

AUSTRALASIAN ANTARCTIC EXPEDITION

1911-14.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, D.Sc., B.E.

SCIENTIFIC REPORTS.

SERIES C.—ZOOLOGY AND BOTANY.

VOL. VII. PART 5.

ECOLOGICAL NOTES AND ILLUSTRATIONS
OF
THE FLORA OF MACQUARIE ISLAND

BY
H. HAMILTON, A.O.S.M.

NINETEEN PLATES. TWO IN COLOURS.

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PREFACE.

WHEN the late Mr. T. F. Cheeseman prepared his report on "The Vascular Flora of Macquarie Island," which constitutes Part 3 of this volume, photographic records made by Mr. Harold Hamilton and other members of the Australasian Antarctic Expedition were not available. This unfortunate circumstance arose from the fact that the bulk of the Macquarie Island negatives were found to be missing at that time. On return of the parties to Australia, at the conclusion of field operations early in the year 1914, the negative collection of the Expedition was placed for copying and co-ordination in the hands of Mr. Frank Hurley, who had occupied the post of official photographer to the Expedition. His sudden departure later in the year as a member of Sir Ernest Shackleton's Second Antarctic Expedition resulted in temporary chaos in the matter of the negatives referred to. Though the bulk of these were taken over by me in the following September from their repository, the illustrations relative to the scientific observations of the Macquarie Island party were not forthcoming until the return of Frank Hurley to Australia in 1919, when he fortunately discovered their whereabouts.

Upon Mr. Harold Hamilton's return from active service he supplied notes describing a number of the more important photographs illustrating the flora. These notes and photographs, which constitute a distinct addition to the ecology of the locality, constitute this present publication and should be read in conjunction with the general account of the flora presented by Mr. Cheeseman.

Mr. Hamilton, the author of this part, is himself photographically represented in Plate I, where he is seen as the figure to the right resting upon a barrel of stores just previously floated ashore from the relief ship.

D. MAWSON.

ECOLOGICAL NOTES AND ILLUSTRATIONS OF THE FLORA OF MACQUARIE ISLAND.

By HAROLD HAMILTON, Dominion Museum, Wellington.

INTRODUCTION.

It is to be regretted that the illustrations herein presented were not available in time for illustrating Mr. Cheeseman's contribution to these reports "The Vascular Flora of Macquarie Island." As now presented, only very short descriptive references are supplied. For further detail reference should be made to Mr. Cheeseman's paper, where also a general map of the Antarctic and Subantarctic Regions is provided, in which the actual location of Macquarie Island is figured. For fixing the localities of the various photographs presented a map of the Island is herein included.

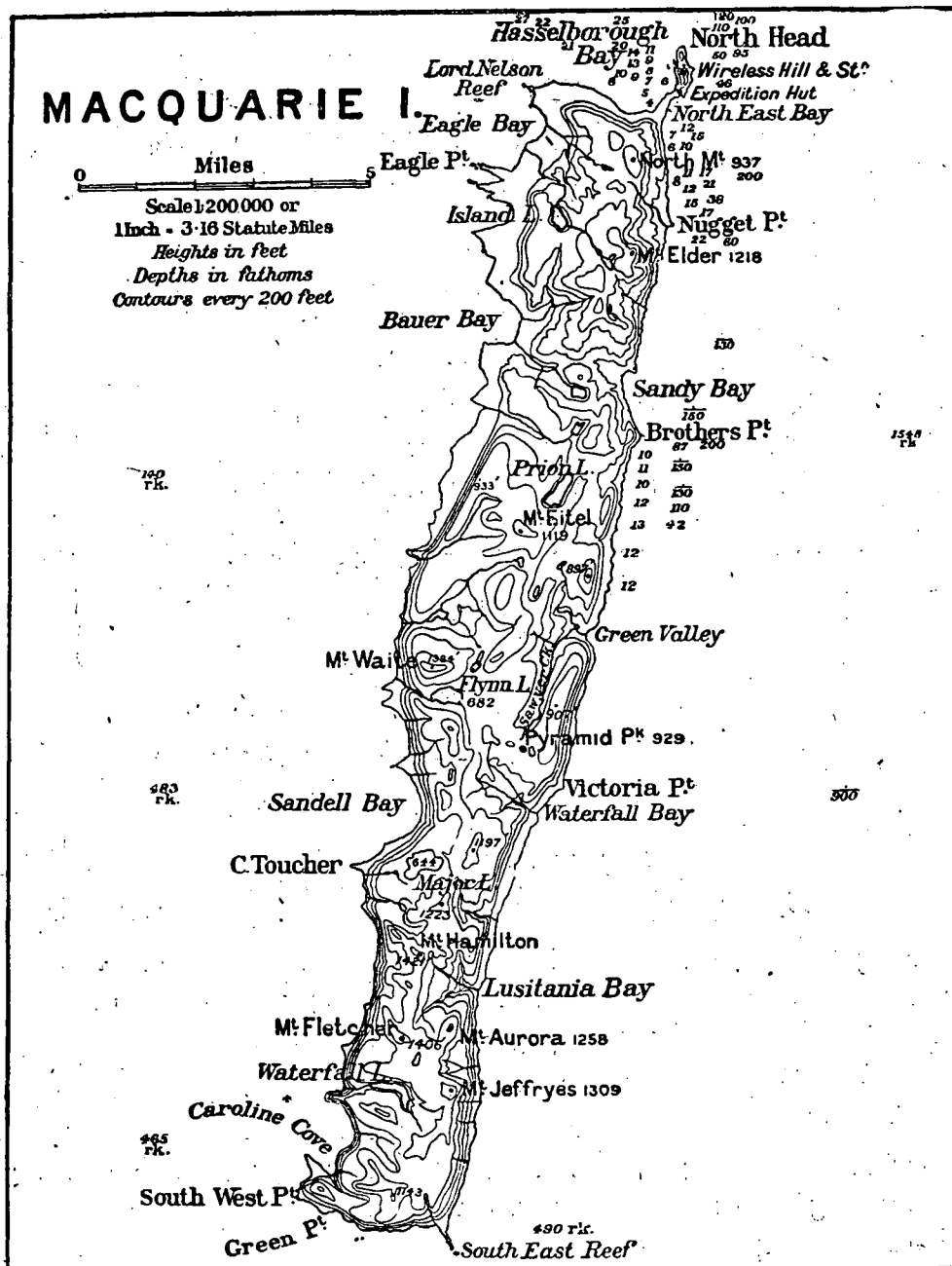
The more conspicuous members of the native flora are all photographically represented herein. In the immediate vicinity of the several old sealing stations on the East Coast certain introduced plants have become established. Such introduced species, though fairly conspicuous in their growth, do not figure in this series of views, which is limited to the native flora. The introduced forms are *Poa annua*, *Stellaria media*, and *Cerastium triviale*. These grow abundantly around the huts and boiling-down works at the Nuggets, also at Lusitania Bay and South-East Harbour.

