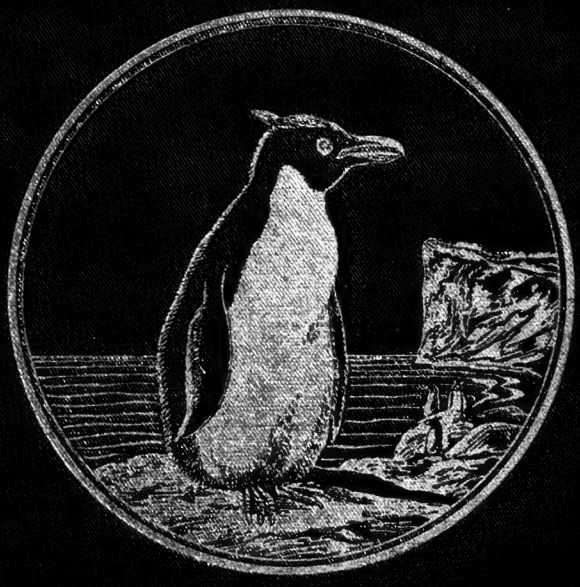

THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

VOL. I.

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THE

SUBANTARCTIC ISLANDS

OF

NEW ZEALAND.

REPORTS

ON THE

GEO-PHYSICS, GEOLOGY, ZOOLOGY, AND BOTANY OF THE ISLANDS LYING TO THE SOUTH OF NEW ZEALAND,

BASED MAINLY ON

OBSERVATIONS AND COLLECTIONS MADE DURING AN EXPEDITION IN THE GOVERNMENT STEAMER "HINEMOA" (CAPTAIN J. BOLLONS) IN NOVEMBER, 1907.

EDITED BY

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IN TWO VOLUMES.

VOL. I.

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1909.

Issued 22nd December, 1909.

" The remoteness of these islands from any continent, together with their inaccessibility, preclude the idea of their being tenanted, even in a single instance, by plants that have migrated from other countries, and still more do they forbid the possibility of man having been an active agent in the dissemination of them. On the contrary, the remarkable fact that some of the most peculiar productions are confined to the narrowest limits is a strong argument in favour of a general distribution of vegetable life over separate spots on the globe. Hence it will appear that islands so situated furnish the best materials for a rigid comparison of the effects of geographical position and the various meteorological phaenomena on vegetation, and for acquiring a knowledge of the great laws according to which plants are distributed over the face of the globe."

—*J. D. Hooker, " Flora Antarctica," vol. i, Introduction ; 1st May,* 1845.

" Il semble que les îles Auckland sont placées à la limite de toute végétation possible. Les oiseaux, quoique peu nombreux, étaient faciles à approcher ; habitués a vivre tranquillement dans ces solitudes, l'instinct de leur conservation ne leur avait point appris à se méfier de l'homme."

—*Dumont D'Urville, " Voyage de l'Astrolabe," vol. ix ;* 1846.

PREFACE.

TOWARDS the end of 1906 a deputation from the Philosophical Institute of Canterbury waited upon the Hon. R. McNab, Minister of Lands, and urged upon him the desirability of extending the magnetic survey of New Zealand to the various groups of islands lying to the south of the mainland, and suggested that in the event of this being done advantage should be taken of the opportunity to further investigate the geology, zoology, and botany of these islands. These proposals were heartily supported by the Otago Institute, and were afterwards endorsed at the annual meeting of the New Zealand Institute in January, 1907. As the result of further correspondence the Government agreed to land a scientific party on the Auckland Islands, and another on Campbell Island, during the annual trip of the Government steamer "Hinemoa" in November, 1907, and to call for these parties on the return journey after the vessel had visited the Antipodes and Bounty Islands. A sum towards the expenses of the expedition was also placed on the parliamentary estimates.

This plan was duly carried out, and as soon as possible after the return to New Zealand arrangements were made for the distribution of the specimens and the working-up of the results, and, on being applied to, the Government generously placed on the estimates a substantial sum as a contribution towards the cost of publication.

The Institute desires to record here its most grateful thanks to the members of the Government, and particularly to the Premier, Sir J. G. Ward; the Acting-Premier, the Hon. W. Hall-Jones; the Minister of Marine, the Hon. J. A. Millar; and the Minister of Lands, the Hon. R. McNab, for their assistance and the warm interest they took in the work. The Defence Department kindly loaned tents and equipment for the parties, and assisted in many other ways. The members of the expedition are unanimous in their gratitude to Captain Bollons, of the Government steamer "Hinemoa," for the assistance he gave and the pains he took to give the various parties every facility for the prosecution of their investigations. In this he was most willingly assisted by the officers and crew of the vessel.

The greater part of the arrangements connected with the expedition fell on the shoulders of Dr. C. Coleridge Farr, who acted as secretary throughout, and to whose untiring energy much of its success is due.

Most of the reports have been prepared by persons resident in New Zealand, but it will be seen from the list of contents that some of them are due to the kind co-operation of specialists in England and Europe.

Professor W. B. Benham, Dr. L. Cockayne, and Mr. G. V. Hudson have acted as sub-editors for Zoology, Botany, and Entomology respectively, and have greatly assisted in the distribution of the specimens and in the preparatory work of securing the reports upon them. The Institute is indebted to Professor L. Diels, of Marburg University, for distributing the Cryptogams and securing their identification by the leading authorities in Europe.

The warmest thanks of the Institute are also due to Mr. John Mackay, Government Printer, and to his various officers for the extreme care they have taken in the production of the work, and their unfailing courtesy in all the negotiations connected therewith.

For assistance in the preparation of the Index I am indebted to Dr. L. Cockayne, and Messrs. R. Speight and E. R. Waite.

When first urging their proposals upon the Government, it was stated by the Philosophical Institute of Canterbury that the subantarctic islands of New Zealand were already so closely associated with the names of Sir James Ross, Sir J. D. Hooker, and other early explorers, and were so important in their bearing on the question of the origin of the New Zealand fauna and flora, that the members of the Institute looked upon the more complete investigation of these islands as an imperative duty, especially considering that the other antarctic and subantarctic regions had recently been investigated by the different antarctic expeditions. The Council of the Institute presents this work to the public in the hope that it may be accepted as evidence that an attempt has been made to discharge some part of this duty.

CHAS. CHILTON,
Editor.

Philosophical Institute of Canterbury,
Christchurch, N.Z., 10th December, 1909.

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MEMBERS OF THE EXPEDITION

TO THE SUBANTARCTIC ISLANDS OF NEW ZEALAND IN NOVEMBER, 1907, ORGANIZED BY THE PHILOSOPHICAL INSTITUTE OF CANTERBURY.

AUCKLAND ISLAND PARTY.

C. C. Farr, D.Sc., Assoc.M.Inst.C.E., Canterbury College	Magnetic survey.
H. D. Cook, M.Sc., B.E., Canterbury College	,,
L. Cockayne, Ph.D., Christchurch	Ecological botany.
J. S. Tennant, M.A., B.Sc., Wellington	Botany.
B. C. Aston, F.I.C., Wellington	Soil survey.
A. A. Dorrien-Smith, D.S.O., Captain Rifle Brigade, Tresco Abbey, Scilly Isles	Botany.
R. Speight, M.A., B.Sc., F.G.S., Canterbury College	Geology.
A. M. Finlayson, M.Sc., Dunedin	,,
W. B. Benham, D.Sc., F.R.S., Otago Museum	General zoology.
G. V. Hudson, F.E.S., Wellington	Entomology.
E. R. Waite, F.L.S., Canterbury Museum	Ichthyology.
S. Page, B.Sc., Canterbury College	Photography.

G. Collyns acted as assistant to the geological party, and W. B. North as cook to the whole party.

F. R. Field travelled in the steamer as a private individual, and camped on the island at the same time as the expedition, and gave general assistance.

This party had the services of a whale-boat and boat's crew (head man, Whaitiri, of Ruapuke Island).

CAMPBELL ISLAND PARTY.

H. F. Skey, B.Sc., Magnetic Observatory, Christchurch	Magnetic survey.
E. Kidson, M.A., M.Sc., Canterbury College	,,
R. M. Laing, M.A., B.Sc., Boys' High School, Christchurch	Ecological botany.
J. Crosby Smith, F.L.S., Invercargill	General botany.
H. B. Kirk, M.A., Victoria College, Wellington	Botany and general zoology.
P. Marshall, M.A., D.Sc., F.G.S., Otago University	Geology.
R. Browne, Feilding	,,
C. Chilton, M.A., D.Sc., F.L.S., Canterbury College	General zoology.
J. B. Mayne, M.A., Christchurch	Botany and zoology.
G. R. Marriner, F.R.M.S., Public Museum, Wanganui	Entomology and general zoology.

C. A'C. Opie acted as assistant to the magnetic-survey party, and C. Eyre acted as cook to the whole party.

Messrs. Chambers and Des Barres camped on the island at the same time as private individuals, and assisted in the work of collection.

NARRATIVE OF THE EXPEDITION.

The Government steamer "Hinemoa," with the members of the expedition on board, left the Bluff on the morning of the 14th November, 1907, and spent the afternoon in Port Pegasus, in Stewart Island. The Snares were reached next morning, and the greater part of the day was spent on them, and the vessel left at night for the Auckland Islands. Port Ross was reached early on the morning of the 16th November, and here were found the survivors from the wreck of the ship "Dundonald." After attending to the wants of the castaways the vessel proceeded direct to Carnley Harbour, one of the shipwrecked crew being taken on board to act as cook for the Campbell Island party. The Auckland Island party was landed with the necessary equipment at Camp Cove, in Carnley Harbour. Campbell Island was reached on the morning of the 17th November, and the party, with tents, &c., put on shore, and that evening the vessel proceeded on her usual trip to the Antipodes and Bounty Islands. She returned to Campbell Island to pick up the party on the 25th November, so that they were on the island for eight days. After taking on board the members of the party, with their collections, the vessel left for the Auckland Islands, and picked up the members of that party in Carnley Harbour on Tuesday, the 26th November, and proceeded to Norman's Inlet, on the east coast of the island, where she anchored for the night. The next day, after calling at Cascade Inlet and Smith's Harbour, on the east coast, the vessel proceeded to Port Ross, and parties were landed for a short time on Enderby and Ewing Islands, and the vessel then proceeded to Erebus Cove, where the night was spent. On the next day, the 28th, some members of the party made a geological and botanical survey of the country near Port Ross, while the vessel, with the remainder, proceeded to Disappointment Island, where most of the party landed, this being the first time that this island had been investigated scientifically. The vessel then returned to Erebus Cove, where the remains of the first mate of the "Dundonald," which had been brought from Disappointment Island, were buried with fitting ceremony. The morning of the next day was spent in the same place, parties being landed at various localities, and about midday the vessel left for the Bluff, which was reached on Saturday afternoon. During the trip dredgings were made at several places, by the kind assistance of Captain Bollons, who also independently secured some dredgings off the Bounty Islands.

HISTORICAL INTRODUCTION.

THE DISCOVERY OF THE ISLANDS.

By R. McNab, M.A., LL.B.

When Captain Cook sailed round the Islands of New Zealand in 1769–70 he directed his attention in the main to ascertaining whether or not a great antarctic continent existed to the south. He therefore went far enough to convince himself that no such mass of land existed, but not far enough to learn that islands were dotted over the Southern Ocean at much higher latitudes than New Zealand. At later dates Cook made four more visits to our shores, but on only one occasion—when he sailed for the Antarctic in 1773—was he in the vicinity of the southern islands. On this occasion he sailed close past the Antipodes.

Twelve years after Cook had left New Zealand for the last time, one of his officers—William Bligh, of the "Resolution"—sailed round the south of New Zealand on a mission to procure breadfruit-trees for the people of Jamaica. On the 19th September, 1788, Bligh discovered a cluster of small rocky islands, which he called the Bounty Isles, after the name of his vessel. This voyage was terminated by the celebrated mutiny of the "Bounty" and Bligh's long voyage in an open boat to a haven of refuge. His name is preserved on our coast in Bligh Sound, indicative rather of his connection with New Zealand trade at a later date, when he occupied the position of Governor of New South Wales.

Bligh's voyage had only taken place three years when a companion of his, and another of Cook's old officers, Vancouver, visited Dusky Sound with an expedition destined for the exploration of the north-west coast-line of North America. After leaving Dusky Sound a fierce storm was encountered, and the two vessels were separated. On the 23rd November, Vancouver, in the "Discovery," discovered a group of islands which he named the Snares. Broughton, in the "Chatham," sighted them later in the same day, and named them Knight's Islands. As a compensation for losing seniority in his discovery, Broughton, on the 29th, discovered a fairly large inhabited island, which he called after his vessel, Chatham Island.

The next mention of any of these islands is contained in the log of the "Britannia," preserved in the Essex Institute, Salem, Mass., U.S.A., where mention is made, under date December, 1792, of sighting the islands now known as the Snares, and naming them Sunday Islands. The names Knight's and Sunday gave place to that given by the first discoverer—the Snares.

The next contribution to southern discovery was by Captain Waterhouse, of H.M.S. "Reliance." The vessel was getting well up in years, and Governor Hunter, being anxious that she should be on the Thames when condemned, ordered her home. On her road, on the 3rd March, 1800, islands were sighted which were named the Penantipodes Islands, because situated near the antipodes of London.

Bass, of Bass Strait fame, came out as surgeon on the "Reliance," and is supposed to have been on board of her when the islands were discovered. If he was, he returned shortly afterwards, and engaged in trade with the Pacific islands. While thus occupied he developed a scheme for a fishing monopoly over the southern portion of New Zealand, and the Snares, Bounties, and Penantipodes. In January, 1803, he submitted his scheme to Governor King, and the correspondence would indicate he had secured the sympathy of the Governor in his proposals. Nothing however, came of it, as Bass sailed for Chili and was never heard of more.

It was probably Bass's scheme which brought the possibilities of the islands into prominence, because in May, 1803, a small sailing-craft from Bass Strait—the "Endeavour"—under the command of Captain Oliphant, tried the new field. Oliphant secured 2,200 skins, and during a gale was driven as far south as the Snares, though at the islands he did not secure any seals.

The first sealing gang on the islands was placed on the Penantipodes by Captain Pendleton, of a New York craft called the "Union," a small vessel of only 99 tons. So far as can be judged, the date of this was about May, 1804, and the gang consisted of an officer and eleven men. While the party was engaged collecting skins the "Union" returned to Sydney, and sailed thence to Fiji to load a cargo of sandalwood for China. At Tongatabu, on the 1st October, Pendleton was killed. On a second attempt the vessel itself was lost. The gang on the Penantipodes was, after a long and dreary exile, relieved by an American whaler called the "Favorite," under the command of Captain Paddock. In the relief voyage the "Favorite" was accompanied to the islands by a small 40-ton tender of the "Union" (the "Independence"), but she, after the two vessels parted at the Penantipodes, was never heard of more. The "Favorite," with the remnant of the men and with 60,000 skins, reached Sydney on the 10th March, 1806.

The interest created in Sydney by the departure of the "Favorite" and the "Independence" for the relief of the gang on the Penantipodes directed the attention of other sealers to these lonely islands. Amongst these was William Stewart, afterwards to give his name to the southern island of New Zealand. He sailed in the "Venus," and, after he had established the second gang, returned in a vessel called the "Star." It is interesting to note that in the next voyage of this vessel to the Penantipodes she took down a young chief of Whangaroa named George, afterwards to be the central figure of the massacre of the "Boyd" in Whangaroa Harbour in 1809.

The other islands appear to have been neglected while the Penantipodes was supplying such a harvest to the bold, enterprising sailors of Sydney Cove. An American captain named Delano, with two vessels under his command, had sighted the Snares and the Bounties in November, 1804, but had not attempted a landing. There is no doubt that vessels called at the islands, but the difficulty of tracing the movements of the small craft when nothing sensational happened prevents the giving of details. The designation of the islands as "the sealing islands," which would include the islands along the New Zealand coast, adds to the difficulties.

No English whaling firm of this date was better known than the Messrs. Enderby, of London. One of their vessels was the "Ocean," commanded by Captain [illegible] while on a whaling voyage to the south of New Zealand several islands were [illegible] on the 18th August, 1806. To them was given the name Lord

Auckland Group, after Lord Auckland, a friend of Captain Bristow's father. Bristow did not land, but returned in October of the following year in another of the firm's vessels—the "Sarah"—and cast anchor in a harbour known to this day as Sarah's Bosom. For the assistance of sailors who might frequent the island Bristow liberated pigs on shore. Returning home a full ship, the "Sarah" was, in October, 1809, captured by a privateer called the "Revenge," but the following month was recaptured by the "Enterprise."

The only other important event in the sealing trade of the islands during 1807 was the placing of a gang upon the Bounties by the captain of the "Santa Anna." The importance of the event lay in the fact that among the gang, which endured intense privations for several months, was a Maori chief named Ruatara, who had shipped on board the "Santa Anna" in order to reach London and see King George. When at last he reached London the captain treated him cruelly, and shipped him back to Australia without his wish being gratified. The Rev. S. Marsden was a passenger by the same boat, and, ascertaining the condition of the Maori, nursed him back to health again. Ruatara never forgot the kindness, and the friendship commenced under such singular circumstances played a very important part in Marsden's later mission to New Zealand.

Following upon these events the discovery of Foveaux Strait (1808–9) opened up to the sealers fresh fields, rich in skins, and old vessels in the trade concentrated their attention upon the shores of Stewart Island.

About the middle of 1810 a vessel called the "Perseverance," owned by Campbell and Co., of Sydney, and commanded by F. Hasselbourgh, was engaged in searching for fresh fields to replace the sealing-grounds which, under indiscriminate plunder, were now failing to supply payable cargoes. Hasselbourgh was successful in discovering two islands. One of these he called after the owner of his vessel—Campbell Island—and the other after the Governor of New South Wales—Macquarie Island. No sooner had the news of the discovery reached Sydney than, within a few days of one another, no less than six vessels set sail for the islands. Macquarie Island was found to be the richer, on account of the vast number of sea-elephants which at certain seasons visited its shores; but Campbell Island did a steady trade for many years in seal-skins.

A sad accident befell the discoverer on his second visit to Campbell Island. On Sunday, the 4th November, 1810, Captain Hasselbourgh set out in a boat to ascertain if certain oil-casks he had left ashore were safe, and on his return a sudden gust of wind struck the boat broadside on, with the result that she filled and sank. Of the six persons thrown into the water, no less than two miles from land, three, including the captain himself, were drowned, and the remainder managed to gain the shore.

It is an indication of the thorough manner in which the captains of the small sealing-craft of the early part of the nineteenth century scoured the ocean to discover seal-rookeries that as early as 1810 they had placed on the map of the Southern Pacific every one of the islands known up to this time.

THE SUBANTARCTIC ISLANDS OF NEW ZEALAND AND THE HISTORY OF THEIR SCIENTIFIC INVESTIGATION.

By CHARLES CHILTON, M.A., D.Sc., F.L.S., Professor of Biology, Canterbury College, University of New Zealand.

To the south and south-east of New Zealand lie a number of islands, or groups of islands, which are in these volumes called the "Subantarctic Islands of New Zealand." They have sometimes been referred to as the "Southern Islands of New Zealand," but this name is apt to lead to their being confused with the South (or Middle) Island of New Zealand, while the term "Southern Islands" is often used in a more general sense for the islands lying in the South Pacific. The islands now being considered are subantarctic in geographical position, and, as the results contained in the following pages will show, are closely allied in climate, fauna, and flora to subantarctic islands elsewhere, and the use of the term "Subantarctic Islands of New Zealand" for them appears to be fully justified.

The islands included in this group are the Snares, the Auckland Island group, Campbell Island, Antipodes Islands, Bounty Islands, and Macquarie Island. The last named belongs politically to Tasmania, and not to New Zealand; but biologically it should be included in the New Zealand group, and the industries carried on there from time to time have usually been worked from ports on the south of New Zealand.

Fuller details with regard to the physiography of these islands will be found in the geological and meteorological papers in this volume; but it may be well here to state briefly one or two facts regarding their position, number, and extent.

The Snares lie sixty miles south-west from the South Cape of Stewart Island, and consist of two small rocky islands and several islets and rocks, mostly covered with low forest, consisting mainly of *Olearia Lyallii*. The largest island can be readily landed on in calm weather. Some years ago this island was surveyed in connection with the proposal to erect a lighthouse upon it, as the Snares lie almost directly in the track of vessels sailing from Australia towards Cape Horn, and are of considerable danger to navigation.

The Auckland Island group consists of several islands lying about 190 miles south by west from the South Cape of Stewart Island. The largest is Auckland Island itself, about twenty-three miles in length, with a greatest width of fifteen miles, lying in the centre; to the north of this lie Enderby and Ewing Islands, and to the south Adams Island, separated from Auckland Island by the fine harbour or strait known as Carnley Harbour or Adams Strait; to the west, at a distance of about four or five miles, lies a rocky islet—Disappointment Island. The main islands are wooded up to a varying altitude, and abundantly covered with various kinds of vegetation. In several places the hills rise to a height of over 2,000 ft. The whole of the west coast is formed of high precipitous cliffs; but on the east coast there are several fine harbours, such as Port Ross (portions of which are also known

Fig. 1.—South Coast of Snares, looking East.
The cliffs are of granite, and at times exhibit the characteristic weathered forms of ruined masonry.

Fig. 2.—Western Coast of Snares, looking South.
The cliffs are of granite, and in places reach a height of 600 ft.

Plate 3.—Subalpine Meadow, with *Danthonia antarctica* in Foreground, and Wind-swept Rata, above Camp Cove, Auckland Island; Adams Island in Background.

Plate 4.—Subalpine Wind-swept Rata, above Camp Cove, Auckland Island.

as Sarah's Bosom and Port Laurie); Norman's Inlet and Musgrave Inlet, nearer the centre of the island; and Carnley Harbour, in the south, which has been already mentioned.

Campbell Island lies 370 miles south by east from the South Cape of Stewart Island, and consists of one fairly large island, about nine miles across, with a few

Fig. 5.—Tree-fern, *Hemitelia Smithii*, Norman's Inlet, Auckland Island.
The southern limit of tree-ferns.

rocky islets near it. The hills are not quite so high as those of Auckland Island, but the greater part of the island is bare, or covered only with tussock and other low-lying plants, though some parts bear a scrub of *Dracophyllum* which does not exceed 10 ft. in height. The island is exposed to the full force of the prevailing

westerly winds, and is more wind-swept even than the Auckland Islands, while, like that group, it suffers from the same lack of sunshine and from frequent mists and gales of rain. Though the temperature is uniformly low, the island does not appear to experience very severe frosts or very heavy falls of snow.

The Antipodes Islands lie 490 miles east-south-east from the South Cape of Stewart Island, and consist of one island larger than the others, named Antipodes Island, and several much smaller islands or rocks, the chief of which is Bollons Island. Antipodes Island is about four miles from east to west, and about two miles from north to south, and its highest point, Mount Galloway, rises to a height of about 1,300 ft. The coast-line is rocky and precipitous, and above the cliffs stretch steep slopes densely covered with tussock, while the shallow gullies are filled with *Coprosma* scrub and *Aspidium vestitum*.

The Bounty Islands lie 490 miles east of the South Cape of Stewart Island, and consist of about twenty islands and rocks of varying sizes, ranging up to nearly 300 ft. in height, and occupying a space about three miles east and west and two miles north and south. Landing on the main island is a matter of difficulty, and the slippery rocks bear on their surface no soil and no land-plants at all, except an *Alga*, which gives them a greenish hue in places. Very few terrestrial animals have been recorded from the island—viz., one or two spiders, a few insects, and a shore hopper.

Macquarie Island lies about six hundred miles to the south-west of New Zealand—more than twice as far away as the Auckland Island group. It consists of one island about twenty miles long and five miles broad, and of two outlying groups of rocks—one, known as the "Bishop and Clerk," lying thirty miles to the south of the south end; the other, the "Judge and Clerk," being situated seven miles to the north of the north head. Though the island is exceedingly hilly, the hills are not more than 600 ft. or 700 ft. in height. As a rule, they rise almost directly from the sea, leaving only a narrow shingly beach, though there is a greater extent of flat land towards the north end of the west coast. There are swamps above the shingle, and on the uplands are a number of small lakes, which empty themselves by streams running down to the sea in valleys that they have made or by falling over the steep hillsides in miniature cascades. The general appearance of the island is described as being barren in the extreme. There is not a tree or shrub on the island, though there are patches of *Stilbocarpa polaris*, *Pleurophyllum*, and other plants known on the Auckland and Campbell Islands. Various species of penguins form rookeries on the island, and the huge sea-elephants are still to be found there, though they have been almost exterminated for the sake of their blubber. Dr. Scott, who visited the island in 1880, states that it is never entirely deserted by the sea-elephants, but by far the greatest number are to be found after October, when they come up to calve.

To the south-east of Macquarie Island there has long been shown on the map a small island called Emerald Island. It appears that in December, 1821, the ship "Emerald," one of those trading to Macquarie Island, saw an island, very high, with peaked mountains, in lat. 57° 30′ S. and long. 162° 12′ E. Mr. Chapman (1891, p. 520)* in his article gives at second hand the evidence of a sea-captain who stated "that he had seen the island, and had been round it, but could see no

* The references are to the General Bibliography at the end of Vol. II.

FIG. 6.—PERSEVERANCE HARBOUR, CAMPBELL ISLAND.

Mount Honey and Venus Cove in the distance; *Poa litorosa* in foreground; the Campbell Island party's camp to the left.

place for landing. It was a small, high, rocky island." No one else has ever seen land in this place. Commodore Wilkes sailed over the site in the "Vincennes," and his vessel the "Porpoise" separately did the same. In 1894 the "Antarctic" also failed to find the island; and, according to cable news recently received, so did Lieutenant Shackleton's ship "Nimrod," though she made a special search on her return voyage from New Zealand to England.*

In about the same latitude, but much further to the east, the "Nimrod Group" has been put down; but even less seems to be known with regard to these reported islands, and they could not be found by the "Nimrod" on her return voyage just referred to.

There is also shown on the map a group of small islands almost directly south from Tasmania, in about lat. 50° S. and long. 143° E., known as the Royal Company Islands, though no scientific information about them is available. D'Urville in 1840 made unsuccessful search for them. The "Antarctic," in 1894, endeavoured to reach their position, but the winds were adverse and she was unable to do so. According to reports published in the newspapers, the "Nimrod" on her homeward voyage steamed over their reported site and spent a day looking for them, but without success. She took soundings, but got no bottom at 2,500 fathoms.

The story of the Subantarctic Islands of New Zealand up to the discovery of Macquarie Island has already been told by Mr. R. McNab in the preceding article, bringing us down to the year 1810. By that time the sealing trade had been well established, but, owing to the ruthless slaughter, the coast of New Zealand itself and the islands nearer had ceased to yield such rich returns as they did at first, and the trade was for a time directed towards Macquarie Island, which was visited by many ships. These vessels usually left a gang of sealers on the island, and, owing to the want of a safe harbour and to the severe gales, it sometimes happened that the gangs were not relieved as soon as they should have been. For instance, a gang was left on Macquarie Island by the "Betsy" on the 13th February, 1815. The ship then proceeded to Auckland Island, and returned to Macquarie Island in August of the same year; but a few days afterwards she was blown out to sea, and failed to make the land again, although three weeks were spent in the attempt; the vessel therefore endeavoured to make her way to Sydney, but owing to scurvy and other troubles the strength of the crew was greatly exhausted, and only after various attempts did a few survivors succeed in reaching New Zealand. Finally, after much hardship and suffering, only two Europeans out of the whole crew returned safely to Sydney. The gang left on Macquarie Island was afterwards rescued by the "Elizabeth and Mary," which left Sydney on the 26th March, 1816, and returned on the 28th May, bringing also another gang that had been left by a former vessel, the name of which has not been recorded.

* The existence of Dougherty or Keates Island, supposed to be situated about half-way between New Zealand and Cape Horn, seems to be equally uncertain. Its position was given as 59° S. lat. and 120° W. long., but on the homeward voyage of the "Discovery" Captain Scott found a depth of 2,418 fathoms at the supposed position, and, as the weather was clear and no land was in sight, he argues that the evidence against the existence of the island is too strong to allow of the explanation that the original discoverer had largely miscalculated its position (1905, vol. ii, p. 401). The "Nimrod" also failed to find the island on her homeward voyage in 1909.

A gang appears also to have been marooned on the Snares for some years between 1810 and 1817 from the ship "Adventure," the reason given being that the vessel was running short of provisions, and that the captain gave these men the choice of going on shore or of starving afloat. They were rescued by an American ship, the "Enterprise," which reached Philadelphia on the 11th May, 1818. If the story told is correct, and a party was actually on the Snares from early in 1810 to early in 1817 without being relieved, it is clear that the islands were not visited by other sealers during that period.

Up to about the year 1820 the sealing trade with New Zealand and these outlying islands was carried on with great vigour, most of it being conducted from Sydney, though other vessels came from Hobart Town, and American and English vessels were also engaged in the trade. One of the best-known of the sealing-vessels was the "Governor Bligh," which made many trips to the islands; in three of these—from 1816 to 1819—this vessel obtained no less than 34,857 skins.

About that time, however, fresh sealing-grounds had been discovered in the South Shetlands, and there was a corresponding lull in the New Zealand trade, though in 1820 the "Governor Bligh" again returned with 5,500 seal-skins. These, however, were obtained from various sources, partly from the mainland of New Zealand, and the rest from the southern islands, though the Campbell and Macquarie Islands are the only two specially mentioned. From about that time the seal trade appears to have almost ceased for a considerable time, so far as the mainland of New Zealand was concerned, though some sea-elephant oil was still imported into Sydney from Macquarie Island. With a view of reviving the New Zealand trade, the New South Wales Government, in 1822, despatched the Government cutter "Snapper," under Captain Edwardson, to report on the prospects of trade. This vessel returned in March, 1823, with favourable reports as to the flax trade; but information as to her visit to the islands, if she did visit them, is not available.

Meanwhile Macquarie Island had been visited in November, 1820, by the Russian explorer Bellingshausen. The account of his voyage was published in Russian, and was thus not available to the ordinary reader, and his researches have therefore not attracted the attention that they deserved.* A translation of the part of his narrative which deals with Macquarie Island is given by Mr. McNab in "Murihiku" (1907, p. 190, and 1909, p. 236), and contains references to the seals, the penguins, and to some of the more conspicuous plants, among the latter being the *Stilbocarpa polaris*, which he speaks of as the Macquarie Island "cabbage" and which was used both by the sealers and by himself and crew as a vegetable. The naturalists in St. Petersburg who first examined the leaves of this plant referred it to *Gunnera*.

The sealing at Macquarie Island continued to be fairly successful until in 1834 the ship "Caroline," after three previous trips, was driven ashore and became a total wreck in a part still known as Caroline Cove. Remains of a vessel were still to be seen in this bay when Professor J. H. Scott visited the island in 1880, and there were also graves of shipwrecked sailors and signs of other wrecks. In 1826 there had been a certain revival of trade, no less than eight visits being made by six

* An abridged translation into German, by Professor H. Gravelius, was published in 1902: see Bibliography.

different vessels, and during the next year the trade was still carried on with equal vigour; but after this there was another decline, and there are records of only two voyages in 1828 and one in 1829. This latter was made by the ship "Faith," and on her return the crew reported that the swarms of sea-elephants and seals had left the island owing to the continued slaughter. It is worth noting that the Macquarie Island parrots were reported to be still abundant, and several were brought back by the crew of this vessel. The "Faith" also brought with her two gangs of men that had been left on the island thirty months before, but the names of the vessels by which they were landed remain unknown.

Of all these sealing trips very little permanent record has been made, and most of that which is available has been unearthed by Mr. McNab's laborious researches. Even in the earlier part of the nineteenth century, however, these islands had begun to attract attention from a wider circle, and to some extent had been described in various works. For example, Delano, an American who made three voyages to various parts of the Pacific between 1790 and 1807, gives a slight description of the Snares and the Bounty Islands in the narrative of his voyages and travels, published in 1817. A glowing account of Auckland Island is given by Captain Morrell in his "Narrative of Four Voyages," published in 1832, in which he states that Auckland Island "is one of the finest places for a small settlement that can be found on any island in the Southern Hemisphere above lat. 35°." He also mentions that scarcely any seals were to be found at the time of his visit—1829–30—either at the Auckland Islands or at the Snares. All of the islands to the south and east of New Zealand are mentioned in D'Urville's imaginary voyage, published in 1834, the material for which he obtained from the writings of many previous explorers. He was afterwards privileged to visit more than once in actual person some of these places which he had described in his imaginary voyage.

Balleny called at Campbell Island on the 17th January, 1839, on his way further south, and there met Biscoe, a seal-hunter in the employ of the London firm of Enderby, who had made important discoveries in southern seas and had previously visited some of the islands to the south of New Zealand.

All this contributed little, however, to the scientific knowledge of the fauna and flora of these islands. Probably about this time, some few plants from Macquarie Island came into the hands of Mr. Charles Fraser, Superintendent of the Sydney Botanical Gardens, and were sent to Sir W. Hooker, but whether Fraser, who had visited the Bay of Islands, in the north of New Zealand, in 1825, gathered them himself or secured them through some of the sealers is not clear. Bellingshausen's visit to Macquarie Island in 1820 has been already referred to.

The real scientific investigation of these islands did not commence till the year 1839, when the French Expedition, in the corvettes "Astrolabe" and "Zélée," under Admiral D'Urville, visited Auckland Island. This expedition was accompanied by Messrs. Hombron and Jacquinot as naturalists, and extensive collections were made, especially of the plants. An account of these was published between 1841 and 1846, under the title of "Voyage au Pôle sud," the Cryptogams being described in 1845 by Camille Montagne. About the same time Auckland Island was visited by the United States Exploring Expedition under Commodore Wilkes, but only a short stay appears to have been made, and the botanical results were somewhat scanty. Macquarie Island was also visited by the United States Expedition.

In the next year the Antarctic Expedition under Sir James Ross visited both the Auckland and the Campbell Islands, and a stay was made in Rendezvous Harbour (now known as Port Ross), in Auckland Island, from the 20th November to the 12th December, 1840, during which time the botanist, Sir J. D. Hooker, with the assistance of Dr. Lyall, made a very complete collection of the plants of the neighbourhood. Campbell Island was visited immediately afterwards. An account of the voyage was published in 1847, and Hooker's results appeared in the first volume of the "Flora Antarctica," which was issued in 1844. Some of the zoological results were published in 1846, the mammals, birds, fishes, and some orders

Fig. 7.—Cemetery at Port Ross, Auckland Islands.

of the insects being then dealt with; but the publication was then stopped owing to lack of funds, and the account of remaining groups—that is to say, the remainder of the insects, the crustacea, and the mollusca—was not published until 1874.

Thus, within a short space of time the islands were visited by no less than three scientific expeditions; but for a long time after that no further advance was made, and the Auckland Islands appear to have been visited only by the few sealers who still found enough seals to make the trip worth their while.

In 1847 Mr. Charles Enderby, a member of the well-known whaling firm, and also a Fellow of the Royal Society, published a letter containing a "Proposal to re-establish the British Southern Whale-fishery" by means of a chartered company,

and he succeeded in obtaining a grant from the Crown assigning Auckland Island to his company as the station suitable for this purpose. In 1849 he issued a further work on the Auckland Islands pointing out the suitability of them as a base for the whale-fishery in the southern seas, and as a result of his efforts the company was formed, and a settlement was established at Port Ross, in Auckland Island, with Mr. Enderby as "Chief Commissioner to the Company and Lieutenant-Governor of the Auckland Islands." The expedition landed on the 4th December, 1849. Considerable enthusiasm seems to have been aroused, and before leaving England Mr. Enderby was entertained at a farewell dinner on the 18th April, 1849, at which Rear-Admiral J. W. D. Dundas, C.B., M.P., acted as chairman, and four hundred guests, including members of Parliament and other prominent persons, were present. Though launched with so much enthusiasm and such high hopes, the scheme failed. The climate and the results of the fishery did not prove so attractive in reality as they had appeared in the prospectus of the company, and after two or three years the settlement was abandoned, leaving little trace of its position, beyond the small area of land that had been cleared of bush and the lonely cemetery still to be seen at Port Ross.

For some years after this little worthy of record happened in connection with these islands, though they were not altogether without notice in published works. An edition of R. M. Martin's "History of the British Colonies" which appeared in 1851 contains references to the Auckland Islands, &c.; and in 1854 was published E. Malone's "Three Years' Cruise in the Australasian Colonies." The writer was an officer on H.M.S. "Fantome," and gives a good account of the Auckland Islands and the Enderby Settlement.

There appears to be no further reference to these islands until attention was once more called to them by disastrous shipwrecks. These islands have, unfortunately, been the scene of many shipwrecks, and in several cases castaway sailors have had to endure a miserable existence on them for many months. How many disasters occurred in the old sealing-days will perhaps never be known, but within the last forty-five or fifty years there have been many shipwrecks, most of them with sad loss of life.

One of the best known is that of the schooner "Grafton," the story of which has been told by the publication of the private journal of the captain, Thomas Musgrave, and also by an account by T. E. Raynal, who acted as mate, though he was really representing the owners, and was himself part owner of the ship. The vessel left Sydney on the 29th December, 1863, with a crew of three men in addition to the captain and mate, and sailed to Campbell Island, for the purpose of investigating mines of argentiferous tin which were supposed to exist there. About a month was spent at the Campbell Islands without any success so far as the primary object of the trip was concerned, though a number of seals were captured. While at Campbell Island Raynal became seriously ill, and for more than a month was unable to assist in the working of the vessel. The ship then proceeded to the Auckland Islands, and entered Carnley Harbour, though the captain imagined he was in Sarah's Bosom (*i.e.*, Port Ross. He made his way some distance up the harbour and entered the North Arm, but, owing to the difficulty of finding a safe anchorage and to the violence of a storm that suddenly arose, the ship was driven on the rocks, and the party had to make the best of their way to the shore. Here they all lived for twenty

months, frequently enduring great hardships from want of proper food and from the inclemency of the climate, against which they were only partially sheltered by the hut which they succeeded in making with timber from the vessel and from the trees growing on the island. They called their home "Epigwait," a name selected by Captain Musgrave from the language of the North American Indians, and meaning "near the great waters." The story of their enforced stay on the island is told by the captain with much graphic description, and is extremely interesting, both as showing the fertility of resource shown by the men and as a record of the kind of weather that they experienced. His journal contains many definite facts as to

Fig. 8.—Remains of the "Grafton" Wreck, Carnley Harbour, Auckland Islands.

the temperature at various times of the year, the barometric readings, the direction and force of the wind, the habits of the seals, and so on. Among other things, he records an earthquake-shock on Sunday, the 15th May, 1864, saying, "It was not violent, but the tremor continued about a minute." Weary of waiting for the rescue that never came, and dreading to have to endure the hardships of a second winter, the castaways, with great labour and ingenuity, succeeded in improving and enlarging the ship's boat which they had saved from the wreck, and in this frail craft, which was only 17 ft. in length, the captain and mate and one of the men started for New Zealand, leaving the other two on Auckland Island, to be rescued subsequently if possible, as the boat could not accommodate more than

three men. After five days of stormy weather they succeeded in reaching Port Adventure, in Stewart Island, almost exhausted. Here they were met and cared for by Mr. Cross, and soon taken over to Invercargill by him in his boat, the "Flying Scud," and by the exertion of Mr. Cross, Mr. Macpherson, and others, money and provisions were raised for the despatch of the "Flying Scud" to Auckland Island to bring back the two men who had been left there. This was successfully accomplished, though with great difficulty, for the "Flying Scud" was only a small vessel, and was more than once driven back in her attempt to make her way to the Auckland Islands. After picking up the two men at Carnley Harbour the vessel pro-

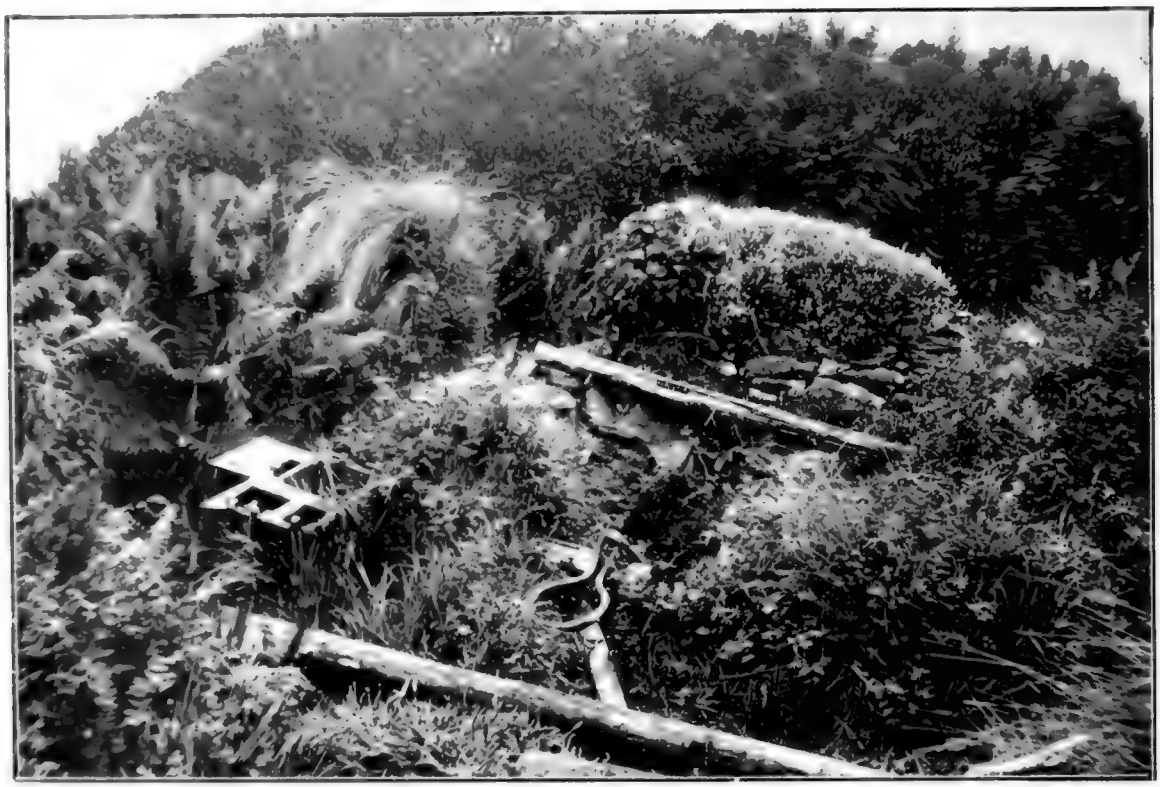

Fig. 9.—Remains of Musgrave's Hut, "Epigwait," Carnley Harbour, Auckland Islands.

ceeded up the east coast of Auckland Island to search for any other castaways that might be there, as the crew of the "Flying Scud" thought they had seen smoke at some distance from the north of the island. In one of the huts at Port Ross they found the dead body of a sailor, beside whom lay a slate, on which he had doubtless written some particulars of his name and history, though this had become quite indecipherable. After burying this corpse the ship returned to Invercargill with all the men of the "Grafton" safe and sound. From a further trip to the islands made by Raynal in the "Swordfish" it appears likely that the dead body was one of the crew of the "Invercauld," which was wrecked on Auckland Island about the same time.

After Captain Musgrave had reached Melbourne, H.M.C.S. "Victoria," under Captain W. H. Norman, was sent to visit the islands in search of any other persons

who might have been shipwrecked upon them. Captain Musgrave accompanied the vessel in order to give the advantage of his local knowledge. No traces of castaways were found, but stores were left at suitable places for any who might be afterwards wrecked on these islands.

The "Invercauld," a vessel of 888 tons, with a crew of twenty-five persons (Captain George Dalgarno), left Melbourne on the 28th April, 1864, in ballast for Callao, and was totally wrecked on the north coast of Auckland Island on the 10th May, 1864. Six of the crew were drowned, but the remaining nineteen, including the captain, succeeded in reaching the shore, and the captain, the chief officer, and one seaman were rescued after being on the island for more than twelve months. The other members had died on the island, some of them after having separated from the captain's party and having proceeded to other parts of the island.*

Another wreck on Auckland Island was that of the ship "General Grant," which sailed from Melbourne for London in May, 1866, and was wrecked on the 13th May. The ten survivors, one of them a woman, were rescued by the whaling-ship "Amherst" about eighteen months afterwards, and were brought to the Bluff on the 13th January, 1868. The chief officer, with three seamen, had left the island on the 22nd January, 1867, in the pinnace, with the desperate intention of reaching the shores of New Zealand, but they must have perished in the attempt. The "General Grant" carried a very valuable cargo, and several attempts to recover the gold that formed part of it were afterwards made. In one of these a small craft, the "Daphne," was lost with six persons on board.

In consequence of the wreck of the "General Grant," the Provincial Government of Southland despatched the "Amherst," with Mr. H. Armstrong, J.P., as their representative, to make a thorough search of the islands for castaways. The vessel visited the Snares, Auckland Islands, Campbell Island, Antipodes Islands, and also the Chathams, and managed to sight the Bounties after battling with the winds for eighteen days. Depots were established at several places on the Aucklands, and at Perseverance Harbour, on Campbell Island. Two woodhens (*Ocydromus*) were liberated on Enderby Island, and some pigs on Campbell Island. Mr. Armstrong's official report to the Southland Government contains interesting details on the physiography, vegetation, and animal-life of the islands, and it is deserving of note that he visited several parts of Campbell Island, and says, "There is no rata" (see Laing, p. 486, Vol. II). Mr. Baker, the Chief Surveyor, had previously made a report to the Superintendent of Southland in 1865 on the physical geography, geology, and resources of the islands, and this was published in the Government *Gazette*, Province of Southland (1865).

The duty of erecting depots, with stores, boats, &c., for castaways was afterwards taken over by the New Zealand Government, and one of the Government vessels now makes periodic trips to replenish the stores and establish new depots where they may appear to be required. In several instances, as will be seen from what is narrated below, these depots have been of great service to castaways.

* In newspaper accounts, published at the time of the rescue of the sailors from the "Dundonald" wreck it is stated that the "Minerva," of Leith, was wrecked on the Auckland Islands in 1864, and that four persons were saved from the wreck, and rescued on the 25th March, 1865." I have, however, been unable to verify this statement, and Dr. T. M. Hocken, who has kindly made many enquiries, has been equally unsuccessful.

Moreover, the visits by the Government steamer have made it possible for various scientific men to visit the islands and to add to our knowledge of the fauna and flora. The results thus obtained are already very considerable, and would be much greater but for the fact that the vessel can only stay a very limited time at each place, and that the boisterous weather often greatly hinders the collecting of specimens.

It was probably owing to these shipwrecks that a description of the islands to the south and east of New Zealand was drawn up and published by the Lords Commissioners of the Admiralty in 1868. This contains interesting notes of their dis-

Fig. 10. Depot, Carnley Harbour, Auckland Islands.
Adams Island in the background.

covery and productions, which were afterwards incorporated with the "Official Sailing Directions." Another indirect result of the shipwrecks was that rabbits, sheep, goats, and cattle were placed on suitable spots by the Government steamer and by other vessels, with the idea that they might afford food for future shipwrecked sailors. Bristow had liberated pigs on the Auckland Islands for the same purpose in 1806, and Armstrong had placed woodhens on Enderby Island and pigs on Campbell Island in 1868. Rats and mice were unintentionally introduced by the sealers, and are mentioned by several subsequent visitors as being abundant on the islands. Details of these introduced animals, and the effect that they have had on the vegetation, will be found in Dr. Cockayne's "Botanical Excursion" (1904, p. 300) and

in the papers by him and by Mr. Laing on the ecological botany; reference to them is also made in Mr. Waite's paper on the vertebrata. Comparison of the effects that have already been produced with those that may hereafter be brought about will afford fruitful subject for future investigation.

This is an appropriate place to refer to the enlightened regulations that have more recently been made by the New Zealand Government for the protection of the seals and birds and other animals on these islands, and for the regulation of the sealing industry. These have already produced very beneficial results, and in view of the exceptional advantages offered by these islands for the study of the habits of many of the ocean-birds, and for the preservation of them and of the seals, it is extremely desirable that some of the islands should be absolutely reserved as sanctuaries and breeding-places, and that no introduced animals of any kind should be allowed upon them. The Snares, the Antipodes, and perhaps Disappointment Island and Adams Island in the Auckland group, appear to be suitable for such reserves.

In July, 1870, H.M.S. "Blanche" surveyed the Auckland Islands and prepared a chart of them.

In 1874 the French Expedition for the Observation of the Transit of Venus of the 9th December proceeded to Campbell Island, and spent a considerable time there. It was accompanied by Dr. H. Filhol as naturalist, and he afterwards made a full report on his observations with regard to the fauna, flora, and geology. This, however, was not published until 1885. The most important parts in it are the observations on the anatomy of the penguins and his report on the crustacea, but there are also lists and references to seals, birds, fishes, mollusca, coelenterata, &c. The botanical portion is short, and adds little new except in the diatoms. The geological observations are treated at considerable length. At the same time a German Expedition visited Auckland Island for the same purpose, but found, as other subsequent visitors have done, that the "weather was the most wretched imaginable." A report on the flora of the islands was afterwards published by Kurtz, the rocks gathered near Port Ross were described by Max Hartmann in 1878, and a report on the meteorology was also published.

Since that time numerous visits have been made to these islands on the occasion of the periodic visits of the Government steamer. Thus, Mr. J. Buchanan visited them in 1883, for the purpose of securing plants for cultivation, and herbarium specimens. The results were afterwards published in the "Transactions of the New Zealand Institute" for 1883, and along with them he gave a series of drawings of the coast of Campbell Island.

Professor J. H. Scott had previously visited Macquarie Island in November, 1880, and in 1883 published an account of his visit, with numerous notes on the zoology and botany of the island.

One of the most important visits was that made by Mr. T. Kirk in 1890. He visited the whole of these islands with the exception of Macquarie Island, and was able to land at the Snares and the Antipodes Islands, this being the first time that a botanist had made collections at these places. He afterwards published several papers on the results of his visit, and gave a comprehensive account of the whole in the "Report of the Australasian Association for the Advancement of Science" for 1891. He was accompanied by Mr. F. R. Chapman (now Mr. Justice Chapman),

who wrote a general account of the islands as a paper in the "Transactions of the New Zealand Institute" (1891, p. 491), which is accompanied by a number of illustrations of the coast scenery of the Auckland Islands from sketches previously made by Mr. Buchanan.

In 1894 Macquarie Island was visited by Mr. A. Hamilton, now Curator of the Dominion Museum in Wellington, and he was able to add many important facts to those that had already been recorded by Professor Scott. Unfortunately, owing to a sudden storm arising, he had to leave on the island most of the collections that he had made. On the voyage back to New Zealand three members of the crew were washed overboard, and further collections were lost in the same way.

During this time parties were still occasionally at work on Macquarie Island in securing the oil from the sea-elephants and from the penguins, and, although the industry was more or less profitable, it led, as in years gone by, to occasional loss of life, and there were also wrecks on some of the other islands.

In May, 1894, the "Antarctic," a vessel fitted out for sealing in southern seas by Commander Sven Foyn, of Tönsberg, Norway, and under the management of H. J. Bull, made two trips to the islands. In the first, during which Mr. Bull remained in Melbourne, she was nearly wrecked at Campbell Island. In the second she reached Macquarie Island, but owing to stormy weather no landing could be made; Campbell Island was then visited, and after a short stay, during which some sealing was done, the vessel sailed for the south. C. E. Borchgrevinck accompanied the vessel on her trip to the Antarctic regions, and was afterwards in charge of the Antarctic Expedition of 1898–1900 in the "Southern Cross," fitted out by Sir George Newnes. The "Southern Cross" made a short stay at Auckland Island on her return trip from Antarctica in March, 1900. (Bernacchi, 1901, p. 277.)

The list of the shipwrecks associated with these islands was added to in 1887, when the "Derry Castle," from Geelong, with a total of crew and passengers of twenty-three, was wrecked on Auckland Island on the 20th March. Fifteen persons were lost at the time of the wreck, and the remaining eight were rescued by the "Awarua" on the 19th August, 1887.

In December, 1890, the small steamer "Kakanui" was sent to Macquarie Island to relieve a gang of men who were engaged in procuring oil from the penguins and sea-elephants, and who were supposed to be short of provisions. The steamer arrived at the island on the 2nd January, 1891, and left the next day, taking with her eight of the men, but leaving some still on the island. She was never heard of afterwards, and it is supposed she must have foundered with nineteen men on board in a great storm that arose two days after she had left the island. Captain Fairchild, in the Government steamer "Hinemoa," was twice sent in search, and visited Macquarie Island, Auckland Islands, Campbell Island, and the Snares, but could find no trace of the missing vessel.

In the same year the "Compadre" was wrecked on Auckland Island on the 18th March, and the fifteen survivors were rescued by the "Janet Ramsay" on the 30th June, 1891.

About two years later the "Spirit of Dawn," of Liverpool, was wrecked on the Antipodes. The captain and five others were drowned, and eleven survivors were found on the island by Captain Fairchild, of the "Hinemoa," after they had been eighty-seven days on the Antipodes, and were brought to Dunedin on the 4th September, 1893.

In 1905 Auckland Island was again the scene of a shipwreck. In March of that year the "Anjou" was wrecked near Cape Bristow, but fortunately all hands got safely to shore, and made their way to one of the depots in Carnley Harbour, where they were found by the "Hinemoa" on the 6th May following.

During the trip of the "Hinemoa" in November, 1907, with the expedition which secured the specimens described in this work, fifteen men from the ship "Dundonald" were found at the depot in Port Ross. The vessel had been wrecked on Disappointment Island on the 7th March, 1907, and twelve men were drowned, the second mate dying of exposure about a fortnight afterwards. The remaining

Fig. 11.—Hut built by Shipwrecked Sailors of the "Anjou" in Carnley Harbour.
Used as camp kitchen by the Auckland Island party.

fifteen had lived on this bleak and inhospitable island for about seven months, when some of them succeeded in reaching the main island in a canvas boat of their own manufacture, and in making their way to the depot at Port Ross. They then brought their companions off Disappointment Island in the boat that they found at the depot, and they all lived there in comparative comfort until rescued about a month later.

Again, on the 13th March, 1908, another ship, the French four-masted barque "President Felix Faure," was wrecked on Antipodes Island. Fortunately no lives were lost, and the whole of the crew were rescued by H.M.S. "Pegasus" and brought to Lyttelton on the 15th May.

The remaining facts with reference to the scientific investigation of these islands can be now briefly related.

In June, 1879, owing to the kind offer of Captain Townsend, R.N., of H.M.S. "Nymphe," Captain Hutton, who was then Curator of the Otago Museum, was able to send Mr. Jennings, the taxidermist, to collect at Auckland and Campbell Islands. Mr. Jennings had two days and a half for collecting at Port Ross, in the Auckland Islands, but only about an hour and a half at Campbell Island. The collections made were described by Captain Hutton in a paper published in the "Transactions of the New Zealand Institute" for 1879.

Fig. 12. Frame of First Boat made by the "Dundonald" Castaways.

Taken at the landing-place, Disappointment Island, where it was abandoned after the return from Auckland Island.

More than twenty years afterwards—in December, 1900—Captain Hutton was able to visit the islands in person, when Lord Ranfurly made an excursion to them in the Government steamer. His results were published in various papers in the volume of the "Transactions of the New Zealand Institute" for 1901.

Sir James Hector and Professor T. J. Parker accompanied the Government steamer on her trip to the islands in 1895, and made collections there. An account of the trip, dealing chiefly with the geology, was given by Sir James Hector in a lecture to the Wellington Philosophical Institute. (Trans. N.Z. Inst., 1895, p. 738.)

Fig. 13. Huts of the "Dundonald" Castaways on Disappointment Island.
The "Hinemoa" near the island; *Bulbinella Rossii* in foreground; the north end of Auckland Island in the distance.

Fig. 14. Depot at Port Ross, Auckland Island.
With jetty and flagstaff built by the "Dundonald" sailors.

Mr. Matthews, the late Chief Government Forester, visited the islands at the same time and made a very extensive collection of living plants, some of which he succeeded in sending to the Royal Botanic Gardens at Kew.

In 1901 Macquarie Island was visited by the National Antarctic Expedition ship "Discovery" on her way to New Zealand before she left for the south polar regions, and some further collections from that island were then made. On their return from the antarctic regions in March, 1904, the three vessels, "Discovery," "Morning," and "Terra Nova," rendezvoused in Port Ross, Auckland Island, thus once more justifying the name of Rendezvous Harbour, which had been given to it by Ross more than sixty years previously. During their stay the officers of the "Discovery" made several further collections.

In the winter of 1903 Dr. Cockayne visited all the islands with the exception of the Snares, at which he was unable to land owing to bad weather, and made extensive collections of the plants, and very extended observations of their winter aspect, which he afterwards embodied in a valuable paper (1904). At the same time he collected zoological specimens belonging to various groups, including some from the Bounty Islands, which were of especial interest. Some of these have been already described in various papers, and others are included in the reports in these volumes.

In February, 1907, at the request of His Excellency the Governor (Lord Plunket), Professor W. B. Benham and Mr. E. R. Waite accompanied him to the islands in the Government steamer "Tutanekai," and extensive collections were made by them, most of which have been incorporated in the various reports in this volume.

In November of the same year the expedition organized by the Philosophical Institute of Canterbury, which has been the immediate cause of the appearance of this work, visited the Auckland and Campbell Islands, a party being left on each for some time. A brief narrative of the expedition, with the list of members, has been already given. During the expedition, Dr. L. Cockayne, acting under instructions from the Government, secured twelve specimens each of the Auckland Island flightless duck (*Nesonetta aucklandica*), the Antipodes Island parrakeet (*Cyanorhamphus unicolor*), and the Auckland Island parrakeet (*C. novae-zealandiae*). These were afterwards liberated on the native birds' sanctuary on Kapiti Island, where, according to the last reports, they were doing well.

In the following year Mr. B. C. Aston, a member of the Auckland Island party, visited the whole of the islands in the Government steamer "Hinemoa," and made further botanical collections, which he generously placed at the disposal of Messrs. Cheeseman and Petrie.

Here, for the time, the story of the scientific investigation of these islands ceases; but it cannot end here. They are the most readily accessible and the richest biologically of all the subantarctic islands; they lie almost in the direct path leading to the best approach to the regions furthest south; and the Balleny, Macquarie, Campbell, Auckland, and Snares Islands form the best series of transitional steps from the barren ice-clad lands of the Antarctic Continent to a country covered with a rich temperate and subtropical vegetation, and their more complete investigation will necessarily follow. Particularly do the Macquarie and the Balleny Islands call for immediate attention: they could be investigated in a short time, and at a

cost insignificant in comparison with the value of the results likely to be obtained. Some day doubtless—and, let us hope, some day not far in the future—there will be a permanent meteorological station on one of the fine harbours of the Auckland Islands, with another on Campbell Island, and perhaps still another on Cape Adare, connected with the first and with New Zealand by wireless telegraphy ;* and if to these stations there be added suitable accommodation and appliances for the collection, preservation, and observation of geological, zoological, and botanical material there will be a ready means afforded for gathering in that rich harvest of results that lies ready for the worker; and earnest workers will not be wanting. The commercial value of such stations would be considerable; their value, judged by the importance of the scientific problems they would help to solve, would be beyond calculation.

* A meteorological station is maintained by the Argentine Government on Laurie Island, in the South Orkneys, in lat. 60° 44′ S., long. 44° 50′ W., on the site of the station set up by the Scottish National Antarctic Expedition.

THE

SUBANTARCTIC ISLANDS OF NEW ZEALAND.

ARTICLE I.—THE MOLLUSCA OF THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By Henry Suter.

PLATE I.

Fam. ISCHNOCHITONIDAE.

Genus Ischnochiton, Gray, 1847.

Distribution.—World-wide.

Ischnochiton contractus (Reeve), [illegible].

Chiton contractus, Reeve, Conch. Icon., Chiton, 1847, pl. xv, fig. 78; Man. Conch. (1), xiv, p. 93, pl. xxiii, figs. 81, 82; Suter, P. Mal. S., vii, p. 293. *Chiton decussatus*, Reeve, Conch. Icon., Chiton, pl. xviii, fig. 107. *Chiton castus*, Reeve, t.c., pl. xxii, fig. 145. *Lepidopleurus speciosus*, Ad. and [illegible]g, P.Z.S., 1864, p. 192; 1865, p. 187.

The girdle-scales are deeply grooved, the lateral areas with radial wrinkles, cut up into granules.

Hab.—Auckland Islands (Captain J. Bollons).
Also Tasmania and Australia.

Ischnochiton parkeri, Suter, 1897.

Ischnochiton parkeri, Suter, P. Mal. S., ii, 1897, p. 186, figs. 1–6 in text. *Lepidopleurus circumvallatus*, Reeve: Hutton, M.N.Z.M., p. 113 (not of Reeve). *Ischnochiton longicymba*, Q. and G.: Filhol and Hutton (not of Quoy and Gaimard).

The girdle-scales are also deeply grooved, but the lateral areas with broad concentric ridges, radiate riblets present or indistinct.

Hab.—Auckland Islands (Professor Benham); Campbell Island (Professor Chilton).

Ischnochiton luteoroseus, Suter, 1907.

Ischnochiton luteoroseus, Suter, P. Mal. S., vii, 1907, p. 293, fig. 1 in text.

Length of shell, 5 mm.; colour, pink and yellowish banded; girdle-scales smooth.

Hab.—Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Dusky Sound, in 30 fathoms.

Genus CALLOCHITON, Gray, 1847.

Distribution.—British seas, Mediterranean, Magellan Province, Antarctic station "Gauss," Australasia, Réunion and Mauritius, Cape of Good Hope. From the littoral zone to about 130 fathoms.

Callochiton puniceus (Gould), 1846.

Chiton puniceus, Gould, P. Bost. S.N.H., ii, 1846, p. 143; U.S. Expl. Exp., xii, p. 324, fig. 412. *Chiton illuminatus*, Reeve, Conch. Icon., iv, 1847, fig. 147. *Chiton dimorphus*, Rochebrune, Miss. Cape Horn, Moll., 1889, p. 142, pl. ix, fig. 10. *Callochiton illuminatus* + *Ischnochiton* (*Trachydermon*) *puniceus*, Pilsbry, Man. Conch. (1), xiv, p. 51, pl. ix, figs. 92–94; p. 81, pl. viii, figs. 76, 77. *Callochiton illuminatus*, Reeve: Suter, P. Mal. S., ii, p. 185; vii, p. 294. *Callochiton* (*Icoplax*) *puniceus* (Gould): Thiele, "Die antarktischen und subantarktischen Chitonen," 1908, p. 14.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Kapiti Island and Stewart Island. Common in the Magellan Province.

Fam. MOPALIIDAE, Pilsbry.

Genus MOPALIA, Gray, 1847.

Distribution.—Shores of the northern Pacific, extending from Lower California to Alaska and Japan. Our species is the only one on record from the Southern Hemisphere.

Mopalia australis, Suter, 1907.

Mopalia australis, Suter, P. Mal. S., vii, 1907, p. 215, pl. xviii, fig. 12.

Length of shell, 9 mm.; anterior valve with 8, intermediate valves with 1 slit on each side; posterior valve with an oblique slit on each side, bisinuate in the middle. Girdle leathery, with sutural tufts.

Hab.—Snares Islands (Captain J. Bollons).

