskine Valley.—The forest in the Erskine Valley between 200 m. and 300 m. altitude was examined. The upper tier of vegetation is composed of trees over 15 m. tall, but they occur in clumps or singly, and their heads, therefore, do not touch over the whole forest. They are usually erect wide-branching trees. The dominant species is *Acicalyptus Fullagari*, but *Dracophyllum Fitzgeraldi* and *Guioa coriacea* are frequent. *Hemicyclia australasica* and *Notelaea quadristaminea* are large forest-trees common in Erskine Valley. The main tier of forest foliage is composed of trees, palms, tree-ferns, and pandani, about 10 m. tall. Here again, as on Transit Hill, there is a good mixture of species. Those of most frequent occurrence include

Drimys howeana, Coprosma putida, Psychotria Carronis, Gemostoma petiolosum, Dysoxylum pachyphyllum, Randia stipulosa, Homolanthus populifolius, and the palm *Howea Belmoreana.* In valleys *Negria rhabdothamnoides* and *Pandanus Forsteri* are conspicuous. The tree-ferns, which are not common, are *Cyathea Macarthuri* and *Alsophila robusta.*

Lianes are fairly common, and climb to the tops of the tallest trees. *Flagellaria indica* and *Malaisa scandens* are frequent and conspicuous.

The undergrowth is scanty, this being doubtless due to the presence of pigs, which destroy young trees and ferns. The ground is therefore mostly bare, while stones, more frequent as one ascends the mountain-sides, cover a considerable portion of the surface. Mixed with young palms and trees are the shrubs *Macropiper excelsum psittacorum, Senecio insularis,* and, less frequently, *Metrosideros nervulosa.* The ferns *Pteris comans* and *Blechnum capense* occur, while damp rocky banks are covered with filmy and other low ferns, those noticed being *Trichomanes Bauerianum, Polystichum Whiteleggei,* and *Dryopteris apicalis.*

Mount Lidgbird.—On the northern slopes of Mount Lidgbird the structure and floristic composition of the forest is somewhat similar to that in Erskine Valley. The upper tier of vegetation is composed of large trees, about 20 m. tall, whose heads do not touch. *Acicalyptus Fullagari, Acronychia Baueri,* and *Hemicyclia australasica* are the dominant species, while *Ficus columnaris* and *Lagunaria Patersoni* are occasionally met with. The main mass of the forest is a mixture of trees, palms, and pandani, 10 m. to 15 m. tall. The trees are *Drimys howeana, Lagunaria Patersoni, Coprosma putida Randia stipulosa, Homalanthus populifolius,* and others. *Howea Belmoreana* is the principal palm, being in fact in many places the dominant forest-plant, though patches of *Howea Forsteriana* occur as high as 300 m. above sea-level *Pandanus Forsteri* is most abundant in the valleys. *Cyathea Macarthuri* and *Alsophila robusta* occur sporadically. The lianes *Flagellaria indica* and *Malaisa scandens* are everywhere common.

There may be a fairly dense undergrowth of young palms (*Howea Belmoreana*), with which may be mixed a little *Senecio insularis* The forest-floor is mostly bare of vegetation, being overrun by pigs, and is covered chiefly with fallen palm and pandanus leaves Here and there, however, patches of *Pteris comans* or *Carex gracilis* occur *Platycerium bifurcatum* occurs on stones, trees, and palms, but is not common.

Lowland Low Forest.

This type of forest is due principally to the absence of such large trees as *Ficus columnaris* and *Acicalyptus Fullagari* It covers the Northern Hills and parts of the flat ground between these and the mountains The forest is of a nearly uniform height of 8 m to 10 m., and is composed of trees and palms, with scant undergrowth Lianes are very common, making dense entanglements in places.

Northern Hills.—The forest which covers the southern slopes of these headlands is composed mainly of small trees and shrubs The palm *Howea Forsteriana* is abundant along the base, but occurs less frequently on the hillsides. The trees are not close together, but their heads touch, forming a fairly close covering. The species most commonly met with are *Hemicyclia australasica, Acronychia Baueri, Cryptocarya triplinervis, Notelaea quadristaminea, Lagunaria Patersoni,* and *Elaeodendron curtipendulum:* while less frequently are found *Myoporum insulare* and *Coprosma prisca.*

Lianes are very abundant, making dense entanglements in places. The larger species are *Flagellaria indica, Malaisa scandens,* and *Smilax australis;* while smaller trailing species are *Tecoma austro-caledonica, Jasminum simplicifolium,* and *Ipomaea palmata.* There is an undergrowth of shrubs, but it is not anywhere dense. The chief species are *Bologhia lucida, Pisonia Brunoniana,* and *Alyxia ruscifolia,* with a few plants of *Cassinia tenuifolia.* The forest-floor is usually bare of vegetation; where, however, more light penetrates, either because of breaks in the foliage or on the outskirts of the forest, there will be an undergrowth, about ½ m. tall, of ferns, sedges, and herbaceous plants. The species commonly seen are *Asplenium Milnei, Adiantum aethiopicum, Pellaea falcata, Carex gracilis, Oplismenus aemulus, Commelyna cyanea,* and *Hydrocotyle hirta.*

Epiphytes are rare. The grass-like orchid *Denrobium Moorei* was noticed, also a few plants of *Platycerium bifurcatum.* The parasite *Korthalsella articulatum* was also occasionally seen.

West Bay.—On the flat sandy ground behind the dunes in West Bay scrub begins along the exposed outer edge, but it rapidly increases in height and passes into low forest 6 m. to 10 m. tall, which itself eventually passes into high *Ficus* forest. The low forest is composed of small trees and palms. The trees comprise a number of species, the following being common: *Rapanea platystigma, Hemicyclia australasica, Cryptocarya triplinervis, Acronychia Baueri, Hymenanthera novae-zealandiae, Pisonia Brunoniana,* and *Celtis amblyphylla.* In many places palms of the species *Howea Forsteriana* are the dominant plants. Mixed with them are a few trees and specimens of *Howea Belmoreana.* The undergrowth is seldom dense, and is composed of young palms where these plants are dominant, and elsewhere of young trees, together with *Alyxia ruscifolia* and *Macropiper excelsum psittacorum.*

Lianes are numerous, including the species *Malaisa scandens, Flagellaria indica, Smilax australis,* and *Jasminum simplicifolium.*

Mountain Low Forest.

On the higher slopes of the mountains, above 300 m. altitude, high forest passes over into a low forest composed of trees, palms, and pandani of a uniform height of 8 m. to 10 m. This forest extends from the upper limit of high *Acicalyptus* forest until it merges into the moss forest on the summit of the mountains. Lianes are few or absent. Palms of the genus *Howea* are here absent, but their place is taken by *Hedyscepe canterburyana,* which is abundant. *Pandanus Forsteri,* in a smaller form than on the lowland, is also common, especially in the valleys at the lower edge of this region.

The trees forming this forest include *Notelaea quadristaminea, Coprosma putida, Geniostoma petiolosum, Dracophyllum Fitzgeraldi, Drimys howeana, Evodia polybotrya,* and others.

As one ascends the forest decreases in height and other species occur. Among these may be mentioned *Pittosporum erioloma, Metrosideros nervulosa, Olearia Ballii,* and *Alyxia squamulosa.*

An undergrowth of small shrubs and ferns occurs, but is not dense. *Macropiper excelsum psittacorum* and *Senecio insularis* are shrubs, while the ferns include *Pteris comans, Dryopteris apicalis,* and others. There also occur on damp rocky places *Luzula longiflora, Brachycome segmentosa,* and *Asplenium howeanum.*

Over large areas no soil is visible, the trees growing among the rocks.

Autecology of Forest-plants.

The trees are usually of irregular growth, with trunks in high forest 10 m. or so before branching into a large rounded head. Plank buttresses are frequent. *Ficus columnaris* and *Acicalyptus Fullagari* have trunks up to 1 m. or 1½ m. in diameter with large plank buttresses. In *Hemycyclia australasica* and *Acronychia Baueri* the bases of old trees show a tendency toward plank buttresses, small ones ½ m. or so up the stem being the rule, and the roots often run for some distance along the surface.

Adventitious roots are developed in *Metrosideros*, *Ficus*, and *Pandanus*. They are small in *Metrosideros nervulosa*, springing from the underside of some of the branches and hanging freely down. In *Ficus columnaris* they arise from the horizontal branches, and, growing downwards, take root on reaching the ground, eventually forming columnar supports similar to the main stem. This itself in most cases began in the same way as the *Ficus* usually begins life—as an epiphyte. As with some other species of the genus, *Ficus columnaris* habitually forms columnar roots, and, like the famous banyan, single specimens may cover a considerable area of ground.

Pandanus Forsteri throws out obliquely downwards from all sides of the stem cylindrical stilt-like roots which eventually replace the main stem. This, when once formed, does not increase in size, and thus it is smallest at the base and gradually thickens upwards. In old plants the lowest and therefore oldest and smallest portion of the main stem is usually withered and dead, the plant depending entirely on the stilt roots for support and nourishment.

Subepidermal aqueous tissue is developed in *Ficus columnaris* (really a three-layered epidermis), *Acicalyptus Fullagari*, *Lagunaria Patersoni*, *Coprosma putida*, *Notelaea quadristaminea*, *Negria rhabdothamnoides*, and *Metrosideros nervulosa*. The mesophyll is not differentiated into palisade and spongy parenchyma in *Randia stipulosa* and *Drimys howeana* There is a thick cuticle in *Ficus columnaris*, *Acicalyptus Fullagari*, *Hemicyclia australasica*, *Metrosideros nervulosa*, and *Baloghia lucida*. It is thinner in *Cryptocarya triplinervis*, *Notelaea quadristaminea*, *Coprosma putida*, *Lagunaria Patersoni*, *Rapanea platystigma*, and *Dracophyllum Fitzgeraldi*. There is a layer of sclerenchyma beneath the upper epidermis in *Dracophyllum Fitzgeraldi*.

2. Moss Forest

The summit of Mount Gower, which, as already mentioned, forms an undulating plateau, is covered with dense scrub or low-forest vegetation, which extends a little way down the steep sides of the mountain. The scrub varies in height, and slightly in composition, according to exposure. Where it is most sheltered, as in the ravines, its height is about 4 m. It is composed of a mixture of small trees or shrubs, palms, and tree-ferns There is an undergrowth of low ferns and sedges, while the floor is for the most part covered with mosses. Epiphytes cover almost every available space on the larger plants. Clouds frequently envelop the mountain-summit, and in consequence the vegetation is usually reeking with moisture One finds here, therefore, a luxuriance and wealth of plant-life unknown on the drier habitats at lower altitudes. I am informed by Mr R S. Bell that some moss forest occurs on the summit of Mount Lidgbird.

Standing on a tree on the highest point of Mount Gower one may get a bird's-eye view of the plateau. The upper surface of the scrub is compact

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[*R. S. Bell, photo.*

Fig. 1.—*Hedyscepe canterburyana*, Erskine Valley.
Fig. 2.—*Negria rhabdothamnoides*, summit of Mount Gower.
Fig. 3.—Moss forest on summit of Mount Gower, showing *Clinostigma Mooreanum* and *Blechnum attenuatum*.

Interior of lowland forest, showing *Pandanus Forsteri.*

but not even. Above the general level project palms, tree-ferns, and *Dracophyllum*. The colour is varied. The numerous round heads of *Dracophyllum Fitzgeraldi* are reddish-brown, the more numerous tree-ferns are light green, while various shades of darker green make up the rest of the surface. As for relative abundance, no one species is dominant. *Dracophyllum Fitzgeraldi* by its colour attracts the eye, as every plant is visible. It is scattered about all over the plateau, sometimes forming small clumps. The tree-ferns *Hemitelia Moorei*, *Cyathea brevipinna*, and *Cyathea Macarthuri* are everywhere most abundant. The palms *Clinostigma Mooreanum* and *Hedyscepe canterburyana*, though scarcely fewer in numbers than the tree-ferns, are less conspicuous from above. *Leptospermum flavescens*, a shrub or small tree, occurs in small patches throughout, and apparently best tolerates wind, as it is especially in evidence in exposed places. The other shrubs making up the bulk of the remainder of the foliage visible from above are *Drimys howeana*, *Metrosideros nervulosa*, *Olearia Mooneyi*, *Coprosma putida*, *Exocarpus homaloclada*, *Pittosporum eriloma*, and *Cryptocarya Gregsoni*. Other species of small trees and shrubs contributing to this formation are *Randia stipulosa*, *Negria rhabdothamnoides*, *Coprosma lanceolaris*, and *Alyxia squamulosa*.

The undergrowth is often extremely dense and almost impenetrable, especially on exposed places, where the scrub is lowest. The large tussocks of *Gahnia xanthocarpa* present formidable obstacles to the person who tries to cross the plateau. The sharp scabrid edges of the leaves cut one's clothes and skin at every movement. Other large tussocks occurring less commonly are *Cladium insulare* and *Moraea Robinsoniana*. Small shrubs noted were *Senecio insularis*, *Olearia Ballii*, and a few plants of *Macropiper excelsum psittacorum* and *Cassinia tenuifolia*. Of low ferns there is a great variety. The most abundant species are *Asplenium pteridoides*, *Blechnum capense*, *Diplazium melanochlamys*, *Blechnum Fullagari*, *Dryopteris apicalis*, and *Histiopteris incisa*.

Mixed with the ferns are commonly *Luzula longiflora*, *Uncinia filiformis debilior*, *Hydrocotyle hirta*, and *Plantago Hedleyi;* while in wet ground in the ravines *Elatostemma reticulatum grande* covers the ground, and in open places *Brachycome segmentosa* appears.

Sometimes there is little or no undergrowth, but the ground is almost everywhere covered with mosses.

Epiphytes form the most conspicuous feature of this moss-forest formation, and thereby contribute largely to the appearance of luxuriance and rankness of growth which impresses the explorer. Almost every available space, whether on standing or prostrate stems and branches of trees, tree-ferns, and palms, appears to be thickly covered with ferns, mosses, and lichens. Horizontal trunks of trees are especially rich in plant-life. On the upper side will be *Tmesipteris tannensis*, *Hymenophyllum multifidum*, *Hymenophyllum tunbridgense*, *Dendrobium gracilicaule howeanum*, *Polypodium diminutum*, and *Polypodium pulchellum;* on the underside will be *Hymenophyllum pumilum*. On erect stems epiphytes show a zonal arrangement. At the base the climbing fern *Blechnum attenuatum* or the moss *Spiridens Muelleri*, or both together, may completely hide the tree-trunk; above this will be the foliaceous lichen *Sticta Freycinetti* and the filmy fern *Hymenophyllum multifidum*. Higher up still the branches of trees or tops of palm-stems may be covered with foliaceous lichens and the beard-like moss *Barbella enervis*.

Autecology of Moss-forest Plants.

Metrosideros nervulosa gives out numerous small adventitious rootlets, but I saw none of any size, and only the lower ones reached the ground.

Aqueous hypoderm is present in *Cryptocarya Gregsoni, Negria rhabdothamnoides, Olearia Mooneyi, Metrosideros nervulosa*, and *Coprosma putida*. The mesophyll is not differentiated into palisade and spongy tissue in *Drimys howeana* and *Randia stipulosa*. In *Dracophyllum Fitzgeraldi* there is a layer of sclerenchyma beneath the upper epidermis.

3. Scrub.

Coastal Scrub.

Along the coast, not far above high-water mark, the forest everywhere passes over, sometimes fairly abruptly, into scrub characterized by its single tier of woody vegetation 1 m. to 3 m. in height, mixed perhaps with a few herbaceous or trailing plants. The scrub at the top of the lower sea-cliffs may be classed in the same formation.

At Ned's Beach, on the east coast, the scrub is very dense, and can be penetrated only with difficulty. It is composed of prostrate entangled shrubs, whose upper surfaces are shorn down by the wind to a certain general level. The most abundant species here are *Celtis amblyphylla, Ochrosia elliptica, Myoporum insulare, Lagunaria Patersoni*, and occasionally *Hemicyclia australasica*. In exposed places are *Coprosma prisca* and *Cassinia tenuifolia*, while the trailing plants *Spinifex inermis* and *Caesalpinia Bonducella* tend to bind together the already dense thicket.

There is little variation in this, either in structure or floristic composition, in other parts of the island. Among rocks in the most exposed places, where constant wind carrying salt spray determines the character of the vegetation, *Melaleuca ericifolia* is sure to be found. At the western base of Mount Gower and at the base of Transit Hill it is this plant, with *Corposma prisca*, which form the outer edge of the woody vegetation. In West Bay the front facing the sea, but separated from high-water mark by a stretch of sand, is composed of shrubs of low dense growth, with their upper surface presenting an even slope to the wind. The principal species here are *Ochrosia elliptica, Myoporum insulare, Rapanea platystigma*, and *Cryptocarya triplinervis;* also outlying plants of *Coprosma prisca*.

On cliffs where small holding-surface and exposure are inimical to the growth of trees detached shrubs constitute the woody vegetation. On the northern sea-cliffs the species are those of coastal scrub—namely, *Melaleuca ericifolia, Cassinia tenuifolia, Coprosma prisca*, and *Myoporum insulare*, together with *Tecoma austro-caledonica* and the tussock sedge *Mariscus haematodes*.

On overhanging cliffs at the base of Mount Gower, where the only water available is that which percolates through the rocks, *Melaleuca ericifolia* was the only shrub noticed; while on the floor of the cave, where the dripping water fell, there were low straggly shrubs of *Coprosma prisca* and *Myoporum insulare*.

In a gap between two hills in the north-west of Lord Howe Island, which is swept by westerly winds, an open-scrub association mixes with the herbaceous-plant formations. In the most exposed portions there occur large rounded bushes of *Melaleuca ericifolia*, 6 m. to 8 m. across and ½ m. to 1½ m. high, closely fitting the ground all round, and highest in the centre. Other shrubs scattered here and there in the meadow formation are *Cassinia tenuifolia, Myoporum insulare*, and *Coprosma prisca*.

FIG. 1.—Mount Lidgbird and Mount Gower, Lord Howe Island.

FIG. 2.—Western side of Lord Howe Island, showing palm (*Howea Forsteriana*) forest on sand-dunes.

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Autecology of Coastal-scrub Plants.—An aqueous hypoderm is present in *Coprosma prisca, Ochrosia elliptica,* and *Lagunaria Patersoni,* but not in *Celtis amblyphylla,* where the palisade tissue occupies half the mesophyll.

Hill Scrub.

On the top of sea-cliffs and on exposed ridges and cliffs on the mountains forest gives way to scrub identical in structure with coastal scrub, but containing quite another association of species.

On the Northern Hills the scrub on the ridges is 1 m. to 2 m. high, and composed of dense, close-growing shrubs. It usually forms an impenetrable mass of vegetation, with no undergrowth; but where the foliage is more lax or broken an undergrowth of low ferns and grasses appears. The following species of shrubs are usually present: *Cassinia tenuifolia, Baloghia lucida, Dodonaea viscosa, Rapanea platystigma, Pimelea congesta, Notelaea quadristaminea, Myoporum insulare, Lagunaria Patersoni, Hemicyclia australasica, Cryptocarya Gregsoni, Jasminum simplicifolium,* and *Alyxia ruscifolia.*

The undergrowth, where present, may contain *Adiantum aethiopicum, Poa caespitosa, Asplenium nidus,* and on light rocky places *Platycerium bifurcatum.*

Scrub similar in structure and floristic composition to that just described is found in exposed places at low elevations on the mountains.

4. LOW SUCCULENT PLANTS.

Lobelia-Mesembryanthemum Association.

In the gap between Mount Eliza and North Head the wind continually sweeps through, usually with great violence. Here there are no trees and only a few detached shrubs, but the area is occupied by formations of herbaceous plants. In the most exposed portion are low succulent plants, while leeward of these is a rush formation. On windy days the whole valley is drenched with salt spray. On the slope facing the sea there are a few detached rounded shrubs of *Melaleuca ericifolia.* Except for these the ground is entirely covered with a low even growth of succulent herbs 15 cm. to 20 cm. high. *Mesembryanthemum aequilaterale* and *Lobelia anceps,* together with some *Cynodon dactylon,* are fairly well mixed. On the crest of the ridge small plants of *Scirpus nodosus* occur, while *Melaleuca ericifolia* disappears.

Salicornia Association.

On coastal rocks just above high-water mark there occurs in West Bay several small patches of *Salicornia australis.*

5. SAND-BINDERS.

Ned's Beach.—Below the scrub is a formation of herbaceous plants covering the steep slope of a headland. The soil is chiefly loose limestone rock undermined by shearwaters (*Puffinus carneipes*), which burrow out heaps of looose sand. The soil is therefore very dry and not unlike a sand-dune. The dominant plants are a trailing sand-binding grass, *Spinifex hirsutus,* and a trailing herb, *Wedelia uniflora,* fairly evenly intermixed. With these are associated several herbaceous plants, all, however, of secondary importance. Fairly common are *Lepidium howei-insulae*

Atriplex cinerea, Sonchus oleraceus, Polycarpon tetraphyllum, Parietaria debilis, Senecio vulgaris, and the trailing plants *Vigna lutea, Lyonsia reticulata,* and *Ipomaea palmata.* Near the sea *Scirpus nodosus, Tetragonia strongylocarpa, Apium prostratum,* and *Mesembryanthemum aequilaterale* appear, while *Wedelea uniflora* is absent.