In a general consideration of the plant life of the Island there are to be distinguished three distinct zones based on the topographical form of the land and exposure or otherwise to the prevalent gales of that latitude. These three fundamental zones are as follow:—

- (1) *Raised terraces at and near sea-level.*—Such situations are less exposed to the wind than the higher land. Also the soil is greatly enriched on these terraces by the guano of bird and seal life, which fact reflects upon the luxurious growth of rank vegetation typical of such situations. Furthermore, these flats are sodden with moisture and traversed at intervals by trickling streams. In certain places whole acres are in a state no better than a bog.

Here *Poa foliosa*, *Stilbocarpa polaris* and *Pleurophyllum hookeri* luxuriate. These three plants are the most characteristic element in the vegetation of Macquarie Island.

A typical view of wet, West Coast terrace land is presented in Plate V. Within that view are many small ponds and lakes scattered over the low-lying area. Also prominent in this region are quaking swamps covered with a mat of *Coprosma repens*, *Pleurophyllum hookeri*, and various grasses. *Coprosma repens*, it should be recorded, is a splendid example of a mat-former, especially in the wind-swept marshes of the West Coast.

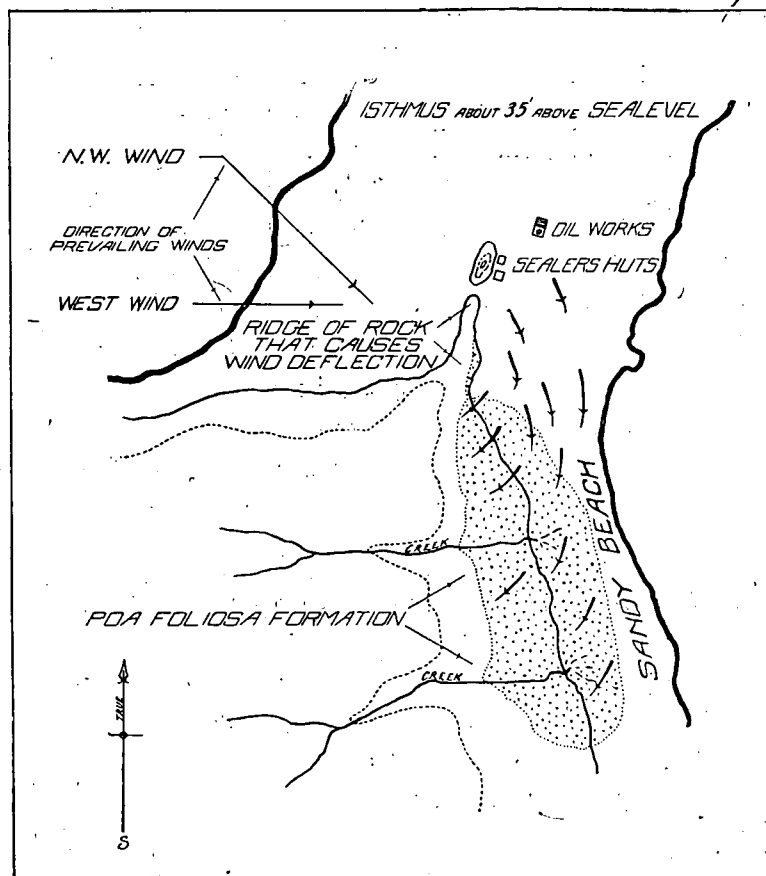


2. The hill sides, on which the vegetation is still rich, but less abundant and more dwarfed at increasing heights and actually scanty in the most exposed situations. *Poa foliosa* is the most conspicuous element, but in sheltered situations a wide range of plant forms exist.

3. *The Summit of the Island.*—This is so wind-swept that the vegetation is much reduced. Where fully exposed to the gales it is a wind desert of a semi-bare character. The drying effect of the wind is disastrous to many forms of the plant life.

The most conspicuous member of the vegetable associations here is *Azorella selago*, which is frequently arranged along the face of small stony terraces as figured in Plates IX and X.

A further effect of the prevailing wind is illustrated in Plate VIII, in which *Scribocarpa polaris* is seen to be distributed in long wind lanes.



Another result of the wind on the vegetation is illustrated in Plate XVII and the sketch section here included, which is explanatory of that plate. Note, however, that the photo is taken looking south, whereas the sketch map is oriented in the reverse direction. The sand patch A indicated in the plate and hatched in the sketch is the only sand area on the Island. It owes its existence to deflection of the prevailing westerlies by a rocky ridge, the sand being drawn up on to the lower slope of the hills. The only vegetation on these sand slopes is an occasional patch of *Poa foliosa*. The plant formation is gradually being killed by the advancing sand.

In view of the interest attaching to temperature observations* in connection with *Azorella* masses a series of such measurements was made as detailed below. The

* See these Reports, Vol. VII, Pt. 3, p. 26.

first three series of temperatures were taken by G. F. Ainsworth and H. Hamilton in conjunction on the 4th February, 1913, at an elevation of about 500 feet above sea level at the top of Gadget Gully, on the north-east end of the mainland mass of the Island. On that occasion there was a fresh north-west wind blowing and zenith clear of cloud.

The fourth series of temperatures was recorded by H. Hamilton on 3rd May, 1913, in the vicinity of Island Lake on the highlands in dull foggy weather with but little wind.

TEMPERATURES OF *Azorella selago* CUSHIONS.

Experiment.	1.	2.	3.	4.
Air temperature	46.8° F.	46.8° F.	47.0° F.	38.2° F.
<i>Azorella</i> in shade or sun	In sun.	In shade.	In sun.	Dull, foggy
Temp. of <i>Azorella</i> , thermometer submerged to 5½ in.	45.0° F.	43.9° F.	45.3° F.	37.0° F.
„ ground 1 ft. away at depth of 3½ in. ...	47.0° F.	43.9° F.	44.4° F.	39.3° F.
„ „ „ „ 5½ in. ...	43.9° F.	42.6° F.	43.0° F.	38.9° F.
„ „ „ „ 8½ in. ...	44.0° F.	42.3° F.	42.1° F.