Genus PLAXIPHORA, Gray, 1847.

Distribution.—Southern extremities of the southern continents: New Zealand, Australia, Tasmania, South Africa, Tristan da Cunha, South America.

Plaxiphora aucklandica, n. sp. (Plate I, fig. 1.)

Shell small, elongately oval, depressed, valves very fragile (animal preserved in formol!), dorsal ridge subangular. Colour light brown, jugal tract whitish, white

dashes on the sides. Girdle wide, black, with sutural tufts of very long bristles. Anterior valve short and broad, flattish, with 8 granulated radial ribs. Intermediate valves wide, depressed, the jugum smooth, with very fine growth-lines; lateral areas not raised, with 2 narrow granulated ribs, the interspaces smooth. Posterior valve smooth, small, the mucro posterior, the hind slope nearly straight. Girdle broad, with very prominent sutural tufts round the anterior and a few round the posterior valve; a second series of tufts with shorter bristles near the margin, which is beset with short brownish hairs; remainder of the girdle quite naked, smooth. Colour of the valves light brown; intermediate and tail valves usually with a dorsal triangular white area with a longitudinal brown median line; one or two white elongated spots are mostly present on the pleural, rarely on the lateral areas; girdle black.

Length, about 15 mm. Divergence, 105°.

The specimen could not be disarticulated without completely destroying the valves.

Type in the Canterbury Museum, Christchurch.

Hab.—Musgrave Harbour, Auckland Islands (Edgar R. Waite).

Plaxiphora superba, Pilsbry, 1893.

Plaxiphora superba, Pilsbry, Man. Conch. (1), xiv, 1893, p. 319, pl. lxviii, figs. 55–61. *Plaxiphora subatrata*, Suter, P. Mal. S., ii, 1897, p. 190, figs. 7–11 in text.

Shell attaining a large size; the posterior valve not much reduced in size or altered in form; central areas unsculptured save for growth-lines; sutural pores or tufts distinctly developed; lateral areas with 2 to 4 low flat ribs. Colour reddish-olive, maculated with darker and paler, or reddish-brown, the jugum dirty pink or with a wedge-shaped white stripe with a brown one in the centre. The shape of the intermediate valves is subject to great variation, from narrow and high to wide and low, but all intermediate grades occur.

Length, 60–75 mm.; breadth, 40–45 mm. Divergence, 110°–125°.

Hab.—Auckland Islands (Professor Benham); Campbell Island (Professor Chilton).

Also Macquarie Island (A. Hamilton).

This species may be *P. campbelli*, Filhol (Compt. Rend., xci, 1880, p. 1095), which was insufficiently described, and not figured.

Fam. ACANTHOCHITIDAE, Pilsbry.

Genus ACANTHOCHITES, Risso, 1826.

Distribution.—World-wide.

Acanthochites (Loboplax) rubiginosus (Hutton), 1872.

Tonicia rubiginosa, Hutton, T.N.Z.I., iv, 1871 (1872), p. 180. *Acanthochites costatus*, Ad. and Ang.: Suter, P. Mal. S., ii, p. 194 (not of Adams and Angas). *Acanthochites rubiginosus*, Hutton: Suter, Journ. Malac., xii, p. 68, pl. ix, figs. 12–17.

Hab.—Auckland Islands (Captain J. Bollons).

In the laminarian zone, from Hauraki Gulf to the Bluff.

Fam. CHITONIDAE, Pilsbry.

Genus CHITON, Linné, 1758.

Distribution.—World-wide.

Chiton aereus, Reeve, 1847, var.

Chiton aereus, Reeve, Conch. Icon., pl. vii, fig. 36; Voy. Ereb. and Terr., pl. i, fig. 9; Man. Conch. (1), xiv, p. 179, pl. xxxvi, figs. 96–97.

Hab.—Auckland Islands (Captain J. Bollons).

Littoral and laminarian zone, from the Bay of Islands to the Bluff.

The only specimen from the Auckland Islands is brownish-red, the central areas are not shagreened, and more of the outer furrows on the pleura extend the whole length than is usually the case.

Genus ONITHOCHITON, Gray, 1847.

Distribution.—From Cape of Good Hope to New Zealand.

Onithochiton undulatus subantarcticus, Suter, 1907.

Chiton undulatus, Quoy and Gaimard, Voy. "Astrolabe," iii, 1835, p. 393, pl. lxxv, figs. 19–24. *O. und. subantarcticus*, Suter, T.N.Z.I., xxxix, 1906 (1907), p. 268.

This colour variety is usually uniform chocolate or purplish-brown, sometimes with white patches on the ridge, or with white concentric lines.

Hab.—Auckland Islands (Professor Benham); Campbell Island.

Also New Brighton and Cook Strait.

Fam. ACMAEIDAE, Philippi.

Genus ACMAEA, Eschscholtz, 1830.

Distribution.—World-wide.

Acmaea intermedia, Suter, 1907.

Acmaea intermedia, Suter, P. Mal. S., vii, 1907, p. 316, pl. xxvii, figs. 6–8.

Shell with 25 to 50 smooth radial riblets, which are sharp, and there are usually no secondary shorter riblets; spatula dark-brown.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).

Acmaea roseoradiata, Suter, 1907.

Acmaea roseoradiata, Suter, P. Mal. S., vii, 1907, p. 317, pl. xxvii, figs. 9, 10.

Shell very small, 3·5 by 2·5 by 1·5 mm., smooth, whitish with 10 radiate pinkish rays.

Hab. Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Stewart Island, Dusky Sound, and Taumaki Island, in 10–30 fathoms.

Acmaea septiformis (Quoy and Gaimard), 1834.

Patelloidea septiformis, Q. and G., Voy. "Astrolabe," iii, 1834, p. 362, pl. lxxi, figs. 43, 44. *Acmaea septiformis*, Q. and G., Man. Conch. (1), xiii, p. 55 pl. xxxvii, figs. 93, 94. *Acmaea scabrilirata*, Angas, P.Z.S., 1865, p. 154. *Acmaea petterdi*, T.-Woods, P. Roy. S. Tasm., 1877, p. 155. *A. septiformis*, Q. and G.: Suter, P. Mal. S., vii, p. 318.

Hab.—Auckland Islands (Professor Benham); Campbell Island (Professor Chilton).

Also Chicken Island, west coast of the Manukau, Dunedin, Tasmania, and Australia.

Acmaea pileopsis (Quoy and Gaimard), 1834.

Patelloidea pileopsis, Q. and G., Voy. "Astrolabe," iii, 1834, p. 359, pl. lxxi, figs. 25–27. *Acmaea pileopsis*, Q. and G., Man. Conch. (1), xiii, p. 57, pl. xxxvii, figs. 90–92; Suter, P. Mal. S., vii, p. 319. *Patelloides antarctica*, Hombron and Jacquinot, Ann. Sci. Nat. (2), xvi, 1841, p. 190. *Patella floccata*, Reeve, Conch. Icon., 1855, fig. 106.

Hab.—Snares Islands (Professor Chilton); Auckland Islands; Campbell Island (Captain J. Bollons).

Also North and South Islands of New Zealand.

Acmaea cantharus (Reeve), 1855.

Patella cantharus, Reeve, Conch. Icon., 1855, fig. 131. *Acmaea cantharus*, Reeve, Man. Conch. (1), xiii, p. 55, pl. xxxvii, figs. 1, 2; Suter, P. Mal. S., vii, p. 320.

Hab.—Auckland Islands.

Also South Island of New Zealand; Macquarie Island (A. Hamilton).

Acmaea campbelli (Filhol), 1880.

Patella campbelli, Filhol, Compt. Rend., xci, 1880, p. 1095; Miss. I.C., 1885, p. 530. *Acmaea campbelli*, Filhol: Suter, P. Mal. S., vii, p. 321, pl. xxvii, figs. 19, 20.

Shell small, roundish-oval, conical, subpellucid, finely ribbed, pink. The radiate riblets are very numerous and close together, about 40 reach from apex to margin, and about 20 are interstitial; they are broadly convex, and crossed by numerous very fine concentric growth-lines. The colour is uniformly pink. Apex small, rounded, situate about the anterior third of the length; anterior slope straight, posterior slope very little convex. Inside pinkish-white, with white radiating rays corresponding to the riblets; central area pink; margin crenulate, with a narrow pink border.

Length, 5 mm.; breadth, 5 mm.; height, 3 mm. Type.

Length, 5·75 mm.; breadth, 4·75 mm.; height, 3 mm. From Auckland Islands.

Hab.—Campbell Island (Filhol); Auckland Islands (Captain J. Bollons).

Fam. PATELLIDAE, Guilding.

Genus NACELLA, Schumacher, 1817.

Distribution.—Cape Horn was evidently the birthplace of *Nacella* and *Patinigera ;* thence they have been distributed eastward to the Falkland, New Georgia, and Kerguelen Islands by the eastward-sweeping Antarctic current, carrying them upon seaweeds (Pilsbry).

Nacella (Patinigera) illuminata (Gould), 1846.

Patella illuminata, Gould, P. Bost. S.N.H., ii, 1846, p. 149 ; U.S. Expl. Exp., xii, p. 340, atlas fig. 441. *Helcioniscus illuminata*, Gould, Man. Conch. (1), xiii, p. 142, pl. lxx, figs. 40–42. *Nacella illuminata*, Gould : Suter, P. Mal. S., vi, p. 353. *Patella terroris*, Filhol, Compt. Rend., xci, 1880 ; Miss. I.C., p. 529.

Hab.—Auckland Islands (Lieutenant Totten) ; Antipodes Islands ; Campbell Island.

Also Macquarie Island (A. Hamilton).

Nacella (Patinigera) fuegiensis (Reeve), 1855.

Patella fuegiensis, Reeve, Conch. Icon., 1855, fig. 73. *Nacella fuegiensis*, Reeve, Man. Conch. (1), xiii, p. 121, pl. xlix, figs. 28–31 ; Suter, P. Mal. S., vi, p. 353.

Hab.—Campbell Island (Filhol).

Also Macquarie Island (A. Hamilton), Tierra del Fuego, Falkland Islands, Kerguelen. Common on the submerged fronds of floating kelp (*Macrocystis*).

Genus HELCIONISCUS, Dall, 1871.

Distribution.—Indian and Pacific Oceans, but not found on the American shores north of Chili. No species have been found in the Atlantic Ocean.

Helcioniscus radians affinis (Reeve), 1855.

Patella affinis, Reeve, Conch. Icon., 1855, fig. 108. *Helcioniscus affinis*, Reeve, Man. Conch. (1), xiii, p. 140, pl. lxix, figs. 32, 33. *Nacella earlii*, Reeve : Hutton, C.M.M., p. 45 (not of Reeve). *Helcioniscus radians affinis*, Reeve : Suter, P. Mal. S., vi, p. 349. *Acmaea chathamensis*, Pilsbry, Man. Conch. (1), xiii, p. 56, pl. xxxv, figs. 43–46 ; Suter, *l.c.*, vii, p. 326.

Hab.—Disappointment Island, Auckland Islands (Captain J. Bollons).

Also North and South Islands of New Zealand, and Chatham Islands.

Helcioniscus stelliferus (Gmelin), 1790.

Patella stellifera, Gmelin, Syst. Nat., ed. 13, p. 3719. *Helcioniscus stellifera*, Gmel., Man. Conch. (1), xiii, p. 141, pl. lxx, figs. 43–45 ; Suter, P. Mal. S., vi, p. 350. *Patella stellularia*, Quoy and Gaimard, Voy. " Astrolabe," Zool., iii, 1834, p. 347, pl. lxx, figs. 18–20.

Hab.—Campbell Island, on rocks (Captain J. Bollons).

Also North and South Islands of New Zealand.

Helcioniscus strigilis (Hombron and Jacquinot), 1841.

Patella strigilis, Hombr. and Jacq., Ann. Sci. Nat. (2), xvi, 1841, p. 190. *Helcioniscus strigilis*, H. and J., Man. Conch. (1), xiii, p. 137; Suter, P. Mal. S., vi, p. 351.

Hab.—Snares Islands (Professor Chilton); Antipodes Islands; Auckland Islands; Campbell Island (Professor Chilton).

Also North and South Islands of New Zealand, and Chatham Islands.

Helcioniscus redimiculum (Reeve), 1854.

Patella redimiculum, Reeve, Conch. Icon., fig. 50; Voy. Ereb. and Terr., p. 4, pl. i, fig. 24. *Helcioniscus redimiculum*, Reeve, Man. Conch. (1), xiii, p. 136, pl. xxiii, figs. 1–3, 5; Suter, P. Mal. S., vi, p. 351. *Patella radians*, Gmel.: Reeve, Conch. Icon., fig. 25 (not of Gmelin). *Patella pottsi*, Hutton, C.M.M., p. 44.

Hab.—Bounty Islands; Auckland Islands (E. R. Waite).

Also South Island of New Zealand, and Chatham Islands.

Fam. SCISSURELLIDAE, Pilsbry.

Widely distributed, and most of them living in deep water.

Genus Scissurella, d'Orbigny, 1823.

Scissurella rosea, Hedley, 1904.

Scissurella rosea, Hedley, Rec. A.M., v, 1904, p. 90, fig. 17 in text.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Lyall Bay and Banks Peninsula.

Genus Schismope, Jeffreys, 1856.

Schismope atkinsoni (T.-Woods), 1877.

Scissurella atkinsoni, T.-Woods, P. Roy. S. Tasm., 1877, p. 149; Man. Conch. (1), xii, p. 66. *Schismope atkinsoni*, T.-Woods: Suter, T.N.Z.I., xxxix, p. 268. *Schismope carinata*, Watson, Chall. Rep., xv, 1886, p. 119, pl. viii, fig. 6; Man. Conch., t.c. p. 65, pl. lxv, figs. 17–19.

Hab.—Near the Snares and Bounty Islands (Captain J. Bollons).

Also Whangaroa Harbour, Tasmania, and Australia.

Schismope beddomei, Petterd, 1884.

Schismope beddomei, Petterd, J. of Conch., iv, 1884, p. 139; Tate and May, P.L.S. N.S. Wales, 1901, p. 407, pl. xxiv, fig. 24; Man. Conch. (1), xii, p. 67.

Hab.—Near the Snares and Bounty Islands (Captain J. Bollons).

Also Foveaux Strait, Tasmania, and Australia.

Schismope brevis, Hedley, 1904.

Schismope brevis, Hedley, Rec. A.M., v, 1904, p. 90, fig. 16 in text.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Lyall Bay (A. Hamilton) and Lyttelton Harbour (T. Iredale).

Fam. HALIOTIDAE, Fleming.

Genus HALIOTIS, Linné, 1758.

Distribution.—Tropical and temperate seas; west coast of Europe, Mediterranean, east coast of Africa, Cape of Good Hope, Indian and Pacific Oceans, China, Japan, California, and Australasia.

Haliotis iris, Martyn, 1784.

Haliotis iris, Martyn, Univ. Conch., ii, fig. 61; Man. Conch. (1), xii, p. 110, pl. xiii, figs. 65, 66.

Hab.—Snares and Auckland Islands.
Throughout New Zealand and at the Chatham Islands.

Haliotis australis, Gmelin, 1790.

Haliotis australis, Gmelin, Syst. Nat., ed. 13, 1790, p. 3689. *H. rugoso-plicata*, Chemnitz, Conch. Cab., x, p. 311, pl. clxvi, fig. 1604 (not binomial); Man. Conch. (1), xii, p. 110, pl. xx, figs. 12, 13. *H. plicata*, Karsten, Mus. Leskeanum, 1789. *H. cruenta*, Reeve, Conch. Icon., fig. 56. *H. costata*, Swainson, Appendix Bligh Cat., p. 3. *H. ruber*, Leach, Zool. Misc., i, p. 54, pl. xxiii.

Hab.—Snares Islands (Captain J. Bollons); Auckland Islands.
Throughout New Zealand and Chatham Islands.

Haliotis virginea huttoni, Filhol, 1880.

Haliotis huttoni, Filhol, Compt. Rend., xci, p. 1094; Miss. I.C., p. 527. *H. gibba huttoni*, Filhol: Hutton, P.L.S. N.S. Wales, ix, p. 370.

Hab.—Campbell Island (Filhol).

Fam. FISSURELLIDAE, Risso.

Genus INCISURA, Hedley, 1904.

Distribution.—New Zealand only.

Incisura lytteltonensis (E. A. Smith), 1894.

Scissurella lytteltonensis, E. A. Smith, P. Mal. S., i, 1894, p. 57, pl. vii, figs. 1, 2. *Incisura lytteltonensis*, E. A. Smith: Hedley, Rec. A.M., v, p. 92, fig. 18 in text.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Lyttelton Harbour and Lyall Bay.

Genus EMARGINULA, Lamarck, 1801.

Distribution.—Mediterranean, Atlantic, Gulf of Mexico, Indo-Pacific, Australasia.

Emarginula striatula, Quoy and Gaimard, 1834.

Emarginula striatula, Q. and G., Voy. " Astrolabe," iii, 1834, p. 332, pl. lxviii, figs. 21, 22 ; Man. Conch. (1), xii, p. 259, pl. lxiv, fig. 2.

Hab.—Snares and Bounty Islands (Captain J. Bollons).
North and South Islands of New Zealand, and Chatham Islands.

Genus PUNCTURELLA, Lowe, 1827.

Distribution.—Northern and southern cold seas.

Puncturella demissa, Hedley, 1904.

Puncturella demissa, Hedley, Rec. A.M., v, 1904, p. 93, fig. 19 in text ; *l.c.*, vi, p. 289, pl. liv, figs. 3–5.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Foveaux Strait and Australia.

Genus FISSURIDEA, Swainson, 1840.

Distribution.—Mediterranean, Atlantic, Indo-Pacific.

Fissuridea monilifera (Hutton), 1873.

Lucapina monilifera, Hutton, C.M.M., p. 42. *Megatebennus moniliferus*, Hutton, Plioc. M., p. 72, pl. viii, fig. 76.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Stewart Island, in 15–20 fathoms.

Fam. TROCHIDAE, d'Orbigny.

Genus TROCHUS, Linné, 1758.

Distribution.—In all warmer seas.

Trochus (Infundibulum) chathamensis (Hutton), 1873.

Polydonta chathamensis, Hutton, C.M.M., p. 36. *Trochus chathamensis*, Hutton : Suter, P. Mal. S., ii, p. 260, fig. in text.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons) ; Auckland Islands (Professor Benham, E. R. Waite).
Also Foveaux Strait and Chatham Islands.

Genus MONODONTA, Lamarck, 1801.

Distribution.—Australasia, west coast of South America. Most species are Old World in distribution, the majority tropical.

Monodonta (Diloma) nigerrima (Gmelin), 1790.

Turbo nigerrimus, Gmelin, Syst. Nat., ed. 13, p. 3597. *Monodonta nigerrima*, Gmelin, Man. Conch. (1), xi, p. 97, pl. xxiii, figs. 77, 78; pl. xx, fig. 18. *Trochus araucanus*, d'Orbigny, Voy. Amér. Mérid., p. 410, pl. lv, fig. 6. *Turbo quoyi*, Kiener, Spec. Icon., Turbo, pl. xxix, fig. 2. *Monodonta porcifera*, Watson: Suter, P. Mal. S., ii, p. 264 (not of Adams nor of Watson). *Trochus gaudichaudi*, Hupé, in Gray, Hist. fis. Chile, Zool., viii, 1854, p. 146, pl. iv, fig. 4.

Hab.—Auckland Islands (Professor Benham, E. R. Waite).

Also Sumner, St. Clair, Preservation Inlet, Stewart Island, and west coast of South America.

Monodonta (Diloma) coracina (Troschel), 1851.

Trochus coracinus, Troschel, in Philippi, Conch. Cab., 1851, p. 148, pl. xxiv, fig. 13. *Monodonta coracina*, Troschel, Man. Conch. (1), xi, p. 103, pl. xix, fig. 94; pl. xxxi, fig. 28. *Labio porcifera*, A. Adams, P.Z.S., 1851 (1853), p. 179. *Diloma nigerrima*, Chemnitz: Hutton, M.N.Z.M., p. 96 (not of Chemnitz).

Hab.—Auckland Islands (Captain Hutton).

Also coast near Kawhia, Wellington, South Island of New Zealand, and Chatham Islands.

Monodonta (Neodiloma) aethiops (Gmelin), 1790.

Turbo aethiops, Gmelin, Syst. Nat., ed. 13, p. 3596. *Monodonta aethiops*, Gmelin, Man. Conch. (1), xi, p. 98, pl. xix, figs. 99–100; pl. xx, fig. 19. *Trochus zelandicus*, Q. and G., Voy. "Astrolabe," iii, 1834, p. 257, pl. lxiv, figs. 12–15. *Monodonta reticularis*, Gray, in Wood's Suppl., fig. 21. ? *Labio concolor*, A. Adams, P.Z.S., 1851, p. 180.

Hab.—Auckland Islands, *teste* Hutton.

Throughout New Zealand and Chatham Islands.

Genus CANTHARIDUS, Montfort, 1810.

Distribution.—Australasian seas.

Cantharidus opalus (Martyn), 1784.

Limax opalus, Martyn, Univ. Conch., i, fig. 24. *Trochus iris*, Gmelin, Syst. Nat., ed. 13, 1790, p. 3580. *Cantharidus iris*, Gmelin, Man. Conch. (1), xi, p. 122, pl. xxxiv, fig. 15. *Cantharidus zealandicus*, A. Adams, P.Z.S., 1851, p. 169.

Hab.—Snares Islands (Professor Chilton).

Also from Cape Maria van Diemen to Cook Strait, Preservation Inlet, Chatham Islands, and Kermadec Islands.

Cantharidus sanguineus caelatus, Hutton, 1884.

Cantharidus sanguineus caelatus, Hutton, P.L.S. N.S. Wales, ix, 1884, p. 363; Suter, P. Mal. S., ii, p. 272.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons). Also Whangaroa Harbour, Foveaux Strait, and Stewart Island.

Cantharidus pruninus (Gould), 1849.

Trochus pruninus, Gould, P. Bost. S.N.H., iii, 1849, p. 90; U.S. Expl. Exp., xii, p. 180, atlas fig. 205. *Cantharidus pruininus*, Gould, Man. Conch. (1), xi, p. 122, pl. xlvi, figs. 60, 61. *Trochus capillaceus*, Philippi, Zeitschr. f. Malac., 1848, p. 102. *Trochus episcopus*, Hombron and Jacquinot, Voy. P. Sud, pl. xiv, figs. 9–11.

Hab.—Auckland Islands (Professor Benham); Campbell Island.
Not known from any other locality.

Subsp. **perobtusus**, Pilsbry, 1889.

Cantharidus pruininus perobtusus, Pilsbry, Man. Conch. (1), xi, p. 123, pl. xxxiv, fig. 1.

Hab.—Auckland Islands; Campbell Island.
Also Macquarie Island (A. Hamilton) and Otago Peninsula (T. Iredale).

Var. **minor**, E. A. Smith, 1902.

Cantharidus pruninus minor, E. A. Smith, Voy. South. Cross, p. 207.

Hab.—Auckland Islands (E. R. Waite); Campbell Island.

Genus Photinula, H. and A. Adams, 1854.

Distribution.—Southern seas: Straits of Magellan, Falkland Islands, Cape of Good Hope, Kerguelen, &c.

Photinula antipoda (Hombron and Jacquinot), 1854.

Margarita antipoda, H. and J., Voy. P. Sud, v, p. 58, pl. xiv, figs. 26–28. *Gibbula antipoda*, H. and J., Man. Conch. (1), xi, p. 217, pl. xxxiii, figs. 102–104; Suter, P. Mal. S., ii, p. 277.

Hab.—Snares and Campbell Islands (Professor Chilton); Antipodes and Auckland Islands (Captain J. Bollons).

Var. **rosea** (Hutton), 1873.

Chrysostoma rosea, Hutton, C.M.M., p. 36. *Margarita rosea*, Hutton, M.N.Z.M., p. 103. *Gibbula rosea*, Hutton, Man. Conch. (1), xi, p. 216; Suter, P. Mal. S., ii, p. 276.

Hab.—Auckland Islands (Professor Benham); Bounty Islands; Campbell Island (Filhol); Antipodes Island (Captain J. Bollons).
Also Stewart Island.

Genus MONILEA, Swainson, 1840.

Distribution.—Indian Ocean, western and south-western Pacific.

Monilea (Minolia) semireticulata, Suter, 1908.

Monilea (*Minolia*) *semireticulata*, Suter, P. Mal. S., viii, p. 22, pl. ii, fig. 1.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Genus CALLIOSTOMA, Swainson, 1840.

Distribution.—World-wide.

Calliostoma punctulatum (Martyn), 1784.

Trochus punctulatus, Martyn, Univ. Conch., ii, fig. 36. *Calliostoma punctulatum*, Martyn, Man. Conch. (1), xi, p. 334, pl. lxv, fig. 75; Suter, P. Mal. S., ii, p. 280. *Zizyphinus punctulatus*, Martyn: Hutton, M.N.Z.M., p. 98. *Trochus diaphanus*, Gmelin, Syst. Nat., ed. 13, 1790, p. 3580. *Turbo grandineus*, Valenciennes, Voy. "Venus," pl. iv, fig. 4.

Hab.—Snares Islands (Captain J. Bollons).
Throughout New Zealand and Stewart Island.

Calliostoma spectabile (A. Adams), 1855.

Zizyphinus spectabilis, A. Adams, P.Z.S., 1854 (1855), p. 37, pl. xxvii, fig. 7. *Calliostoma spectabile*, A. Adams, Man. Conch. (1), xi, p. 332, pl. xvi, fig. 12; Suter, P. Mal. S., ii, p. 280.

Hab.—Auckland Islands (Dr. Krone, Captain J. Bollons).
Also Foveaux Strait; Chatham Islands, *teste* Pilsbry.

Calliostoma aucklandicum, E. A. Smith, 1902.

Calliostoma aucklandicum, E. A. Smith, Voy. South. Cross, p. 207, pl. xxiv, fig. 5.

Hab.—Auckland Islands, in 10 fathoms.

Fam. LIOTHIDAE, Gray.

Genus LIOTIA, Gray, 1847.

Distribution.—Tropical and subtropical seas.

Liotia polypleura, Hedley, 1904.

Liotia polypleura, Hedley, Rec. A.M., v, 1904, p. 93, fig. 20 in text.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).
Also Lyall Bay and Banks Penninsula.

Liotia rotula, Suter, 1908.

Liotia rotula, Suter, P. Mal. S., viii, 1908, p. 24, pl. ii, fig. 6.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. CYCLOSTREMATIDAE, Fischer.

Genus Cyclostrema, Marryatt, 1818.

Distribution.—Nearly universal.

Cyclostrema eumorpha, Suter, 1908.

Cyclostrema eumorpha, Suter, P. Mal. S., viii, 1908, p. 25, pl. ii, figs. 7–9.
Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Genus Cirsonella, Angas, 1877.

Distribution.—Australia and New Zealand.

Cirsonella densilirata, Suter, 1908.

Cirsonella densilirata, Suter, P. Mal S., viii, 1908, p. 26, pl. ii, fig. 13.
Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Fam. VITRINELLIDAE, K. J. Bush.

Genus Lissospira, K. J. Bush, 1897.

Distribution.—Most likely similar to that of *Cyclostrema*.

Lissospira micra (T.-Woods), 1877.

Cyclostrema micra, T.-Woods, P. Roy. S. Tasm., 1877, p. 147; Man. Conch. (1), x, p. 95, pl. xxxiii, fig. 13; Suter, P. Mal. S., viii, p. 24.
Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Tasmania, South Australia, and Victoria.

Genus Circulus, Jeffreys, 1865.

Distribution.—Most likely similar to that of *Cyclostrema*.

Circulus sub-tatei (Suter), 1907.

Cyclostrema sub-tatei, Suter, T.N.Z.I., xxxix, 1906 (1907), p. 258, pl. ix, figs. 6–8.
Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Hauraki Gulf, near Little Barrier Island, Lyall Bay.

Genus Cyclostremella, K. J. Bush, 1897.

Distribution.—East and west coast of North America.

Cyclostremella neozelanica, Suter, 1908.

Cyclostremella neozelanica, Suter, P. Mal. S., viii, 1908, p. 25, pl. ii, fig. 12.
Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. TURBINIDAE, Gray.

Genus Turbo, Linné, 1758.

Distribution.—Warmer and tropical seas.

Turbo (Modelia) granosus (Martyn), 1784.

Trochus granosus, Martyn, Univ. Conch., i, 1784, fig. 37. *Turbo granosus*, Martyn, Man. Conch. (1), x, p. 213, pl. xlviii, fig. 39. *Turbo rubicundus*, Chemnitz: Reeve, Conch. Icon., fig. 11. *Liotia* (*Arene*) *shandi*, Hutton, C.M.M., p. 35 (young shell).

Hab.—Auckland Islands.
Bay of Islands to Stewart Island, and Chatham Islands.

Genus Leptothyra, Dall, 1871.

Distribution.—Nearly all tropical and subtropical seas, but most numerous in the Pacific.

Leptothyra fluctuata (Hutton), 1883.

Cyclostrema fluctuata, Hutton, N.Z. Journ. Sci., i, 1883, p. 477; T.N.Z.I., xvi, p. 215. *Leptothyra fluctuata*, Hutton, Man. Conch. (1), x, p. 259, pl. lxiv, figs. 47, 48; Murdoch, T.N.Z.I., xxxvii, p. 222, pl. vii, fig. 10.

Hab.—Near the Snares and Bounty Islands (Captain J. Bollons).
From Whangaroa to Stewart Island.

Var. **immaculata**, Suter, 1908.

Leptothyra fluctuata immaculata, Suter, P. Mal. S., viii, p. 27.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Leptothyra crassicostata, Murdoch, 1905.

Leptothyra crassicostata, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 223, pl. vii, fig. 11.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Whangaroa Harbour.

Fam. COCCULINIDAE, Dall.

Genus Cocculina, Dall, 1882.

Distribution.—North Europe, north-eastern and western Atlantic, Philippines, Australasia, and Indian Ocean.

Cocculina tasmanica (Pilsbry), 1895.

Acmaea parva tasmanica, Pilsbry, "The Nautilus," ix, p. 128. *Nacella tasmanica*, Tate and May, P.L.S. N.S. Wales, 1901, p. 411, pl. xxvii, figs. 89, 90. *Cocculina meridionalis*, Hedley, Mem. A.M., iv, 1903, p. 331, fig. 64 in text. *Cocculina tasmanica*, Pilsbry: Murdoch and Suter, T.N.Z.I., xxxviii, p. 301.

Hab.—North-east of Auckland Islands, in 85 fathoms (E. R. Waite).
Also off Great Barrier Island, Stewart Island, Tasmania, and Australia.

Cocculina clypidellaeformis, Suter, 1908.

Cocculina clypidellaeformis, Suter, P. Mal. S., viii, 1908, p. 27, pl. ii, figs. 19, 20.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. LITORINIDAE, Gray.

Genus LITORINA, Férussac, 1821.

Distribution.—World-wide.

Litorina (Melaraphe) cincta, Quoy and Gaimard, 1833.

Littorina cincta, Q. and G., Voy. "Astrolabe," ii, 1833, p. 481, pl. xxx, figs. 20, 21; Reeve, Conch. Icon., x, fig. 53. *L. angulifera*, Gould, Otia Conch., 1846, p. 55. *L. luctuosa*, Reeve, Conch. Icon., x, fig. 65.

Hab.—Snares Islands (Professor Chilton).
Throughout New Zealand and Chatham Islands.

Genus LAEVILITORINA, Pfeffer, 1886.

Distribution.—Antarctic Sea.

Laevilitorina antipodum (Filhol), 1880.

Assiminea antipodum, Filhol, Compt. Rend., xci, p. 1094; Miss. I.C., p. 523.

Hab.—Campbell Island (Filhol, Professor Chilton); Auckland Islands (Professor Kirk).

Fam. FOSSARIDAE, Fischer.

Genus COUTHOUYIA, A. Adams, 1860.

Distribution.—The type is from Japan, Indian Ocean, and Australasia.

Couthouyia corrugata, Hedley, 1904.

Couthouyia corrugata, Hedley, Rec. A.M., v, 1904, p. 95, fig. 22 in text.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Foveaux Strait and near Cuvier Island.

Fam. RISSOIDAE, Gray.

Genus RISSOA, Fréminville, 1814.

Distribution.—World-wide, from high-water to about 1,100 fathoms.

Rissoa (s. str.) **huttoni**, Suter, 1898.

Rissoa huttoni, Suter, P. Mal. S., iii, p. 2. *Rissoa nana*, Hutton, C.M.M., p. 28 (not of Philippi). *Barleeia nana*, Hutton, M.N.Z.M., p. 81.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Stewart Island, off Otago Heads, and Whangaroa Harbour.

Rissoa (s. str.) **rufoapicata**, Suter, 1908.

Rissoa rufoapicata, Suter, P. Mal. S., viii, 1908, p. 28, pl. ii, fig. 21.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also obtained by Mr. E. R. Waite during the "Nora Niven" expedition, in depths from 50 to 120 fathoms.

Rissoa (Alvania) cheilostoma, T.-Woods, 1877.

Rissoa cheilostoma, T.-Woods, P. Roy. S. Tasm., 1877, p. 152; Man. Conch. (1), ix, p. 366, pl. lxviii, fig. 91. *Rissoa plicata*, Hutton, C.M.M., p. 29 (not of Deshayes), 1838. *Rissoina plicata*, Hutton, M.N.Z.M., p. 80. *Eglisia plicata*, Hutton, P.L.S. N.S. Wales, ix, p. 939.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons). Also Cape Maria van Diemen to Stewart Island, Tasmania, and Australia.

Rissoa (Alvania) exserta, Suter, 1908.

Rissoa exserta, Suter, P. Mal. S., viii, 1908, p. 28, pl. ii, fig. 22.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Rissoa (Onoba) suteri, Hedley, 1904.

Rissoa suteri, Hedley, Rec. A.M., v, 1904, p. 96, fig. 23 in text.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait.

Rissoa (Onoba) foliata, Suter, 1908.

Rissoa foliata, Suter, P Mal. S., viii, 1908, p. 28, pl. ii, fig. 23.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Rissoa (Ceratia) fumata, Suter, 1898.

Rissoa fumata, Suter, P. Mal. S., iii, 1898, p. 5, fig. 1 in text; Murdoch, T.N.Z.I., xxxvii, pl. viii, fig. 26.

Hab.—Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also near Lyttelton, Cook Strait, and Taumaki Island.

Rissoa (Ceratia) foveauxiana, Suter, 1898.

Rissoa foveauxiana, Suter, P. Mal. S., iii, 1898, p. 5, fig. 2 in text; Murdoch, T.N.Z.I., xxxviii, pl. viii, fig. 27.

Hab. -Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait, Dusky Sound, Taumaki Island, Banks Peninsula, and Lyall Bay.

Rissoa (Ceratia) insculpta, Murdoch, 1905.

Rissoa insculpta, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 229, pl. viii, fig. 28.

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Stewart Island, Dusky Sound, Taumaki Island, Banks Peninsula, and Whangaroa Harbour.

Rissoa (Cingula) subfusca, Hutton, 1873.

Rissoa subfusca, Hutton, C.M.M., p. 28 ; Suter, P. Mal. S., iii, p. 4. *Rissoa purpurea*, Hutton, t.c., p. 29 ; Man. Conch. (1), ix, p. 344, pl. lxxi, fig. 89.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

From Omaha to Stewart Island.

Subsp. **micronema**, Suter, 1898.

Rissoa subfusca micronema, Suter, P. Mal. S., iii, 1898, p. 4.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Stewart Island ; Banks Peninsula ; off Wreck Reef, in 50 fathoms ; off Long Point, in 120 fathoms (E. R. Waite) ; Whangaroa Harbour.

Rissoa (Cingula) rosea, Hutton, 1873.

Rissoa rosea, Hutton, C.M.M., p. 29. *Barleeia rosea*, Hutton, M.N.Z.M., p. 81 ; Man. Conch. (1), ix, p. 393, pl. lxxi, fig. 6 ; Suter, P. Mal. S., iii, p. 8.

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons) ; Auckland Islands (Professor Benham).

Also Stewart Island, Dusky Sound, Taumaki Island, and Whangaroa Harbour.

Rissoa (Setia) lubrica, Suter, 1898.

Rissoa lubrica, Suter, P. Mal. S., iii, 1898, fig. 3 in text ; viii, p. 29, pl. ii, fig. 24.

Hab.—Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait.

Rissoa (Setia) neozelanica (Suter), 1898.

Barleeia neozelanica, Suter, P. Mal. S., iii, 1898, p. 8, fig. 5 in text.

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Stewart Island and Banks Peninsula.

Rissoa (Setia) microstriata, Murdoch, 1905.

Rissoa microstriata, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 229, pl. viii, fig. 25.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait, Banks Peninsula, and Whangaroa Harbour.

Rissoa (Setia) micans, Webster, 1905.

Rissoa micans, Webster, T.N.Z.I., xxxvii, 1904 (1905), p. 277, pl. ix, fig. 4.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Cook Strait and Hauraki Gulf.

Rissoa (Setia) atomus, Suter, 1908.

Rissoa atomus, Suter, P. Mal. S., viii, 1908, p. 30, pl. ii, fig. 27.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).

Rissoa (Setia) verecunda, Suter, 1908.

Rissoa verecunda, Suter, P. Mal. S., viii, 1908, p. 30, pl. ii, fig. 28.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Queen Charlotte Sound.

Rissoa (Setia) porcellana, Suter, 1908.

Rissoa porcellana, Suter, P. Mal. S., viii, 1908, p. 30, pl. ii, fig. 29.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Dusky Sound and off Otago Heads.

Genus ANABATHRON, Frauenfeld, 1867.

Distribution.—Australasia.

Anabathron gradatum, Suter, 1908.

Anabathron gradatum, Suter, P. Mal. S., viii, 1908, p. 32, pl. iii, fig. 33.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Genus RISSOINA, d'Orbigny, 1840.

Distribution.—World-wide.

Rissoina (Eatoniella) chiltoni, n. sp. (Plate I, fig. 2.)

Shell minute, elongated conic, imperforate, rather solid, smooth, black. There is no sculpture; the surface in most specimens much corroded. Colour black, peristome white, interior of aperture bluish-black. Spire conic, obtuse; its height about $1\frac{1}{2}$ that of the aperture; outlines straight. Protoconch somewhat globular. Whorls 5, regularly increasing, very lightly convex; base rounded. Suture not much impressed. Aperture subvertical, oval, angled above. Peristome continuous, simple, straight and sharp, very little callous inside. Columella short, arcuate; inner lip slightly expanded towards the very slight umbilical depression. Operculum horny, rather thin, with an oblique claviform inner process.

Diameter, 1·5 mm.; height, 2·7 mm.

Dentition: Central tooth rhomboidal, with 5 denticles, the mesial larger than the others. Lateral tooth elongated, with a broad short reflection, and 5 small

cutting-points, the middle one largest. First marginal with 3 subequal denticles, the second with 2 sharp minute hooks at the apex, the upper one with a number of very small cutting-points.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island, type (Professor Chilton); Auckland Islands (Captain J. Bollons). Specimens from the latter locality are also in the British Museum.

The species is named in honour of its discoverer, Professor C. Chilton, D.Sc., M.A., M.B.

Fam. OMALOGYRIDAE, Sars.

Genus Omalogyra, Jeffreys, 1860.

Distribution.—Europe, Greenland, and South Africa.

Omalogyra bicarinata, Suter, 1908.

Omalogyra bicarinata, Suter, P. Mal. S., viii, 1908, p. 33, pl. iii, fig. 37.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. CERITHIIDAE, Fleming.

Genus Bittium, Gray, 1847.

Distribution.—Numerous species in temperate seas.

Bittium retiferum, Suter, 1908.

Bittium retiferum, Suter, P. Mal. S., viii, 1908, p. 34, pl. iii, fig. 38.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. CERITHIOPSIDAE, H. and A. Adams.

Genus Cerithiopsis, Forbes and Hanley, 1853.

Distribution.—Mostly in northern and temperate seas.

Cerithiopsis sarissa, Murdoch, 1905.

Cerithiopsis sarissa, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 221, pl. vii, figs. 8, 9.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also off Otago Heads, Banks Peninsula, Cook Strait, Kawhia Harbour, and Whangaroa Harbour.

Cerithiopsis crenistria, Suter, 1907.

Cerithiopsis crenistria, Suter, T.N.Z.I., xxxix, 1906 (1907), p. 256, pl. ix, fig. 4.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Hauraki Gulf.

Cerithiopsis cessicus, Hedley, 1906.

Cerithiopsis cessicus, Hedley, P.L.S. N.S. Wales, 1906, p. 529. *Bittium minimum*, T.-Woods, P. Roy. S. Tasm., 1878, p. 123. *Cerithiopsis minima*, T.-Wood : Tate and May, P.L.S. N.S. Wales, 1901, p. 385 (not of Brusina, 1864).

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Tasmania and Australia.

Cerithiopsis subantarctica, Suter, 1908.

Cerithiopsis subantarctica, Suter, P. Mal. S., viii, 1908, p. 35, pl. iii, fig. 41.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Cerithiopsis canaliculata, Suter, 1908.

Cerithiopsis canaliculata, Suter, P. Mal. S., viii, 1908, p. 35, pl. iii, fig. 42.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).

Cerithiopsis styliformis, Suter, 1908.

Cerithiopsis styliformis, Suter, P. Mal. S., viii, 1908, p. 36, pl. iii, fig. 43.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Cerithiopsis marginata, Suter, 1908.

Cerithiopsis marginata, Suter, P. Mal. S., viii, 1908, p. 36, pl. iii, fig. 44.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Genus SEILA, A. Adams, 1861.

Distribution.—Tropical, subtropical, and temperate seas.

Seila bulbosa, Suter, 1908.

Seila bulbosa, Suter, P. Mal. S., viii, 1908, p. 37, pl. iii, fig. 46.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Seila dissimilis, Suter, 1908.

Seila dissimilis, Suter, P. Mal. S., viii, 1908, p. 37, pl. iii, fig. 47.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. TRIFORIDAE, Jousseaume.

Genus TRIPHORA, Blainville, 1828.

Distribution.—Europe, West Indies, Indian Ocean, Polynesia, and Australasia.

Triphora huttoni, Suter, 1908.

Triphora huttoni, Suter, P. Mal. S., viii, 1908, p. 38, pl. iii, fig. 48. *Cerithium* (*Ino*) *minimus*, Hutton, C.M.M., p. 27. *Triforis angasi*, Crosse: Von Martens, Errata and Addenda to C.M.M., p. 2; Hutton, M.N.Z.M., p. 75 (not of Crosse).

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).
Also Whangaroa Harbour, Whangarei Heads, and Stewart Island.

Triphora fascelina, Suter, 1908.

Triphora fascelina, Suter, P. Mal. S., viii, 1908, p. 38, pl. iii, fig. 49.

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Triphora lutea, Suter, 1908.

Triphora lutea, Suter, P. Mal. S., viii, 1908, p. 39, pl. iii, fig. 50.

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Fam. TURRITELLIDAE, Clark.

Genus TURRITELLA, Lamarck, 1799.

Turritella difficilis, Suter, 1908.

Turritella difficilis, Suter, P. Mal. S., viii, 1908, p. 40, pl. iii, fig. 52.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. CAPULIDAE, Fleming.

Genus NEOJANACUS, Suter, 1907.

Distribution.—New Zealand only.

Neojanacus perplexus, Suter, 1907.

Genus (?), Murdoch and Suter, T.N.Z.I., xxxviii, 1905 (1906), p. 301, pl. xxvii, figs. 52–54. *Neojanacus perplexus*, Suter, T.N.Z.I., xxxix, 1906 (1907), p. 266.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).
Also off Great Barrier Island, in 110 fathoms; Stewart Island, in 18 fathoms.

Fam. NATICIDAE, Swainson.

Genus NATICA, Scopoli, 1777.

Distribution.—World-wide; mostly in warm seas.

Natica australis (Hutton), 1878.

Lunatia australis, Hutton, J. de Conch., 1878, p. 23; T.N.Z.I., x, p. 295. *Natica australis*, Hutton, Plioc. M., p. 54, pl. vii, fig. 38.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Hauraki Gulf; off Great Barrier Island, in 110 fathoms.

Genus Polinices, Montfort, 1810.

Distribution.—World-wide.

Polinices (Lunatia) amphialus (Watson), 1881.

Natica amphiala, Watson, J.L.S., xv, 1881, p. 260; Chall. Rep., xv, p. 437, pl. xxvii, fig. 6. *Natica vitrea*, Hutton, C.M.M., p. 21. *Lunatia vitrea*, Hutton, M.N.Z.M., p. 72.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also north-east from New Zealand, in 700 fathoms; Stewart Island; Chatham Islands.

Fam. LAMELLARIIDAE, d'Orbigny.

Genus Lamellaria, Montagu, 1815.

Distribution.—Atlantic, Indian, and Pacific Ocean.

Lamellaria ophione, Gray, 1850.

Lamellaria ophione, Gray, P.Z.S., 1849 (1850), p. 169. *Lamellaria indica*, Leach: Hutton, C.M.M., p. 21 (not of Leach). *Coriocella ophione*, Gray: Hutton, M.N.Z.M., p. 59. *Marsenia ophione*, Gray, Index F.N.Z., p. 80.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Kermadec Islands, Hauraki Gulf, Cook Strait, Tasmania, and southern Australia.

Fam. TRICHOTROPIDAE, Gray.

Genus Trichotropis, Broderip and Sowerby, 1829.

Distribution.—Mostly Arctic and Antarctic.

Trichotropis clathrata, Sowerby, 1874.

Trichotropis clathrata, Sowerby, Conch. Icon., xix, pl. ii, fig. 10; Voy. Ereb. and Terr., p. 3, pl. i, fig. 21; Man. Conch. (1), ix, p. 43, pl. vii, fig. 51. *Trichotropsis inornata*, Hutton, C.M.M., p. 26.

Hab.—Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Throughout New Zealand and Chatham Islands.

Fam. SEPTIDAE.

Genus Argobuccinum, Herrmansen, 1846.

Distribution.—Tropical and warm seas.

Argobuccinum argus (Gmelin), 1790.

Murex argus, Gmelin, Syst. Nat., ed. 13, 1790, p. 3547. *Triton ranelliformis*, King, Zool. Journ., v, 1832, p. 347. *Ranella vexillum*, Sowerby, Conch. Illustr., 1841, pl. i, fig. 3. *Ranella kingi*, d'Orbigny, Voy. Amér. Mérid., v, 1841,

p. 451. *Bursa (Apollon) proditor*, Frauenfeld, Reise "Novara," Moll., p. 4, pl. i, fig. 1. *Bursa tumida*, Dunker, Nov. Conch. *Apollo argus*, Gmel., Index F.N.Z., p. 75.

Hab.—Auckland Islands.

Throughout New Zealand and Chatham Islands; also Tasmania, Australia, St. Paul and Amsterdam, Tristan da Cunha, Natal, Cape Colony, and Chili.

Fam. EPITONIIDAE.

Genus Epitonium, Bolten, 1798.

Distribution.—World-wide, from low water to 400 fathoms.

Epitonium (Acrillus) levifoliatum, Murdoch and Suter, 1906.

Scala levifoliata, Murdoch and Suter, T.N.Z.I., xxxviii, 1905 (1906), p. 295, pl. xxv, figs. 35, 36.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also off Great Barrier Island, in 110 fathoms; near Little Barrier Island, in 20 fathoms; off the coast of New South Wales, in 80 fathoms.

Genus Crossea, A. Adams, 1865.

Distribution.—Japan and Australasia.

Crossea glabella, Murdoch, 1905.

Crossea glabella, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 225, pl. viii, figs. 16, 17.

Hab.—Near the Snares Islands, n 50 fathoms (Captain J. Bollons).

Also Stewart Island, Foveaux Strait, Dusky Sound, off Otago Heads, and Whangaroa Harbour.

Genus Aclis, Lovén, 1846.

Distribution.—A small number of species are known, mostly from the European seas.

Aclis succincta, Suter, 1908.

Aclis succincta, Suter, T.N.Z.I., xl, 1907 (1908), p. 362, pl. xxviii, fig. 4.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Fam. PYRAMIDELLIDAE, Gray.

Genus Turbonilla, Risso, 1826.

Distribution.—Universal.

Turbonilla zealandica (Hutton), 1873.

Chemnitzia zealandica, Hutton, C.M.M., p. 22. *Turbonilla neozelanica*, Hutton, Plioc. M., p. 56, pl. vii, fig. 44.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Throughout New Zealand.

Genus ODOSTOMIA, Fleming, 1813.

Distribution.—Universal, from low water to 700 fathoms.

Odostomia taumakiensis, Suter, 1908.

Odostomia taumakiensis, Suter, T.N.Z.I., xl, 1907 (1908), p. 363, pl. xxviii, fig. 7.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons). Also near Taumaki Island, in 10 fathoms.

Odostomia inornata, Suter, 1908.

Odostomia inornata, Suter, T.N.Z.I., xl, 1907 (1908), p. 364, pl. xxviii, fig. 8.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Odostomia (Pyrgulina) rugata, Hutton, 1886.

Odostomia (*Parthenia*) *plicata*, Hutton, T.N.Z.I., xvii, 1884 (1885), p. 319, pl. xviii, fig. 17 (not of Montfort, 1810). *Odostomia rugata*, Hutton, *l.c.*, xviii, 1885 (1886), p. 353; Plioc. M., p. 58, pl. vii, fig. 51; Murdoch, T.N.Z.I., xxxvii, p. 227.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons). Throughout New Zealand.

Odostomia (Menestho) sabulosa, Suter, 1908.

Odostomia (*Menestho*) *sabulosa*, Suter, T.N.Z.I., xl, 1907 (1908), p. 367, pl. xxix, fig. 15.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Fam. EULIMIDAE, Adams.

Genus EULIMA, Risso, 1826.

Distribution.—Tropical and temperate seas.

Eulima treadwelli, Hutton, 1893.

Eulima micans, Hutton, T.N.Z.I., xvii, 1884 (1885), p. 318 (not of Carpenter nor T.-Woods). *Eulima treadwelli*, Hutton, Plioc. M., 1893, p. 55, pl. vii, fig. 42; Suter, T.N.Z.I., xxxviii, p. 324.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons). Also Stewart Island, in 15 fathoms.

Eulima aucklandica, n. sp. (Plate I, fig. 3.)

Shell small, subulate, lightly curved forwards, white, smooth, glossy. There is no sculpture, except very fine growth-lines and rather inconspicuous discontinuous varices. Colour white, the red remains of the animal shining through the upper whorls. Spire lightly curved forwards, about twice the height of the aperture. Protoconch globular. Whorls 8, gradually increasing, but faintly convex, the last

slightly flattened below the suture, convex at periphery and base. Suture superficial, white-banded below. Aperture pyriform, subvertical, angled above, regularly arched and somewhat effuse below. Peristome sharp, simple, the outer lip very little convex, slightly advancing at the middle. Columella subvertical, arcuate; inner lip narrow, callous. There is a very slight umbilical depression.

Diameter—Maj., 2·4 mm.; min., 2 mm. Height, 6·4 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Carnley Harbour, Auckland Islands, on shore (Professor Benham).

Fam. CHRYSODOMIDAE, Cossmann.

Genus EUTHRIA, Gray, 1850.

Distribution. — Japan, California, Mediterranean, South America, Falkland Islands, New Zealand, Kerguelen, and South Africa.

This is a distinctly southern genus.

Euthria linea (Martyn), 1784.

Buccinum linea, Martyn, Univ. Conch., ii, 1784, fig. 48. *Fusus lineatus*, Quoy and Gaimard, Voy. "Astrolabe," ii, p. 501, pl. xxxiv, figs. 6–8. *Euthria lineata*, Martyn, Man. Conch. (1), iii, p. 151, pl. lxxii, figs. 229–231.

Hab.—Antipodes, Auckland, and Campbell Islands.

Throughout New Zealand and Chatham Islands.

Subsp. **pertinax**, Martens, 1878.

Euthria lineata pertinax, Martens, Sitzber. Naturf. Fr., Berlin, 1878, p. 23. *E. lineata*, var. A, Hutton, M.N.Z.M., p. 51.

Hab.—Auckland Islands.

Also Hauraki Gulf, Banks Peninsula, and Foveaux Strait.

Euthria vittata (Quoy and Gaimard), 1833.

Fusus vittatus, Quoy and Gaimard, Voy. "Astrolabe," ii, 1833, p. 504, pl. xxxiv, figs. 18, 19. *Euthria vittata*, Q. and G., Man. Conch. (1), iii, p. 152, pl. lxxii, figs. 235, 236. *Buccinum trilineatum*, Reeve, Conch. Icon., 1846, fig. 98. *Fusus bicinctus*, Hutton, C.M.M., p. 10. *Euthria bicincta*, Hutton, J. de Conch., 1878, p. 15.

Hab.—Auckland Islands.

Throughout New Zealand and Chatham Islands.

Euthria littorinoides (Reeve), 1846.

Buccinum littorinoides, Reeve, Conch. Icon., 1846, fig. 46. *Euthria lineata littorinoides*, Reeve, Man. Conch. (1), iii, p. 151, pl. lxxii, fig. 231. *Euthria lineata*, Martyn, var. C: Hutton, M.N.Z.M., p. 51.

Hab.—Auckland Islands (Professor Benham).

Throughout New Zealand.

Euthria strebeli, Suter, 1908.

Euthria strebeli, Suter, T.N.Z.I., xl, 1907 (1908), p. 369, pl. xxx, fig. 4. *Euthria antarctica*, Reeve: Hutton, M.N.Z.M., p. 52 (not of Reeve).

Hab.—Auckland Islands (E. R. Waite); ? Campbell Island.
Also southern parts of the South Island.

Fam. BUCCINIDAE, Fleming.

Genus COMINELLA, H. and A. Adams, 1853.

Distribution.—Southern Hemisphere, Magellan Province, Kerguelen, Australasia, South Africa, and St. Helena.

Cominella maculata (Martyn), 1784.

Buccinum maculatum, Martyn, Univ. Conch., ii, 1784, fig. 49. *Cominella maculata*, Martyn, Man. Conch. (1), iii, p. 204, pl. lxxxi, figs. 421–424. *Buccinum adspersum*, Bruguière, Encycl. Méth., i, 1789, p. 265. *Buccinum turgidum*, Gmelin, Syst. Nat., ed. 13, 1790, p. 3641. *Buccinum testudineum*, Lamarck, var.: Quoy and Gaimard, Voy. "Astrolabe," pl. xxx, fig. 12.

Hab.—Auckland Islands, *teste* Hutton.
Also North Island, Pelorus Sound, and Chatham Islands.

Cominella nassoides (Reeve), 1846.

Buccinum nassoides, Reeve, Conch. Icon., 1846, fig. 12. *Cominella nassoides*, Reeve, Man. Conch. (1), iii, p. 206, pl. lxxxi, fig. 442. *Buccinum* (*Cominella*) *zealandicum*, Reeve: Hutton, C.M.M., p. 14 (not of Reeve). *Cominella nodicincta*, Martens, Sitzber. Naturf. Fr., Berlin, 1878, p. 23. *Buccinum veneris*, Filhol, Compt. Rend., xci, 1880, p. 1094.

Hab.—Auckland and Campbell Islands.
Also Stewart Island, Foveaux Strait, Preservation Inlet, and Chatham Islands.

Cominella campbelli (Filhol), 1880.

Buccinum campbelli, Filhol, Compt. Rend., xci, 1880, p. 1094; Miss. I.C., p. 524. *Cominella campbelli*, Filhol, Index F.N.Z., p. 73.

Hab.—Campbell Island (Filhol, Professor Chilton).

Fam. MURICIDAE, Fleming.

Genus TROPHON, Montfort, 1810.

Distribution.—Austral and boreal seas. The latter show more variety, and have developed several types among themselves, all different from the Antarctic group.

Trophon ambiguus (Philippi), 1844.

Fusus ambiguus, Philippi, Abbild. und Beschr. neuer Conch., Fusus, 1844, pl. i, fig. 2. *Trophon ambiguus*, Philippi, Man. Conch. (1), ii, pl. xxxiii, fig. 365.

Fusus cretaceus, Reeve, Conch. Icon., 1847, fig. 48. *Vitularia candida*, H. and A. Adams, P.Z.S., 1863, p. 430. *Murex lyratus*, Lamarck: Hutton, C.M.M., p. 7 (not of Lamarck). *Fusus varius*, Lamarck: Hutton, t.c., p. 9 (not of Lamarck).

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons).

Throughout New Zealand in the laminarian, rare in the coralline zone; Kermadec Islands.

Trophon (Kalydon) aucklandicus (E. A. Smith), 1902.

Euthria aucklandica, E. A. Smith, Voy. South. Cross, 1902, p. 203, pl. xxiv, figs. 12, 13.

Hab.—Auckland Islands (Professor Benham); Campbell Island (Captain J. Bollons).

Also Preservation Inlet.

Trophon (Kalydon) curtus, Murdoch, 1905.

Trophon curtus, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 228, pl. viii, fig. 22.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Also Stewart Island, Hauraki Gulf, and Whangaroa Harbour.

Trophon (Kalydon) erectus, n. nov.

Trophon columnaris, Suter, P. Mal. S., viii, p. 178, pl. vii, fig. 1 (not *T. columnarius*, Hedley, 1908).

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).

Trophon (Trophonopsis) crispulatus, Suter, 1908.

Trophon (*Trophonopsis*) *crispulatus*, Suter, P. Mal. S., viii, 1908, p. 178, pl. vii, fig. 2.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also north-east of Wreck Reef, in 50 fathoms; twenty-four miles south-east of Long Point, in 120 fathoms (E. R. Waite).

Fam. THAISIDAE.

Genus Thais, Bolten, 1798.

Distribution.—In most seas, but the maximum occurs in the tropics.

Thais (Polytropalicus) striata (Martyn), 1784.

Buccinum striatum, Martyn, Univ. Conch., i, 1784, fig. 7 (not of Pennant, 1777). *Polytropa striata*, Martyn: Hutton, M.N.Z.M., p. 56. *Buccinum lacunosum*, Bruguière, Encycl. Méth. (Vers) (1), 1789, p. 258. *Purpura rugosa*, Lamarck, A.s.V., vii, 1820, p. 242. *Purpura rupestris*, Valenciennes, Voy. "Venus," pl. ix, fig. 1; Voy. P. Sud, p. 89, pl. xxii, fig. 23.

Hab.—Auckland Islands (Professor Benham); Campbell Island; Bounty Islands, in 50 fathoms, embryonic shells (Captain J. Bollons).

South Island of New Zealand and Chatham Islands.

Fam. CANCELLARIIDAE, Adams.

Genus Admete, Kröyer, 1842.

Distribution.—Arctic and Subantarctic. From the Southern Hemisphere it is recorded from Chili, Strait of Magellan, Kerguelen, and New Zealand.

Admete trailli (Hutton), 1873.

Cancellaria trailli, Hutton, C.M.M., p. 26; M.N.Z.M., p. 46; Plioc. M., p. 58, pl. vii, fig. 52.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Stewart Island, in 15 fathoms.

Fam. PYRENIDAE.

Genus Mitrella, Moerch, 1859.

Distribution.—Mediterranean, Antilles, Pacific Ocean, &c.

Mitrella rosea (Hutton), 1873.

Obeliscus roseus, Hutton, C.M.M., p. 22. *Columbella pseutes*, Suter, T.N.Z.I., xxxviii, 1905 (1906), p. 329. *Pyramidella rosea*, Hutton, Index F.N.Z., p. 74.

Hab.—Snares Islands, in 50 fathoms (Captain J. Bollons); Auckland Islands (Professor Benham).
Also Stewart Island, Cook Strait, and Hauraki Gulf.

Mitrella subantarctica, Suter, 1908.

Mitrella subantarctica, Suter, P. Mal. S., viii, 1908, p. 180, pl. vii, fig. 5.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).

Mitrella leptalea, Suter, 1908.

Mitrella leptalea, Suter, P. Mal. S., viii, 1908, p. 180, pl. vii, fig. 6.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons).
Also Foveaux Strait, in 15 fathoms.

Genus Alcira, H. Adams, 1860.

Distribution.—The type is the only species recorded by Tryon, occurring at the Cape of Good Hope.

Alcira transitans (Murdoch), 1905.

Columbella transitans, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 224, pl. vii, fig. 13.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons); Auckland Islands (Professor Benham); Campbell Island (Professor Chilton).
Also Stewart Island and Whangaroa Harbour.

Alcira varians (Hutton), 1885.

Columbella varians, Hutton, T.N.Z.I., xvii, 1884 (1885), 314, pl. xvii, fig. 2; Plioc. M., p. 44, pl. vi, fig. 16 (not of Sowerby). *Surcula varians*, Hutton: Suter, T.N.Z.I., xxxi, p. 69. *Columbella inconstans*, Suter, T.N.Z.I., xxxviii, 1905 (1906), p. 329.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons); Auckland Islands (Professor Benham).

Also Foveaux Strait and Dunedin Harbour.

Alcira sanguinea, Suter, 1908.

Alcira sanguinea, Suter, P. Mal. S., viii, 1908, p. 181, pl. vii, fig. 7.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons).

Fam. MARGINELLIDAE, Adams.

Genus MARGINELLA, Lamarck, 1801.

Distribution.—In warm and tropical seas. Found in depths to nearly 400 fathoms.

Marginella (Volvarina) albescens, Hutton, 1873.

Marginella albescens, Hutton, C.M.M., p. 19. *Marginella* (*Volvarina*) *infans*, Reeve: Hutton, T.N.Z.I., xvi, p. 224 (not of Reeve).

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons). Also Stewart Island, near Cuvier Island, and Chatham Islands.

Marginella (Glabella) amoena, Suter, 1908.

Marginella (*Glabella*) *amoena*, Suter, P. Mal. S., viii, 1908, p. 184, pl. vii, fig. 15.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Marginella (Glabella) lurida, Suter, 1908.

Marginella (*Glabella*) *lurida*, Suter, P. Mal. S., viii, 1908, p. 183, pl. vii, fig. 14.

Hab.—Near the Snares and Bounty Islands, in 50 fathoms (Captain J. Bollons). Also Foveaux Strait, in 15 fathoms.

Marginella (Glabella) plicatula, n. sp. (Plate I, figs. 4, 5.)

Shell very small, volutiform, fairly solid, white, axially finely plaited. The sculpture consists of very fine subequidistant axial plications. Colour a dirty white. Spire very little raised, broadly conoidal, with obtuse apex. Whorls about 3, the last large, convex, slightly contracted at the base. Suture inconspicuous. Aperture high and narrow, almost as high as the shell. Outer lip thickened, smooth inside, with an outer varix extending along the base. Columella slightly oblique, almost

straight, with 4 prominent plaits, the upper 2 more transverse than the lower 2, which are much closer together; inner lip very narrow.

Diameter, 1·7 mm.; height, 3 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Ten miles north of Enderby Island, Auckland Islands, in 85 fathoms, one specimen (E. R. Waite).

Fam. TURRITIDAE, H. and A. Adams.

Genus Drillia, Gray, 1838.

Distribution.—Mostly in warm seas.

Drillia verrucosa (Suter), 1899.

Surcula verrucosa, Suter, T.N.Z.I., xxxi, 1898 (1899), p. 70, pl. iii, fig. 1. *Drillia verrucosa*, Suter, Journ. Malac., xii, p. 73.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Stewart Island and Foveaux Strait.