Sand-dunes, which are found chiefly in Blinkenthorp Bay, Ned's Beach, and West Bay, are occupied chiefly by *Spinifex hirsutus* and *Ipomaea pescaprae.*

6. Rush Formations.

West Bay.—Between the beach and the forest is a stretch of level sand about 50 m. wide, and extending almost the whole length of the beach. This is covered with a dense growth of rushes and grasses up to 1 m. tall. The dominant plant is *Scirpus nodosus,* but along the sea-edge a fair amount of *Spinifex hirsutus* is found. Mixed with the *Scirpus* and *Spinifex* are sundry other plants of lesser importance. A few shrubs of *Myoporum insulare, Ochrosia elliptica,* and *Coprosma prisca* occur, but scarcely grow higher than the *Scirpus. Poa caespitosa* is common, also *Lepidium howei-insulae.* Trailing plants are *Wedelia uniflora, Vincetoxicum carnosum,* and *Mucuna gigantea.*

North Hills.—In the gap between Mount Eliza and North Head the succulent-plant formation on the exposed side is replaced on the leeward side by a covering, 1 m. or more tall, of rushes and grasses, with a few shrubs intermixed. The whole valley is usually drenched with salt spray. *Scirpus nodosus* is the dominant plant. Each side up the hill-slope it mixes with *Cassinia* scrub, which then passes to forest. Among the *Scirpus* there grow *Poa caespitosa, Cynodon dactylon, Lobelia anceps,* and the trailing plant *Ipomaea palmata.*

Over extensive areas the tall grass *Phragmites communis* is mixed with *Scirpus nodosus* and the shrub *Cassinia tenuifolia.* The whole association is very dense, and up to 2 m. in height. Trailing over it are *Ipomaea palmata* and *Stephania Forsteri.* In the lowest portion of this formation near the forest large shrubs, 3 m. tall, of *Coprosma prisca* and *Myoporum insulare* are fairly common.

7. Tussock Sedges.

At the western base of Mount Gower is a talus slope, known as the Little Slope, and occupied chiefly by *Ficus* forest. At the northern end is a large patch of *Mariscus haematodes.* The large tussocks occupy the whole surface. Few other species are present, the most conspicuous being the trailing *Ipomaea palmata.* The ground is everywhere undermined by petrels (*Pterodroma melanopus*), which breed in burrows during the summer months.

On the steep sides of the gap in the Northern Hills, already referred to, there are large patches of *Mariscus haematodes.*

8. Herbaceous Plants.

Damp ground: A small area of the flat ground in West Bay is sufficiently damp as to be called locally a swamp This is occupied by a close growth, about ½ m. high, of *Kyllinga monocephala.* Here and there are a few plants of *Juncus pallidus* and *Mariscus haematodes.*

Dry ground: On exposed ridges on the Northern Hills, where not occupied by scrub, rocky ground supports a miscellaneous lot of herbaceous plants. Those noted in this situation were *Poa caespitosa, Dichelachne crinita, Polycarpon tetraphyllum, Oxalis corniculata, Cynodon dactylon, Gnaphalium luteo-album, Sonchus oleraceus, Scirpus nodosus, Sporobolus indicus,* and *Bidens pilosa.*

9. MANGROVE.

On a shingle beach between tide-marks at the north end of the lagoon there are a few detached plants of *Avicennia officinalis.* Farther south, near the mouth of Deep Creek, *Aegiceras corniculatum* occurs.

Geographic Relationships of the Forest Formations.

The forest which clothes the greater part of Lord Howe Island is a temperate rain forest. Except for the absence of gymnosperms it agrees closely in essential characteristics with the rain forests of New Zealand and Tasmania, and apparently with the forest along the northern rivers of New South Wales and the "vine scrub" of south Queensland. It is quite unlike the *Eucalyptus* forest of Australia and Tasmania.

The moss forest of Mount Gower is similar to that on Sunday Island and on high ground in the North Island of New Zealand, especially where clouds are frequent. The most accessible example occurs on Te Aroha Mountain, while an apparently similar association is described by Cockayne (*Report on Waipoua Kauri Forest,* p. 14, 1908) as occurring on the upper slopes of Toetoehatiko, south of Hokianga.

III. ORIGIN OF THE FLORA.

GEOLOGICAL HISTORY OF LORD HOWE ISLAND.

Between New Zealand and the islands of the tropical Pacific is an expanse of ocean broken on the surface only by the three island groups of Lord Howe, Norfolk, and the Kermadecs, but with a most irregular bed. Study of a map showing ocean-floor contour-lines reveals the presence of two submarine ridges extending from New Zealand in northerly directions. The Kermadec ridge extends as far northward as the Samoan Group. To the eastward of it is an unbroken expanse of ocean over 5,000 m. in depth. A broader submarine ridge trends from New Zealand towards New Caledonia and tropical Australia. Its western edge is comparatively high, a continuous raised ridge less than 1,800 m. stretching from the South Island of New Zealand to the latitude of New Caledonia. It is on the extreme western limit of this that Lord Howe Island is situated.

The eastern edge of the broad ridge presents a more uneven surface, being between the northern peninsula of New Zealand and New Caledonia raised in a line of detached portions coming within 1,800 m. of the surface. One of these raised portions reaches the surface at Norfolk Island. Between the Lord Howe Island ridge and Australia is a deep trough, over 4,000 m. in depth, stretching as far north as S. lat. 25°.

Assuming the comparative permanence of the main features of the ocean-floor, at least during Tertiary times, these ridges would indicate that at a former period of upheaval Lord Howe Island would be in closer touch with New Zealand and New Caledonia than it would with temperate Australia. The presence of this remarkable submarine ridge is the only

evidence of a dynamical nature that can be advanced to support the theory of a former land connection of New Zealand and New Caledonia with Lord Howe Island; but it has been many times pointed out that the relationships of the animals and plants of this island can best be explained by assuming such a connection.

As to the age of Lord Howe Island its geological characteristics yield little evidence, but the nature of the fauna and flora indubitably proves that the island has been above the surface of the ocean ever since there was a direct land connection between it and New Caledonia. Thus the Lord Howe Island volcano was in existence before the land bridge joining New Zealand and New Caledonia finally disappeared. Mr. Speight tells me that my specimens of rocks from Mount Gower are not likely to date before the commencement of the Tertiary era. But early Tertiary gives ample time for the subsidence of the ocean-floor to its present depth

The more recent geological history of Lord Howe Island throws little light on the present subject. Briefly it is as follows: A long period of quiescence following on the building-up of the Lord Howe Island volcano resulted in it being denuded by sea-action to the fragments represented by the two remarkable mountains Gower and Lidgbird, and the pinnacle of Balls Pyramid. A revival of thermal activity next resulted in the building-up of three small volcanic hills, which, except at the extreme north-west portion of the island, have not suffered much from the effects of marine denudation. In point of fact, certain conditions which I am unable to explain, but no doubt coincident with subsidence of the area, allowed the deposition of limestone beds in shallow water. The area has since risen, exposing these beds for perhaps 30 m. above sea-level, this being the last vertical movement of the land in this region of which there is evidence.

Land Connection with Lord Howe Island

The idea of a land connection to explain the origin of the fauna and flora of Lord Howe Island has been supported by practically all scientific writers who have dealt with the subject

Moore (*Trans. Roy. Soc. N.S.W.*, 1871, p. 29), after discussing the geographical relationships of the plants, concludes, "I am constrained to adopt . . . that this island, Norfolk Island, New Zealand, New Caledonia, and the islands of the Western Pacific formed at one time either a portion of this or another vast continent."

Wallace (*Island Life*, p 455, 1880), in discussing the New Zealand fauna, states that the Bampton Shoal, west of New Caledonia, and Lord Howe Island, farther south, probably formed the western limits of an extensive land in which were developed the great wingless birds and other isolated members of the New Zealand fauna.

Hedley (*Proc. Linn Soc N.S.W.*, vol. 7, p. 338, 1893) argues for "the essential unity of the *Placostylus* area as a zoological province, embracing the archipelagoes of Solomon, Fiji, New Hebrides, New Caledonia, Lord Howe, and New Zealand—a unity explicable only on the theory that they form portions of a shattered continent. . . . This Melanesian plateau was never connected with, nor populated from, Australia; probably its fauna was derived from Papua, via New Britain." Again (*Proc. Linn. Soc N.S.W.*, vol. 24, p. 397, 1899), in discussing the migration of Pacific faunas, he places Lord Howe Island in the continental area connecting New Zealand

with New Caledonia. A stream of migration is described as branching off in New Guinea and traversing the Solomons and the New Hebrides. It then turns to New Caledonia, sends an offshoot to Lord Howe Island, and ultimately reaches New Zealand.

Hemsley (*Ann. Bot.*, vol. x, p. 282, 1897) favours a land connection to explain the character of the flora of Lord Howe Island when considered in connection with that of New Zealand, Norfolk Island, and east Australia. He quotes Engler as having the same view, but Drude as thinking a land connection between New Zealand and Lord Howe Island improbable on account of the endemic character of the flora of the latter.

My own conclusions, derived from a study of the birds (*Trans. N.Z. Inst*, vol. 44, p. 216, 1912) and of the flora, are that a land connection is necessary to account for the remarkable set of animals and plants endemic in the island; but a considerable element due to a trans-oceanic immigration of Australian forms is present. The evidence on which these conclusions are based will now be considered.

Genera.

Of the 169 genera of vascular plants represented in Lord Howe Island four are endemic. *Colmeiroa* and *Hedyscepe* are allied to New Zealand forms, *Negria* to both New Zealand and New Caledonian genera, while *Howea* is related to Malayan and tropical Australian genera. If the five species belonging to these four genera be taken as modified descendants of species which arrived by a land bridge, then they would indicate a New Caledonia-New Zealand migration, with the land connection severed first at the southern end, thus accounting for a greater degree of peculiarity for the New Zealand related species.

Of the non-endemic genera ninety-five are widely distributed, occurring in New Zealand, Australia, and Polynesia; and forty-seven more range widely through tropical countries, but do not reach New Zealand. Their presence may largely be due to the accident of latitude, and stamps the flora as subtropical. The remaining genera have the following range: New Zealand, 1 (*Carmichaelia*); Australia, 5; Polynesia, 3; New Zealand and Australia, 11; New Zealand and Polynesia, 2; Africa, 1 (*Moraea*). Numerically, therefore, Australian genera (158) preponderate; Polynesia comes second with 147, and New Zealand has 109. The presence of a large proportion of widely distributed genera and species might have been expected in the flora of an isolated island, because species possessing facilities for wide dispersal would naturally form the bulk of immigrants after land connection had been severed.

Species.

There are seventy endemic species of vascular plants in Lord Howe Island, or 33 per cent. of the total number of species occurring there. If these be divided according to their affinities, which can only be done approximately, the following result is obtained: Related to species found in New Zealand only, 17; Australia only, 11; Polynesia only, 10; New Zealand and Australia, 3; New Zealand and Polynesia, 2; Australia and Polynesia, 11, widely distributed, 16. Stated in this way the relationships of the endemic species are about evenly balanced between the three regions named. As supporting evidence of a former land connection it may be pointed out that, compared with the Australian forms, the Polynesian and New Zealand elements in the endemic plants are far higher than they are in the non-endemic species.

The non-endemic species are mainly widely distributed forms with a large proportion of Australian types. The distribution of these species is as follows: New Zealand only, 5; Australia only, 27; Polynesia only, 4; New Zealand and Australia, 28; New Zealand and Polynesia, 2; Australia and Polynesia, 36; all three regions, 37 (The more extended distribution of most of the species is here not taken into account.) I believe that with every species common to Lord Howe Island and one or more of the adjacent regions there is a suspicion of immigrants having from time to time been received across the intervening tract of ocean; consequently, if it be assumed that the greater number are capable of being transported across wide expanses of ocean, their presence must not be regarded as supporting a land connection.

Geographical.

The New Zealand element in the Lord Howe Island flora is important, as it includes two (*Colmeiroa* and *Hedyscepe*) of the four endemic genera, to which should perhaps be added a third (*Negria*) A highly characteristic New Zealand genus, *Carmichaelia*, with nineteen species in that country, has a twentieth in Lord Howe Island. Other genera represented in Lord Howe Island by endemic species related to New Zealand species include *Coprosma*, *Sideroxylon*, *Dracophyllum*, *Senecio*, *Pittosporum*, *Melicope*, and *Pimelea*; while amongst those species restricted to the two places are *Uncinia filiformis*, *Hymenanthera novae-zelandiae*, and *Gahnia xanthocarpa*.

The Polynesian element stamps the flora as distinct from that of New Zealand. The genera include important members of the flora, two of them. *Acicalyptus* and *Clinostigma*, being dominant in their respective habitats, while *Boehmeria* is not now common, but is suspected of having been destroyed in many places by introduced pigs. *Metrosideros nervulosa*, *Alyxia squamulosa*, *Alyxia Lindii*, and *Symplocus candelabrum* are endemic species related to Polynesian forms; while confined to Lord Howe Island and Polynesia are *Metrosideros villosa*, *Tecoma austro-caledonica*, *Zanthoxylum pinnata*, and *Blechnum attenuatum*

The Australian element, considered numerically, is considerably larger than either the New Zealand or Polynesian. But the proximity of the Australian Continent, its great extension in a north and south direction, and the direction of the prevailing winds in the south-west Pacific Ocean no doubt account for this preponderance The genera confined to Australia and Lord Howe Island are *Notelaea*, *Lyonsia*, *Melaleuca*, *Lagunaria*, and *Westringia*. It may be noted here that the most characteristic Australian genera are either entirely absent from Lord Howe Island or represented by one or two species only. The species occurring in Australia and New Zealand but not in Polynesia may have entered Lord Howe Island from either country, and show a latitudinal dispersal in the Temperate Zone independent of that in subtropical regions, indicated by the widely distributed tropical species not extending to New Zealand.

Moraea is known only in Africa and Lord Howe Island. It is a remarkable case of discontinuous distribution, and possibly the Lord Howe Island form is a relict species indicating a former wider distribution of the genus.

If we consider only the species which, occurring in Lord Howe Island, extend to one only of the regions named, and also those endemic forms related to species having a similarly restricted distribution, we find that for Polynesia and New Zealand the ratio of endemic to non-endemic species is 2 or 3 to 1, while for Australia it is less than $\frac{1}{2}$ to 1. Here again,

therefore, the case for an early migration along a New Caledonia - New Zealand land line is well supported, while for the New Zealand related species the degree of peculiarity is greatest.

Endemism.

Among the causes resulting in endemism two only need be considered here: Firstly, there must be effective barriers to the frequent entrance of further members of the same species in order that new variations may not be swamped; secondly, a sufficient time must elapse for the species to alter in accordance with the changed conditions of the new habitat, and thus degree of peculiarity is roughly an index to the period of isolation. It may perhaps, therefore, be laid down as a working hypothesis that those species longest in the land will comprise the largest proportion of endemic forms and the highest degree of peculiarity, while the presence of widely distributed species indicates that dispersal is probably still going on, and this in the case of an oceanic island leads one to conclude that no direct land connection is required to explain their occurrence.

The geographical position of Lord Howe Island indicates a considerable lapse of time since it was directly connected by land with any other place, and species that arrived by a land bridge should show a degree of endemism relatively greater than that exhibited by the whole flora. But it is just those which arrived by land that we are endeavouring to discover. The following table is obtained by combining together the figures already given, the figures in the first column including the non-endemic species plus the number shown in the second column.

	Total Number of Species.	Endemic Species included in Total.	Percentage of Endemic Forms.
Whole flora	209	70	33
Australia	168	41	24
New Zealand ..	109	38	35
Polynesia	116	39	34

These figures might be taken as supporting the hypothesis of a land connection between New Caledonia and New Zealand. The proportion of endemic forms in the Australian element is well below that of the other two regions, though the figures for these latter places probably include species which have actually arrived at Lord Howe Island from the Australian Continent. In any case, it may reasonably be inferred from the table that arrivals from Australia are more frequent than from Polynesia and New Zealand, and that therefore oversea migration probably accounts for the preponderance of the continental forms.

Ecological Groups.

Dividing the plants into what may be termed ecological groups, and considering these in connection with their geographical relationships and with regard to endemism, brings out some significant facts which will support the conclusions already obtained from other viewpoints. Of fifty-four arborescent and semi-arborescent forest-plants, thirty-eight, or 70 per cent., are endemic. Numerically, Australian forms preponderate, while the New Zealand element is weakest; but their proportion of endemic forms gives the opposite result. On the face of it this might be construed as indicating that the last land connection was with Australia. But judging from the contour of the ocean-floor this could not be, and the conclusion

one is forced to is that already stated—namely, the greater number of species of Australian affinities, including a large proportion of them identical in island and continent, proves that trans-oceanic migration has been the chief means of transport for this element. The fact of arborescent forest-plants showing a high degree of endemism follows from their lessened facility for dispersal compared with the other plants.

The coastal plants, twenty-four in number, include eight shrubby species. With the exception of *Coprosma prisca, Hymenanthera novae-zelandiae, Lepidium howei-insulae,* and *Cassinia tenuifolia,* which are mainly of New Zealand affinities, and of which three are endemic in Lord Howe Island, the whole of them are found in Australia, all but two extending to New Zealand and Polynesia as well. Here, probably, ocean currents have been the chief means of dispersal.

The seeds of orchids, grasses, and sedges are probably distributed mainly by wind. Of the twenty-three species found in Lord Howe Island, four are endemic and related to New Zealand and Australian forms; the remainder occur in New Zealand and Australia, one or both, some extending to Polynesia as well. The Pteridophyta, with their minute spores, probably always owe their wide dispersal to wind. In Lord Howe Island there are forty-nine species, the bulk of which are of wide range. The four tree-ferns and twelve others are endemic and related to widely distributed species. Only one non-endemic species, *Blechnum attenuatum,* is Polynesian but not found in Australia or New Zealand. Taking the last three groups together—that is, coastal plants, orchids and grasses, and Pteridophytes—the suggestion naturally presents itself that as distributing agencies wind and ocean currents in the region of Lord Howe Island act mainly from the Australian Continent eastward. Distribution in a north and south direction is not favoured by these means, and thus the strong New Zealand and Polynesian elements in the Lord Howe Island flora demand land connections. The high percentage of endemic forms in the same elements suggests that such connections were severed a long time ago, while the submarine ridge on which the island is situated indicates the direction in which the land bridges lay. The only evidence for direct land connection between Australia and Lord Howe Island is the fact that a large proportion of the Lord Howe Island species of plants extend to or are related to species in Australia. But a land connection with Australia since one with New Zealand or New Caledonia is disproved by the fact that a deep ocean trough separates the continent from the submarine ridge on which the island stands; while the coastal plants, grasses; and ferns indicate that a stream of migrants is ever crossing the ocean eastwards from Australia. It will thus be seen that speculations based on dynamic and biological facts may lead to opposite conclusions. I have taken the former as of greatest importance in indicating ancient land lines, and endeavoured to explain how the latter do not really conflict with them.

Tate, who considered Lord Howe and Norfolk Islands to form part of the New Zealand region, says, "One is tempted to suggest a modern immigration of Australian species which has dimmed the lustre of the original flora."

Summary: The plants of Lord Howe Island indicate former land connections with both New Zealand and New Caledonia. The greater degree of peculiarity in the New Zealand elements points to the earlier severance of that connection. No closer connection with temperate Australia need be postulated to explain the affinities of the flora of Lord Howe Island and

the continent. The last land connection being with New Caledonia, Lord Howe Island ought properly to be considered an outlier of that region. This conclusion conflicts with that I arrived at when considering the birds of Lord Howe Island (*Trans. N.Z. Inst.*, vol. 44, p. 214, 1912), but Iredale has subsequently shown that the flightless rail is more closely related to a New Caledonian form than to the New Zealand *Gallirallus*. In the light of this information the line of reasoning followed in my former article will produce precisely the result here arrived at from a study of the flora.

IV. LIST OF INDIGENOUS SPECIES.

1. LYCOPODIALES.

Lycopodium varium R. Br.

Lycopodium varium R. Br., *Prodr. Fl. Nov. Holl.* 165, 1810.

Recorded: Bentham, *Fl. Austr.* vii, 674, 1878; Hemsley, *Ann. Bot.* 10, 260, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 27, 351, 1892.

Habitat: On ground in moss forest near summit of Mount Gower.

Distribution: New Zealand, Tasmania, Australia, Pacific islands.

Tmesipteris tannensis (Spreng.) Bernh.

Lycopodium tannensis Spreng., *Schrad. Journ. Bot.* i, 267, 1799.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870; Hemsley, *Ann. Bot.* x, 260, 1896.

Habitat: Epiphyte on stems of trees in moss forest, summit Mount Gower.

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, New Caledonia, Pacific islands.

Psilotum triquetrum Sw.

Psilotum triquetrum Sw., *Syn. Fil.* 117, 1806.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* x, 118, 1877; Hemsley, *Ann. Bot.* x, 260, 19, 1896.

Habitat: Rocky places in forest.

Distribution: Norfolk Island, Kermadecs, New Zealand, Australia, New Caledonia, tropical and subtropical regions.