No doubt the nature of the soil, its colour as compared with that of the plant (affecting absorption of sun's rays), the degree of moisture present, the meteorological conditions, the time of day and season of the year, are all factors that play a part in the comparative temperatures recorded. Accepting all these variables as influencing the result, it seems probable that there is, on the average, a higher temperature gradient within the *Azorella* clumps than in the adjacent soil.

These notes would not be complete without special reference to *Poa foliosa*, locally known as "tussock grass," which is the most important constituent of the vegetation of Macquarie Island. It is well illustrated in Plate I, where it is seen luxuriating on the rich soil of an old raised beach, a few feet above sea level, adjacent to the pebbly beach of Hasselborough Bay at the north end of the Island. In this illustration it is observed growing in clumps over all the terrace and extending in the background far up the hillsides into the mist-enshrouded highlands.

This remarkable grass forms huge tussocks which, when growing in extremely wet ground or standing in running water, become so enormously developed as to stand perched on tall stools or trunks several feet in height. It forms "nigger heads" on small creeks traversing the lowland flats, examples of which may be seen in the middle distance on the left of the view in Plate V.

Near the shore line in localities specially favoured by seal life deep and treacherous bogs, a few feet across, where the sea-elephants wallow and slumber, separate the individual tussocks.

In sheltered localities on the steep slopes *Poa foliosa* may be met with in pendant masses, not erect as in exposed situations. This form appears gracing the steep gully sides in Plate VI.

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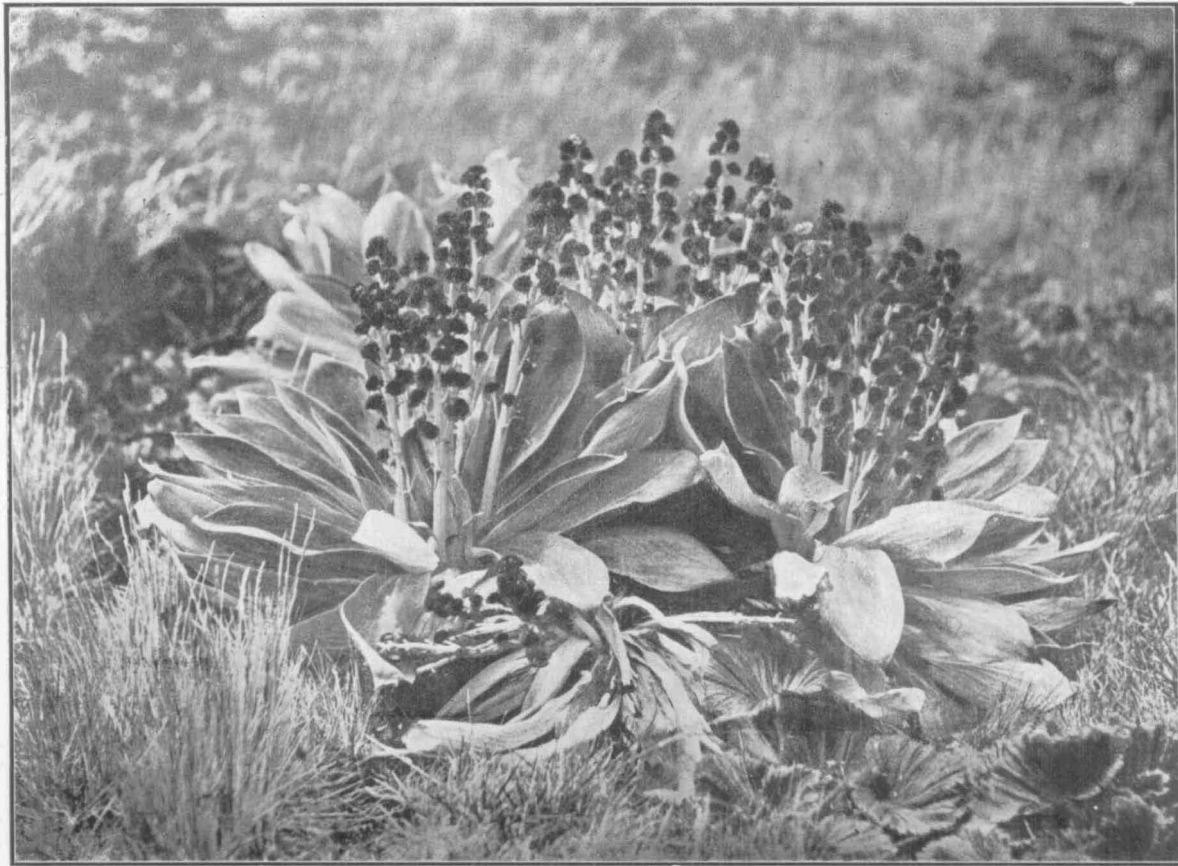
PLATE XVIII.—Fig. 1.—The giant kelp *Durvillaea antarctica* writhing in the surge of the ocean. *Photograph by D. MAWSON* 26

Fig. 2.—A close view of *Durvillaea antarctica* piled on the rocks. *Photograph by D. MAWSON* 26

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Terrace grassland fringing the rocky beachline of Hasselborough Bay.



A clump of *Pleurophyllum Hookeri* in flower on a low-lying coastal platform, on the 19th January, 1913.

The grass at the left is *Agrostis magellanica*. *P. Hookeri* is a handsome plant with sage-green leaves and purple flowers. It is abundant and widely distributed on the Island, its habitat ranging from coastal platform to wind-swept plateau.



Fig. 1.—A ring of young *Pleurophyllum Hookeri* plants growing around the dead parent root.