Drillia (Crassispira) laevis parva, n. subsp.

Pleurotoma laevis, Hutton, C.M.M., p. 12; Suter, P. Mal. S., viii, 1908, p. 185.

Distinguished from the species by its much smaller size, the broader shoulder, and the slender, short, oblique costae, sometimes reduced to pointed tubercles on the last whorl, their number being 12 to 14 on the last whorl.

Diameter, 3·5 mm.; height, 8 mm.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

The type, from Cuvier Island (37 fathoms), is in my collection.

Genus Mitromorpha, A. Adams, 1865.

Distribution.—Japan, California, Barbados, Porto Rico, and Australasia.

Mitromorpha gemmata, Suter, 1908.

Mitromorpha gemmata, Suter, P. Mal. S., viii, 1908, p. 186, pl. vii, fig. 18.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also twenty-four miles south-east of Long Point, in 120 fathoms; south-east of Cape Saunders, in 100 fathoms (E. R. Waite).

Genus Bathytoma, Harris and Burrows, 1891.

Distribution.—California, Philippines, East Africa, and Australasia.

Bathytoma albula (Hutton), 1873.

Pleurotoma albula, Hutton, C.M.M., p. 12; Plioc. M., p. 49, pl. vi, fig. 22. *Pleurotoma antipodum*, E. A. Smith, A.M.N.H. (4), xix, p. 491; M.N.Z.M., p. 43.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Throughout New Zealand, in about 5 to 25 fathoms; not common.

Genus MANGILIA, Risso, 1826.

Distribution.—All parts of the globe.

Mangilia protensa (Hutton), 1885.

Daphnella protensa, Hutton, T.N.Z.I., xvii, 1884 (1885), p. 317. *Pleurotoma protensa*, Hutton, Plioc. M., p. 49, pl. vi, fig. 25. *Pleurotoma* (*Drillia*) *awamoaensis*, Hutton, T.N.Z.I., xv, p. 131. *Drillia awamoaensis*, Hutton, Man. Conch. (1), vi, p. 208, pl. xii, fig. 25 (not of C. Tert. M., 1873). *Drillia* (?) *amoena*, E. A. Smith, A.M.N.H. (5), xiv, p. 318.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Bay of Islands; Hauraki Gulf; off Great Barrier Island, in 110 fathoms; Stewart Island.

Mangilia dictyota (Hutton), 1885.

Clathurella dictyota, Hutton, T.N.Z.I., xvii, 1884 (1885), p. 316, pl. 18, fig. 8; Plioc. M., p. 53, pl. vii, fig. 37. *Mangilia dictyota*, Hutton: Suter, T.N.Z.I., xxxi, p. 72.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait; Chatham Islands; Lyall Bay; Hauraki Gulf; off Great Barrier Island, in 110 fathoms.

Mangilia flexicostata, Suter, 1899.

Mangilia flexicostata, Suter, T.N.Z.I., xxxi, 1898 (1899), p. 73, pl. iii, fig. 3.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait, Hauraki Gulf, and Whangaroa Harbour.

Mangilia epentroma (Murdoch), 1905.

Clathinella epentroma, Murdoch, T.N.Z.I., xxxvii, 1904 (1905), p. 219, pl. vii, figs. 3, 4.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Also Foveaux Strait and Whangaroa Harbour.

Mangilia devia, Suter, 1908.

Mangilia devia, Suter, P. Mal. S., viii, 1908, p. 187, pl. vii, fig. 20.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Mangilia quadricincta, Suter, 1908.

Mangilia quadricincta, Suter, P. Mal. S., viii, 1908, p. 187, pl. vii, fig. 21.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Mangilia cophinodes, Suter, 1908.

Mangilia cophinodes, Suter, P. Mal. S., viii, 1908, p. 188, pl. vii, fig. 22.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Genus DAPHNELLA, Hinds, 1844.

Distribution.—Mostly in warm seas.

Daphnella chariessa, Suter, 1908.

Daphnella chariessa, Suter, T.N.Z.I., xl, 1907 (1908), p. 351, pl. xxvii, fig. 9.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also near Cuvier Island, in 38 fathoms.

Daphnella totolirata, Suter, 1908.

Daphnella totolirata, Suter, P. Mal. S., viii, 1908, p. 189, pl. vii, fig. 23.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Foveaux Strait, Chatham Islands, and Whangaroa Harbour.

Daphnella acicula, Suter, 1908.

Daphnella acicula, Suter, P. Mal. S., viii, 1908, p. 189, pl. vii, fig. 24.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Daphnella tenuistriata, Suter, 1908.

Daphnella tenuistriata, Suter, P. Mal. S., viii, 1908, p. 190, pl. viii, fig. 25.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Daphnella amphipsila, Suter, 1908.

Daphnella amphipsila, Suter, P. Mal. S., viii, 1908, p. 190, pl. vii, fig. 26.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).

Daphnella crassilirata, Suter, 1908.

Daphnella crassilirata, Suter, P. Mal. S., viii, 1908, p. 190, pl. vii, fig. 27.

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons).
Also Stewart Island, twenty-three miles north of Wreck Reef, in 50 fathoms (E. R. Waite).

Fam. SCAPHANDRIDAE, Fischer.

Genus MNESTIA, H. and A. Adams, 1854.

Distribution.—World-wide.

Mnestia striata (Hutton), 1873.

Cylichna striata, Hutton, C.M.M., p. 52; Murdoch, T.N.Z.I., xxxvii, p. 218, pl. vii, figs. 1, 2 (not *C. striata*, Hutton—Pilsbry, Man. Conch. (1), xv, p. 319, pl. lix, figs. 11, 12—which is *C. thetidis*, Hedley).

Hab.—Near the Snares Islands, in 50 fathoms (Captain J. Bollons); ten miles north of Enderby Island, Auckland Islands (E. R. Waite).
From Whangaroa to Stewart Island, in the laminarian and coralline zone.

Fam. GONIODORIDIDAE, Adams.

Genus ACANTHODORIS, Gray, 1850.

Distribution.—North Atlantic, North Pacific, New Zealand, and Tasmania. The genus is characteristic of the colder seas, and is not recorded from the tropics.

Acanthodoris mollicella, Abraham, 1877.

Acanthodoris mollicella, Abraham, P.Z.S., 1877, p. 262, pl. xxx, figs. 1–4; Eliot, P. Mal. S., vii, pp. 329, 349. ? *A. pilosa novae-zealandiae*, Bergh: Semper's Reise Philippines, Malac. Untersuch., vi, 2, p. 94, pl. vi, figs. 23–26: pl. vii, fig. 1.

Hab.—Auckland Islands.
Also Sumner, near Lyttelton.

Fam. DORIDIDAE, Gray.

Genus DORIS, Linné, 1758.

Subgenus CTENODORIS, Eliot, 1907.

Only two species of the subgenus are known, the type from the Maldive Archipelago and the New Zealand form.

Doris (Ctenodoris) flabellifera, Cheeseman, 1881.

Doris (?) *flabellifera*, Cheeseman, T.N.Z.I., xiii, 1880 (1881), p. 222; Eliot, P. Mal. S., vii, 1907, pp. 328, 339.

Hab.—Snares Islands (Professor Chilton).
Also Auckland Harbour.

Fam. SIPHONARIIDAE, Adams.

Genus SIPHONARIA, Sowerby, 1824.

Distribution.—Warm and temperate seas, the maximum of the species in the Southern Hemisphere.

Siphonaria obliquata, Sowerby, 1825.

Siphonaria obliquata, Sowerby, Cat. Coll. Tankerville, 1825, App. p. 7; Conch. Icon., ix, fig. 56. *Siphonaria scutellum*, Deshayes: Guérin's Mag. Zool., 1841, pl. xxxv. *Siphonaria diemenensis*, Quoy: Hutton, C.M.M., p. 55 (not of Quoy).

Hab.—Auckland Islands.
South Island of New Zealand and Chatham Islands.

Siphonaria (Liriola) lateralis, Gould, 1846.

Siphonaria lateralis, Conthouy, MS.: Gould, P. Bost. S.N.H., ii, 1846, p. 153; U.S. Expl. Exp., xii, p. 363, atlas fig. 462; Strebel, Zool. Jahrb., xxv, p. 172,

pl. iii, figs. 27–29; Schwedische Südpolar Exped., vi, 1, 1908, p. 8. *S. redimiculum*, Reeve, Conch. Icon., ix, 1856, pl. v, fig. 24; Martens, Deutsche Tiefsee Exped. "Valdivia," p. 72; Melvill and Standen, Scottish Nat. Antarctic Exp., p. 142. *Kerguelenia redimiculum*, Reeve: Rochebrune and Mabille, Miss. Cap Horn, p. 29. *S. tristensis*, Leach: Watson, Chall. Rep. xv, p. 675 (not of Leach).

Hab.—Antipodes Islands; Auckland and Disappointment Islands (Professor Benham, Captain J. Bollons); Campbell Island (Professor Chilton).

Also Macquarie Island, Tasmania, Kerguelen, Patagonia, Strait of Magellan, and Falkland Islands.

Fam. PHENACOHELICIDAE, Suter.

Genus Allodiscus, Pilsbry, 1892.

Distribution.—New Zealand, Tasmania, and Australia.

Allodiscus planulatus (Hutton), 1883.

Charopa planulata, Hutton, N.Z. Journ. Sci., i, 1883, p. 477. *Psyra planulata*, Hutton, T.N.Z.I., xvi, p. 202. *Gerontia* (*Allodiscus*) *planulata*, Hutton: Pilsbry, Man. Conch. (2), viii, p. 67. *Flammulina* (*Allodiscus*) *planulata*, Hutton: Pilsbry, *l.c.*, ix, p. 15, pl. iii, figs. 4–6.

Hab.—Auckland Islands (Professor Benham).

Three specimens were found under logs. The perforation is a little more open than in the type, otherwise there is no difference. The species is widely distributed over the North and South Islands of New Zealand, but is nowhere common.

Genus Thermia, Hutton, 1904.

Distribution.—New Zealand only.

Thermia (?) **expeditionis**, n. sp. (Plate I, figs. 6–8.)

Shell small, depressed globose, umbilicated, very thin, translucent, somewhat shining, radially plicately ribbed. Sculpture: protoconch microscopically spirally striate, the succeeding whorls with radial rounded and flexuous riblets, about 10 per millimeter, slightly inequidistant, and getting obsolete upon the base. Colour uniformly olive. Epidermis thin and slightly polished. Spire depressed conoidal, its height less than that of the aperture. Protoconch of 2 slightly convex whorls. Whorls $4\frac{1}{4}$, regularly increasing, flatly convex, periphery of last whorl rounded, very faintly angled; base convex. Suture deep. Aperture oval, somewhat excavated by the parietal wall, which is lightly convex. Peristome sharp, simple. Columella vertical, the inner lip slightly reflexed. Umbilicus narrow, open, deep.

Diameter—Maj., 2·9 mm.; min., 2·5 mm. Height, 2 mm.

Animal unknown, and therefore the generic position somewhat uncertain.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland Islands, under a log, one specimen only (Professor Benham).

Genus THERASIA, Hutton, 1883.

Distribution.—New Zealand only.

Therasia (?) antipoda (Hombron and Jacquinot), 1854.

Helix antipoda, Hombron and Jacquinot, Voy. P. Sud., v, p. 18, pl. vi, figs. 13–16. *Charopa* (*Thalassia*) *zelandiae antipoda*, Man. Conch. (2), ii, p. 214, pl. lxiii, figs. 65–67. *Helix aucklandica*, Le Guillou, Rev. Zool. v, 1842, p. 140; Hutton, M.N.Z.M., p. 19.

An emended diagnosis, derived to some extent from specimens collected by Professor Benham, is here offered.

Shell small, orbicularly conoidal, umbilicated, striated, shining, thin and semi-transparent, periphery keeled. Sculpture: protoconch indistinctly microscopically striate, the following whorls with inequidistant and very unequal oblique radial striae and plaits, the interstices minutely reticulated by growth and spiral striation, the radial sculpture less prominent over the base. Colour yellowish-brown, with radial unequal streaks of rufous. Epidermis very thin and shining. Spire broadly conoidal, of about the same height as the aperture. Protoconch of $1\frac{1}{2}$ smooth and flatly convex volutions. Whorls $5\frac{1}{2}$ to 6, regularly increasing, flattish, the last sharply keeled; base convex. Suture much impressed. Aperture broadly subquadrangular. Peristome acute, simple, very thin; outer lip descending almost straight, angled on meeting the slightly convex basal lip. Columella oblique, concave, slightly reflexed. Umbilicus moderate, somewhat perspective, deep.

Diameter, 7 mm.; height, 4 mm. Type.

Jaw arcuate, composed of numerous vertical plaits. Only a very young specimen was at my disposal for preparing the radula, and the teeth were so small that even a magnifying-power of 720 did not show their character very clearly. All teeth of a transverse row seemed to be alike, narrow and elongated, with 2 minute cusps. This leads one to assume that in this species at least the differentiation of the teeth takes place at a later period of growth.

Hab.—Auckland Islands, under logs (Professor Benham).

This is the first time I have seen this species, and I have now come to the conclusion that *Helix aucklandica*, Le Guillou, and *Helix antipoda*, H. and J., are identical. As Le Guillou gave no figure of his species, I give validity to the name bestowed on the shell by Hombron and Jacquinot.

This species is somewhat allied to *Therasia traversi*, E. A. Smith, which, however, is a larger shell, has no radial plaits, and a much narrower umbilicus. The dentition being still unknown, it is uncertain whether the species belongs to *Therasia* or *Thalassohelis*; for the present I class it under the former genus.

The *Thalassohelix zelandiae antipoda* of Hutton, from the South Island of New Zealand, has nothing to do with the species of Hombr. and Jacq.; it is simply a variety of *T. zelandiae*, Gray, in which the brown radial bands extend over the base.

Genus PHENACOHELIX, Suter, 1892.

Distribution.—New Zealand only.

Phenacohelix (?) subantarctica, n. sp. (Plate I, figs. 9–11.)

Shell very small, depressed globose, perforated, finely costate, thin and very fragile, with radiate whitish and brown streaks. Sculpture consisting of somewhat flexuous, subequidistant, fine radiate riblets, about 16 per millimeter, the interstices with numerous very fine incremental lines, decussated by microscopic spiral striae. Colour yellowish-white, upper surface with somewhat unequal light-brown radiate streaks; base uniformly brown. Epidermis thin, horny, not shining. Spire low, broadly conoidal, with blunt apex, its height a little less than that of the aperture; outlines slightly convex. Protoconch flattish, of 1½ very lightly rounded whorls, which are indistinctly microscopically spirally striated. Whorls 4, regularly increasing, moderately convex, the last very lightly angled at the periphery; base convex. Suture impressed. Aperture lunate, angled above. Peristome sharp, thin, the outer lip convex, subangled; basal lip broadly rounded. Columella short, vertical, arcuate, slightly reflexed above. Umbilicus narrow, perfectly open, pervious.

Diameter, 3 mm.; height, 2·1 mm.

Hab.—Campbell Island, mostly on *Dracophyllum*, not uncommon (W. K. Chambers).

Type in the Canterbury Museum, Christchurch.

I used six dried-up animals for preparing jaw and radula, but, curiously enough, I was unable to find a trace of these organs; they no doubt were only remnants of the animals. The generic position of the species therefore remains somewhat uncertain, but the characters of the shell are those of *Phenacohelix*, and, in a much lesser degree, of *Allodiscus*.

Phenacohelix, sp.

A small, very thin, and fragile shell, but badly damaged on the body-whorl, was amongst the shells collected by Professor Benham on the Auckland Islands. Unfortunately, it was completely destroyed when handling it for drawing up the diagnosis. Being unable to give a figure, I refrain from naming it, but the following characters will help to recognise the shell in case it should be found again:—

The shell is depressed globose, radially sharply ribbed, about 15 riblets per millimeter. Colour yellowish, with radial straight streaks of light brown. Protoconch of 1½ whorls, the nucleus smooth, the remainder spirally striate. Whorls convex, regularly increasing, periphery of the last whorl rounded. Umbilicus narrow, open.

Diameter, about 3–4 mm.

Hab.—Auckland Islands (Professor Benham).

Genus Flammulina, von Martens, 1873.

Distribution.—New Zealand, Tasmania, Lord Howe Island, Norfolk Island, and Ponape, Caroline Islands.

Flammulina phlogophora (Pfeiffer), 1850.

Helix phlogophora, Pfeiffer, P.Z.S., 1849 (1850), p. 127; Conch. Icon., vii, pl. cxxx, fig. 790. *Vitrina zebra*, Le Guillou, Rev. Zool., v, 1842, p. 136. *Flammulina*

zebra, Le Guillou, Man. Conch. (2) ix, pl. iii, fig. 23. *Helix flammigera*, Pfeiffer, P.Z.S., 1852 (1854), p. 147. *Helix multilimbata*, Hombron and Jacquinot, Voy. P. Sud., v, 1854, p. 16, pl. vi, figs. 5–8.

Hab.—Auckland Islands (Le Guillou).

The specific name *zebra* has no doubt priority, but, as no figure of the shell was given, I select Pfeiffer's *phlogophora*, as being the next in chronological order, and which was figured by Reeve. Moreover, I have not seen Le Guillou's species from the Auckland Islands, which is narrowly umbilicated, and may be distinct from *F. phlogophora*.

Genus RANFURLYA, Suter, 1903.

Distribution.—Auckland Islands only.

Ranfurlya constanceae, Suter, 1903.

Ranfurlya constanceae, Suter, Journ. Malac., x, 1903, p. 62, pl. iv, figs. 1–5.

Animal limaciform, black, very small, with subcentral visceral hump, the greater part of the viscera protected by an auriform shell, which in turn is partly covered by the mantle.

Length, 6 mm.

Two specimens, slightly larger than the type, were found by Professor Benham, one at 1,350 ft. altitude, the second occasion on which this apparently rare mollusc has been recorded.

Hab.—Auckland Islands (Professor Benham).

Fam. ENDODONTIDAE, Pilsbry.

Genus ENDODONTA, Albers, 1850.

Distribution.—Polynesia, Carolines, Celebes, Philippines, New Caledonia, Australasia, South Africa, and St. Helena.

Endodonta (Charopa) anguiculus (Reeve), 1852.

Helix anguiculus, Reeve, Conch. Icon, vii, 1852, pl. cxxxi, fig. 802. *Helix* (*Patula*) *anguiculus*, Reeve, Man. Conch. (2), iii, p. 23, pl. iii, fig. 13.

Hab.—Auckland Islands (Dr. H. Krone).

Endodonta (Charopa) benhami, n. sp. (Plate I, figs. 12–14.)

Shell very small, subdiscoidal, umbilicated, finely ribbed, thin and fragile. Sculpture consisting of very fine slightly flexuous radial riblets, about 30 per millimeter, the interstices microscopically reticulated by fine growth and spiral striae. Colour uniformly light chestnut-brown. Epidermis thin, not shining. Spire flat, but little elevated above the last volution. Protoconch of $1\frac{1}{2}$ smooth and convex whorls. Whorls very narrowly wound up, regularly increasing, moderately convex, periphery of last whorl and base rounded. Suture very deep. Aperture somewhat oblique, semilunar. Peristome regularly rounded, simple, sharp and thin. Columella very short, vertical and concave, not callous, and not reflexed. Umbilicus broad, about a third of the diameter, deep, and perspective.

Diameter—Maj., 2·6 mm.; min., 2·4 mm. Height, 1·4 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Auckland Islands, several specimens found under logs (Professor Benham).

This species is allied to such forms as *E. corniculum*, *E. sterkiana*, *E. eremita*, and *E. brouni*, but is distinct from all of them.

It is with greatest pleasure that I am uniting the name of our distinguished scientist Professor W. B. Benham, D.Sc., F.R.S., with the species.

Endodonta (Ptychodon) minuta, n. sp. (Plate I, fig. 15.)

Shell minute, discoidal, thin and fragile, radially costate, umbilicated. Sculpture consisting of fine, sharp, equidistant, and flexuous thread-like riblets, about 30 per millimeter, the interstices with fine growth-lines; there is no spiral sculpture. Colour yellowish-white, with distant narrow radial brown streaks, not extending below the periphery on the last whorl. Epidermis thin, slightly shining. Spire flat, not elevated above the last whorl. Protoconch flat, rather large, of $1\frac{1}{2}$ smooth and lightly convex volutions. Whorls $3\frac{1}{2}$, regularly increasing, moderately convex, the last rounded at the periphery and base. Suture impressed. Aperture lunar, oblique, much excavated by the parietal wall; the outer wall with 8 long, thin, spiral lamellae, the lowest two closer together, and the three uppermost inconspicuous; no lamellae on the parietal wall and columellar lip. Peristome simple, thin, sharp, regularly rounded. Columella short, vertical, arcuate, very little reflexed. Umbilicus wide, perspective, about a third of the greatest diameter.

Diameter, 1·4 mm.; height, 0·7 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island, one specimen (W. K. Chambers).

The specimen is not adult, and it is well possible that lamellae on the parietal wall and columellar lip appear only at a later stage of growth. The numerous slender lamellae on the outer wall induce me to class it for the present under *Ptychodon*.

Laoma (Phrixgnathus) campbellica (Filhol), 1880.

Helix campbellica, Filhol, Bull. Soc. Philomat., iv, 1880, p. 126; Miss. I.C., p. 570.
Microphysa campbellica, Filhol: Hutton, T.N.Z.I., xvi, p. 195.

Hab.—Campbell Island (Filhol).

I have not seen this species.

Laoma (Phrixgnathus) cognata, n. sp. (Plate I, fig. 16.)

Shell minute, conical, thin, finely costate, keeled, perforated. Sculpture consisting of exceedingly fine, equal, flexuous, radiate riblets, about 50 per millimeter, crossed by fine microscopic spiral striae. Colour yellowish-white, with radial broad and regularly spaced streaks of fulvous; base uniformly light brown. Epidermis thin, not shining. Spire conical, with a blunt apex, about $1\frac{1}{2}$ times the height of the aperture; outlines straight. Protoconch comparatively large, globose, of $1\frac{1}{2}$ quite smooth and strongly convex turns. Whorls 5, regularly increasing, convex, the last sharply angled at the periphery; base convex. Suture deep. Aperture transverse, slightly oblique, subrhomboidal, not much excavated by the penultimate whorl. Peri-

stome simple, thin, sharp; outer lip angled; basal lip very lightly convex. Columella short, arcuate; inner lip reflexed above. Umbilicus quite open, narrow, pervious.

Diameter, 2·2 mm.; height, 1·7 mm.

Type in the Canterbury Museum, Christchurch.

Hab.—Campbell Island, mostly on *Dracophyllum;* apparently not common, or perhaps easily overlooked (W. K. Chambers).

Fam. ATHORACOPHORIDAE, Fischer.

Genus Athoracophorus, Gould, 1852.

Distribution.—Both Islands of New Zealand, the Snares, Auckland Islands, Campbell Island, and Macquarie Island.

Athoracophorus (Pseudaneitea) huttoni, n. sp. (Plate I, figs. 17–19.)

Animal (spirit specimen) rather small, back rounded, tail tapering to a rather sharp point; yellowish, with four longitudinal rows of black spots on the notum, the median part usually of darker colour, with numerous prominent papillae, the head-shield with a median groove; anal orifice near the perinotum. The ground-colour is a light yellow, very likely amber when alive; on the notum there are two rows of dark-brown or blackish spots on each side from the median line, the inner row of larger and often coalescing spots, the outer row formed by smaller and but rarely confluent specks; the broad median area between the two inner rows is usually of a darker colour, but the mantle-area, the median groove in front, and the papillae are of lighter colour; there are in most specimens irregularly distributed small black spots above and below the perinotum; sole uniformly light yellow. Head transversely oval, separated from the sole by a deep groove; oral lobes very distinct, oval, separated by a narrow flat ridge, and limited on the inner and outer side by distinct frontal grooves. Tentacles retracted. Head-shield extending to about half-way between head and mantle, with a median groove which is shallower than the side grooves. The notum is thickly covered with very prominent round papillae, arranged in longitudinal rows, 5 in a lateral field behind the mantle, but gradually reduced from 4 to 2 in front of the mantle. The median groove extends nearly the whole length of the back, bifurcating on approaching the tail-tip. Lateral grooves narrow, slanting backwards, very seldom bifurcating towards the margin, and extending, through contraction in alcohol, over hyponotum and sole; there are about 18 to 21 grooves on each side, 9 of which are postpallial. A distinct pre-anal groove is present. The mantle is distinctly triangular, limited by grooves; at the anterior angle and in the median groove is the renal orifice, covered by a small oval flap; the pulmonary orifice subcentral. The anal opening is on the right side, below the mantle, but nearer to the perinotum. The hyponotum is very distinct, 2 mm. broad; the perinotum is also well marked, nodulous, no doubt through contraction in alcohol. Sole aulacopod, again the result of contraction.

The shell is rudimentary, consisting of about 20 small white calcareous grains of various shapes and sizes, the largest having about 1 mm. major diameter.

Measurements of largest specimen: Length over back from head to tip of tail, 28 mm.; width of back to perinotum, 16 mm. Sole—Length, 25 mm.; breadth,

7 mm. Breadth of hyponotum, 2 mm. Anal orifice, 11 mm. behind right tentacle, and 2 mm. above the perinotum. Pulmonary opening, 14 mm. behind the right tentacle. Genital orifice on right side of the right tentacle.

Jaw (fig. 18) as usual in the genus, the median basal projection sharply produced or rather obsolete. Radula (fig. 19) with very numerous teeth, the central tooth small and slender, with 3 small cusps and a blunt denticle on each; lateral teeth with about 7 denticles, the 2 innermost largest. Pedal gland long, nearly half the length of the sole, narrow, flat, thin.

Reproductive organs: The sheath of the male organ is rather long, convolute, narrowed towards the distal end, where the vas deferens enters and the retractor muscle is fixed; the verge armed with papillae, slender, drawn out to a long sharp point. There is a short free oviduct, with the receptaculum seminis near its proximal end. Albumen-gland large, oval, yellowish. The hermaphrodite gland is large, globular, light brown; the hermaphrodite duct is not very long and convolute.

Type in my collection, co-type in the Canterbury Museum.

Hab.—Snares Islands, type (Capt. F. W. Hutton, Dr. D. Colquhoun); Campbell Island (W. K. Chambers).

Remarks.—Some eight years ago the late Captain Hutton brought specimens from the Snares, and kindly presented some of them to me. Seeing that they were new to science, I named them provisionally in honour of the distinguished discoverer. Subsequently Dr. D. Colquhoun, of Dunedin, found specimens in the same locality. It is interesting to see the same species turning up on Campbell Island, one specimen having been collected during the present scientific expedition.

Athoracophorus (Amphiconophora) martensi, n. nov.

Athoracophorus marmoratus (von Martens), Simroth, Nova Acta Leop. Carol. Akad., liv, 1889, p. 71, pl. iv, figs. 3–10 (non *A. marmoreus*, Hutton, 1879).

Animal rather large, yellowish-white, black spots being scattered over the notum, the triangular small mantle-area usually margined by black. From the outer angle of the mantle a groove runs down to the anal orifice, which is somewhat nearer the mantle than to the perinotum. The side grooves are shallow, and the surface of the back is without papillae in spirit specimens. There is no hyponotum.

Length over back from head to tail, 47 mm.; width of back to perinotum, 25 mm.; anal orifice, 8 mm. behind the right tentacle, and 5 mm. below the pulmonary opening.

Hab.—Auckland Islands, very common under logs (Professor Benham).

One specimen has also been found on Macquarie Island by Dr. D. Colquhoun.

Athoracophorus (Amphiconophora) verrucosus, Simroth.

Athoracophorus verrucosus (von Martens), Simroth, Nova Acta Leop. Carol. Akad., liv, 1889, p. 77, pl. iv, figs. 11–14.

Var. nigricans (v. Mts.), Simroth.

Animal not very large, rather long and slender, notum black, with well-impressed lateral grooves, which frequently bifurcate, and small tubercles. There is a distinct

hyponotum. Mantle-area transversely triangular, the renal orifice in the anterior angle, the respiratory opening in the middle near the median groove, anal orifice in the right outer corner, within the area.

Length over back from head to tail, 34 mm.; width of back to perinotum, 11 mm.

Hab.—Auckland Islands, two specimens (Professor Benham).

Var. **fasciatus** (v. Mts.), Simroth, em. (**fuscatus**).

Back of the animal light brown, with three longitudinal rows of black streaks. The renal, respiratory, and anal orifices in the same places as in the other variety. Side grooves but rarely bifurcating. Notum with very numerous papillae, some of them of a slightly larger size.

One specimen has the verge exserted; it is cylindrical, with 6 sharp longitudinal ridges, armed with dense minute spines.

Jaw elasmognathic. Radula with very numerous teeth, having a broad reflection, with 7 to 8 denticles, the inner one largest. I was unable to find a central tooth in the radula I prepared. Simroth states that he found the radula exactly like that of *A. marmoratus*, but the rake-shaped teeth with 5 to 7 denticles, instead of 4 to 6.

Hab.—Auckland Islands, very common (Professor Benham).

Specimens from cliffs near head of North Arm of Carnley Harbour have larger papillae on the back.

Fam. ONCHIDIDAE, Philippi.

Genus Onchidella, Gray, 1850.

Distribution.—Littoral zone of most seas.

Onchidella campbelli, Filhol, 1880.

Onchidella campbelli, Filhol, Compt. Rend., xci, 1880, p. 1094; Miss. I.C., 1885, p. 521.

Resembling *O. nigricans*, Q. and G., but the marginal pores are much more numerous.

Hab.—Auckland Islands; Campbell Island (Professor Chilton).

Fam. DENTALIIDAE, Gray.

Genus Dentalium, Linné, 1758.

Distribution.—All seas, some species living in great depths.

Dentalium nanum, Hutton, 1873.

Dentalium nanum, Hutton, Cat. Tert. Moll. N.Z., 1873, p. 1; Plioc. M., p. 73, pl. viii, fig. 78.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).

Also North and South Islands of New Zealand.

Dentalium huttoni, T. W. Kirk, 1880.

Dentalium huttoni, T. W. Kirk, T.N.Z.I., xii, 1879 (1880), p. 306.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).

In deep water on the coasts of New Zealand.

The type specimens were found in the stomach of a trumpeter.

Genus CADULUS, Philippi, 1844.

Distribution.—Mediterranean, Atlantic, and Pacific; mostly in deep water.

Cadulus spretus, Tate and May, 1900.

Cadulus spretus, Tate and May, T.R.S. S. Aust., xxiv, 1900, p. 102; P.L.S. N.S. Wales, 1901, p. 420, pl. xxv, fig. 52.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).

Also Dusky Sound, 5 fathoms; Queen Charlotte Sound, 16 fathoms; near Cuvier Island, 38 fathoms; Tasmania.

Fam. ANOMIIDAE, Adams.

Genus ANOMIA, Müller, 1776.

Distribution.—In most seas in the laminarian and coralline zone.

Some valves of a small white and fragile species were obtained in 50 fathoms near the Bounty Islands and north of Enderby Island, but not in sufficiently good condition for description. They most likely represent a new species.

Fam. ARCIDAE, Gray.

Genus ARCA, Lamarck, 1799.

Distribution.—World-wide, the maximum in tropical seas. Some species are abysmal.

Arca (Lissarca) aucklandica, E. A. Smith, 1902.

Lissarca aucklandica, E. A. Smith, Voy. South. Cross, 1902, p. 212, pl. xxiv, figs. 14, 15.

Shell small, equivalve, very inequilateral, convex, purplish-red; growth-lines fine and dense, sublamellar posteriorly, with faint fine postmedian radiate striae. Beaks not very prominent, approximate, but not quite contiguous. Teeth in each valve about 5. Valves having the margins strongly denticulate inside, except on the anterior ventral and the posterior median lateral parts.

Length, 4½ mm.; diameter, 2⅓ mm.; altitude, 3½ mm.

Hab.—Auckland Islands, in 10 fathoms.

Allied to *Lissarca rubra-fusca*, E. A. Smith, from Kerguelen Island.

Fam. PHILOBRYIDAE, Bernard.

Genus PHILOBRYA, P. Carpenter, 1872.

Distribution.—Cosmopolitan.
Animal carnivorous.

Philobrya costata (Bernard), 1896.

Hochstetteria costata, Bernard, Bull. d. Nat. du Mus., 1896. *Philobrya costata*, Bernard, J. de Conch., xlv, 1897, p. 15, pl. i, fig. 5; p. 33, fig. 7 in text.

Shell very small, thick, convex, very inequilateral, outlines subquadrangular. Prodissoconch very prominent. Ligament internal. Teeth oblique behind, short in front. Surface with strong serrate radial ribs, about 9–10.

Diameter ant.-post., 2·5 mm.; diameter dorso-ventral, 3·2 mm. Diameter, 2·2 mm.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).
Also along the coasts of New Zealand, from the littoral to the coralline zone.
The Pliocene *P. trigonopsis*, Hutton, is nearly allied.

Fam. MYTILIDAE, d'Orbigny.

Genus MYTILUS, Linné, 1758.

Distribution.—World-wide, the maximum of the species in the Arctic and Antarctic Seas.

Mytilus edulis, Linné, 1758.

Mytilus edulis, Linné, Syst. Nat., ed. 10, 1758, p. 705.

Hab.—Auckland and Campbell Islands.
Throughout New Zealand, Kerguelen, Patagonia, and Falkland Islands; abundant in European seas.

Mytilus magellanicus, Lamarck, 1836.

Mytilus magellanicus, Lamarck, A.s.V., ed. 2, vii, 1836, p. 37. *M. polydontes*, Quoy and Gaimard: Gray in Dieff. N.Z., ii, p. 259 (non Quoy and Gaimard). *M. crenatus*, Lamarck: Krauss, Südafrik. Moll., 1848, p. 24 (non Lamarck). *M. capensis*, Dunker: Menke, Zeitschr. f. Malak., 1846, p. 108.

Hab.—Auckland Islands; Campbell Island (Professor Chilton).
North and South Islands of New Zealand, Chatham Islands, and Fiji.
The species is circumaustral.

Genus MODIOLUS, Lamarck, 1799.

Distribution.—World-wide.

Modiolus australis, Gray, 1827.

Modiola australis, Gray, App. King's Voy., ii, 1827, p. 477. *Mytilus* (*Modiola*) *areolatus*, Gould, P. Bost. S.N.H., iii, 1850, p. 343; U.S. Expl. Exp., xii, p. 452, atlas fig. 562. *Modiola albicostata*, Lamarck: Hutton, C.M.M., p. 78 (non Lamarck).

Hab.—Auckland Islands; Campbell Island (J. B. Mayne).
Throughout New Zealand, Chatham Islands, Tasmania, and Australia.

Modiolus ater (Zelebor), 1866.

Mytilus ater, Zelebor, Verhandl. Zool. Bot. Gesell. Wien, 1866, p. 914. *Perna confusa*, Angas, P.Z.S., 1871, p. 21, pl. i, fig. 33. *Mytilus crassus*, T.-Woods, P. Roy. S. Tasm., 1876 (1877), p. 157.

Hab.—Auckland Islands (E. R. Waite).
Throughout New Zealand, Chatham Islands, Tasmania, and Australia.

Fam. LIMIDAE, d'Orbigny.

Genus Lima, Bruguière, 1797.

Distribution.—In all seas.

Lima angulata, Sowerby, 1843.

Lima angulata, Sowerby, Thes. Conch., i, 1843, p. 86, pl. xxii, figs. 39, 40; Conch. Icon., xviii, pl. iii, fig. 13. *Lima basilanica*, Adams and Reeve, Voy. "Samarang," p. 75, pl. xxi, fig. 6. *Lima orientalis*, Adams and Reeve, *op. cit.*, p. 75, pl. xxi, fig. 7.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).
Also North Island of New Zealand, Australia, Philippines, New Caledonia, and Panama.

Fam. MODIOLARCIDAE, Gray.

Genus Modiolarca, Gray, 1847.

Distribution.—Subantarctic seas.

Modiolarca pusilla (Gould), 1850.

Mytilus (*Modiolarca*) *pusillus*, Gould, P. Bost. S.N.H., iii, 1850, p. 345; U.S. Expl. Exp., xii, p. 455, atlas fig. 585.

Shell minute, thick and solid, transversely oval, beaks nearly terminal, elevated and tumid, somewhat excurved, like *Isocardia*; the whole shell inflated, subcylindrical; dorsal and basal margins nearly parallel; posterior end broadly rounded; anterior end vertical; basal angle obtuse; surface concentrically striate; epidermis very delicate, colour pale cinereous, sometimes tinted reddish; interior clouded brown, and an intense red-brown; hinge margin intense blood-red; a single, obsolete, apical, oblique, coaptate tooth in each valve, continued posteriorly, so as, with the posterior edge, to form a ledge for the ligament, simulating sometimes an elongated lateral tooth; the apical tooth sometimes bifid (Gould).

Length, 5 mm.; height, 3 mm.

Hab.—Antipodes and Auckland Islands.

Also Otago Peninsula and Macquarie Island. The type is from Tierra del Fuego.

Fam. CARDITIDAE, Férussac.

Genus VENERICARDIA, Lamarck, 1801.

Distribution.—Northern seas, west coast of Africa, Mediterranean, Indian Ocean, west coast of America, Australasia, &c.

Venericardia difficilis (Deshayes), 1854.

Cardita difficilis, Deshayes, P.Z.S., 1852 (1854), p. 103, pl. xvii, figs. 16, 17; Hutton, M.N.Z.M., p. 159.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).
North and South Islands of New Zealand.

Venericardia (Miodon) corbis (Philippi), 1836.

Cardita corbis, Philippi, Enum. Moll. Siciliae, i, 1836, p. 55.

Shell small, subtriangular, equivalve, slightly inequilateral, convex, with 10 to 11 stout imbricating radiate ribs.

Length, 5 mm.; height, 6 mm.; diameter, 4 mm.

Hab.—Near the Bounty Islands, in 50 fathoms (Captain J. Bollons); ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).
Coasts of New Zealand, in 20 to 50 fathoms.

Fam. LEPTONIDAE, Gray.

Genus NEOLEPTON, Monterosato, 1875.

Distribution.—In most seas.

Neolepton antipodum (Filhol), 1880.

Kellia antipodum, Filhol, Compt. Rend., xci, 1880, p. 1095; Miss. I.C., 1885, p. 543.
Neolepton antipodum, Filhol: Hedley, T.N.Z.I., xxxviii, p. 74, pl. 1, fig. 5.

Hab.—Campbell Island (Filhol).
Also North Island of New Zealand.

Genus ROCHEFORTIA, Vélain, 1876.

Distribution.—Southern seas.

Rochefortia donaciformis (Angas), 1878.

Mysella donaciformis, Angas, P.Z.S., 1878, p. 863, pl. liv, fig. 13.

Hab.—Campbell Island (Professor Chilton).
Also Stewart Island, in 18 fathoms; Australia.

Genus LASAEA (Leach), Brown, 1827.

Distribution.—Cosmopolitan.

Lasaea miliaris, Philippi, var.

Lasaea miliaris, Philippi, Wiegman's Archiv. f. Naturgesch., 1845, p. 51.

Shell minute, oval, equivalve, inequilateral, dark red, with somewhat irregular growth-lines; beaks prominent, broadly rounded.

Length, 2·5 mm.; height, 2 mm.; diameter, 1·3 mm.

Hab.—Snares Islands (Captain J. Bollons); Auckland Islands (Professor Benham); Campbell Island (Professor Chilton).

Also Macquarie Island, Chatham Islands, Whangaroa Harbour, Banks Peninsula, Dunedin, and Stewart Island.

Fam. SPHAERIIDAE, Dall.

Genus SPHAERIUM, Scopoli, 1777.

Distribution.—Almost world-wide, in lakes, ponds, and rivers.

Sphaerium novae-zelandiae, Deshayes, 1853.

Sphaerium novae-zelandiae, Deshayes, Cat. Conchif. Brit. Mus., 1853, p. 272; Conch. Icon., xx, pl. iv, fig. 37; Suter, T.N.Z.I., xxxvii, p. 242, figs. 5–7 in text.

Hab.—Auckland Islands, in a pool (Professor Benham).

The specimens perfectly resemble specimens I collected at Birch Hill Station, Tasman Valley.

North and South Islands of New Zealand.

Fam. MESODESMATIDAE, Deshayes.

Genus MESODESMA, Deshayes, 1831.

Distribution.—Mediterranean, east coast of North America, west coast of South America, Indian Ocean, Philippines, and Australasia.

Mesodesma australe aucklandicum, v. Martens, 1879.

Mesodesma aucklandicum, v. Martens, Sitz. Ber. Gesell. Nat. Fr., Berlin, 1879, p. 37.

A larger and more solid shell than *M. australe*.

Hab.—Auckland Islands (H. Krone, Captain J. Bollons).

Fam. VENERIDAE, Gray.

Genus CHIONE, Megerle, 1811.

Distribution.—Almost cosmopolitan.

Chione stutchburyi (Gray), 1828.

Venus stutchburyi, Gray, in Wood's Index Test., Suppl., 1828, fig. 4. *Venus zelandica*, Quoy and Gaimard, Voy. "Astrolabe," iii, 1835, p. 522, pl. lxxxiv, figs. 5, 6. *Venus dieffenbachi*, Gray, Dieff. N.Z., p. 250 (young shell).

Cardita zelandica, Potiez and Michaud, Gall. des Moll., 1838, p. 166. *Chione macleayana*, T.-Woods, P. Roy. S. Tasm., 1879, p. 38.

Hab.—Auckland Islands (Captain J. Bollons).

Throughout New Zealand, Kermadec Islands, Chatham Islands, and Kerguelen Island.

Chione mesodesma (Quoy and Gaimard), 1835.

Venus mesodesma, Q. and G., Voy. "Astrolabe," iii, 1835, p. 532, pl. lxxxiv, figs. 17, 18. ? *Venus spurca*, Sowerby, P.Z.S., 1835, p. 23. *Murcia scansilis*, Römer, Mal. Blätter, vii, p. 161. *Chione mesodesma*, Q. and G.: Suter, P. Mal. S., vi, p. 204.

Hab.—Auckland Islands, 10 fathoms.

Throughout New Zealand, but more common in the north; Kermadec Islands; Tristan da Cunha, in 1,000 fathoms.

Chione crassa (Quoy and Gaimard), 1835.

Venus crassa, Q. and G., Voy. "Astrolabe," iii, 1835, p. 525, pl. lxxxiv, figs. 7, 8. *Venus spissa*, Deshayes: Lamarck, A.s.V., ed. 2, vi, p. 373 (a misprint for *crassa*). *Chione gibbosa*, Hutton, C.M.M., p. 71. *Chione crassa*, Q. and G.: Suter, P. Mal. S., vi, p. 203.

Hab.—Auckland Islands (Captain J. Bollons).

Also Stewart Island, Preservation Inlet, and Banks Peninsula.

Remarks.—This is certainly not an old and thickened form of *C. mesodesma*, as young shells are just as gibbous in proportion as old shells.

Chione subsulcata, Suter, 1905.

Chione subsulcata, Suter, P. Mal. S., vi, 1905, p. 205. *Venus sulcata*, Hutton, P.L.S. N.S. Wales (2), i, 1887, p. 226 (non *V. sulcata*, Hutton, 1875).

Hab.—Auckland Islands (Captain J. Bollons).

Also Stewart Island.

Genus PAPHIA, Bolten, 1798.

Distribution.—Temperate and warm seas.

Paphia (Ruditapes) intermedia (Quoy and Gaimard), 1835.

Venus intermedia, Q. and G., Voy. "Astrolabe," iii, 1835, p. 526, pl. lxxxiv, figs. 9, 10. *Venus largillierti*, Philippi, Zeitschr. für Malak., 1847, p. 87.

Hab.—Auckland and Campbell Islands.

Throughout New Zealand.

Fam. CARDIIDAE, Gray.

Genus PROTOCARDIA, Beyrich, 1845.

Protocardia (Nemocardium) pulchella (Gray), 1843.

Cardium striatulum, Sowerby, P.Z.S., 1840, p. 105 (non Brocchi). *Cardium pulchellum*, Gray, Dieff. N.Z., p. 252; Conch. Icon., ii, pl. viii, fig. 42.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).

Throughout New Zealand, Tasmania, and Australia.

Fam. SAXICAVIDAE, Gray.

Genus SAXICAVA, Bellevue, 1802.

Distribution.—Cosmopolitan.

Saxicava arctica (Linné), 1767.

Mya arctica, Linné, Syst. Nat., ed. 12, p. 1113. *Corbula australis*, Lamarck, A.s.V., vi, p. 153. *Saxicava australis*, Lam., Conch. Icon., xx, pl. ii, fig. 8. *Hiatella minuta*, Gray, Dieff. N.Z., p. 252.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).

Throughout New Zealand, Chatham Islands, and Kermadecs. The species is cosmopolitan, occurring from low water to 500 fathoms.

Fam. MYOCHAMIDAE, Dall.

Genus MYODORA, Gray, 1840.

Distribution.—Chinese seas, Philippines, and Australasia.

Myodora antipodum, E. A. Smith, 1880.

Myodora antipodum, E. A. Smith, P.Z.S., 1880, p. 585, pl. lviii, fig. 7.

Hab.—Ten miles north of Enderby Island, in 85 fathoms (E. R. Waite).

Hauraki Gulf (Colonel Bolten); near Cuvier Island, in 38 fathoms (Captain J. Bollons); off Great Barrier Island, in 110 fathoms; Dusky Sound, in 10–30 fathoms.

Fam. POLYPODIDAE, Hoyle.

Genus POLYPUS, Schneider, 1784.

Distribution.—All seas.

Polypus campbelli, E. A. Smith, 1902.

Polypus campbelli, E. A. Smith, Voy. South. Cross, Moll., 1902, p. 201, pl. xxiv, figs. 7–11.

The body of this octopus is short and purselike, dark, dirty olivaceous upon the dorsal surface and buff beneath; body finely granular above and below, the granules small and very close together on the ventral surface; above each eye is a small compressed cirrus. Arms (in spirit) keeled above, connected at the base by a short web, all of about the same thickness. The right dorsal is shorter than the left; it has 38 pairs of suckers, the left having 67 pairs. The suckers are of moderate size, excepting the seventh pair from the base on the 2 lateral pairs of arms: these are enormously developed, and stand out 4 mm. from the surface, and are about the same in diameter. It is curious that the upper of the left lateral pair has developed only a single large sucker instead of two. The presence of these large suckers indicate the male sex of the specimen, and this is substantiated by the hectocotylized lower arm of the right lateral pair; this has only 36 pairs of suckers, whereas the corresponding arm on the other side has 75 pairs.

Length from web between dorsal arms to the end of body, 48 mm.; width of body across back, 24 mm.; from back to front, 19 mm. (Smith).

Hab.—Campbell Island.

A female specimen from the same locality is in my collection.

Genus PINNOCTOPUS, d'Orbigny, 1845.

Distribution.—New Zealand only.

Pinnoctopus cordiformis (Quoy and Gaimard), 1832.

Octopus cordiformis, Q. and G., Voy. "Astrolabe," ii, 1832, p. 87, pl. vi, fig. 3.

Hab.—Campbell Island (Filhol).

The type is from Tasman Bay.

DISTRIBUTION OF SPECIES.

[In the last column "New Zealand" is used in a restricted sense, applying to the main islands only, and excluding the Chathams and other islands that are nevertheless within the New Zealand biological region.]

Sna. = Snares. Bou. = Bounty. Ant. = Antipodes. Auck. = Auckland. Cam. = Campbell.

	Sna.	Bou.	Ant.	Auck.	Cam.	Other Localities.
Ischnochiton contractus	..	..	..	x	..	Tasmania, Australia.
,, *parkeri*	..	..	..	x	x	
,, *luteoroseus*	..	x	..	..	..	Dusky Sound.
Callochiton puniceus	x	..	..	..	..	New Zealand, Magellan.
Mopalia australis	x	..	..	..	..	
Plaxiphora aucklandica	..	..	..	x	..	
,, *superba*	..	..	..	x	x	Macquarie Island.
Acanthochites rubiginosus	..	..	..	x	..	New Zealand.
Chiton aereus, var.	..	..	..	x	..	,,
Onithochit. undulat. subantarct.	..	..	..	x	x	,,
Acmaea intermedia	..	x	..	..	..	
,, *roseoradiata*	x	..	..	..	..	New Zealand
,, *septiformis*	..	..	..	x	x	New Zealand, Tasmania, Australia.
,, *pileopsis*	x	..	..	x	x	New Zealand.
,, *cantharus*	..	..	..	x	..	New Zealand, Macquarie Island.
,, *campbelli*	..	..	..	x	x	
Nacella illuminata	..	..	x	x	x	Macquarie Island.
,, *fuegiensis*	..	..	..	..	x	Macquarie, Tierra del Fuego, Falkland, Kerguelen.
Helcioniscus radians affinis	..	..	..	x	..	New Zealand, Chathams.
,, *stelliferus*	..	..	..	..	x	New Zealand.
,, *strigilis*	x	..	x	x	x	New Zealand, Chathams.
,, *redimiculum*	x	..	..	x	..	,, ,,
Scissurella rosea	x	..	..	..	..	New Zealand.
Schismope atkinsoni	x	x	..	..	..	New Zealand, Tasmania, Australia.
,, *beddomei*	x	x	..	..	..	,, ,, ,,
,, *brevis*	x	..	..	..	..	New Zealand.

DISTRIBUTION OF SPECIES—*continued.*

Sna. Snares. Bou. Bounty. Ant. = Antipodes. Auck. = Auckland. Cam. = Campbell.

	Sna.	Bou.	Ant.	Auck.	Cam.	Other Localities.
Haliotis iris	x	..	..	x	..	New Zealand, Chathams.
,, *australis*	x	..	..	x	..	,, ,,
,, *virginea huttoni*	..	..	..	..	x	
Incisura lytteltonensis	x	..	..	..	..	New Zealand.
Emarginula striatula	x	x	..	..	..	New Zealand, Chathams.
Puncturella demissa	x	..	..	..	..	New Zealand, Australia.
Fissuridea monilifera	x	..	..	..	..	New Zealand.
Trochus chathamensis	x	x	..	x	..	New Zealand, Chathams.
Monodonta nigerrima	..	..	..	x	..	New Zealand, west coast of South America.
,, *coracina*	..	..	..	x	..	New Zealand, Chathams.
,, *aethiops*	..	..	..	x	..	,, ,,
Cantharidus opalus	x	..	..	..	..	New Zealand, Chathams, Kermadecs.
,, *sang. caelatus*	x	x	..	..	..	New Zealand.
,, *pruninus*	..	..	..	x	x	
,, ,, *perobtusus*	..	..	..	x	x	New Zealand, Macquarie Island.
,, ,, *minor*	..	..	..	x	x	
Photinula antipoda	x	..	x	x	x	
,, ,, *rosea*	..	x	..	x	x	New Zealand.
Monilea semireticulata	x	..	..	..	..	
Calliostoma punctulatum	x	..	..	..	..	New Zealand.
,, *spectabile*	..	..	..	x	..	New Zealand, Chathams.
,, *aucklandicum*	..	..	..	x	..	
Liotia polypleura	..	x	..	..	..	New Zealand.
,, *rotula*	x	..	..	..	..	
Cyclostrema eumorpha	x	..	..	..	..	
Cirsonella densilirata	x	x	..	..	..	
Lissospira micra	x	..	..	..	..	Tasmania, Australia.
Circulus sub-tatei	x	..	..	..	..	New Zealand.
Cyclostremella neozelanica	x	..	..	..	..	
Turbo granosus	..	..	..	x	..	New Zealand, Chathams.
Leptothyra fluctuata	x	x	..	..	..	New Zealand.
,, ,, *immaculata*	x	..	..	..	..	
,, *crassicostata*	x	..	..	..	..	New Zealand.
Cocculina tasmanica	..	..	..	x	..	New Zealand, Tasmania, Australia.
,, *clypidellaeformis*	x	..	..	..	..	
Litorina cincta	x	..	..	..	..	New Zealand, Chathams.
Laevilitorina antipodum	..	..	..	x	x	
Couthouyia corrugata	x	..	..	..	..	New Zealand.
Rissoa huttoni	x	..	..	..	..	,,
,, *rufoapicata*	x	..	..	..	..	,,
,, *cheilostoma*	x	x	..	..	..	New Zealand, Tasmania, Australia.
,, *exserta*	x	x	..	..	..	
,, *suteri*	x	..	..	..	..	New Zealand.
,, *foliata*	x	..	..	..	..	
,, *fumata*	..	x	..	..	..	New Zealand.
,, *forcauxiana*	x	x	..	..	..	,,
,, *insculpta*	x	x	..	..	..	,,

DISTRIBUTION OF SPECIES—*continued.*

Sna. = Snares. Bou. = Bounty. Ant. = Antipodes. Auck. = Auckland. Cam. = Campbell.

	Sna.	Bou.	Ant.	Auck.	Cam.	Other Localities.
Rissoa subfusca	x	..	..	..	..	New Zealand.
,, ,, *micronema*	x	..	..	..	..	,,
,, *rosea*	x	x	..	..	..	,,
,, *lubrica*	..	x	..	..	..	,,
,, *neozelanica*	x	x	..	..	..	,,
,, *microstriata*	x	x	..	..	..	,,
,, *micans*	x	..	..	..	..	,,
,, *atomus*	..	x	..	..	..	
,, *verecunda*	x	..	..	..	..	New Zealand.
,, *porcellana*	x	..	..	..	..	,,
Anabathron gradatum	x	..	..	..	..	
Rissoina chiltoni	..	..	..	x	x	
Omalogyra bicarinata	x	..	..	..	..	
Bittium retiferum	x	..	..	..	..	
Cerithiopsis sarissa	x	x	..	..	..	New Zealand.
,, *crenistria*	x	..	..	..	..	,,
,, *cessicus*	x	..	..	..	..	Tasmania, Australia.
,, *subantarctica*	x	x	..	..	..	
,, *canaliculata*	..	x	..	..	..	
,, *styliformis*	x	..	..	..	..	
,, *marginata*	x	..	..	..	..	
Seila bulbosa	x	..	..	..	..	
,, *dissimilis*	x	..	..	..	..	
Triphora huttoni	x	x	..	..	..	New Zealand.
,, *fascelina*	x	x	..	..	..	
,, *lutea*	x	x	..	..	..	
Turritella difficilis	x	..	..	..	..	
Neojanacus perplexus	..	x	..	..	..	New Zealand.
Natica australis	x	..	..	..	..	,,
Polinices amphialus	..	x	..	..	..	New Zealand, Chathams.
Lamellaria ophione	x	..	..	..	..	New Zealand, Kermadecs, Tasmania, Australia.
Trichotropis clathrata	x	x	..	..	..	New Zealand, Chathams.
Argobuccinum argus	..	..	..	x	..	New Zealand, Chathams, Tasmania, Australia, St. Paul and Amsterdam, Tristan da Cunha, Natal, Cape Colony, Chili.
Epitonium levifoliatum	x	..	..	..	..	New Zealand, New South Wales.
Crossea glabella	x	..	..	..	..	New Zealand.
Aclis succincta	x	..	..	..	..	
Turbonilla zealandica	x	x	..	..	..	New Zealand.
Odostomia taumakiensis	x	x	..	..	..	,,
,, *inornata*	x	x	..	..	..	
,, *rugata*	x	x	..	..	..	New Zealand.
,, *sabulosa*	x	x	..	..	..	
Eulima treadwelli	x	..	..	..	..	New Zealand.
,, *aucklandica*	..	..	..	x	..	
Euthria linea	..	..	..	x	x	New Zealand, Chathams.
,, ,, *pertinax*	..	..	..	x	..	New Zealand.
,, *vittata*	..	..	..	x	..	New Zealand, Chathams.

DISTRIBUTION OF SPECIES—*continued.*

Sna. = Snares. Bou. = Bounty. Ant. = Antipodes. Auck. = Auckland. Cam. = Campbell.

	Sna.	Bou.	Ant.	Auck.	Cam.	Other Localities.
Euthria littorinoides	..	..	..	x	..	New Zealand.
,, *strebeli*	..	..	..	x	x ?	,,
Cominella maculata	..	..	..	x ?	..	New Zealand, Chathams.
,, *nassoides*	..	..	..	x	x	,, ,,
,, *campbelli*	..	..	..	..	x	
Trophon ambiguus	..	x	..	..	..	New Zealand, Kermadecs.
,, *aucklandicus*	..	..	..	x	x	New Zealand.
,, *curtus*	..	x	x	..	..	,,
,, *erectus*	..	x	x	..	..	
,, *crispulatus*	..	x	..	..	..	New Zealand.
Thais striata ..	..	..	x	x	x	New Zealand, Chathams.
Admete trailli ..	..	x	..	..	..	New Zealand.
Mitrella rosea ..	..	x	..	x	..	,,
,, *subantarctica*	..	..	x	..	..	
,, *leptalea*	..	x	x	..	..	New Zealand.
Alcira transitans	..	x	x	x	x	,,
,, *varians*	..	x	..	x	..	,,
,, *sanguinea*	..	..	x	..	..	
Marginella albescens	..	x	x	..	..	New Zealand, Chathams.
,, *amoena*	..	x	..	..	..	
,, *lurida*	..	x	x	..	..	New Zealand.
,, *plicatula*	..	..	..	x	..	
Drillia verrucosa	..	x	..	..	..	New Zealand.
,, *laevis parva*	..	x	..	..	..	,,
Mitromorpha gemmata	..	x	..	..	..	,,
Bathytoma albula	..	x	..	..	..	,,
Mangilia protensa	..	x	..	..	..	,,
,, *dictyota*	..	x	..	..	..	New Zealand, Chathams.
,, *flexicostata*	..	x	..	..	..	New Zealand.
,, *epentroma*	..	x	..	..	..	,,
,, *devia*	..	x	..	..	..	
,, *quadricincta*	..	x	..	..	..	
,, *cophinodes*	..	x	..	..	..	
Daphnella chariessa	..	x	..	..	..	New Zealand.
,, *totolirata*	..	x	..	..	..	New Zealand, Chathams.
,, *acicula*	..	x	..	..	..	
,, *tenuistriata*	..	x	..	..	..	
,, *amphipsila*	..	x	..	..	..	
,, *crassilirata*	..	x	..	..	..	New Zealand.
Mnestia striata	..	x	..	x	..	,,
Acanthodoris mollicella	..	..	..	x	..	,,
Doris flabellifera	..	x	..	..	..	,,
Siphonaria obliquata	..	..	..	x	..	New Zealand, Chathams.
,, *lateralis*	..	..	x	x	x	Macquarie Island, Tasmania, Kerguelen, Patagonia, Magellan, Falkland Islands.
Allodiscus planulatus	..	..	..	x	..	New Zealand.
Thermia expeditionis	..	..	..	x	..	
Therasia antipoda	..	..	..	x	..	

DISTRIBUTION OF SPECIES—*continued.*

Sna. = Snares. Bou. = Bounty. Ant. = Antipodes. Auck. = Auckland. Cam. = Campbell.

	Sna.	Bou.	Ant.	Auck.	Cam.	Other Localities.
Phenacohelix subantarctica	..	..	..	..	x	
,, sp.	..	..	..	x	..	
Flammulina phlogophora	..	..	..	x	..	New Zealand.
Ranfurlya constanceae	..	..	..	x	..	
Endodonta anguiculus	..	..	..	x	..	New Zealand.
,, *benhami*	..	..	..	x	..	
,, *minuta*	..	..	..	..	x	
Laoma campbellica	..	..	..	..	x	
,, *cognata*	..	..	..	..	x	
Athoracophorus huttoni	..	x	..	..	x	
,, *martensi*	..	..	..	x	..	Macquarie Island.
,, *verrucosus*	..	..	..	x	..	
Onchidella campbelli	..	..	..	x	x	
Dentalium nanum	..	..	..	x	..	New Zealand.
,, *huttoni*	..	..	..	x	..	,,
Cadulus spretus	..	..	..	x	..	,,
Anomia, sp.	..	..	x	x	..	
Arca aucklandica	..	..	..	x	..	
Philobrya costata	..	..	..	x	..	New Zealand.
Mytilus edulis	..	..	..	x	x	New Zealand, circumaustral, Europe
,, *magellanicus*	..	..	..	x	x	New Zealand, circumaustral.
Modiolus australis	..	..	..	x	x	New Zealand, Chathams, Tasmania, Australia.
,, *ater*	..	..	..	x	..	New Zealand, Tasmania, Australia.
Lima angulata	..	..	..	x	..	New Zealand, Australia, New Caledonia, Philippines, Panama.
Modiolarca pusilla	..	..	x	x	..	New Zealand, Macquarie Island, Tierra del Fuego.
Venericardia difficilis	..	..	..	x	..	New Zealand.
,, *corbis*	..	x	..	x	..	,,
Neolepton antipodum	..	..	..	..	x	,,
Rochefortia donaciformis	..	..	..	..	x	New Zealand, Australia.
Lasaea miliaris, var.	x	..	..	x	x	New Zealand, Macquarie Island.
Sphaerium novae-zelandiae	..	..	..	x	..	New Zealand.
Mesodesma australe aucklandicum	..	..	..	x	..	
Chione stutchburyi	..	..	..	x	..	New Zealand, Chathams, Kermadecs, Kerguelen.
,, *mesodesma*	..	..	..	x	..	New Zealand, Kermadecs, Tristan da Cunha.
,, *crassa*	..	..	..	x	..	New Zealand.
,, *subsulcata*	..	..	..	x	..	,,
Paphia intermedia	..	..	..	x	x	,,
Protocardia pulchella	..	..	..	x	..	New Zealand, Tasmania, Australia.
Saxicava arctica	..	..	..	x	..	New Zealand, cosmopolitan.
Myodora antipodum	..	..	..	x	..	New Zealand.
Polypus campbelli	..	..	..	..	x	
Pinnoctopus cordiformis	..	..	..	..	x	New Zealand.

SUMMARY.

The result of the scientific expedition to the subantarctic islands of New Zealand is, as far as *Mollusca* are concerned, very satisfactory, especially when considering the fact that no conchologist accompanied the expedition. Of special interest and great importance is the discovery of new non-marine species of *Mollusca*, which number 6, and the marine 4.

The total of the genera now known to occur, and enumerated, amounts to 105, and the number of species and varieties to 208, which is certainly more than one would expect in these latitudes. A great number of these are also met with in New Zealand, some in Tasmania and Australia, and only a small number are circumaustral or partly so.

Leaving out the small forms dredged near the Snares and Bounty Islands, the following twenty-eight species may be mentioned as being precinctive to our subantarctic islands, as far as our present knowledge goes :—

Ischnochiton parkeri.
Mopalia australis.
Plaxiphora aucklandica.
„ *superba.*
Acmaea intermedia.
„ *campbelli.*
Nacella illuminata.
Cantharus pruninus.
Calliostoma aucklandicum.
Laevilitorina antipodum.
Turritella difficilis.
Eulima aucklandica.
Cominella campbelli.
Thermia expeditionis.
Therasia expeditionis.
„ *antipoda.*
Phenacohelix subantarctica.
Ranfurlya constanceae.
Endodonta benhami.
„ *minuta.*
Laoma campbellica.
„ *cognata.*
Athoracophorus huttoni.
„ *martensi.*
„ *verrucosus.*
Onchidella campbelli.
Arca aucklandica.
Polypus campbelli.