Selaginella uliginosa (Lab.) Spring.

Lycopodium selaginosum Lab., *Nov. Holl. Pl. Sp.* ii, 104, 1806.

Recorded: Bentham, *Fl. Austr.* vii, 678, 1878; Hemsley, *Ann. Bot.* x, 260, 1896.

Distribution: Tasmania, Australia

2. FILICALES.

Trichomanes javanicum Bl.

Trichomanes javanicum Bl., *Enum. Pl. Java*, 224, 1828.

Recorded: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 146, 1898.

Habitat: Forest in Deep Creek (Maiden).

Distribution: Tasmania, Australia, Polynesia, Malaya, tropical Asia.

Trichomanes Bauerianum Endl.

Trichomanes Bauerianum Endl., *Prodr. Fl. Norf.* 17, 1833.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*T. meifolium* var. *Bauerianum*); F. Muell., *Fragm. Phytogr. Austr.* vii, 121, 1870 (*T. polyanthus*); Bentham, *Fl. Austr.* vii, 703, 1878 (*T. apiifolium*); Hemsley, *Ann. Bot.* x, 262, 1896 (*T. apiifolium*).

Habitat: On wet banks in ravines in forest from near sea-level to summit of Mount Gower.

Distribution: Norfolk Island, Australia, New Caledonia, Polynesia, Malaya.

Hymenophyllum tunbridgense (L.) Sm.

Trichomanes tunbridgense L., *Sp. Plant.* ii, 1098, 1753.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870; Hemsley, *Ann. Bot.* x, 262, 1896.

Habitat: Epiphyte on stems of trees, ferns, and logs in moss forest, summit of Mount Gower.

Distribution: New Zealand, Tasmania, Australia, Europe, South Africa, tropical America, Chile.

Hymenophyllum pumilum C. Moore.

Hymenophyllum pumilum Moore in Hook. & Bak. *Syn. Fil.* ed. ii, 464, 1874.

Recorded: Baker, *Syn. Fil.* ed. ii, 464, 1874 (*H. Moorei*); Bentham, *Fl. Austr.* vii, 706, 1878; Hemsley, *Ann. Bot* x, 262, 1896.

Habitat: Epiphyte on underside of horizontal branches of trees, summit of Mount Gower.

Distribution: New South Wales.

Hymenophyllum multifidum (Forst. f.) Sw.

Trichomanes multifidum Forst. f., *Fl. Austr Prodr.* 85, 1786.

Recorded: Bentham, *Fl Austr.* vii, 707, 1878, Hemsley, *Ann. Bot.* x, 261, 1896.

Habitat: Epiphyte on stems of trees and tree-ferns in moss forest, summit of Mount Gower.

Distribution: Norfolk Island, New Zealand, Australia, New Guinea, Fiji, Samoa, Celebes.

Hymenophyllum minimum A. Rich.

Hymenophyllum minimum A. Rich., *Fl. Nouv. Zel.* 91, t. 14, f. 2, 1832.

Recorded: Bentham, *Fl. Austr.* vii, 706, 1878; Hemsley, *Ann. Bot.* x, 261, 1896.

Habitat: Summit of Mount Gower (Bentham) and Mount Lidgbird (Watts)

Distribution. New Zealand.

Hymenophyllum flabellatum Lab.

Hymenophyllum flabellatum Lab., *Nov. Holl. Pl. Sp.* ii, 101, t. 250, f. 1, 1806.

Recorded: Bentham, *Fl Austr.* vii, 705, 1878; Tate, *Macleay Mem. Vol.* 218, 1893 (*H. intens*), Hemsley, *Ann Bot* x, 261, 1896.

Distribution: Kermadecs, New Zealand, Tasmania, Australia, Samoa.

Cyathea Macarthuri (F. Muell.) Baker.

Hemitelia Macarthuri F. Muell., *Fragm. Phytogr. Austr.* viii, 176, 1874.

Recorded: Hook. & Baker, *Syn. Fil.* 26, 1868 (*C. dealbata*); F. Muell., *l.c.*; Baker, *Syn. Fil.* ed. ii, 453, 1874 (*C. Moorei*); Bentham, *Fl. Austr.* vii, 708, 1878; Hemsley, *Ann. Bot.* x, 261, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 144, 1898; Watts, *Proc. Linn. Soc. N.S.W.* 39, 261, 1914.

Habitat: In forest from near sea-level to summit of Mount Gower.

Distribution: Endemic.

Cyathea brevipinna Baker.

Cyathea brevipinna Baker in Benth. *Fl. Austr.* vii, 179, 1878.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* viii, 177, 1874 (*C. medullaris*); Bentham, *l.c.*; Hemsley, *Ann. Bot.* x, 260, 1896; Watts, *Proc. Linn. Soc. N.S.W.* 39, 261, 1914.

Habitat: Abundant in moss forest, summit of Mount Gower.

Distribution: Endemic. This species has been compared with *C. medullaris* of New Zealand.

Hemitelia Moorei Baker.

Hemitelia Moorei Baker, *Gard. Chron.* 252, 1872.

Recorded: Baker, *l.c.*; Bentham, *Fl. Austr.* vii, 709, 1878; Hemsley, *Ann. Bot.* x, 261, 1896; Watts, *Proc. Linn. Soc. N.S.W.* 39, 261, 1914.

Habitat: In wet forest, summit of Mount Gower; not common.

Distribution: Endemic. *Hemitelia* is a tropical genus, mostly American, with one species in New Zealand but none in Australia.

Alsophila robusta C. Moore.

Alsophila robusta C. Moore ex Maiden, *Proc. Linn. Soc. N.S.W.* 23, 144, 1898.

Recorded: Hook. & Baker, *Syn. Fil.* 27, 1868 (*Cyathea affinis*); Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*A. excelsa*); Bentham, *Fl. Austr.* vii, 711, 1878 (*A. australis* var. ? *nigrescens*); Hemsley, *Ann. Bot.* x, 261, 1896 (*A australis* var. *nigrescens*); Maiden, *l c.*; Watts, *Proc. Linn. Soc. N.S.W.* 39, 261, 1914.

Habitat: Forest from sea-level to summit of Mount Gower.

Distribution: Endemic. Laing describes a Norfolk Island plant as a variety, *norfolkiana*, of this species (*Trans. N.Z. Inst.* 47, 9, 1915). Bentham and Maiden compare *A. robusta* with *A. australis* of eastern Australia.

Dryopteris nephrodioides (Baker) Watts.

Deparia nephrodioides Baker, *Gard. Chron.* 253, 1872.

Recorded: Baker, *l.c.*; Bentham, *Fl. Austr.* vii, 714, 1878 (*Deparia*); Hooker, *Icon. Plant.* t. 1606, 1886 (*Deparia*); Hemsley, *Ann. Bot.* x, 261, 1896 (*Dicksonia*); Watts, *Proc. Linn. Soc. N.S.W.* 39, 259, 1914.

Distribution: Endemic. A very distinct species, with the sori terminating short lobes of the pinnules.

Dryopteris apicalis (Baker) O. Kuntze.

Nephrodium apicale Baker, *Syn. Fil.* ed. ii, 499, 1874.

Recorded: Baker, *l c.*; Bentham, *Fl. Austr* vii, 758, 1878 (*Aspidium*), Hemsley, *Ann. Bot* x, 265, 1896 (*Aspidium*); Watts, *Proc Linn. Soc N.S.W* 39, 259, 1914.

Habitat: Undergrowth in moss forest, summit of Mount Gower; and on damp bank in forest, Erskine Valley

Distribution: Endemic.

Dryopteris parasitica (L.) O. Kuntze.

Polypodium parasiticum L, *Sp. Plant.* ii, 1090, 1753.

Recorded: F. Muell, *Fragm Phytogr. Austr* ix, 196, 1875 (*Aspidium molle*), Hemsley, *Ann. Bot* x, 266, 1896 (*A. molle*), Oliver, *Trans N Z. Inst* 42, 159, 1910.

Habitat: Robin's Swamp (Watts).

Distribution: Norfolk Island, Kermadecs. New Zealand. Australia, New Caledonia. tropical and subtropical regions.

Polystichum Whiteleggei Watts.

Polystichum Whiteleggei Watts, *Proc. Linn. Soc N S W* 39, 258, 1914

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*Aspidium aculeatum*); Bentham, *Fl. Austr.* vii, 758, 1878 (*A capense*), Hemsley, *Ann Bot.* x, 265, 1896 (*A. capense*); Watts, *Proc Linn. Soc. N S W.* 39, 397. 1913 (*P Moorei*); Watts, *l c*

Habitat: Undergrowth in forest.

Distribution: Endemic Related to the widely distributed *Polystichum aculeatum.*

Polystichum Moorei (Christ) W. R. B. Oliver comb. nov.

Aspidium aculeatum var *Moorei* Christ ex Maiden, *Proc. Linn. Soc. N.S W.* 23, 146, 1898.

Recorded: Maiden, *l c.*, Watts, *Proc. Linn Soc. N S.W.* 37, 401, 1913 (*Polystichum Kingii*); Watts, *id.* 39, 258, 1914.

Besides the typical form, Mr. Watts describes a variety *tenerum* with a dense cluster of scales at the base of the stipes.

Habitat: In caves near sea-level, and in crevices of the overhanging cliffs, western base of Mount Gower.

Distribution: Endemic

Arthropteris tenella (Forst. f.) J. Sm.

Polypodium tenellum Forst f., *Fl. Austr. Prodr.* 81, 1786

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*Polypodium*); Hemsley, *Ann. Bot.* x, 267, 1896 (*Polypodium*)

Habitat: In forest, scrambling over rocks and tree-trunks.

Distribution: Norfolk Island, New Zealand, Australia, New Caledonia.

Nephrolepis cordifolia (L.) Pr.

Polypodium cordifolium L., *Sp. Plant.* ii, 1089, 1753.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*N. tuberosum*); Hemsley, *Ann. Bot.* x, 265, 1896 (*Aspidium*).

Habitat: Open rocky places on north ridge of Mount Gower.

Distribution: Norfolk Island, Kermadecs, New Zealand, Australia. New Caledonia, Japan, tropical regions

Diplazium melanochlamys (Hook.) Moore.

Asplenium melanochlamys Hook., *Sp Fil.* iii, 259, 1860.

Recorded: Hook., *l.c.*; Bentham, *Fl Austr.* vii, 751, 1878 (*Asplenium*); Hemsley, *Ann. Bot* x, 264. 1896 (*Asplenium*).

Habitat: Undergrowth in forest from sea-level to summit of Mount Gower

Distribution: Endemic

Asplenium adiantoides (L.) C. Chr.

Trichomanes adiantoides L., *Sp Plant.* ii, 1098, 1753.

Recorded: F. Muell, *Fragm. Phytogr. Austr.* ix, 78, 1875 (*A. falcatum*); Hemsley, *Ann. Bot.* x, 264, 1896 (*A. falcatum*).

Habitat: Northern Hills (Watts).

Distribution: Norfolk Island, Kermadecs (*A. caudatum*), New Zealand, Australia, New Caledonia, tropical Polynesia, Asia, Africa.

Asplenium Milnei Carr.

Asplenium Milnei Carr. ex Seem., *Flora Vitiensis*, 353, 1873.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*A. lucidum*); Carr ex Seem., *l.c*; F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*A. marinum*); Hemsley, *Ann. Bot.* x, 264, 1896 (*A. obtusatum*).

Habitat: Abundant as undergrowth in lowland forest and coastal scrub.

Distribution: Endemic. Allied to *A. remotum* Moore, of Polynesia, New Guinea, and Celebes.

Asplenium nidus L.

Asplenium nidus L., *Sp. Plant.* ii, 1079, 1753.

Recorded: Hook. & Baker, *Syn. Fil.* 190, 1868; Hemsley, *Ann. Bot.* x, 265, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 146, 1898 (*A. Robinsoni*).

Habitat: Rocky places on sea-cliffs and in forest near coast.

Distribution: Norfolk Island, Australia, New Caledonia, tropics from East Africa to Asia and Polynesia.

Asplenium pteridoides Baker.

Asplenium pteridoides Baker, *Jour. Bot.* xi, 17, 1873.

Recorded: Baker, *l.c*; Bentham, *Fl. Austr.* vii, 749, 1878; Hook., *Icon. Plant.* t 1649, 1886; Hemsley, *Ann. Bot.* x, 265, 1896.

Habitat: Undergrowth in moss forest, summit of Mount Gower.

Distribution: Endemic. A very distinct species, belonging to the same group as *A. bulbiferum* and *A. flaccidum.*

Asplenium howeanum (Watts) W. R. B. Oliver comb. nov.

Asplenum bulbiferum var. *howeanum* Watts, *Proc. Lnn. Soc. N.S.W.* 37, 399, 1913.

Recorded : Watts, *l.c.*

Habitat : Undergrowth in wet rocky places in forest, Erskine Valley to summit of Mount Gower.

Distribution : Endemic. Allied to the widely distributed *A. bulbiferum.*

Blechnum attenuatum (Sw.) Mett.

Onoclea attenuata Sw., *Schrad. Journ.* 1800, 73, 1801.

Recorded : Bentham, *Fl. Austr.* vii, 736, 1878 (*Lomaria*), Hemsley, *Ann. Bot.* x, 264, 1896 (*Lomaria*).

Habitat : Climbing up trunks of tree-ferns and trees in wet forest, summit of Mount Gower.

Distribution : Polynesia, Juan Fernandez, South Africa.

Blechnum capense (L.) Schlecht.

Osmunda capensis L., *Mant. Plant.* 306, 1771.

Recorded : Moore, *Lord Howe Id. Official Visit,* 26, 1870 (*Lomaria*), Hemsley, *Ann. Bot.* x, 264, 1896 (*Lomaria*).

Habitat : Undergrowth in forest, Erskine Valley to summit of Mount Gower

Distribution : Kermadecs, New Zealand, Tasmania, Australia, New Caledonia, Polynesia, Malaya, South Africa, tropical and southern America.

Blechnum Fullagari (F. Muell.) C. Chr.

Lomaria Fullagari F. Muell., *Fragm Phytogr. Austr.* viii, 157, 1874.

Recorded : F. Muell, *l c* ; Baker, *Syn. Fil.* ed. ii, 481, 1874 (*Lomaria auriculata*) ; Bentham, *Fl. Austr* vii, 737, 1878 (*Lomaria*) ; Hemsley, *Ann. Bot.* x, 264, 1896 (*Lomaria*).

Habitat : Undergrowth in moss forest, summit of Mount Gower

Distribution : Endemic Mueller compares this species with *Lomaria gibba* from New Caledonia and *L. emarginata* from New Hebrides.

Doodia aspera R. Br.

Doodia aspera R. Br., *Prodr Fl Nov Holl.* 151, 1818.

Recorded : Bentham, *Fl. Austr.* vii, 741, 1878 ; Hemsley, *Ann. Bot.* x, 264, 1896.

Distribution : Norfolk Island, eastern Australia.

Pellaea falcata (R. Br.) Fée.

Pteris falcata R. Br., *Prodr. Fl. Nov. Holl.* 154, 1810.

Recorded : F. Muell, *Fragm Phytogr. Austr.* ix, 78, 1875 (*Pteris*) ; Hemsley, *Ann Bot.* x, 263, 1896 (*Pteris*).

Habitat : Undergrowth in forest on Northern Hills.

Distribution : Kermadecs, New Zealand, Tasmania, Australia, New Caledonia, Malaya, India.

Notholaena distans R. Br.

Notholaena distans R. Br., *Prodr. Fl. Nov. Holl.* 146, 1810.

Recorded: Bentham, *Fl. Austr.* vii, 774, 1878.
Habitat: Exposed rocky ridge on Northern Hills.
Distribution: Norfolk Island, New Zealand, Australia, New Caledonia, Polynesia, Celebes

Hypolepis tenuifolia (Forst. f.) Bernh.

Lonchitis tenuifolia Forst. f., *Fl. Austr. Prodr.* 80, 1786.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875; Hemsley, *Ann. Bot.* x, 263, 1896.
Habitat: Undergrowth in forest.
Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, New Caledonia, Polynesia, Malaya, China.

Adiantum aethiopicum L.

Adiantum aethiopicum L., *Syst. Nat.* ed. x, ii, 1329, 1759.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 79, 1875; Hemsley, *Ann. Bot* x, 262, 1896.
Habitat: Undergrowth in low forest and scrub on Northern Hills.
Distribution: New Zealand, Tasmania, Australia, tropical Africa.

Adiantum hispidulum Sw.

Adiantum hispidulum Sw., *Schrad. Journ.* 1800, 82, 1801.

Recorded: Moore, *Trans. Roy. Soc. N.S.W.* 1871, 30, 1872; Hemsley, *Ann. Bot.* x, 262, 1896.
Habitat: Undergrowth in forest, Northern Hills and north ridge of Mount Gower.
Distribution: Norfolk Island, Kermadecs, New Zealand, Australia, New Caledonia, Polynesia, Malaya, India, Africa.

Pteris comans Forst. f.

Pteris comans Forst. f., *Fl. Austr. Prodr.* 79, 1786.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875; Hemsley, *Ann. Bot.* x, 263, 1896.
Habitat: Undergrowth in forest.
Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Polynesia, Juan Fernandez.

Pteris tremula R. Br.

Pteris tremula R. Br., *Prodr. Fl. Nov. Holl.* 154, 1810.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*P. arguta*); Bentham, *Fl. Austr.* vii, 731, 1878; Hemsley, *Ann. Bot.* x, 263, 1896.
Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Fiji

Histiopteris incisa (Thbg.) J. Sm.

Pteris incisa Thbg., *Prodr. Fl. Jap.* 171, 1800.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*Pteris*); Hemsley, *Ann. Bot.* x, 263, 1896 (*Pteris*).

Habitat : Undergrowth in moss forest, summit of Mount Gower.

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, New Caledonia, tropical and southern extra-tropical regions.

Pteridium aquilinum (L.) Kuhn var. **esculentum** (Forst. f.) Hook. f.

Pteris aquilina L, *Sp. Plant.* ii, 1075, 1753; *P. esculenta* Forst. f., *Pl. Escul.* 79, 1786.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*Pteris aquilina*); Hemsley, *Ann. Bot.* x, 263, 1896 (*Pteris*).

Habitat : North Head (Watts).

Distribution : Of subspecies—Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Southern Hemisphere ; of species—cosmopolitan.

Polypodium diminutum Baker.

Polypodium diminutum Baker, *Syn. Fil.* ed. ii, 507, 1874.

Recorded · Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*P. australe*); Baker, *l.c.*; Hemsley, *Ann Bot.* x, 266, 1896 (*P. australe*); Watts, *Proc. Roy. Soc. N S.W.* 49, 388, 1916 (*P. howeanum*).

Habitat : Epiphyte on stems and branches of trees in moss forest, summit of Mount Gower.

Distribution : Endemic. Allied to the widely distributed *P Billardieri.*

Polypodium pulchellum Watts.

Polypodium (Grammitis) pulchellum Watts, *Proc. Roy. Soc. N.S.W.* 49, 386, 1916.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* vii, 104, 1870 (*P. Hookeri*), Hemsley, *Ann. Bot.* x, 266, 1896 (*P Hookeri*); Watts, *l.c*

Habitat : Epiphyte on stems of trees in moss forest, summit of Mount Gower.

Distribution : Endemic Related to the Australian and Polynesian *P. Hookeri.*

Polypodium diversifolium Willd.

Polypodium diversifolium Willd , *Sp Plant.* v, 166, 1810.

Recorded : Moore, *Lord Howe Id Official Visit*, 26, 1870 (*P scandens*), F. Muell , *Fragm Phytogr Austr.* ix, 78, 1875 (*P. Billardieri*); Benthan, *Fl. Austr.* vii, 769, 1878 (*P. pustulatum*), Hemsley, *Ann. Bot.* x, 267, 1896 (*P. pustulatum*).

Habitat : Undergrowth in lowland forest.

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania. Australia, New Caledonia.

Cyclophorus confluens (R. Br.) C. Chr.

Polypodium confluens R. Br., *Prodr. Fl. Nov. Holl.* 146, 1810.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*Polypodium*); Bentham, *Fl. Austr.* vii, 767, 1878 (*P. confluens*); Hemsley, *Ann. Bot.* x, 266, 1896 (*P. confluens*).

Habitat: Northern Hills (Watts).

Distribution: Norfolk Island, Australia, New Caledonia.

Platycerium bifurcatum (Cav.) C. Chr.

Acrostichum bifurcatum Cav., *Anal. Hist. Nat.* i, 105, 1799.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*P. alcicorne*); Hemsley, *Ann. Bot.* x, 267, 1896 (*P. alcicorne*).

Habitat: On rocks and trees in forest from sea-level to 200 m. alt.

Distribution: Australia, New Caledonia.

Leptopteris Moorei (Baker) Christ.

Todea Moorei Baker, *Journ. Bot.* xi, 16, 1873.

Recorded: Baker, *l.c.*; Bentham, *Fl. Austr.* vii, 700, 1878 (*Todea*); Hooker, *Icon. Plant.* t. 1697, 1887 (*Todea*); Hemsley, *Ann. Bot.* x, 267, 1896 (*Todea*).

Habitat: Summit of Mount Gower (Watts).