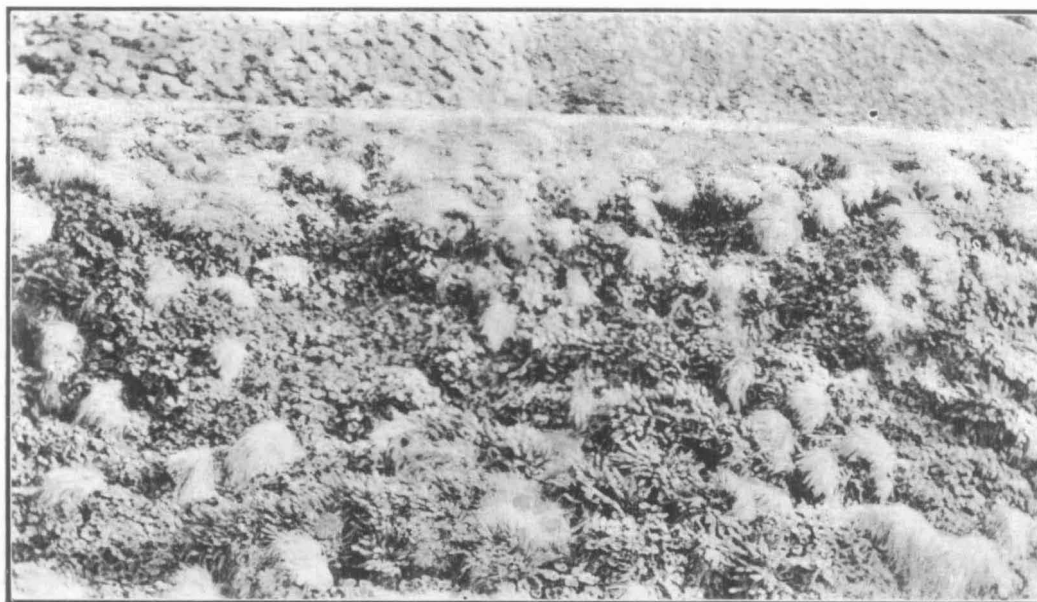
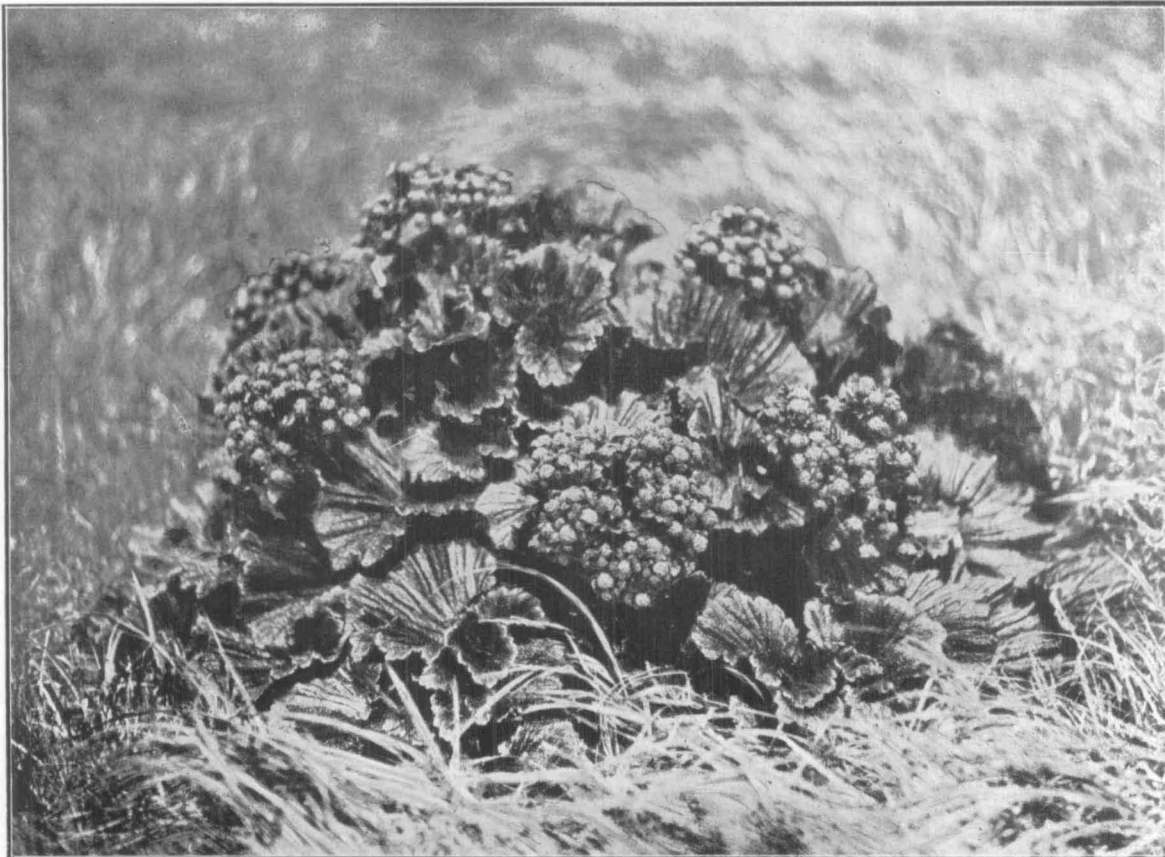


Fig. 2.—A fluvial terrace above Sandy Bay.

View taken from a terrace over the creek which is in the foreground out of the picture.

On the steep creek sides are strong growths of *Pleurophyllum Hookeri*, *Poa foliosa*, *Stilbocarpa polaris*, *Lomaria penna-marina*, *Aspidium vestitum*, and *Acena adscendens*. On the terrace itself small, single plants of *P. Hookeri* are leading, growing in water, very often. On the far hill side the *P. foliosa* and *S. polaris* are predominant.



Stilbocarpa polaris showing the flower heads.

A remarkable and handsome plant with bright green leaves. Noted to be in seed on February 8th, 1912. Found all over the Island growing in large patches, but stunted in the more elevated localities.

It is sometimes referred to as "Macquarie Island Cabbage," though it rather resembles a rhubarb plant. Its fleshy stems may be eaten as a poor substitute for vegetables. It proved an excellent fodder plant for the few sheep brought to the Island; they showed a great partiality for it and fattened on it.