More or less circumaustral are the following nine species :—

Callochiton puniceus.
Nacella fuegiensis.
Monodonta nigerrima.
Argobuccinum argus.
Siphonaria lateralis.
Mytilus magellanicus.
Modiolarca pusilla.
Chione stutchburyi.
„ *mesodesma.*

Another circumaustral species is *Laevilitorina caliginosa*, Gould, which has been found at Macquarie Island, but seems to be absent or not yet found on the islands to the north-east.

It is very interesting to see *Doris* (*Ctenodoris*) *flabellifera* turning up at the Snares, the species having been known only from Auckland Harbour.

A former land connection between New Zealand and the subantarctic islands seems to be proved by the occurrence in the islands of *Allodiscus planulatus*, *Flammulina phlogophora*, *Endodonta anguiculus*, *Sphaerium novae-zelandiae*, and also of the genus *Athoracophorus*. *Athoracophorus huttoni* is found on the Snares and on Macquarie Island ; *A. martensi* lives on the Auckland Islands and on Macquarie Island, which also suggests a former land communication between the respective islands.

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EXPLANATION OF PLATE I.

Fig.
1. *Plaxiphora aucklandica*, Suter.
2. *Rissoina chiltoni*, Suter.
3. *Eulima aucklandica*, Suter.
4–5. *Marginella plicatula*, Suter.
6–8. *Thermia* (?) *expeditionis*, Suter.
9–11. *Phenacohelix* (?) *subantarctica*, Suter.
12–14. *Endodonta benhami*, Suter.
15. „ *minuta*, Suter.
16. *Laoma cognata*, Suter.
17. *Athoracophorus huttoni*, Suter.
18. „ „ Jaws.
19. „ „ Teeth of radula.

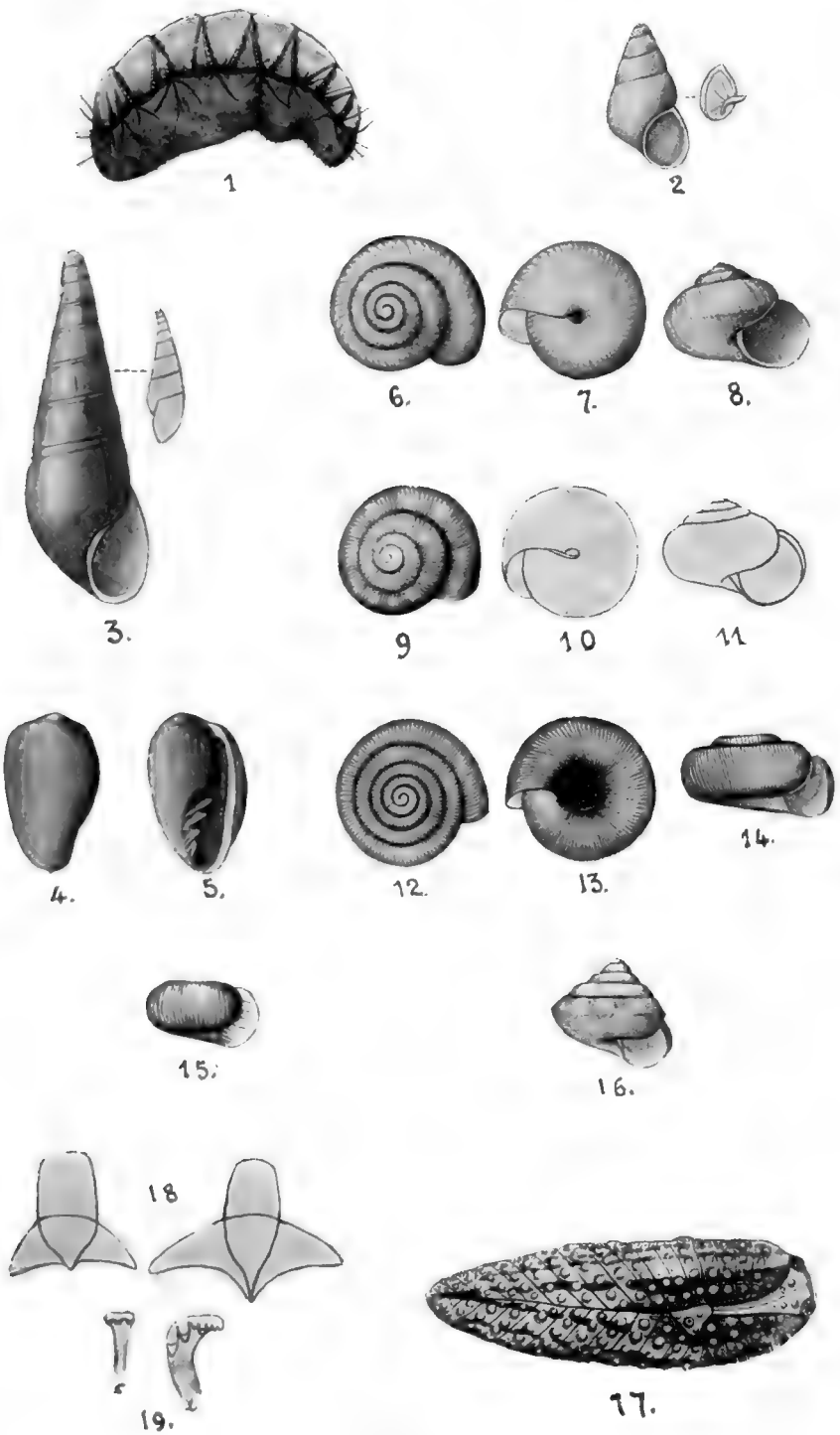

PLATE I.

ARTICLE II.—GENERAL NOTES ON THE ENTOMOLOGY OF THE SOUTHERN ISLANDS OF NEW ZEALAND.

By G. V. Hudson, F.E.S.

PLATES II, III, AND IV.

(1.) THE SNARES.

The work of the expedition at the Snares was limited to about five hours on the morning of the 15th November, but, notwithstanding this, the entomological results were very satisfactory, the island visited evidently being very productive in insects, especially beetles. The weather during our visit was principally cloudy, with a moderate north-west wind, culminating in rain when we were leaving. A total of fourteen species of insects was observed here, which I think indicates that the insect fauna of these small and isolated islands is probably a very rich one. The following species were taken, the descriptions of which follow in systematic order:—

Coleoptera.

Mecodema hudsoni. (p. 83.)

Six specimens of this handsome insect were found under logs in forest composed of *Olearia Lyallii*. (Plate III, fig. 5.)

Diglymma castigatum. (p. 84.)

This very pretty beetle also occurred under fallen branches of *Olearia Lyallii*, and fourteen fine specimens were secured.

Synteratus ovalis. (p. 85.)

Four specimens of this little species were taken.

Morychus tumidellus. (p. 102.)

Only two specimens of this interesting species occurred.

Odontria longitarsis. (p. 105.)

This is a large and handsome species, and so far is represented by a single specimen only. (Plate III, fig. 14.)

Pseudhelops quadricollis. (p. 107.)

Fairly common; seven specimens taken.

Catadryobius vestitus. (p. 109.)

Six specimens of this very fine weevil were found by Professor Kirk and Mr. Browne on the stems of *Olearia Lyallii*. (Plate III, fig. 10.)

LEPIDOPTERA.

Leucania pagaia. (p. 67.)

One specimen only, taken by Dr. Benham. (Plate II, fig. 9.)

A *Tortrix* near *Pyrgotis*, but not in a condition to describe, also occurred. In addition, I saw a species of *Glyphipteryx*, which I was unable to capture, on the *Olearia*.

DIPTERA.

Two flies, *Allophylopis punctata* (p. 143) and an allied species, were taken.

ORTHOPTERA.

Onosandrus pallitarsis, Walker? (Plate IV, fig. 9.)

This species belongs to the genus *Onosandrus*, and appears to be closely allied to, if not specifically identical with, *O. pallitarsis*, Walker, a species common among the roots of plants in various parts of New Zealand. (See Hutton, Trans. N.Z. Inst., xxix, p. 221.) Seven specimens of this fine weta were found by Professor Kirk.

A species of weta, *Ischyroplectron isolatum*, Hutton, has been recorded from the Bounty Islands "under rocks (Fairchild)," the genus being known from Bounty Islands only. (Hutton, *l.c.*, pp. 227–29.)

(2.) AUCKLAND ISLANDS.

Nine entire days and two half-days were spent by the expedition at Carnley Harbour, in the south of Auckland Island, and, as the weather fortunately allowed some collecting to be done on each day, a fairly complete collection was made of the insects which were about at the time. One day was perfectly fine and almost calm, and the major part of three other days was warm and sunny. In addition to the stay at Carnley Harbour, short visits were made to Norman Inlet, Enderby Island, Disappointment Island, and Port Ross, and collections made at each of these places.

The total number of species of insects taken on the Auckland Islands amounted to sixty-one, distributed amongst the orders as follows:—

Coleoptera	15
Hymenoptera	3
Diptera	20
Lepidoptera	20
Neuroptera	3
Total	61

Prior to the visit of the expedition the total number of species known from the Auckland Islands amounted to twenty-eight (eleven *Coleoptera* and seventeen *Diptera*), and, so far as I have been able to ascertain, no specimens of insects belonging to the other orders had ever been obtained. In considering the entomological results of the expedition, especially in respect of the *Lepidoptera*, it must be borne in mind that the best season of the year had not arrived, and that a visit during the middle or end of January would no doubt bring to light a large number of species which were not in evidence as early as November. No butterfly was seen on the islands,

and only one species of *Noctuina* was found; but it would be an unwarranted assumption to infer that no butterfly exists there, or that the *Noctuina* are as poorly represented as the collection would lead us to suppose. I consider that the existence of a satyrid butterfly on Auckland Island allied to *Erebia* or *Argyrophenga* is probable, but I do not think it likely that any member of the genus *Vanessa* occurs there, seeing that hibernated specimens of such a species would almost certainly have been on the wing during November. I always kept a very sharp look-out for butterflies, but none were seen, although on several occasions the weather-conditions for their appearance were highly favourable. It will be seen that all the species taken are closely allied to New Zealand forms, and in several cases are specifically identical therewith.

The following is a list of the insects taken, with a few brief remarks on their habits and the nature of the localities where each species occurred. With the exception of four species of *Lepidoptera*, at present represented by single specimens only, the scientific descriptions which follow have been kindly drawn up by specialists in each of the orders dealt with.

Coleoptera.

Oopterus tripunctatus. (p. 87.)

This smart-looking little beetle was very common under logs and amongst moss at Carnley Harbour. Seven specimens were also taken at Enderby Island.

Loxomerus fossulatus. (p. 93.)

Four specimens only—one from Carnley Harbour, two from Enderby Island, and one taken on Adams Island by Mr. J. S. Tennant.

Loxomerus ambiguus. (p. 92.)

Only one specimen, taken at Port Ross.

Catops avivorus. (p. 101.)

A long series of this little necrophagous beetle was found by Mr. H. D. Cook in a bird's skull on a small island in Camp Cove, Carnley Harbour.

Liochria longula. (p. 104.)

Two specimens, under logs, Carnley Harbour. A rare and handsome species. (Plate III, fig. 2.)

Liochria sumptuosa. (p. 103.)

Two specimens taken as above, and one specimen from Enderby Island.

Pseudhelops tuberculatus. (p. 106.)

This is one of the commonest beetles on Auckland Island. It occurred in profusion under the bark of the rata-trees round Carnley Harbour, and was also found on Enderby Island. It has a considerable superficial resemblance to *Adelium amaroides*, a common and widely distributed New Zealand species.

Catadryobius benhami. (p. 110.)

Three specimens of this beautiful bronzy-metallic weevil were found by Dr. Benham under a log on Enderby Island.

Catadryobius erubescens. (p. 111.)

One specimen, discovered by Dr. Benham under a log at the camp, Carnley Harbour. (Plate III, fig. 1.)

Catadryobius tetricus. (p. 110.)

Three specimens, taken under logs, Carnley Harbour; probably fairly common. (Plate III, fig. 11.)

Catadryobius grandis. (p. 112.)

Discovered by Mr. Browne in a mollymawk's nest on Disappointment Island. Some weevil-larvae were also found, which are probably referable to this species. Mr. Browne's capture is probably the only entomological specimen extant from Disappointment Island. (Plate III, fig. 15.)

Heterexis sculptipennis. (p. 113.)

This striking weevil was discovered by Mr. R. Speight on Adams Island.

Hycanus frontalis. (p. 116.)

Three specimens, found under logs on Enderby Island.

Pachyderris punctiventris. (p. 121.)

One specimen, from Carnley Harbour.

Erirhinus dracophyllae. (p. 118.)

This beautiful little weevil was extremely common on the *Dracophyllum*, which was in flower at the time, at Carnley Harbour and Port Ross, 20th to 27th November. (Plate III, fig. 6.)

LEPIDOPTERA.

Melanchra erebia. (p. 68.)

A single specimen was taken by Mr. Browne at Erebus Cove, Port Ross. This was the only noctuid which occurred on Auckland Island. (Plate II, fig. 15.)

Chloroclystis indicataria. (p. 70.)

Twelve males and four females of this species were captured in forest on the shores of Carnley Harbour. The insect was mostly taken by beating the fronds of *Aspidium vestitum*. As usual, a considerable amount of variation exists both in the depth of the brown ground-colour and in the intensity of the markings. Some specimens have more or less extensive patches of white on the forewings. (Plate II, figs. 20–22.)

Venusia charidema. (p. 70.)

This was one of the commonest moths on Auckland Island, frequenting damp rata forests round Carnley Harbour and Norman's Inlet, mostly in the neighbourhood of streams. Both sexes vary considerably in the depth of the general colouring, though the markings appear to be very constant. Fresh specimens of the female are often of a very vivid orange-brown colour. This moth is also common on Campbell Island. (Plate II—fig. 10, male; fig. 11, female.)

Xanthorhoe orophylloides. (p. 68.)

A single specimen only, taken by Captain Dorrien-Smith at the head of the North Arm, Carnley Harbour. (Plate II, fig. 12.)

Xanthorhoe oxyptera. (p. 67.)

I am also indebted to Captain Dorrien-Smith for a single specimen of this interesting species, which was also found at the head of the North Arm of Carnley Harbour. The outline of the wings is distinct and remarkable, and has been reproduced in the figure from an impression taken from the actual specimen on photographic paper. (Plate II, fig. 23.)

Drepanodes neoselena. (p. 70.)

Four specimens of this large and striking insect were captured in forest to the west of the large stream near Camp Cove, Carnley Harbour. Like its New Zealand relative, *D. muriferata*, it is attached to *Polypodium Billardieri*, which is very abundant in the rata forest in that locality, and on which its larva probably feeds. It is much larger and darker in colour than its New Zealand ally. (Plate II, fig. 13.)

Protyparcha scaphodes. (p. 71.)

Seventeen specimens of this very distinct little species were taken during hot sunny intervals amongst tussock-grass in openings in the rata forest near a small stream, Camp Cove, Carnley Harbour. This was the only lepidopteron I found frequenting the open country. It was very active and inconspicuous. (Plate II, fig. 16.)

Scoparia triscelis. (p. 71.)

Eight specimens of this species were captured in dense rata forest around Carnley Harbour and Norman's Inlet. (Plate II, fig. 1.)

Scoparia parmifera. (p. 72.)

Only three specimens of this very neatly marked species were taken, and one seen. All occurred in rata forest at Carnley Harbour. This species was also found at Campbell Island. (Plate II, fig. 2.)

Scoparia epicomia. (p. 72.)

Four specimens of this New Zealand species occurred in damp spots in dense forest. Three were taken at Carnley Harbour, and one at Norman's Inlet. All are identical with the New Zealand species, but are rather duller and less distinctly marked than the majority of New Zealand specimens.

This insect may possibly have reached Auckland Island as a larva or pupa, enclosed in a cocoon, amongst moss on a floating log, in which case it would, of course, have been necessary for a member of each sex to have been simultaneously transported. On the other hand, it is possible, though not very probable, that its presence on the island may be explained by a fertile female having been blown across the ocean during an exceptionally heavy northerly gale.

Scoparia epicomia is a fragile insect, of such feeble flight that the question of its having flown over more than two hundred miles of ocean need not be considered.

Apart, therefore, from the two possibilities already mentioned, the occurrence of the insect on the island can only be explained by the existence of a former land connection with the mainland of New Zealand, at a period not sufficiently remote to have allowed any changes to have taken place in the specific characters of the insect.

Scoparia sabulosella. (p. 72.)

Three specimens of this extremely common New Zealand species were taken on Enderby Island, amongst European grasses. It is variable in colour, as in New Zealand. The larva feeds on mosses.

Although the Enderby Settlement was originally established by colonists from Australia, it is nevertheless possible that this species may have been introduced by man, as it is constantly found in fields and other cultivated places in New Zealand, and the eggs or perfect insects might readily be transported amongst agricultural produce. There is no record of *Scoparia sabulosella* having been found in Australia.

Scoparia halopis. (p. 72.)

This species occurred at Norman's Inlet and Enderby Island. A total of six specimens were secured, and one was bred from a pupa taken home to New Zealand. (Plate II, fig. 3.)

Scoparia psammitis (?).

One specimen only, which is probably correctly identified as *Scoparia psammitis*, a locally abundant New Zealand species, commonest in the southern districts.

Musotima nitidalis.

One large specimen was taken at Carnley Harbour, and one small one at Enderby Island. These belong to the rather pale form which occurs principally in the southern parts of New Zealand, and is also found abundantly in New South Wales and Victoria. In New Zealand the insect is attached to *Pteris incisa;* in Australia to *Adiantum*, and perhaps other ferns. It is a common species in both countries.

Of course, it is just possible that the species was introduced from Australia into Enderby Island at the time of the Enderby Settlement, and that it was subsequently blown across to Auckland Island. It is, however, much more likely that the species has inhabited the islands, in an unchanged condition, ever since the time of their separation from the mainland of New Zealand.

Platyptilia aeolodes. (p. 73.)

Two specimens of this interesting plume-moth were captured in the forest at Carnley Harbour. It also occurs in New Zealand and at the Chatham Islands. (Plate II, fig. 14.)

Pyrgotis plagiatana. (p. 73.)

This was by far the commonest lepidopteron on Auckland Island, and occurred abundantly amongst clumps of *Aspidium vestitum* in the forest at Carnley Harbour and Norman's Inlet. The species was extremely variable, and mostly rather larger than ordinary New Zealand specimens. One small specimen of a typical female belonging to the variety *luciplagana* was, however, taken. (Plate II, figs. 4–7, varieties.)

Cacoecia syntona. (p. 73.)

Two specimens of this interesting insect were bred from larvae, inadvertently taken by Mr. J. S. Tennant amongst botanical specimens of *Pleurophyllum speciosum* at Port Ross on the 28th November, 1907. The pupa was noted on the 10th January, and the moth emerged on the 14th February, 1908. In this instance a valuable entomological discovery was made at the sacrifice of a few specimens of a well-known plant. (Plate II, fig. 8.)

Heterocrossa gonosemana. (p. 74.)

This pretty species occurred amongst *Aspidium vestitum* in forest at Carnley Harbour, Norman's Inlet, and on Enderby Island. It was very sluggish, and was principally taken by beating the fronds of the fern into an umbrella. Most of the specimens taken were considerably darker than the usual New Zealand form. (Plate II, fig. 17.)

Proterodesma byrsopola. (p. 74.)

This insect is extremely sluggish, and the female must be almost, if not entirely, incapable of flight. Fifteen specimens were taken, resting on the under-surfaces of dead rata logs in the forest at Carnley Harbour; the species was also observed at Norman's Inlet. (Plate II—fig. 18, male; fig. 19, female.)

Plutella maculipennis (cruciferarum).

One specimen of this common garden-pest occurred on Enderby Island, and was evidently a relic of the Enderby Settlement.

DIPTERA.

Zaluscodes aucklandicus. (p. 130.)

This remarkable species was common in damp places in forest, Carnley Harbour. It runs rapidly over the ground, like a small harvestman spider. An extremely fragile insect. The colour is white when alive. (Plate IV, fig. 1.)

Simulium vexans. (p. 124.)

This sandfly was very abundant near the beach and round the streams near Carnley Harbour. Its bites were persistent and painful.

Calliphora quadrimaculata. (p. 125.)

This common New Zealand blowfly was a fearful pest in the camp, especially during fairly calm mild weather.

Polytocus spinicosta. (pp. 127 and 145.)

Four males and five females of this very large and conspicuous fly were found resting under dead rata logs in the forest at Carnley Harbour. No specimens were observed on the wing, and all those found were very sluggish, and never attempted to use their wings for flight. (Plate IV—fig. 2, male; fig. 3, female.)

(3.) CAMPBELL ISLAND.

The insects captured by the members of the Campbell Island party were mostly *Coleoptera* and *Diptera*, and were all alcoholic specimens. These have been handed over to the specialists who have dealt with the respective orders, and the descriptions of them follow in systematic order. The following general observations on the entomology of Campbell Island have been kindly supplied by Mr. Marriner.

Campbell Island, in November at least, is not a good place for insects. The island is mostly covered with tussocks, and, with the exception of some very dense dry *Dracophyllum* scrub, there is no shelter. The country, during the time the expedition was on the island, was swept almost continually night and day by very cold strong gales of wind, accompanied by heavy mists, sleet, and rain. These storms naturally hid the warmth and brightness of the sun, and made anything but ideal conditions for entomological investigations. The enormous meadows of *Bulbinella Rossii*, which cover miles of the country, must afford a good food-supply for the insects; indeed, on nearly every plant small groups of flies could be generally seen feeding on the large yellow racemes. The *Dracophyllum* scrub is very dense, and under the upper green covering very dead and dry, owing, no doubt, to the dry needles of the plant falling in large numbers to the ground. On the few flowers of this plant that were out, insects were often to be seen abstracting honey.

Owing to the prevailing heavy winds, the insects at Campbell Island fly very little, and unless they are captured whilst at rest on some plant it is almost impossible to net them, as the wind picks them up the moment they leave the flower, and whirls them away some ten or twenty feet.

Lepidoptera.

This order was represented by about half a dozen species of moths, which were most frequently met with amongst the tussocks fringing the shore, and in the sheltered areas between the patches of scrub. An attempt was made to attract moths at dusk by means of a lantern, but was not successful. The following species were found on the island, but none of the specimens are in good condition.

(1.) A species of **Chloroclystis**, apparently allied to *C. indicataria* from New Zealand, but not in a fit condition to describe.

(2.) **Venusia charidema.** (p. 70.)

A large number of this common Auckland Island insect was brought back by Messrs. Des Barres and Chambers, having been captured during the summer following the visit of the expedition.

(3.) A species near **Hydriomena similata**, but not in a fit condition to describe.

(4.) **Xanthorhoe orophylloides.** (p. 68.)

Several specimens in very poor condition which appear to belong to this species were taken by Messrs. Des Barres and Chambers after the departure of the expedition.

(5.) **Scoparia parmifera.** (p. 72.)

Mr. Marriner reports that this species was the commonest moth on the island. It was rare on Auckland Island.

In addition, several geometer larvae and one larva of a wood-boring tineid allied to *Izatha* were taken by various members of the Campbell Island party.

Coleoptera.

This order was poorly represented, and none were found in the scrub or amongst the vegetation.

Oopterus marrineri (p. 88) was fairly common in the cracks between the stone slabs on the rocky peaks of Mount Col and Mount Lyall.

Oopterus elongellus (p. 89) was found in a similar situation, but was very rare.

The excessive moisture of the peaty soil, and the absence of logs and rocks at the lower levels, may have accounted for the absence of beetles.

Hymenoptera.

Seem to be absent.

Diptera.

This order was by far the most in evidence, and certainly the most numerous. However, blowflies were almost absent from the camp, and were only seen sitting on the flowers of *Bulbinella* in company with smaller flies. Under the stones at the sea-shore small flies were numerous, but fortunately sandflies were never troublesome, and only one bite was recorded.

Orthoptera.

This order was represented by two immature specimens of an insect apparently allied to *Neonetus*.

Hemiptera.

No species belonging to this order were observed.

Neuroptera.

Represented by a larva of a species of *Perlidae* only.

EXPLANATION OF PLATES II–IV.

(See p. 69.)

ARTICLE III.—DESCRIPTIONS OF FOUR NEW SPECIES OF MACRO-LEPIDOPTERA FROM THE SOUTHERN ISLANDS.

By G. V. Hudson, F.E.S.

PLATE II.

Leucania pagaia, n. sp. (Plate II, fig. 9.)

The expansion of the wings is $1\frac{1}{2}$ in. The head and thorax are rather dark brownish-ochreous, very densely scaled, the latter with a slight anterior crest. The abdomen is paler. The antennae are reddish-brown, moderately bipectinated, *the pectinations without ciliations.* The forewings are rather broad, with the apex rounded, and the termen very oblique towards the tornus, *brownish-ochreous slightly tinged with greenish ;* the markings are very obscure, consisting of four minute black dots marking the boundaries of the reniform stigmata, a group of blackish scales a little before the end of vein 1 ; *four small patches of blackish scales between veins* 2 *and* 3, 3 *and* 4, 4 *and* 5, *and* 5 *and* 6 *respectively.* The hindwings are rather dark brownish-ochreous, slightly reddish-tinged. The cilia of all the wings are ochreous.

This species is closely allied to *Leucania unica,* but may be distinguished by the slight greenish tinge, the absence of the ciliations on the pectinations of the antennae, and the characteristic though minute blackish markings on the forewings.

Described and figured from a single specimen captured by Dr. Benham on the Snares.

Xanthorhoe oxyptera, n. sp. (Plate II, fig. 23.)

The expansion of the wings is $1\frac{3}{8}$ in. The head, thorax, and abdomen are brownish-ochreous, the last-named with two blackish spots on the back of each segment. The palpi are slender, nearly as long as the head, whitish-ochreous. *The antennae are whitish-ochreous, with long black pectinations extending to the apex.* The forewings are elongate, narrow, *with the apex extremely acute and the tornus rounded,* rather dark greyish-brown, very glossy, with the bases of the veins and a broad costal band pale brownish-ochreous ; a small black discal dot. Hindwings narrow, apex and tornus rounded, greyish-brown, very glossy, without markings except a few extremely minute blackish marginal dots. On the underside all the wings are whitish-ochreous, the costa of the forewing and the whole of the hindwing darker ; the basal portions of all the veins are strongly marked in blackish-brown. The cilia of all the wings are very pale-ochreous.

This very interesting species, which may be at once recognised by its peculiar outline, was captured by Captain Dorrien-Smith at the head of the northern

arm of Carnley Harbour. As it is represented by a single specimen only, I am unwilling to denude the wings in order to accurately determine the neuration. Hence I cannot be sure that it is correctly referred to the genus *Xanthorhoe*.

Xanthorhoe orophylloides, n. sp. (Plate II, fig. 12.)

The expansion of the wings is $1\frac{1}{8}$ in. The head is brownish-grey. The antennae are moderately bipectinated. The thorax and abdomen are pale grey, the latter with the segmental divisions dull ochreous; there are also two black dots on the back of each segment. *The forewings are rather narrow*, with the apex somewhat acute, and the termen slightly curved oblique, pale bluish-grey with pale brownish-black markings; a rather faint transverse line at about $\frac{1}{3}$ strongly marked on the cell by a cloudy wedge-shaped mark; *a stronger transverse line at $\frac{3}{4}$ well marked by a series of dark marks on each of the veins*, those nearest the cell being considerably larger than the rest; a fairly distinct terminal shading of dark grey and a large wedge-shaped pale apical area; *the median band generally is paler and browner than the rest of the wing.* The hindwings are pale grey. The cilia are greyish-white, with a few brownish-black scales only.

This species is very closely allied to *Xanthorhoe orophylla* and *X. rosearia*, but may be easily separated from either by its narrower wings. One male specimen only was captured by Captain Dorrien-Smith, at the head of the North Arm of Carnley Harbour. I have also several specimens of what appear to be faded and worn individuals of the same species from Campbell Island. These were captured by Messrs. Des Barres and Chambers during the summer following the departure of the expedition from the islands.

Melanchra erebia, n. sp. (Plate II, fig. 15.)

The expansion of the wings is a little over $1\frac{5}{8}$ in. The head is very roughly scaled, with tufts of scales at the bases of the antennae, brownish-red mixed with black. The palpi are rather short, slender, tipped with dull white. The antennae are serrate, each serration being clothed with two extremely fine hairs. The thorax is reddish-grey, with moderate anterior crest and two rather prominent reddish-brown and black lateral markings. The abdomen is dull brownish-grey. The forewings are moderately broad, with the apex rounded and the termen moderately bowed; *dull grey with black markings, speckled with reddish-brown scales, especially near the base;* a broad much-broken transverse line at the base; a wavy, broad, shaded transverse line at about $\frac{1}{4}$ connected with the first transverse line near the costa and termen; a broad pale central band; *a branched transverse line, the two branches starting at $\frac{2}{3}$ and $\frac{3}{4}$ of costa respectively, uniting near the middle of the wing, and reaching the dorsum at about $\frac{3}{4}$*; this line is very deeply indented towards the termen; a subterminal row of blackish dots. The hindwings are dark brownish-grey. The cilia of all the wings appear to be pale brownish-ochreous.

The single specimen, which, unfortunately, is not in the best condition, was captured by Mr. Browne in the forest on the shores of Erebus Cove, at Port Ross, Auckland Island.


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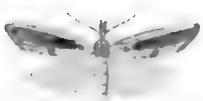
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PLATE II.


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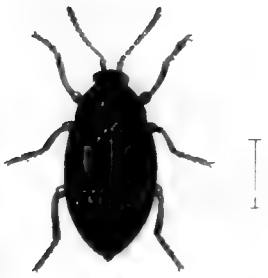
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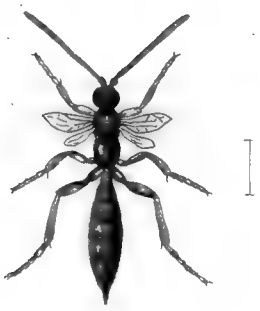
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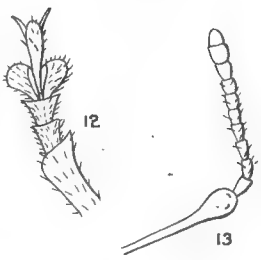
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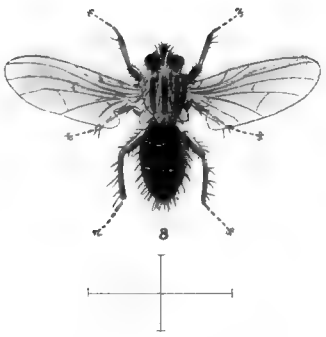
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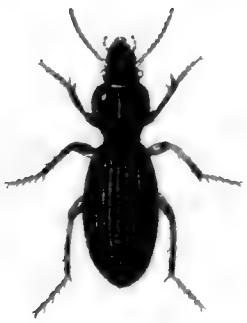
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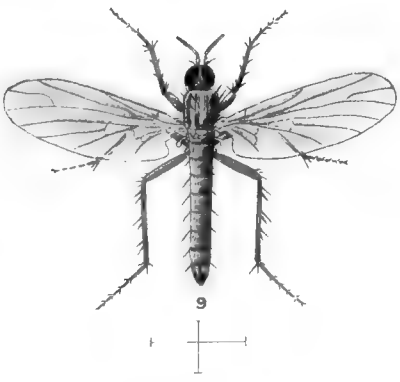
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PLATE III.

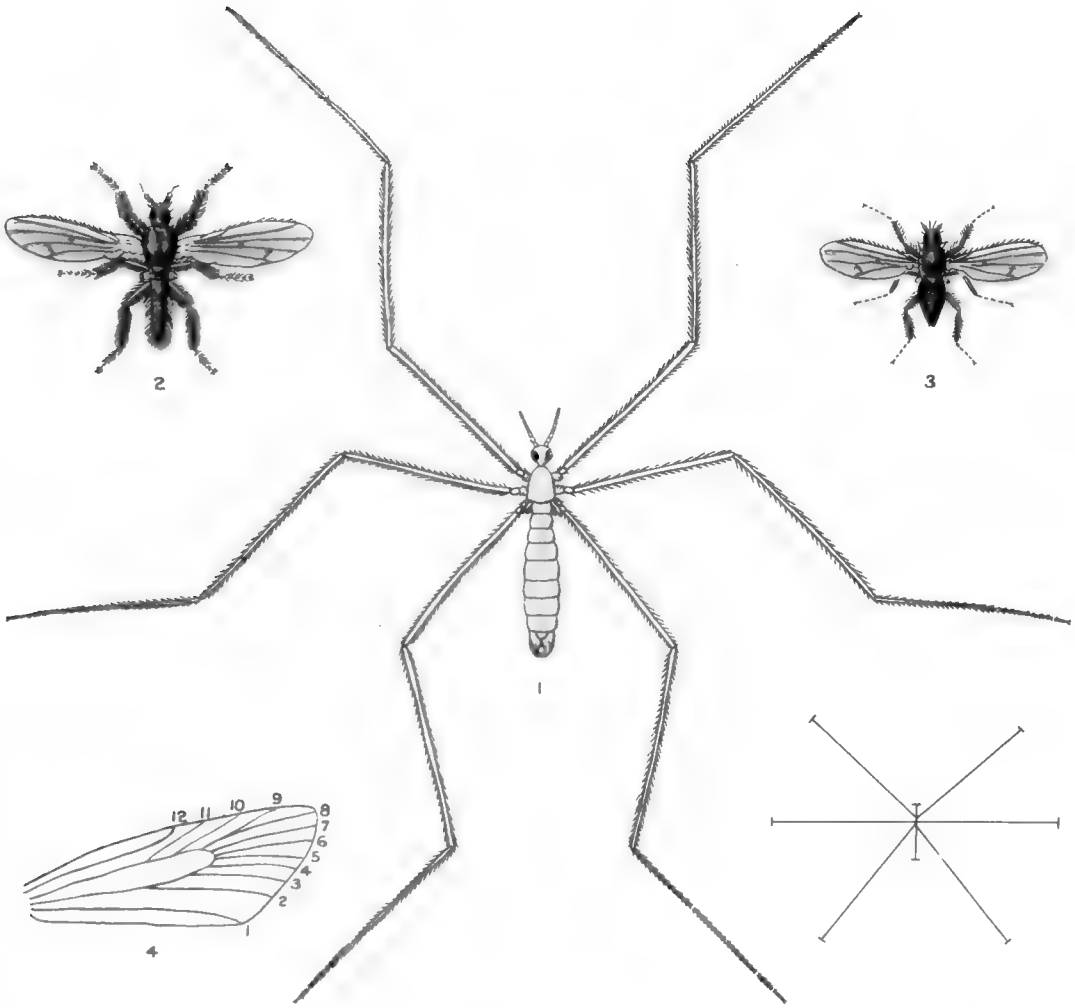

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PLATE IV.

EXPLANATION OF PLATES II–IV.

Plate II.—Lepidoptera from Auckland Island.

Fig. 1. *Scoparia triscelis.*
Fig. 2. ,, *parmifera.*
Fig. 3. ,, *halopis.*
Figs. 4–7. *Pyrgotis plagiatana*, varieties.
Fig. 8. *Cacoecia syntona.*
Fig. 9. *Leucania pagaia.* Snares.)
Fig. 10. *Venusia charidema*, ♂.
Fig. 11. ,, ♀.
Fig. 12. *Xanthorhoe orophylloides.*
Fig. 13. *Drepanodes neoselena.*
Fig. 14. *Platyptilia aeolodes.*
Fig. 15. *Melanchra erebia.*
Fig. 16. *Protyparcha scaphodes.*
Fig. 17. *Heterocrossa gonosemana.*
Fig. 18. *Proterodesma byrsopola*, ♂.
Fig. 19. ,, ♀.
Figs. 20–21. *Chloroclystis indicataria*, ♂ varieties.
Fig. 22. ,, ♀.
Fig. 23. *Xanthorhoe oxyptera.*

Plate III.—Insects from Auckland Island and the Snares.

Fig. 1. *Catadryobius erubescens.*
Fig. 2. *Liochria longula.*
Fig. 3. ,, Antenna.
Fig. 4. ,, Tarsus.
Fig. 5. *Mecodema hudsoni.*
Fig. 6. *Erirhinus dracophyllae.*
Fig. 7. *Aucklandella flavomaculata.*
Fig. 8. *Trichopticus curvipes.*
Fig. 9. *Empis smithii.*
Fig. 10. *Catadryobius vestitus.*
Fig. 11. ,, *tetricus.*
Fig. 12. ,, ,, Extremity of tibia and tarsus.
Fig. 13. ,, ,, Antenna.
Fig. 14. *Odontria longitarsis.*
Fig. 15. *Catadryobius grandis.*

Plate IV.—Insects from Southern Islands.

Fig. 1. *Zaluscodes aucklandicus.*
Fig. 2. *Polytocus spinicosta*, ♂.
Fig. 3. ,, ♀.
Fig. 4. Neuration of forewing of *Protyparcha scaphodes.*
Fig. 5. ,, hindwing ,,
Fig. 6. Head of *Protyparcha scaphodes.*
Fig. 7. Antenna of *Protyparcha scaphodes.*
Fig. 8. *Triacanthella alba.*
Fig. 9. *Onosandrus pallitarsis*, Walker ? (Snares weta.)

ARTICLE IV. LEPIDOPTERA FROM AUCKLAND ISLAND.

By E. Meyrick, B.A., F.R.S.

The following species of *Lepidoptera* taken during the expedition to Auckland Island were transmitted to me, by the kindness of Mr. G. V. Hudson, for examination. They contain a good proportion of new and interesting forms, but all appear to have obvious affinity to the New Zealand fauna, of which they constitute an outlying colony.

Hydriomenidae.

Chloroclystis indicataria, Walk.

Carnley Harbour, Auckland Island; three fine specimens, which I am unable to separate from New Zealand examples.*

Venusia charidema, n. sp.

♂ ♀. 30–32 mm. Head deep ferruginous, between antennae white. Antennae white, more or less distinctly ringed with fuscous except on basal third, pectinations in male pale-yellowish. Thorax ferruginous-brown. Abdomen brownish-ochreous. Forewings triangular, costa slightly arched, apex obtuse, termen slightly rounded, oblique; in male brown, in female ferruginous-brown; costal edge sprinkled with blackish, and whitish on basal third; in male veins more or less marked with whitish, and dotted with blackish towards dorsum and termen; a dark-fuscous discal dot; a moderately broad cloudy fuscous or grey streak from apex to middle of dorsum; in male terminal area beyond this marked with several fine cloudy grey lines, and sometimes a band of dark-grey irroration along costa: cilia concolorous, towards tips paler. Hindwings elongate, ochreous-grey-whitish, in female reddish-tinged; in male several waved grey lines on posterior half: cilia pale ochreous tinged with reddish.

Carnley Harbour and Norman Inlet, Auckland Island; four specimens (two male, two female).

Though showing general relationship to *undosata*, Feld., and *verriculata*, Feld., between which it is perhaps intermediate, it is specifically very distinct.

Selidosemidae.

Drepanodes neoselena, n. sp.

♀. 40 mm. Head, thorax, and abdomen fuscous suffusedly irrorated with white. Forewings somewhat elongate-triangular, costa posteriorly strongly arched, apex obtuse, falcate, termen oblique, prominently bowed beneath middle, and concave between this and apex; dark reddish-fuscous suffusedly irrorated with whitish except towards costa beyond middle, with some scattered black specks; lines formed

*In this article the number of specimens has reference to the number examined by Mr. Meyrick when preparing the descriptions, and not to the total number collected.—Ed.

by darker fuscous tinge and absence of whitish irroration, cloudy, first from $\frac{1}{3}$ of costa to $\frac{2}{3}$ of dorsum, bent just beneath costa, second straight, from $\frac{4}{5}$ of costa to beyond middle of dorsum; a short slender crescentic whitish discal mark, surrounded with dark-fuscous suffusion: cilia reddish-fuscous, tips whitish. Hindwings with colour and second line as in forewings, but second line central; a small white discal dot on anterior edge of second line.

Carnley Harbour, Auckland Island; one specimen.

This is closely allied to the common *muriferata*, Walk., but distinguishable by the large size, entire discal lunule of forewings (in *muriferata* broken into two dots), and the much closer dorsal approximation of the lines of forewings.

CRAMBIDÆ.

Protyparcha, n. g.

Head loosely haired; ocelli present; tongue developed. Antennae $\frac{4}{5}$, in male unipectinated to apex. Labial palpi very long, porrected, clothed above and beneath with long rough projecting hairs diminishing towards apex. Maxillary palpi porrected, clothed with long rough projecting hairs. Thorax clothed with loose hairs above and beneath. Coxae and femora clothed with long hairs. Forewings with 2 from $\frac{2}{3}$, 4 and 5 somewhat approximated, 7 separate, 8 and 9 stalked, 8 to costa, 10 and 11 separate. Hindwings $1\frac{1}{3}$, ovate; 4 and 5 approximated, 7 connate with 6, anastomosing shortly with 8. (Plate IV, figs. 4–7.)

An interesting genus, of which the nearest ally is the New Zealand *Argyria pentadactyla*, Zell. (= *claviferella*, Walk., = *strigosa*, Butl.); from this it differs by the long rough hairs of palpi, hairy coxae and femora, and unipectinated antennae.

Protyparcha scaphodes, n. sp.

♂. 18–21 mm. Head and thorax black mixed with whitish hairs. Palpi black, projecting hairs ochreous-whitish. Antennae black, towards base with whitish scales. Abdomen blackish, sprinkled with yellowish scales, towards apex suffused with ochreous-whitish. Forewings elongate, narrow, posteriorly dilated, costa sinuate, apex obtuse, termen rounded, rather strongly oblique; rather dark purplish-bronzy-fuscous mixed with ferruginous-ochreous and black, and sometimes posteriorly with whitish-ochreous; a suffused white streak along costa from base to about $\frac{2}{3}$; a broad white dorsal streak from near base to tornus, thence continued as a gradually attenuated subterminal streak to apex, edged above broadly with black suffusion: cilia white, basal third grey mixed with pale ochreous, sometimes mostly suffused with grey. Hindwings blackish-grey; cilia white, with grey basal shade, sometimes partially suffused with grey round apex.

Carnley Harbour, Auckland Island; in open tussock country; three specimens.

This is a very distinct species.

PYRAUSTIDAE.

Scoparia triscelis, n. sp.

♂. 21 mm. Head ochreous-brown, face mixed with black, with a white line above eyes. Palpi 3, white mixed with blackish. Antennae fuscous, ciliations $\frac{2}{3}$. Thorax brownish-ochreous mixed with dark fuscous. Abdomen pale whitish-ochreous irrorated with light grey. Forewings elongate-triangular, costa slightly

arched, apex obtuse, termen slightly bowed, rather oblique; brownish-ochreous, suffusedly irrorated with dark fuscous except on veins; basal area somewhat marked with white; lines narrow, white, first from $\frac{1}{5}$ of costa to $\frac{2}{5}$ of dorsum, subsinuate outwards near costa and inwards near dorsum, second from $\frac{4}{5}$ of costa to $\frac{3}{4}$ of dorsum, indented near costa, strongly curved outwards in middle; orbicular formed by a dark-fuscous dot surrounded with a pale ring of ground-colour; claviform represented by an oval blotch of dark-fuscous suffusion edged posteriorly with white suffusion; a quadrate patch of white suffusion between orbicular and discal spot; discal spot three-lobed, blackish, edged with whitish; a band of white irroration preceding second line; subterminal line slender, white, very acutely dentate, interrupted in middle; a white terminal line: cilia whitish-ochreous, with two fuscous shades. Hindwings $1\frac{1}{4}$, without long hairs in cell; ochreous-grey-whitish; a faint grey dot and cloudy post-median line: cilia ochreous-whitish, with a grey line.

Carnley Harbour and Norman Inlet, Auckland Island; one specimen.

Apparently most allied to *colpota*, Meyr., but very distinct; the peculiar discal spot is a notable character.

Scoparia parmifera, n. sp.

♂. 22 mm. Head ochreous-brown, face mixed with dark fuscous. Palpi $2\frac{1}{2}$, brown mixed with dark fuscous, white towards base beneath. Antennae pale greyish-ochreous ringed with fuscous, dentate, ciliations 1. Thorax brownish, shoulders suffused with dark fuscous. Abdomen light ochreous-grey. Forewings elongate-triangular, costa slightly arched, apex obtuse, termen nearly straight, rather oblique; light ochreous-brown, irregularly sprinkled with blackish; a triangular blackish spot on base of costa, reaching half across wing; lines narrow, whitish, edged interiorly with blackish irroration, first from $\frac{1}{5}$ of costa to $\frac{2}{5}$ of dorsum, rather irregular, sinuate inwards near dorsum, second from before $\frac{4}{5}$ of costa to $\frac{2}{3}$ of dorsum, indented towards costa and thrice on lower half; a large blackish irregular-edged oblong patch extending along costa from first line to $\frac{2}{3}$ and reaching about half across wing, lower edge prominent before middle, surrounded beneath and posteriorly by white suffusion; subterminal line represented by a pale-ochreous irregular-edged fascia just before termen, followed by blackish irroration: cilia grey-whitish, with two grey shades. Hindwings $1\frac{1}{4}$, without long hairs in cell; pale grey, somewhat darker posteriorly: cilia grey-whitish, with grey subbasal shade.

Carnley Harbour, Auckland Island; Campbell Island; one specimen.

Nearest to *acharis*, Meyr., but also very distinct by the large oblong blackish costal patch and peculiar form of second line.

Scoparia epicomia, Meyr.

Carnley Harbour, Auckland Island; Enderby Island: one specimen, quite normal.

Scoparia sabulosella, Walk.

Enderby Island; one specimen, normal.

Scoparia halopis, n. sp.

♂ ♀. 26–29 mm. Head white, more or less sprinkled with pale ochreous. Palpi $3\frac{1}{4}$, brownish-ochreous sometimes mixed with dark fuscous, white towards

base beneath, and suffused with white above. Antennae ochreous-grey-whitish, ciliations $\frac{1}{2}$. Thorax white mixed with brownish. Abdomen whitish-ochreous. Forewings elongate, narrow, posteriorly dilated, costa posteriorly slightly arched, apex obtuse, termen slightly rounded, rather oblique; white, more or less sprinkled with pale brownish-ochreous, and with some scattered black specks; lines in male very little marked except towards costa, where they are margined interiorly with blackish, in female fairly distinct, white edged on each side with pale brownish-ochreous suffusion, darker towards costa, first from before $\frac{1}{4}$ of costa to $\frac{2}{5}$ of dorsum, curved, second from $\frac{4}{5}$ of costa to $\frac{4}{5}$ of dorsum, indented near costa, very abruptly curved outwards in disc, preceded and followed by short undefined dashes of black irroration on veins, especially on upper half; orbicular in male obsolete, in female represented by an ochreous-fuscous dash attached to first line; discal spot indistinct, narrow-reniform, dark fuscous, sometimes pale-centred, followed by two dark-fuscous dots, its lower end traversed in female by a dark-fuscous dash; a terminal series of short blackish dashes on veins: cilia whitish, with two lines in male dark fuscous, in female brownish. Hindwings $1\frac{1}{2}$, with long hairs in cell; pale whitish-ochreous, with a brassy tinge, in female slightly greyish posteriorly: cilia pale whitish-ochreous, with a faint fuscous line.

Carnley Harbour, Auckland Island; Enderby Island: two specimens.

The differences between these, as specified above, are probably—at least, in part—individual rather than sexual. The species is closely related to *petrina*, Meyr., but distinguishable by the rather shorter and broader forewings, whiter colouring, obsolescence of orbicular and claviform, absence of bars in cilia, and other small differences.

PTEROPHORIDAE.

Platyptilia aeolodes, Meyr.

Carnley Harbour, Auckland Island; one specimen. Occurs also in New Zealand and the Chatham Islands.

TORTRICIDAE.

Pyrgotis plagiatana, Walk.

Carnley Harbour and Norman Inlet, Auckland Island; seven specimens.

Compared with a long series of New Zealand specimens, these are a large, dark, richly coloured form, very variable, but with the tendency to white marking or suffusion much reduced. Some of the specimens have the forewings distinctly narrower and more elongate than in New Zealand examples, but others cannot be distinguished in this respect. I am unable to find any reliable differences in structure or markings, and can only regard them as an interesting local race.

Cacoecia syntona, n. sp.

♂. 26 mm. Head, palpi, antennae, and thorax light yellow-ochreous; palpi 4, sprinkled with fuscous; antennae flatly dentate, ciliations $\frac{1}{2}$. Abdomen pale whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex round-pointed, termen faintly sinuate, oblique, costal fold moderate, extending from base to near $\frac{2}{3}$; light yellow-ochreous; markings red-brown irregularly sprinkled with blackish; a moderately broad median longitudinal streak from base to apex, attenuated towards base, crossed by a broad oblique central fascia which is narrow above it and obsolete on costa, and divides into two irregular arms towards tornus,

and posteriorly expanded into a triangular blotch whose base is connected with costa by three very short arms, and apex connected by a striga with termen below middle; dorsal edge mostly blackish; two dots on costa beyond central fascia, and some irregular strigulae along termen: cilia light yellow-ochreous, basal half barred with blackish. Hindwings ochreous-whitish; a suffused streak of grey strigulae along posterior part of median fold, and a streak of grey strigulae beneath vein 2: cilia whitish-ochreous, basal third blackish-grey.

Auckland Island; one specimen, bred from larva feeding in flower-heads of *Pleurophyllum speciosum*.

Allied to *astrologana*, Meyr., but distinct by form of wing and markings.

Phaloniadae.

Heterocrossa gonosemana, Meyr.

Carnley Harbour, Auckland Island; two specimens (male and female).

These are more irrorated with grey and a few black scales than my Dunedin specimens, but hardly more than some from Wellington; the black spot on base of costa is more obviously triangular; but after close comparison I am unable to regard them as distinct.

Tineidae.

Proterodesma, n. g.

Head densely rough-haired; ocelli and tongue absent. Antennae 1, in male? Labial palpi, long, curved, ascending, second joint beneath rough-scaled and with numerous projecting bristles, terminal joint moderately long, slender, obtuse. Maxillary palpi long, filiform, folded. Posterior tibiae clothed with hairs above. Forewings with 1*b* furcate, 2 from towards angle, 7 to costa, 11 from $\frac{1}{4}$ of cell, widely remote from 10, 8–11 becoming obsolete near costa and connected by a more or less developed subcostal bar, most distinct between 10 and 11. Hindwings $\frac{1}{3}$, ovate-lanceolate, cilia $\frac{3}{4}$; 2–7 separate, tolerably parallel, 6 to costa.

A peculiar form, probably related to *Tinea terranea*, Butl., but the exceptional structure of the costal veins is analogous to that found in *Trichophaga*.

Proterodesma byrsopola, n. sp.

♀. 20–22 mm. Head pale ochreous, with some dark-fuscous hairs. Palpi and antennae pale ochreous. Thorax pale ochreous, shoulders suffused with fuscous. Abdomen pale greyish-ochreous, more or less infuscated. Forewings elongate, rather narrow, costa moderately arched, apex round-pointed, termen extremely obliquely rounded; whitish-ochreous tinged with brownish and more or less mixed with fuscous; an undefined blackish streak in disc from before middle to $\frac{2}{3}$, appearing to be terminated by indications of pale spots; a strong blackish streak along fold from near base to near tornus, interrupted by two whitish-ochreous spots, second more elongate: cilia whitish-ochreous. Hindwings light purplish-bronzy-grey, paler and tinged with whitish-ochreous towards base, margin towards apex suffused with whitish-ochreous; cilia whitish-ochreous.

Carnley Harbour and Norman Inlet, Auckland Island; three specimens.

In one of these, in one hindwing only, vein 6 is long-furcate, both branches terminating in the costa, so that there appears to be an additional vein, an uncommon abnormality which deserves record when noticed.

ARTICLE V.—DESCRIPTIONS OF FOUR SPECIES OF HYMENOPTERA FROM AUCKLAND ISLAND.

By P. Cameron.

The *Hymenoptera* collected by Mr. G. V. Hudson during the expedition of the Canterbury Philosophical Society to Auckland Island are four in number. One of them—the *Apanteles*—belongs to an almost cosmopolitan genus of parasites, chiefly on *Lepidoptera*, not yet recorded from New Zealand; but several species are known from Australia. The three ichneumons belong to a new genus, remarkable for the females being semiapterous, the male being fully winged, if I have correctly united the male in the collection to the same genus as the females; and I have no doubt that I have done so, for, apart from the fact that the females and the male were taken in the same place, they agree in the body-structure and, more particularly, in the structure of the metanotum, which differs from what we find it to be in the genera belonging to the *Ichneumoninae* in the known total absence of areae or keels.

The species were taken at Carnley Harbour, Auckland Island, in November.

ICHNEUMONIDAE.

Aucklandella, gen. nov.

Wings abbreviated, reaching, when turned back, hardly to the apex of the 1st abdominal segment; radial cellule closed, complete, the radius issuing from shortly beyond its middle; the median and submedian cellules complete; the transverse median nervure received beyond the transverse basal, as are also the cubito-discoidal and the 2nd discoidal cellule. There is a large areolet, narrowed in front; both the nervures forming it are united to the basal third of the radius; the 1st has a rounded oblique slope, the 2nd is straight, not so sharply obliquely sloped; the cubital nervure does not extend much beyond the 2nd transverse cubital nervure, and issues from shortly below the middle of the 2nd discoidal cellule. In all there are only 6 closed cellules. The cubitus in the hindwings is broken very shortly above the middle; in front are 2 cellules, the basal extending beyond the middle, the apical small, almost semicircular. Metathorax entirely without keels, and consequently without areae; the spiracles small, broadly ovate. Mesonotum somewhat depressed. Basal joints of flagellum about 3 times longer than wide. Eyes long, narrow. Mandibles bidentate. First abdominal segment broad at the base, becoming gradually wider towards the apex, which has not a clearly defined post-petiole; there are 8 segments, the last short; there is a long, projecting ovipositor, with a broad sheath. Legs stout, the hinder tibiae broadly narrowed at the base; the apices of the tarsal joints spinose.

The antennae in the small species (*A. nigromaculata*) are 23-jointed; in it, too, the radius does not extend much beyond the 1st transverse cubital nervure; the 1st transverse cubital nervure is widely broken in front; the 2nd is short. In

both species the temples and cheeks are margined; there is a distinct malar space. Temples broad, rounded; the occiput broadly, roundly incised, not transverse.

This is the only genus of *Ichneumoninae* (the group to which *Aucklandella* belongs) with abbreviated wings, although apterous and semiapterous species are common enough with the *Cryptinae*. It differs further from typical *Ichneumoninae* in the metanotum being entirely without longitudinal or transverse keels. The long, projecting ovipositor also is characteristic; but this is not altogether peculiar, as *Exephanes* has a similar one, as well as 8 distinct abdominal segments. In both the Auckland Island species the base of the tibiae is narrowed. The calcaria are short, the claws simple.

Aucklandella flavomaculata, sp. n. (Plate III, fig. 7.)

Rufo-ferruginous; the inner eye-orbits, the line continued more broadly to the occiput, a spot on the top of the outer and a larger one on the bottom extending on to the malar space, a broad line on the edge of the pronotum, tegulae, a line on either side of the mesonotum, a small spot on the base of the mesopleurae above and one on the apex lower down, and the apex of the 4 anterior trochanters, sulphur-yellow. Wings hyaline, the costa blackish, the basal nervures testaceous, the apical much paler, the stigma pale yellow. Female.

Length, 9 mm.; ovipositor, 1 mm.

Front and vertex moderately closely and finely punctured, and covered with short white pubescence; the face and clypeus much more strongly punctured; the 2 are clearly separated by a furrow, which ends laterally in a large transverse fovea; they are roundly convex. Base of mandibles tinged with yellow; the teeth black. Metanotum finely punctured, the scutellum more weakly so to shortly beyond the middle. Metanotum finely closely shagreened; its apical slope in the centre irregularly longitudinally striated, almost reticulated, this part being bordered by keels; the part outside it is more strongly shagreened than the base. Basal segment of abdomen finely shagreened; the base of the 2nd is, at the sides, slightly transversely depressed.

Aucklandella nigromaculata, sp. nov.

Dark rufo-testaceous; the temples broadly, base and apex of metanotum and a line down the centre uniting the black basal and apical parts, the central depressed part of propleurae, the mesopleurae broadly above, the greater part of the metapleurae and of the back of the abdomen, black; a line on the inner orbits, dilated above and extending beyond the eyes, the greater part of the malar space, a narrow line on pronotum, tegulae and base of mandibles, pale lemon-yellow; legs darker-coloured than the body, the femora and apical two-thirds of hind coxae blackish, the anterior 4 coxae infuscated; the basal joints of antennae blackish. Female.

Length, 5 mm.; ovipositor, almost 1 mm.

The sculpture is as in the preceding species, from which, apart from the difference in coloration, it may be known by the radius not extending beyond the 2nd transverse cubital nervure, and in both the transverse cubital nervures being only indicated posteriorly, not reaching to the radius; the 2nd is short, through the cubitus converging towards the radius.

Aucklandella (?) flavolineata, sp. nov.

Along with the two above-described females Mr. Hudson sends a male, which is probably the other sex of one or other of them. It has the wings fully developed, and has the neuration pretty much as in *Ichneumon;* the areolet 5-angled, with the apical transverse cubital nervure faint, the recurrent nervure received beyond the middle, the disco-cubital nervure broken by a minute stump, the transverse median nervure interstitial, and the transverse median nervure in the hindwings is broken near the bottom. The antennae are stout, 26-jointed, the last joint double the length of the penultimate, the basal joints of flagellum 4 times longer than thick. The form of the head and thorax (including the absence of keels from the metanotum) is as in the preceding two species. The abdomen has 8 segments, and is bluntly rounded at the apex.

Dark ferruginous, the antennae darker, the legs lighter coloured; the eye-orbits, narrowly in the middle, more broadly above and below, the clypeus, mandibles, except the teeth, palpi, a line on the pronotum and a narrower one on the lower edge of the propleurae, 2 lines on the centre of mesonotum, dilated inwardly at the base, the lower part of mesopleurae, and the coxae in front, pallid yellow; the ocellar region, centre of propleurae, the parts bordering the scutellum, the greater part of metathorax, and the basal segment of the abdomen, black; the 2nd to 6th abdominal dorsal segments broadly infuscated on the sides. Coxae pale-yellow, the hinder darker, black in the middle above. Wings clear hyaline, the stigma testaceous, the nervures blackish. Male.

Length, 6 mm.

There are 2 impressed lines down the centre of the metanotum, commencing at the top of the basal slope; the apical slope is distinctly finely irregularly striated, the sides feebly striated.

BRACONIDAE.

Apanteles aucklandensis, sp. nov.

Black, shining, smooth, the palpi pale testaceous, the legs rufo-testaceous, the femora darker-coloured above, the hind coxae black, except narrowly at the apex; the apex of hind tibiae darker-coloured, tarsi blackish; the basal ventral segment pale testaceous in the middle. Wings hyaline, the nervures and stigma black. Metanotum opaque, shagreened, the sides almost rugosely punctured — striated, margined on the outer edge; the base is bordered by a transverse furrow. Front depressed. Mesonotum minutely punctured. First abdominal segment a little wider than long, the raised central part minutely punctured, the lateral depressions fuscous. The lateral projections of the genital armature are white on the basal half. There is a distinct transverse furrow at the base of the scutellum; the post-scutellar region is raised, as compared with the base of the metanotum. Male.

Length, 4 mm.

The pubescence is short, sparse, and white. The long spur of the hind tibiae is thin, and longer than the width of the tibiae. The antennae are longer than the body, and bear a dense microscopic pile.

ARTICLE VI.—DESCRIPTIONS OF COLEOPTERA FROM THE SUB-ANTARCTIC ISLANDS OF NEW ZEALAND;

WITH REMARKS ON THE AFFINITIES OF THE GENERA, ETC.

By Major T. Broun, F.E.S.

PLATE V.

On reference to the following list it will be seen that the *Coleoptera* now described consist of forty-six species, located in twenty-six genera.

Two of these genera seem doubtful. One, Blanchard's *Pristancylus*, so far as can be judged by its description, is synonymous with *Pristonychus*, which has been long known to occur in Europe, Asia, Algeria, Oceania, and Chili. The second genus, *Calathus*, is spread over nearly the same regions, but as Baron Chaudoir has stated that Blanchard's *C. rubromarginatus* in the male "has four joints of the anterior tarsi dilated and brushlike underneath," and as nothing is said about the denticulated claws, that species may belong to an altogether distinct genus.

The genera *Omalium*, *Catops*, *Morychus*, *Dorytomus*, and *Acalles* are almost cosmopolitan, and are numerously represented in New Zealand, but these southern islands, as yet, have yielded only one species of each.

Seven genera having been accounted for as more or less of world-wide distribution, we may restrict further observations to the remaining nineteen. Mere general allusions, however, will be of little scientific or practical value, so we must consider some at least of the more significant forms more carefully if we wish to learn anything from the collection brought here by the various members of the recent expedition.

Pseudhelops is nearly related to *Helops*, the species of which latter are widely scattered, and to *Adelium*, which is tolerably common in Australia and New Zealand, and is said to have been found in Chili and New Caledonia. The four species now brought to light have not been seen beyond Carnley Harbour and Campbell Island.*

Loxomerus, with five species, is a purely antarctic form, having *Migadops* from Tierra del Fuego and the Falkland Islands as its nearest congener, but its species seem to be confined to the Auckland Islands.

* Addendum.—Since the foregoing was in print I have described *Pseudhelops substriatus*, a new species found in New Zealand. This discovery is important, as it confirms my views respecting the close affinity of the New Zealand and Auckland Islands coleopterous faunæ.—Thos. Broun.

Catodryobius with five species, *Inocatoptes* with one, and *Heterexis* with two are all comparatively large, apparently apterous, and in several cases rather finely decorated weevils. They exhibit no very salient structural characters; their whole structure, indeed, may be termed primitive. *Heterexis* is found at Adams Island only; the others occur at Carnley Harbour, the Snares, Enderby, and Disappointment Islands, but not elsewhere, so far as I know.

Hycanus, with two rare obscure species, and *Stilbodiscus* with one, are undoubtedly allied to the New Zealand *Clypeorhynchus*, whilst *Pachyderris*, with a unique specimen only, is related to some of the New Zealand allies of *Acalles*.

Pactolotypus, another small weevil, is almost a fac-simile of the New Zealand *Pactola demissa* as regards both superficial appearance and structure, but is at once distinguishable by its 6-jointed funiculus.

Baeostethus is remarkable for the extreme abbreviation of its metasternum as compared with its peculiarly elongated body; this reduction is so great that the intermediate coxae almost overlap the posterior pair. So far as I am aware, it has no near relationship outside of its habitat, Campbell Island

Kenodactylus, also from Campbell Island, is a small, somewhat depressed, geodephagous beetle of special interest. The form and vestiture of the basal 2 articulations of the tarsi approximate it to *Oopterus* and the New Zealand *Diglymma*, but the prominent horny lobe attached to the 4th joint of all the tarsi at once differentiates it, and indicates an affinity with *Loxomerus*.

Mecodema, a fine genus, has two Australian, one Tasmanian, and upwards of thirty New Zealand species, but appears to have but one in the south, at the Snares.

Diglymma, hitherto regarded in New Zealand as endemic, with seven species, has one at the Snares.

Oopterus was originally defined as an antarctic form. The Auckland Islands have now contributed six species, New Zealand double that number.