Distribution: Endemic. Allied to *L. hymenophylloides* of New Zealand.

Marattia fraxinea Sm. var. howeana W. R. B. Oliver n. var.

Marattia fraxinea Sm., *Pl. Ic.* ined. 2, t. 48, 1790.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*M. salicina*); Bentham, *Fl. Austr.* vii, 695, 1878; Hemsley, *Ann. Bot.* x, 267, 1896; Watts, *Proc. Linn. Soc. N.S.W.* 37, 396, 1913 (*M. fraxinea* var. *salicina*).

Pinnae oblongae, 30 cm. long., 12 cm. lat. Pinnulae oblongae, obtusae, ad basim oblique cunatae, 70–90 mm. long., 18–20 mm. lat. Sori in venis circa 2 mm. a margine distantes; sporangia 10–16 in omni synangio.

Fronds large, 3–4 m. long, deltoid, 2–3-pinnate. Pinnae oblong, 30 cm. long, 12 cm. broad. Pinnules shortly stalked, oblong, obtuse, obliquely cuneate at the base, margins crenulate, 70–90 mm. long, 18–20 mm. wide. Veins simple or once forked. Sori oblong, 2–3 mm. long, on the veins about 2 mm. from the margin; sporangia 10–16 in each synangium.

Distinguished by the short obtuse pinnules with sori distant from the margin But for the variation exhibited by *M. fraxinea* I would not have hesitated to set up the Lord Howe Island form as a distinct species.

Habitat: Side of stream in ravine, Deep Creek, in forest; and young plants seen in forest in Erskine Valley. Probably formerly plentiful in forest, but now nearly exterminated by pigs.

Distribution of *M. fraxinea:* Australia, New Caledonia, Polynesia, Malaya, Philippines, India, South Africa.

Ophioglossum vulgatum L. var. **Prantlii** (C. Chr.) W. R B. Oliver comb. nov.

Ophioglossum vulgatum L., *Sp. Plant.* ii, 1062, 1753, *O Prantlii* C. Chr., *Ind. Fil.* 471, 1896.

Recorded: Watts, *Proc. Linn. Soc. N.S.W.* 37, 396, 1913; Watts, *id.* 39, 266, 1914 (*O. vulgatum* var. *lanceolatum*)

Habitat: Track through Johnson's garden (Watts).

Distribution of species: Norfolk Island, Kermadecs, New Zealand, Australia; cosmopolitan.

3 ANGIOSPERMS.

Pandanus Forsteri Moore & Muell.

Padanus Forsteri Moore & Muell., *Fragm. Phytogr. Austr.* viii, 220, 1874.

Recorded: (Moore, *Lord Howe Id. Official Visit*, 26, 1870, nom nud), Moore & Muell., *l.c.*; Moore & Betche, *Handb. Flora N.S W* 521, 1893 (*P. Moorei* nom. nud. and *P Forsteri*), Bentham, *Fl Austr.* vii, 149, 1878, Hemsley, *Ann. Bot* x, 256, 1896; Maiden, *Proc Linn. Soc. N.S.W.* 23, 140, 1898.

Habitat: Common in forest in main tier of vegetation from sea-level to 400 m. alt.

Distribution: Endemic. Related to the widely distributed *P tectorius* Sol. of Polynesia, Australia, and south Asia

Halophila ovalis (R. Br.) Gaud.

Caulinia ovalis R. Br., *Prodr. Fl. Nov. Holl.* 339, 1810.

Recorded: Bentham, *Fl. Austr.* vii, 187, 1878; Tate, *Macleay Mem. Vol.* 220, 1893 (*H. ovata*); Hemsley, *Ann Bot* x, 256, 1896 (*H ovata*).

Distribution: Tasmania, Australia, shores of Indian and Pacific Oceans.

Paspalum distichum L.

Paspalum distichum L, *Amoen. Acad* v, 391.

Recorded: Maiden, *Proc Linn Soc N S.W* 23, 142, 1898, *id*, 39, 383, 1914.

Habitat: Ned's Beach, old settlement (Maiden).

Distribution: New Zealand, Australia, tropical and subtropical regions.

Oplismenus aemulus (R. Br.) Kunth.

Orthopogon aemulus R. Br., *Prodr. Fl. Nov. Holl.* 194, 1810.

Recorded: F. Muell, *Fragm Phytogr Austr* viii, 199, 1874 (*Panicum compositum*); Bentham, *Fl. Austr* vii, 492, 1878 (*Oplismenus setarius*); Hemsley, *Ann Bot.* x, 258, 1896 (*Opl. compositum*)

Habitat. Undergrowth in lowland forest.

Distribution: Norfolk Island, Kermadecs, New Zealand, Australia, all warm countries.

Spinifex hirsutus Lab.

Spinifex hirsutus Lab, *Nov Holl Pl Sp.* ii, 81, 1806

Recorded: Moore, *Lord Howe Id Official Visit*, 26, 1870 (*S sericeus*), F. Muell., *Fragm Phytogr Austr.* ix, 78, 1875, Hemsley, *Ann Bot* x, 258, 1896.

Habitat: Sand-dunes and maritime meadow along sea-shore

Distribution: New Zealand, Tasmania, Australia, New Caledonia

Echinopogon ovatus (Forst. f.) Beauv.

Agrostis ovata Forst. f., *Fl. Austr. Prodr.* 8, 1786.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 196, 1875 (*Cinna*).

Habitat : Open spaces in forest, northern slopes Mount Lidgbird and summit Mount Gower.

Distribution : Norfolk Island, New Zealand, Tasmania, Australia.

Calamagrostis avenacea (Gmel.) W. R. B. Oliver comb. nov.

Agrostis avenacea Gmel., *Syst.* i, 171.

Recorded : Bentham., *Fl. Austr.* vii, 579, 1878 (*Deyeuxia Forsteri*); Hemsley, *Ann. Bot.* x, 259, 1896 (*D. Forsteri*).

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia.

Dichelachne crinita (L. f.) Hook. f.

Anthoxanthum crinitum L. f., *Suppl.* 90, 1781.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*Stipa micrantha* var. *crinita*) ; Hemsley *Ann. Bot.* x, 259, 1896.

Habitat : Open rocky ridge on Northern Hills.

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia.

Phragmites communis Trin.

Phragmites communis Trin., *Fund. Agrost.* 134, 1820.

Recorded : Bentham., *Fl. Austr.* vii, 636, 1878 ; Hemsley, *Ann. Bot.* x, 258, 1896.

Habitat : Tall rush meadow, gap in Northern Hills.

Distribution : Tasmania, Australia ; cosmopolitan in tropical and temperate regions.

Poa caespitosa Spreng.

Poa caespitosa Spreng., *Mant.* i, *Fl. Hal.* 33, 1807.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 ; Hemsley, *Ann. Bot* x, 259, 1896.

Habitat : Abundant on the lower levels as undergrowth in forest, on rocky exposed ridge on Northern Hills, in *Scirpus* meadow and sand-flat.

Distribution : New Zealand, Tasmania, Australia.

Agropyron scabrum (Lab.) Beauv.

Festuca scabra Lab., *Nov. Holl. Pl. Sp.* i, 22, 1806.

Recorded : F Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*Festuca Billardieri*), Hemsley, *Ann. Bot.* x, 259, 1896.

Distribution . Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia.

Mariscus haematodes (Endl.) Laing.

Cyperus haematodes Endl., *Prodr. Fl. Norf.* 22, 1833.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* viii, 269, 1874 (*Cyperus congestus*) ; Bentham, *Fl. Austr.* vii, 285, 1878 (*Cyperus*) ; Hemsley, *Ann. Bot.* x, 257, 1896 (*Cyperus*).

Habitat : The dominant plant in the tussock-sedge formation in damp places at the lower levels, Northern Hills and talus slope west base of Mount Gower.

Distribution : Norfolk Island. Related to *M ustulatus* of New Zealand.

Kyllinga monocephala Rottb.

Kyllinga monocephala Rottb., *Desc. et Ic.* 13, t. 4, 1773.

Habitat: Swamp in lowland.

Distribution: Norfolk Island, Australia, New Caledonia, Polynesia, tropical Asia and Africa.

Scirpus nodosus (R. Br.) Rottb.

Isolepis nodosus R. Br., *Prodr. Fl. Nov. Holl.* 221, 1810.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 6, 1875 (*Isolepis*); Hemsley, *Ann. Bot.* x, 257, 1896

Habitat: Sand-dunes and maritime meadow; also exposed rocky ridge on Northern Hills.

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, southern temperate and subtropical regions.

Cladium insulare Bentham.

Cladium insulare Bentham, *Fl. Austr.* vii, 403, 1878.

Recorded: Bentham, *l.c.*; Hemsley, *Ann. Bot.* x, 257, 1896.

Habitat: In damp open places from sea-level to the summit of Mount Gower. Abundant on the high cliffs of Mount Gower; especially conspicuous where water falls over the cliffs

Distribution: Endemic. Allied to *C Sinclairii* Hook. f. of New Zealand.

Gahnia xanthocarpa Hook. f.

Lampocarya xanthocarpa, Hook. f., *Fl Nov. Zel.* i, 278, 1853.

Recorded: F. Muell, *Fragm Phytogr Austr.* ix, 13, 1875 (*Cladium*); Hemsley, *Ann. Bot* x, 257, 1896; Bentham, *Fl Austr.* vii, 418. 1878

Habitat: Undergrowth in forest, usually in open places from near sea-level to summit of Mount Gower.

Distribution: New Zealand.

Uncina filiformis Boott. var. debilior (F. Muell.) W. R. B. Oliver comb nov.

Uncinia filiformis Boott. in Hook f., *Fl. Nov. Zel.* i, 286, 1853; *U. debilior* F. Muell., *Fragm. Phytogr. Austr.* viii, 151, 1874.

Recorded: F. Muell., *l.c*; Bentham, *Fl. Austr.* vii, 435, 1878 (*U. debilior*); Hemsley, *Ann. Bot.* x, 257, 1896 (*U. filiformis*)

The Lord Howe Island plant comes nearest to *U filiformis*, but is a large form with culms 45 cm. tall and glumes usually longer than the utricles.

Habitat: Undergrowth in wet forest, summit of Mount Gower.

Distribution of species: New Zealand.

Carex breviculmis R. Br. var. stipitata Kukenth

Carex breviculmis R. Br, *Prodr. Fl. Nov. Holl* 242, 1810, *C breviculmis* var *stipitata* Kükenth, *Pflanzenreich*, Heft 38, p. 469, 1909

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix. 78, 1875; Hemsley, *Ann. Bot.* x, 257, 1896, Kükenth., *l c.*

Habitat: Summit of Mount Lidgbird; high on Mount Gower (Bentham).

Distribution of species: New Zealand, Tasmania, Australia, China, Japan, Himalayas.

Carex gracilis R. Br.

Carex gracilis R. Br., *Prodr. Fl. Nov. Holl.* 242, 1810.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* viii, 250, 1874; Hemsley, *Ann. Bot.* x, 258, 1896.

Habitat: Undergrowth in forest at the lower levels; abundant.

Distribution: Eastern Australia.

Howea Forsteriana (F. Muell.) Becc.

Kentia Forsteriana F. Muell., *Fragm. Phytogr. Austr.* vii, 100, 1870.

Recorded: F. Muell., *l.c.*; Hemsley, *Ann. Bot.* x, 255, 1896; Maiden, *Proc. Linn Soc. N S.W.* 23, 138, 1898 (*Kentia*).

The two species of *Howea* are closely related. The more apparent differences are contrasted in the following statement: *H. Forsteriana* (thatch-palm)—Stem stout; petiole short; leaflets drooping; spikes short, 4 to 7 united at base; fruit elongated. *H. Belmoreana* (curly palm)—Stem slender; petiole long; leaflets erect; spikes long, single; fruit stout.

Habitat: In forest, chiefly below 150 m. alt., but on northern slopes of Mount Lidgbird ascends to 300 m., mixing with *Hedyscepe canterburyana*. It is often the dominant plant in lowland forest, its foliage-level being below that of *Ficus*.

It has been recorded (Etheridge, *Mem. Austr. Mus.* ii, 6, 1889) that "Wherever the soil is derived from the decomposition of the coral-sand rock the thatch-palm (*K. Forsteriana*) exclusively prevails, whilst the appearance of the curly palm [*K. Belmoreana*] at once indicates a volcanic soil." Maiden also (*Proc. Linn Soc. N.S.W.* 23, 138, 1898) states that *H. Belmoreana* will not grow on the coral-sandy ground; it is always found on basalt. I paid particular attention to the distribution of the two species of *Howea* in Lord Howe Island, and consider there is no foundation in fact for the above-quoted statements. *Howea Belmoreana* is common enough in places on the sandy flats, though not nearly so abundant there as *H. Forsteriana*. Conversely, *H Belmoreana* is the dominant palm on the mountain-slopes up to 300 m., though *H. Forsteriana* on the northern slopes of Mount Lidgbird ascends to that height.

Distribution: Endemic.

Hybrids of Howea.

At the north end of West Bay, Lord Howe Island (19th November, 1913), I examined two specimens of supposed hybrids between *Howea Forsteriana* and *H. Belmoreana*. In their essential characters they were both *H Forsteriana*, but had some of the habits of *H. Belmoreana*. Although one must be cautious in accepting as hybrids variants in nature, I think the present specimens are best considered as such

Specimen 1.—Characters of *H. Forsteriana:* Leaves with drooping pinnae, spikes in clusters of three or four, stem stout, fruit long. Characters of *H Belmoreana:* Spikes long, 1·6 m.

Specimen 2.—Characters of *H. Forsteriana:* Leaves with horizontal or slightly drooping pinnae, spikes in clusters of three or four. Characters of *H. Belmoreana:* Spikes long (much longer than those of *H. Forsteriana* in same locality), pinnae in central leaves with upward tendency, stem slender, fruit robust.

Howea Belmoreana (Moore & Muell.) Becc.

Kentia Belmoreana Moore & Muell, *Fragm. Phytogr. Austr.* vii, 99, 1870.

Recorded: Moore & Muell, *l c.*; Bentham, *Fl Austr.* vii, 137, 1878 (*Kentia*); Hemsley, *Ann. Bot* x, 255, 1896, Maiden, *Proc. Linn. Soc N.S W.* 23, 138, 1898 (*Kentia*)

Habitat: In forest from sea-level to 300 m alt, but not plentiful below 100 m. On the mountains it forms a considerable portion of the main tier of vegetation in the forest.

Distribution: Endemic

Clinostigma Mooreanum F. Muell.

Kentia Mooreana F. Muell., *Fragm. Phytogr. Austr.* vii, 101, 1870

Recorded. F. Muell., *l.c.*; Bentham, *Fl. Austr.* vii, 139, 1878; Hemsley, *Ann. Bot.* x, 255, 1896; Maiden, *Proc. Linn. Soc. N.S W* 23, 140, 1898.

Habitat: Plentiful in moss forest on summit of Mount Gower; also on summit of Mount Lidgbird.

Distribution: Endemic. Besides this species, *Clinostigma* contains three or four in New Caledonia and Samoa.

Hedyscepe canterburyana Moore & Muell.

Kentia canterburyana Moore & Muell, *Fragm Phytogr Austr.* vii, 101, 1870.

Recorded. Moore & Muell, *l.c*, Bentham, *Fl. Austr* vii, 138, 1878 (*Kentia*); Hemsley, *Ann Bot* x, 254, 1896, Maiden, *Proc. Linn. Soc. N.S.W.* 23, 138, 1898; Maiden, *id* 24, 382, pl. 32, 33, 1899

Habitat: In forest on the mountains from 300 m alt to summit of Mount Gower. The plants decrease in size as the altitude increases.

Distribution Endemic *Hedyscepe* is a monotypic genus related to *Rhopalostylis* of New Zealand and Norfolk Island

Flagellaria indica L.

Flagellaria indica L., *Sp Pl.* 333, 1753

Recorded. Macgillivray, *Kew Journ Bot.* vi, 353, 1854, Hemsley, *Ann. Bot.* x, 254, 1896

Habitat: Scandent in forest, ascending to the tops of the highest trees, from near sea-level to about 300 m. alt.

Distribution: Australia, Polynesia, Borneo, tropical Asia and Africa

Commelyna cyanea R. Br.

Commelyna cyanea R Br, *Prodr. Fl Nov. Holl* 269, 1810

Recorded: F Muell, *Fragm Phytogr Austr* viii, 59, 1873 (*C communis*), Bentham, *Fl Austr* vii, 84, 1878, Hemsley, *Ann Bot* x, 254, 1896

Habitat: Undergrowth in lowland forest, Transit Hill, Northern Hills.

Distribution: Norfolk Island, Australia, New Caledonia.

Juncus pallidus R. Br.

Juncus pallidus R. Br., *Prodr. Fl. Nov. Holl.* 258, 1810.

Recorded: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*J. maritimus*); Hemsley, *Ann. Bot.* x, 254, 1896 (*J. maritimus*); Maiden, *Proc. Linn. Soc. N.S.W.* 23, 136, 1898 (*Juncus* sp.). Maiden records that two of the islanders, Robins and King, say this species was introduced to Lord Howe Island.

Habitat: In swamp; a few plants only among *Kyllinga*.

Distribution: New Zealand, Tasmania, Australia.

Luzula longiflora Bentham.

Luzula longiflora Bentham, *Fl. Austr.* vii, 123, 1878.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*L. campestris*); Bentham, *l.c.*; Hemsley, *Ann. Bot.* x, 254, 1896.

Habitat: Undergrowth in wet forest, summit of Mount Gower, and down the slopes for a considerable distance.

Distribution: Endemic. According to Bentham, allied to *L. crinita*, confined to the Subantarctic Islands of New Zealand, and now considered to be a variety of the widely distributed *L. campestris*.

Dianella caerulea Sims.

Dianella caerulea Sims, *Bot. Mag.* 505.

Recorded: Bentham, *Fl. Austr.* vii, 16, 1878; Hemsley, *Ann. Bot.* x, 253, 1896.

Habitat: On open rocky ridge, north spur of Mount Gower, about 450 m. alt.

Distribution: Australia.

Geitonoplesium cymosum (R. Br.) Cunn.

Luzuriaga cymosa R. Br., *Prodr. Fl. Nov. Holl.* 282, 1810.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 196, 1875; Hemsley, *Ann. Bot* x, 253, 1896.

Habitat: Scandent in lowland forest; common.

Distribution: Norfolk Island, Australia, Borneo, New Caledonia, Polynesia

Smilax australis R. Br.

Smilax australis R. Br., *Prodr. Fl. Nov. Holl.* 293, 1810.

Recorded. Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*S. latifolia*); F Muell, *Fragm. Phytogr. Austr.* ix, 78, 1875; Hemsley, *Ann. Bot.* x, 253, 1896

Habitat Scandent in lowland forest

Distribution. Australia.

Moraea Robinsoniana (Moore & Muell.) Bentham.

Iris Robinsoniana Moore & Muell., *Fragm Phytogr. Austr.* vii, 153, 1871

Recorded: Moore & Muell., *l c*, Anon., *Gard Chron.* 393, 1872 (*Iris*); Bentham, *Fl Austr.* vi, 409, 1873; Hemsley, *Ann. Bot.* x, 253, 1896; Maiden, *Proc Linn. Soc N.S.W.* 23, 136, 1898

Habitat Occurs from sea-level to the summit of Mount Gower in coastal scrub on cliffs and in rocky places. Always in exposed places, it does not form part of the undergrowth of forest

Distribution: Endemic. The flowers nearly resemble those of *M. iridioides* (Bentham). With the exception of the Lord Howe Island species, the genus is confined to Africa.

Microtis unifolia (Forst. f.) Reichen.

Ophrys unifolia Forst f., *Fl. Austr. Prodr.* 59, 1786.

Recorded: F Muell., *Fragm Phytogr. Austr* ix, 78, 1875 (*M porrifolia*); Hemsley, *Ann Bot.* x, 252, 1896 (*M porrifolia*)

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia.

Dendrobium gracilicaule F. Muell var howeanum Maiden.

Denrobium gracilicaule var. *howeanum* Maiden, *Proc Linn. Soc. N.S W* 24, 382, 1899; *D gracilicaule* F. Muell., *Fragm. Phytogr Austr* i, 179, 1859.

Recorded: Moore, *Lord Howe Id Official Visit*, 26, 1870 (*D gracilicaule*); Maiden, *l c*; Hemsley, *Ann. Bot.* x, 252, 1896.

Habitat: Epiphyte on trees in moss forest, summit of Mount Gower.

Distribution: Endemic; of species, east Australia.

Dendrobium Moorei F. Muell.

Denrobium Moorei F. Muell, *Fragm Phytogr Austr.* vii, 29, 1869.

Recorded: F. Muell, *l c*; Bentham, *Fl. Austr* vi, 281, 1873, Hemsley, *Ann Bot* x, 252, 1896

Habitat: On trees in forest.

Distribution: Endemic Near *D macranthum* and *D. calcaratum* of Vanikoro, and *D. lancifolium* of Bouru (Mueller).

Bolbophyllum exiguum F. Muell.

Bolbophyllum exiguum F Muell, *Fragm Phytogr. Austr* ii, 72, 1860.

Recorded: F. Muell, *Fragm Phytogr Austr* ix, 78, 1875, Hemsley, *Ann Bot* x, 252, 1896

Distribution Australia.