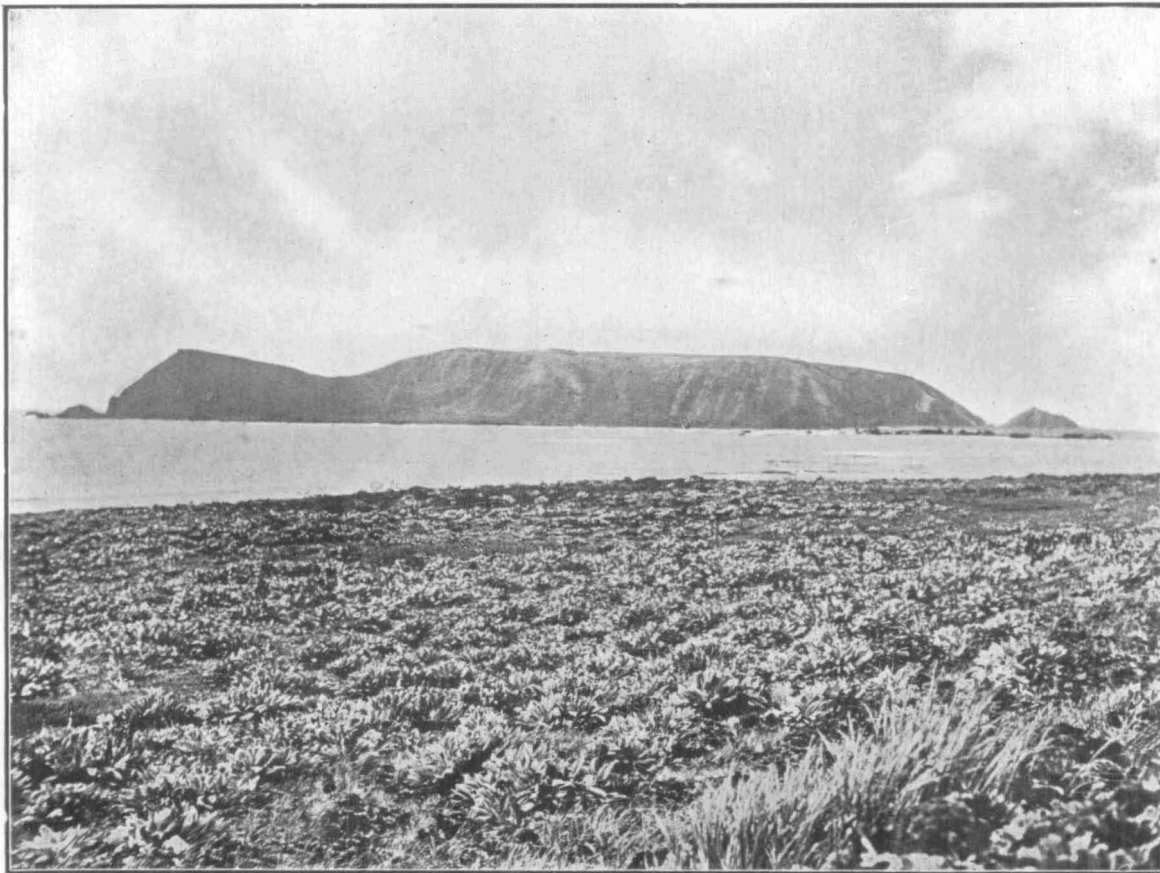
View looking South from West Point

Raised beach terraces prominent, covered with *Stilbocarpa polaris*, *Poa foliosa* and *Agrostis magellanica*.



Waterfall Creek, on the Eastern side of the Island.

The steep sides covered with *Poa foliosa*, encircling patches of *Stilbocarpa polaris*.



A *Pleurophyllum Hookeri* meadow or association at West Point.

View looking north-east from West Point showing the north end of the Island. In the foreground a raised beach sloping gradually to the foothills on the right. There is very little *Stilbocarpa polaris* in this association, it being almost solely *Pleurophyllum Hookeri*.



Looking directly at West Point from the slopes of the foothills.

A coastal platform about 30 feet in elevation above sea-level. Most of this area is a quaking swamp, possible to walk over in most places. The lines of *Pleurophyllum Hookeri*, well seen in the foreground, show the direction of the prevailing westerly winds. The seeds are distributed down wind, and the seedlings are sheltered in the lee of the parent plants. The dark patches in the middle distance are slight mounds covered with *Stilbocarpa polaris* and *Acena adscendens*, *Coprosma repens* and *Juncus scheuchzerioides* form a springy cushion between the *P. Hookeri* rows.



Fig 1.—A *Pleurophyllum Hookeri* meadow on the summit of Wireless Hill at the northern extremity of the Island.
In flower October 28th, 1912.

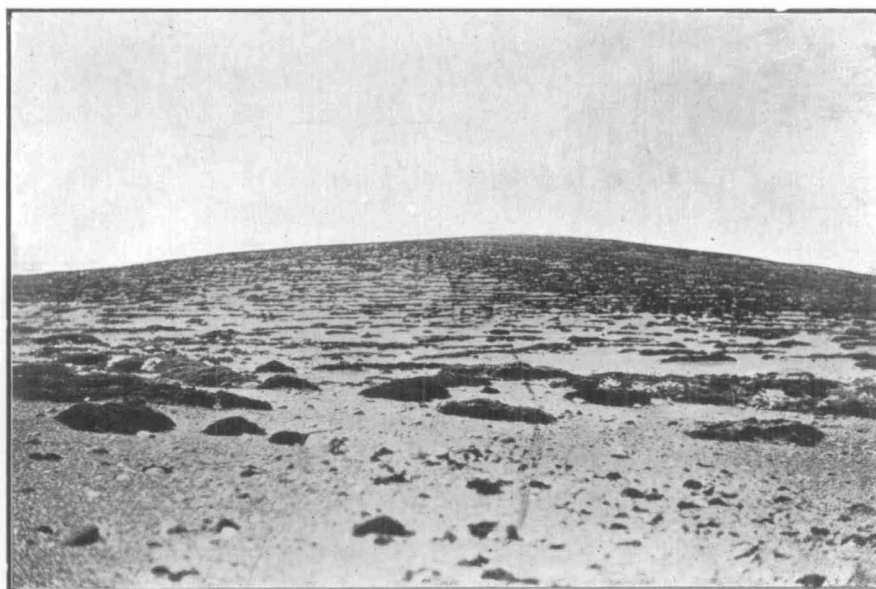
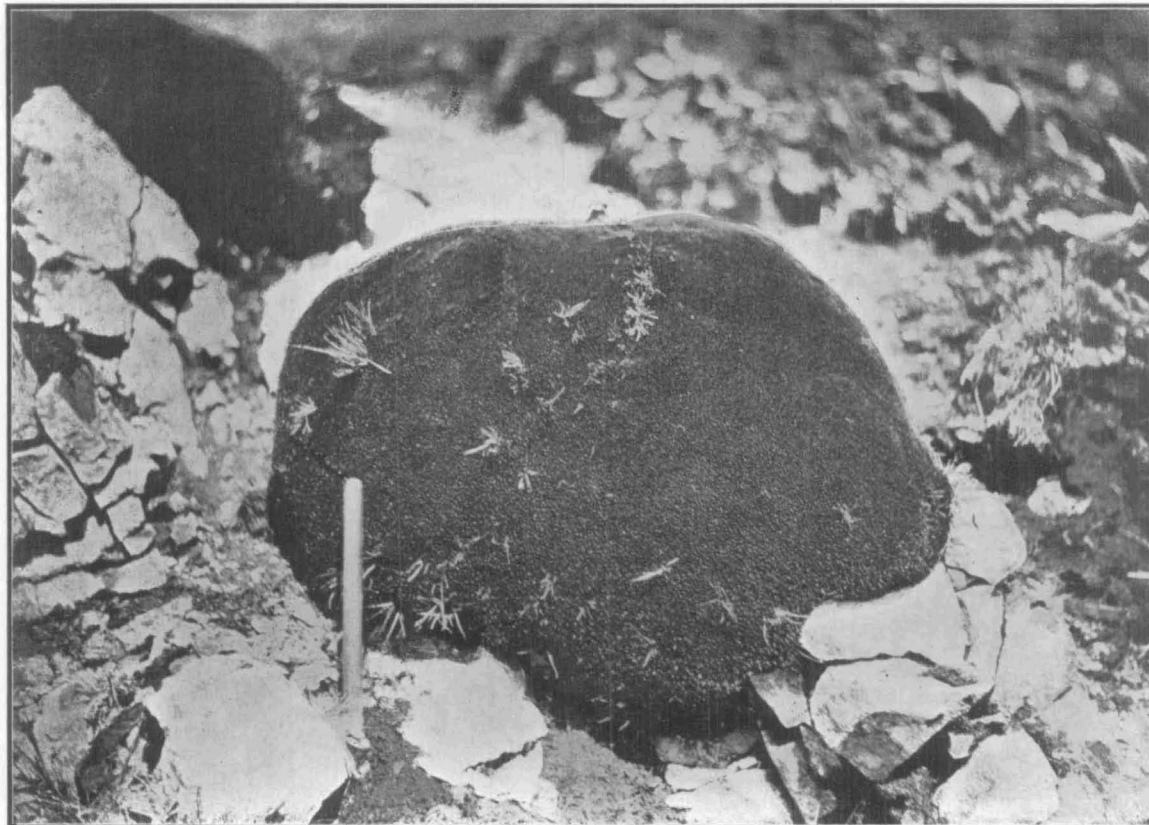