Liochoria, instituted for a New Zealand species allied to *Morychus*, has had two beautiful species added to it from Carnley Harbour.

Odontria, another New Zealand genus, now comprises twenty species, one of which was obtained at the Snares.

Namostygnus, from Carnley Harbour, *Thomosis*, from Bounty Island—one exponent of each—are nearly allied to New Zealand genera, slight modifications only being required to transform them.

Synteratus completes the generic synopsis. Although a very small member of the predaceous ground-beetles, it is, nevertheless, significant and instructive, exhibiting in its general aspect and structure the connection between *Oopterus* and the New Zealand *Amarotypus*. This latter, though outwardly resembling the northern *Amara*, is structurally allied to *Migadops* and *Loxomerus*.

Having briefly sketched the more salient characteristics of most of the genera, we have now before us some data that may enable us to form some definite conclusions. Before attempting this it may be necessary to state that I have had to create twelve new genera and describe thirty-nine new species, so as to arrange the older as well as the recent collections into something like systematic order.

In the first place, it may be taken as granted that the presence of no less than seven genera of almost universal geographical distribution shows that these oceanic islets, ages long past, must have had some sort of connection with the Northern Hemisphere. No doubt exists in my own mind that the species representing these genera were derived originally, and during a very limited period, from New Zealand, which, therefore, may be considered to have been the connecting-link between the two areas.

The bulk, ornamentation, and structure of a large proportion of the species should lead us to believe that their progenitors originated and flourished in some larger, if not continental, area then enjoying a climate very different from the inclement one that now prevails.

If we regard my twelve new genera and the older *Loxomerus*—exactly half of the total number—as genuine exponents of a special fauna, it seems clear that the isolation of these islands must have continued during a vast period.

The genus *Loxomerus*, made up of wingless species, being related to *Migadops*, should lead us to infer that some approximation had formerly existed between the Auckland and Falkland Islands and Tierra del Fuego. This, however, is the only genus that points *directly* to such an induction.

The subject now awaiting elucidation is the affinity existing between the coleopterous faunae of New Zealand and the Auckland Islands. That such relationship is real can be amply demonstrated by the following statements.

Five genera—*Mecodema*, *Diglymma*, *Oopterus*, *Liochoria*, and *Odontria*—are, with but one exception, confined exclusively to these two groups of islands. The exception has been already alluded to—viz., the presence of three species of *Mecodema* in the Australian region. These form one-fifth almost of the total number of genera found in the Auckland Islands. All but one are apterous.

Namostygnus, *Thomosis*, *Hycanus*, *Stilbodiscus*, and *Pactolotypus*, as previously mentioned, are so nearly congeneric with an equal number of New Zealand insects that their metamorphoses might be easily accomplished; whilst *Synteratus*, *Kenodactylus*, and the large weevils *Inocatoptes* and *Catodryobius* are all more or less intimately allied to New Zealand genera. *Pseudhelops* is also related, the home of *Adelium* being as much in New Zealand as Australia. If these be united to the five enumerated in the preceding paragraph the two series will amount to more than half of the southern fauna.

The conclusion arrived at—inevitably, I think—after a rather exhaustive study of the *Coleoptera* may be expressed in very few words. Assuming that a considerable area of land formerly extended from the Auckland Islands towards Patagonia, the New Zealand Islands must have formed a portion of it.

As I have had no communication whatever with other naturalists on this subject, or with those who may be engaged with separate contributions to this volume, it is probable that my views may not coincide with theirs.

LIST OF COLEOPTERA FROM THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

	Locality.	Author.
Group Cnemacanthidae.		
1. *Mecodema hudsoni*	The Snares	Broun.
2. *Diglymma castigatum*	,,	,,
3. *Synteratus ovalis*	,,	,,
4. *Oopterus clivinoides*	Auckland Islands	Guérin.
5. ,, *plicaticollis*	,,	Blanchard.
6. ,, *tripunctatus*	Carnley Harbour, Auckland Islands	Broun.
7. ,, *marrineri*	Campbell Island	,,
8. ,, *tarsalis*	,,	,,
9. ,, *elongellus*	,,	,,
10. *Kenodactylus capito*	,,	,,
Group Anisodactylidae.		
11. *Loxomerus nebrioides*	Auckland Islands	Guérin.
12. ,, *ambiguus*	Port Ross, Auckland Is.	Broun.
13. ,, *fossulatus*	Carnley Harbour, ,,	,,
14. ,, *cilicollis*	,, ,,	,,
15. ,, *huttoni*	,, ,,	,,
Group Anchomenidae.		
16. *Pristancylus castaneus*	Auckland Islands	Blanchard.
17. ,, *brevis*	,,	,,
18. *Calathus rubromarginatus*	,,	,,
Group Aleocharidae.		
19. *Baeostethus chiltoni*	Campbell Island	Broun.
Group Omalidae.		
20. *Omalium venator*	Campbell Island	Broun.
Group Spheridiidae.		
21. *Namostygnus rufipes*	Auckland Islands	Broun.
22. *Thomosis guanicola*	Bounty Island	,,
Group Silphidae.		
23. *Catops avivorus*	Auckland Islands	Broun.
Group Byrrhidae.		
24. *Morychus tumidellus*	The Snares	Broun.
25. *Liochoria sumptuosa*	Carnley Harbour, Auckland Islands	,,
26. ,, *longula*	Carnley Harbour, Auckland Islands	,,
Group Melolonthidae.		
27. *Odontria longitarsis*	The Snares	Broun.
Group Helopidae.		
28. *Pseudhelops tuberculatus*	Auckland Islands	Guérin.
29. ,, *quadricollis*	The Snares	Broun.
30. ,, *posticalis*	Campbell Island	,,
31. ,, *interruptus*	,,	,,

LIST OF COLEOPTERA FROM THE SUBANTARCTIC ISLANDS OF NEW ZEALAND—*contd.*

	Locality.	Author.
Group Otiorhynchidae.		
32. *Catodryobius vestitus*	The Snares	Broun.
33. ,, *benhami*	Enderby Island, Auckland Is.	,,
34. ,, *tetricus*	Carnley Harbour, ,,	,,
35. ,, *erubescens*	,, ,,	,,
36. ,, *grandis*	Disappointment Island, ,,	,,
37. *Inocatoptes incertus*	Carnley Harbour, ,,	,,
38. *Heterexis sculptipennis*	Adams Island, ,,	,,
39. ,, *laeviusculus*	,, ,,	,,
Group Rhyparosomidae.		
40. *Hycanus cockaynei*	Auckland Islands	Broun.
41. ,, *frontalis*	Carnley Harbour, Auckland Is.	,,
42. *Stilbodiscus setarius*	Campbell Island	,,
Group Erirhinidae.		
43. *Erirhinus dracophyllae*	Carnley Harbour, Auckland Is.	Broun.
44. *Pactolotypus striatus*	,, ,,	,,
Group Cryptorhynchidae.		
45. *Acalles piciventris*	Carnley Harbour, Auckland Is.	Broun.
46. *Pachyderris punctiventris*	,, ,,	,,

Group CNEMACANTHIDAE.

Mecodema, Blanchard.

Body elongate, more or less convex. *Head* rather narrower than front of thorax. *Eyes* rounded and prominent. *Labrum* transverse, rounded in front. *Mentum* large, deeply emarginate, with a short median tooth, which is sometimes grooved near its apex. *Palpi* with elongate moderately thickened terminal joints, truncate at extremity. *Mandibles* robust, more or less elongated, the right with an inner tooth. *Thorax* cordiform. *Elytra* elongate, more or less oviform. Anterior *tibiae* dilated, strongly emarginated, and spined inwardly near the extremity, sometimes slightly prolonged externally at the apex; the intermediate usually somewhat prominent externally at the apex; the posterior simple. *Tarsi* with the basal 4 joints cordate, the outer angles of the first 3 slightly prominent in the male, nearly glabrous underneath. *Antennae* rather short, not attaining base of thorax, basal 3 articulations of nearly equal length, joints 5 to 11 pubescent.

Oregus has almost securiform terminal joints to the maxillary and labial palpi. The tibiae are not angulate or produced at the extremity.

In *Metaglymma* the palpi have moderately slender terminal joints; these are rounded at the apex. The tibiae are dilated and strongly prominent at the extremity, and the antennae are very sparingly pubescent.

I have not seen Blanchard's description, but the above details will define the genus with sufficient accuracy.

Mecodema hudsoni, sp. nov. (Plate III, fig. 5.)

Elongate, glossy black, legs and antennae rufo-piceous, palpi rufescent.

Head rather broad, with prominent eyes; finely, sometimes indistinctly, punctured across its hind part; frontal impressions large; there are 2 or 3 rugae and 1 setigerous puncture near each eye, some longitudinal grooves in front, and a series of setigerous punctures at the apex of the broadly rounded labrum. *Thorax* cordiform, one-seventh broader than long, very slightly emarginate at base and apex, lateral margins slightly crenulate, with several setigerous punctures; it is but little rounded before the middle, but evidently, though not very abruptly, sinuously narrowed behind; close to the base the sides are nearly straight, with obtuse angles; disc almost quite smooth, the dorsal furrow well marked; the usual frontal curvate impression is obsolete; there is, however, a fovea near each anterior angle, sometimes another a little behind it; the basal fossae are moderately large, and situated close to the sides and base; this last is sometimes feebly strigose. *Elytra* very elongate-oval, regularly and deeply striate; the 4 sutural striae on each elytron are finely yet distinctly punctured, the outer more distinctly but none very coarsely, the marginal punctures also are less coarse than usual; 3rd and 5th interstices broader than the others on the disc; these latter generally have 2 or 3 large punctures; the 7th, 3 or 4.

Legs rather slender, external apical angle of the front and intermediate tibiae slightly prominent. Antennae finely pubescent from the 5th joint onwards.

Underside shining black and nearly smooth, there being only fine punctures on the flanks of the prosternum and very fine rugae on the ventral segments, each of which, except the terminal one, has 2 setigerous punctures on the middle; in the male the terminal one has 2 on each side of the middle, at the apex.

An elegant and distinct species, with elongate deeply sculptured elytra.

♂. Length, 12½–14 lines; breadth, 4¼–4½ lines.

The Snares.

Described from two specimens discovered by Mr. G. V. Hudson.

DIGLYMMA, Sharp, 1886.

Allied to *Mecodema*.

Antennae short, moniliform, joints 5–11 pubescent. *Palpi* slender, terminal articulation slender, slightly thicker than its predecessor. Anterior *tibiae* moderately broad, straight externally, not at all produced apically. *Tarsi* short.

The two species which I refer to this genus are allied to *Metaglymma*, from which they differ by the unproduced angle of the front tibiae, and by the strongly pubescent antennae, as well as by the mandibles, which in *Metaglymma* are elongate and have no seta in the scrobe, whereas in *Diglymma* the scrobe is setigerous.

They have the terminal joint of the palpi more slender than in any other yet-described New Zealand *Broscini*, and in this respect differ strongly from *Oregus*, which also has front tibiae simple at the apex. *Diglymma* differs from *Mecodema* by the tibial structure, and by the shorter tarsi and more slender palpi.

The above is an exact transcription of the original description.

Obs.—In my description of *D. punctipenne*, No. 1768, it was stated that the basal joints of the front tarsi were dilated "not at the outer angle only, but along the whole side."

The following notes appear in my description of *D. tarsalis:* Male—Anterior tarsi with fine setae at the sides, the basal 4 joints somewhat expanded, 3rd transversely cordiform; the basal 2 largest, 2nd strongly transverse but not exactly cordate; these two articulations broadly dilated inwardly, and provided underneath, at the inner side, with patches of grey spongelike pubescence.

These notes on my two species not only define the actual structure of the male anterior tarsi, but incontestably prove that Dr. Sharp's genus is abundantly distinct, and, moreover, differentiated by structural characters that cannot well be mistaken. He, no doubt, had seen female specimens only.

Diglymma castigatum, sp. nov.

Subcylindrical, medially narrowed, slightly convex, a little nitid; black, legs rufo-piceous, palpi and antennae more rufescent.

Head narrower than thorax, with well-marked frontal impressions, which, as well as the back part, are more or less finely punctured. *Eyes* only moderately prominent. *Thorax* apparently elongate, yet slightly broader than long, rather wider near the middle than elsewhere, its sides gently rounded, more narrowed towards the obsolete posterior angles; the lateral margins fine but distinct, near the base they are a little sinuate and curved inwards, so that there they do not limit the true sides, which are thus slightly uncovered; apex truncate, base slightly incurved; basal fossae small and nearly sulciform, situated at the sides but at some little distance from the base, the dorsal groove deep but not attaining the base or apex, sometimes a few fine punctures may be seen in front of the base. *Elytra* elongate, a little broader than the thorax; in one specimen but little, in another very gradually yet a good deal, narrowed posteriorly; one example has 8 series of fine but distinct punctures on each elytron, connected by extremely slender linear impressions which can hardly be termed striae, the other has more feebly impressed sculpture; in both, at the base, there is a transverse series of rather coarse deep punctures, there are also 3 or 4 moderate punctures near each side. *Antennae* with very scanty pubescence, joints 4 to 10 moniliform, 11th ovate and acuminate. *Tibiae* not incrassate or prominent at the extremity, the intermediate coarsely setose externally.

This is the smallest and most slender species.

♀. Length, $3\frac{3}{4}$–$4\frac{1}{4}$ lines; breadth, $1\frac{1}{4}$–$1\frac{3}{8}$ lines.

The Snares; two females.

This is another of Mr. G. V. Hudson's discoveries.

SYNTERATUS, gen. nov.

Body compact, elongate-oval, slightly convex, glabrous, apterous.

Head rather narrower than front of thorax. *Eyes* longitudinally oval, just free from the thorax, not at all convex, distinctly faceted. *Labrum* transverse, entire. *Palpi* setose, moderately elongate; 2nd joint of the maxillary stout, elongate, arched externally; 3rd elongate, slender at the base, gradually yet considerably dilated towards the extremity; the terminal thick at the base, tapering towards the acuminate apex, it equals the preceding one in length; terminal joint of the labial similar to that of the maxillary. *Mentum* bisetose, with a simple central tooth which is truncate in front. *Antennae* filiform, the basal 2 joints and half of the

3rd glabrous, the 2nd not much shorter than the 3rd. *Thorax* closely adapted to the base of the elytra. *Scutellum* invisible. *Tarsi* moderately elongate; basal 2 joints of the anterior in the male dilated, the inner angle of each prolonged; 4th transverse, not in the least lobate, truncate at the extremity.

In general contour this small member of the *Carabidae* somewhat resembles *Longosternus semistriatus* from Sierra Leone and our New Zealand *Amarotypus*, but the palpi and tarsi are essentially different, being, in fact, almost completely identical with those of our Antarctic *Oopterus*.

There is on each elytron, near the extremity, a curvate carina similar to that of an *Oopterus*, but which is lacking in *Amarotypus*. The scutellum is distinct in these two genera, in *Synteratus* it is concealed. The sternal structure resembles that of *Amarotypus*, but the whole underside is more elevated longitudinally. The anterior coxae are less prominent, the posterior are narrower at the apex and not marginated, and the trochanters are more exposed and elongated. The *mesosternum* is decidedly longer, and instead of being depressed in front is sharply ridged along the middle. The *prosternum* is deeply grooved along the middle as far as the back part of the coxae, where it ends, and in place of being simply incurved is deeply emarginate in front but quite truncate in the middle. The *metasternum* is broadly channelled longitudinally instead of being almost unimpressed.

The above details sufficiently indicate the complex structure and affinities of the type, which, though one of the smallest, is assuredly one of the most interesting insects brought to light by the members of the expedition.

Synteratus ovalis, sp. nov. (Plate V, fig. 1.)

Shining, cupreo-fuscous tinged with red; the head, apex of thorax, the suture, and margins of elytra rufescent; legs, antennae, and palpi testaceous.

Head slightly transversely convex, densely and minutely sculptured, the interantennal suture straight: clypeus truncate in front, with 2 obvious setigerous punctures; front of labrum with 6; there is another conspicuous one near the back of each eye: frontal impressions rather shallow. *Thorax* of the same width as the elytra at the base, finely margined laterally, gently yet considerably narrowed anteriorly; posterior angles rectangular but not acute, the anterior not at all prominent; it is one-third broader than long, moderately convex, but somewhat depressed towards the front angles; the dorsal furrow does not reach the apex, there are 4 shallow foveae near the base and a few indistinct punctures and feeble rugae, the surface is even more minutely sculptured than the head, and there are only mere vestiges of transverse striae. *Elytra* distinctly marginated and channelled at the sides, gradually narrowed posteriorly; their striae are moderately well defined but their punctuation is not, interstices nearly quite plane, the 3rd tripunctate, there are about 8 marginal punctures; the carina is very slender at the apex, where it forms the margin, and extends forwards until merged with the 6th interstice before reaching the hind thigh. *Tibiae* straight, the anterior rounded at the extremity and bearing 3 or 4 short and rather coarse setae, the others setose. Posterior *tarsi* more slender and elongate than the intermediate, the basal and terminal joints of nearly equal length, the 4th entire.

♂. Length, 2 lines; breadth, $\frac{7}{8}$ line.

Female.—Underside shining coppery-brown, the last 3 ventral segments paler; the prosternum, coxae, and trochanters reddish; the intermediate ventral segments with 2 fine setigerous punctures, the terminal with 4 at the extremity, which is broadly rounded, and, like the preceding two, impressed near each side. It is from the reversed specimen of this sex that the structure of the underside has been studied.

♀. Length, $2\frac{3}{4}$ lines; breadth, 1 line.

The Snares.

We are indebted to Mr. Hudson for this valuable little beetle.

Oopterus, Guérin-Menev.

Palpi elongate; 2nd joint of the maxillary broad, strongly arched externally, nearly straight inwardly; 3rd about as long as the preceding one, slender near the base, gradually dilated apically, straight outwardly, arcuate inwardly; the terminal also elongate, thick at the base, tapering towards the acuminate extremity; penultimate joint of the labial stout, the terminal attached at right angles to the apex of its predecessor, elongate, and tapering towards the extremity. *Mentum* deeply emarginate, with a simple prominent median tooth, the outer lobes acute; it bears 2 elongate setae at each side. *Ligula* angulate at the extremity, with a projecting seta there. *Antennae* filiform, reaching backwards beyond the base of the thorax; the basal 2 joints and basal half of the 3rd glabrous, but provided with one or more outstanding setae; the succeeding ones more or less densely pubescent and setose; 2nd articulation about as long as the exposed part of the 1st, not as stout as it is; 3rd quite as long or longer than the preceding one.

There are 2 setigerous punctures alongside each eye, 2 on the forehead, 1 at each side of the thorax near the middle, and another at each posterior angle. The sutural margin of the elytra is bent outwards at the extremity and prolonged forwards near the side as a distinct carina.

Male.—Anterior tibiae notched inwardly, incrassate, but not prolonged at the apex. Tarsi setose, the front with feeble squamae, or spongy, underneath; basal 2 joints moderately dilated and prolonged at inner angles, the 1st oblong or subquadrate, the 2nd cordiform; the 3rd and 4th but little expanded, both subcordate; intermediate tarsi simple.

Female.—Basal joint of anterior tarsi stout and oblong, joints 2 to 4 cordiform and about as broad as the 3rd and 4th of the male.

The above description has been drawn up from specimens from Carnley Harbour, and substituted for the original one.

Oopterus clivinoides, Guérin.

Shining, dark brown.

Head oblong, narrower than the thorax, smooth, with 2 broad longitudinal grooves between the antennae. *Antennae* and palpi yellowish-brown. *Thorax* convex, cordate, margined, with a feeble median groove, a few fine transverse striae near the sides, with a rather large fossa near each posterior angle, and a few longitudinal striae at the basal margin. *Scutellum* triangular. *Elytra* much broader than the thorax, especially near the middle, rather convex, quite oval, smooth and

shining, with lightly impressed finely punctured striae, nearly obsolete at the sides, the interstices flattened; the external and sutural margins nearly fulvous brown. *Legs* brownish. *Abdomen* nearly black.

Length, 5 mm.

Hab.—Auckland Islands.

The above is an essentially correct translation of Guérin's description. None of the few specimens placed at my disposal agree with it.

Oopterus plicaticollis, Blanchard.

Piceo-aeneous; head oblong, bisulcate; antennae piceous, reddish at base; thorax cordate, convex, transversely plicate; elytra arched, smooth, striate-punctate.

Smaller than *O. divinoides*, thorax narrower, elytra broader, body bronzed brown. *Head* oblong, narrower than the thorax, with wide interantennal grooves. *Antennae* blackish-brown, the first 3 articulations fulvous, as are also the palpi. *Thorax* convex, cordate, margined, with a well-marked median groove, a very large cavity near each posterior angle, and a few fine transverse ridges. *Elytra* broad, perfectly oviform, smooth, shining, bronzed brown like the other parts of the body, with well-marked finely punctured striae, the interstices narrow, the margins rufo-fuscous near the extremity. *Legs* light-reddish. *Abdomen* nigro-fuscous, the extremity rufescent.

Length, 4–5 mm.

Hab.—Auckland Islands.

The remarks appended to the description of *O. divinoides* are applicable to this species also. Unfortunately, we cannot examine the types.

Oopterus tripunctatus, sp. nov.

Shining, fusco-niger, the suture and posterior margins of elytra rufescent, legs infuscate-fulvous, basal 3 joints of antennae red, the others darker. Palpi rufo-testaceous.

Head as long as, and, including the eyes, nearly as broad as, the middle of thorax, being only one-sixth narrower; the forehead has 2 setigerous punctures and a small central fovea, it is slightly incurved in front; at each side there is a narrow groove separated from the large frontal impressions by an obtuse elevation; there are 2 setigerous punctures near each side—one near the middle of the eye, the other behind it; its whole surface is densely and very minutely sculptured. *Labrum* with 6 apical setigerous punctures. *Eyes* large and prominent, with distinct facets. *Antennae* pubescent from the middle of the 3rd joint onwards. *Thorax* subtruncate at base and apex, its sides finely but distinctly margined, rounded, rather wider just before the middle than elsewhere, more narrowed behind than in front, with rectangular but not sharply defined or prominent posterior angles; the basal fossae are large and extend forwards for one-third of the whole length, the intervening basal space is slightly depressed, and marked with short fine longitudinal striae and a few fine punctures; the median groove rather fine, and not always prolonged to the apex; there are no definite lateral striae, and those across the middle of the disc are very feebly impressed; it is nearly as long as broad. *Scutellum* sub-triangular. *Elytra* broadly oval, not double the width of thorax, with lateral channels and margins; these become obsolete where the wide sinuous posterior contraction

begins; apices individually rounded but not dehiscent at the suture, the shoulders almost obliquely narrowed; the sutural striae and their fine punctures are well marked, but do not reach the base; at each side of the scutellar region there is usually a rather deep oblique groove; the other striae are visible, but become obsolete towards the sides, along which punctures only are seen; the 3rd interstices are tripunctate; the posterior carina does not extend further than the top of the declivity. *Tibiae* straight, finely setose.

Underside subopaque, dark, without obvious sculpture.

Female.—One setigerous puncture at each side of the middle, at the apex, of the terminal ventral segment.

♂ ♀. Length, $2\frac{3}{4}$ lines (= at least 6 mm.); breadth, $1\frac{1}{8}$ lines.

Carnley Harbour.

Both sexes from Mr. Hudson.

Obs.—This cannot be either of the preceding species, because, independently of other details, their descriptions make no mention of the 3 intestitial punctures, and, as these are much more conspicuous than those of the elytral striae, it would be absurd to suppose that they had pass unnoticed. The name "*divinoides*" itself, if it means anything at all, implies an elongate narrow form, just the reverse of what the actual measurements prove *O. tripunctatus* to be.

Oopterus marrineri, sp. nov. (Plate V, fig. 3.)

Nitid, nigro-piceous; the front and sides of the head, the base and sides of the thorax, and the suture and lateral margins of the elytra rufescent; legs and antennae ferruginous; tarsi and palpi rufo-testaceous.

Head, including the eyes, one-fifth narrower than the widest part of the thorax, subovate, a little compressed or constricted behind, so that the ocular orbits appear swollen; the frontal impressions long and broad, the groove near each eye also rather broad, the interval ridged; it has the common setigerous punctures. *Thorax* rather short, one-fifth broader than long, widest before the middle, gradually and more narrowed behind than in front, posterior angles acutely rectangular but not projecting, base truncate, apex sometimes feebly incurved but not causing any prominence of the front angles; lateral margins well developed, with fine but distinct channels; discoidal sulcus rather fine, and abbreviated in front; basal fossae large, rather broad, not very deep, not prolonged forwards, and with an indistinct lateral plica near the outer margin of each; the basal area is without punctures or striae; the disc exhibits only feebly impressed transverse striae, but in one specimen 2 or 3 small fovae. *Elytra* oblong-oval, evidently less than twice the width of the thorax; their striae distinct and finely punctured, but less so near the sides; 3rd interstices tripunctate.

This differs from *O. tripunctatus* by the smaller eyes but more enlarged orbits; by the more quadrate and perceptibly less-rounded thorax with well-developed lateral channels; by the more oblong, distinctly narrower, and more obviously striate elytra; besides differences in sculpture. The dense minute sculpture of the head is more apparent, near the eyes especially.

♂. Length, $2\frac{1}{2}$ lines; breadth, $\frac{7}{8}$ line.

Campbell Island.

It bears the name of its discoverer, Mr. G. R. Marriner.

Oopterus tarsalis, sp. nov.

Shining, pitchy-black, labrum and mandibles rufescent, palpi testaceous, legs also testaceous or slightly infuscate, basal 2 joints of antennae shining ferruginous, the remaining joints dark and opaque.

Head as long and almost as broad as the thorax, constricted behind the eyes, the frontal impressions like those of *O. marrineri*. *Thorax* apparently narrow, in reality slightly broader than long, its sides almost evenly rounded, yet more but only gradually narrowed backwards than in front, posterior angles rectangular; dorsal groove very fine, sometimes indistinct near the front; the basal fossae large, not prolonged anteriorly, the base without distinct punctures or rugae, the disc very vaguely transversely striate. *Elytra* oval, nearly double the breadth of the thorax, almost obliquely narrowed near the base, the lateral margins and channels well developed; their striae well marked and finely punctured, but becoming finer towards the sides; the space just in front of the posterior carina almost quite smooth; 3rd interstices with 3 or 4 punctures.

Most nearly resembles *O. tripunctatus*, from Carnley Harbour, but the thorax seems narrower; its lateral rims and channels, however, are more distinct. The elytra, though similar in shape, are evidently, instead of being somewhat feebly, striate. The basal 2 joints of the antennae are very perceptibly differentiated from the following opaque ones, and the basal 2 articulations of the male anterior tarsi, though dilated, are much less prominent at the inner angles. This last characteristic and the oval elytra at once distinguish it from *O. marrineri*.

♂. Length, 2½ lines; breadth, 1 line.

Campbell Island.

We are indebted to Mr. Marriner for this species also.

Oopterus elongellus, sp. nov.

Body rather elongate, nitid, piceous; front of head, sides and base of thorax, and the elytral suture and margins more or less piceo-rufous; the legs and 3 basal joints of antennae chestnut-red, remaining joints darker, palpi fulvescent.

Head ovate, as long as the thorax but not quite so wide as it is; labrum, epistome, and mandibles red; frontal impressions broad; the groove near each eye also broad, but rather indefinite, owing to the presence of 2 or 3 longitudinal rugae; the carina somewhat flattened; ocular orbits dilated, and a little prolonged backwards, so that the back of the head seems somewhat abruptly constricted. *Thorax* subquadrate, hardly broader than long, slightly wider before the middle than it is elsewhere, moderately rounded towards the front, very gradually and not sinuously narrowed backwards, hind angles rectangular, base truncate, apex very slightly emarginated; lateral margins distinct, but the channels extremely narrow; discoidal furrow well marked, but not attaining the front; the transversal striae feebly impressed; basal fossae large, but not extended forwards, its base slightly rugose. *Elytra* rather elongate, oblong-oval, a good deal narrowed posteriorly, shoulders rounded, lateral margins and channels moderately developed, not very broad; their striae well marked and finely punctured except near the apex; the carinae are present, fine and distinct at the extremity but becoming obsolete within a short distance from the apices.

An easily recognised species, owing to its proportionally narrow outline, well-impressed elytral grooves, and the relatively small eyes scarcely protruding beyond their dilated and posteriorly prolonged orbits.

♀. Length, $3\frac{1}{8}$ lines; breadth, $1\frac{1}{8}$ line.

Campbell Island; one female only.

The third species brought to light by Mr. Marriner.

Kenodactylus, gen. nov.

Body depressed, head very large, elytra oviform, apices subtruncate. *Mandibles* curvate, ridged above, elongate, broad and explanate near the base, curved and acute at apex; the right inwardly angularly dilated between the base and the middle, with a median tooth; the left abruptly angulate near the base. *Labrum* transverse, with a deep median semicircular excision, its angles rounded, each with a conspicuous setigerous puncture, the emargination with 4 smaller ones. *Forehead* truncate in front, with 2 setigerous punctures near each side, the interantennal suture curvate. *Eyes* distinctly faceted; rather small, only moderately prominent, lateral, distant from thorax. *Antennae* inserted at the sides before the eyes, reaching backwards beyond the base of thorax, filiform, joints 3–11 pubescent, each with a short basal stalk, the basal 2 and base of 3rd with setae only, the 1st much stouter and a third longer than 2nd, 3rd rather longer than 4th. *Mentum* large, deeply emarginate, bisetose, with a short triangular central tooth. *Ligula* not free, nearly invisible, with outstanding frontal setae. Maxillary *palpi* elongate and stout, 2nd joint arched externally and subclavate, the penultimate gradually dilated; terminal almost as long as 3rd, tapering towards but not acute at the extremity; labial with similar terminal articulations, the 2nd bisetose. Anterior *coxae* prominent, placed close to the hind margin of the prosternum, the intervening process of moderate width; intermediate similarly separated; posterior trochanters subcylindrical but stout. *Abdomen* with 5 nearly equal segments, the last with 2 setigerous punctures at the apex, near each side and distant from the middle. *Legs* rather slender; anterior tibiae very deeply emarginated inwardly below the middle.

Male.—Anterior tarsi with the basal 2 joints widely dilated inwardly, with slightly prominent angles, the 2nd strongly transverse and nearly as long as the exposed upper portion of the 1st, these two with some grey squamae on the expanded parts underneath; 3rd joint rather small and unsymmetrical, being a little prominent at the inner angle: 4th joint also small, not truly bilobed, having only a short frontal excavation, at the external angle an attached horny lobe proceeds half-way alongside and underneath the 5th joint, whilst featherlike grey setae extend to the extremity of the terminal one. Intermediate tarsi slightly dilated, 1st joint oblong but not the length of the following 2 combined, 5th elongate. Posterior pair longest, their basal articulation as elongate as the terminal one. The 4th joint of both the middle and hind pairs, at the inner angle, have the same corneous protuberance and feathery setae as the corresponding joint of the front pair. All the tarsi bear a few coarse setae above and at the sides, but there is no brushlike vestiture underneath. Claws simple. Terminal segment of abdomen uncovered.

The presence of squamae on the expanded parts of the basal joints of the tarsi prevents the location of this genus in the *Anisodactylidae*. The thorax and elytra

much resemble the New Zealand *Demetrida picea*, but the head is more like that of the European *Anopthalmus bilimeki*, both of which belong to separate and entirely different groups. The structure of the tarsi and palpi indicates a transitional form and ally of *Oopterus* and *Loxomerus*. The emargination of the labrum approaches that of *Dicrochile*. It seems evident, therefore, that here we have another curious Antarctic genus which is utterly unlike any of the Northern Hemisphere.

Kenodactylus capito, sp. nov. (Plate V, fig. 2.)

Subopaque, fusco-piceous, the head and suture of elytra more or less piceo-rufous, the legs and basal joint of antennae rufo-testaceous, remaining joints piceous, palpi fulvescent.

Head as broad as front of thorax, and, including the mandibles, nearly twice as long as it is; the genae swollen, so that the back part seems somewhat abruptly and a good deal contracted; the frontal depressions are broad and deep, and extend almost from the front of the forehead to beyond the back of the eye; there is no distinct groove or carina alongside the eye, and only one setigerous puncture; there is, however, another behind each longitudinal depression, but no other evident sculpture. *Thorax* widest near the front, its sides slightly rounded there, rather gradually narrowed behind; the base subtruncate but a little oblique towards the sides, so that the angles are not exactly rectangular; the lateral margins are well developed and reflexed, the channels distinct, the apex subtruncate; it is rather broader than long, nearly flat, with feeble transverse striae behind the middle and near the sides; the median groove is well marked throughout; there are, near the middle, 2 conspicuous punctiform foveae; there are no basal fossae; there is 1 setae at each side near the front, and another at the hind angle. *Scutellum* triangular. *Elytra* marginated and channelled like the thorax to within a short distance of the extremity, the apical margin indistinct but bent forward near each side as a feeble carina; on each there are 3 shallow impunctate striae which are more or less effaced near the base and apex, and 3 setigerous punctures on the 3rd interstice, 1 in line with the hind thigh, 2 at the apex, and about 9 along the side; their surface is almost flat and minutely coriaceous; at the middle they are nearly double the width of the thorax, the shoulders, however, are curvedly narrowed.

♂. Length, 2½ lines; breadth, ⅞ line.

Campbell Island.

Captured by Professor Chilton on the beach between high- and low-water marks. Described from a single specimen; female *incog.*

Group ANISODACTYLIDAE.

Loxomerus, Chaudoir.

Body apterous. *Mentum* transverse, strongly emarginated, with a large median tooth which is rounded at the apex, lateral lobes divergent, with a minute terminal tooth. *Ligula* nearly membranous, somewhat prominent, widened and ciliated in front. *Paraglossae* short, partly concealed by the mentum-tooth. *Palpi* elongate, filiform, terminal joint subcylindrical, a little obliquely truncate at the extremity. *Mandibles* short, broad near the base, depressed, arched and rather acute at the extremity, the lower margin carinate. *Labrum* transversal, entire. *Epistome* short,

incurved in front. *Eyes* slightly prominent. *Antennae* reaching backwards beyond base of thorax, filiform; basal articulation large, stout, and oval; 2nd short; 3rd and 4th equal. *Thorax* cordiform, base and apex truncate. *Elytra* ample, broader than thorax at the base, oval, rather convex, rounded posteriorly. *Legs* rather long. *Tibiae* slender, the anterior strongly emarginated. Anterior *tarsi* of the male with brushlike soles, the basal 4 joints strongly dilated and cordiform; those of the intermediate more triangular and elongated; the 4th joint prolonged at the inner angle as an elongate lobe.

The above is my translation of the description given by Lacordaire (Hist. des Ins. Coléopt., tom. i, p. 275). The genus was instituted by Guérin under the name *Heterodactylus*, which, being preoccupied, was replaced by Chaudoir's *Loxomerus*.

Loxomerus nebrioides, Guérin.

Shining black.

Head smooth, with 2 wide fossae in front; mandibles with one tooth, the margins widened, reddish, and slightly transparent. *Antennae* longer than the head and thorax, the first 4 joints smooth and shining, the second shortest, the others downy. *Thorax* cordate, truncated in front and behind, smooth, finely margined, with a longitudinal groove in the middle, a feeble transverse impression in front, and two rather deep fossae behind, near the hind angles. *Scutellum* rounded, slightly rugose. *Elytra* oval, of the width of thorax at base, without humeral projections, feebly margined, widest in the middle, smooth, and with 9 striae on the disc, but nearly obliterated on the sides; these striae do not all reach the end, the 2nd especially stops a little beyond the middle, and on the outer margin are some impressions most marked behind; beneath and legs smooth.

Length, 7½ lines to 8 lines.

Hab.—Auckland Islands.

As I have not the original description, Dr. Benham kindly forwarded the above copy of that given by White (Voy. Ereb. Terr.), no doubt an essentially correct translation of the original.

Loxomerus ambiguus, sp. nov.

Shining piceo-niger; the back of the head, lateral margins of thorax, the shoulders, and an oblique subapical space on the elytra more or less rufescent; legs, palpi, and basal 4 joints of antennae shining piceo-rufous, remaining joints of these last opaque and pubescent.

Head, including the moderately prominent eyes, as wide as front of thorax, narrowed anteriorly, its surface not smooth, the broad interocular impressions being wrinkled; on the middle, in front of these, the rugae almost represent an enlarged asterisk; the hind portion, especially behind the eyes, is irregularly and finely but quite perceptibly wrinkled; the dilated sides of the mandibles are rufescent and semitransparent; the forehead has an almost-vertical frontal slope, but its apex is truncate. *Thorax* about one-third broader than long, widest just before the middle, moderately rounded towards the slightly projecting but obtuse anterior angles, a good deal sinuate-angustate behind, posterior angles rectangular, lateral margins well developed; the median longitudinal groove distinct, but not attaining the base or apex; basal fossae rather large and deep, near each side at the middle

there is an elongate curved feeble impression, and an equally indistinct transverse one near the front; the disc is more or less irregularly and finely striated across. *Scutellum* short and broad, nearly smooth. *Elytra* oval, rather widest behind, gradually narrowed towards the base, the shoulders, however, are distinctly broader than the base of the thorax; lateral rims fine but distinct; the 4 or 5 inner striae on each are well marked, the outer rather feebly, 8th and 9th obsolete, the 2nd terminates at the summit of the posterior declivity; these striae when carefully examined are seen to be very finely punctured; interstices broad, nearly smooth, the 7th ends at some distance from the base. *Legs* elongate and slender. *Tibiae* sparingly setose. The basal joint of anterior *tarsi* subtriangular, 2nd and 3rd cordate, 4th moderately prolonged at inner angle, the corresponding joint of the 2 hind pairs more evidently elongated at the outer angle.

♂. Length, 7½ lines; breadth, 2 lines.

Port Ross.

Mr. Hudson's unique specimen, mounted on cardboard, appeared to me at first sight to be *L. nebrioides*, but more prolonged study revealed discrepancies, so it was considered advisable to draw up such a description as would enable any one to identify it. The type of *L. nebrioides* is quite inaccessible to students in New Zealand, and very probably to entomologists in Britain also.

Loxomerus fossulatus, sp. nov. (Plate V, fig. 4.)

Body slightly shining, fusco-piceous, the sides of the thorax and elytra somewhat rufescent, femora piceous, tibiae and tarsi pitchy-red, palpi fulvescent. *Head*, including the eyes, almost as broad as the front of thorax, nearly as long as it is, moderately narrowed anteriorly. *Labrum* transverse, truncate in front, with 6 setigerous punctures. *Epistome* widely incurved, with a large setigerous puncture near each side; interocular impressions broad and very shallow, the space behind the suture finely and irregularly wrinkled; there is only one puncture, near the inner and back part of each eye. *Mandibles* dilated but nearly straight at the sides, reddish and semitransparent there, curved at extremity. *Eyes* finely faceted, moderately prominent, subrotundate, not very distant from thorax. *Antennae* filiform, extending beyond base of thorax, basal 4 joints glabrous, 3rd slightly longer than 4th, 2nd distinctly shorter than 3rd, the 1st stout and cylindrical, joints 5 to 11 pubescent, of nearly equal length, 11th elongate-oval. *Thorax* one-sixth broader than long, its sides finely but distinctly marginated, rounded, widest near the middle, a good deal sinuated and narrowed behind, posterior angles rectangular and a little obtuse; base and apex subtruncate, the anterior angles, though obtuse, are slightly prominent; its whole surface, like that of the head, densely and very minutely coriaceous, median furrow distinct but not attaining the apex; basal fossae large, rather deep and elongate; in line with each of these a disconnected shallow impression extends forwards; there are not any distinct transverse striae. *Scutellum* but little exposed. *Elytra* slightly convex, oblong-oval, not much narrowed posteriorly, and without any trace of sinuosity there, rather finely margined; the shoulders rounded, yet rather broader than base of thorax; their striae rather fine, yet quite obvious, apparently impunctate, less distinct near the sides; the 2nd striae terminate at the top of the posterior declivity, the 3rd and 7th interstices do not reach the base. Anterior tibiae distinctly dilated at the extremity so as to cover the base of the 1st

tarsal joint, with one apical calcar and another at the notch of the inner edge; the intermediate a little arcuate, bicalcarate at apex, sparsely setose; posterior slender and elongate.

♂. Length, 4½ lines; breadth, 2 lines.

Carnley Harbour.

One specimen, on cardboard, from Mr. Hudson.

Though doubts may exist respecting *L. ambiguus*, there can be none as to the validity of this species, as, independently of its small size, the thorax is differently formed, being more deeply sinuate near the base, with the posterior angles, though rather more obtuse, yet more, though but slightly, prominent. The enlarged 2nd and 3rd joints of the front tarsi are very perceptibly different, both, the 3rd particularly, being unmistakably transverse, whilst those of the intermediate are less triangular and elongate—quite cordiform, in fact. No one seems to have secured a single example of the female of any of the species of this genus.

Loxomerus cilicollis, Broun.

Subopaque, fusco-piceous, with a large fusco-testaceous space near the extremity of the elytra, legs pitchy-red, palpi ferruginous, antennae rufescent.

Head finely and irregularly rugose, with shallow indefinite frontal impressions. *Thorax* similar to that of *L. fossulatus*, but the basal fossae are very shallow, usually perhaps almost indistinct, its hind angles a little more sharply defined. *Elytra* similarly sculptured; the 3rd and 7th interstices are insulated before the middle and consequently do not reach the base, whilst the 2nd striae end near the apical declivity; they are decidedly longer and more narrowed towards the base. The front *tarsi* of the male also differ, their dilated joints being more cordiform and less transverse, like those of the larger *L. ambiguus*, whilst the intermediate *tibiae* are nearly as straight and slender as the posterior. The front of the thorax is finely ciliate in both species.

♂. Length, 5¼ lines; breadth, 2⅜ lines.

Carnley Harbour.

One mutilated specimen, the description of which appeared in Trans. N.Z. Inst., 1901.

Loxomerus huttoni, Broun.

Body rufo-piceous, slightly nitid, legs pitchy-red, antennae and palpi paler. *Head* finely rugose, not short. *Thorax* about as long as broad, widest near the middle, only moderately rounded there; anterior angles slightly prominent, the basal rectangular, and, owing to the large deep fossae, appearing as if slightly elevated; the median dorsal groove is distinct. *Scutellum* short. *Elytra* oblong-oval, rather broad, with fine, regular, impunctate striae; interstices simple.

In this species the eyes are less prominent and more distant from the thoracic margin than in *L. cilicollis*. The thorax is rather longer, and differs in shape; its sides are quite obviously marginated, and the basal foveae are large and deeply impressed. The elytra also differ in contour, owing chiefly to being less narrowed towards the shoulders.

♂. Length, 5 lines; breadth, 2⅛ lines.

Carnley Harbour; found under a stone; one only. Preserved in the Canterbury Museum.

This species has been named in honour of its discoverer. The description was published along with that of the preceding one; the type I have not seen since 1901.

Group ANCHOMENIDAE.

Pristancylus, Blanchard.

Body oblong, perceptibly convex. *Head* short and broad. *Mandibles* stout, flattened above, moderately acute at the extremity. Terminal joint of the *palpi* oval, somewhat truncate at the extremity. *Mentum* trilobate, the median shorter than the others and rounded at the apex. Antennae moderately thick, the 1st articulation stout, the 3rd as short as the succeeding ones. *Thorax* cordate. *Elytra* oval, rounded at the extremity. Anterior *tibiae* strongly notched.

This genus, formed for the reception of two species collected at the Auckland Islands, approaches *Pristonychus* and *Sphodrus*, but is distinguished from both by the enlarged head and the abbreviation of the 1st articulations of the antennae.

Pristancylus castaneus, Blanchard.

Oblong, slightly convex, brilliant dark chestnut.

Head almost as broad as long, with 2 small unequal interocular foveae. *Antennae* nigro-fuscous, the 1st articulations shining, the others dull. *Thorax* cordate, smooth, its sides finely margined, with a fine median groove joining an anterior one, which is transverse and moderately distant from the margin. *Elytra* oblong, a little broader than the thorax, finely striated and feebly punctured, with 1 row of large marginal punctures; the interstices perfectly smooth. *Legs* of the same colour as the body, or slightly brighter.

Length, 16 mm.

Hab.—Auckland Islands.

Pristancylus brevis, Blanchard.

Shorter and relatively broader than the preceding, especially posteriorly. Wholly rather brilliant black.

Head as broad as long, with a very feeble depression near each eye. *Antennae* brownish-black. *Thorax* short, broad, more convex than in the preceding species, with a very slight rather indistinct median groove. *Elytra* oval, nearly twice the width of the thorax, with somewhat fine but little-punctured striae; on each side there is a row of large punctures; interstices perfectly smooth and flat. *Legs* and *tarsi* reddish-brown.

Length, 14 mm.

Hab.—Auckland Islands.

Obs.—Neither of these species having been found by our expedition, translations of the original descriptions have been given. The generic diagnosis does not point out very clearly how these species differ in structure from *Pristonychus*.

Calathus, Bonelli.

Mentum large, deeply emarginated, with a strong bifid median tooth. *Ligula* rounded in front. Last joint of the *palpi* subcylindric, truncate at the extremity.

Mandibles a little prominent, feebly arcuate, acute at apex. *Labrum* transverse, entire. *Head* oval, slightly narrowed behind. *Eyes* rather large and a little prominent. *Antennae* filiform, as long as the head and thorax; 1st joint stout, cylindric; 2nd short; 3rd rather longer than its successors, which are about equal. *Thorax* usually longer than broad, as wide as elytra at the base, a little narrowed anteriorly. *Elytra* oval or oblong, slightly convex, generally not sinuate near the apices. *Legs* moderate. *Tibiae* spinose. *Tarsi* glabrous above, the first 3 joints of the anterior in the males strongly dilated, triangular or cordiform, and subequal; the 4 posterior grooved externally. *Claws* finely denticulate, comblike, inwardly. *Body* usually narrowed towards both front and rear.

The above is my translation of Lacordaire's description on page 342, tom. i, Hist. des Ins. Coléopt.

Calathus rubromarginatus, Blanchard.

Nitid, fuscous; palpi and antennae obscurely rufescent; thorax broad, its sides broadly rufescent; elytra striate, interstices very smooth.

Body broad, dark glossy brown. *Head blackish*, very slightly excavated near each eye. *Palpi* reddish. *Antennae* brown, pubescent. *Thorax* very broad, flat or hardly convex, with the posterior markings peculiar to this genus very little marked, brilliant blackish-brown, its sides distinctly reddish. *Elytra* very slightly convex, of exactly the same width as the thorax at the base, of a bright-brown colour, the lateral margins reddish, with fine obsoletely punctured striae, interstices perfectly smooth. *Legs* of the same colour as the body.

This species in general form approaches *C. fuscus*, Fabr., but the body is more parallel-sided.

Length, 10–11 mm.

Hab.—Auckland Islands.

Obs.—As I have not seen any species of this genus from the Auckland Islands, an interpretation of the old description is all that is available.

Group ALEOCHARIDAE.

Baeostethus, gen. nov.

Body very elongate. *Head* subrotundate, with a short narrow muzzle. *Thorax* cordate-quadrate. *Elytra* very short. *Hind-body* very elongate. *Eyes* minute. *Mentum* very large, slightly emarginate in front. Labial *palpi* rather short; basal 2 joints cylindric, equally elongate; 3rd slender and nearly the length of the penultimate. Maxillary *palpi* setose; basal joint small; 2nd stout and elongate, gradually thickened; 3rd inserted at apex of the preceding one but so as to be at a right angle to it, rather longer than 2nd, gradually incrassate towards and truncate at the apex; 4th joint small, aciculate. *Mandibles* stout, rather short, acutely curvate at extremity, with 3 inner teeth. *Antennae* inserted at the sides of the forehead, in front of the eyes; basal 3 joints stout and elongate, narrowed towards the base; 2nd articulation a little shorter than 1st, but slightly longer than 3rd; 4th oblong; 5th and 6th oviform; 7th and 8th slightly broader than preceding one; 9th and 10th subquadrate; 11th oblong-oval. *Tarsi* filiform, the posterior pentamerous, intermediate quadriarticulate, the anterior seemingly also

4-jointed but so short and compact and thickly setose that the basal joints cannot be distinguished separately. *Claws* elongate, simple. All the *coxae* elongate, prominent, and contiguous. *Prosternum* corneous across the middle, membranous elsewhere. The *ligula* appears to be simple and aciculate.

Notwithstanding the elongation of the body, the metasternum is so excessively reduced that the intermediate and posterior coxae are in actual contact. This character of itself is distinctive.

Baeostethus chiltoni, sp. nov. (Plate V, fig. 7.)

Subopaque, finely pubescent; head and elytra obscure infuscate red; thorax, legs, and antennae fusco-testaceous; hind-body fuscous or nigrescent, the segments with a short pallid basal membrane. *Head* broadly rounded, somewhat depressed on the middle, closely and very minutely punctate, with 2 small indistinct median foveae. *Forehead* rather abruptly narrowed, short, medially convex, nearly smooth and shining, with a setigerous fovea at each side, truncate and with a short grey membrane in front. *Labrum* prominent, rounded and bearing fine yellow setae in front. *Eyes* minute, situated at the sides in front, depressed, hardly discernible. There is no *neck*. *Thorax* widest in front, gradually narrowed backwards; base truncate, apex feebly and broadly curvate; it is without definite lateral margins; the angles are nearly rectangular; there is a feeble median impression behind; its surface is finely and closely punctured, and bears slender greyish and infuscate pubescence. *Scutellum* large and broad. *Elytra* abbreviated, shorter than thorax, each strongly rounded and finely margined at the base so as to be oblique towards the suture, apices subtruncate yet almost oblique inwardly, their sides curvedly narrowed towards the base; their surface dull, the sculpture concealed by the pubescence, but consisting apparently of very minute distant granules. *Hind-body* very elongate, broadly marginated, the basal 5 segments transversal, each however becoming rather longer than its predecessor, 6th with short styles, 7th narrow and testaceous, all finely and moderately closely punctured and pubescent. *Legs* slender. *Femora* and *tibiae* ciliated with fine greyish setae.

Length, 2½ lines; breadth, quite ⅜ line.

Campbell Island.

Named in honour of Professor Chilton, to whom we are indebted for the discovery of this and some other species.

Group OMALIDAE.

Omalium, Gravenh.

Mentum transversal, a little narrowed and truncated at apex. *Ligula* bilobed, its lobes rounded. Labial *palpi* with the 2nd joint short, the 1st and 3rd equal; the 2nd of the maxillary moderately long, 3rd short, the apical more or less elongate and almost acuminate. Lobes of the *maxillae* membranous; the external slightly longer than the internal, ciliated at the extremity. *Mandibles* short, unarmed. *Labrum* transversal, furnished with a short membranous border, and ciliated in front. *Head* trigonal, provided with a rather distinct neck. *Eyes* moderate, rounded, prominent; ocelli situated near the margin of the eyes. *Antennae* gradually thickened towards the extremity; the basal joint longer and stouter than the others;

2nd and 3rd obconical, subequal; joints 4–10 of variable form, in general gradually becoming transverse; 11th short, oval. *Prothorax* usually narrower than the elytra, transversal. *Elytra* covering the base of the abdomen. *Abdomen* more or less elongate, rounded posteriorly, strongly margined laterally. *Legs* rather short. *Tibiae* very finely spinose. *Tarsi* short, their 4 basal joints very short, equal to one another, the apical as long as or longer than the others taken together. *Body* oblong or elongate, depressed, smooth or finely pubescent, winged.

Translated from Lacordaire's Hist. des Ins. Coléopt., tom. ii, p. 143.

Omalium venator, sp. nov.

Narrow and elongate, depressed, slightly nitid; head nigrescent; thorax and elytra rufo-piceous; hind-body fuscous, apical segments fusco-testaceous, basal 4 segments with short greyish pubescence; legs, palpi, and basal 5 joints of antennae more or less fusco-testaceous, remaining joints fuscous, opaque, and pubescent.

Head abruptly contracted behind the eyes, finely coriaceous, vertex nearly smooth; frontal impressions rather shallow, interocular foveae well marked, the ocelli placed in these; there is a distinct puncture near each eye with duplicate setae, 2 finer ones on the back part of each of the foveae, and 1 near each antenna. *Thorax* subquadrate, transverse, anterior angles depressed and strongly rounded, the posterior almost rectangular, its sides indistinctly marginated, a little narrowed behind the middle; its surface with coriaceous sculpture and some fine scattered punctures; the 2 longitudinal impressions on the middle are shallow; there are 4 setae in front, 1 at each hind angle, 2 or 3 near each side, and 2 at the base. *Scutellum* large, curvilinearly triangular, and apparently smooth. *Elytra* oblong, extending to just beyond the hind thighs, broader than thorax there, apices with rounded angles, but truncate towards the suture; they are finely and rather distantly punctate, but almost smooth behind; there are also a few larger but not at all coarse punctures with setae proceeding from them. *Hind-body* nearly smooth along the middle, the basal 4 segments distinctly sculptured towards the sides, and with broad flattened margins; 5th and 6th very finely sculptured, the margins of the former broad near the base but curvedly narrowed behind; 7th short and narrow, its hind angles prolonged alongside the small 8th. *Antennae* attain base of throax, basal joint stout, cylindric, 3rd evidently longer than 2nd, joints 4 and 5 equal, 6–10 obconical, 11th ovate. *Tibiae* finely spinose. Basal 4 joints of tarsi with long slender grey setae. The *labrum* is pallid, almost membranous, and deeply incurved in front. The *eyes* distinctly faceted, rather large, but only moderately convex.

Length, 2 lines; breadth, nearly $\frac{1}{2}$ line.

Campbell Island.

Caught by Professor Chilton on the beach between high- and low-water marks.

Group SPHERIDIIDAE.

Namostygnus, gen. nov.

Mentum transversely quadrate, not narrowed towards the front, medially convex. Maxillary *palpi* moderately elongate, 2nd joint slender at base, clavate at extremity; 3rd rather shorter than the terminal, which is subcylindric. *Antennae* inserted just before the eyes in deep broad grooves which extend backwards, below,

beyond the eyes, and are then bent inwards; they are 8-articulate; the basal joint cylindric and as long as the succeeding 4 combined; 2nd suboviform, as thick as the 1st; 3rd slender at base, longer than broad; 5th larger than the small 4th, a good deal expanded at the extremity, so as to be nearly as broad as the base of the club; this is laxly articulated, elongate, densely and minutely pubescent; the terminal joint is oval and evidently longer than either of its 2 predecessors. *Prosternum* carinate along the middle in front of the coxae. *Mesosternal process* very narrow, quite perpendicular in front. *Metasternum* carinate along the middle; this carina unites with the narrow mesosternal process, so that the intermediate coxae are only slightly separated, as are also the posterior. *Ventral segments* very minutely and densely sculptured and pubescent, the basal not carinate. *Femora* stout but flattened, minutely punctate and pubescent underneath. The anterior *tibiae* gradually dilated and bicalcarate at the extremity, minutely denticulate externally, and with 3 spiniform setae. *Tarsi* with yellow pubescence underneath, moderately elongate and stout, basal joint one-third longer than 2nd, 5th moderately elongate and stout, the claws very minute.

The genus *Cyclonotum*, which occurs in Europe, America, and Australia, is represented by one species in New Zealand; it may be at once distinguished by its 9-jointed antennae. In the New Zealand *Adolopus* the antennae are also 9-articulate. *Cyloma* undoubtedly is structurally the nearest ally, having, like *Namostygnus*, 8-jointed antennae, but the mesosternal process is thicker; there is no trace of any carina on the metasternum, which, moreover, is longer, the 4 hind tibiae are more asperate and ciliated externally with spiniform setae, and, what is of more importance, the basal joint of the posterior tarsi is shorter, and the claws are more developed. The humeral angles protrude so as to clasp the base of the thorax, as in *Cyloma thomsonus*, and the eyes are larger and somewhat acuminate in front.

Namostygnus rufipes, sp. nov.

Convex, ovate-oblong, nude, nitid, piceous; a spot before each eye, the sides of the thorax and elytra and an interrupted space on the posterior declivity fusco-rufous; palpi similar in colour, but with basal half of the terminal joint piceous; legs dark red; antennae fusco-testaceous, club nigrescent and opaque.

Head finely but quite definitely and moderately closely punctured, not quite as broad as the front of thorax, gradually and slightly narrowed anteriorly. *Thorax* transverse, as wide as elytra at the base, gently but not curvedly narrowed towards the rounded anterior angles, the posterior angles rectangular but not acute; its sculpture similar to that of the head; apex widely but only just perceptibly incurved near each side; finely margined. *Scutellum* large, triangular, minutely punctate. *Elytra* suboblong, broadly and evenly rounded posteriorly; their surface very finely and moderately punctured; this fine sculpture, however, is somewhat effaced near the sides; each elytron has a fine sutural stria, which is obsolete before the middle but well developed behind; 7 others are well marked behind; those along the sides are transformed into series of distinct punctures, none of which quite reach the base; the margins are rather fine; the humeral angles are rectangular, but not at all porrect.

Length, 1½ lines; breadth, nearly 1 line.

Auckland Islands.

One individual, forwarded by Mr. G. V. Hudson. As the specimen was simply gummed on cardboard so that the legs, antennae, &c., were invisible, the preparation of the foregoing descriptions, generic and specific, was a work of more than ordinary difficulty. The insect had to be removed from the cardboard and thoroughly cleaned and freed from gum and sappy matter before any structural characters could be studied, and as it is small and convex, and the antennae, tarsi, &c., rather fragile, these were very delicate and tedious operations. Duplicates should always be supplied in the case of small insects, so that one may be mounted on its back.

Thomosis, Broun, 1903.

Body oblong-oval, convex. Antennae 9-articulate, their basal joint longer than the following 5 combined, gradually incrassate towards the extremity; 2nd cylindric, barely one-third the length of the basal; 3rd as long as the preceding one; 4th and 5th short; 6th also short, but distinctly broader than the 5th. *Club* 3-jointed, oblong-oval, pubescent, the intermediate transverse and shorter than the others. *Labrum* porrect, medially emarginate. *Epistome* widely incurved in front. *Eyes* flat, smooth. *Mentum* large, flat, not transverse. *Femora* punctate, their punctuation closer and finer at the base than beyond it; the intermediate distinctly pubescent, the posterior with minute, almost indistinguishable, pubescence. *Tibiae* stout, the anterior armed at the extremity with 2 stout unequal spurs, with 2 small subapical denticles on the outside, and 2 or 3 higher up; the other pairs are bicalcarate at the apex, and bear coarse ciliae. *Tarsi* moderately elongate, not compressed, pilose; the exposed portion of the basal joint of the posterior short, hardly more than half as long as the 2nd, which is rather longer and stouter than the 5th. Anterior *coxae* very large and prominent, contiguous, the middle pair widely separated. *Sternal lamina* large and plane, tapering from the base of the metasternum to beyond the intermediate coxae. *Mesosternal process* vertical and short, its suture curvate.

Nearly allied to the New Zealand *Hydrostygnus*, but may be readily distinguished therefrom by the large prominent coxae. The antennae differ, the club is shorter and broader, the maxillary palpi are much thicker, and the mentum is altogether different.

Thomosis guanicola, Broun, 1903.

Nude, moderately nitid, nigro-piceous, the legs and lateral margins pitchy-red, palpi and antennae usually testaceous; tarsi, labrum, and forehead rufescent.

Head not half the width of thorax, longer than broad, narrowed anteriorly, closely and moderately finely punctured. *Thorax* almost twice as long as broad, regularly curvedly narrowed towards the front, lateral margins moderately developed, its sculpture like that of the head, sometimes with 2 small frontal foveae. *Scutellum* triangular. *Elytra* closely and finely punctate, and with 10 series of distinct but not coarse punctures on each, the sutural, at the apex, almost form striae.

Underside nigrescent, mostly densely and finely sculptured, with short inconspicuous dark-ashy pubescence. Abdomen with 5 segments, the intermediate 3 nearly equal, the basal subcarinate along the middle.

Length, 3½ lines; breadth, 1¾ lines.

Bounty Islands.

Three specimens, found by Dr. L. Cockayne feeding amongst deposits of guano.

Group SILPHIDAE.

Choleva, Latreille.

Body oblong or oval, clothed with fine silky pubescence. *Mentum* transversely quadrate, a little narrowed in front. *Ligula* as broad as the mentum at its base, widely and strongly emarginate in front. Internal lobe of the *maxillae* with a horny terminal hook. Maxillary *palpi* notably larger than the labial, their 3rd joint obconical, the 4th much more slender, conical, and acuminate; the 3rd of the labial a little longer than the 2nd. *Mandibles* short, with a molar tooth at the base, arched, acute, and unidentate at the extremity. *Labrum* short, rounded, and slightly sinuate medially in front. *Eyes* almost rotundate, moderately prominent. *Head* deflexed, obtuse in front. *Antennae* slender, as long as head and thorax, their basal 6 articulations of variable length, subcylindrical, the 8th joint smaller than the contiguous ones, the last 5 forming a rather variable club. *Thorax* subquadrate, as wide as elytra at the base. *Elytra* oblong or oval, convex. *Legs* long and slender. Anterior and middle *coxae* very prominent, the former not contiguous. *Tibiae* very rarely dilated at the extremity, terminated with 2 spines. *Tarsi* with brushlike soles, the basal 4 joints of the anterior in the males, especially the first 2, and sometimes the 1st of the intermediate, dilated. *Mesosternum* often carinate.

Syn. *Catops*, Paykull.

Catops avivorus, sp. nov.

Ovate-oblong, moderately convex, covered with slender decumbent yellowish or ashy hairs, subopaque, rufo-fuscous or castaneous; legs, antennae, and palpi rufescent; tarsi fulvescent.

Head trigonal in front, much narrowed behind, finely yet quite perceptibly and closely punctate, its pubescence yellow. *Thorax* strongly transverse, apex moderately deeply and widely incurved, with rounded angles, its sides rounded and more narrowed in front than behind, base feebly and widely incurved and overlapping the elytra, posterior angles almost rectangular, across the middle it is slightly wider than the elytra; its whole surface very minutely sculptured, the punctuation fine and rather close, but somewhat remote in front at the middle. *Elytra* as broad as thorax at the base, very gradually narrowed posteriorly, apices individually rounded so as to be slightly dehiscent at the suture and leaving the obconical pygidium uncovered; on each elytron there is a moderately well-marked sutural stria; their surface is closely, finely, and rugosely punctured.

Underside similar to upper surface in colour and clothing. The sculpture of the 6 ventral segments very fine and close. Coxae contiguous, none distinctly separated, the anterior very prominent. Mesosternum finely but distinctly and closely sculptured, not medially carinate.

Antennae inserted below the lateral margins of the forehead, and therefore at some distance from the eyes; they are finely pubescent; basal articulation elongate-oblong, with slightly rounded angles; joints 2–5 about equal, each almost as long as the 1st and becoming slightly thicker than the 2nd; 7th rather shorter and broader than 6th; 8th obviously smaller than the contiguous ones; 9th and 10th quadrate, shorter and slightly broader than 7th; the terminal ovate. *Femora* simple. Anterior *tibiae* slightly but quite definitely notched or emarginate under-

neath above the middle and curvedly dilated lower down, straight externally, with 2 or 3 spiniform setae at the extremity, clothed like the tarsi with slender bright-yellow setae; intermediate tibiae curvate, the posterior straight, bispinose at apex. Anterior *tarsi* with basal 3 joints dilated; 1st largest, suboblong, and notched at apex; 2nd and 3rd transverse, emarginate at apex, the former the larger; 4th small, half the width of the preceding one; terminal slender, not as long as the preceding ones conjointly; claws simple. The intermediate tarsi elongate, basal 4 joints only moderately expanded; the 5 joints of the posterior of nearly equal thickness, none dilated.