Cleisostoma erectum Fitzg.

Cleisostoma erectum Fitzg, *Orchid Austr* i, pt 4

Recorded Fitzgerald, *l c*, Hemsley, *Ann Bot* x, 252, 1896

Habitat On rocks and trees (Fitzgerald)

Distribution Endemic Closely allied to *C tridentatum* of eastern Australia

Macropiper excelsum (Forst f) Miq var psittacorum (Endl) Laing.

Piper psittacorum Endl, *Prodr Fl Norf* 37, 1833, *Piper excelsum* Forst f, *Fl. Austr Prodr* 5, 1786

Recorded: Bentham, *Fl Austr* vi, 204, 1873 (*Piper excelsum*), Hemsley, *Ann Bot* x, 249, 1896 (*Piper excelsum*)

Habitat: Undergrowth in forest from sea-level to summit of Mount Gower.

Distribution: Norfolk Island, Kermadecs, South Pacific islands; of species, New Zealand.

Peperomia tetraphyllum (Forst. f.) W. R. B. Oliver comb. nov.

Piper tetraphyllum Forst. f., *Fl. Austr. Prodr.* 5, 1786.

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*P. reflexa*); Hemsley, *Ann. Bot.* x, 249, 1896 (*P. reflexa*); Maiden, *Proc. Linn. Soc. N.S.W* 39, 383, 1914 (*P. affinis*).

Habitat: Among rocks North ridge, Mount Gower, 300 m. alt., in open rocky places.

Distribution: Norfolk Island, New Zealand, Australia, tropical regions.

Peperomia Urvilleana Rich.

Peperomia Urvilleana Rich. *Fl. Nouv. Zel.* 356, 1832.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 76, 1875; Hemsley, *Ann Bot* x, 249, 1896.

Distribution. Norfolk Island, Kermadecs, New Zealand, New Caledonia (*P. Endlicheri*).

Celtis amblyphylla F. Muell.

Celtis amblyphylla F. Muell., *Fragm Phytogr. Austr.* ix, 76, 1875.

Recorded: Bentham, *Fl. Austr* vi, 156, 1873 (*C. paniculata*); F. Muell., *l c*, Hemsley, *Ann. Bot.* x, 251, 1896

Anatomy of leaf from coastal scrub, Ned's Beach: Upper epidermis of single row of cells deeper than, sometimes twice as deep as, wide. Outer walls thickened. Palisade tissue of three or four rows of long narrow cells occupying half the mesophyll. Stomata in the upper epidermis open into large chambers the width of four or five palisade cells. Spongy parenchyma, occupying lower half of mesophyll, of small irregular cells with air-spaces. Lower surface similar to upper, the stomata opening into large chambers in the spongy parenchyma.

Habitat. Forest near sea-coast, West Bay; coastal scrub at Ned's Beach.

Distribution: Endemic. Allied to *C. paniculata* Planch. of Norfolk Island and Australia

Malaisa scandens (Lour.) Planch.

Caturus scandens Lour, *Fl. Cochinch* 612, 1790.

Recorded · Bentham, *Fl. Austr.* vi, 180, 1873 (*M. tortuosa*); Hemsley, *Ann Bot* x, 251, 1896 (*M tortuosa*)

Habitat Scandent in forest, reaching to the tops of the highest trees. Abundant from sea-level to 300 m alt.

Distribution · Australia, West Polynesia, Malaya.

Ficus columnaris Moore & Muell.

Ficus columnaris Moore & Muell, *Proc Accl. Soc. Vic.* iii, 71, 1874.

Recorded · Moore, *Lord Howe Id. Official Visit*, 25, 1870; Bentham, *Fl Austr.* vi, 168, 1873 (*F. rubiginosa*); Moore & Muell., *l.c.*; Hemsley, *Ann. Bot* x, 251, 1896; Maiden, *Proc. Linn Soc. N.S.W.* 23, 134, 1898.

An immense tree, which from its branches, some 10 m. to 15 m. above the ground, sends down much-branched bunches of aerial roots. One or more of these on reaching the ground takes root and eventually grows into a trunk perhaps as large as the original one, and thus forms a further

outpost for the tree to spread from. The head of a large tree, therefore, forms an immense complicated system of branches bearing large leaves which are not usually very dense. Thus in its habit this species is similar to the famous banyan of India.

The bases of the trunks are irregular, as would naturally result from their origin, especially when formed from the union of several descending roots. The bark is reddish-brown, about 10 mm. thick, and when cut discharges copiously a thick white latex Plank buttresses are formed, usually high ones, beginning 1 m to 2 m. from the ground and extending out for several metres, twisting and branching the way. The roots or continuations of these buttresses are often more or less exposed above the ground for some distance.

Anatomy of leaf from forest, Transit Hill: Upper surface with cuticle. Upper epidermis of three layers of cells, the outer ones small and flat, then a layer of larger squarish cells, followed by an inner layer of large long cells, no chloroplasts A few of the inner large epidermal cells are greatly enlarged and contain cystoliths Palisade parenchyma of three or four rows of small narrow cells densely packed with chloroplasts Spongy parenchyma of very small cells with few chloroplasts Lower epidermis of one layer of small flat cells with cuticle.

Habitat. Forms the uppermost tier of vegetation, which is patchy, from sea-level to about 150 m alt., but odd specimens occur in the Erskine Valley up to 400 m alt. In the forest on the Northern Hills a young tree was noticed in the fork of a *Hemicyclia australasica* and sending a root to the ground

Looking over the island from the Northern Hills one may easily note the distribution of *Ficus*. It can always be distinguished by the brown colour of the undersides of the leaves, which show in the wind It occurs right across the island on the lower ground. It is not found quite near to the water's edge · the wind probably determines its limit in this direction. For a similar reason it does not occur high up on the hills

It has been recorded that *Ficus* trees on Lord Howe Island have been killed by scale insects I have concluded that the distribution of *Ficus* on the island is determined by wind On mentioning this to Mr Kirby he expressed the opinion that it was the wind that killed the *Ficus* trees when the settlers first cut down the surrounding vegetation. I have little doubt that this explanation is correct—that wind is the primary cause of the death of so many of the large *Ficus* trees Scale insects may possibly have assisted as the vitality of the trees was lowered

Distribution. Endemic

Elatostema reticulatum Weddell var **grande** Bentham.

Elatostema reticulatum Weddell, *Ann Sci Nat* (4), 1, 188, 1854.
E. reticulatum var *grande* Bentham, *Fl Austr* VI, 184, 1873

Recorded: Moore, *Lord Howe Id Official Visit*, 25, 1870 (*E nemorosa*), Bentham, *l c.*, Hemsley, *Ann Bot.* X, 251, 1896, Maiden, *Proc. Linn. Soc. N S W* 23, 134, 1898

Habitat. In wet places from sea-level to summit of Mount Gower; floor of cave under dripping water at base, and in watercourse on summit, of Mount Gower Common in places inaccessible to pigs.

Distribution Australia.

Boehmeria calophleba Moore & Muell.

Boehmeria calophleba Moore & Muell., *Fragm. Phytogr. Austr.* viii, 11, 1872.

Recorded: Moore & Muell., *l.c.*; Bentham, *Fl. Austr.* vi, 184, 1873; Hemsley, *Ann. Bot.* x, 252, 1896.

Habitat: In scrub or low forest from sea-level to about 300 m. alt.

Distribution: Endemic. Very closely allied to *B. australis* Endl. of Norfolk Island. The genus is Polynesian, not extending to either Australia or New Zealand.

Parietaria debilis Forst. f.

Parietaria debilis Forst. f., *Fl. Austr. Prodr.* 73, 1786.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann Bot.* x, 252, 1896

Habitat. Among sand-binders on exposed headlands, Ned's Beach.

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Polynesia, temperate and tropical regions.

Korthalsella articulata (Burmf. f.) Van Tiegh.

Viscum articulatum Burmf. f., *Fl. Ind.* 311, 1768.

Recorded: Moore, *Lord Howe Id. Official Visit*, 24, 1870 (*Viscum opuntioides*, syn. *V. articulatum*); Hemsley, *Ann. Bot.* x, 250, 1896 (*Viscum*); Maiden, *Proc. Linn. Soc. N.S W.* 23, 134, 1898 (*Viscum*).

Habitat: Parasitic on trees in lowland forest; abundant. The following hosts have been noticed by different observers: *Hemicyclia australasica, Elaeodendron curtipendulum, Coprosma putida, Cryptocarya triplinervis, Ochrosia elliptica.*

Distribution: Norfolk Island, Australia, Polynesia, tropical Asia.

Exocarpus homaloclada Moore & Muell.

Exocarpus homaloclada Moore & Muell., *Fragm. Phytogr. Austr.* viii, 9, 1872.

Recorded: Moore & Muell, *l c.*; Bentham, *Fl. Austr.* vi, 230, 1873; Hemsley, *Ann. Bot* x, 250, 1896.

Habitat: In forest, a shrub in the undergrowth, from near sea-level to summit of Mount Gower.

Distribution: Endemic. Allied to *E. striata* of Tasmania and south-east Australia

Rumex Browni Campd.

Rumex Browni Campd., *Monogr. Rum.* 81, 1819.

Recorded: Maiden, *Proc. Linn. Soc. N S.W.* 23, 133, 1898.

Habitat. Open rocky ridge, Northern Hills.

Distribution: Tasmania, Australia.

Muehlenbeckia axillaris (Hook. f.) Walp.

Polygonum axillare Hook. f. in *Hook. Lond. Journ. Bot.* vi, 278, 1847.

Recorded: Bentham, *Fl. Austr.* v, 275, 1870; Hemsley, *Ann. Bot.* x, 249, 1896.

Habitat: Scrambling over ground near seashore in West Bay.

Distribution: New Zealand, Tasmania, Australia.

Rhagodia baccata (Lab.) Moq.

Chenopodium baccatum Lab., *Pl. Nov. Holl.* i, 71, t 96, 1806

Recorded : Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*R Billardieri*) ; Hemsley, *Ann. Bot.* x, 248, 1896 (*R. Billardieri*).

Distribution : Tasmania, Australia.

Atriplex cinerea Poir.

Atriplex cinerea Poir , *Encycl. Suppl.* i, 471.

Recorded : Bentham, *Fl. Austr.* v, 171, 1870 , Hemsley, *Ann. Bot.* x, 248, 1896.

Habitat : Among sand-binders on exposed headlands at Ned's Beach.

Distribution : New Zealand, Tasmania, Australia

Salicornia australis Sol.

Salicornia australis Sol ex Forst., *Fl Austr Prodr.* 88, 1786.

Recorded : Maiden, *Proc Linn Soc. N.S.W.* 23, 133, 1898.

Habitat : Coastal rocks at north end of West Bay.

Distribution : New Zealand, Tasmania, Australia

Achyranthes aspera L.

Achyranthes aspera L., *Sp. Plant.* 204, 1753.

Recorded : Bentham, *Fl Austr.* v, 246, 1870 , Hemsley, *Ann Bot.* x, 249, 1896.

Habitat : In open rocky places on edge of forest

Distribution : Norfolk Island, Australia, New Caledonia, Polynesia, tropical and subtropical regions

Boerhaavia repens L.

Boerhaavia repens L , *Sp Plant* 3, 1753.

Recorded : F. Muell., *Fragm Phytogr Austr* ix, 77, 1875 (*B diffusa*) ; Hemsley, *Ann. Bot.* x, 248, 1896 (*B. diffusa*).

Distribution · Australia. New Caledonia, Polynesia, tropical and subtropical Asia and Africa

Pisonia Brunoniana Endl.

Pisonia Brunoniana Endl , *Prodr Fl Norf* 43, 1833.

Recorded · Moore. *Lord Howe Id. Official Visit*, 25, 1870 ; Hemsley, *Ann. Bot.* x, 248, 1896 (*P umbellifera*)

Habitat A small tree in lowland forests

Distribution : Norfolk Island, Kermadecs, New Zealand, Australia.

Sesuvium portulacastrum L.

Sesuvium portulacastrum L , *Syst Nat* ed x, 1058, 1759.

Recorded : F. Muell , *Fragm Phytogr Austr* ix, 77, 1875 ; Hemsley, *Ann. Bot.* x, 238, 1896.

Distribution . Australia, Polynesia, tropical and subtropical regions

Tetragonia expansa Murray.

Tetragonia expansa Murray, *Comm. Gotting.* vi, 13, 1783.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot.* x, 237, 1896.

Habitat: Maritime meadow, Ned's Beach, Admiralty Islets (Maiden).

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Japan, extra-tropical South America.

Tetragonia strongylocarpa (Endl.) W. R. B. Oliver comb. nov.

Tetragonia expansa Murr. var. *strongylocarpa* Endl., *Prodr. Fl. Norf.* 73, 1833

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 (*T. implexicoma*); Hemsley, *Ann. Bot.* x, 237, 1896 (*T. implexicoma*).

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia.

Mesembryanthemum aequilaterale Haw.

Mesembryanthemum aequilaterale Haw., *Misc. Nat.* 77, 1803.

Recorded: Moore, *Lord Howe Id. Official Visit*, 24, 1870; Hemsley, *Ann. Bot.* x, 237, 1896.

Habitat: Maritime meadow, Admiralty Islets (Maiden).

Distribution: Norfolk Island, New Zealand, Tasmania, Australia, California, Chile.

Mesembryanthemum australe Sol.

Mesembryanthemum australe Sol. in Ait. *Hort. Kew*, ed. i, ii, 187.

Recorded: F Muell., *Fragm Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot* x, 237, 1896

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia

Clematis glycinoides DC.

Clematis glycinoides DC., *Syst Veg.* i. 145, 1818.

Recorded: Bentham, *Fl. Austr.* i, 7, 1863, Hemsley, *Ann. Bot.* x, 230, 1896

Habitat: Lowland forest, trailing over other plants.

Distribution: Norfolk Island, Australia, Polynesia.

Stephania Forsteri (DC.) A. Gray.

Cocculus Forsteri DC., *Syst. Veg.* i, 517, 1818.

Recorded: Moore, *Lord Howe Id Official Visit*, 24, 1870 (*S. hernandifolia*), Hemsley, *Ann. Bot.* x, 231, 1896 (*S. discolor*).

Habitat: Trailing over shrubs in coastal scrub; also in rush formation in gap in Northern Hills.

Distribution: Australia, New Caledonia, New Guinea, Malaya, Polynesia.

Drimys howeana F. Muell.

Drimys howeana F. Muell., *Fragm. Phtyogr. Austr.*, vii, 17, 1869.

Recorded: F Muell., *l c.*; F Muell., *id.* ix, 76, 1875 (*D. insularis*); Hemsley, *Ann. Bot* x, 230, 1896.

Anatomy of leaf: Upper epidermis of single row of cells with rather thickened outer walls. Mesophyll of about ten rows of small cells; the

upper two rows contain many chloroplasts and represent palisade tissue; the rest of the cells have fewer chloroplasts and there are numerous air-spaces. Lower epidermis similar to upper

Habitat: Common in forest from sea-level to summit of Mount Gower.

Distribution: Endemic Closely allied to *D. semicarpifolia* F Muell., of Queensland.

Cryptocarya triplinervis R. Br.

Cryptocarya triplinervis R. Br., *Prodr. Fl. Nov. Holl* 402, 1810

Recorded. Bentham, *Fl Austr* v, 297, 1870; Hemsley, *Ann. Bot* x. 249, 1896; Maiden, *Proc Linn Soc N S W* 23, 133, 1898

Anatomy of leaf of specimen from forest, Transit Hill. Thin cuticle on upper surface Upper epidermis of single row of oblong or square cells. Palisade tissue, half the mesophyll, of two or three rows of long cells interrupted by large empty cells the width of about four palisade cells Spongy tissue with air-spaces Lower epidermis similar to upper, but with thinner cuticle

Habitat: Common in lowland forest, Transit and Northern Hills

Distribution Australia

Cryptocarya Gregsoni Maiden.

Cryptocarya Gregsoni Maiden, *Proc Linn Soc N S.W.* 27, 347, 1902.

Recorded. Maiden, *l c*, Maiden, *id* 23, 135, 1898 (black plum)

Anatomy of leaf of specimen from scrub on summit of Mount Gower Thin cuticle on upper surface Upper epidermis of oblong cells deeper than wide Hypoderm of two rows of clear rounded cells Palisade tissue two-layered, with a few large empty cells among it Spongy parenchyma of small cells with air-spaces. Lower epidermis similar to upper, but with thinner cuticle (See fig 2, *c*)

Habitat In forest on mountains from 300 m alt to summit of Mount Gower, in scrub on Northern Hills.

Distribution · Endemic

Lepidium howei-insulae Thell.

Lepidium howei-insulae Thell, *Gatt Lepid* 291, 1906

Recorded. Bentham, *Fl Austr* i, 86, 1863 (*L foliosum*), Hemsley, *Ann Bot* x, 231, 1896 (*L foliosum*); Maiden, *Proc Linn Soc N S W* 23, 123, 1898 (*L foliosum*), Thellung, *l c*; Maiden, *Proc Linn Soc N S W* 39, 381, 1914 (*L foliosum*)

Habitat: Maritime meadow, talus slopes, and sand-flats; Ball's Pyramid and Admiralty Islets (Maiden)

Distribution · Endemic. Nearly allied to *L oleraceum* of New Zealand

Colmeiroa carpodetoides F. Muell.

Colmeiroa carpodetoides F Muell, *Fragm Phytogr Austr.* vii, 149, 1871

Recorded · F Muell., *l c*; Hemsley, *Ann Bot* x, 236, 1896

Habitat: In forest, upper slopes of Mount Gower

Distribution: Endemic Allied to *Carpodetus* of New Zealand

Pittosporum erioloma Moore & Muell.

Pittosporum erioloma Moore & Muell., *Fragm. Phytogr. Austr.* vii, 139, 1871.

Recorded : Moore and Muell., *l.c.* ; Hemsley, *Ann. Bot.* x, 232, 1896.

Habitat : In forest from near sea-level to summit of Mount Gower. More common at the higher levels.

Distribution : Endemic. Mueller compares this species with *P. umbellatum* of New Zealand.

Caesalpinia Bonducella (L.) Fleming.

Guilandina Bonducella L., *Sp. Plant.* 545, 1753.

Recorded : Moore, *Lord Howe Id. Official Visit*, 24, 1870 (*Guilandina*) ; Hemsley, *Ann Bot.* x, 235, 1896 ; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 128, 1898.

Habitat : Coastal scrub.

Distribution : Norfolk Island, Australia, New Caledonia, tropical regions.

Sophora tetraptera J. Mill. var. howinsula W. R. B. Oliver n. var.

Sophora tetraptera J. Mill , *Icon. Plant.* t 1.

Recorded : F Muell., *Fragm. Phytogr. Austr.* vii, 26, 1869 (*S. tetraptera*) ; Moore, *Lord Howe Id Official Visit*, 24, 1870 (*Edwardsia chrysophylla*) ; Hemsley, *Ann Bot.* x, 235, 1896 (*S. tetraptera*).

Foliolae 8–9 jugae lineari-oblongae, 25–27 mm. longae, 8–10 mm. latae. Racemi 4–8-flori. Flores 35 mm. longi. Legumen inter semina profunde constrictum alis latis undulatis.

A small erect slender tree Leaflets 8–9 pairs, linear-oblong, 25–27 mm. long, 8–10 mm. broad. Racemes 4–8-flowered. Flowers golden-yellow, 35 mm. long ; standard scarcely shorter than the wings. Pod with 5–9 seeds, wings broad and wavy, each section containing a seed being orbicular in outline.

This variety differs from the New Zealand variety *grandiflora* in its broader leaflets, much smaller flowers, and broader wings to the pods.

Habitat : A small tree in forest, Transit Hill.

Distribution of species : New Zealand, South America.

Carmichaelia exsul F. Muell.

Carmichaelia exsul F. Muell , *Fragm Phytogr. Austr.* vii, 126, 1871.

Recorded : F. Muell., *l c.* ; Hemsley, *Ann. Bot.* x, 235, 1896 (*C. exul*).

Habitat : In forest and scrub on mountains 300 m. to 600 m. alt.

Distribution : Endemic. In addition to the present species the genus contains about nineteen others, all confined to New Zealand.

Mucuna gigantea DC.

Mucuna gigantea DC., *Prodr.* ii, 405.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 ; Hemsley, *Ann Bot.* x, 235, 1896

Habitat : Trailing over sand-dunes in West Bay.

Distribution : Australia, New Caledonia, Polynesia, Malaya, tropical Asia

Canavalia obtusifolia DC.

Canavalia obtusifolia DC., *Prodr.* II, 404.

Recorded : Moore, *Lord Howe Id Official Visit*, 24, 1870 , Hemsley, *Ann. Bot.* x, 235, 1896

Distribution : Norfolk Island, Australia, Polynesia, tropical regions

Vigna lutea (Sw.) Gray.

Dolichos luteus Sw., *Prodr Veg. Ind Occ.* 105.

Recorded : F. Muell , *Fragm Phytogr Austr.* IX, 77, 1875 , Hemsley, *Ann. Bot* x, 235, 1896 , Laing, *Trans. N Z Inst* 47, 27, 1915 (*V retusa*).