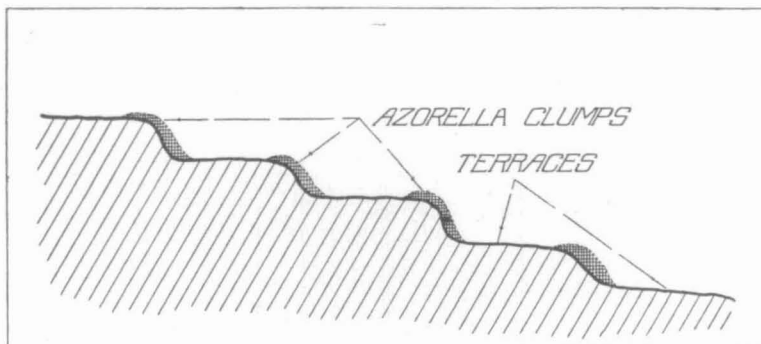
Fig 2.—The highest point of the upland wind desert.

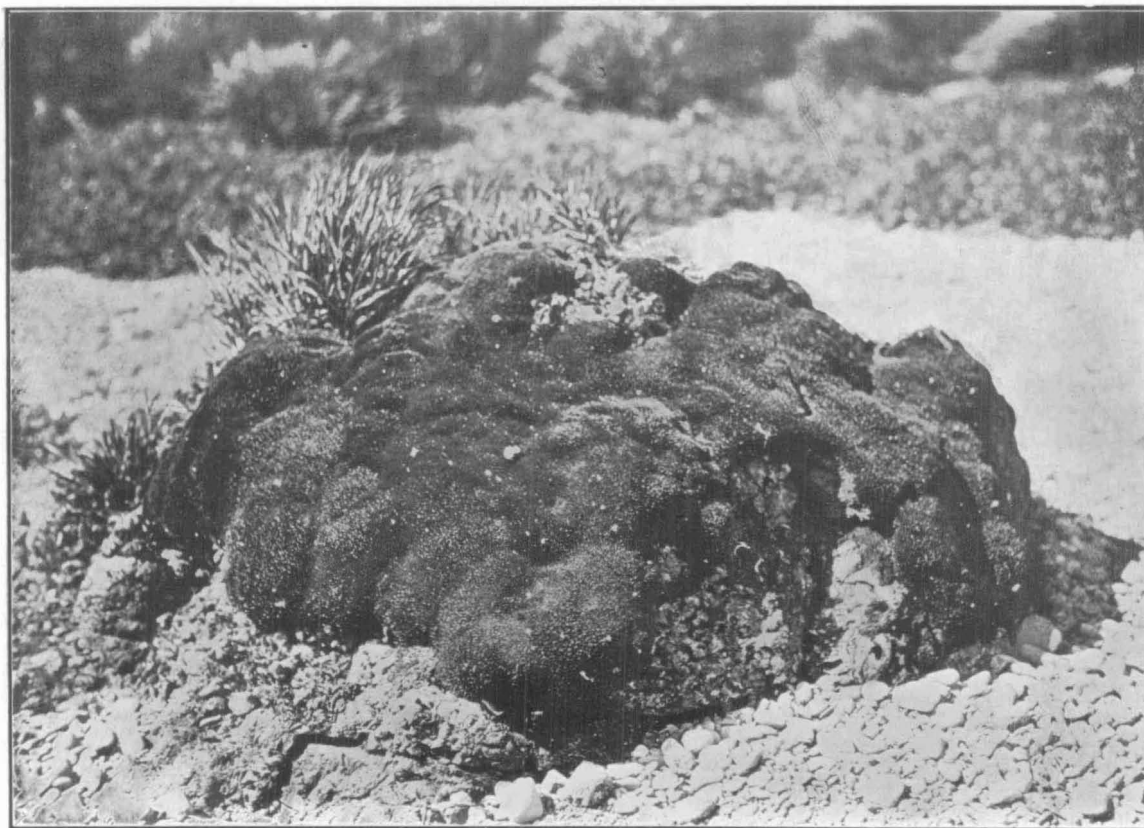
The stunted plants *Azorella selago*, *Pleurophyllum Hookeri*, mosses and grasses survive only in terraces and lines lying parallel to the direction of the prevailing wind.