Female.—Tibiae simple, bispinose at apex, the middle pair only slightly curved; tarsi not dilated; antennae nearly similar, 9th and 10th joints smaller, 11th acuminate.

♂. Length, 2 lines; breadth, $\frac{7}{8}$ line.

Auckland Islands.

Both sexes found within the head of a kingfisher (Mr. Hudson).

Somewhat similar to the European *C. morio*, but with a narrower hind-body, and differing in colour and sculpture, but more especially in the peculiar excision of the anterior tibiae; this last character I have not observed amongst our New Zealand species, so it seems to be quite distinctive. The specific description is complete; there cannot, consequently, be any difficulty in identifying the insect.

Group BYRRHIDAE.

Morychus, Erichson.

The organs of the *mouth*, save the mandibles, labrum, and a part of the eyes, concealed during the retraction of the head. *Ligula* short, horny in the centre, coriaceous externally, scarcely emarginate in front. Last joint of the labial *palpi* subglobular, truncate at the end; that of the maxillary oval. *Mandibles* very short, without membranous margin and basal tooth. *Labrum* transversely quadrate, rounded anteriorly, strongly carinated at its base. *Antennae* gradually incrassated. *Legs* similar to those of *Cytulus*.

Morychus tumidellus, sp. nov.

Compact, oblong-oval, convex, sparingly clothed with slender decumbent inconspicuous greyish hairs; dark shining bronze, slightly tinged with green; legs and basal joint of antennae dark red, remaining joints and the tarsi rufo-testaceous.

Head rather finely but not closely punctured, with fewer punctures near the middle. *Thorax* transverse, gradually narrowed anteriorly, its posterior angles more acutely prominent than the anterior; its surface finely, distinctly, and rather more closely punctured than the head. *Scutellum* triangular, nearly smooth. *Elytra* not strongly curvate at the sides, only moderately narrowed backwards, and rather broadly rounded behind, the upper posterior slope rather gradual; near the apex of each elytron there are 2 shallow impressions, the interval between these when viewed from above appears somewhat swollen but hardly nodose; their sculpture perceptibly finer and closer than that of the thorax; the intervals between the punctures are not sculptured or coriaceous; this last remark is applicable to the head and thorax as well. *Tibiae* nearly glabrous, minutely fringed along the inner

face, slightly arched externally, the anterior broadly yet not at all deeply impressed for the reception of the tarsi during repose. *Tarsi* nearly as long as the tibiae, the membranous appendage of 3rd joint well developed, usually very elongate. *Antennae* with fine yellow pubescence from the 6th joint onwards; basal joint stout; 2nd cylindric, shorter but rather thicker than the 3rd, which is slender, and longer than the 4th; 5th shorter than 4th; joints 6–10 become shorter and broader, the terminal being larger than its predecessor.

On comparison with our numerous New Zealand species of *Morychus* or *Pedilophorus* this exhibits two or three distinguishing features which at once appear characteristic. These are the gradual downward slope of the hind-body behind the disc, the broad and not at all acuminate extremity, and the small swelling near the apex of each elytron.

Length, $2\frac{3}{4}$ lines; breadth, $1\frac{5}{8}$ lines.

The Snares; found under logs of *Olearia Lyallii*.

One example, from Mr. Hudson, mounted on cardboard.

All measurements in this group are taken from specimens on cardboard, with the head fully exposed.

Liochoria, Pascoe, 1875.

Antennae subelongate, joints 6–10 perfoliate, and, with the 11th, forming a narrow club. *Labrum* large, distinct. Last joint of the maxillary *palpi* oval. Anterior *tibiae* excavate externally.

Liochoria sumptuosa, sp. nov.

Body compact, only moderately convex, oblong-oval, sparsely clothed with minute brassy setae; glossy, head and thorax cupreo-viridis, elytra metallic green, with numerous irregular fusco-cupreous spots; legs and basal joint of antennae rufo-piceous, the tarsi and joints 2 to 4 of the antennae infuscate red, remaining joints pale castaneous.

Head distinctly but not closely punctured, with 2 small interocular foveae. *Thorax* transverse, very slightly emarginated towards the acute anterior angles; base a little rounded at the middle, and very slightly but widely sinuated outwardly; posterior angles rectangular, acute, but directed backwards; its sides with well-developed margins, gradually narrowed anteriorly; its punctuation like that of the head, but rather finer and closer near the sides. *Scutellum* triangular, rather small. *Elytra* a little wider near the middle than elsewhere, much narrowed behind, apices singly rounded; there is an elongate sutural depression near the base, and the suture behind this is obviously elevated towards the extremity, so that there seems to be a broad groove, particularly near the apex, along each side of it; their punctures are rather finer than those on the thorax, and the coppery spots are almost smooth beyond the basal and sutural areas. *Tibiae* with a few fine inconspicuous greyish hairs, the intermediate slightly arcuate, the anterior grooved on the outer face or front, but only at the extremity; femora grooved underneath. *Tarsi* pilose; the pallid membrane of the 3rd joint of the anterior is prolonged below as far as two-thirds of the length of the terminal one; 4th joint very small. *Claws* thickened at the base. *Antennae* inserted just in front of the eyes, below the edge of the forehead, their 1st joint stout and quite free, having a distinct basal stalk by which

it is attached to the head; joints 2–4 slender, 2nd rather the stoutest and shortest; 5th almost as long as the 4th, but slightly thicker; joints 6–10 evidently shorter and broader than the preceding one; the terminal about one-half longer than the 10th. Terminal articulations of the maxillary and labial *palpi* broadly oval. There are no well-marked excavations of the basal ventral segment for the accommodation of the legs during repose, these parts being punctated and on the same plane, or nearly so, as the rest of the surface; the legs during retraction are received under the raised margin of the coxal lamina. The tip of the prosternal process is fitted into an angular frontal cavity of the mesosternum. The intermediate *coxae* are more widely separated than the posterior.

Underside bronzed black, distinctly punctured, 4th and 5th ventral segments broadly impressed at each side.

Length, $3\frac{3}{4}$ lines; breadth, 2 lines.

Carnley Harbour; under logs.

One mounted specimen received from Mr. Hudson; a second, pinned, was submitted for inspection by Dr. W. Benham, who found it at Erebus Cove, Auckland Island.

Liochoria longula, sp. nov. (Plate III, figs. 2–4.)

Body only moderately convex, sparingly clothed with minute erect yellow setae, shining, cupreous, the head and posterior portion of elytra more or less viridescent, legs and basal joint of antennae rufo-piceous, the tarsi and last 6 joints of the antennae castaneous.

This resembles *L. sumptuosa*, but is considerably larger; the elytra are more attenuate and slightly compressed behind, so that the apical margins appear slightly explanate, or broader than the upper portion. There is no sutural depression behind the scutellum, which is larger, of somewhat cordiform outline, and acute at the extremity. The *head* is more closely punctured behind, has a large smooth coppery space on the middle, a wide curved feeble impression between the eyes, and 2 transverse oblique frontal foveae. The *thorax* is rather more closely punctured. The darker spots on the *elytra* are less smooth, and their whole surface is more of a reddish-coppery hue. The *antennae* are shorter, joints 2 to 6 are obviously thicker, whilst joints 7 to 10 are quadrate instead of being rather longer than broad. The *mandibles* are bifid at the extremity. The basal and lateral grooves of the large *labrum* are not as broad.

I do not think it is the female of *L. sumptuosa*, as I consider the ridging of the elytral suture, also well developed in this specimen, a male character.

Length, $4\frac{3}{4}$ lines; breadth, $2\frac{1}{4}$ lines.

Carnley Harbour; under a log.

One mutilated individual, on cardboard, sent to me by Mr. Hudson.

Group MELOLONTHIDAE.

Odontria, White.

Mentum obtrapezoidal, its ligular part very much narrower than the other, oblique and sinuated in front. External lobes of the *maxillae* furnished with 4 or 5 teeth. Last joint of the labial *palpi* oval, that of the maxillary oblong-oval.

Labrum rather prominent, almost horizontal, semicircularly hollowed in front. *Head* broad, the clypeus separated from the forehead by a flexuous furrow; widely rounded and marginated in front. *Antennae* 8-jointed; the basal joint stout, obconical; 2nd pyriform; 3rd elongate, obconical; 4th and 5th of variable form; joints 6 to 8 forming an oval club. *Prothorax* transversal, widely and strongly emarginated in front, with a membranous border, rounded and somewhat angulated laterally, and rather strongly lobate medially at its base. *Elytra* oval, moderately convex. Anterior *tibiae* tridentate, the others carinated externally. *Tarsi* rather long, their joints thickened apically. *Claws* long, simple, moderately arcuate. *Pygidium* transversal.

There are about twenty members of this New Zealand genus. Among these there is much diversity in the structure of the antennae, there being 5 very elongate leaflets in the club of some species. The sternum is usually thickly covered with long hairs.

Odontria longitarsis, sp. nov. (Plate III, fig. 14.)

Subopaque, broadly oviform, moderately convex, sparingly clothed with fine short testaceous setae; the surface more or less variegated with dull fuscous and rufo-castaneous; palpi, antennae, and tarsi red, legs infuscate testaceous; ventral segments variegate, fuscous and fusco-testaceous, with somewhat elongated punctures and very scanty pubescence; the metasternum testaceous.

Clypeus distinctly marginated, subtruncate in front, its punctuation rather shallow, moderately coarse, not very close, somewhat rugose; it is quite glossy, and reddish-brown. *Head* also shining, darker than the clypeus, with better-defined, larger, and more distinctly separated punctures. *Thorax* strongly transverse, bisinuate at base, widely incurved in front, the anterior angles not projecting beyond the back of the eyes, posterior angles rectangular but obtuse; its sides gently rounded, very finely margined, and bearing numerous rigid rufescent setae; disc opaque, fuscous, the sides broadly pale rufo-fuscous; punctuation distinct, yet rather fine. *Elytra* of exactly the same width as thorax at the base, widest behind the middle, apices individually broadly rounded; their striae well marked alongside the suture, less so beyond; the sculpture of these striae peculiar—not definite punctures, but shallow elongate impressions, each minutely margined; the interstices closely transversely rugose; the sides bear stiff reddish setae, but there are very few on the disc, those that are visible usually arise from the few scattered pale spots. *Pygidium* very closely and minutely sculptured. *Legs* shining, elongate. Anterior *tibiae* tridentate externally. All the *tarsi* very long and slender, quite a third longer than the tibiae. *Antennae* short, the exposed part of the basal joint not much longer than the 2nd; 3rd more slender, just longer than broad; 4th short and transverse, slightly produced inwardly. *Club* short, quadriarticulate, its 1st joint quite one-third shorter than the others.

A large species, without the common sternal villosity, and with different clothing above. The peculiar sculpture of the elytral striae is without precedent.

♂. Length, 8 lines; breadth, 4½ lines.

The Snares.

A single specimen, sent for examination by Mr. G. V. Hudson.

Group HELOPIDAE.

Pseudhelops, Guérin.

Mentum trapeziform, convex along the middle. *Ligula* subtriangular, widest and truncate in front. Labial *palpi* very short, terminal articulation oblong, truncate at apex; the maxillary more elongate, their last joint broad, concave and obliquely truncate at the extremity, so that the inner side is obviously shorter than the outer. *Mandibles* bifid at apex. Eyes very transverse, somewhat prolonged below the head, distinctly faceted, not perceptibly emarginate in front. *Antennae* attaining base of thorax; basal joint stout, its uncovered portion of about the same length as the short 2nd; 3rd usually evidently longer than 4th; joints 5–7 about equal to one another; 8–10 obconical, and rather broader than the preceding; 11th subovate, longer than its predecessor. *Thorax* closely adapted to elytra at the base, which is feebly bisinuate, quite or very nearly truncate at apex. *Scutellum* small, rounded behind. *Elytra* oblong, much narrowed behind, very slightly wider than the thorax at the base. *Legs* moderately elongate. *Tibiae* simple, with small apical spines. *Tarsi* filiform, with fine yellow setae underneath; basal 4 joints of the 2 front pairs, taken together, no longer or more dilated than the terminal one; basal joint of the posterior elongate, 2nd and 3rd each longer than broad, all 3 combined hardly longer than the 4th. *Prosternal process* broad, truncate at apex, prolonged beyond the coxae, nearly horizontal, broadly depressed along the middle. *Ventral segments* 1–4 decrease in length, 5th subtrigonal.

The above does not exactly correspond with the description given in Lacordaire's work in some respects, but exhibits the structural characters just as I find them existing in the typical species described hereunder.

Pseudhelops tuberculatus, Guérin.

Body apparently glabrous, ovate-oblong, moderately convex, slightly nitid; head and thorax generally aeneo-niger, elytra more obviously bronzed, legs piceo-rufous, antennae and tarsi rufous.

Head short, of the same width, eyes included, as apex of thorax. *Clypeus* obliquely narrowed towards the front, where it is deflexed and truncate. *Labrum* transverse, red, and bearing erect yellow setae; the punctuation of the head distinct though moderately fine, becoming rather closer and finer near the antennal orbits and on the forehead. *Eyes* convex and prominent. *Thorax* finely margined laterally, its sides gently rounded, more narrowed in front than behind, rather wider behind the middle than it is elsewhere, just one-fifth broader than long, posterior angles slightly obtuse yet nearly rectangular and resting on the base of elytra, anterior angles not prominent and barely reaching the eyes; its punctuation rather finer and closer than that of the head. *Elytra* a little, yet quite appreciably, wider near the hind thighs than elsewhere, in some specimens this slight dilation is hardly noticeable, the sides being slightly rounded, but they are evidently obliquely narrowed behind; their whole surface is finely and irregularly punctured, and on some parts feebly rugose; each elytron has 8 series of punctures, some a little larger than others, none very close, and hardly forming distinct striae, all become indistinct near the base; at each side on the summit of the hind slope there are 3 nodosities, and just below the outermost one the external interstice, which is convex, ends abruptly, so that there seems to be a fourth nodiform elevation at that point. The *legs* bear

inconspicuous fine setae only, but the fine yellow setae attached to the tarsi and the extremity of the anterior tibia are quite discernible. Under a strong magnifying lens numerous minute grey setae may be seen on the body.

Underside shining, black, finely and irregularly punctate, the head transversely rugose and punctate, the femora finely punctured.

Length, $3\frac{1}{2}$–4 lines; breadth, $1\frac{5}{8}$ lines.

Carnley Harbour; under logs of rata-trees.

The foregoing description has been drawn up from eight specimens received from Mr. Hudson.

Pseudhelops quadricollis, sp. nov. (Plate V, fig. 8.)

Oblong-oval, moderately glossy, apparently nude; head and thorax violaceo-niger, elytra viridescent, legs and antennae piceo-rufous.

Head moderately closely and distinctly punctured, a good deal narrower than front of thorax. *Thorax* subquadrate, one-fifth broader than long, its sides nearly straight, only slightly narrowed in front, the base just perceptibly broader than the middle, posterior angles obtusely rectangular, the base distinctly bisinuate, apex slightly and widely incurved, the lateral margins thicker in front than behind; its punctuation rather closer and finer than that of the head. *Scutellum* small. *Elytra* gradually narrowed backwards, a good deal near the extremity, where the margins are more visible than along the sides; their whole surface finely punctured, not at all striate, the serial punctures rather small, not close to each other, and all more or less obsolete in front of the middle; there are two slight somewhat elongated obtuse prominences on each near the extremity, and the external interstice is swollen but not quite nodiform.

Underside black, shining; closely, rugosely, and very distinctly punctured. Prosternal process perfectly flat, not in the least grooved along the middle, finely punctured.

This appears smoother than the typical species; the slight posterior nodosities do not interrupt the oviform outline; the elytra, instead of being of a brownish-coppery hue, are greenish; the eyes are less prominent; and the shape of the thorax is entirely different. The basal joint of the posterior tarsi is evidently shorter than the terminal one.

Length, $3\frac{1}{4}$ lines; breadth, $1\frac{1}{2}$ lines.

The Snares; one individual, found under logs of *Olearia Lyallii* by Mr. Hudson.

Pseudhelops posticalis, sp. nov.

Subovate, rather elongate, slightly bronzed, nigro-fuscous, head and thorax subopaque, elytra more shining, legs pitchy-red, antennae more rufescent.

Head rather narrower than front of thorax, its punctuation more shallow and distant and rather finer than in the preceding two species. *Thorax* one-fourth broader than long, subquadrate, gently curved laterally, a little narrower in front than behind, very little wider at the middle than at the base, which is only feebly bisinuate, with obtusely rectangular angles, apex truncate, the lateral margins more developed near the middle than elsewhere; its surface very finely and not closely punctured. *Elytra* elongate-oval, widest near the middle, a good deal narrowed and somewhat prolonged at the apices; their sculpture not well defined, appearing to consist of rather distant very fine punctures, which, however, on some parts seem

as if transformed into very minute granules; they are somewhat irregularly substriate, and bear numerous very minute yet quite perceptible greyish setae; the 3 elongated elevations on each elytron are here mere swellings of the terminal portions of the interstices, the outermost is not sufficiently raised to form a 4th.

Most nearly resembles *P. tuberculatus*, but the elytral apices appear more prolonged, the sculpture of the head and hind-body is quite appreciably finer, the sides of the thorax are less rounded, and there are no distinct serial punctures on the elytra.

In all three species the surface seems glabrous: in reality all bear very minute inconspicuous setae, which may pass unnoticed; they are most easily detected on parts that are turned away from the light. The antennae of all bear distinct yellow pubescence on the terminal 4 joints; the other joints are more or less bare. In *P. posticalis* the minute brassy setae along the lower half of the anterior tibiae, in front, are more distinct than in the other species.

Length, $3\frac{3}{4}$ lines; breadth, $1\frac{3}{4}$ lines.

Campbell Island.

A single specimen (Mr. Marriner).

Pseudhelops interruptus, sp. nov.

Oblong-oval, convex, nitid; thorax fusco-cupreous; elytra somewhat cyaneous, with reddish-coppery specks; legs and antennae rufescent; sparingly clothed with minute greyish setae.

Head fusco-piceous, a little uneven, finely and distantly punctured. *Thorax* subquadrate, an eighth broader than long, quite as wide at the base as at the middle, the sides between these slightly sinuate, gently curvedly narrowed anteriorly, base bisinuate; its whole surface densely and very minutely sculptured, the punctuation a little irregular, fine, but not close. *Scutellum* subquadrate. *Elytra* oblong-oval, with dense minute sculpture; they are irregularly striate, moderately deeply at the sides and extremity but shallow near the base and suture, all more or less finely interrupted or flexuous at short intervals; interstices finely but not closely punctured; 3rd, 5th, and 7th only moderately prominent behind.

This differs from *P. posticalis* as follows: It is rather smaller; the 2nd, 4th, and 5th joints of the antennae are more elongate and slender; the apices of the elytra are not prolonged; their striae are deeper but less regular; and the nodosities, though smaller, are more definite; the thoracic margins are finer; and the coloration is materially different.

Length, $3\frac{1}{4}$ lines; breadth, $1\frac{5}{8}$ lines.

Campbell Island.

Discovered recently by Messrs. W. K. Chambers and F. S. Des Barres.

Group OTIORHYNCHIDAE.

Catodryobius, gen. nov.

Body robust, apparently apterous, subovate, clothed with decumbent slender squamae.

Rostrum shorter than thorax, moderately dilated, subpterygiate, near the front, without sharply marked triangular clypeal sutures. *Mentum* truncate at apex, gradually curvedly narrowed towards its base, about as long as it is broad, the

peduncle transversely quadrate, slightly incurved at sides and apex so that its front angles are acute. *Palpi* minute and rigid. *Scrobes* quite open above, extending from near the apex, where they are deep, towards but not reaching the eyes. *Scape* very gradually and only slightly incrassate, attaining the back of the eye. *Funiculus* 7-articulate, basal 2 joints of equal length, 3rd rather shorter than 2nd, joints 3–7 decrease in length, each longer than broad, all obconical. *Club* elongate, triarticulate, oval, the intermediate joint transverse. *Eyes* very slightly convex, distinctly faceted, quite lateral, free from thorax, obliquely truncate in front, subacuminate. *Thorax* subquadrate, base and apex truncate, ocular lobes altogether absent or scarcely appreciable. *Scutellum* proportionally small. *Elytra* very slightly wider than thorax at the base, oviform, much narrowed and sometimes subacuminate at apices. *Femora* simple, moderately inflated medially. *Tibiae* flexuous, inwardly mucronate at the extremity, the anterior subserrate along the inner face. *Tarsi* with dense brushlike soles, their 3rd joint appearing spongy when examined directly from below, the slender basal portion of the first 2 and the terminal one almost glabrous, 3rd moderately expanded and cleft almost to the base, the 4th elongate, arched, its claws thickened at the base. *Prosternum* only slightly incurved in front; the coxae large and prominent, situated about midway between the base and apex, almost contiguous, their cavities confluent. Intermediate *coxae* moderately separated by the cuneiform mesosternal process; the posterior widely distant. *Metasternum* relatively short. *Abdomen* elongate; basal segment nearly double the length of the 2nd in the middle, its intercoxal suture strongly rounded; 2nd not as long as the following 2 combined, its frontal suture nearly obliterated in the middle, in reality, however, extremely fine and broadly outwardly curved there; 4th a little shorter than 3rd; 5th elongate, subtrigonal, but truncate at extremity. *Epipleurae* extremely narrow throughout. The *mandibular scar* is present. The *corbels* of the posterior tibiae are simple, without any truncature at the outer extremity. The whole structure, indeed, seems primitive.

After prolonged study I fail to find any very salient characters. The rostrum is much less pterygiate than the European *Otiorhynchus*. The Malayan *Rhinoscapha* is somewhat similar in form, but one-half of the posterior corbel is truncate. Some of the Polynesian genera have similar slender scales, but differ otherwise, *Elytrurus*, for example, having prolonged elytral apices. Its systematic position must be in the first section of the group, according to Lacordaire's classification. *Catoptes* is its nearest ally here.

Catodryobius vestitus, sp. nov. (Plate III, fig. 10.)

Nigrescent, slightly nitid, antennae and tarsi rufo-piceous; squamosity slender, metallic, chiefly yellowish, but intermingled on some parts with green.

Rostrum carinate along the middle, broadly grooved at each side of the middle, finely rugosely punctate near the almost-nude apex, the other sculpture concealed by the squamae. *Thorax* of equal length and breadth, its sides nearly straight behind, a little narrowed anteriorly, slightly wider before the middle than elsewhere; its punctuation very irregular, near the sides the sculpture consists principally of short irregular rugosities, it is nearly bare along the middle and on an elongate space near each side, the rest of the surface bears numerous small scales. *Scutellum* squamose. *Elytra* only moderately curvate at the sides, striate-punctate, interstices slightly

convex, with a few scattered punctures which are larger and more foveiform than the others. *Scape* punctate, with fine decumbent setae. *Funiculus* shining, very scantily clothed. *Club* densely and minutely pubescent.

Female.—Underside shining piceous, the squamae slender, grey or yellowish. Prosternum subgranulose. Basal ventral segment broadly impressed, the 5th with 2 elongate impressions at the base, its sculpture fine and rugose.

♂. Length (rost. incl.), 6½ lines; breadth, 2¼ lines. ♀. Length (rost. incl.), 8 lines; breadth, 3¼ lines.

The Snares; found under bark of *Olearia Lyallii*.

One of each sex transmitted to me by Mr. Hudson, but collected by other members of the expedition.

Catodryobius benhami, sp. nov.

Body pale brown, tibiae ferruginous, funiculus piceous, 3rd and 4th joints of tarsi rufescent; the squamosity fine, somewhat variegate, fulvescent and greenish, that of the latter colour predominating on the sides of the thorax; middle and hind legs densely covered, quite glossy and cupreous, and also bearing many outstanding slender yellowish setae. The front legs abraded and damaged in my specimen.

Rostrum with 2 broad longitudinal grooves and a central carina, punctate and finely longitudinally rugose, covered with coppery scales principally, apical portion finely rugosely punctured, with some erect yellow setae at the extremity. *Scrobes* quite open above and deep in front, but quite shallow and oblique towards the eyes. *Head* a little longer than that of *C. vestitus*, with an interocular depression. *Thorax* as long as it is broad, slightly dilated laterally before the middle, its surface a little uneven, rather finely punctured, slightly elevated along the middle in front, this ridge has a narrow groove which disappears at the middle but reappears near the base; the central area is nearly nude, but in fresh unabraded specimens it is most likely as beautifully squamose as other parts. *Scutellum* covered with yellow scales. *Elytra* hardly wider than thorax at the base, their sides a little rounded and a good deal narrowed posteriorly, their apices slightly prominent and divergent; punctate-striate, the punctures not coarse, interstices moderately convex, densely and minutely sculptured, the scales small, many oviform like those on the rostrum and thorax. The *scape* reaches just beyond the back of the eye, and bears slender depressed scales. *Funiculus* sparsely setose, joints 3–7 decrease in length so that the 7th is but little longer than broad. *Club* very elongate, opaque, fuscous. Posterior *corbels* very slightly concave, encircled with setae. *Tarsi* setose above.

♂. Length (rost. incl.), 9 lines; breadth, 3 lines.

Enderby Island; under logs.

Discovered by Dr. W. Benham, in whose honour it is named. This, the most handsomely ornamented species, is described from a specimen mounted on cardboard so that the underside cannot be seen; it is no doubt a male.

Catodryobius tetricus, sp. nov. (Plate III, figs. 11–13.)

Nigro-piceous, a little shining, tarsi piceo-rufous; sparingly clothed with very slender inconspicuous decumbent greyish setae and slender yellowish-grey squamae.

Rostrum slightly shorter than thorax, rather broad and flat above, the central carina somewhat obsolete, rather finely punctate-rugose, not squamositate, with

prominent brassy setae at the extremity. There is a punctiform interocular fovea. *Thorax* about one-third broader than long, widest before the middle, a little uneven above, moderately closely and irregularly punctured, some of the punctures rather larger than others, none, however, are coarse ; there is a slight median ridge in front, and the apex in the middle is slightly emarginate. *Scutellum* rounded behind. *Elytra* a little wider than thorax at the base, oblong-oval ; rather finely punctate-striate, interstices moderately convex and minutely sculptured. *Tibiae* finely setose, the front and intermediate rather strongly flexuous.

Underside similar to upper surface, but with more distinct setae. Front coxae contiguous. Metasternum and basal ventral segment broadly impressed, the former with a transverse median fovea. The head with a linear impression along the middle. The 2nd ventral segment evidently shorter than the following 2 taken together, its frontal suture fine, broadly rounded in the middle. The 5th segment transversely and distinctly punctured near the extremity.

This is distinguishable from *C. vestitus* by the inconspicuous clothing, the broader and more flattened rostrum, shorter thorax, more strongly bent intermediate tibiae, and more striate elytra. The scape is more clavate at the extremity. The funiculus is decidedly thicker and its 7th joint is distinctly broader than its predecessor ; the club, too, is larger. The 4th ventral segment is not abbreviated.

Length (rost. incl.), 8 lines ; breadth, 3 lines.

Carnley Harbour ; under logs.

A single individual is all I have seen, forwarded by Mr. Hudson.

Catodryobius erubescens, sp. nov.

Elongate, subovate, slightly glossy, rufo-castaneous, tarsi and funiculus piceo-rufous ; sparingly clothed with an admixture of pale-yellowish depressed slender scales and setae.

Rostrum a little shorter than thorax, broadly bisulcate, not sharply carinate, somewhat rugosely punctured, the punctures shallow along the middle, deeper on the obtuse lateral ridges, the squamae disposed transversely ; the apex is piceous, and bears outstanding yellow setae. *Head* moderately punctured, with an elongated punctiform fovea on the centre, the squamae somewhat concentrated near the eyes. *Thorax* only one-seventh broader than long, gradually narrowed backwards, widest before the middle, very slightly uneven, a little more convex on the middle than elsewhere ; its punctuation rather fine and shallow, its clothing not conspicuous but thicker near the sides than on the disc, the greater part of which is nearly nude. *Elytra* elongate, oviform, slightly wider than thorax at the base, moderately finely striate-punctate, interstices broad and almost quite plane, their whole surface closely and minutely sculptured, apices only minutely and indistinctly protuberant. *Antennae* of normal structure, the clavate extremity of the scape distinctly rufescent. *Club* elongate, opaque, fuscous and densely pubescent.

Of rather more elongate contour than *C. vestitus*, the sculpture and clothing very much finer, and the coloration entirely dissimilar.

♂. Length (rost. incl.), 8 lines ; breadth, $2\frac{3}{4}$ lines.

Carnley Harbour ; under logs.

The unique specimen found by Dr. Benham, and set out on cardboard, has been returned.

Catodryobius grandis, sp. nov. (Plate III, fig. 15.)

Robust, slightly nitid, piceo-niger, legs and antennae piceo-rufous, somewhat unevenly covered with slender brassy squamae, and on the elytra with some erect yellowish setae.

Rostrum one-fifth shorter than thorax, nearly plane above, nude; irregularly, moderately finely, yet distinctly punctured. *Clypeus* rather convex, finely punctate, with erect yellow setae at the apex. *Head* similarly sculptured, with a well-marked elongate interocular fovea, the slender squamae congregated near the eyes. *Thorax* nearly glabrous on the middle, rather broader than long, widest near the middle, obtusely rounded laterally; the discoidal punctuation rather fine but close and slightly rugose, near the sides the punctures are larger and much more distant from each other; it is slightly uneven, on the middle of the apex there is a minute angular excision. *Elytra* ample, widest behind the middle, rather wider than thorax at the base, apices divergent and slightly though definitely protuberant; their whole surface minutely granulate or rugose; they are relatively rather finely striate-punctate, with a very few larger but not deep impressions behind; 3rd interstices obtusely and slightly elevated from base to apex; the 5th also raised, though only from the middle, and becoming plane near the extremity; the sides slightly prominent; on all these the erect setae are more or less concentrated. *Femora* sparingly clothed with slender scales, the tibiae setose. *Scape* subclavate and reddish at the extremity, distinctly punctured, and bearing some yellow setae. *Funiculus* similarly setose, joints 5 and 6 moniliform, 7th transverse. *Club* rufo-fuscous, elongate.

Underside glossy piceous, nearly nude, rather finely and irregularly punctured; basal ventral segment evidently medially incurved behind, the suture between it and the 2nd well marked, 3rd and 4th deeply transversely depressed at the base, 5th emarginate at apex.

This, the largest of the series, may be readily identified by a glance at the subcostate elytral interstices. The deciduous supplementary mandibles are present in the specimen submitted to me.

Length (rost. incl.), 11½ lines; breadth, 4½ lines.

Disappointment Island.

The type is unique, and was returned to Mr. Hudson.

Inocatoptes, Broun, 1901.

Allied to *Catodryobius*, but differing therefrom as follows: —

Eyes transversely oval, not acuminate, their greatest bulk from above downwards. *Mentum* transversely quadrate, curvate and depressed in front. *Ocular lobes* distinct, though not strongly developed. Anterior *coxae* quite contiguous, and extending to the raised and thickened hind margin of the prosternum; there is no such margin in *Catodryobius*, and the coxae are more distant from the base of the prosternum. The *mesosternal process* is broader, and between the intermediate coxae distinctly separated from the obtuse apex of the metasternum; in *Catodyrobius* the metasternum is cariniform there. The *mesosternum* itself is abbreviated so that the middle coxae are almost in contact with the hind margin of the prosternum, whereas in *Catodrybius* it is as long as the metasternum; the intermediate, there-

fore, are far apart from the anterior coxae. The 2nd ventral segment is nearly the length of the 1st, and their suture is well marked and medially curvate.

In the New Zealand list it should be located between *Inophloeus* and *Catoptes*.

Inocatoptes incertus, Broun, 1901.

Subovate, moderately convex, without nodiform elevations, thinly clothed with yellowish slender setiform squamae, which, however, are more numerous on the rostrum and sides of the thorax and elytra ; with the exception of the piceous funiculus, it is almost uniformly castaneo-rufous.

Rostrum rather shorter than thorax, rather flat, with a fine central carina terminating in a small fovea between the eyes. *Scrobes* open above, extending from the apex, where they are deep, towards, but not reaching, the eyes. *Scape* straight, somewhat abruptly clavate at the extremity, and extending beyond the back of the eye. *Funiculus* 7-articulate ; basal 2 joints of equal length ; 3rd obconical, distinctly shorter than the preceding one ; 4–7 moniliform. *Club* elongate, quite half the length of funiculus, triarticulate. *Thorax* one-third broader than long, widest near the front, more obliquely narrowed in front than behind ; its surface uneven, with a median basal and 1 or 2 lateral impressions, its punctuation indistinct, fine, and shallow. *Scutellum* distinct, its apex curvate. *Elytra* oviform, a little wider than thorax at the base ; on each elytron there are 6 series of punctures ; the 4 nearest the suture are finer than the outer 2, and almost form striae ; interstices broad and nearly plane, without distinct sculpture, the 7th from the shoulder backwards, and the 3rd near the apex, more or less convex. *Legs* stout. *Femora* medially dilated. *Tibiae* flexuous and acutely produced at the inner angle. *Corbels* of the posterior simple, concave. *Tarsi* with brushlike soles, 3rd joint expanded and bilobed.

The unique specimen was found on the main island by the Hon. H. C. Butler, and is deposited in the Canterbury Museum.

Length (rost. incl.), 8 lines ; breadth, $3\frac{1}{4}$ lines.

Hab.—Auckland Islands.

HETEREXIS, gen. nov.

Elongate. Rostrum broad, one-third longer than the head but shorter than the thorax, its apex moderately dilated ; the clypeal portion subtriangular, connate, without lateral grooves. *Scrobes* quite apical and open above. *Scape* straight, clavate at extremity, attaining the back of the eye. *Funiculus* 7-articulate, basal 2 joints obconical and only moderately elongate, 1st rather longer than 2nd, joints 3–7 slightly decrease in length, moniliform, 7th quite transverse. *Club* oblong, triarticulate, intermediate articulation quadrate and as long as the basal one, terminal small and conical, and in one appearing to consist of two closely united articulations. *Head* as broad as front of thorax, slightly narrowed anteriorly. *Eyes* widely distant from each other and from the thorax, quite lateral, not quite flat, transversely oval. *Thorax* subquadrate, base and apex slightly emarginate in the middle, without (*H. sculptipennis*) or with feeble (*H. laeviusculus*) ocular lobes. *Scutellum* distinct. *Elytra* oblong, slightly oviform, their shoulders narrow and equal to base of thorax in width, narrowed posteriorly and leaving a portion of the pygidium exposed. *Femora* moderately clavate. *Tibiae* flexuous, incrassate at apex, the anterior

mucronate, and with a second but more minute projection at the apex in front. Posterior *corbels* concave, but without duplicate ciliae or lateral truncature. *Tarsi* with dense brushlike soles; the basal portion of the first 2 joints, however, is glabrous; 3rd joint deeply lobed. *Claws* short and stout. *Prosternum* incurved in front; anterior *coxae* prominent and contiguous. *Abdomen* elongate; 2nd segment about as long as the basal at the sides, its frontal suture quite obsolete in the middle; 3rd and 4th equal, not abbreviated, yet a little shorter than the 2nd; 5th subconical.

From *Catodryobius* it is distinguished by the absence of any distinct mandibular scar, by the entirely different scrobes, transversal eyes, and the partial exposure of the pygidium, this last a very unusual character.

Heterexis sculptipennis, sp. nov.

Elongate, slightly nitid, quite black, legs and antennae piceous; sparsely clothed with depressed slender scales of a yellowish colour, and somewhat concentrated towards the hinder portion of the elytra and there intermingled with setae.

Rostrum about a fourth shorter than thorax, smooth and not in the least carinate along the middle, rather finely and rugosely punctured towards the sides, the triangular clypeus connate but quite definite, with 2 elongate spiniform conspicuous setae in front. *Head* with a shallow, finely punctured, rugose impression close to each eye, and a well-marked elongate central impression, nearly smooth behind. *Thorax* of nearly equal length and breadth; there are 2 median impressions, the frontal one elongate, and 2 near each side, the one nearest the base somewhat rounded, the other more shallow and larger; the areas surrounding these are more closely, but not coarsely, punctured than the middle of the disc; basal margin a little thickened towards each side; it is obviously broader near the front than it is elsewhere. *Scutellum* rounded behind. *Elytra* slightly but quite definitely broader than thorax at the base, oblong, their sides slightly rounded but a good deal narrowed posteriorly and not covering the pygidium; the suture is a little elevated throughout and smooth along its basal half; the 3rd and 5th interstices are costiform near the base but more or less interrupted by transverse impressions further back; they do not extend beyond the top of the posterior declivity; the 7th, which limit the sides, are similarly raised as far as the hind thighs; there are 2 ill-defined striae with coarse irregular punctures between the suture and 3rd interstice on each elytron; the 2nd interstice is divided into short lengths by transverse impressions; the sculpture between the 3rd and 5th and the 5th and 7th is nearly similar, all coarse and ill defined, so as to produce a rough-looking surface. *Femora* much compressed near the base. Anterior *tibiae* rounded at the extremity in front and only slightly angulate at the inner side. There is no trace of *ocular lobes* in this species. The two outstanding duplicate but connate spiniform *setae* at the extremity of the rostrum are remarkable. The *scutellum* is sublunate behind but vertical in front.

Length (rost. incl.), 8 lines; breadth, 3 lines.

Adams Island.

Discovered by Mr. R. Speight. Another specimen, mounted on cardboard, returned to Mr. G. V. Hudson after examination.

Heterexis laeviusculus, Broun, 1901.

Subopaque, rufo-piceous, rostrum and thorax nigrescent; very sparingly clothed with slender decumbent setiform testaceous squamae.

Rostrum nearly plane above, obsoletely carinate, rather finely punctured, more closely at the sides. *Head* finely strigose behind, its punctuation like that of the rostrum, with a linear interocular impression. *Thorax* subquadrate, very slightly narrowed towards the base and apex, uneven above, there being a shallow median impression and 3 more or less transversal ones near each side, its punctuation moderately fine and close. *Scutellum* triangular. *Elytra* oblong-oval, each elytron obtusely tricostate, the intermediate one abbreviated, the others nearly confluent behind; between these there are some ill-defined transverse elevations; the serial punctures, rather fine alongside the suture but coarser beyond, become obsolete behind; their surface more or less minutely sculptured. *Underside* almost smooth. *Head* closely transversely strigose. Basal *ventral segment* broadly impressed; all the segments more or less impressed at the sides, the 5th with some distinct punctures.

The apex of the rostrum bears several setae. The surface is not rough-looking. The pygidium is partly uncovered. The ocular lobes, though feeble, are perceptible, but I cannot conceive their use to an insect whose eyes are situated quite beyond their influence.

♂ ♀. Length (rost. incl.), 9–12 lines; breadth, $3\frac{1}{4}$–5 lines.

Adams Island.

Two specimens were captured by Captain Bollons, of the "Hinemoa," whilst feeding on *Ligusticum antipodum* in January, 1901. The larger specimen, retained in the Canterbury Museum, is probably the female, with very indefinite elytral costae. The genus seems confined to Adams Island.

Group RHYPAROSOMIDAE.

Hycanus, Broun, 1905.

Rostrum rather shorter than thorax, stout, broadest and subpterygiate at the point of antennal insertion—the middle—so that it appears contracted behind; its apical portion smooth and shining, the remainder rugose-punctate. *Scrobes* quite open above in front, directed towards but not quite reaching the eyes. *Mandibles* prominent, laminate. *Eyes* almost rotundate, flat, distinctly faceted, just free from thorax, widely distant from each other. *Antennae* implanted before the middle. *Scape* stout, clavate, attaining the back part of the eye. *Funiculus* longer than scape, basal joint only one-third the length of the scape, 2nd distinctly shorter, joints 3–7 decrease in length, 4–7 moniliform and hardly at all longer than broad. *Club* oval, triarticulate. *Thorax* subcylindric. *Scutellum* obsolete. *Elytra* oblong-oval, wider than thorax at the base. *Legs* of moderate length. *Femora* clavate. *Tibiae* simple, their inner angles not prolonged and acuminate. *Tarsi* rather short, with finely pilose soles, their 3rd joint bilobed, the lobes, however, are short. *Prosternum* moderately incurved. *Ocular lobes* obsolete. Anterior *coxae* prominent and contiguous, intermediate moderately separated, the posterior widely. *Abdomen* elongate; the basal segment at the sides but little longer than the 2nd; 3rd and 4th about a third shorter than 2nd; these and the 2nd with straight sutures; 5th rather long.

With some modifications, the only exponent of this genus might be transformed into a *Clypeorhynchus*. This latter, however, has more slender and much longer antennae; the eyes, instead of being rotundate, are transverse, their greatest

diameter being from above downwards: their 3rd tarsal joint is formed of very elongate and evidently separated lobes; the prosternum is more deeply and abruptly emarginated; the elytra are closely adapted to the thorax, and at the base do not exceed it in width; the rostrum is nearly cylindrical throughout, whereas in *Hycanus* the anterior two-thirds is of oviform outline, and the smooth apical portion is not limited behind by any definite suture.

Hycanus cockaynei, Broun, 1905.

Subovate, slightly convex, opaque; fuscous; apex of thorax, elytral suture, and legs castaneous; antennae rufescent; tarsi testaceous; very sparingly clothed with rather fine short grey setae, on the hind-body, however, many longer erect ones occur.

Rostrum rather coarsely punctate, but smooth, shining, and reddish near the extremity; this part bears a few slender white hairs, but is not marked off from the asperate portion by any basal suture; on the head there is a feeble longitudinal interocular furrow. *Thorax* slightly longer than broad, widest near the front, slightly constricted at apex, gradually narrowed behind; it is not uneven, there being only a short groove in front; its whole surface is densely and minutely sculptured, and the visible punctures are only moderately coarse. *Elytra* oblong-oval, much narrowed posteriorly; they are punctate-striate on the disc; towards the base and sides the punctures are distinct, but the striae are not; the interstices are plane and minutely and closely sculptured. *Antennae* sparsely pubescent.

Underside with a few small grey setae; the prosternum with some coarse shallow punctures, the ventral segments finely sculptured.

Length (rost. incl.), $2\frac{3}{4}$ lines; breadth, $\frac{7}{8}$ line.

Auckland Islands.

Described from one example found amongst moss in July, 1903, by Dr. L. Cockayne, in whose honour it has been named. The specimen was forwarded to me by Professor Chilton.

Hycanus frontalis, sp. nov.

Rostrum longer than thorax, somewhat pterygiate just before the middle, so that the scrobes are open above at that point, its frontal portion deflexed, nearly smooth and shining, almost truncate at apex; its hinder portion distinctly narrowed backwards, the punctuation rather shallow; a triangular impression, with almost carinate borders, occupies most of the basal surface. *Eyes* flat, oblique, with coarse facets. *Thorax* of about equal length and breadth, a little wider before the middle than it is elsewhere, slightly narrower at the front than behind, apex truncate, base submarginated; its surface closely and minutely sculptured, and with rather irregular coarse shallow punctures which are sometimes hidden by sappy matter, the dorsal groove interrupted in the middle and rather broader near the base than in front. *Scutellum* absent. *Elytra* elongate, base obliquely truncate towards the suture, slightly wider than thorax there, shoulders a little rounded, sides nearly parallel, apex considerably narrowed; the entire surface minutely and densely sculptured, and bearing a few erect testaceous setae; they are evidently regularly striate-punctate. *Body* subdepressed, opaque, fuscous, legs and antennae dark-reddish, tarsi paler but somewhat variegate, the deflexed frontal portion of rostrum pitchy-red.

Antennae with a few yellow setae. *Scape* elongate, slender, gradually incrassate towards the extremity. Basal joint of *funiculus* rather longer and stouter than 2nd, 3rd longer than broad, 4–6 beadlike, the others broken off.

Underside slightly nitid, dark reddish-brown, nearly glabrous, there being only a few short slender brassy setae, densely and minutely sculptured, with very few shallow indistinct punctures, head closely and distinctly transversely striate. Epipleurae extremely narrow throughout. Prosternum moderately incurved.

Rather longer than the typical species, the deflexed apical portion of the rostrum slightly longer, and bearing yellow in place of white hairs; the elytra more parallel-sided, with deeper striae; the scrobes deeper and more sharply limited above, and almost extending to the front of the eyes; the scape is rather longer; the tibiae a little flexuous and dilated at the extremity.

Length (rost. incl.), $3\frac{1}{8}$ lines; breadth, 1 line.

Carnley Harbour; under a log.

Another of Mr. Hudson's discoveries. Described from a damaged specimen set out on cardboard.

Stilbodiscus, gen. nov.

Rostrum rather shorter than thorax, stout, slightly arched, subpterygiate near the front, contracted behind, truncate at apex. *Clypeus* short, deeply emarginate, appearing to consist of 2 rounded lobes. *Mandibles* prominent. *Scrobes* quite open and expanded above, beginning near the apex, deep there, but becoming shallow towards the eyes. *Antennae* inserted between the middle and apex of the rostrum. *Scape* very gradually incrassate, attaining the back of the eye. *Funiculus* 7-articulate, basal joint as long as 2nd and 3rd combined, 2nd longer than 3rd or 4th, joints 5 to 7 moniliform. *Club* oval, triarticulate, stout. *Eyes* large, transversely oval, widely distant from each other, just free from thorax. *Thorax* subovate, as long as broad, without ocular lobes. *Scutellum* obsolete. *Elytra* more than twice the length of thorax and rather wider at the base. *Pygidium* slightly exposed. *Legs* moderately elongate. *Femora* medially clavate. *Tibiae* flexuous, the anterior rounded externally at the apex and mucronate inwardly. *Tarsi* setose, 2nd joint transverse, 3rd deeply lobate, the terminal elongate. *Claws* simple. *Prosternum* deeply incurved. The *coxae* prominent and contiguous; intermediate coxae also prominent, nearly approximated; the posterior widely separated. *Abdomen* elongate, its basal segment longer than the metasternum, 2nd as long as 1st at the sides, 3rd and 4th conjointly rather shorter than 2nd but not abbreviate, 5th nearly as long as the preceding 2 taken together, subconical, the supplementary short, with a deep sublunate transverse basal impression.

This genus is distinguished from all its allies by the somewhat shining body, and must be placed between *Hycanus* and the New Zealand *Clypeorhynchus*. From the latter it is differentiated by the structure of the rostrum and antennae, by the absence of ocular lobes, &c. It differs from *Hycanus* in having longer antennae, an unclavate scape, larger and transverse eyes, and elongate lobes to the 3rd tarsal joint; these lobes, in fact, are about as long and slender as in the corresponding joint of *Clypeorhynchus*.

Stilbodiscus setarius, sp. nov. (Plate V, fig. 6.)

Elongate, slightly convex, moderately nitid, castaneo-rufous, tarsi paler; sparingly clothed with short slender depressed, and erect elongate yellowish setae.

Rostrum almost tricarinate, smooth near the apex. *Head* almost as wide as front of thorax, narrowed anteriorly, irregularly sculptured, some of the punctures being relatively coarse, the others fine. *Thorax* widest before the middle, slightly constricted near the apex, very gradually narrowed behind the middle; the disc broadly bi-impressed longitudinally, its punctuation moderately coarse but not close, and rather shallow; its base is truncate. *Elytra* elongate, not closely adapted to the thorax, much narrowed posteriorly, shoulders obtuse; each elytron with 6 series of moderate punctures, the sutural 2 form striae which are deepest near the base; interstices rather broad, minutely sculptured, and slightly rugose.

Underside moderately shining, rufo-castaneous, sparingly punctured, and bearing some yellowish setae. Ventral segments with well-marked sutures.

♂. Length (rost. incl.), $3\frac{3}{4}$ lines; breadth, $1\frac{1}{8}$ lines.

Campbell Island.

One specimen, from the recent collection made by Messrs. W. K. Chambers and F. S. Des Barres, of Gisborne.

Group ERIRHINIDAE.

Erirhinus, Schoenherr.

Antennae inserted near the middle of the rostrum, more or less elongate, slender. *Scape* thickened gradually; 1st and 2nd joints of the *funiculus* elongate, the former the larger, joints 3–7 shorter, obconical. *Club* articulate, oblong-oval. *Rostrum* more or less elongated, cylindrical, slender, arched; its scrobes beginning between the middle and extremity, almost rectilinear, and attaining the eyes. *Eyes* briefly oval, transversal. *Thorax* transverse, usually a little convex, more or less rounded laterally, truncate at base and apex, with feeble ocular lobes. *Scutellum* punctiform or triangular, small. *Elytra* oblong or oblong-oval, narrowed behind, a little wider than the thorax, slightly emarginate at the base. *Legs* of at least moderate length. *Femora* clavate, often almost pedunculate at base, unarmed. *Tibiae* slender, more or less flexuous, mucronate at extremity. *Tarsi* rather long, narrow, spongy underneath, 3rd joint distinctly broader than 1st or 2nd, 4th moderate, likewise the claws. 2nd abdominal *segment* as long as 3rd and 4th taken together, separated from the 1st by a nearly straight suture. *Intercoxal process* rather wide, rounded or angulated in front. *Metasternum* more or less elongate. *Body* oblong or oval, generally densely pubescent.

Dorytomus, Germar, is considered synonymous by many European entomologists; it is without ocular lobes, but the femora are dentate below.

Erirhinus dracophyllae, sp. nov. (Plate III, fig. 6.)

Elongate, subovate, slightly nitid, fulvescent, elytra testaceous; pubescence scanty, greyish, slender, and inconspicuous.

Rostrum arched, slender, very elongate, about as long as the elytra; longitudinally grooved, with a series of punctures across the extremity. *Mandibles* prominent, bifid at apex. *Head* rotundate, globose underneath. *Eyes* subrotundate,

distinctly faceted, situated close to the base of the rostrum and just free from the thorax. *Scrobes* extending from the middle of the rostrum to the eyes. *Scape* elongate and slender, attaining front of eye. *Funiculus* 7-articulate, basal joint nearly twice as long and stout as 2nd, 3–7 become shorter and thicker, 7th evidently larger than 6th. *Club* oblong-oval. *Thorax* transverse, its sides rounded, somewhat constricted in front, moderately closely and distinctly punctured. *Scutellum* small. *Elytra* wider than thorax at the base, oblong, narrowed posteriorly, regularly punctate-striate. *Femora* angulate and dentate underneath. *Tibiae* a little flexuous, mucronate at the extremity. *Tarsi* finely hispid below, 3rd joint broadly lobed. *Claws* thickened near the base.

Underside sparsely pubescent, finely punctate. Metasternum moderately elongate, longitudinally grooved in the middle. 2nd ventral segment but little longer than 3rd or 4th.

Length (rost. excl.), $1\frac{1}{4}$ lines; breadth, $\frac{1}{2}$ line.

Auckland Islands.

Taken off *Dracophyllum* by Mr. Hudson. Distinct from our New Zealand species.

PACTOLOTYPUS, gen. nov.

Body compact, subovate, moderately convex. *Rostrum* rather shorter than thorax, slightly contracted before the middle. *Scrobes* deep, oblique, beginning near the apex and extending to the underside half-way to the eyes. *Scape* rather slender, somewhat incrassate near the extremity, it attains the back of the eye. *Funiculus* 6-articulate; basal joint large, slender at base, clavate at apex; 2nd of similar form, but very much more slender; 3–6 small, moniform, 6th a little larger than the preceding one. *Club* moderately large, ovate, triarticulate. *Head* as wide as front of thorax, quite half its length. *Eyes* distant from thorax and each other, lateral, prominent, distinctly faceted, subrotundate. *Thorax* subcylindric, base and apex truncate, without ocular lobes. *Scutellum* small or indistinct. *Elytra* less than twice the width of the thorax at the base, ovate, shoulders not prominent. *Legs* moderately elongate, stout. The 2 front pairs of *femora* simple; the posterior long, strongly clavate towards the extremity, angulate and strongly spiniform underneath. *Tibiae* flexuous, the posterior very much so, all unarmed. *Tarsi* with pilose soles, 3rd joint cleft to the base, its lobes expanded and divergent. *Claws* subdentate. *Prosternum* emarginate in front. Anterior *coxae* prominent and contiguous; intermediate moderately, the posterior widely, separated. *Abdomen* elongate; basal 2 segments very large, seemingly connate, without any distinct suture; 3rd and 4th short, with deep sutures.

This genus is closely related to the New Zealand *Pactola;* in fact, on a superficial examination the type appears almost identically the same as the smaller and narrower species, *Pactola demissa*. *Pactolotypus* is, however, essentially different in some respects. The funiculus has only 6 joints instead of 7, the humeral angles are narrow and rounded in place of being broad, there is no well-marked suture between the basal 2 ventral segments, &c.

Pactolotypus striatus, sp. nov. (Plate V, fig. 5.)

Small, opaque, piceous; the antennae and base of hind thighs testaceous or castaneo-rufous, legs infuscate; covered with erect grey setae and small variegated

squamae, chiefly fuscous, the middle of thorax and elytra sometimes fusco-testaceous, the elytra in some cases irregularly maculate, near the apices especially.

Rostrum nearly as broad as the head, slightly asperate. *Thorax* slightly narrowed anteriorly, with a small indistinct tubercle near the middle, closely punctate. *Elytra* moderately convex, their sides only a little rounded, a good deal narrowed posteriorly but little wider than thorax at the base, evidently punctate-striate. *Legs* more or less variegate. Front *tibiae* usually testaceous; they bear slender scales and setae.

Underside subopaque, rufo-piceous, scantily clad with short slender grey setae; abdomen finely, distinctly, but not closely punctured.

Length (rost. excl.), 1¼ lines; breadth, ½ line.

Auckland Islands.

I am indebted to Mr. Hudson for my three specimens of this interesting little weevil.

Group CRYPTORHYNCHIDAE.

Acalles, Schoenherr.

Rostrum rather long, more or less robust, slightly widened apically. *Scrobes* beginning at or beyond the middle, rectilinear. *Antennae* moderate, more or less robust. *Scape* clavate, reaching the eye. 1st and 2nd joints of *funiculus* elongate, the others somewhat rounded and compact. *Club* oblong-oval, obtuse, articulate. *Eyes* more or less strongly faceted, large, subdepressed, triangular, acuminate below. *Thorax* transversal or not, more or less convex, laterally rounded, moderately projecting in front, with feeble lobes, truncate or slightly bisinuate at base. *Scutellum* none. *Elytra* convex, ovate or oblong-oval, wider than thorax, narrowed at base, truncated. *Legs* usually robust. *Femora* gradually incrassated. *Tibiae* straight, compressed, uncinated. *Tarsi* rather short, moderately dilated, spongelike below, 1st joint elongate, 4th rather large, as are its claws. *Pectoral canal* short. *Body* oblong-oval, unequal.

Acalles piciventris, sp. nov.

Minute, elongate, subovate; rufo-piceous, covered with depressed scales and coarse erect setae, antennae dark red, tarsi dark infuscate red.

Rostrum shorter than thorax, moderately broad, very slightly and gradually narrowed medially, squamose near the base, a little shining and apparently smooth in front. *Scape* gradually thickened, barely reaching the eye. *Funiculus* 7-articulate, basal joint much longer and stouter than 2nd, joints 4–7 beadlike. *Club* ovate and pubescent. *Thorax* rather longer than broad, rounded behind the middle, where it is widest, more but not abruptly narrowed anteriorly than behind; somewhat flattened along the middle, and broadly but not deeply depressed near the front; its surface closely and, in proportion to its small size, coarsely punctured; there are no crests, but the apex is obtusely rounded over the head. *Scutellum* apparently absent. *Elytra* suboblong, a little wider than thorax at the base, their sides very little rounded, a good deal obliquely narrowed behind, posterior declivity forming a rather long slope; they are rather deeply punctate-striate, the coarse erect setae follow the course of the interstices. *Legs* stout, covered with squamiform greyish setae. *Tarsi* setose, their 3rd joint broadly bilobed, the terminal stout.

Underside piceous, distinctly but not closely punctured. Basal ventral segment larger than 2nd, 3rd and 4th abbreviated, with deep straight sutures, and apparently glabrous. Pectoral canal deep, its hind margin not elevated in line with the back part of the intermediate coxae. Metasternum short and plane, medially incurved behind.

The vestiture is obscure grey or yellowish-grey.

Length (rost. excl.), $\frac{7}{8}$ line; breadth, $\frac{3}{8}$ line.

Auckland Islands.

Two examples, from Mr. Hudson.

PACHYDERRIS, gen. nov.

Allied to *Acalles*, but differing somewhat in form and structure.

Scutellum distinct. *Pectoral canal* limited behind by the raised borders of the mesosternum, and extending as far as the middle of the intermediate coxae. *Metasternum* short, medially depressed. *Abdomen* elongate; basal segment elongate, one-third longer than 2nd; 3rd and 4th not abbreviated, each shorter than the 2nd; suture between the basal 2 truncate. *Legs* long and slender. *Tibiae* with well-developed terminal hooks. *Tarsi* slender and elongate, their basal joint rather longer than the terminal one, not at all spongelike underneath, being clothed with fine yellow hairs, 3rd joint bilobed. *Rostrum* elongate, gradually narrowed towards the middle. *Thorax* obtusely prominent, its sides, in front, incurved, but becoming prominent and ciliate lower down so as to form ocular lobes; it is truncate at the base.

Pachyderris punctiventris, sp. nov.

Convex, opaque, densely covered with blackish depressed squamae, and scattered erect griseous squamiform setae; legs and rostrum piceo-rufous.

Rostrum a little nitid, rather longer than thorax, finely yet distinctly and moderately closely punctured, but with the linear space along the middle smooth. *Head* globose. *Thorax* as long as broad, gradually narrowed anteriorly; punctate and squamose, and bearing many erect yellowish-grey squamiform setae; it is somewhat transversely depressed in front, on the middle some infuscate squamae are concentrated but do not form crests. *Elytra* closely adapted to base of thorax, with oblique shoulders, so that the base does not exceed that of the thorax; they are gradually narrowed backwards from the hind thighs, so that the apex is only half the width of the basal half; posterior declivity not vertical; they are apparently punctate-striate near the suture, and are indistinctly and irregularly crested, so that any description of one elytron would not be applicable to the other so far as the basal part is concerned, but two spaces, one near the base, the other in front of the declivity, are intensely black, the last has a small yellowish tuft at each side, just on top of the declivity the suture is nodiform; their sides are nearly vertical. *Legs* long and slender, variegated, rufescent and piceous, with coarse greyish setae. *Antennae* medially inserted. *Scape* rather slender, just attaining the eye. *Funiculus* longer than scape, 7-articulate, basal 2 joints of nearly equal length, 3rd oval, 4–7 small, the last larger than 6th. *Club* oval, articulate. *Scrobes* lateral, deep throughout, sharply limited above and below. *Eyes* subroundate.

Length (rost. excl.), $2\frac{1}{4}$ lines; breadth, 1 line.

Carnley Harbour.

The specimen is unique. It is another of Mr. Hudson's captures.

EXPLANATION OF PLATE V.

[I am indebted to Mr. Albert Waterworth, of Auckland, for preparing the micro-photos. All are magnified. It must be understood that it is almost impossible to get every part of an opaque convex insect into focus at once. The specimens were preserved in alcohol, which made the mounting of them on cardboard in anything like natural positions an extremely difficult operation.]

Fig. 1. *Synteratus ovalis*, Broun.
Fig. 2. *Kenodactylus capito*, Broun.
Fig. 3. *Oopterus marrineri*, Broun.
Fig. 4. *Loxomerus fossulatus*, Broun.
Fig. 5. *Pactolotypus striatus*, Broun.
Fig. 6. *Stilbodiscus setarius*, Broun.
Fig. 7. *Baeostethus chiltoni*, Broun.
Fig. 8. *Pseudhelops quadricollis*, Broun.

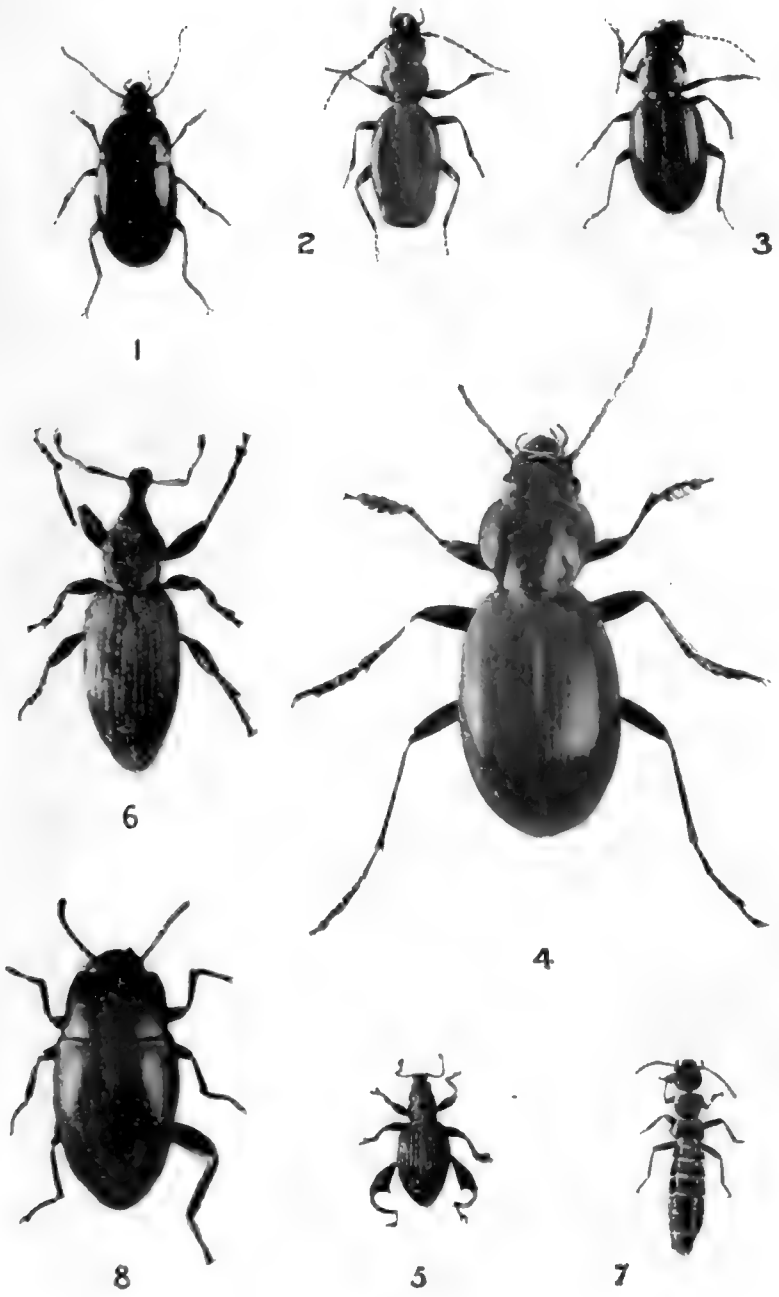


PLATE V.

ARTICLE VII. -THE DIPTERA OF THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By C. G. Lamb, M.A., B.Sc., Clare College, Cambridge.

SIMULIIDAE.

Simulium, Ltr.