Habitat · Trailing among sand-binders on exposed headlands at Ned's Beach.

Distribution : Norfolk Island, Australia, New Caledonia, tropical regions.

Pelargonium australe Willd.

Pelargonium australe Wild., *Spec. Pl.* III, 675, 1800.

Recorded : F. Muell . *Fragm Phytogr Austr* IX. 77. 1875 , Hemsley, *Ann. Bot.* x, 233, 1896

Distribution . Norfolk Island, Tasmania, Australia

Oxalis corniculata L

Oxalis corniculata L , *Sp Plant.* 435, 1753

Recorded : F. Muell , *Fragm. Phytogr Austr* IX. 77, 1875 ; Hemsley *Ann. Bot* x, 233, 1896.

Habitat : Rocky ridge on top of cliffs, north coast

Distribution · Norfolk Island, Kermadecs, New Zealand, Tasmania Australia, temperate and tropical regions

Zanthoxylum pinnata (Forst).

Blackburnia pinnata Forst., *Char Gen* 6, 1776.

Recorded : Bentham, *Fl Austr* I, 363, 1863 (*Z Blackburnia*) , F. Muell , *Fragm Phytogr Austr.* IX, 77, 1875 (*X howeanum* , described VII, 141, 1871) ; Hemsley, *Ann. Bot.* x, 233, 1896 (*Z. Blackburnia*).

Habitat · Forest

Distribution : Norfolk Island, Vavau (Tonga Islands), New Caledonia (Laing).

Evodia polybotrya Moore & Muell.

Euodia polybotrya Moore & Muell., *Fragm Phytogr Austr* VII, 143, 1871

Recorded : Moore & Muell , *l c* . Hemsley, *Ann Bot* x, 233, 1896

Habitat · In forest from near sea-level to upper slopes of Mount Gower, about 600 m alt

Distribution : Endemic

Melicope contermina Moore & Muell

Melicope contermina Moore & Muell , *Fragm Phytogr Austr.* VII, 144, 1871.

Recorded · Moore & Muell , *l.c.* , Hemsley, *Ann Bot* x, 233, 1896.

Habitat : In forest, Erskine Valley.

Distribution : Endemic. Very near the New Zealand *M. ternata* Forst.

Acronychia Baueri Schott.

Acronychia Baueri Schott., *Fragm. Rut.* 5, t. 3.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot.* x, 233, 1896; Maiden, *Proc. Linn. Soc.* 23, 124, 1898.

Habitat: In lowland forests, forming part of main tier of vegetation.

Distribution: Australia.

Dysoxylum pachyphyllum Hemsley.

Dysoxylum pachyphyllum Hemsley, *Kew Bulletin*, 1907, 58.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 61, 1875 (*D. Fraserianum*), Hemsley, *Ann. Bot.* x, 234, 1896 (*D. Fraserianum*), Maiden, *Proc. Linn Soc. N.S.W.* 23, 124, 1898 (*D. Fraserianum*); Hemsley, *l.c.*; Hooker, *Icon. Plant.* t. 2827, 1907; Maiden, *Proc. Linn. Soc. N.S.W.* 39, 382, 1914.

Habitat: In forest, Erskine Valley to summit of Mount Gower.

Distribution: Endemic. Related to *D. Fraserianum* of eastern Australia.

Hemicyclia australasica Muell. Arg.

Hemicyclia australasica Muell. Arg. in DC., *Prodr.* xv, ii, 487.

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870; F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 (*H. sepiaria*); Hemsley, *Ann. Bot.* x, 250, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 134, 1898.

Anatomy of leaf of specimen from forest, Transit Hill: Upper epidermis of single row of thick-walled cells with thick cuticle. Palisade tissue a single row of cells about $1\frac{1}{2}$ times as long as the thickness of the epidermis, densely packed with chloroplasts. Spongy tissue of irregular cells with many air-spaces. Lower epidermis similar to upper, the cuticle equally as thick. (See fig. 1, *c.*)

Habitat: Common from sea-level to 400 m. alt. A shrub in coastal scrub and on ridge at top of sea-cliffs, Northern Hills; a large tree in forest.

Distribution: Australia.

Baloghia lucida Endl.

Baloghia lucida Endl., *Prodr. Fl. Norf.* 84, 1833.

Recorded: Moore, *Lord Howe Id Official Visit*, 25, 1870; Hemsley, *Ann Bot.* x, 251, 1896.

Anatomy of leaf of specimen from Northern Hills: Upper epidermis with thick cuticle, one layer of cells with thick walls. Palisade tissue of two or three rows, the first of long, the second and third of shorter, cells; chloroplasts dense. Spongy tissue occupies about two-thirds of the mesophyll; small cells with a few air-spaces. Lower epidermis similar to upper. Vascular bundles with large sheath of sclerenchymatous tissue, little wider than the bundle above it, but much wider below it. (See fig. 2, *b.*)

Habitat: A shrub in lowland forest, in coastal scrub, and scrub on ridge at top of cliffs, north coast

Distribution: Norfolk Island, Australia, New Caledonia.

Homolanthus populifolius Graham.

Homolanthus populifolius Graham in Jameson's *Edinb. New Philos. Journ. Sci.* 115, 1827

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870; F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 (*Carumbium*); Tate, *Macleay Mem. Vol.* 219, 1893 (*H. Leschenaultianus*); Hemsley, *Ann. Bot.* x, 251, 1896 (*H Leschenaultianus*).

Habitat: In forest from sea-level to 300 m. alt. A small tree, not reaching main upper-foliage tier Fairly abundant

Distribution: Norfolk Island, Australia.

Euphorbia Sparmanni Boiss.

Euphorbia Sparmanni Boiss, *Cent Euph.* 5, 1860.

Recorded: Bentham, *Fl Austr* vi, 46, 1873, Hemsley, *Ann. Bot.* x, 250, 1896

Habitat: Near the beach (Mueller).

Distribution: Norfolk Island, Australia, Polynesia.

Elaeodendron curtipendulum Endl.

Elaeodendron curtipendulum Endl., *Prodr Fl. Norf.* 81, 1833.

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*E australe*); F. Muell., *Fragm Phytogr. Austr* ix, 77, 1875 (*E. australe* var *melanocarpa*); Moore & Betche, *Handb. Fl. N S W* 518, 1893; Hemsley, *Ann. Bot.* x, 234, 1896 (*E. melanocarpum*); Maiden, *Proc Linn Soc. N S.W.* 23, 125, 1898.

Habitat: In lowland forest.

Distribution Norfolk Island.

Guioa coriacea Radlk.

Atalaya coriacea Radlkoper *Sitz Kon. Akad* p 326, 1878.

Recorded · F Muell, *Fragm. Phytogr Austr.* ix, 77, 1875 (*Cupania anacardioides*), Radlkoper, *l.c.*, Maiden, *Proc. Linn Soc. N S W.* 23, 126, 1898 (*Cupania Howeana*); *id.*, 26, 156, 1901 (synonymy), Hemsley, *Ann. Bot.* x, 234, 1896 (*Atalaya*).

Habitat: Large forest-tree forming part of upper tier of vegetation, Erskine Valley, Transit Hill.

Distribution: Endemic Nearest allied to *Cupania semiglauca* of Australia (Maiden).

Dodonaea viscosa Jacq.

Dodonaea viscosa Jacq, *Enum. Pl. Carib.* 19, 1760.

Recorded: Moore, *Lord Howe Id. Official Visit*, 24, 1870; F. Muell., *Fragm. Phytogr Austr.* ix, 77, 1875 (*D. lanceolata*); Hemsley, *Ann. Bot.* x, 234, 1896 (*D lanceolata*).

Habitat: In scrub on rocky ridges and exposed outskirts of forest, up to 300 m. alt.

Distribution: Norfolk Island, New Zealand, Tasmania. Australia, New Caledonia, tropical and subtropical regions.

Lagunaria Patersoni (Andrews) Don.

Hibiscus Patersonius Andrews, *Bot. Reposit.* t. 286.

Recorded : Moore, *Lord Howe Id. Official Visit,* 24, 1870 (*Hibiscus*); Hemsley, *Ann. Bot.* x, 232, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 124, 1898.

Anatomy of leaf of specimen from coastal scrub, Ned's Beach : Upper epidermis of single row of cells with thin cuticle. Hypoderm of three rows of large empty cells, the first and second longest in the direction of the lamina, the third longest in a direction transverse to the surface. Palisade tissue of three rows of cells with numerous chloroplasts, in centre of mesophyll Spongy tissue of irregular cells with few air-spaces. Lower epidermis similar to upper. Lower surface of leaf with covering of stellate hairs.

Habitat : Large tree in forest from sea-level to about 200 m. alt. Small shrub on coastal rocks, and in scrub on exposed ridge on Northern Hills.

Distribution : Norfolk Island, Queensland.

Hibiscus diversifolius Jacq.

Hibiscus diversifolius Jacq., *Ic. Plant. Rar.* t. 551.

Recorded . Moore, *Lord Howe Id. Official Visit,* 24, 1870; Hemsley, *Ann. Bot.* x, 232, 1896.

Distribution : Norfolk Island, New Zealand, Australia, New Caledonia, Pacific islands, South Africa, Madagascar.

Hibiscus tiliaceus L.

Hibiscus tiliaceus L., *Sp. Plant.* 694, 1753.

Recorded : Moore, *Lord Howe Id. Official Visit,* 24, 1870; Hemsley, *Ann. Bot* x, 232, 1896; Maiden, *Proc Linn. Soc. N.S.W.* 23, 123, 1898.

Habitat : Valley at north end of island (Duff); Middle Beach Road, swamp on King's property (Maiden).

Distribution : Norfolk Island, Australia, New Caledonia, Pacific islands, tropics.

Hymenanthera novae-zelandiae (A. Cunn.) Hemsl.

Scaevola ? novae-zelandiae A. Cunn., *Ann. Nat. Hist.*, ii, 52, 1839.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 (*H. latifolia*); Hemsley, *Ann. Bot.* x, 231, 1896 (*H. latifolia*); Hemsley, *Kew Bull.* 1908, 96; Maiden, *Proc. Linn. Soc. N.S.W.* 39, 381, 1914.

Habitat . In forest near sea-coast.

Distribution : New Zealand.

Xylosma ovatum Bentham.

Xylosma ovatum Bentham, *Fl. Austr.* i, 108, 1863.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 60, 1875; Hemsley, *Ann. Bot.* x, 231, 1896.

Habitat : In forest. My specimens are not typical, and may represent a distinct species.

Distribution : Australia.

Passiflora Herbertiana Lindl.

Passiflora Herbertiana (Ker Gawl.) in *Bot. Reg.* t. 737.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot.* x, 237, 1896.

Distribution: Australia.

Pimelea congesta Moore & Muell.

Pimelea congesta Moore & Muell., *Fragm. Phytogr. Austr.* viii, 9, 1872.

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*P. prostrata*); Moore & Muell., *l.c*; Bentham, *Fl Austr.* vi, 7, 1873 (*P. longifolia*); Hemsley, *Ann. Bot.* x, 250, 1896 (*P. longifolia*).

Habitat: In rocky places in scrub on ridges, Northern Hills; Mount Gower, 400 m. to 600 m. alt.

Distribution: Endemic. This species belongs to the section *Eupimelea*, which includes the whole of the New Zealand species and three or four from Australia.

Acicalyptus Fullagari F. Muell.

Acicalyptus Fullagari F. Muell., *Fragm. Phytogr. Austr.* viii, 15, 1873.

Recorded: F. Muell, *l.c.*; Hemsley, *Ann. Bot.* x, 236, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 129, 1898.

A large forest-tree with sinuous plank buttresses 2 m above the ground, and rough reddish-grey bark, 7 mm. to 9 mm. thick, which falls off in flakes.

Anatomy of leaf from specimen from forest, Transit Hill. Thick cuticle on upper surface. Upper epidermis of small cells, in length a little more than the thickness of the cuticle. Palisade parenchyma of four rows of cells: the upper row of rectangular cells about as deep as the epidermis and cuticle together; the following three rows of long narrow cells. Spongy tissue of seven or eight rows of rectangular cells, the rows clearly defined especially near the lower surface. Lower epidermis and cuticle similar to that on upper surface. (See fig. 1, *a*.)

Habitat: Abundant everywhere in forest from near sea-level to 500 m. alt. Forms an upper tier of vegetation, equal to *Ficus*, above the palms

Distribution: Endemic. Four other species of *Acicalyptus* are known, three in Fiji and one in New Caledonia.

Metrosideros nervulosa Moore & Muell.

Metrosideros nervulosa Moore & Muell., *Fragm. Phytogr Austr* viii, 15, 1873.

Recorded: Moore & Muell., *l c.*; Hemsley, *Ann. Bot.* x, 236, 1896.

Anatomy of leaf: Moderately thick cuticle on upper surface. Upper epidermis of single row of cells about the same thickness as the cuticle. Hypoderm of two rows of large oblong cells, some of which are empty. Palisade parenchyma of three or four rows of narrow cells. Spongy parenchyma of small irregular cells with air-spaces. Lower epidermis and cuticle similar to upper.

The chief features of the leaf as seen in cross-section are the vascular bundles and accompanying sclerenchyma, which occupy about half the view. They are long-oval in section, and extend nearly across the lamina,

there being only two or three rows of cells between each end and the epidermis. The lower half is narrower than the upper, and contains the vascular bundle. The sclerenchyma cells are clear, pentagonal, with a small central lumina. (See fig. 1, *b*.)

Habitat: In forest from 150 m. alt. to summit of Mount Gower, chiefly above 300 m.

Distribution: Endemic.

Metrosideros villosa Sm.

Metrosideros villosa Sm, *Trans. Linn. Soc.* iii, 268, 1797.

Recorded: F Muell., *Fragm. Phytogr. Austr.* viii, 14, 1873 (*M. polymorpha*); Hemsley, *Ann. Bot* x, 236, 1896 (*M. polymorpha*); Gibbs, *Jour. Linn. Soc. Bot.* 39, 146, 1909.

Habitat: In the higher valleys (Mueller).

Distribution: Kermadecs, New Caledonia, Polynesia.

Leptospermum flavescens Sm.

Leptospermum flavescens Sm., *Trans. Linn. Soc.* iii, 262, 1797.

Recorded: F. Muell, *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot* x, 236, 1896.

Habitat: In moss forest on summit of Mount Gower, forming a large portion of the main tier of vegetation.

Distribution: Tasmania, Australia, Malaya.

Melaleuca ericifolia Sm.

Melaleuca ericifolia Sm., *Trans Linn. Soc.* iii, 276, 1797.

Recorded: Bentham, *Fl. Austr.* iii, 159, 1866; Hemsley, *Ann. Bot.* x, 236, 1896; Maiden, *Proc. Linn. Soc N.S.W.* 23, 129, 1898.

Habitat. A prostrate shrub on coastal rocks and cliffs in exposed places; in wind-swept gap in Northern Hills

Distribution: Tasmania, Australia.

Nothopanax cissodendron (Moore & Muell.) W. R. B. Oliver comb. nov.

Panax cissodendron Moore & Muell, *Fragm. Phytogr. Austr.* vii, 96, 1870

Recorded: Moore & Muell, *l.c.*; Hemsley, *Ann. Bot.* x, 238, 1896 (*Panax*).

Habitat: In forest.

Distribution: Endemic. Allied to *Panax Murrayi* F. Muell. of New South Wales (Hemsley).

Hydrocotyle hirta R. Br.

Hydrocotyle hirta R. Br. ex A. Rich, *Ann. Sci. Phys.* vi, 204, 1820.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot.* x, 238, 1896.

Habitat: Scrambling over the ground in fores from sea-level to summit of Mount Gower; plentiful.

Distribution: Tasmania, Australia.

Apium prostratum (DC.) Thou.

Petroselinum prostratum DC., *Prodr.* iv, 102.

Recorded: Bentham, *Fl Austr.* iii, 372, 1866 (*A. australe*); F. Muell, *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot.* x, 238, 1896; Maiden, *Proc. Linn Soc N.S W.* 23, 129, 1898.

Habitat: Coastal rocks and meadow (narrow-leaved form), and as undergrowth in lowland forest

Distribution. Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, antarctic America, South Africa

Dracophyllum Fitzgeraldi Moore & Muell.

Dracophyllum Fitzgeraldi Moore & Muell, *Fragm Phytogr. Austr.* vii, 27, 1869.

Recorded: Moore & Muell, *l.c.*, Hemsley, *Ann. Bot* x, 241, 1896, Maiden, *Proc Linn Soc N S W* 23, 120, 1898

A large spreading tree with leaves in clusters at the ends of the twigs forming a canopy of foliage Bark reddish-brown, very rough, splitting longitudinally, giving it a peculiar stringy appearance

Anatomy of leaf of specimen from Erskine Valley. Upper epidermis with cuticle, cells large, one layer, slightly deeper than wide Hypoderm of two layers of sclerenchymatous cells; cells about twice as long as broad in cross-section. Palisade tissue of three layers of cells Spongy tissue of small cells. Lower epidermis of single row of cells, smaller than those of upper epidermis, cuticularized. Vascular bundles surrounded by sclerenchymatous tissue of small pentagonal cells, the sclerenchyma extending as a tissue two to three cells thick to meet the hypoderm. The sclerenchymatous tissue extends to the lower epidermis, or a layer of spongy tissue cells may intervene. (See fig 3, *b*)

Habitat · Plentiful in forest on the mountains from 200 m alt to summit of Mount Gower. In Erskine Valley it occurs as a large forest-tree, forming with *Acicalyptus* part of the upper tier of vegetation, but is more plentiful in the main tier. On the summit of Mount Gower it occurs singly and in clumps, is very conspicuous, and forms a considerable portion of the vegetation.

Distribution. Endemic Allied to *D latifolium* of New Zealand.

Leucopogon Richei (Lab.) R. Br

Styphelia Richei Lab, *Nov Holl Pl Sp* i, 44, t. 60, 1806

Recorded: F Muell, *Fragm Phytogr Austr* ix, 77, 1875 (*Styphelia*); Tate, *Macleay Mem Vol* 218, 1893, Hemsley, *Ann Bot* x, 241, 1896

Distribution: New Zealand, Tasmania, Australia

Aegiceras corniculatum (L.) Blanco.

Rhizophora corniculatum L., *Amoen. Akad* iv, 123, 1760.

Recorded: Moore, *Lord Howe Id. Official Visit,* 25, 1870 (*A. fragrans*), F. Muell., *Fragm Phytogr. Austr* ix, 77, 1875 (*A majus*); Hemsley, *Ann. Bot.* x, 242, 1896 (*A majus*).

Habitat. Near the mouth of Deep Creek.

Distribution: Australia, Malaya, Indian and Pacific Oceans.

Rapanea myrtillina Mez.

Rapanea myrtillina Mez., *Pflanzenreich*, Heft 9, 370, 1902.

Recorded: Mez., *l.c.*; Maiden, *Proc. Linn. Soc. N.S.W.* 27, 349, 1902.
Distribution: Endemic

Rapanea platystigma (F. Muell.) Mez.

Myrsine platystigma F. Muell., *Fragm. Phytogr. Austr.* viii, 48, 1873.

Recorded: F. Muell., *l.c.*; Hemsley, *Ann. Bot.* x, 242, 1896 (*Myrsine*); Mez., *Pflanzenreich*, Heft 9, 370, 1902; Maiden, *Proc. Linn. Soc. N.S.W.* 27, 349, 1902.

Anatomy of leaf of specimen from scrub on Northern Hills: Upper epidermis of single row of large cells of irregular size, cuticularized. Palisade tissue of one or two rows of cells filled with chloroplasts. Spongy tissue of six or seven rows of small rounded cells. Lower epidermis similar to upper (See fig. 3, *c*.)

Habitat: In forest from sea-level to upper slopes of Mount Gower, 700 m. alt.; in scrub on ridge at top of sea-cliffs, Northern Hills.

Distribution: Endemic.

Sideroxylon Howeanum (F. Muell.) Moore & Betche.

Achras Howeana F. Muell., *Fragm. Phytogr. Austr.* ix, 72, 1875.

Recorded: Bentham, *Fl. Austr.* iv, 282, 1869 (*A. australis*); Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*A. costata*); F. Muell., *l.c.*; Moore & Betche, *Handb. Fl. N.S W.* 520, 1893; Hemsley, *Ann. Bot.* x, 242, 1896.

Habitat: In lowland forest, on banks of Deep Creek near the sea.

Distribution: Endemic. Apparently related to *S. novae-zealandiae* of New Zealand.

Symplocos candelabrum Brand.

Symplocos candelabrum Brand, *Pflanzenreich*, Heft 9, 39, 1901.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 (*S. Stawelli*); Hemsley, *Ann Bot.* x, 242, 1896 (*S. Stawelli*); Brand, *l.c.*; Maiden, *Proc. Linn. Soc. N.S.W.* 27, 348, 1902

Distribution: Endemic. Allied to *S. aneityensis* Brand from New Hebrides.

Notelaea quadristaminea (F. Muell.) Hemsl.

Chionanthus quadristamnea F Muell, *Fragm. Phytogr. Austr.* viii, 41, 1873.

Recorded. F Muell., *l c.*; *id.*, x, 89, 1876 (*Mayepa*); Hemsley, *Ann. Bot.* x, 243, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 23, 130, 1898 (blue plum).