A cushion of *Azorella selago*.

Note thermometer case for scale. Flowers seen on the West Coast on November 7th, 1912. This plant assumes bright green convex masses or cushions of stems and leaves. This form is very resistant to the wind, and though distributed throughout the Island figures most conspicuously in the wind-swept areas. It assumes cushions of large dimensions, some were noted to occupy an area of 35 square feet, the cushion being unbroken and standing 2 feet above the ground level. On the true upland wind desert this plant occupies acres in extent, but is broken up into small patches separated by bare stony ground. On these "wind terraces" the *Azorella* occupies the slopes between two successive terraces as indicated in the sketch herewith.





A cushion of *Colobanthus muscoides* several feet across growing on a rock on the shingle beach just above high-water mark, 15 yards from the sea.

Photo at the north end of Macquarie Island. It was actually in flower when photographed. *Poa Hamiltoni* (?) is seen in association with it. Out of focus in the background is seen a fringe of *Cotula plumosa* bordering the *Poa foliosa* formation.



An old glacial moraine field on the summit of the Island, towards the north end.

Large boulders covered with black moss, the smaller rocks bound together and covered with *Azorella selago* and *Colobanthus muscoides*. The *P. Hookeri* and other plants (grasses, &c.) are stunted and dwarfed by the altitude (1,100 feet) and wind effects.



The fern *Aspidium vestitum* growing in a sheltered locality at South East Harbour.
The largest fronds would be 4 feet long. *Silbocarpa polaris* surrounds the clump.



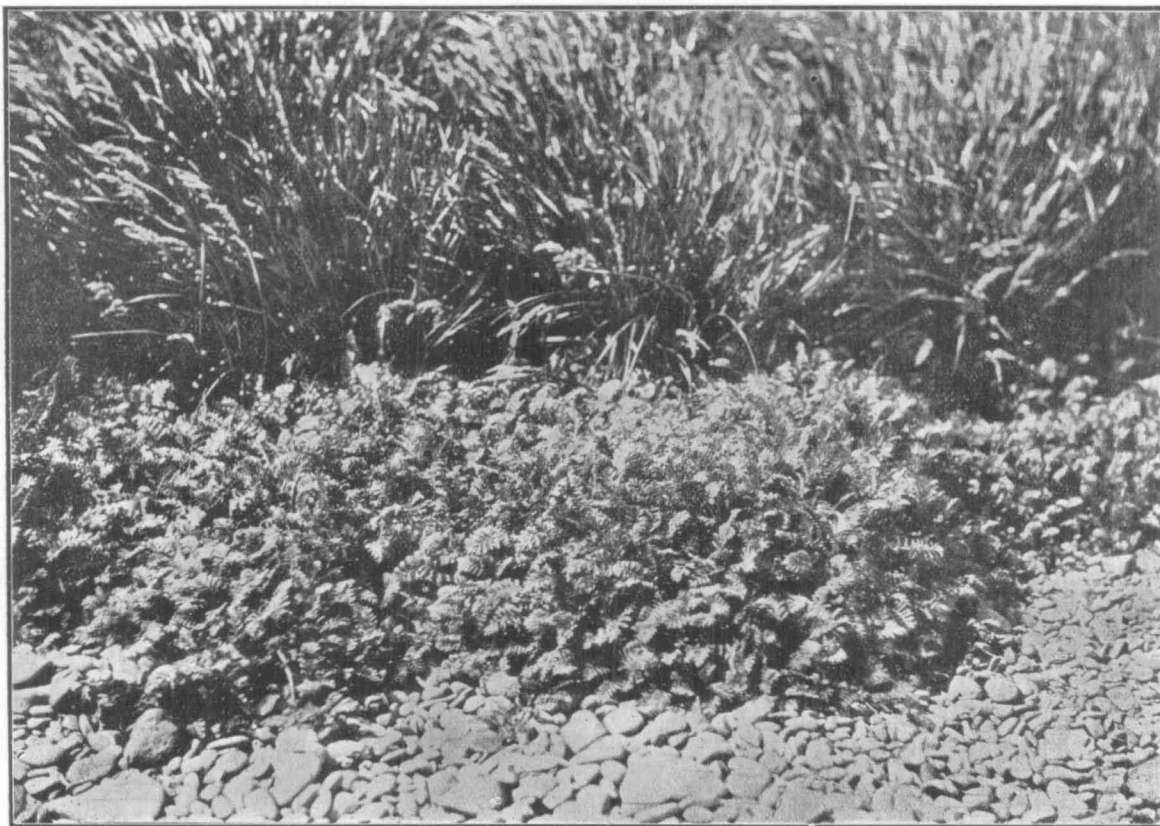
Asbidium vestitum growing amongst *Poa foliosa* in the neighbourhood of the Nuggets.

This fern has a wide distribution in sheltered localities throughout the Island.



A luxuriant growth of *Acæna adscendens* surrounding a plant of *S. polaris*.

This growth is on a peat knoll such as are met with on the terrace near West Point. This is a rubescent plant, common near the sea, but ascending to a considerable height on the hill sides, where, however, it is somewhat dwarfed. It assumes the mat form in situations unprotected from the wind.