* *Simulium vexans*, Mik. Verh. Z.B. Ges. Wien, xxi, 201 ; also, T.N.Z.I., xxxiv, 169.
Campbell Islands, *l.c.* ; * Auckland Islands.

LIMNOBIIDAE.

Dicranomyia, Steph.

Dicranomyia insularis, Mik. Verh. Z.B. Ges. Wien, xxi, 195 ; also, T.N.Z.I., xxxii, 50.
Auckland Islands, *l.c.*

Dicranomyia kronei, Mik. Verh. Z.B. Ges. Wien, xxi, 195 ; also, T.N.Z.I., xxxii, 50.

* *Dicranomyia annulata*, sp. nov.
* Auckland Islands.

Limnophila, Mcq.

Limnophila bryobia, Mik. Verh. Z.B. Ges. Wien, xxi ; also, T.N.Z.I., xxxii, 50.
Auckland Islands, *l.c.*

Trichocera, Mg.

Trichocera antipodum, Mik. Verh. Z.B. Ges. Wien, xxi ; also, T.N.Z.I., xxxii, 50.

Zaluscodes, gen. nov.

* *Zaluscodes aucklandicus*, sp. nov.
* Auckland Islands.

RHYPHIDAE.

Rhyphus, Ltr.

* *Rhyphus undulatus*, sp. nov.
* Auckland Islands.

STRATIOMYIDAE.

Beris, Ltr.

Beris micans, Hutton. T.N.Z.I., xxxiii, 6.
The Snares, T.N.Z.I., xxxiv, 169.

EMPIDAE.

Empis, L.

* *Empis smithii*, Hutton. T.N.Z.I., xxxiii, 30. (See Plate III, fig. 9.)
* Auckland Islands.

DOLICHOPIDAE.

Schoenophilus, Mik.

* *Schoenophilus pedestris*, sp. nov.
* Macquarie Islands.

Aphrosylopsis, gen. nov.

* *Aphrosylopsis lineatus*, sp. nov.
* Bounty Islands.

SYRPHIDAE.

Syrphus, F.

* *Syrphus novae-zealandiae*, Mcq. Dipt. Ex. Suppl. 5, 115; also, T.N.Z.I., xxxiii, 40.
* Auckland Islands; * Campbell Islands.

Helophilus, Mg.

* *Helophilus campbellicus*, Hutton, T.N.Z.I., xxxiv, 170.
Campbell Islands, *l.c.*; * Auckland Islands.

* *Helophilus interruptus*, sp. nov.
* Campbell Islands.

MUSCIDAE.

Calliphora, Dsv.

* *Calliphora quadrimaculata*, Swederus. Nya Handling, viii, 289, No. 49 (1787); also, T.N.Z.I., xxxiii, 64.
* Auckland Islands, T.N.Z.I., xxxiv, 170.

* *Calliphora icela*, Wlk. Cat. Dip. B.M. 897; also, T.N.Z.I., xxxiii, 65.
* Auckland Islands, T.N.Z.I., xxxiv, 170.

* *Calliphora eudypti*, Hutton. T.N.Z.I., xxxiv, 170.
The Snares, Auckland and * Campbell Islands, *l.c.*

Calliphora antipodea, Hutton, T.N.Z.I., xxxiv, 171.
Antipodes Islands, *l.c.*

Calliphora cockaynei, Hutton, T.N.Z.I., xxxvi, 155.
Campbell Islands, *l.c.*

* *Calliphora flavipes*, sp. nov.
* Auckland Islands.

ANTHOMYIIDAE.

Limnophora, Dsv.

* *Limnophora aucklandica*, Hutton. T.N.Z.I., xxxiv, 172.
* Auckland Islands, *l.c.*

* *Limnophora lasiophthalma*, sp. nov.
* Auckland Islands.

Paralimnophora, gen. nov.

* *Paralimnophora depressa*, sp. nov.
* Antipodes and * Enderby Islands.

* *Paralimnophora indistincta*, sp. nov.
* Enderby Island.

Melanochila, Rnd.

* *Melanochila insularis*, sp. nov.
* Campbell Islands.

Trichopticus, Rnd.

* *Trichopticus villosus*, Hutton. T.N.Z.I., xxxiv, 171.
* Auckland Islands, *l.c.*

* *Trichopticus curvipes*, sp. nov.
* Auckland Islands.

Homalomyia, Bouché.

Homalomyia fraxinea, Hutton. T.N.Z.I., xxxiii, 74.
Auckland and Antipodes Islands, T.N.Z.I., xxxiv, 172

Homalomyia fuliginosa, Hutton. T.N.Z.I., xxxiii, 75.
The Snares, T.N.Z.I., xxxiv, 172.

Coenosia, Mg.

* *Coenosia filipennis*, sp. nov.
* Campbell Islands.

* *Coenosia fumipennis*, sp. nov.
* Campbell Islands.

PHYCODROMIDAE.

Coelopa, Mg.

Coelopa littoralis, Hutton. T.N.Z.I., xxxiii, 80.
Auckland and Campbell Islands, T.N.Z.I., xxxiv, 172.

Coelopa curvipes, Hutton. T.N.Z.I., xxxiv, 172.
Auckland Islands, *l.c.*

Coelopa rufa, Hutton. T.N.Z.I., xxxiv, 173.
The Snares, *l.c.*

* *Coelopa debilis*, sp. nov.
* Campbell Islands.

* *Coelopa nigrifrons*, sp. nov.
* Macquarie Islands.

ICARIDION, gen. nov.

* *Icaridion nasutum*, sp. nov.
* Campbell Islands.

BAEOPTERUS, gen. nov.

* *Baeopterus robustus*, sp. nov.
* Campbell and Ewing Islands.

HELOMYZIDAE.

ALLOPHYLOPSIS, gen. nov.

* *Allophylopsis punctata*, sp. nov.
* The Snares.

HETEROMYZA, Fln.

Heteromyza laquei, Hutton. T.N.Z.I., xxxiv, 173.
The Snares, *l.c.*

DRYOMYZIDAE.

POLYTOCUS, gen. nov.

* *Polytocus spinicosta*, sp. nov.
* Auckland Islands.

LONCHAEIDAE.

LONCHAEA, Fln.

Lonchaea aucklandica, Hutton. T.N.Z.I., xxxiv, 173.
Auckland Islands, *l.c.*

SAPROMYZIDAE.

LAUXANIA, Ltr.

Lauxania carbonaria, Hutton. T.N.Z.I., xxxiv, 173.
Auckland Islands, *l.c.*

DROSOPHILIDAE.

DROSOPHILA, Fln.

Drosophila enderbii, Hutton. T.N.Z.I., xxxiv, 174.
Enderby Island, *l.c.*

MILICHIDAE.

Milichia, Mg.

Milichia littorea, Hutton. T.N.Z.I., xxxiv, 174.
Antipodes Islands, *l.c.*

AGROMYZIDAE.

Agromyza, Fln.

Agromyza australiensis, Mik. Verh. Z.B. Wien, xxxi, 202; also, T.N.Z.I., xxxiii, 93.
Auckland Islands, *l.c.*

Ochthiphila, Fln.

Ochthiphila australis, Hutton. T.N.Z.I., xxxiv, 174.
Campbell Islands, *l.c.*

List.—The list of species includes those hitherto recorded from these subantarctic islands, together with those now described in this paper. The former records were partly obtained from Hutton's list (Index Faunæ N.Z., 1904) and partly from the "Zoological Record." A certain number of the specimens sent belonged to species already described, and these are marked in the list by an asterisk (*), which mark is also put against new localities for previously recorded species. The new genera and species are also indicated.

Material.—Many of the specimens were well pinned and set, but a considerable proportion were in tubes, being preserved in spirit. When this is the case it is mentioned in the description. In the case of *Diptera*, spirit specimens are very unsatisfactory: they cannot be dealt with in the wet state, as the hairs and other structures are matted up, and when dried a considerable and unequal amount of contraction takes place. With such a specimen, while it is often fairly easy to decide on the generic relationships, the specific details are usually difficult to make out. Further, it is practically impossible to make drawings from such specimens, owing to the resulting distortion. All *Diptera* should be taken in an ordinary killing-bottle, and pinned on small papered cork blocks. For this purpose only silver pins should be used, or pins containing but little alloy, as otherwise the pins corrode, in some families with considerable rapidity. If sufficient specimens are taken, it is desirable to have at least one specimen of each sex pinned with the ventral surface upwards. In the case of a single specimen of a species, the most useful method is, however, to pin the insect on its side, the pin passing through the thorax just below the wing-insertion; the legs should be prevented from contracting together by the insertion of one or two ordinary small pins, which can be removed when the insect is dry. A specimen pinned in this way suffers less damage to many important details of thoracic chaetotaxy, &c., than when pinned in any other manner, and is quite useful for purposes of study.

It is evident from the nature of the species sent that the collecting of the same was almost entirely confined to the coast. In view of the interest of the species

obtained from such a small and localised part of the total area, it is very important that the interior-dwelling forms be collected in the larger islands. Immigrant forms will, doubtless, be introduced to some extent, and the alteration of the natural conditions will cause considerable disturbance to the local species. Many species of *Diptera* are extraordinarily local in their distribution, being sometimes confined to a few square yards of favourite locality, and such localities are readily destroyed. The coast forms are likely to be far less affected by settlement and cultivation than the inland ones, and hence attention should be at once paid to the latter.

Aetiology.—A remarkable feature of the collections was the abnormal number of species with reduced wings. This is probably due in part to the method of collection, which would most likely favour the capture of species which were unable to fly. It is, however, a feature in the *Diptera* of the southern islands. From Kerguelen Island we have had species described by Mr. G. H. Verrall (Phil. Trans. R.S.L., extra vol., 1878) with greatly reduced wings. These belong to various families—*Calycopteryx moseleyi* to the *Micropezidae*, *Amalopteryx maritima* and *Apetenus litoralis* to the *Ephydridae*, and *Anatalanta aptera* to the *Borboridae;* the latter is quite devoid both of wings and halteres. Becker has also recently described a *Scatophila* (*Ephydridae*), in the "Reports of the Swedish Antarctic Expedition," which has greatly reduced wings. In the present paper species of reduced size are described belonging to the families *Dolichopidae*, *Anthomyiidae*, and *Phycodromidae*. Additional evidence is thus present for the correlation of this condition with the existence of a very windy climate.

The genera of *Diptera* are very cosmopolitan in their distribution, and, furthermore, collections of them are but scanty both in numbers and in material; hence it is not possible at present to draw any conclusions as to the regional relationships of the species considered in this paper.

My thanks are due to the following gentlemen for their kind help in regard to certain critical points: Professor P. Stein, of Treptow, Pomerania; Mr. G. H. Verrall, F.E.S.; and Mr. J. E. Collin, F.E.S., of Newmarket, England.

DESCRIPTIONS OF NEW SPECIES.

LIMNOBIIDAE.

DICRANOMYIA, Stephens. Cat. of Brit. Ins., ii, 243 (1829).

Dicranomyia annulata, sp. nov.

A pair belonging to this genus was sent from the Auckland Islands. They are very much like the common European species, *D. chorea*, and do not agree with the description of any of the forms hitherto noted from the Antarctic islands.

Length.—Body, 8 mm.; wing, 9 mm.

The *heads* are shrivelled, but apparently offer no particular characters.

Wings.—A spot on the praefurca at its origin. The stigmatical spot present, and just fills the space from the marginal cross-vein to the forking-point of the radial vein. The origin of the radial vein is slightly behind the end of the mediastinal. The subcostal cross-vein is indistinct, and is just perceptibly before the origin of the radial vein. The discal cell is closed. The veins have minute bristles, which are most evident on the radial vein.

The *body* is ochreous-brown, with the abdomen annulate in brown and yellow. This is most striking with no magnification. We can also express it by saying that the ground-colour is yellow-brown with a broad brown hind border to each segment.

The male has a pair of large fleshy yellow forceps.

The *legs* are yellowish, with the last tarsal joints very slightly infuscate.

HAB.—Auckland Islands.

TYPES.—Cambridge Museum.

ZALUSCODES, gen. nov.

Wings much abbreviated, with no distinct veins. *Antennae* with 16 joints. *Palpi* with 4 joints, the last orbicular and attached to the side of the small 3rd joint (see fig. 1). Tibial spurs present on all the legs.

FIG. 1.—PALP.

In the "Zoologischer Anzeiger," band xxix (1905–6), p. 69, the genus *Zalusa* was established by Dr. Enderlein for a Limnobiid with abbreviated wings which was obtained from the Falkland Islands. Among the insects sent for examination was a pair of another Limnobiid, also with shortened wings; but it was felt necessary to make a separate genus for the species. The differences between *Zalusa* and *Zaluscodes* are as follows:—

Zalusa.	*Zaluscodes.*
Antennae, 14-jointed.	Antennae, 16-jointed.
Wings about length of thorax, with well-defined veins.	Wings about half length of thorax, with no recognisable veins.
Tibial spurs absent.	Tibial spurs present.

The male genitalia appear to be somewhat as shown for *Zalusa* in Dr. Enderlein's paper, but the specimen was not in such condition as to make an exact comparison possible.

The female of *Zalusa* is not known. In *Zaluscodes* the female is provided with a well-developed ovipositor, which is larger in proportion than is the case in Limnobiids in general.

Zaluscodes aucklandicus, sp. nov. (Plate IV, fig. 1.)

Length.—About 5 mm.

MALE.—Uniformly yellow-brown, with the exception of the last joint of the palpi, which is blackish-brown, and the last tarsal joints, which are somewhat suffused with black.

Head.—Nearly circular in side profile, with bare circular eyes, whose diameter is about 0·6 of the vertical depth of the head.

Proboscis.—Truncated, conical in form, about half as long as the depth of the head. *Antennae:* 1st joint somewhat strap-like; 2nd, spherical, with a diameter about twice that of the flagellar joints; 3rd, pyriform; 4th to 16th, nearly orbicular at first, and becoming somewhat more elongate towards the tip, each joint provided with a few hairs; length, about 1 mm. (see fig. 2).

FIG. 2.—ANTENNA.

Wings.—Greatly abbreviated, about $\frac{1}{2}$ mm. in length and $\frac{1}{10}$ mm. broad. No veins present, but a slight thickening along the central axis of the wing. No bristles present, except a few hairlike ones scattered along the inner margin (see fig. 3).

Fig. 3.—Wing.

Legs.—Clothed with uniformly distributed and somewhat adpressed black hairs. Tibiae slightly darkened at the tip and the tarsi on the last joints. Each tibia has a pair of short but fairly stout pale spurs.

Abdomen.—Clothed with fairly uniformly distributed pale hairs. Genitalia clubbed, and apparently similar in general form to those of *Zalusa*.

Female.—Similar to the male, except as follows: The hairs on the *legs* are somewhat longer and not adpressed. *Abdomen* piceous, and provided with a well-developed sabre-like ovipositor about $\frac{3}{4}$ mm. long. The breadth of the latter, viewed from the side, is nearly constant for about one-third of its length, and then suddenly diminishes, tapering thence to the end (see fig. 4). It has a few scattered hairs on the basal half.

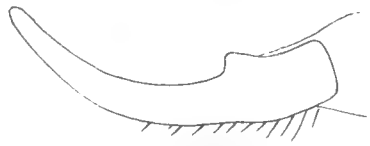


Fig. 4. Ovipositor.

Hab.—Auckland Islands.

Type.—Cambridge Museum.

RHYPHIDAE.

Rhyphus, Latreille. Hist. Nat. Crust. et Ins., xiv, 291 (1804).

Rhyphus undulatus, sp. nov.

Two specimens, sent by Mr. Hudson.

Size.—Body, 7 mm.; wing, 8 mm.

This is a more robust and larger species than *R. neozealandicus*. The main points of difference are as below:—

Antennae black, with brown basal joints, instead of yellow with black tips.

Thorax blackish, with 2 yellowish somewhat indistinct stripes extending from the base of the wings to about the humeri; also 2 very narrow dorsal stripes joined in front to the first two stripes.

Abdomen black, mottled with complex yellow markings.

Wings.—The 2nd vein bent up sharply to the costa; the 3rd more undulated than in *R. neozealandicus*, thicker than in that species. The stigma is confined to the distal half of the shorter radial cell, instead of filling it wholly. The wings are very like these of the common British *R. fenestralis*. The difference between the wings of *R. neozealandicus* and *R. undulatus* is shown below (figs. 5 and 6.)

Fig. 5.—Wing of *Rhyphus undulatus*.

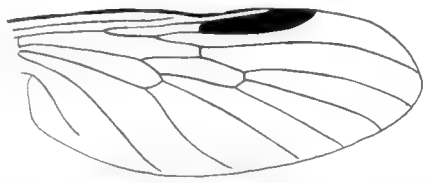


Fig. 6.—Wing of *Rhyphus neozealandicus*.

Legs yellow, with the knees and tips of the hind tibiae narrowly blackened; last tarsal joints blackish.

HAB.—Carnley Harbour, Auckland Islands.

TYPE.—Cambridge Museum.

DOLICHOPIDAE.

SCHOENOPHILUS, Mik. Dept. Untersuch., 9 (1878).

Two specimens are referable to this genus. They were collected by Mr. Hamilton in 1894 at the Macquarie Islands.

Schoenophilus pedestris, sp. nov.

The size is about the same as the European species *S. versutus*—namely, about 2½ mm. The wings are, however, reduced to very narrow linear strips. Owing to the specimens having been preserved in spirit, it is impossible to give any figures, as they have shrivelled up too much. The wingless condition would in all probability be sufficient for diagnosis.

HAB.—Macquarie Islands.

TYPE.—Cambridge Museum.

Two specimens of a Dolichopid from the Bounty Islands were among the spirit specimens sent. They were both in somewhat bad condition, the wings being crumpled, and one being devoid of a head. The nearest genus to which they can be referred is *Aphrosylus* (Walk.). This genus has a 3rd joint of the antennae conical in form, with a terminal arista, and the palpi are spatulate in form and hang free, so that the insect has the power of moving them laterally with a vibratory motion. The insect under consideration has a close general relation to a large *Aphrosylus*, but differs in the antennal arista and the palpi.

APHROSYLOPSIS, gen. nov.

Of the general form and characters of *Aphrosylus* (Walk.), including the absence of any achrostical bristles, and the possession of hairy eyes.

The following are the chief points of difference:—

Antennae.—Oval 3rd joint with a somewhat acuminate end. Arista inserted dorsally about half-way down the joint, and somewhat thickened at the base, and bent.

Mouth produced below the eyes; the *palpi* lie along the stout proboscis, and are attached by a broad base, and have a rounded tip.

The *wings* are much as in *Aphrosylus*, but could not be well examined owing to their being much crumpled up. The *eyes* are thickly covered with short silky hairs, and the *thorax* is quite devoid of achrostical bristles. The hind *tibiae* have a dorsal row of fine bristles.

Aphrosylopsis lineatus, sp. nov.

Only the salient points can be given, owing to the effect of the spirit used for preservation.

Thorax.—Ground-colour brown, with a central grey stripe. This is narrow in front, but broadens out in a trumpet-shape to the scutellum. This stripe is bordered along the stalk of the trumpet by a narrow dark-brown line. Pleurae dark grey. *Scutellum* grey, like the stripe. *Halteres* yellow.

Abdomen greyish-green.

Legs black, except the tips of all the knees, which are narrowly reddish.

The genitalia in *Aphrosylus* differ considerably with the species. The present insect has small outer lamellae, which are subtriangular in form; the inner are much chitinized, and are larger than the outer pair.

Hab.—Bounty Islands.

Type.—Cambridge Museum.

SYRPHIDAE.

Some specimens belonging to the genus *Syrphus* were sent both from Carnley Harbour and from Campbell Island. All these can be fairly referred to the species *S. novae-zealandiae*. It is impossible to be sure of the limits of species in such a difficult genus as *Syrphus* without a good deal of material, and in the absence of this it seems best to put all the species sent under the above name.

Helophilus, Meigen. Syst. Besch., iii, 368 (1822).

Helophilus interruptus, sp. nov.

A female specimen of the above genus was collected by Messrs. Des Barres and Chambers at Campbell Island. It is superficially very like a rather small *H. trilineatus*. The points of difference are tabulated below :—

trilineatus, ♀	*interruptus*, ♀
A pronounced facial tubercle.	No real tubercle; the whole face is formed of a rounded swelling.
Thorax of a grey ground-colour, with 3 broad black stripes.	The ground-colour yellow-grey, with 3 broad black stripes, the centre one having a median grey line not extending to the ends of the black one.
Front tibiae yellow.	Front tibiae yellow, with a black ring at the end.
Hind femora rufous inside and on the distal half outside.	Hind femora all black.
Hind tibiae orange, with dark-rufous base.	Hind tibiae black, with broad yellow central band.
Wing-veins yellow-brown.	Wing-veins black, and slightly infuscate.
Discal cross-vein oblique, and somewhat S-shaped.	Discal cross-vein oblique, but only bent where it is crossed by the vena spuria.
No stigmatic colour.	Well-marked black stigma.

Hab.—Campbell Islands.

Type.—Cambridge Museum.

MUSCIDAE.

CALLIPHORA, Robineau-Desvoidy. "Essai sur les Myodaires," 433 (1830).

Among the specimens of this genus was one which was well marked off from the other New Zealand species by its completely yellow legs.

Calliphora flavipes, sp. nov.

Size.—Length, 9 mm.; wing, 8 mm.

Head.—Frons black, with lighter eye-margins; facial ridges and a short stripe under the front part of eye dusky orange; jowls black. *Eyes* bare. *Antennae* with the basal joints orange, the 3rd joint dark testaceous, but lighter on the inner side.

Thorax blackish, with no distinct stripes. The prothoracic and metathoracic stigmata with the usual bright-orange spots.

Wings pellucid, slightly suffused with yellow at the base; veins yellow at the base, darker at the tip; the usual yellow scales at the base of the wing. The bend of the 4th vein is only slightly curved; the hind cross-vein moderately undulated. *Halteres* orange. *Squamae* yellow-brown.

Legs.—All the joints of all the legs are orange, but the last tarsal joints are very slightly darkened.

Abdomen.—The basal segment is concolorous with the thorax; the other segments are dark violet.

HAB.—Carnley Harbour.

TYPE.—Cambridge Museum.

ANTHOMYIIDAE.

Among the specimens sent, two were referred with more or less certainty to the species *Trichopticus villosus* and *Limnophora aucklandica* of Hutton. With one exception, it seemed at present best to place the other specimens under the genera as recognised by Hutton. In some cases, however, the species do not satisfactorily fall in line with the European forms usually placed in the genera, and there can be little doubt that when the *Diptera* of New Zealand and the subantarctic islands are more fully known some of the present species will have to be placed in new genera. It is necessary, however, to have a much larger amount of material at disposal before the limits of the New Zealand insects can be made out.

LIMNOPHORA, Robineau-Desvoidy. "Essai sur les Myodaires," 517 (1830).

The species of this genus should have bare eyes, but among the insects sent were two species from the Auckland Islands which had respectively slightly pubescent and very hairy eyes. These were sent to Professor Stein, who is of opinion that they, nevertheless, are members of the genus. The species with only slightly pubescent eyes is rather rubbed, but in most respects it agrees very well with the description of Hutton's species *L. aucklandica*. In the description of that species the eyes are said to be bare, but in the specimen under consideration the pubescence is slight, though definite. In default of more and better material it seems best to refer this specimen to that species.

The second species is much like an ordinary form of the genus, except for the hairy eyes. It is proposed to make the following species for the specimens, which are one male and two females. As the species of this genus are moderately sexually dimorphic, the descriptions of the sexes are given separately.

Limnophora lasiophthalma, sp. nov.

Size.—Body, about 6 mm.; wing, about 5½ mm.

MALE.—*Head.*—Vertex and frons narrow, more than is usual in the genus; black. The face in profile is conical from the side view, and is a very little hollowed out between the end of the frons and the mouth-margin. Cheeks black from a side view, with golden reflections on front view. Face and jowls silvery-grey. *Antennae* black, the 3rd joint long with subparallel sides and a slightly rounded end to the same. Arista evidently pubescent, especially on the basal half. *Palpi* black. *Eyes* normal in shape for the genus, but closely and thickly covered with fine yellow hair.

Thorax and scutellum black, with a bluish tone; an indistinct and irregular silveriness or sheen extends from the humeri to the wing-base.

Abdomen.—Basal segment black. The 2 middle segments with a greyish-yellow ground-colour and a pair of slightly indistinct spots on each; these spots are roughly trapezoidal in form. The hind boundary is formed by the hind margin of the segment, and extends from near the centre line of the abdomen to slightly before the edge of the same. The front boundary of the spot is formed by the front margin of the segment, and extends from near the centre line, but only a short distance along the segment. The other two boundaries (across the abdominal segment) are as follows: The inner one is straight, so that between the pair of spots the ground-colour shows as a somewhat indistinct straight line; the outer boundary is an undulated line passing from the front edge of the segment to the back edge. The terminal segments have on them two indistinct black spots.

Legs black, with the usual stout bristly fringe on the lower side, and large yellow foot-pads.

Wings and squamae of the normal form for the genus; wings clear, with black veins. *Squamae* unequal. The *halteres* are bright yellow.

FEMALE.—*Head* far less prominent than in the male; vertex and frons broad; black. Cheeks, face, and jowls with a bright-yellow pollination. *Antennae* as in the male, but the arista less evidently pubescent. *Eyes* as in the male.

Thorax black, with a pair of indistinct narrow grey lines extending from the front to the cross-suture. A light-grey pollinated irregular line passes from the humeri to the wing-root in the place occupied by the silvery line in the male. *Scutellum* with the disc yellowish in the centre line and grey each side of that line. The sides black and the tip yellow. A pair of pollinated spots on each side at the base, and a similar pair on the disc of the thorax just before the base of the scutellum.

Abdomen with the spots more extensive than in the male, so that the ground-colour only shows on the centre line, and as a pair of roughly semicircular spots on each of the mid segments, those spots being on the front margins of the segments; consequently the hind and outer-side margins of the segments are black from the extension of the spots.

Legs as in the male, but with less fringe and very small pads.
Wings, &c., as in the male.
Hab.—Auckland Islands.
Types.—Cambridge Museum.

Paralimnophora, gen. nov.

Some specimens from the Enderby and Campbell Islands have a fairly close resemblance to the genus *Limnophora*, but differ from the normal forms to a noticeable extent. It seems best to place them under a new genus, for which the above name is proposed.

Head.—Forehead prominent, as in *Limnophora*, but the face is more retreating; a line tangential to the end of the frons and the outer edge of the mouth is nearly vertical in *Limnophora*, in the new genus it slopes considerably backwards. The *eyes* are far apart in the male, and quite bare; the ratio of vertical height to breadth is far less than in *Limnophora*, and the eyes are more rounded in form. The *mouth* is slightly prominent, and the *face* is slightly hollowed out between the mouth-margin and the base of the antennae. The jowls are deep, owing to the less vertical height of the eye. The *antennae* have a slightly rounded end to the 3rd joint, and the arista is just pubescent when a fairly high power is used; this pubescence exists at least on the basal half, and is less than in *Limnophora*. The *bristles* present are: Ocellar, very small post-verticals, subparallel inner verticals which are larger than the smaller divergent outer verticals; 2 pairs of small upper fronto-orbitals; the lower fronto-orbitals are not somewhat hairlike, as in *Limnophora*, but are bristly and bent inwards so that they nearly meet on the centre line of the frons; there is no crossed frontal pair. The mouth is provided with strong vibrissae and other mouth-bristles on the margin.

Thorax much as in *Limnophora*.

Abdomen.—This is peculiar in form; it is much depressed, being flattened in the horizontal plane. The form is oval, with roughly parallel sides and rounded ends. The macrochaetae are rather weak, and are mostly on the lateral portions of the disc. The 2 middle segments are spotted, as in *Limnophora*, except that the spots are somewhat more indistinct in form and boundary. The male genitalia form a well-marked rounded knob below the last segments.

Wings as in *Limnophora*, but the 6th vein is at first stout and then suddenly becomes faint; the 7th vein is faint throughout. The *squamae* are unequal.

Paralimnophora depressa, sp. nov.

Length.—Of body, 5 mm.; of wing, 5 mm.

Head grey, cheeks silvery. *Antennae* black. *Palpi* yellow. *Proboscis* black.

Thorax shaped as above; grey; minutely bristled between the macrochaetae.

Abdomen grey; a pair of indistinct brownish spots of fairly large size on the 2nd and 3rd segments, with a lighter grey median stripe between them.

Legs.—All the femora dark grey; knees and rest of all the legs yellow.

Wings clear; 1st vein brown, others blackish, except at the base, where they are yellowish; no spur on costa; 6th and 7th veins not reaching margin, the latter

nearly straight and faint. *Halteres* yellow. *Squamae* moderate in size, white, unequal.

HAB.—Enderby and Antipodes Islands.

TYPE.—Cambridge Museum.

Paralimnophora indistincta, sp. nov.

One specimen differs so considerably from the rest that, in default of more material, which might show intermediate forms, it seems best to treat it as a distinct species.

Similar in size, form, and main characters to the last species, but differs as follows :—

Colour.—All blue-grey, with the face and cheeks silvery. The abdominal spots are practically invisible, being only seen as a slight darkening of the surface on looking sideways.

Wings, *legs*, &c., as last species, except that the thickened part of the 6th vein is proportionally shorter.

The achrostical bristles between the dorso-central ones are sparer than in the last species, and are roughly arranged in two rows.

HAB.—Enderby Island.

TYPE.—Cambridge Museum.

MELANOCHILA, Rondani. Att. Soc. Ital. Milano, ix, 72, 136 (1866).

Three specimens of an Anthomyiid from Carnley Harbour seem best placed in this genus. They agree well in character with the European species *M. riparia*, but the head is not quite so much excavated under the antennae, which are consequently not quite so porrect as in that species. The specimens having been preserved in spirit may account for some alteration in form.

Melanochila insularis, sp. nov.

Size.—About 4 mm.

Head.—Frons brown-grey, with darker eye-margins and ocellar area. *Face* lighter grey ; jowls with the front part light grey, the back part brown. Back of head grey. *Palpi* yellow, darkened at the ends. *Antennae* dark grey, the 3rd joint moderately pointed.

Thorax.—Brown-grey, with 2 narrow greyer stripes more evident in front. Pleurae lighter grey. *Scutellum* with a small light-grey spot on each side at the base.

Wings.—Slightly suffused with brown ; the unequal moderately sized *squamae* with orange edges. *Halteres* orange.

Legs.—Femora dark grey, knees and tibiae orange ; tarsal joints getting darker towards the last 2, which are black.

Abdomen.—Traces of large darker spots are visible on the middle segments.

Specimens in spirit.

HAB.—Campbell Islands.

TYPE.—Cambridge Museum.

TRICHOPTICUS, Rondani. Dept. Ital. Prod., iv, 9 (1861).

A specimen from Carnley Harbour is apparently best put under this genus, as it agrees quite well with the general character of Hutton's other species of the genus which are in the Cambridge Museum.

Trichopticus (?) curvipes, n. sp. (Plate III, fig. 8.)

Head.—Eyes fairly well separated in the male; very hairy; black-grey in colour, with some yellow pollination on the face and jowls.

Thorax.—Black-grey, with the humeri and front of thorax slightly lighter, and an indistinct central black line.

Abdomen.—Dark yellowish-grey, with very indistinct subtriangular spots (having rounded angles) on the 2nd, 3rd, and 4th segments.

Legs.—Femora of all the legs black; the knees and rest of legs light testaceous. The hind tibiae are remarkably bowed. The end of the tibia appears as if it extended slightly beyond the insertion of the metatarsus.

The insect is of the size of *T. melas.*

HAB.—Carnley Harbour.

TYPE.—Cambridge Museum.

COENOSIA, Meigen. Syst. Beschr., v, 210 (1826).

Two species were sent, the one with the wings reduced to strips, the other with ample blackened wings. The former was assigned by Professor Stein to this genus. The second species is more doubtful in its affinities, but it is thought best to, at any rate provisionally, place it in the genus as interpreted by Hutton.

Coenosia filipennis, sp. nov.

The specimen was preserved in spirit; it was collected in Campbell Island in November, 1907.

Size.—Body, 5½ mm.; wing, about 1½ mm.

Head.—Vertex and frons brown, face more silvery. *Antennae* black, the arista bare except under a magnification of about 50, when it is perceptibly pubescent.

Thorax grey, with three indistinct longitudinal brown stripes. *Scutellum* brown, with a grey central line.

Abdomen cylindrical, grey, with a broad brown central line; this varies in breadth along each segment, being narrower on the top edge than on the bottom edge of each segment. The stripe is faintly interrupted on the centre line by the ground-colour showing through. All the bristles stand on brown spots. The male genitalia are well developed, standing out as a grey knob on the end of the abdomen.

Legs black, with yellow knees and a slight grey pollination on the femora and coxae.

Wings reduced to rudimentary strips, which are narrow and acuminate, and about 1½ mm. long. The costa is evident, and is provided with minute black bristles; in addition, another long vein is present, and 2 minute cells at the base of the wing. The *squamae* are present, but very small. *Halteres* normal, yellowish-white in colour.

HAB.—Campbell Islands.

TYPE.—Cambridge Museum.

Coenosia fumipennis, sp. nov.

Length.—Body, 5½ mm.; wing, 6 mm.

Head.—Frons brown, with a light-grey mark extending forward from the ocelli, of an elongated-heart shape. Eye-margins grey. *Face* grey; jowls light grey. *Antennae* grey; arista bare. *Palpi* and proboscis blackish.

Thorax yellowish-grey, with light-grey pleurae; scutellum grey, with a broad darker central line.

Wings rather narrow and long, suffused with blackish to about the distal third of the wing, which is much blackened; no costal spine. *Squamae*, lighter.

Legs.—Femora grey. Tibiae dusky testaceous. Tarsi black.

Specimen preserved in spirit.

Hab.—Monument Harbour, Campbell Island.

Type.—Cambridge Museum.

Note.—This species can only be referred with some doubt to the genus *Coenosia*, as the antennae are shorter than in ordinary species, and the mouth-bristles are far less developed.

PHYCODROMIDAE.

This family includes some very interesting forms. One is a large and robust insect with reduced wings, for which a new genus, *Paeopterus*, is proposed; there are several examples of this insect in the British Museum collection. Another is devoid of halteres, and has the wings reduced to strips; for this the new genus *Icaridion* is proposed. Hutton has described several species of the genus *Coelopa*, and the Cambridge collection contains specimens from him of his species *C. litoralis*. The female of this species is very like the European forms, but the male differs considerably. It possesses a conspicuous spinal armature on the femora of all the legs, especially on the hind femora, a character foreign to the normal forms; the rest of the legs bear the usual fur characteristic of the males in *Coelopa*. In addition, the male has a singular provision of a chaetotaxy on the underside of the first few abdominal segments. The arista of *C. litoralis* is like that of the normal forms, being practically bare under a high power, and being somewhat chitinous in texture. Among the insects sent were two species of Phycodromids in which the characters were those of the genus *Coelopa*, but the arista is evidently pubescent and is more hairlike in form; it recalls to some extent that of certain Borborids. This form of arista is also found in the new genus *Icaridion*. It also differs from the normal type of arista in *Coelopa*, inasmuch as the basal joints of the same are more thickened. As this point is not referred to in any of the diagnoses of Hutton's species from the islands, it is proposed to keep the new species in the genus *Coelopa* for the present, but it is possible that a more extended knowledge of the genus may necessitate the separation of these forms from the normal ones.

To this form of *Coelopa* with pubescent arista belong the two following species.

Coelopa, Meigen. Syst. Beschr., vi, 8 (1830).

Several specimens of a small species were sent, but the material was very unsatisfactory, and a full diagnosis is impossible.

Coelopa debilis, sp. nov.

The species is best characterized by its small size, it being only about 3½ mm. long. It is uniformly blackish-grey in colour, with somewhat greyer pleurae and light testaceous legs. The general form is much like that of the female of *C. litoralis*, but the small size at once separates it.

The specimens were preserved in spirit.

HAB.—Monument Harbour, Campbell Island.

TYPE.—Cambridge collection.

Coelopa nigrifrons, sp. nov.

One male and two females were collected by Mr. Hamilton in 1894 in the Macquarie Islands.

Size.—Body, 4½ mm.; wing, 5½ mm.

Head.—Vertex black, with a slight V-shaped depression bordering the front of the ocellar area; back of head and upper eye-margins grey, the boundary between the black and grey colours thus forming an M-shaped line. *Face* and cheeks grey. *Palpi* brown. *Proboscis* yellow. *Antennae* slightly reddish, in tone with the pubescent arista mentioned above.

Thorax.—The ground-colour is a dark blackish-grey, with a slight yellowish pollination. The surface is uniformly covered with short closely set suberect hairs. *Scutellum* as thorax in colour; pleurae grey.

Abdomen piceous. The male genitalia are prominent, but the specimen is not in good-enough condition for figuring or detailed description.

Legs.—All yellow, with a very slight and indistinct darkening on the upper side of the femora; somewhat hairy in the female and very hairy in the male.

Wings slightly suffused with brown, the veins uniformly brown.

The specimens were preserved in spirit.

HAB.—Macquarie Islands.

TYPE.—Cambridge collection.

ICARIDION, gen. nov.

This genus is founded for a very interesting form, in which the halteres are absent and the wings are reduced to mere strips. The generic name refers to the last circumstance.

Head.—Frons much protuberant, broad and flattened, and thickly covered with hairs, so that the bristles are but little evident amongst the hairs. *Mouth* only moderately produced, so that the frons overhangs the rest of the face to a considerable extent. *Labrum* prominent. *Antennae* with joints as in *Fucomyia*, but with the 3rd joint somewhat larger in proportion; arista long and sparsely pubescent (recalling the arista of some *Borboridae*). *Eyes* longish-oval, with the long axis vertical, more rounded in front than behind.

Thorax with bristles as in *Fucomyia*.

Wings reduced to very short chitinous strips, about ⅓ as long as the thorax. *Halteres* absent.

Legs as in *Coelopa*; more hairy in the male than the female.

Icaridion nasutum, sp. nov.

Size.—About 4½ mm.

Colour blackish; frons yellow-grey.

Antennae and *palpi* blackish; pleurae grey.

Legs fusco-testaceous.

Abdomen hairy.

The short strip-like wings have one fairly strong central forked vein; the posterior margin is somewhat bristly.

Specimens preserved in spirit.

Hab.—Monument Harbour, Campbell Island.

Type.—Cambridge Museum.

Baeopterus, gen. nov.

This genus is well marked by its much-shortened wings (smaller in the female than in the male), the greatly elongated legs, and the extraordinarily reduced chaetotaxy.

Texture coriaceous.

Head.—Frons and mouth prominent, much excavated between the two. Lunula well developed and furrowed longitudinally. *Antennae* inserted on the underside of the forehead: 1st joint small, 2nd conical, 3rd small and partially hidden by the 2nd. Arista long and bare, thickened at the base. The only bristles present are the ocellar ones. *Eyes* bare; anterior margin semicircular, posterior far less curved; vertical diameter about half the depth of the head. *Palpi* stout, rod-shaped, prominent, and extending beyond the mouth. *Proboscis* fleshy, with a blunt conical tip pointing backwards (see fig. 7).

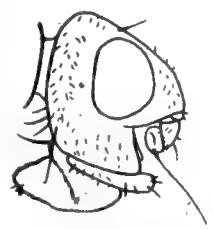


Fig. 7.—Head.

Thorax.—The suture and humeral callus well developed. No dorsal or pleural bristles, and only a short pair of scutellar ones. The tubercle on the pleura before the halteres is exceptionally well developed.

Wings reduced in size, but with well-developed veins; they appear as if the distal part had been abbreviated in comparison with the proximal. Cross-vein nearer the end of discal cell. Costa devoid of spines (see fig. 8). *Halteres* long, clubbed at end.

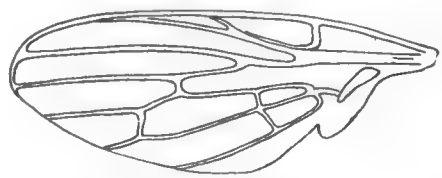


Fig. 8.—Wing of Male (5 mm.).

Legs very long in proportion to the body-length. Femora incrassated in the male; the hind pair are about 1½ times as long as the others, and are strongly spined beneath; in the female not incrassated. Mid tibiae with an apical crown of bristles; hind tibiae with two preapical bristles. Claws and pads very well developed.

Abdomen somewhat flattened horizontally. Male genitalia well developed, with an outer pair of appendages which are forked at the tip, and a chitinous inner pair.

Baeopterus robustus, sp. nov.

Lengths.—Male: Body, 10 mm.; wing, 5 mm.; hind legs about 14 mm., others about 10 mm.

Colour.—Dull brown-piceous. The prothoracic calli, the front of the thorax, and two patches on the outer sides of the dorsal suture dull orange. Pleurae yellow-brown.

Antennae of the same colour as the body, but with arista pale transparent brown, except as to its basal joints.

Wings orange-tinted, with brown veins. *Halteres* with a pale stalk and dark-brown club.

Legs orange, with darkened tibiae and tarsi.

The whole insect is covered with uniformly but sparsely distributed short adpressed hairs.

The female is smaller than the male; the wings are about half the size of the male's wings; the femora are not at all incrassated.

Specimen preserved in spirit.

Hab.—Campbell and Ewing Islands.

Type.—Male, Cambridge Museum; female, British Museum.

Note.—One male was sent from Campbell Island, but there are several males and a female in the British Museum from Ewing Island, and I have been able to compare the same with the Campbell Island specimen.

HELOMYZIDAE.

Two specimens from the Snares belong to this family. From the absence of a prothoracic bristle they belong to the *Helomyzinae*, and the presence of a humeral bristle would make them belong to the genus *Allophyla*. But the chaetotaxy and other characters at once differentiate it from that genus, and the general form of the insect recalls the *Blepheropterinae* section, which should, however, have a prothoracic bristle. It would appear to be an aberrant form of this subfamily. I propose to make the following genus for this species.

Allophylopsis, gen. nov.

The difference between the chaetotaxy of this genus and *Allophyla* is given below:—

Allophyla.	*Allophylopsis.*
Post-verticals crossed.	Post-verticals converging.
Two pairs vertical, inner very long.	Two pairs vertical, inner moderately long.
One pair orbital.	Two pairs orbital.
1 + 4 dorso-centrals.	0 + 3 dorso-centrals.

Others the same in both.

One preapical bristle on the middle tibiae just before the end.	Two stout preapical bristles on the middle tibiae some distance before the end.

Head rounded, the upper lip slightly though sharply prominent. Labrum narrowly visible below the mouth almost all round. *Antennae* normal. *Eyes* bare, almost orbicular in side view, but the angles on the vertex are sharp and not rounded.

Thorax.—Much like *Allophyla* in form, but the mesopleura is hairy instead of bare.

Legs.—Front and hind normal; middle with the above-mentioned strong remote pair of preapical bristles. The small black apical spines on the tips of the tarsal joints are much stronger than is usual in this family, especially those at the tip of the first tarsal joint.

Wings.—First (= subcostal) vein considerably shorter than usual; middle cross-vein far beyond the junction of the first with the costa. Costal spines minute.

Allophylopsis punctata, sp. nov.

Size, 5½ mm.; wing-length, 4½ mm.

Head greyish-yellow, with a lighter triangular patch in front of the ocelli, which is produced in a narrow stripe to the front of the head. The sides of this stripe and of the patch are blackened. *Antennae* yellowish, with the outer side of the 3rd joint blackened. Arista practically bare, the basal joint of the same being pale. *Proboscis* yellow, a conspicuous black chitinous strip along the upper edge of the same.

Thorax yellow-grey, covered with minute black spots, on each of which is a minute bristle. Pleurae pale and unspotted, but with a dark stripe from the prothorax to the base of the wings along the upper part of the pleura. Disc of *scutellum* darkened, but with a very narrow pale median line; sides pale yellow-grey.

Wings with all the long veins pale, but the two cross-veins suffused.

Legs pale, with the last tarsal joints somewhat darkened.

Hab.—The Snares.

Type.—Cambridge Museum.

Note.—It is just possible that this species is the same as, or near to, the one described by Hutton as *Leria fulva*, but in the absence of any reference to the bristles in his description, and from the shortness of the diagnosis, it is impossible to be sure without reference to the type.

DRYOMYZIDAE.

Among the Acalptrates was a pair of a very fine species from Carnley Harbour. The exact position of this species is a matter of some difficulty. The strongly bristled costa and the long "stigma" recall the *Helomyzidae*, but there are no vibrissae and the post-vertical bristles are nearly parallel. The form of the head and wings is much like that of some *Sciomyzidae*, while the legs and body remind one of a *Scatophaga*. The chaetotaxy and some other considerations have decided me to put it in the *Dryomyzidae*. The generic name indicates the many relations of the insect.

Polytocus, gen. nov.

Head.—In side view the frons slopes downwards to the front margin and the face upwards from the retreating mouth, so that the forehead is well produced. The *antennae* are inserted exactly on the end (see fig. 9). Frons flat and broad, unfurrowed, with the eye-margins, on which are the obital bristles, broad. Face broadly keeled in the median line, with narrow cheeks. Head somewhat swollen behind. The front of the vertex, the jowls, and back of head with bristly hairs. *Eyes* bare; small for the size of insect; longish-oval, with the long axis roughly vertical; less than half the depth of the head. *Antennae* porrect; 1st joint of moderate size, 2nd and 3rd of nearly equal length, each about three times the 1st; 2nd hairy, with a long anterior bristle. Arista fine, bare, basal joints slightly swollen. *Palpi* stout and bristly, especially at the ends. *Proboscis* with a broad backward-projecting end.

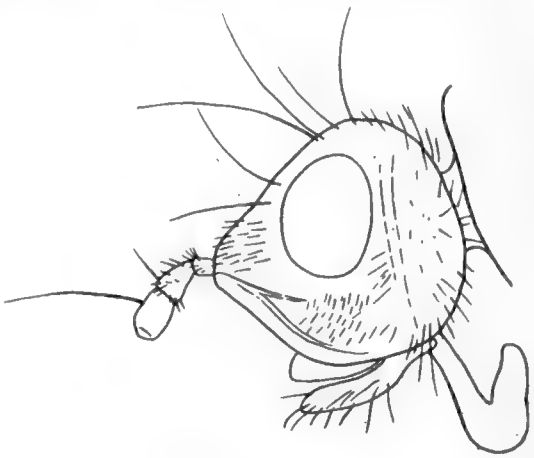


Fig. 9.

Chaetotaxy.—Bristles very well developed. Post-verticals nearly parallel; inner vertical the same; outer verticals diverging; long ocellars pointing forwards; two pairs of orbital, the front pair much diverging; no vibrissae.

1 + 3 dorso-central bristles; weak but fairly long praescutellars; 4 scutellar; humeral; prothoracic; praesutural; 2 noto-pleural; 3 supra-alar; 2 sterno-pleural.

Wings long, rather narrow and pointed. Main branch of 1st vein (= subcostal) stout, its junction with the costa being well along the latter, somewhat less than half the wing-length from the insertion; auxiliary branch of 1st (= mediastinal) evident throughout, very close to main branch at base, but with the end merging in the costa far before the main branch, thus leaving a long pale "stigma" recalling that of *Heteromyza*. Veins 2, 3, and 4 parallel at ends; cross-vein somewhat beyond the middle of the discal cell; costa extending to junction of 4th vein; 5th vein not quite reaching wing-margin; hind cross-vein straight and somewhat oblique. Basal and anal cells small.

The costa is provided with a remarkable series of spines. In addition to the ordinary short bristling on the costa, there is a row of stout bristles, which alternately bend slightly below and above the plane of the wing. These bristles extend from just before the humeral or basal cross-vein to just before the junction of the 2nd vein. (These spines are rather easily knocked off.)

Legs.—Preapical bristles and spurs on all the tibiae; the middle tibia with a multiple spur or crown of bristles. Claws and pads well developed.

Abdomen cylindrical, with fairly small male genitalia, and in the female with the last segments forming a short ovipositor.

Polytocus spinicosta, sp. nov. (Plate IV, figs. 2, 3.)

Length, 14 mm. ; wings 16 mm. long, with a maximum breadth of 4 mm.

Colour.—Brownish-yellow ; front of frons and the legs paler.

Jowls, frons, side and back of head with stout bristly hairs.

Thorax with short bristles on the disc.

Wings uniformly suffused with brownish-yellow ; the veins pale ; cross-veins suffused, especially the middle one.

Legs covered with long hairs in the male and with shorter bristly hairs in the female. The latter has a well-marked comb of long bristly hairs on the underside of the front femora. The preapical bristles on the front and hind legs are long and hairlike, those on the middle legs strong.

Abdomen very hairy in the male.

HAB.—Carnley Harbour.

TYPE.—Cambridge Museum.

ARTICLE VIII.—ON A SMALL COLLECTION OF HOLOTHURIANS FROM THE AUCKLAND ISLANDS.

By Arthur Dendy, D.Sc., F.R.S., Sec. Linn. Soc., Hon. Member of the New Zealand Institute, Professor of Zoology in King's College (University of London).

PLATE VI.

Although small, this collection is of very considerable interest from two points of view. Of the three species obtained, two—*Cucumaria leonina* and *C. brevidentis*—occur also in the South American fauna, while the third—*Chirodota benhami*—affords useful evidence as to the supposed value of the wheel spicule for purposes of classification. *Cucumaria leonina* has not been recorded before from the New Zealand area; *C. brevidentis*, var. *carnleyensis*, is a variety of a very common New Zealand species, and *Chirodota benhami* is evidently very nearly related to *C. dunedinensis*, which occurs abundantly at Dunedin.

I wish to express my indebtedness to my friend Professor Benham, F.R.S., by whom all the specimens were collected, and who has undertaken to see this paper through the press.

Cucumaria leonina, Semper, var.

1868. *Cucumaria leonina*, Semper, "Reisen im Archipel der Philippinen," Holothurien, p. 53, pl. xv, fig. 9. 1868. *Cucumaria dubiosa*, Semper, *op. cit.*, p. 238, pl. xxxix, fig. 19. 1898. *Cucumaria leonina*, Ludwig, "Hamburger Magalhaensische Sammelreise," Holothurien, Hamburg, p. 36 (further synonomy and references are given in this paper). 1905. *Cucumaria leonina*, Rémy Perrier, "Holothuries antarctiques," "Annales des Sciences naturelles," Zool. et Pal., ser. ix, vol. i, p. 25.

There are two small specimens in the collection, from Carnley Harbour, which must be referred to this characteristically antarctic but variable species. They were found under stones. The smaller of the two is somewhat damaged by rupture, and the following description is taken entirely from the larger.

The body (in spirit) is fusiform, the tentacles being entirely retracted. It is truncated anteriorly and blunt behind; slightly flexed, with the convexity of the curve ventral. The length is 15 mm. and the transverse diameter in the middle 4 mm. The anus is posterior and terminal, surrounded by 5 small reticulate calcareous nodules (anal teeth) only recognisable under the microscope. The colour in spirit is light grey. The tube-feet are arranged in 5 well-marked, irregularly double, ambulacral bands; rather more numerous and more prominent in the 3 ventral ambulacra than in the 2 dorsal; especially prominent anteriorly, where the

arrangement in rows is obscure, and they become crowded round the opening of the introvert. A few of the tube-feet are carried in with the invagination of the introvert, where they are seen, on opening it up, in front of the pharynx and tentacles. There are apparently 10 short much-branched tentacles, but, owing to the state of contraction and the copious branching, it is difficult to make out their arrangement satisfactorily.

The pharynx is large, with 5 long retractor muscles attached posteriorly to the radial longitudinal muscles well behind the middle of the body. There is *apparently* no calcareous ring, but microscopic examination reveals the presence of 5 rudimentary radials, ⅄-shaped, with the long arm pointing forwards. The total length of each radial piece is only about 0·6 mm. The interradials are either absent or are represented by a few granules.

The pharynx is followed by an elongated oesophagus, which terminates in a slightly dilated muscular-looking "stomach" of about the same diameter as the intestine which immediately follows it. On the outer wall of the oesophagus are numerous large specks of dark-brown pigment, while a thin ring of similar pigment marks the junction of the "stomach" with the intestine. The intestine is slightly convoluted, and terminates in a short rectum attached to the body-wall by numerous muscular threads. There is a pair of rather feebly developed, slightly branched respiratory trees.

There is a single well-developed convoluted stone-canal, situated dorsally, and ending in an irregular nodular madreporite containing reticulate calcareous deposits. There are two Polian vesicles, both long and slender, situated one on either side of the mid-ventral line. Tube-foot ampullae are not recognisable, though the tube-feet are well developed and have reticulate end-plates.

The gonads consist of half a dozen rather short, stout, unbranched caeca, up to about 5 mm. in length, springing from the end of a long genital duct at about the middle of the body, and thus at a considerable distance behind the water-vascular ring. Some, if not all, of the fully developed caeca contain rather large ova. There are several minute undeveloped caeca at the point of attachment of the bunch to the genital duct.

The spicules of the body-wall consist of knobbed reticulate plates, about 0·12 mm. long, with one end drawn out somewhat and dentate (figs. 1*a*, 1*b*). They overlap one another closely in the body-wall, and the dentate extremities point obliquely outwards. There are apparently none of the more or less symmetrically ended, reticulate, knobbed buttons, such as Ludwig figures for the species,* though some of the spicules make a near approach to this form. A few smooth irregular reticulate plates also occur in boiled-out preparations of the integument (fig. 1*c*).

The tube-feet possess well-developed circular smooth reticulate end-plates, and the tentacles contain numerous smooth irregular reticulate plates or rods.

Remarks.

I have followed Ludwig, who gives an extensive synonymy, in regarding Semper's two species—*C. leonina* and *C. dubiosa*—as identical, although Semper's original

* "Zoologische Jahrbücher," bd. ii, 1887, pl. i, fig. 1.

descriptions certainly do not support this view. *C. leonina* was originally described by Semper as follows* :—

"Body egg-shaped, 20 mm. long, 11 mm. in diameter. Yellowish-grey, more darkly sprinkled. Five separate rows of tube-feet, two tube-feet in breadth. No anal teeth.

"One specimen. Singapore.

"The genital follicles are very long; they extend to the hindmost end, and wind around all the organs. There is one large Polian vesicle on the water-vascular ring, and a single dorsally situated stone-canal. The calcareous ring consists of 10 simple pieces. The mesenteries are fenestrated membranes. In the skin are found only 'buckles'† those of the upper layer elongated on one side; the dentate elongation looks towards the surface of the skin."

The original description of *C. dubiosa* may be translated as follows :—

"Ten almost equal-sized tentacles. Body of the solitary example cylindrical, 12 mm. long, 5 mm. thick. A double row of tube-feet on each ambulacrum, besides several small tube-feet in the dorsal interambulacra. Colour uniformly yellowish (in spirit).

"Locality: Peru (Museum Godeffroy).

"Very similar to the preceding species [*C. koellikeri*], but distinguished by several important characters. There is a distinct muscular stomach‡, as in *Colochirus* (wanting in the preceding species). There are 4 long Polian vesicles on the ring-canal. The genital follicles are unbranched, scarcely 1 mm. long, attached at one-third of the distance from the anterior end. The calcareous bodies of the skin (pl. 39, fig. 19) are strikingly similar to those of *C. koellikeri*."

We may note the following differences between the two species as described by Semper :—

(1.) The genital caeca are very long in *C. leonina* and very short in *C. dubiosa*. This probably depends upon the state of development.

(2.) There is only 1 Polian vesicle in *C. leonina*, while there are 4 in *C. dubiosa*. This is certainly a variable character.

(3.) *C. leonina* has a calcareous ring of 10 simple pieces. In *C. dubiosa* none is mentioned, but our specimen shows that it might easily be overlooked.

(4.) *C. leonina* has only one kind of spicule in the skin, while *C. dubiosa* has two distinct kinds. The two kinds, however, are essentially of the same type, and doubtless pass into one another.

(5.) *C. dubiosa* has a muscular stomach (*kaumagen*), while none such is mentioned in *C. leonina*. It was probably overlooked, not being very conspicuous.

Ludwig has described a large number of specimens from the coast of Patagonia,§ and has thereby greatly extended our knowledge of the species. We learn from him not only that anal teeth are present (probably overlooked by Semper), but also that the living animal is of a rosy-red colour; that single tube-feet may or may

* "Reisen im Archipel der Philippinen," Holothurien. I have translated the description.

† *Schnallen*. The figure shows these to be perforated plates, with one end drawn out and dentate.

‡ *Kaumagen*.

§ "Zoologische Jahrbücher," bd. ii, p. 15, 1887.

not be present in the dorsal interambulacra; that the calcareous ring is similar to that figured by Semper for *C. godeffroyi*,* which apparently consists of 5 radial and 5 interradial pieces, none of them very strongly developed; and that there are usually 4 but sometimes only 3 Polian vesicles, showing that this character is variable.

As regards the calcareous ring, we cannot make a comparison with the type of *C. dubiosa*, but in the Carnley Harbour specimen it appears to be considerably less well developed than in Semper's type of *C. leonina* or in Ludwig's examples. This is especially seen in the disappearance of the interradials.

It is probable that in Semper's original type of *C. dubiosa* the ring was also very feebly developed, or he would surely have mentioned its presence at least. In any case, the difference, if any, can hardly be regarded as of specific value.

While doubting the correctness of the locality—Singapore—given for the original type of *C. leonina*, Ludwig points out that the range of this typically antarctic species is tolerably extensive, beginning west at Peru and Chili, embracing the southern extremity of America, extending northwards on the east side of South America to latitudes 34° S., and including the Falkland Islands.† Rémy Perrier has also recently recorded a large number of specimens from the neighbourhood of Cape Horn, where the species appears to be very common.‡

It is extremely interesting to find the species again at Carnley Harbour, in the Auckland Islands.

Cucumaria brevidentis (Hutton), var. **carnleyensis**, nov.

(For synonymy of *C. brevidentis*, *vide* Dendy and Hindle, "Some Additions to our Knowledge of the New Zealand Holothurians," Linn. Soc. Journ., Zool., vol. xxx, p. 99, 1907.)

Three specimens of this variety were sent to me for examination, but it must be very common in Carnley Harbour, for Professor Benham writes to me about it as follows: "The little Holothurian is, in life, bright crimson with whitish papillae; found at very low water (spring tide); it occurred in hundreds near our camp in Carnley Harbour—to wit, on the rocks of Masked Island—pressing itself into crevices, so as to assume all sorts of irregular forms, and looking like strawberries. The vertical face of the dark rock on one side of the island was bespangled with them."

All three specimens reached me in a very contracted state, the tentacles being quite invisible externally. The shape of the body (in spirit) is oval, and somewhat depressed. The largest specimen is 26 mm. long and 12 mm. in greatest breadth. A pinkish tinge was still visible in parts, especially on the dorsal surface, but the integument was nearly bleached by the alcohol. The dorsal surface is covered with irregularly scattered retracted papillae, less strongly developed in the mid-dorsal interradius. The ventral surface bears numerous tube-feet arranged in several

* "Reisen im Archipel der Philippinen," Holothurien, taf. xv, fig. 14.

† "Hamburger Magalhaensischen Sammelreise," p. 37.

‡ "Holothuries antarctiques," "Annales des Sciences naturelles," Zool. et Pal., ser. ix, tome i, p. 25, 1905.

irregular longitudinal rows on each of the three radii, with a few in the interradii. The integument is thick, hard, and leathery.

There are 10 copiously branched tentacles, of which the 2 ventral ones are smaller than the others. The tentacle-branches are now white, but their stems, and also the lining of the introvert, are still bright crimson. The calcareous ring is short, and generally similar to that figured by me for *C. calcarea*, but it is difficult to make out the exact shape and boundaries of the component pieces. The 5 radials are bifid anteriorly, where the retractor muscle is attached, and notched posteriorly. The 5 interradials are smaller and less conspicuous; they appear to be very narrow, and simply pointed anteriorly (a good deal narrower posteriorly than figured for *C. calcarea*).

Immediately behind the pharynx, containing the retracted tentacles, the alimentary canal bears a short bulbous dilatation, the thick muscular wall of which is thrown into deep longitudinal folds internally. Behind this dilatation, or "stomach," the canal narrows suddenly, and then gradually widens again to form the considerably convoluted intestine. The latter gradually narrows again towards the rectum, which is greatly dilated and attached to the body-wall by very numerous slender muscle-bands. The more anteriorly placed of these muscle-bands are long and conspicuous, extending forwards for some distance in front of the rectum, and attached to the body-wall, some radially and some at the sides of the longitudinal muscle-bands.

The respiratory trees open into the rectum close to its junction with the intestine. They are long and copiously branched throughout their length, extending forwards to the anterior end of the body-cavity. The 5 retractor muscles of the pharynx are well developed. The chalky-white convoluted stone-canal is situate dorsally, and a single large spherical Polian vesicle, with a short stalk, lies on the left side, opposite to the left dorsal retractor muscle. Tube-foot ampullae are abundant on the inner surface of the ventral body-wall, chiefly at the sides of the longitudinal muscle-bands, but also extending into the interradial areas. There are none visible on the dorsal body-wall, neither at the sides of the dorsal longitudinal muscles nor in the mid-dorsal interradius; which indicates that the papillae of the dorsal surface are not really fully developed tube-feet, though they still possess reticulate end-plates.

There are 2 bunches of long unbranched genital caeca, of a deep-orange colour. There are about a dozen in each bunch, of varying length, the longer ones being nearly, if not quite, as long as the body. The 2 bunches are attached right and left of the dorsal mesentery, at about the level of the calcareous ring (the tentacles being completely retracted). The gonads are thus very copious, and almost fill up the coelom around the alimentary canal. The genital duct, as usual, runs forwards in the dorsal mesentery from the point of attachment of the gonads.

The spiculation is generally similar to that of *C. brevidentis* (type). The thick, knobbed, reticulate buttons (fig. 2*a*) are perhaps less numerous in proportion to the other spicules, but they sometimes reach a very large size.*

Small perforated cups with a row of projections around the margin and one or two projections at the bottom are very numerous (figs. 2*b*–2*g*). These cups are

* None of these very large, knobbed buttons or plates are figured.

connected by transitional forms with much larger, knobbed, reticulate plates (figs. 2*h*, 2*k*). There are also irregular smooth reticulate plates of larger size (fig. 2*l*), and smooth circular end-plates. All these forms occur in a boiled-out preparation of the integument.

Remarks.

There can be no doubt of the close relationship of this form with *C. brevidentis*, with which it is now generally admitted that my *Colochirus calcarea* is specifically identical. Unfortunately, nothing is known of the internal anatomy of the type of *C. brevidentis;* that of *C. calcarea*, however, was described in my first paper on the New Zealand Holothurians,* and exhibits certain differences as compared with the Carnley Harbour form. Thus, in *C. calcarea* there appears to be no muscular stomach, and the respiratory trees are short and merely digitate instead of copiously branched, and the genital caeca also appear to be short. The difference in the calcareous ring has already been referred to. It is doubtful, however, if any of these differences are of more than varietal value.

The occurrence of *C. brevidentis* at Juan Fernandez, as recorded by Ludwig,† forms another interesting case of agreement between the marine fauna of New Zealand and that of South America.

Chirodota benhami, sp. nov.

This species is represented in the collection by two specimens from Masked Island, in Carnley Harbour, where it occurs under stones.

The larger of the two is about 21 mm. in length by 2·5 mm. in diameter.