Anatomy of leaf of specimen from scrub on Northern Hills: Upper epidermis of single row of small rectangular cells with thin cuticle. Hypoderm of single row of small cells similar to epidermal cells, with no chloroplasts. Palisade tissue of single row of long narrow cells reaching almost to centre of leaf. Spongy tissue of six to eight rows of small irregular rounded cells. Lower epidermis similar to upper, but with thinner cuticle.

Habitat: In forest on the mountains from 200 m. to 600 m. alt. A large tree, forming part of the main tier of vegetation.

Distribution: Endemic.

Olea paniculata R. Br.

Olea paniculata R Br., *Prodr. Fl. Nov. Holl.* 523, 1810.

Recorded : Moore, *Lord Howe Id. Official Visit*, 25, 1870 ; Hemsley, *Ann. Bot.* x, 243, 1896

Habitat : In forest from near sea-level to above 350 m. alt ; plentiful.

Distribution . Australia, New Caledonia.

Jasminum didymum Forst. f.

Jasminum didymum Forst. f , *Fl. Austr. Prodr.* 3, 1786.

Recorded : Moore, *Lord Howe Id Official Visit*, 25, 1870 ; Hemsley, *Ann Bot* x, 242, 1896.

Distribution : Australia, New Caledonia, Pacific islands, Malaya.

Jasminum simplicifolium Forst. f.

Jasminum simplicifolium Forst f , *Fl. Austr. Prodr.* 3, 1786.

Recorded . F. Muell., *Fragm. Phytogr Austr.* ix, 77, 1875 , Hemsley, *Ann Bot.* x, 243, 1896

Habitat Scandent in forest from sea-level to 150 m alt Small divaricating shrub in scrub on ridge at top of sea-cliffs, north coast

Distribution . Norfolk Island, Australia, New Caledonia, Pacific islands.

Geniostoma petiolosum Moore & Muell.

Geniostoma petiolosum Moore & Muell , *Fragm. Phytogr. Austr* vii, 28, 1869

Recorded . Moore & Muell , *l c* , Hemsley, *Ann Bot* x, 244, 1896.

Habitat · Common in forest from sea-level to 300 m. alt A small tree

Distribution : Endemic. According to Mueller, allied to *G. australiana* of Queensland

Alyxia Lindii F. Muell.

Alyxia Lindii F Muell , *Fragm Phytogr. Austr.* viii, 46, 1873.

Recorded . F. Muell., *l c* , Hemsley, *Ann. Bot.* x, 243, 1896

Habitat . Moss forest at summit of Mount Gower

Distribution : Endemic Mueller compares this species with *A. bracteolata* A. Rich., from Fiji, Tonga, and Samoa

Alyxia ruscifolia R. Br.

Alyxia ruscifolia R Br , *Prodr. Fl Nov Holl* 470, 1810

Recorded . Bentham, *Fl. Austr* iv, 308, 1869 , Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*A gymnopogon*) , Hemsley, *Ann Bot* x, 243, 1896.

Habitat . Small shrub in forests near the sea , in scrub on ridge at top of sea-cliffs, north coast.

Distribution . Australia

Alyxia squamulosa Moore & Muell.

Alyxia squamulosa Moore & Muell., *Fragm Phytogr. Austr.* viii, 47. 1873.

Recorded · Moore & Muell , *l c* ; Hemsley, *Ann Bot* x, 243, 1896.

Habitat · In scrub on summit and on ridge near summit of Mount Gower.

Distribution : Endemic Allied to *A stellata* R. Br , from Fiji, Tonga, and New Caledonia

Ochrosia elliptica Lab.

Ochrosia elliptica Lab., *Sert. Austr.-Caled.* 25, t. 30, 1825.

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870; Hemsley, *Ann. Bot.* x, 243, 1896.

Anatomy of leaf of specimen from coastal scrub, Ned's Beach: Upper epidermis of single row of square cells, with thin cuticle. Hypoderm of single row of large empty cells. Palisade parenchyma of three rows of small elongated cells. Spongy parenchyma of small irregular cells with air-spaces. Lower epidermis of single row of cells with thickened outer walls.

Habitat: In coastal scrub and forest; abundant.

Distribution: Australia, New Caledonia, Pacific islands.

Lyonsia reticulata F. Muell.

Lyonsia reticulata F. Muell., *Rep. Budek. Exped.* 16.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875; Hemsley, *Ann. Bot.* x, 244, 1896.

Habitat. A woody climber in scrub and forest from the sea-coast to the upper slopes of Mount Gower, 550 m. alt.; trailing over coastal meadow on exposed point, Ned's Beach.

Distribution. Australia.

Vincetoxicum carnosum (R. Br.) Benth.

Oxystelma carnosum R. Br., *Prodr. Fl. Nov. Holl.* 462, 1810.

Recorded. Hemsley, *Ann. Bot.* x, 244, 1896.

Habitat: Trailing over sand-dunes in West Bay.

Distribution: Australia.

Tylophora biglandulosa (Endl.) A. Gray.

Hybanthera biglandulosa Endl., *Prodr. Fl. Norf.* 59, 1833.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 70, 1875 (*T. enervis*); Hemsley, *Ann. Bot.* x, 244, 1896 (*T. enervis*); Maiden, *Proc. Linn. Soc. N.S.W.* 28, 710, 1904.

Habitat: Scandent in lowland forest.

Distribution: Norfolk Island.

Marsdenia rostrata R. Br.

Marsdenia rostrata R. Br., *Prodr. Fl. Nov. Holl.* 461, 1810.

Recorded: Bentham. *Fl. Austr.* iv, 339, 1869; F. Muell., *Fragm. Phytogr. Austr.* ix, 71, 1875 (*M. tubulosa*), Hemsley, *Ann. Bot.* x, 244, 1896.

Habitat: Liane in lowland forest, reaching to the tops of the highest trees.

Distribution: Australia.

Calystegia Soldanella (L.) R. Br.

Convolvulus Soldanella L., *Sp. Plant.* 226, 1753.

Recorded. F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 (*Convolvulus sepium* var. *Soldanella*), Hemsley, *Ann. Bot.* x, 246, 1896.

Habitat. Sand-dunes.

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, temperate and subtropical regions.

Calystegia marginata R. Br.

Calystegia marginata R. Br , *Prodr. Fl. Nov Holl.* 483, 1810.

Recorded : F. Muell., *Fragm Phytogr. Austr.* ix, 78, 1875 (*Convolvulus*) ; Hemsley, *Ann Bot.* x, 246, 1896

Distribution : Norfolk Island, New Zealand, Australia.

Ipomoea pes-caprae (L.) Roth.

Convolvulus pes-caprae L , *Sp Plant.* 226, 1753.

Recorded . Moore, *Lord Howe Id. Official Visit*, 25, 1870 , Hemsley, *Ann Bot* x, 245, 1896 (*I. biloba*)

Habitat : Sand-dunes and maritime meadow.

Distribution . Norfolk Island, Kermadecs, Australia, New Caledonia tropical sea-coasts

Ipomoea grandiflora Lam.

Ipomoea grandiflora Lam , *Tabl Encyc* i, 467, 1791

Recorded : Hemsley, *Ann Bot* x, 245, 1896

Distribution : Norfolk Island (*I bona-nox*), Australia, New Caledonia, tropical East Africa, Asia, and Polynesia

Ipomoea palmata Forsk.

Ipomoea palmata Forsk , *Fl Aegypt-Arab.* 43, 1775.

Recorded · Bentham, *Fl Austr* iv, 415, 1869 ; Hemsley, *Ann. Bot* x, 245, 1896.

Habitat : Near the coast on meadow and *Mariscus*

Distribution : Norfolk Island, Kermadecs, New Zealand, Australia, New Caledonia, tropical regions.

Avicennia officinalis L.

Avicennia officinalis L , *Sp Plant.* 110, 1753.

Recorded : F. Muell , *Fragm Phytogr Austr.* ix, 78, 1875 ; Hemsley, *Ann Bot.* x, 247, 1896

Habitat : A few plants on shingle beach between tide-marks at north end of lagoon in West Bay

Distribution : New Zealand, Australia, tropical regions (rare in Polynesia).

Westringia rosmariniformis Sm.

Westringia rosmariniformis Sm in *Vet Acad Handl Stockh.* 171, 1797.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875 , Hemsley, *Ann Bot* x, 247, 1896

Distribution : Australia.

Plectranthus parviflorus Willd.

Plectranthus parviflorus Willd., *Hort. Berol.* t. 65, 1816.

Recorded · Maiden, *Proc Linn Soc. N S W* 23, 132, 1898.

Distribution : Australia, New Caledonia, Pacific islands.

Solanum aviculare Forst. f.

Solanum aviculare Forst. f., *Fl. Austr. Prodr.* 18, 1786.

Recorded: Moore, *Lord Howe Id. Official Visit*, 25, 1870 (*S. laciniatum*); F. Muell.; *Fragm. Phytogr. Austr.* ix, 78, 1875; Hemsley, *Ann. Bot.* x, 245, 1896.

Habitat: Undergrowth in forest from sea-level to summit of Mount Gower; a few plants only seen.

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia

Solanum nigrum L.

Solanum nigrum L, *Sp. Plant.* 186, 1753.

Recorded: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 150, 1898 (as introduced).

Habitat: Lowlands in waste places, in forest clearing at summit of Mount Gower.

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia; cosmopolitan.

Solanum Bauerianum Endl.

Solanum Bauerianum Endl., *Prodr. Fl. Norf.* 54, 1833.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 74, 1875; Hemsley, *Ann. Bot* x, 245, 1896.

Distribution: Norfolk Island.

Tecoma austro-caledonica Burm.

Tecoma austro-caledonica Burm., *Bull. Soc. Bot. Fr.* ix, 163, 1862.

Recorded: Bentham, *Fl. Austr.* iv, 537, 1869 (*T. australis*); Hemsley, *Ann. Bot.* x, 246, 1896; Maiden, *Proc. Linn. Soc. N.S.W.* 39, 382, 1914.

Habitat: Scrambling in lowland forest; summit of Mount Gower (Maiden).

Distribution: New Caledonia.

Negria rhabdothamnoides F. Muell.

Negria rhabdothamnoides F. Muell., *Fragm. Phytogr. Austr.* vii, 152, 1871.

Recorded: F. Muell., *l.c.*; Hemsley, *Ann. Bot.* x, 246, 1896.

A small widely branching tree. The foliage consists of clusters of rosettes of large leaves, which with the flowers, three to a pedicel, are borne at the ends of the branches. Bark very soft, rough with large lenticels, light grey, yellow within, 5 mm thick.

Anatomy of leaf of specimen from moss forest on summit of Mount Gower. Upper epidermis of single row of shallow cells of various sizes. Outer wall scarcely or not thicker than the others. Hypoderm of three or four rows of large empty cells. Palisade tissue of three rows of rather short cells in centre of mesophyll. Spongy tissue of about ten rows of small cells Scattered simple hairs on under-surface of leaf. (See fig. 3, *a*.)

Habitat: In forest from 150 m. alt. to summit of Mount Gower; at the lower altitudes most abundant near running water.

Distribution: Endemic. Allied to *Rhabdothamnus* monotypic in New Zealand.

Eranthemum variabile R. Br. var. grandiflorum Benth.

Eranthemum variabile R. Br., *Prodr. Fl. Nov. Holl.* 477, 1810.
E. variabile var. ? *grandiflorum* Bentham, *Fl Austr.* iv, 555, 1869.

Recorded: Bentham, *l.c*; Hemsley, *Ann. Bot.* x, 247, 1896.
Distribution: Australia, New Caledonia.

Myoporum insulare R. Br.

Myoporum insulare R. Br., *Prodr. Fl Nov Holl.* 516, 1810.

Recorded: Moore, *Lord Howe Id Official Visit*, 25, 1870 (*M. acuminatum*), F. Muell., *Fragm. Phytogr. Austr* vii, 110, 1870; Hemsley, *Ann. Bot.* x, 247, 1896

Habitat: Near the coast in forest and scrub, and on sand-flat in West Bay

Distribution: Australia.

Plantago Hedleyi Maiden.

Plantago Hedleyi Maiden, *Proc. Linn. Soc. N.S W.* 39, 379, 1914.

Recorded: Maiden, *l.c.*

Habitat: Damp rocky places in forest; upper slopes and summit of Mount Gower above 450 m alt

Distribution: Endemic. Nearest to *P. aucklandica* Hook f of New Zealand.

Randia stipulosa Moore & Muell.

Randia stipulosa Moore & Muell, *Fragm. Phytogr. Austr.* vii, 47, 1869.

Recorded: Moore & Muell, *l c.*; Moore, *Lord Howe Id Official Visit*, 25, 1870 (*R macrophylla*); Moore & Betche, *Handb. Fl. N S.W.* 519, 1893 (*R. stipularis*); Hemsley, *Ann. Bot.* x, 238, 1896

Anatomy of leaf of specimen from forest on Transit Hill · Upper and lower epidermis with thin cuticle. Mesophyll little differentiated. Chloroplasts most dense in upper portion, three or four rows of the cells here being elongated in direction transverse to the surface and thus representing palisade tissue. The lower half of the mesophyll has a more open appearance owing to the presence of air-spaces and to there being fewer chloroplasts. Cells rounded, small, about ten rows.

Habitat: A small tree in forest from near sea-level to summit of Mount Gower.

Distribution: Endemic. Closely allied to *R. Fitzalani* F. Muell. of Queensland.

Psychotria Carronis Moore & Muell.

Psychotria Carronis Moore & Muell., *Fragm. Phytogr. Austr.* vii, 49, 1869.

Recorded: Moore & Muell., *l c.*; Hemsley, *Ann. Bot.* x, 239, 1896.

Habitat: In forest forming part of the main tier of vegetation from sea-level to 200 m alt.

Distribution: Endemic.

Coprosma prisca W. R. B. Oliver n. sp.

Recorded: F. Muell., *Fragm. Phytogr. Austr.* ix, 69, 1875 (*C. Bauerı*); Hemsley, *Ann. Bot.* x, 239, 1896 (*C. Bauerı*).

Frutex vel parva arbor. Foliae angusto-oblongae, obtusae vel subacutae, basibus cuneatis, marginibus reflexis, petiolis brevibus tenuibus, 50–60 mm. longae, 17–25 mm. latae. Flores masculi in capitulis 8–12-floris, calyce minutae 4-dentato, corolla 3 mm. longa 4-lobata. Flores feminei in fasciculis bifloris, limbo calycis obscure 4-dentato, corolla profunde 4-lobata. Drupa ovata, 7 mm. longa.

A shrub 1–2 m. tall, or more rarely a small tree 8 m. tall. Leaves almost fleshy, narrow-oblong, obtuse or subacute, base cuneate, margin recurved, veins conspicuous on the lower surface, petiole short, slender; length (including petiole) 50–60 mm., breadth 17–25 mm. Male flowers in 8–12-flowered heads on axillary peduncles. Calyx minute, 4-lobed. Corolla 3 mm. long, 4-lobed. Female flowers in 2-flowered axiliary fascicles, calyx-limb obscurely 4-toothed, corolla deeply 4-lobed, the lobes longer than the tube. Drupe ovoid, 7 mm. long.

Anatomy of leaf of specimen from coastal scrub, Ned's Beach: Upper epidermis of single row of cells longer than deep, with thickened outer walls. Hypoderm of two rows of large cells with few or no chloroplasts, the first row of rectangular cells, the second of cells elongated in direction to surface of leaf. Palisade tissue of two or three rows of cells in the centre of the leaf. Spongy tissue of small irregular cells with air-spaces. Lower epidermis of single layer of cells longer than deep, with thickened outer walls and a few small hairs.

Habitat: Near the coast in scrub, forest, and on sand-flat (West Bay), and ridge on top of sea-cliffs, north coast.

Distribution: Endemic. The coastal coprosmas inhabitating New Zealand, Chatham, Lord Howe, Norfolk, and the Kermadec Islands form a group of five closely allied species, one confined to each of the places named. The Chatham Island form (*C. chathamica* Cockayne), with rather acute leaves and short petioles, is the most distinct. That from Lord Howe Island approaches it, but has narrower leaves. The Kermadec species (*C. petiolata* Hook. f.) has subacute leaves with slender petioles, and closely approaches the New Zealand species (*C. retusa* Hook. f.), which has broad obtuse leaves with short stout petioles. Finally, the Norfolk Island plant (*C. Bauerı* Endl.) has retuse leaves with slender petioles.

In separating the New Zealand form as a species distinct from the Norfolk Island plant I have been obliged to restore Hooker's name *retusa* (*Lond. Journ. Bot.*, vol. 3, p. 415, 1844) for the former, and to restrict Endlicher's familiar name *Baueri* to the latter. This change invalidates Petrie's name *C. retusa* (*Trans. N Z Inst.*, vol. 26, p. 268, 1894) for which I now propose to substitute *C. crenulata*

Coprosma lanceolaris F. Muell.

Coprosma lanceolaris F. Muell., *Fragm. Phytogr. Austr.* ix, 70, 1875.

Recorded: F. Muell, *l c.*; Hemsley, *Ann. Bot.* x, 239, 1896.

Habitat: Scrub at base of Mount Gower, and in moss forest on summit.

Distribution: Endemic. Very similar to *C. foetidissima* Forst. of New Zealand.

Coprosma putida Moore & Muell.

Coprosma putida Moore & Muell, *Fragm. Phytogr. Austr.* vii, 45, 1869.

Recorded: Moore & Muell, *l.c.*, Hemsley, *Ann Bot.* x, 239, 1896; Maiden, *Proc. Linn. Soc. N.S W.* 23, 129, 1898.

Anatomy of leaf: Cells of upper epidermis with thick outer walls. Hypoderm of two or three rows of large cells. Palisade parenchyma of two rows of small elongated cells. Spongy parenchyma of about seven rows of small cells, increasing in size towards the lower epidermis. Cells of lower epidermis with thickened outer walls. (See fig. 2, *a*)

Habitat: Small tree in forest from sea-level to summit of Mount Gower

Distribution: Endemic. Mueller compares this with *C. grandifolia* from New Zealand.

Sicyos australis Endl.

Sicyos australis Endl, *Prodr. Fl. Norf* 67, 1833.

Recorded: F Muell, *Fragm. Phytogr Austr.* ix, 77, 1875 (*S. angulata*); Hemsley, *Ann. Bot.* x, 237, 1896 (*S. angulata*).

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Pacific islands.

Wahlenbergia gracilis (Forst. f.) Schrad.

Campanula gracilis Forst. f., *Fl. Austr. Prodr.* 15, 1786

Recorded · F Muell, *Fragm Phytogr. Austr* ix, 77, 1875; Hemsley, *Ann Bot* x, 241, 1896.

Distribution · Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, New Caledonia, Tonga, Malaya, tropical Asia, South Africa.

Lobelia anceps L. f.

Lobelia anceps L f, *Suppl* 395, 1781.

Recorded: Bentham, *Fl. Austr* iv, 128, 1869; Hemsley, *Ann. Bot.* x, 241, 1896.

Habitat: Coastal rocks and cliffs

Distribution: Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, South Africa, extra-tropical South America

Scaevola frutescens (Mill) Krauss.

Lobelia frutescens Mill., *Gard. Dict.* ed. viii, n 1, 1768.

Recorded · Moore, *Lord Howe Id Official Visit*, 25, 1870 (*S. Koenigii*); Hemsley, *Ann. Bot.* x, 240, 1896 (S *Koenigii*)

Distribution · Australia, Polynesia, tropical Asia

Brachycome segmentosa Moore & Muell.

Brachycome segmentosa Moore & Muell, *Fragm Phytogr Austr* viii, 144, 1874

Recorded Moore & Muell, *l c*, F Muell, *id* ix, 77, 1875 (*B diversifolia*), Hemsley, *Ann Bot* x, 239, 1896

Habitat. In damp rocky places on ground and on cliffs in scrub and forest from sea-level to summit of Mount Gower

Distribution: Endemic. Allied to *B. multifidum* of Australia.

Olearia Balli (F. Muell.) Hemsl.

Aster Balli F. Muell., *Fragm. Phytogr. Austr.* viii, 143, 1874.

Recorded : F. Muell., *l.c.* ; Hemsley, *Ann. Bot.* x, 239, 1896.

Habitat : In scrub on north ridge of Mount Gower above 400 m. alt., and in undergrowth in moss forest on summit of Mount Gower.

Distribution : Endemic.

Olearia Mooneyi (F. Muell.) Hemsl.

Aster Mooneyi F. Muell., *Fragm. Phytogr. Austr.* viii, 144, 1874.

Recorded : F. Muell , *l.c.* ; Hemsley, *Ann. Bot.* x, 239, 1896.

Anatomy of leaf of specimen from moss forest on summit of Mount Gower . Upper epidermis of single row of very small cells with cuticle. Hypoderm of three rows of large empty cells. Palisade tissue of two rows of cells in centre of mesophyll. Under-surface of leaf thickly covered with simple hairs.

Habitat : Small tree in moss forest, summit of Mount Gower.

Distribution : Endemic.

Gnaphalium japonicum Thunb.

Gnaphalium japonicum Thunb., *Fl. Jap.* 311, 1784.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875 ; Hemsley, *Ann. Bot.* x, 240, 1896.