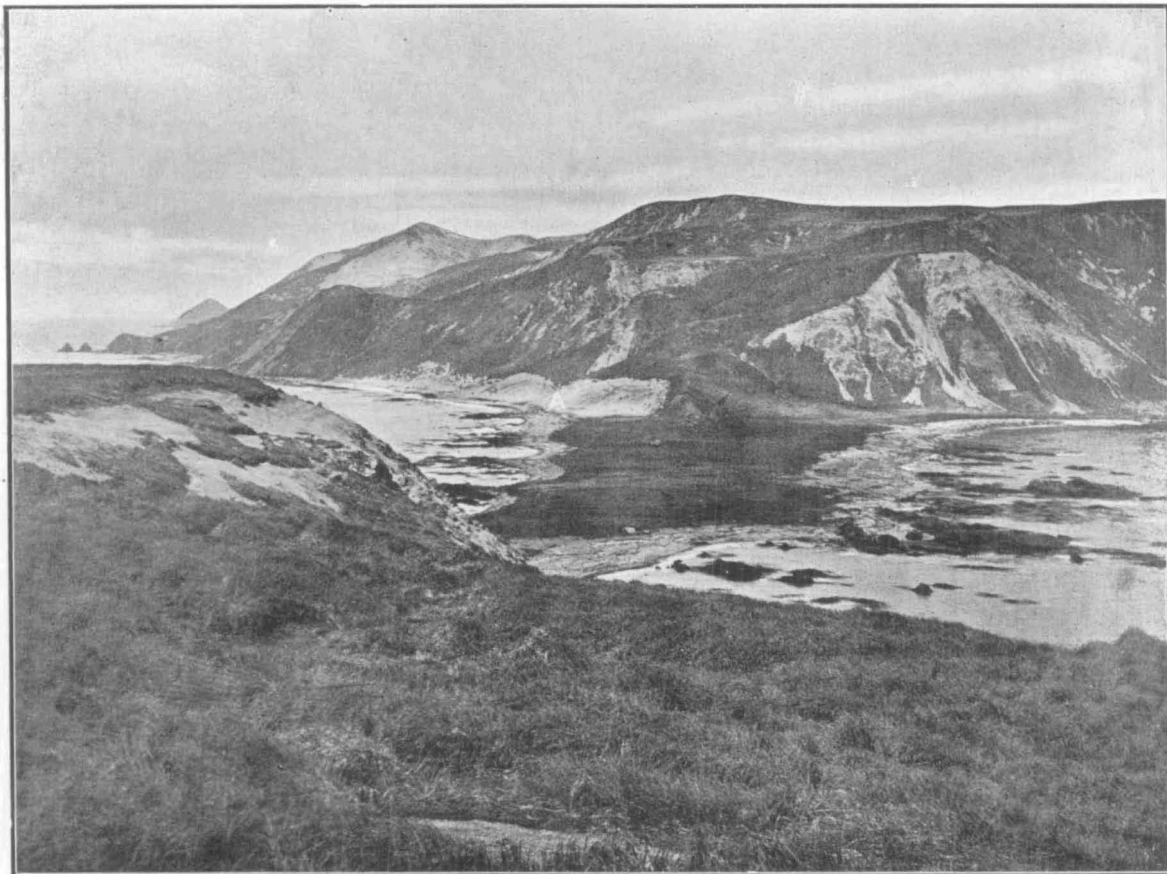


A fringe of *Cotula blumosa* separating the Stony Beach (in foreground) from the *Poa Hamiltoni* and *Poa foliosa* associations.



This plant is found as luxuriant blue-green patches on the coastal flats. It is abundant along the shore on rocks or gravel or in grassy places, but never far from the sea.

In its early stages this plant assumes a definite "rosette" form as shown in sketch. On a track cleared through the tussock in the autumn of 1912, young *Cotula* plants appeared keeping their rosette form until about 3 inches in diameter. They then began to ramify.



View looking south from the North End (Wireless Hill), showing the isthmus connecting with the mainland.

Above the beach, at the spot marked "A," is the only sand area on the Island. This accumulation of sand is effected by the westerly winds deflected as indicated in the sketch map on page 7. The only vegetation on that sandy slope is an occasional patch of *P. foliosa*. The plant formation is gradually being killed by the advancing sand. On the sea beach below, *Cotula plumosa* makes a small stand.

The top of Wireless Hill (in the foreground) is flat, boggy in places, and contains areas of peat. The predominant plant covering here is *P. foliosa*.



Fig 1.—Masses of the giant kelp *Durvillaea antarctica* writhing in the surge of the ocean swell amongst rocky reefs bordering Hasselborough Bay.

This giant marine alga is a most conspicuous feature of the rocky coast line. It grows attached to the rocks at one end and floats upwards, yards in length, towards the surface. So thickly and rankly is it matted along some portions of the coast, that the sea-elephants often find difficulty to force a passage through it to the land.

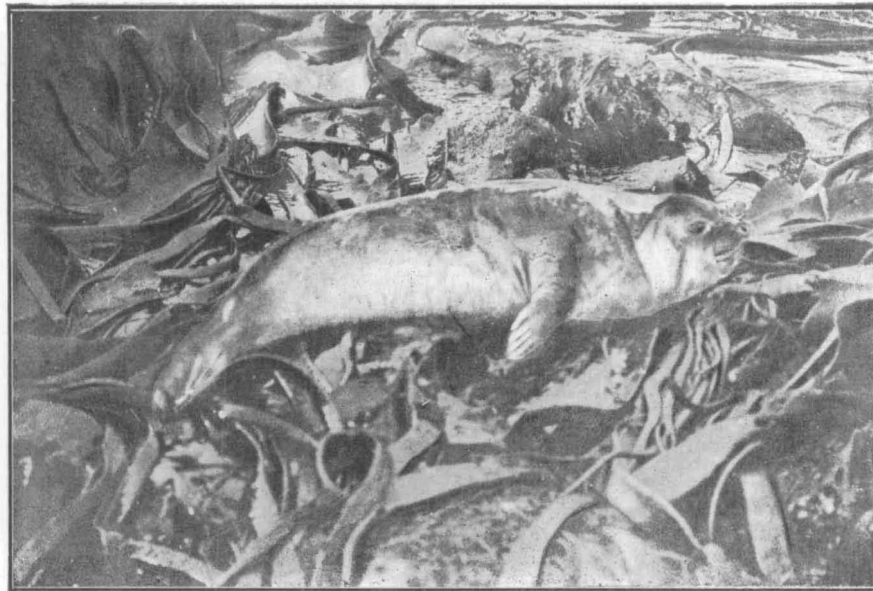


Fig. 2.—A close view of *Durvillaea antarctica* piled on the rocks at low tide.

A baby sea-elephant is seen basking thereon.



The lichen covered boulders of an elevated beach. North end of Macquarie Island.

The two green patches are mats of *Colobanthus muscoides*.

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TICKS	Prof. L. HARRISON, B.A., B.Sc., University, Sydney.
PYCNOGONIDA	Prof. T. T. FLYNN, D.Sc., University of Tasmania, Hobart.
TUNICATES (COMPOSITE)	Prof. Sir W. A. HERDMAN, F.R.S., D.Sc., University, Liverpool, England.
BIRDS	H. HAMILTON, Dominion Museum, Wellington, N.Z., and R. BASSET HULL, Sydney.
MAMMALS	H. HAMILTON, Dominion Museum, Wellington, N.Z.

BOTANY.

**PHYTOPLANKTON AND FRESH-WATER
ALGÆ**

A. MANN, National Museum, Washington.