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Malaya, China, Japan.

Gnaphalium luteo-album L.

Gnaphalium luteo-album L., *Sp. Plant.* 851, 1753.

Recorded : Bentham, *Fl Austr* iii, 653, 1866 ; Hemsley, *Ann. Bot.* x, 240, 1896.

Habitat : Open rocky ridge on top of sea-cliffs, north coast.

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, New Caledonia , cosmopolitan (except colder regions).

Cassinia tenuifolia Bentham.

Cassinia tenuifolia Bentham, *Fl. Austr.* iii, 585, 1866.

Recorded . Bentham, *l c.* ; Hemsley, *Ann Bot* x, 240, 1896.

Habitat : Sea-level to summit of Mount Gower, mainly in coastal scrub. A few plants in forest undergrowth on Northern Hills, and elsewhere in exposed places.

Distribution : Endemic Bentham says this may be a state of *C. laevis* of east Australia, but the inflorescence is different.

Wedelia uniflora (Spreng.) Oliver W. R. B. comb. nov.

Buphthalmum uniflorum Spreng. *Syst.* iii, 605.

Recorded : Bentham, *Fl Austr.* iii, 539, 1866 (*W. biflora*) ; Hemsley, *Ann. Bot* x, 240, 1896 (*W biflora*).

Habitat : Coastal rocks, sand-dunes, and sand-flat.

Distribution : Norfolk Island, Australia, New Caledonia, Pacific islands, tropics of East Africa and Asia.

Bidens pilosa L.

Bidens pilosa L., *Sp. Plant.* 832, 1753.

Recorded : F. Muell., *Fragm. Phytogr. Austr.* ix, 77, 1875.

Habitat : Open places on rocky ridge on top of sea-cliffs, north coast. Maiden states that this species was brought with potatoes by whalers from Sunday Island (*Proc. Linn. Soc. N S.W* 23, 150, 1898)

Distribution : Norfolk Island, Kermadecs, New Zealand, Australia, New Caledonia, tropical regions.

Cotula australis (Sieb.) Hook. f.

Anacyclus australis Sieb. ex Spreng , *Syst.* iii, 497.

Recorded : Maiden, *Proc. Linn. Soc N S.W.* 23, 130, 1898.

Distribution : Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia, Tristan da Cunha

Erechtites quadridentata (Lab.) DC.

Senecio quadridentata Lab., *Nov. Holl. Plant. Sp.* ii, 48, 1806.

Recorded : F. Muell., *Fragm Phytogr. Austr.* ix, 77, 1875 , Hemsley, *Ann. Bot.* x, 240, 1896.

Habitat : Admiralty Islets (Maiden).

Distribution : New Zealand, Tasmania, Australia.

Senecio insularis Bentham.

Senecio insularis Bentham, *Fl. Austr.* iii, 666, 1866.

Recorded : Bentham, *l c.* , Hemsley, *Ann. Bot.* x, 240, 1896.

Habitat : Undergrowth in forest from sea-level to summit of Mount Gower; abundant

Distribution : Endemic. According to Bentham, approaches in several respects the New Zealand *S Kirkii* Hook f.

Sonchus oleraceus L.

Sonchus oleraceus L , *Sp Plant.* 794, 1753.

Recorded : Macgillivray, *Kew Journ Bot* vi, 353, 1854 , Maiden, *Proc. Linn. Soc N.S.W.* 23, 130, 1898.

Habitat : Maritime meadow, rocky ridge on top of sea-cliffs, north coast Admiralty Islets (Maiden).

Distribution Norfolk Island, Kermadecs, New Zealand, Tasmania, Australia , cosmopolitan.

V. INTRODUCED ELEMENTS

1. Plants.

A list of all plants recorded as introduced to Lord Howe Island by human agency follows. These occur in waste places among the settlements, and appear where the forest has been disturbed by man. Otherwise, as far as my observations go, they have scarcely entered any of the natural plant formations on the island

Imperata arundinacea Cyr.. Maiden, *Proc. Linn. Soc. N.S.W.* 23, 143, 1898 (as indigenous).

Panicum sanguinale L. : F. Muell., *Fragm Phytogr Austr.* viii, 153, 1874 (as indigenous).

Stenotaphrum americanum Schrank.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 151, 1898.
Sporobolus indicus R. Br. Moore, *Lord Howe Id. Official Visit*, 26, 1870 (*S. elongatus*).
Polypogon monspeliensis Desfont.. F. Muell., *Fragm. Phytogr. Austr.* viii, 114, 1873 (as indigenous).
Cynodon Dactylon Pers.: Moore, *Lord Howe Id. Official Visit*, 26, 1870 (as indigenous)
Briza minor L : Bentham, *Fl. Austr.* vii, 660, 1878.
Poa annua L.: Bentham, *Fl. Austr.* vii, 654, 1878.
Bromus unioloides H. B. & K.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 151, 1898.
Crinum pedunculatum Br : Moore, *Lord Howe Id. Official Visit*, 26, 1870 (as indigenous).
Chenopodium murale L. · Maiden, *Proc. Linn. Soc. N.S.W.* 23, 150, 1898.
Mirabilis jalapa L.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 150, 1898
Portulaca oleracea L.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 149, 1898.
Stellaria media L.: Macgillivray, *Hook. Kew Journ. Bot.* 1854.
Cerastium vulgatum L : Maiden, *Proc. Linn. Soc. N.S.W.* 23, 149, 1898.
Polycarpon tetraphyllum Loefl.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 149, 1898.
Lepidium ruderale L.: Hemsley, *Ann. Bot.* x, 231, 1896 (as indigenous).
Senebiera didyma Pers.: Moore, *Lord Howe Id. Official Visit*, 24, 1870.
Cakile maritima Scop.. Maiden, *Proc. Linn. Soc. N.S.W.* 23, 123, 1898 (as indigenous)
Capsella bursa-pastoris Moench.: Moore, *Lord Howe Id. Official Visit*, 24, 1870.
Cassia laevigata Willd.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 149, 1898.
Medicago denticulata Willd . Maiden, *Proc. Linn. Soc. N.S.W.* 23, 149, 1898.
Vicia sativa L.: Maiden, *Proc. Linn Soc N.S.W.* 23, 149, 1898.
Ricinis communis Willd.: Moore, *Lord Howe Id. Official Visit*, 25, 1870.
Anagallis arvensis L.: Maiden, *Proc. Linn. Soc. N.S.W.* 39, 382, 1914.
Verbena bonariensis L.: Moore, *Lord Howe Id. Official Visit*, 25, 1870.
Physalis peruviana L.: Moore, *Lord Howe Id. Official Visit*, 25, 1870.
Erigeron linifolius DC.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 150, 1898.
Taraxacum dens-leonis Desf.: Maiden, *Proc. Linn. Soc. N.S.W.* 23, 150, 1898
Senecio vulgaris L : not hitherto recorded.

2. ANIMALS.

Important changes have been wrought in the forest on Lord Howe Island by goats and pigs liberated by the early settlers. These animals have overrun most parts of the island, but are not on Transit Hill, close to the settlement, nor have they been able, thanks to the precipices, to ascend to the summits of the mountains. Throughout the area over which goats and pigs roam the undergrowth has been largely depleted. Goats eat herbage and bark, while pigs uproot the plants on which they feed. Where these animals are found there is little or no undergrowth, where formerly one is forced to believe there must have been a considerable amount. In such places as the summit of Mount Gower, Transit Hill, and the slope at the western base of Mount Gower there is often a dense undergrowth. Over most of Erskine Valley it has almost vanished. Certain species are known to have been common in the forest, but are now very

scarce. such are *Marattia fraxinea howeana* and *Boehmeria calophleba. Elatostema reticulatum grande* is recorded by Maiden (*Proc Linn Soc. N.S W.* 23, 135, 1898) as being eaten by pigs, which devour both foliage and tubers. It is impossible now to say what other plants have also been suppressed in the area now overrun by these destructive animals.

VI LITERATURE AND HISTORY

1853. *Proposed New Penal Settlement* Sydney Contains a number of reports on Lord Howe Island. That by J D Macdonald, "Remarks on the Natural History and Capabilities of Lord Howe Island," contains a short general account of the vegetation. Macdonald visited Lord Howe Island as Assistant Surgeon on H M S "Herald," which surveyed the island in 1853.

1854. J. MACGILLIVRAY, Letters from, Naturalist on H M.S "Herald," in Hooker's *Kew Journal of Botany*, vi, 353. Gives a short general account of the vegetation The vascular plants collected by Milne and Macgillivray, naturalists to the "Herald," are included in Bentham's *Flora Australiensis*

1870. *Lord Howe Island: Official Visit by the Water Police Magistrate and the Director of the Botanic Gardens, Sydney.* Contains reports on Lord Howe Island by members of a party which visited the island on official business in the New South Wales Government steamer "Thetis" in May-June, 1869. The report at page 17, by C. Moore, Director of the Sydney Botanical Gardens, "Sketch of the Vegetation of Lord Howe Island," contains a general account of the vegetation and the first published list of the plants of Lord Howe Island A hundred and nine names are given, of which twenty-nine are generic names only, and nine are recorded as apparently introduced, thus leaving seventy-one indigenous species. (I have omitted three of Moore's species, transferred two to the list of introduced plants, and consider as indigenous *Sonchus oleraceus*, which he lists as introduced) In the report by E S Hill, "Description of Lord Howe Island," an interesting general account of the island is given, with a description of the vegetation.

1872 "*Iris Robinsoniana* F v M," *Gardeners' Chronicle*, p 393, 1872. A full account of the species, with two figures

1872 J. G BAKER, "Ferns of Lord Howe Island," *Gardeners' Chronicle*, p. 253, 1873 Records *Alsophila excelsa*, and describes as new *Hemitelia Moorei* and *Deparia nephrodioides*

1872 C MOORE, "Remarks on the Botany of Lord Howe's Island," *Trans. Roy. Soc. N S W* 1871, p 29 Gives a table of the genera of plants, with remarks on the geographical relationships

1873 J. G BAKER, "New Ferns from Lord Howe Island," *Journ. Bot* xi, 16. *Todea Moorei* and *Asplenium pteridoides*, collected by the Eclipse Expedition of 1871, are described as new

1874 J G BAKER, "Tree-fern from Lord Howe Island," *Journ Bot.* xii, 279. States that *Hemitelia Macarthuri* F Muell. is identical with *Cyathea Moorei* Hook & Baker

1875 F. v. MUELLER, *Fragmenta Phytographicae Australiae*, ix Melbourne. A list is here given containing 185 names In addition to these, four other species are mentioned in numbers of the *Fragmenta* between 1873 and 1877. (I have omitted four species from Mueller's list, transferred five to the list of introduced plants, and include his *Marsdenia tubulosa* as not different from *M rostrata* Mueller's names include four generically

determined only, so that 175 indigenous species are accepted in my list.) In vols. vii to ix of the *Fragmenta*, issued between 1870 and 1875, Mueller, either alone or conjointly with C. Moore, published the descriptions of thirty-two new species of plants from Lord Howe Island.

1863–78. G. BENTHAM, *Flora Australiensis.* London. The first volumes contain very few plants recorded from Lord Howe Island, only twenty appearing in the first five volumes (1863–70), sixteen in vol. vi (1873), and seventy-six in vol. vii (1878). One hundred and twelve names are thus given by Bentham as Lord Howe Island plants, of which four are indicated as being introduced. (I have omitted three species and transferred three to the list of introduced plants, thus leaving 102 indigenous species.)

1882. J. B. WILSON, *Report on the Present State and Future Prospects of Lord Howe Island.* Sydney. The island was visited officially on the 4th April, 1882, by the Hon. J. B. Wilson and a party of observation in the "Thetis." The volume is illustrated by seventeen photographic views and two maps. At page 17 is a "Report on the Geology," by H. Wilkinson. A list of the timbers of the island is given, eighteen specific names being mentioned. At page 28 is a "Report on the Vegetation," by J. Duff. Interesting information is given of twelve of the principal forest-plants of the island.

1889. *Lord Howe Island: its Zoology, Geology, and Physical Characters.* Memoir No. 2, Australian Museum, Sydney. This volume consists of the reports on the collections made by a party, despatched by the Australian Museum to Lord Howe Island, in August-September, 1887. It is illustrated by seven plates and four maps. In Report No. 5, "The Physical and Geological Structure of Lord Howe Island," by R. Etheridge, there is a short general account of the vegetation; while the same author, in Report No 1, "The General Zoology of Lord Howe Island," makes some remarks about the *Ficus* and four species of palms found on the island.

1893. C. MOORE and E. BETCHE, *Handbook of the Flora of New South Wales.* Sydney. At page 518 there is a "List of Lord Howe and Norfolk Island Plants excluded from the Descriptive Part of the Flora." Lord Howe Island is credited with sixty-seven species, one of which, *Marsdenia tubulosa*, I treat as identical with *M. rostrata.*

1893. R. TATE, "The Geographic Relations of the Floras of Norfolk and Lord Howe Islands," *Macleay Memorial Volume*, p. 205. The author discusses the relationships of the genera and species, regarding "Lord Howe Island as a companion outlier to Norfolk Island of the New Zealand region" Tate's list is a compilation which unfortunately contains many mistakes. Altogether 207 species are listed as occurring in Lord Howe Island. (I reduce his list to 189 indigenous species by transferring four to the list of introduced plants, omitting thirteen, and reducing *Marsdenia tubulosa* to the synonymy of *M. rostrata.*)

1896. J. DAVEAU, "Dichogamie Proterandre chez le *Kentia (Howea) Belmoreana*," *Journ. Botanique.*

1896. W. B. HEMSLEY, "The Flora of Lord Howe Island," *Ann. Bot.* x, p. 22. This is the most complete account of the plants of Lord Howe Island that has yet appeared. Besides a list of the species, giving references and distribution, there is a discussion on the origin of the flora. Hemsley's list contains 210 names, besides *Pandanus* sp indet. (and, in a supplementary note, two names taken from Tate's list). (I have transferred five of Hemsley's species to the list of introduced plants, omitted eleven altogether, and consider *Marsdenia tubulosa* the same as *M. rostrata.* This leaves 193

indigenous species accepted in my list. Of the two species added from Tate's list I omit *Aspidium decompositum.*)

1898. J. H. MAIDEN, "Observations on the Vegetation of Lord Howe Island," *Proc. Linn. Soc. N.S.W.* 23, 112. Mr. Maiden visited Lord Howe Island in March-April, 1898, in H.M C.S. "Thetis" His paper only enumerates those plants about which he has some information to add, besides which he gives a list of introduced plants and some bibliographical notes. (Altogether 100 species are dealt with, of which twenty are listed as introduced, four could not be identified, four are Hemsley's names recommended to be removed, three I consider to be introduced, and *Asplenium Robinsoni* I treat as a form of *A. nidus,* thus leaving sixty-eight indigenous species, of which eight are additions to Hemsley's list. Of Maiden's introduced plants I include in my list as indigenous *Bidens pilosa, Solanum aviculare,* and *S nigrum*—this last an addition to Hemsley's list.)

1899. J. H. MAIDEN, "Some Further Observations on the Vegetation of Lord Howe Island," *Proc. Linn. Soc. N.S.W.* 24, 381. Four species are mentioned, including the Lord Howe Island variety of *Dendrobium gracilicaule,* which is described as new (*howeanum*).

1901. J. H. MAIDEN, "On one of the So-called Honeysuckles of Lord Howe Island," *Proc. Linn. Soc. N.S.W.* 26, 156 (*Guioa coriacea* Radlk.)

1902. J. H. MAIDEN, "On a New *Cryptocarya* from Lord Howe Island, together with Notes on other Plants from that Island," *Proc. Linn Soc. N.S.W.* 27, 347. Seven species are mentioned, including *Cryptocarya Gregsoni* Maiden n. sp., *Rapanea myrtillina* Mez

1906. A. THELLING, "Die Gattung *Lepidium* (L.)" Zurich. Describes as new *L. howei-insulae.*

1907. W. B. HEMSLEY, *Kew Bulletin,* p. 56. Describes as new *Dysoxylum pachyphyllum*

1913. W. W. WATTS, "The Ferns of Lord Howe Island," *Proc Linn. Soc N S.W.* 37, 395 Mr. Watts visited Lord Howe Island in July-August, 1911, and made a special study of the ferns. In his paper he admits forty-one species, of which two (*Asplenium howeanum* n sp. and *Ophioglossum vulgatum*) are additions to the flora.

1914 J. H MAIDEN, "Further Notes on the Botany of Lord Howe Island," *Proc Linn Soc N.S.W.* 39, 377 Notes are given on sixteen species, including *Plantago Hedleyi,* described as new. There is also a list of twenty-four species collected by Mr Hedley in September, 1908

1914 W W. WATTS, "Additional Notes on the Ferns of Lord Howe Island," *Proc Linn Soc. N S W.* 39, 257. Notes on eleven species, describing as new *Polystichum Whiteleggei* and *P Kingii*

1916. W. W WATTS, "Two Lord Howe Island Polypodia," *Proc Roy. Soc N.S.W.* 49, 385. Two species described as new, *P. pulchellum* and *P howeanum.*

VII. SPECIES OMITTED

In addition to the names relegated to synonymy in the systematic account, the following are omitted altogether, the species with which some are considered to be confused being indicated in parentheses —

Aspidium decompositum: Tate, *Macleay Mem Vol.* 218, 1893.

Cheilanthes tenuifolia: F Muell., *Fragm Phytogr Austr.* ix, 78, 1875; Bentham; Tate; Hemsley. (= *Notochlaena distans*)

Polypodium punctatum: Bentham, *Fl Austr* vii, 764, 1878; Tate, Hemsley. (= *Hypolepis tenuifolia*)

Davallia dubia: Bentham, *Fl. Austr.* vii, 716, 1878; Tate; Hemsley. (= *Hypolepis tenuifolia.*)
Davallia flaccida: Moore, *Lord Howe Id. Official Visit,* 26, 1870.
Pteris Milneanum: Moore, *Lord Howe Id. Official Visit,* 26, 1870.
Stipa micrantha: Hemsley, *Ann. Bot.* x, 258, 1896. (= *Dichelachne crinita.*)
Chloris pumilio: Moore, *Lord Howe Id. Official Visit,* 26, 1870; Hemsley.
Smilax purpurata: Tate, *Macleay Mem. Vol.* 217, 1893.
Peperomia leptostachya: Tate, *Macleay Mem. Vol.* 217, 1893.
Celtis paniculata: Tate, *Macleay Mem. Vol.* 219, 1893. (= *C. amblyphylla.*)
Elaeodendron australe: Hemsley, *Ann. Bot.* x, 234, 1896. (= *E. curtipendulum.*)
Calophyllum inophyllum: Hemsley, *Ann. Bot.* x, 232, 1896.
Nephelium semiglaucum: Tate, *Macleay Mem. Vol.* 220, 1893. (= *Guioa coriacea.*)
Cupania anacardioides: Hemsley, *Ann. Bot.* x, 234, 1896. (= *Guioa coriacea.*)
Xanthoxylum howeanum: Tate, *Macleay Mem. Vol.* 220, 1893.
Myrsine crassifolia: F. Muell., *Fragm. Phytogr. Austr.* viii, 48, 1873; Tate; Hemsley (= *Rapanea platystigma.*)
Sideroxylon australe: Tate, *Macleay Mem. Vol.* 220, 1893. (= *S. howeanum.*)
Plantago varia: F. Muell., *Fragm. Phytogr. Austr.* ix, 78, 1875; Hemsley.
Ipomoea bona-nox: F. Muell., *Fragm. Phytogr. Austr.* ix, 74, 1875; Tate; Hemsley. (= *I. grandiflora.*)
Brachycome diversifolia: Tate, *Macleay Mem. Vol.* 221, 1893. (= *B. segmentosa.*)

ART. IX.—*Botanical Results of an Excursion to the Upper Makarora Valley and the Haast Pass, supported by a List of the Species observed.*

By D. L. POPPELWELL.

[*Read before the Otago Institute, 1st August, 1916; received by Editors, 30th December, 1916; issued separately, 9th July, 1917.*]

DURING the Christmas and New Year holidays of 1915–16 a party of four, consisting of Messrs. G. Biggar, of Gore, O. V. Davies and C. Seelye, of Dunedin, and myself, visited the Upper Makarora Valley and Haast Pass with the object of examining the flora and vegetation of that area. The locality is of special interest from a phytogeographical point of view inasmuch as it was supposed to form the connecting-link between L. Cockayne's Western and Fiord South Island Botanical Districts. (See p. 65 of this volume, where the whole of Cockayne's proposed "districts" are defined.) An investigation of the flora was therefore of great importance from the standpoint of plant-distribution, since up to the present, so far as I know, no botanical work whatever has been undertaken in the above area.

The Haast Pass is situated about seventeen miles from the head of Lake Wanaka, and is reached by following the Makarora River up to the junction of the Fish River with the main stream. The Fish River is then followed until the pass is encountered. The saddle is only about 1,850 ft. above sea-level, and is clothed in forest. It is the watershed between the Fish River and the Haast.

In addition to examining this forest, we climbed the mountains above the east side of the pass, reaching a height of 6,000 ft., noting the plant-covering as we went. The upper line of the forest is about