The colour is now (in alcohol) yellowish-grey with a slight pinkish tinge, and the surface is transversely corrugated and papillated. There are 10 short tentacles, each with 4 or 5 pairs of digits, the terminal pair being conspicuously larger than any of the others.

The alimentary canal exhibits 3 limbs, forming the usual S-shaped figure, and is a good deal sacculated in its present condition. The calcareous ring is slender, and consists of 10 simple slightly curved rods, joined end to end. The water-vascular ring is of a pale-purplish colour, and gives off a single large ventral Polian vesicle of the same colour, consisting of a slender stalk with an oval dilated sac at its extremity. The madreporic canal appears to be represented by a minute dorsally placed body.

The gonads consist of a pair of bunches of short, slightly branched ovarian caeca, each with only about 2 or 3 branches, situated close to the anterior extremity of the body-cavity, right and left of the dorsal mesentery.

Numerous large "ciliated funnels" are scattered singly in the neighbourhood of the dorsal mesentery. (Similar funnels occur in *C. dunedinensis*, though not hitherto noted.)

Both longitudinal and circular muscles are well developed in the body-wall.

[The smaller specimen appears to be immature; no gonads are recognisable. The alimentary canal is apparently not looped in an S-shape, but much sacculated, and perhaps slightly convoluted.]

* Journ. Linn. Soc., Zool., vol. xxvi, p. 22.

† "Die Holothurien der Sammlung Plate," Zoolog. Jahrbüch., suppl. iv, heft 2, 1898.

The spicules of the body-wall consist of wheels and hooks (sigmata). The wheels (figs. 3*a*, 3*b*) are few in number and of small size, sparingly scattered in the integument. In the larger specimen they measure about 0·053 mm. in diameter. In the smaller specimen, after much searching, I was only able to find a single wheel (fig. 3*e*), but this was slightly larger, about 0·067 mm. in diameter. The wheels agree in structure with those of *C. dunedinensis*, but the crenation or dentation of the inner edge of the rim is relatively much coarser. There is, at any rate sometimes, as in *C. dunedinensis*, a round hole in the middle of the face of the wheel opposite to the 6-rayed cross (fig. 3*e*). The wheel in *C. dunedinensis*, however, is very much larger than in *C. benhami*—about 0·16 mm. in diameter (*cf.* fig. 4*a*).

The hooks, or sigmata, closely resemble those of *C. dunedinensis*, and are of about the same size—about 0·11 mm. from bend to bend (figs. 3*c*, 3*d*, 3*f*, 3*g*).

The tentacles are supported by rather slender curved rods, up to about 0·06 mm. in length, with once or twice dichotomously branched ends (figs. 3*h*, 3*k*, 3*l*). Similar spicules occur in *C. dunedinensis*, though not hitherto noted.

Remarks.

This species is of interest as showing clearly the impossibility of basing generic distinctions merely upon the arrangement or even upon the presence or absence of the wheels. In this respect, with its scarce and feebly developed wheels, it is intermediate between *C. dunedinensis* and *C. geminifera*, Dendy and Hindle, in which the wheels have completely disappeared, while in *Rhabdomolgus novae-zealandiae*, Dendy and Hindle, not only the wheels but also the sigmata, or hook spicules, have disappeared.*

C. dunedinensis, *C. benhami*, and *C. geminifera* are all very closely related to one another, and the following comparative notes may be of service in distinguishing them :—

C. benhami appears to attain a considerably larger size than *C. dunedinensis*, but the tentacles are relatively, if not absolutely, smaller, and the digits do not increase gradually in size from base to apex, the terminal pair being considerably larger than any of the others. In *C. dunedinensis* the diameter of the wheels, though variable, may be more than twice that of the wheels in *C. benhami*, and the inner margin of the rim is much more finely toothed, especially in proportion to the size (*cf.* figs. 3*a*, 3*b*, 3*e*, and 4*a*).

C. geminifera differs from both the foregoing in the complete absence of wheels, and also in the much smaller size of the hooks. These spicules were, unfortunately, at first wrongly described and figured,† the material having apparently been accidentally subjected to the action of some acid, whereby the spicules had become corroded and quite altered in character. This mistake has already been rectified,‡ but the spicules are now for the first time correctly figured (figs 5*a*–5*c*).

* Dendy and Hindle, Linn. Soc. Jour., Zool., vol. xxx, p. 113, 1907.

† *Loc. cit.*, p. 112.

‡ Dendy, "Note on the Spicules of *Chirodota geminifera* Dendy and Hindle," Linn. Soc. Jour. Zool., vol. xxx, p. 251, 1908.

As to *C. dunedinensis*, this species is not rare, as Lyman Clark surmises.* In company with Professor Benham, I collected it in quantity myself at Dunedin in July, 1898, and have still numerous specimens in my possession, but those which I have examined do not show any dark spots on the inner side of the tentacles, as described by Parker.†

The apodous Holothurians have recently been the subject of a revised classification by Dr. Lyman Clark‡, who recognises no less than seven genera in the subfamily *Chirodotinae*, distinguished from one another largely by the presence or absence of wheels and sigmata (hooks) and by the arrangement of the wheels, whether scattered or in papillae.

The genus *Rhabdomolgus* is placed by Clark in the subfamily *Synaptinae ;* if we include it, as I prefer to do, in the *Chirodotinae*, we see that five species of this subfamily have been found in the New Zealand area, viz. :—

(1.) *C. dunedinensis*, Parker, with 10 tentacles, numerous comparatively large scattered wheels and sigmata.

(2.) *C. benhami*, Dendy, with 10 tentacles, very few small scattered wheels and numerous sigmata.

(3.) *C. geminifera*, Dendy and Hindle, with 10 tentacles, numerous rather small sigmata, but no wheels.

(4.) *C. gigas*, Dendy and Hindle, with 12 tentacles, with wheels partly collected in papillae and partly scattered, and with curved rods in place of sigmata.

(5.) *Rhabdomolgus novae-zealandiae*, Dendy and Hindle, with ten tentacles and no spicules at all.

The first three of these species are evidently all closely related to one another ; so much so that I have even doubted whether they ought to be considered as more than varieties of one and the same species. The general anatomy and the form of the sigmata and wheels (when present) clearly indicate their affinity.

C. gigas is obviously a very distinct species, and is very instructive with regard to the value to be attached to the arrangement of the wheels in papillae.

The relationships of *Rhabdomolgus novae-zealandiae* are less obvious, but it appears to be derived from a *Chirodota* similar to *C. dunedinensis* by complete loss of spicules.

The study of these New Zealand species makes it perfectly clear to my mind that the presence or absence of wheels and sigmata, and the arrangement of the wheels (in papillae or scattered), cannot reasonably be used as the main basis for a generic classification of the subfamily, and until some more satisfactory proposal is forthcoming I prefer to revert to the old generic name *Chirodota* for, at any rate, the New Zealand species of the subfamily, with the exception, for the present at least, of *Rhabdomolgus novae-zealandiae.*

* " The Apodous Holothurians," " Smithsonian Contributions to Knowledge," vol. xxxv, 1907, p. 124.

† " On a New Holothurian (*Chirodota dunedinensis*, n. sp.)," Trans. and Proc. N.Z. Inst., vol. xiii, p. 418, 1881.

‡ *Op. cit.*

EXPLANATION OF PLATE VI.

Figs. 1*a*–1*c*. *Cucumaria leonina*, var. (specimen from Carnley Harbour).

1*a*, 1*b*. Knobbed reticulate plates with dentate extremities. (× 280.)
1*c*. Smooth reticulate plate. (× 280.)

Figs. 2*a*–2*l*. *Cucumaria brevidentis*, var. *carnleyensis*.

2*a*. Knobbed reticulate button. (× 280.)
2*b*–2*g*. Small perforated cups. (× 280.)
2*h*–2*k*. Knobbed reticulate plates. (× 280.)
2*l*. Smooth reticulate plate. (× 280.)

Figs. 3*a*–3*l*. *Chirodota benhami*.

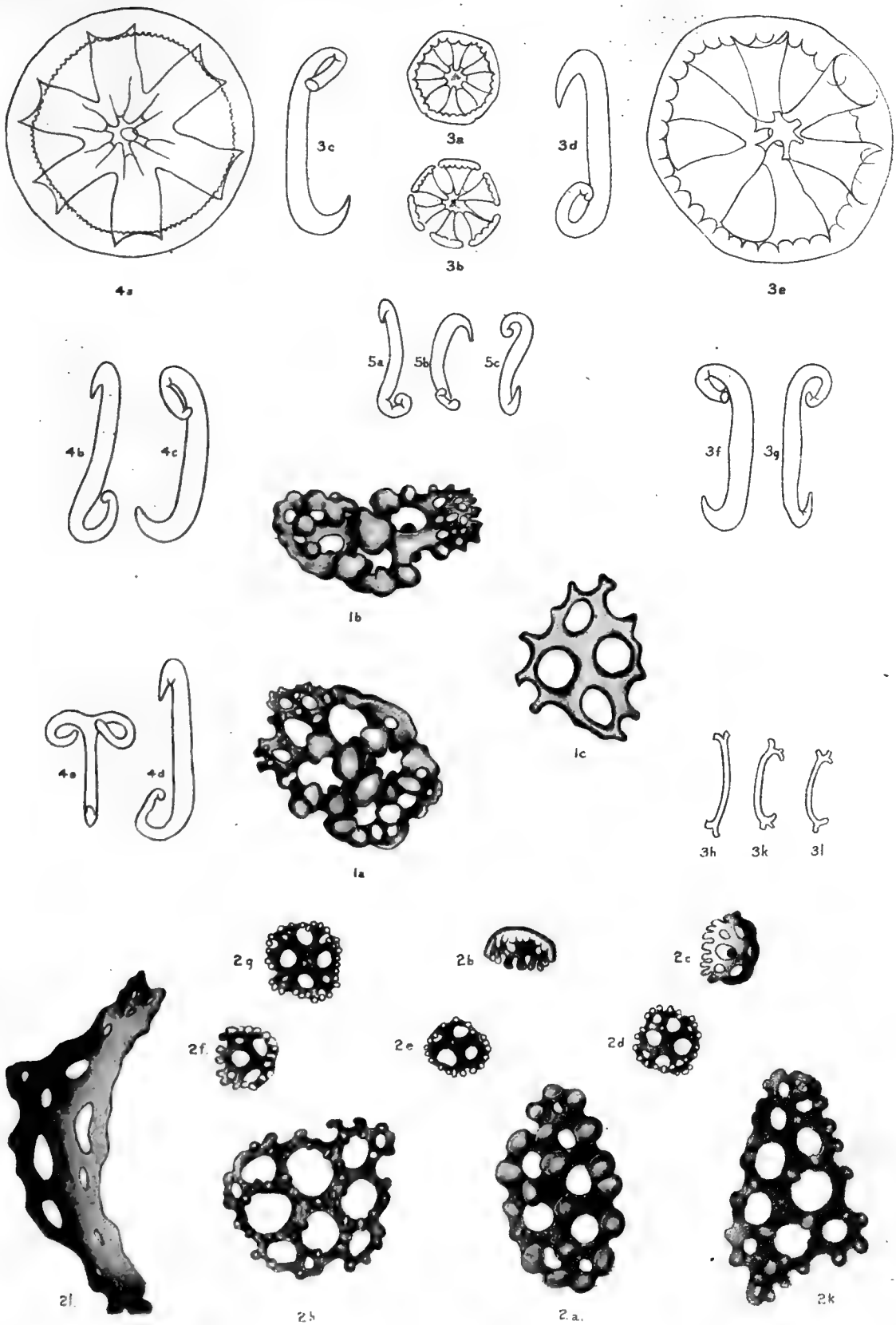
3*a*, 3*b*. Wheels from larger specimen. (× 280.)
3*c*, 3*d*. Hooks from larger specimen. (× 280.)
3*e*. Wheel from smaller specimen. (× 650.)
3*f*, 3*g*. Hooks from smaller specimen. (× 280.)
3*h*–3*l*. Curved rods from tentacles of smaller specimen. (× 280.)

Figs. 4*a*–4*e*. *Chirodota dunedinensis*.

4*a*. Wheel. (× 280.)
4*b*–4*d*. Hooks. (× 280.)
4*e*. An abnormal hook, showing bifurcation at one end. (× 280.)

Figs. 5*a*–5*c*. *Chirodota geminifera*.

5*a*–5*c*. Hooks. (× 280.)



A. Dendy, del.

PLATE VI.

ARTICLE IX.—SPIDERS AND OPILIONES FROM THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By H. R. Hogg, M.A., F.Z.S.

PLATES VII AND VIII.

The specimens of the *Arachnidae* herein described were kindly forwarded to me by Professor W. B. Benham, of the Otago University, Dunedin, and Dr. Chilton, of Canterbury College, Christchurch; and I wish to thank these gentlemen for having allowed me the opportunity of examining them. They were mainly collected by the New Zealand Subantarctic Expedition in 1907, some few specimens having been previously deposited in the collections of the Otago Museum.

The islands from which the specimens have been collected are:—

	S. Lat.	E. Long.
Macquarie Islands	54°	159°
Auckland Islands	51°	166°
Snares Islands	48° 28′	166° 34′
Campbell Island	52° 30′	169°
Bounty Island	47° 49′	179°

A record of the fauna of these islands is especially interesting and valuable from its bearing on the evidence already collected suggesting an early northern extension of the Antarctic continent.

The supposition of an ancient land-link between South America, Australia, and southern Africa is more or less of a necessity in order to account for the present distribution of creatures which it is difficult to believe could have reached their respective habitats by any other means.

These islands, the natural remains of such an extension, supposing it to have existed, contain the best remaining evidence of the route by which such migrations have taken place.

The specimens I have examined are, as is usually the case from colder localities, of comparatively small size, sober colouring, and of simple type. Examples of the more brilliant coloration and highly specialised forms so conspicuous in warmer parts, where food in the shape of insect life is more abundant, are altogether absent.

With the exception of genera of such world-wide distribution as *Araneus*, *Amaurobius*, *Lycosa*, and the *Attidae*, there appears to be one group only—namely, *Cyboeeae*—which has representatives ranging over the whole distance between South America, southern Australia and its islands, and South Africa, although there are many connections between the Australasian region and the one side or the other.

The preponderating number of specimens as well as the area of distribution of the genera *Myro*, Cambr., and *Rubrius*, E. Simon, of this group is certainly not a little remarkable. It stands forward as quite an antarctic type. The disposition of the front row of eyes in both genera, two small median eyes between two much larger, is rare north of the Line and even in the southern equatorial region. This arrangement extends even into the representatives of the families of *Dictynidae* and *Clubionidae* found on the islands.

Among the specimens sent me there are representatives of fifteen species from eleven genera and seven families, but of these eight species and four genera belong to the one group of *Cyboeeae* above mentioned.

LIST OF SPECIES.

Order ARANEAE.

Fam. PZECHRIDAE.

Genus STIPHIDION, Simon.

Stiphidion minutissimum, nov. sp.

Fam. DICTYNIDAE.

Genus AMAUROBIUS, D. Koch.

Amaurobius rubrioides, nov. sp.

Genus BADUMNA, Thorell.

Badumna scylla, nov. sp.

Fam. ARGIOPIDAE.

Subfam. ARGIOPINAE.

Genus ARANEUS, Clerck.

Araneus verrucosus, Walck.

Fam. CLUBIONIDAE.

Subfam. CLUBIONINAE.

Group CLUBIONEAE.

Genus AMAUROBIOIDES, Cambr.

Amaurobioides piscator, nov. sp.

Fam. AGALENIDAE.

Subfam. CYBOEINAE.

Group CYBOEEAE.

Genus MYNOGLENES, Simon.

Mynoglenes marrineri, nov. sp.

Genus RUBRIUS, E. Simon.

Rubrius nummosus, nov. sp.
„ *cruciferus*, nov. sp.
„ *falxiatus*, nov. sp.

Genus MYRO, Cambr.

Myro hamiltoni, nov. sp.
„ *kirki*, nov. sp.
„ *ovalis*, nov. sp.

Genus PACIFICANA.

Pacificana cockayni, H. R. Hogg.

Fam. SALTICIDAE.

Group MARPISSEAE.

Genus CLYNOTIS, E. Simon.

Clynotis barresis, nov. sp.

Order OPILIONES.

Suborder MECOSTETHI.

Group INSIDIATORES, Loman.

Fam. TRIOENONYCHIDAE.

Genus TRIOENONYX, Sorensen.

Trioenonyx enderbei, nov. sp.

Order ARANEAE.

Fam. PZECHRIDAE.

Genus STIPHIDION, E. Simon.

Stiphidion, E. Simon, Bull. Soc. Ent. France, 8 Oct., 1902; Hist. Nat. des Ar., vol. ii, suppl., p. 974.

Stiphidion minutissimum, nov. sp. (Plate VII, figs. 1*a*–1*d*.)

The cephalothorax is pale canary-yellow, with 2 black blotchy streaks reaching from the posterior pair of eyes to the rear slope, and similar blotchy black lines round the margin of the cephalothorax. The mandibles are darker yellow, with a similar black longitudinal streak on each falx reaching from base to the falx-sheath. The fangs are pink. The lip, maxillae, and sternum are pale yellow. The legs and palpi are yellow, with 3 black stripes or spots on the underside of the femur.

The abdomen is pale yellow above, with black blotches on the posterior part. Underneath the same are a pair of dark median blotches and transverse darker folds in front of the cribellum.

The cephalothorax is slightly raised at the sides, but more or less flat along the median line. It is as broad as long, rounded at the sides, and narrowed to half its greatest width in front. The eyes are in 3 rows, 4 in the median and 2 pairs in front and behind.

Taking them as two strongly recurved lines, the posterior 4 are about equal in diameter, and of an orange colour, the median being one and a half times their diameter apart, the laterals their diameter from the same, and 4 diameters apart from one another.

The median eyes of the front row are smaller than the rear eyes, rather more than their diameter apart, yellow with black centres, and their laterals half the diameter of the rear median, and a whole diameter away from same, rather below the line joining their lower edge.

The *mandibles* are conical, rather kneed at the base, tapering to the extremities, where the fangs are small and weak. The *maxillae* are rounded at the top and outer sides. The *lip*, much broader than long, and rounded in front, lies across their lower part.

The *sternum* is a broad ovate, straight in front, the rear coxae not quite contiguous.

The legs are fine, and tapering to the posterior end. The patella is much shorter than the tibia, 3 claws on the tarsus, rather straight and smooth. There are 5 long erect spines, with roots on the tibial and metatarsal joints of all legs—2 underneath, 1 or 2 above, and 1 on the side.

There is no decided calamistrum, but on the inner side of tibia iv are a number of short fine downlying spines which may answer the same purpose.

The abdomen is ovate, straight in front, and pointed at the rear. In front of the spinnerets is a specially long and broad cribellate area without a break, rounded at the sides, and carrying 5 or 6 transverse lines of short brown bristles. The superior spinnerets are wider apart than the inferior, and from underneath can be seen on each side of the latter.

The measurements (in millimetres) are as follows: Cephalothorax, 1 mm. long, 1 mm. broad ($\frac{1}{2}$ mm. in front); abdomen, 2 mm. long, $1\frac{1}{2}$ mm. broad; mandibles, $\frac{5}{8}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$\frac{3}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{4}$	=	$4\frac{3}{8}$
2	$\frac{3}{8}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	=	$4\frac{1}{8}$
3	$\frac{1}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{4}$	=	$3\frac{3}{4}$
4	$\frac{3}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{1}{2}$	=	$4\frac{5}{8}$
Palpi	0·2	0·5	0·5	0·4	=	$1\frac{1}{2}$ (1·6)

This genus differs from *Acanthoctenus* in the lip being short and much broader than long, in having only a few long spines on tibia and metatarsus, and its large single cribellum, which has almost the appearance of a stridulating organ.

One female, from Campbell Island.

Of this genus there is only one species previously described (by M. Simon, *loc. cit.*), from Hobart.

Fam. DICTYNIDAE.

Genus AMAUROBIUS.

Amaurobius, C. Koch, Ueb. Ar. Syst., vol. i, 1837, p. 15. *Ciniflo*, Blackwall, Tr. Linn. Soc., xviii, 1841, p. 607. *Amaurobius* et *Titanoeca*, Thorell, Eur. Spid., 1869–70, pp. 124–126; E. Simon, Ar. Fr., vol. i, 1874, pp. 207–220. *Amaurobius*, E. Simon, Hist. Nat. des Ar., vol. i, p. 237.

Amaurobius rubrioides, nov. sp. (Plate VII, figs. 2*a*, 2*b*.)

Colour.—Cephalothorax yellow-brown, with rather darker narrow median and side stripes, and darker over the eye-area, sparsely covered with long brown upstanding hairs. Eyes bright yellow. Mandibles dark red-brown; fangs black at base, red on lower half.

Sternum, lip, maxillae, and coxae light yellow-brown. The skin of the abdomen appears to be moulting, but it is covered with short downlying and long upstanding brown hairs. The legs are dark yellow-brown ringed with dark grey. The palpi yellow.

The cephalic part of the cephalothorax is well raised up, broad and straight in front, and rounded at the anterior corners. The thoracic part is rounded at the sides, and slopes steeply down to the margin. There is a deep fovea at the head of the rear slope.

The rear row of eyes is procurved, the upper edge of the laterals being on a level with the lower edge of the median. They are equal in size, the median being slightly more than their diameter apart, and the laterals twice their diameter therefrom. The front row is shorter than the rear, the laterals as large as the rear laterals, on a common protuberance with them, half their diameter apart. The median eyes are two-thirds the diameter of the laterals, twice their own diameter apart, and the same distance from the laterals. The clypeus is rather more than twice the breadth of the front median eyes. The distance between the front and rear median eyes is twice the diameter of the former.

The *mandibles* are long and powerful, conical, and slightly divergent; the fangs strong and well curved. On the inner margin of the falx-sheath are 2 small teeth, and 1 large between 2 smaller on the outer.

The *maxillae* are upright, straight on the inner and well rounded on the outer side, and narrowing to the base.

The *lip* is longer than broad, widest just above the basal constriction, straight and slightly hollowed in front, where it is narrowest.

The *sternum* is shield-shaped, straight, and not quite its widest in front, pointed at the rear, where the coxae are half their breadth apart, and it slightly projects between them.

The *legs* are long and strong, tapering to the basal tarsal joints, furnished with long hairs but no spines on the underside of the femoral joints and 2 spines above on each. There are long single spines on the tibial and metatarsal joints. The superior claws are stout, well curved at anterior end, with 9 pectinations on the basal half. The inferior claw is smooth. There is no defined calamistrum, but short and long thin hairs on the lower end of metatarsus iv.

The *abdomen* is a moderately broad oval. The spinnerets are 2-jointed, the inferior pair stoutest, 1st joint conical, the 2nd hemispherical. The superior have the 1st joint cylindrical, with the 2nd joint half as long as the 1st, and conical.

The *cribellum* is single, thin, and linear.

The 4th pair of legs is barely as long as the 2nd.

This species differs from the accepted limits of the genus in its wider clypeus; the greater procurvature of the rear row of eyes, which makes the area of the median longer than broad; and in the single cribellum. This latter, however, I have found before in some males of the genus. It is a true *Amaurobius* in other respects.

The measurements (in millimetres) are as follows: Cephalothorax, 7 mm. long, 5 mm. broad (3½ mm. in front); abdomen, 9 mm. long, 6 mm. broad; mandibles, 3½ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	2½	7½	7½	8½	=	26
2	2½	6½	6½	7½	=	23
3	2	6	6	6½	=	20½
4	2½	6½	6½	7	=	22½
Palpi	1	2½	2½	2½	=	8½

One male, from the Snares Islands (not quite adult); Professor H. B. Kirk.

Genus Badumna, Thorell.

Amaurobius, L. Koch, Ar. Austr., 1873, p. 325 (ad. part *A. inornatus*). *Badumna*, T. Thorell, Rag. Mal., pt. iv, 1890, p. 322; E. Simon, Hist. Nat. des Ar., vol. i, p. 238, 1892.

Badumna scylla, nov. sp. (Plate VII, figs. 3*a*–3*c*.)

Colour.—Cephalothorax orange, darker in the median and side lines and round the margin. The upstanding hairs are dark brown. The eyes have orange rims, with black centres.

The *mandibles* are dark yellow-brown with brown hairs above, dark orange with short white hairs underneath; fangs yellowish-red; basal muscle-spots yellow.

The lip, maxillae, and coxae are yellow-brown, the lip having 2 dark-brown streaks, 1 each side of the median line. The sternum is a dingy yellowish-grey, darker than the rest. The legs are yellow, with dark-grey rings. Palpi yellow.

The abdomen above is black mottled with yellow, with brown upstanding and pale-yellow downlying hairs. On each side of the median line anteriorly are broad yellow patches to one-third of the length of the abdomen, and just in the middle a yellow St.-Andrew-shaped cross. On the underside are 4 longitudinal yellow stripes, reaching from the anterior to the posterior tracheal apertures, on a black ground. The hairs brown, upstanding, and fine pale yellow. The *spinnerets* are dark brown and the *cribellum* white.

The cephalic part of the cephalothorax is raised up equally with the thoracic part in the median area, whence it slopes steeply to the margin.

The rear row of eyes are procurved, the tops of the laterals being on a level with the bottom of the median. The latter are their diameter apart, and about twice

that distance from the laterals. The front and rear laterals are on a common protuberance, half their diameter apart; they are equal in size, and almost the same as the rear median.

The front row is straight, and shorter than the rear row. The median pair are only half the diameter of the rear median, and twice their diameter apart, and nearly twice that distance again from the rear median. They are rather farther from the side eyes than from one another. The breadth of the clypeus is the same as their distance from the side eyes.

The *mandibles* are twice as long as broad, straight, and only slightly kneed at the base. There are 3 quite small teeth on the inner side of the falx-sheath, and 3 larger on the outer.

The *maxillae* are upright, straight on the inner side, and only slightly curved on the outer.

The *lip* is as broad as long, and about half the length of the maxillae, straight but slightly hollow in front.

The *sternum* is shield-shaped, broad and truncate in front, pointed at the rear, where the 4th pair of coxae are quite contiguous. The legs are moderately long and strong, on the metatarsus of the 4th pair is a well-formed rather long calamistrum; there are single spines on all the metatarsi, 1 median underneath on tibia iii and iv, and 1 each on the femora above, the underside being smooth. The superior tarsal claws are well curved, and have about 7 pectinations. The inferior seem to be smooth.

The *abdomen* is ovate, rounded both anteriorly and posteriorly, the latter end pointed. The cribellum is double, with well-defined spines on it. The spinnerets are normal.

This species so nearly resembles the *Amaurobius* from the same locality (described above) in its eyes, coloration, and proportions generally, although only two-thirds the size of the non-adult male, that it seemed as if it must be a smaller but adult of the same. However, the mandibles are not so much kneed at the base; the lip is very clearly shorter; and the maxillae are narrower, and not nearly so much rounded on the outer side.

The cribellum is double, and the calamistrum well marked; the front median eyes smaller in proportion; also, the rear coxae are quite contiguous, instead of half their width apart.

In all other respects there is nothing to distinguish them. The difference in the cribellum is often sexual, but the lip is quite clear.

The measurements (in millimetres) are as follows: Cephalothorax, $4\frac{1}{2}$ mm. long, 3 mm. broad (2 mm. in front); abdomen, 5 mm. long, 3 mm. broad; mandibles, 2 mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$1\frac{1}{4}$	$4\frac{1}{2}$	$4\frac{1}{2}$	5	=	$15\frac{1}{4}$
2	$1\frac{1}{4}$	4	4	$4\frac{1}{2}$	=	$13\frac{3}{4}$
3	1	$3\frac{1}{2}$	$3\frac{1}{2}$	4	=	12
4	$1\frac{1}{4}$	4	4	$4\frac{1}{2}$	=	$13\frac{3}{4}$
Palpi	$\frac{1}{2}$	2	$1\frac{1}{2}$	$1\frac{1}{2}$	=	$5\frac{1}{2}$

One female, from the Snares Islands; collected by Professor H. B. Kirk.

Fam. ARGIOPIDAE.

Subfam. ARGIOPINAE.

Group ARANEAE.

Genus ARANEUS, Clerck.

Araneus verrucosus, Walck.

Epeira verrucosa, Walck., Hist. Nat. des Ins. Apt., tome ii, p. 135; E. Keyserling, Besch. n. und w.b. arten aus der fam. der Orbitelariae; in den Sitzungsb. der Isis zu Dresden, 1863, p. 139, pl. vi, f. 20, 21; L. Koch, Die Arach. Austr., 1872, p. 112. Urquhart, Trans. and Proc. N.Z. Inst., vol. xxiv, 1891, p. 226. *Araneus verrucosus*, Hogg, Proc. Royal Soc. Victoria, vol. xiii, 1900, p. 74; E. Simon, Arach. des Iles Chatham, Zool. Jahrb., 21 band, heft. 4, 1905, p. 417.

Two males and two females from the Auckland Islands, three females from Campbell Islands. Previously recorded from New Zealand, Wharekauri, Chatham Isles, and Victoria.

Fam. CLUBIONIDAE.

Subfam. CLUBIONINAE.

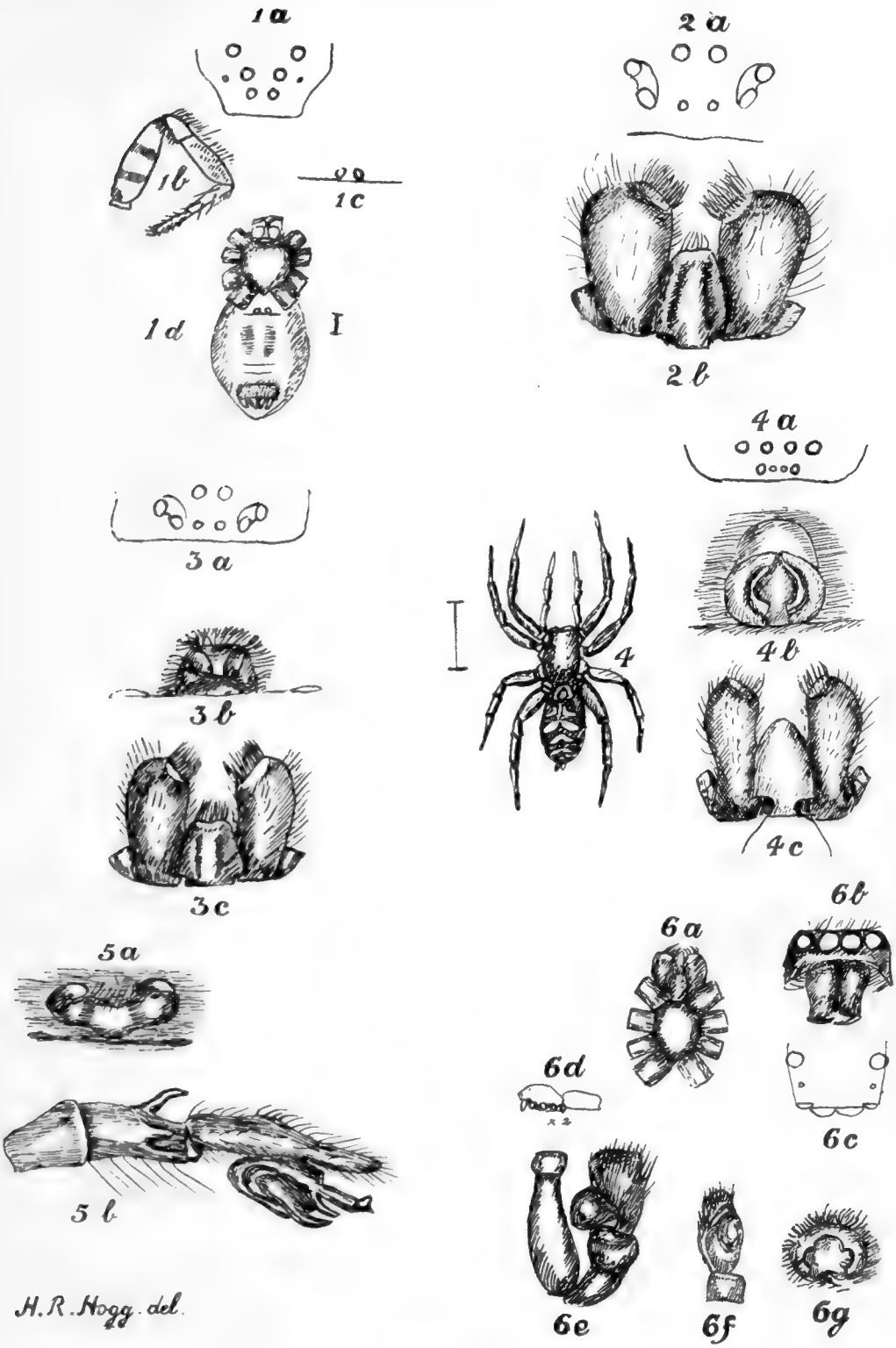
Group CLUBIONEAE.

Genus AMAUROBIOIDES, Cambr.

Amaurobioides, O. P. Cambridge, Proc. Zool. Soc., 1883, p. 356, pl. xxxvi, fig. 3; P. Goyen, Trans. N.Z. Inst., 1887, p. 140; E. Simon, Hist. Nat. des Ar., vol. ii, p. 89, 1897. *Uliodon*, E. Simon, Hist. Nat. des Ar., vol. ii, suppl., p. 1034.

There can be no reasonable doubt that these specimens found on Campbell Island, on rocks between the tide-marks, are closely allied to the species described by the Rev. O. P. Cambridge, *A. maritima* (*loc. cit*), as having been found on rocks in the sea at Allday Bay, Otago, and for which he formed the genus *Amaurobioides*. The fact that these were taken in a similar position on Campbell Island would seem to establish their claim to be really marine spiders in the same sense as those of the genus *Desis*. The only difference of generic value is that Mr. Cambridge states the cephalothorax to be in length double its breadth. In this species it is $3\frac{1}{2}$ mm. broad to $4\frac{1}{2}$ mm. long, but, as he makes the cephalothorax in his drawing (which is quite as likely to be correct) in the ratio 5 to $7\frac{1}{2}$, I place them in his genus.

M. Simon joins this genus with *Uliodon*, L. Koch, to which *Zora*, L. Koch (*non* C. Koch), had previously been added. The specimens described below agree very closely with Mr. Cambridge's genus, but differ materially from *Uliodon*, L. Koch, and more still from Zora, L. Koch. The eyes are, of course, different, and so is the proportion of the legs, but the cephalothorax is much broader in front, and certainly not oval. The maxillae are more upright, and not so narrowed at their bases. The lip is somewhat similar at the base, but not so pronouncedly concave in front. The


1a
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H.R. Hogg del.

PLATE VII.

sternum, long and narrow, is not broader than the length of the coxae. Mr. C. bridge's and this new species have both pronounced claw-tufts of spatulated brist and the female epigyne is of a totally different type. I can see no justification associating the two genera.

Amaurobioides piscator, nov. sp. (Plate VII, figs. 4*a*–4*c*.)

The cephalothorax is black-brown, covered with short fine downlying forward-pointing grey hairs. The mandibles are black-brown, with short brown hair on the basal part and long brown upstanding bristles on the lower half; the fangs are red, darkest at the basal end. The lip and maxillae are red-brown with paler edgings in front. The sternum and coxae are bright yellow-brown. The legs and palpi are darker yellow, with dark-grey hairs and bristles; a dark-grey scopula on tarsus and metatarsus of the front 2 pairs, and grey claw-tufts.

The *abdomen* is black-brown above, with a succession of yellow transverse chevrons, the anterior 2 pairs being divided by the brown colour. The spinnerets are yellow. The underside of the abdomen is yellow, with transverse rows of fine short hairs.

The cephalothorax is only slightly narrower in front than in its broadest part. It is moderately high in front, and from a level space the breadth of the rear row of eyes, reaching from thence half-way to the rear, it slopes to the edges. The rear row of eyes is straight, and the eyes are equidistant, as far apart as the diameter of the laterals, which are one-third larger than the median. The lateral eyes of the front row are as large as the rear median, and as far from the rear laterals as the diameter of the latter. The small median eyes are one-half the diameter of the rear median, their lower edges being in a straight line. They are all equidistant, being separated by one-third the diameter of the laterals. The distance of the front row from the margin of the clypeus is about the diameter of the front median, but viewed from above they appear right upon it.

The *mandibles* are kneed in front, conical, divergent, with long curved fangs. There are 3 large teeth on the inner edge of the falx-sheath, and 1 similar tooth on the outer edge, between 2 smaller ones, the upper being twice as far from it as the lower.

The *maxillae* are upright and narrow, straight on the inner side, rounded anteriorly, and at the back constricted in the middle. The *lip* is nearly twice as long as broad, rounded and rather pointed in front, much constricted at the base.

The *sternum* is a long shield shape, straight, and the breadth of the lip in front, pointed posteriorly, where the 2 rear coxae are separated by half their breadth. The sternum and coxae are all thickly covered with regularly laid short fine hair.

The *legs* are moderately stout, covered with strong upstanding bristly hair. A scopula of thick hairs, ending in claw-tufts of spatulate bristles, are on tarsi and metatarsi of the front 2 pairs, and are replaced in the 2 rear pairs by a thick coating of upstanding hair and just a few tufty bristles at the end of the tarsi. The claws are well curved, with about 7 small pectinations on the basal half.

The abdomen is ovate, straight in front, and pointed at the rear.

The spinnerets are rather long, and all of about equal length. The anterior pair are cylindrical, with a short conical 2nd joint. The superior are stouter and conical; the 2nd joint, though indicated, is hardly distinguishable as such. They all stand on a strong cartilaginous base, with a small colulus in front.

The general form and size, pattern on back of abdomen, and eye pattern of this spider very closely resembles *A. maritima*, Cambr. The cephalothorax is here lower. The 1st, 2nd, and 4th pairs of legs are of equal length, instead of 1, 4, 2, 3. There are 2 spines on the upper and under sides of femora, while in the other they are only on the tibia and metatarsus.

The measurements (in millimetres) are as follows: Cephalothorax, $4\frac{1}{2}$ mm. long, $3\frac{1}{2}$ mm. broad; abdomen, 6 mm. long, $3\frac{1}{2}$ mm. broad: mandibles, $2\frac{1}{2}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$1\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	3	=	$11\frac{1}{2}$
2	$1\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	3	=	$11\frac{1}{2}$
3	$1\frac{1}{4}$	3	3	$2\frac{3}{4}$	=	10
4	$1\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	3	=	$11\frac{1}{2}$
Palpi	$\frac{3}{4}$	2	2	2	=	$6\frac{3}{4}$

Three adults and six non-adult females from Campbell Islands; on rocks between tide-marks.

Fam. AGALENIDAE.

Subfam. CYBOEINAE.

Group CYBOEEAE.

Genus MYNOGLENES, Simon.

Mynoglenes, Simon, Zool. Jahrb. 21, pt. 4, 1905.

Mynoglenes marrineri, nov. sp. (Plate VIII, figs. 1*a*–1*c*.)

The *cephalothorax* is rather dark yellow-brown; darker brown round the margin, down a median stripe, and in the striations. The *mandibles* are the same colour; the fangs red-brown; the lip and maxillae much darker, the upper margin of the lip being yellow, maxillae the same, but not too pronounced. The *legs*, including the coxae, are bright orange-yellow, with bands of brown on all joints, except the tarsi, brown upstanding bristly hairs. In one specimen the legs are yellow without bands. The ground-colour of the abdomen is black on the back and sides, with a large yellow-grey patch in front, followed by a succession of pairs of triangular yellow spots each side of the black median line all the way to the rear end. There is a greyish-yellow longitudinal median area on the underside, the spinnerets being yellow-brown.

The *cephalothorax* is broad in front and rounded at the sides, the thoracic part being convex. The cephalic part, rising again from this, is highest a little way behind the eyes. There is a broad and deep longitudinal fovea behind the cephalic part to half-way down the rear slope. From the fovea 6 pairs of lateral depressions reach to the margin. The whole surface is very finely granulated, as is also that of mandibles, lip, maxillae, and sternum, with only a few scattered upright hairs at the anterior end. The *clypeus* is broad and perpendicular. Underneath the protuberance on which the lateral eyes stand, on each side, is a deep fovea, and

between the two a shallow depression passing under the median eyes. Viewed from in front this gives the appearance of the eyes standing on a rounded platform above the clypeus proper. The rear row of eyes procurved, when seen from in front, the side eyes being about half their diameter below the median. The median pair, if anything rather larger than the side, are half their diameter apart, and a full diameter from the laterals. The front and rear laterals are on a common protuberance, close together, the lower ones as large as the rear median. The latter are their diameter from the front median pair, which, half the diameter of the same, are one-half their own diameter apart. As their lower edges are on a line with the lower margin of the laterals, the whole row looks somewhat recurved. The clypeus is about five times as wide as the front median eyes.

The *mandibles* are broad at the base, rather strongly kneed, slightly divergent, with long and powerful fangs. On the inner margin of the falx-sheath are 2 large teeth at the lower end, and 5 small above them. On the outer margin are 5 large teeth, and 1 small between the basal end and the first of them. The troncature is long and sloping.

The *lip* is broader than long, broadest in front, where it is convex, and protrudes over the basal portion the whole of its width. The *maxillae* bend over the lip, but are upright along their outer edge, rounded to the troncature, which slopes forward so as to nearly meet the opposite one at its lowest point, thence sloping back to the edge of the lip.

The *sternum* is shield-shape, broad in front, pointed at the rear. It is convex, with hollows in front of each coxae, and strongly granulated all over, but with only a few upstanding hairs.

The rear *coxae* are contiguous, but the 2nd and 3rd on each side are separated by about one-third the diameter of the former. The legs are fine, and nearly smooth. The femora are no thicker than their respective coxae, and curve towards the body. The patella is barely as long as the coxa of its respective leg. The metatarsus and tarsus are very fine, with upstanding hairs. All the tarsi and the metatarsi of the front 2 pairs are without spines. The 2 rear pairs of legs have a pair of spines on the upper side, and a single one underneath, both very fine.

The *abdomen* is oval, the back and sides being covered with short longitudinal corrugations, and a few short downlying hairs. The spinnerets are 2-jointed; the broadest inferior pair, being contiguous, has its short 2nd joint nearly hemispherical, that on the superior being conical and slightly longer. There is a small colulus.

The epigyne is rather triangular in shape, with a median ridge at the lower edge, and 2 punctuations above.

The measurements (in millimetres) are as follows: Cephalothorax, 3 mm. long, 2 mm. broad (1½ mm. in front); abdomen, 5 mm. long, 3 mm. broad; mandibles, 2 mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	¾	3¼	3¾	4½	=	12¼
2	¾	3¼	3¾	4½	=	12¼
3	¾	3	3	4	=	10¾
4	¾	4	4	5	=	13¾
Palpi	½	1½	1½	1¼	=	4¾

Three females were collected by Mr. G. R. Marriner, after whom I have named it, from under stones on the sea-shore, at Monument Harbour, Campbell Island.

This species, while nearly allied to the genera *Cyboeus*, *Cyboeolus*, and *Cedicus*, of E. Simon, differs from *Cyboeus* in having 5 equally large teeth and 1 small on the outer margin of the falx-sheath, instead of 1 large between 2 smaller; and in having the legs scarcely bespined at all, instead of strongly bespined; also in its distinctly 2-jointed instead of 1-jointed spinnerets.

It resembles *Cedicus* in the largely dentated inner margin to its falx-sheath; in its colulus; its front median eyes, much nearer one another than to the laterals; and in its spinnerets: but differs in its shorter lip, wider clypeus, and straight or recurved front row of eyes instead of procurved.

It resembles *Cyboeolus* in the smooth metatarsi of its front 2 pairs of legs; in its rear median eyes, nearer to one another than to the laterals: but differs in its unequally-sized front row of eyes, its convex mandibles, and broad-topped lip, as well as where *Cyboeolus* agrees with *Cyboeus* as above noted.

A single smaller but adult female from Enderby Island (Auckland Islands) is clearly the same as the above-described from Campbell Islands, the only difference being that the legs are shorter in proportion to the cephalothorax and abdomen, and colouring rather darker.

The measurements (in millimetres) are as follows: Cephalothorax, $2\frac{1}{2}$ mm. long, 2 mm. broad ($1\frac{1}{2}$ mm. in front); abdomen, 4 mm. long, 3 mm. broad; mandibles, $1\frac{1}{4}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	=	$8\frac{1}{4}$
2	$\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	=	$7\frac{1}{2}$
3	$\frac{1}{2}$	2	2	$2\frac{1}{2}$	=	7
4	$\frac{3}{4}$	3	3	4	=	$10\frac{3}{4}$
Palpi	$\frac{1}{4}$	$1\frac{1}{4}$	1	$\frac{3}{4}$	=	$3\frac{1}{4}$

Genus Rubrius, E. Simon.

Coelotes, E. Simon, Bull. Soc. Zool. Fr., 1884, p. 123 (ad. part *C. subfasciatus*). *Rubrius*, E. Simon, Mission Scient. du Cap Horn, Zool., vi, Aracn., 1887; Hist. Nat. des Ar., vol. ii, p. 245, 1898. *Myntbes*, E. Simon, Hist. Nat. des Ar., vol. ii, p. 245, 1898. *Rubrius*, E. Simon, Hist. Nat. des Ar., Supplt. general, p. 1041, 1903.

Rubrius nummosus, nov. sp. (Plate VIII, figs. 2*a*–2*d*.)

Cephalothorax bright red-brown, darker at the sides of the cephalic part and the eye-space. Mandibles dark red-brown, with yellow muscle-spots at base. Fangs black-brown at base, red-brown at lower half. Lip, maxillae, sternum, legs, and palpi slightly darker than the cephalothorax.

The *abdomen* is rather bright yellow-brown in front and at the sides; at one-third of the distance from the base is a dark-grey median line, with 4 pairs of wavy

side lines of the same colour, and mottlings on the yellow ground; underneath dark brown. Spinnerets yellow-brown.

The *cephalothorax* is only moderately raised up, and the thoracic part is only slightly lower. In front it is rather more than half its greatest width.

The rear row of eyes are equal, and equidistant, not quite $1\frac{1}{2}$ times their diameter apart. They are procurved, so that the top of the lateral and the bottom of the median are in the same straight line. The front and rear laterals are on a common protuberance, nearly their diameter apart.

The front laterals are as large as the eyes of the rear row, and their diameter from the front median; the median pair, their diameter apart, are two-fifths the diameter of the laterals. The whole line being straight, the clypeus is four times the diameter of the front median eyes.

The *mandibles* are rather longer than the breadth in front of the cephalothorax, kneed at base, and conical, with rather long wavy fangs. There are 2 teeth on the inner side of the falx-sheath and a thick fringe on the outer.

The *lip* is longer than broad, straight, slightly hollowed in front, with straight sides, widest just above the constricted base. The *maxillae* are upright, rounded on the outer side, with base as broad as the front of the lip.

The *sternum* is shield-shaped, truncate in front, with point at rear protruding between the 4 pair of coxae, which are not quite contiguous.

The *legs* are moderately stout. There are spines on the femora, tibiae, and metatarsi, but the tarsi are all smooth. There are thick bristles on the underside, hardly, however, amounting to a scopula. The superior claws have 5 or 6 pectinations, and the inferior is apparently smooth.

The *abdomen* is oval, slightly rounded at the sides. The inferior spinnerets are largest in diameter, cylindrical, with a short hemispherical 2nd joint, and on bases not quite contiguous, separated by a large broad-topped colulus.

The superior pair are also cylindrical, and have a quite distinct conical 2nd joint.

The measurements (in millimetres) are as follows: Cephalothorax, $8\frac{1}{2}$ mm. long, $6\frac{1}{2}$ mm. broad ($3\frac{1}{2}$ mm. in front); abdomen, 10 mm. long, $6\frac{1}{2}$ mm. broad; mandibles, 4 mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$2\frac{1}{2}$	8	8	9	=	$27\frac{1}{2}$
2	$2\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{1}{2}$	$7\frac{1}{2}$	=	25
3	2	$6\frac{1}{2}$	$6\frac{1}{2}$	$6\frac{1}{2}$	=	$21\frac{1}{2}$
4	$2\frac{1}{2}$	8	8	9	=	$27\frac{1}{2}$
Palpi	$1\frac{1}{2}$	$4\frac{1}{2}$	$3\frac{1}{2}$	3	=	$12\frac{1}{2}$

One female, from Bounty Island.

This differs from the species from the Campbell and Auckland Islands not only in its much greater size, but in the closer eye-spacing, and equal distance of the rear row of eyes, though the legs are similar in proportion, and the epigyne of the female very similar.

Bounty Island is about 4° farther north than the Auckland and Campbell Groups, and naturally would have a milder climate.

Rubrius cruciferus, nov. sp. (Plate VIII, figs. 3, 3*a*–3*d*.)

Female.—Cephalothorax yellow-brown, darkening anteriorly and at the sides to nearly black-brown. Mandibles black-brown; fangs black at base, red at lower end. Lip and maxillae black-brown, paler in front. Sternum dark yellow-brown at edges, paler in the centre. Coxae and legs yellow-brown all over, with dark-brown upstanding hairs. Tarsi darker than the rest, claws dark-brown. Abdomen above is dark yellow-brown, interspersed with so many black spots as to look nearly black. A broad paler yellow-brown longitudinal stripe extends from the base to the posterior end, where it narrows to a point; within this, at the anterior end, is a darker median stripe; angular side-pieces come out from the sides at intervals all the way down; the pair in the middle of the back are longer than the rest, giving the appearance of a St. Andrew's Cross, with the lighter colour above them. The underside is dingy yellow-brown in front as far as the genital aperture, the remainder being black-brown, with the exception of the epigyne and spinnerets, which are yellow-brown.

The *male* is similarly coloured throughout, but the sternum is not so dark, and the ground-colour of the abdomen much lighter through the absence of black patches. The back is covered with long brown upstanding hairs.

In some specimens the sternum, lip, and maxillae are rather paler than in others.

The cephalic part of the *cephalothorax* is long, square in front, rather abruptly convex, and more so in the male than in the female. It is bounded by narrow depressions, and has a slight median one extending the whole length from the eye-space to the anterior end of the sulcus, with a row of short bristles therein. There are also bristles on the fore part, but it is mostly smooth. The thoracic part is slightly rounded at the sides, but does not add much to the breadth.

The rear row of eyes, which are equal in size, is rather strongly procurved, the lower edge of the median pair being half their diameter above the upper edge of the laterals. The median are twice their diameter apart, and three diameters from their laterals, as well as the same distance from the front median, the median quadrilateral being thus longer than broad. The front row is only as long as the distance between the rear lateral eyes, which are on a common tubercle with those of the front row, the latter being slightly larger. The small median eyes are in a line with the laterals, half their diameter, and equidistant from them and each other. The clypeus is three times their breadth.

The *mandibles* are as long as the front of the cephalothorax, slightly kneed at the base, conical, and divergent. The claws are long and strong. There are 3 larger and some smaller teeth on the outer edge of the falx-sheath, and 2 small on the inner margin.

The *lip* is longer than broad, straight but slightly hollowed in front, and more than half the length of the *maxillae*, which are upright, straight on the inner and rounded on the outside.

The sternum is convex, shield-shape, straight in front, narrowing to a point between the rear coxae, which are a short distance apart. All the coxae have a longitudinal suture at the side.

The legs are only moderately stout, and fine at the anterior ends. The claws are strong, with about 9 pectinations on the superior.

The abdomen is ovate, straight in front, and rounded at the posterior end, with long bristly hair on the upper side, and rather short stiff hair on the under.

The spinnerets are 2-jointed, the 2nd short and hemispherical on the inferior pair, rather more pointed on the superior, with a broad colulus between the inferior pair, which, however, meet above it.

The measurements (in millimetres) are as follows :—

Female.—Cephalothorax, $5\frac{1}{2}$ mm. long, 4 mm. broad (3 mm. in front); abdomen, $6\frac{1}{2}$ mm. long, 4 mm. broad; mandibles, $3\frac{1}{2}$ mm. long (longer than patella 1).

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$1\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	=	$16\frac{1}{2}$
2	$1\frac{1}{2}$	4	$4\frac{1}{2}$	5	=	15
3	$1\frac{1}{2}$	4	$4\frac{1}{2}$	4	=	14
4	$1\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{2}$	5	=	$16\frac{1}{2}$
Palpi	$\frac{3}{4}$	2	2	$1\frac{1}{2}$	=	$6\frac{1}{4}$

Male.—Cephalothorax, 5 mm. long, $3\frac{1}{2}$ mm. broad ($2\frac{1}{2}$ mm. in front); abdomen, 5 mm. long, 3 mm. broad; mandibles, 2 mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$1\frac{1}{2}$	5	$6\frac{1}{2}$	$6\frac{1}{2}$	=	$19\frac{1}{2}$
2	$1\frac{1}{2}$	$4\frac{1}{2}$	5	$5\frac{1}{2}$	=	$16\frac{1}{2}$
3	$1\frac{1}{2}$	$3\frac{1}{2}$	4	$4\frac{1}{2}$	=	$13\frac{1}{2}$
4	$1\frac{1}{2}$	4	$4\frac{1}{2}$	5	=	15
Palpi	$\frac{3}{4}$	2	1	1	=	$4\frac{3}{4}$

There are numerous specimens from the Auckland and Campbell groups, all certainly the same. Of fifty specimens sent from these two groups, one-half are members of this genus, so that it would appear to be the most firmly established of any in the locality.

Rubrius falxiatus, nov. sp. (Plate VIII, figs. 4*a*–4*d*.)

The cephalothorax is yellow, quite smooth, the eyes a bright topaz. The mandibles a darker orange, with paler basal muscle-spots. The fangs red, brown-red at the anterior end. The lip and maxillae dark yellow. Sternum, legs, and palpi yellow. Abdomen on upper side black, mottled with small yellow spots anteriorly, and yellow backward-curving transverse stripes on black ground on posterior half. Long upstanding brown hairs, and patches of flat white plumose hairs or bristles. The underside is yellow.

The convex cephalic part occupies the major part of the *cephalothorax*, which is as broad in front as in its widest part. The rear row of eyes is procurved, by the width of a diameter, from in front, but nearly straight viewed from above, equal in size, and equidistant by rather more than the breadth of their diameter. The front row is straight, its laterals on a common protuberance with the rear laterals half their diameter distant. It is shorter in length than the rear row by the width of

these. The median eyes are half the diameter of the laterals, their diameter apart, and the same distance from the side eyes. The clypeus is the breadth of the side eyes.

The *mandibles* (in male) are long, narrow, and projecting, as long as the cephalothorax, and in breadth less than half the width of the same in front; they do not quite meet at their bases. There is a large well-defined basal spot. From their base to half their length they gradually broaden, narrowing again to the apex, with a fang-sheath reaching to their middle point. At quite the lower end of this are 3 small equal teeth on the inner margin, 1 larger above, and 2 quite small teeth on the outer, all close together. The fangs are half as long as the mandibles, thin, and wavy. In the female the mandibles are shorter, and vertical.

The *lip* is broad and straight in front, slightly longer than broad, and more than half the length of the *maxillae*. These are upright, straight, and wide in front, the straight outer margin incurving from the point where it joins the top, in an angle on one maxilla, but rounded on the other (probably the angular one is abnormal); the inner margin curves over the lip till it meets the sloping troncature.

The *sternum* is shield-shaped, convex, straight in front, and projecting in a narrow point between the rear coxae, which are not contiguous.

The *legs* are very fine and long. The tarsal joints are without spines, terminated by 3 small fine claws, with about 5 short pectinations on the superior and 3 on the inferior. On the metatarsi there is 1 spine above, a pair at the sides, and a bunch at the anterior end. The *palpi* are long and thin; the tibial joint much longer than the patellar, and the cap of the distal joint as long as the tibia, with a small bulb and projector at the basal end.

The *abdomen* is cylindrical, long and narrow, with rough hairs on the upper side, finer and sparser hairs on the under.

The spinnerets stand on hard smooth bases, the inferior largest, half their diameter apart, with a quite short 2nd joint; the superior the same. They are preceded by a colulus.

This species would seem to conform to M. Simon's South American species rather than to the Tasmanian forms described by him. It has 3 equal teeth on the inner margin of the falx-sheath, a squarer-shaped lip, and narrower clypeus; the smooth tarsi, however, and long sloping mandibular troncatures agree with the latter. In none of the descriptions of the species to which I have been able to refer is there any mention of projecting mandibles equal in length to the cephalothorax, as in this case, and in this particular it is more like an *Argyroneta*.

In size it agrees most closely with *R. paroculus*, E. Simon, from Tasmania, though not the same, as in the latter all the eyes are equal, and the colouring of lip, maxillae, sternum, and legs much darker. M. Simon writes of it as being "a very abnormal species, which will without doubt become the type of a special genus." He does not, however, point out the specialities to which he alludes. I leave this one in the genus *Rubrius* for a better knowledge of it gained from more material. I think its proper place should be in the *Argyroneteae*, somewhere between *Argyroneta* and *Cambridgea*, with the latter of which it has many points in common, notably the lip and maxillae and male palp; still, it agrees with every point mentioned in M. Simon's specification of the genus *Rubrius*.

The measurements (in millimetres) are as follows: Cephalothorax, $2\frac{1}{2}$ mm. long, 2 mm. broad; abdomen, 3 mm. long; mandibles, $2\frac{1}{2}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$1\frac{1}{2}$	4	5	6	=	$16\frac{1}{2}$
2	1	$3\frac{1}{2}$	4	$4\frac{1}{2}$	=	13
3	1	3	3	3	=	10
4	1	$3\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{1}{2}$	=	$12\frac{1}{2}$
Palpi	$\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{1}{4}$	=	$6\frac{1}{2}$

One male, from the Auckland Islands; and one non-adult female (?).

There is no record of the situation in which these were found, but the bottle next in number to them from the same group contains a spider of the same genus (*Amaurobioides*, Cambr.) as one from the Campbell Islands, found under stones on the sea-shore. The *Argyroneta*- or *Desis*-shaped mandibles suggest that this also may possibly be a marine spider.

Genus Myro, Cambr.

Myro, O. P. Cambridge, Proc. Zool. Soc. Lond., 1876, p. 263; E. Simon, Hist. Nat. des Ar., vol. ii, pp. 245–46.

Myro hamiltoni, sp. nov. (Plate VIII, figs. 5*a*, 5*b*.)

The cephalothorax, mandibles, lip, maxillae, sternum, legs, and palpi a uniform bright yellow-brown. Abdomen yellow-grey above; 2 dark-brown spots about the middle; from the inner side of these spots 2 thin lines reach to the posterior end, and 2 dark spots on the outside of these lines; front part irregularly mottled. The underside is a dingy yellow-grey.

The cephalic part of the cephalothorax is rather elevated.

The rear row of *eyes* are so strongly procurved as to make two lines; all 4 eyes in wide black rings. They are equal in size, the median pair being about $1\frac{1}{2}$ their diameter apart. The laterals are only twice the same diameter apart, and the distance of their diameter below the median. The front laterals are oval, rather more than their long diameter apart, and half that distance from the rear side eyes, the minute median eyes being just above their inside edges. The clypeus is about half the long diameter of the front laterals.

The *mandibles* are kneed at the base, and conical; the fangs slight and weak, and the margin obliquely sloping. On the inner side of the falx-sheath are 2 large and 1 smaller teeth; on the outer side, rather long incurved bristles.

The *lip* is as long as broad, slightly rounded in front.

The *legs* are fine, the tarsal and metatarsal joints quite tapering. The tibiae and metatarsi are furnished with long stout spines. The superior claws have about 5 small pectinations, the inferior being apparently smooth; the 1st and 2nd pairs are equal in length.

The *palpi* have the tibial joint longer than the patellar.

The *abdomen* is ovate, straight in front. There are 6 2-jointed spinnerets, the inferior pair being largest and close together; the 2nd joint is nearly hemispherical. There is a colulus.

The epigyne is oval, longer than broad, with a rectangular opening reaching from the base to two-thirds of its height upwards.

The measurements (in millimetres) are as follows: Cephalothorax, $2\frac{1}{2}$ mm. long, 2 mm. broad ($1\frac{1}{2}$ mm. in front); abdomen, 4 mm. long, $2\frac{3}{4}$ mm. broad; mandibles, $1\frac{1}{2}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Tib. and Pat.	Met. and Tars.		
1	$\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	3	=	$8\frac{1}{2}$
2	$\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$	3	=	$8\frac{1}{2}$
3	$\frac{1}{2}$	2	$2\frac{1}{2}$	3	=	8
4	$\frac{3}{4}$	$2\frac{1}{2}$	3	4	=	$10\frac{1}{4}$
Palpi	$\frac{1}{4}$	$1\frac{1}{4}$	1	1	=	$3\frac{1}{2}$

Two females from Macquarie Island are the only specimens brought from that locality. The Rev. O. P. Cambridge's *Myro kerguelenensis* was the only spider found on Kerguelen Island by the Transit of Venus Expedition, and M. Eugene Simon has described one other, *M. caffer*, from the Cape of Good Hope.

The above differs from *M. kerguelenensis* in the more procurved rear row of eyes, the small median front eyes being quite below the laterals in the former instead of lying between them. The epigyne is longer than broad instead of broader than long (*sec.* Camb.). In the Cape of Good Hope species the legs (*sec.* Simon) are darker, and tinged with red.

This species is named in honour of Mr. A. Hamilton, Curator of the Dominion Museum, Wellington.

Myro kirki, nov. sp. (Plate VII, figs. 5*a*, 5*b*.)

Cephalothorax rather dark yellow-brown. Eyes bright topaz-yellow.

Mandibles, lip, maxillae, sternum, coxae the same. The coxae have a darker longitudinal median stripe.

The *legs* are yellow-brown, with grey rings on the femora, patella, and tibia, grey hair and bristles, and brown spines and claws. The tibia, metatarsus, and tarsus are darker.

The *abdomen* (casting skin) is yellow-grey, with brown and paler-yellow hair. Spinnerets yellow, with brown hairs.

The *cephalothorax* is moderately convex, highest in front of the rear slope, where there is a short deep fovea, rounded at the sides, and narrowing to nearly half its width in front.

The *eyes* of the rear row are equal and equidistant, about half their diameter apart, and procurved so that the upper edge of the laterals are on a level with the lower edge of the median. The laterals of the front row are as much below the rear laterals as the rear median are above them, but nearer to them, and of the same size. The front median eyes, one-third the diameter of the others, are their diameter apart, and that distance from the side eyes, but their bottom edges above the upper edges of the front laterals. The clypeus is twice the breadth of the front laterals.

There are rather long curved bristles inside the eye-space.

The *mandibles* are kneed at the base, conical, and divergent, the fangs long and strong. Four teeth on the inner margin of the falx-sheath, and a thick scopula on the outer.

The *lip* is as broad as long, straight, broad, and slightly hollowed on the front margin, the sides rounded to the smaller base. The lip is half the length of the *maxillae*, which slightly converge over it. From the anterior end, where they are straight for a short distance from the troncature, they are rounded to the base, where they are narrowest. The sternum is a broad shield-shape, straight in front, and narrowing to a point at the rear, where it separates the 4th pair of coxae. The 1st and 2nd pair of coxae are contiguous, but separated by an interval from the 3rd pair. The coxae of the 4th pair are broader than any of the others, and separated by a fourth of their width.

The *legs* are moderately strong, tapering to the ends, with long stout spines: 1 above, on the femora; 3 pairs below tibia i; 2 pairs below metatarsus i; and 3 pairs below, 3 at the sides, and 3 above on metatarsus iv. The claws are long and strong, with 8 pectinations on the superior pair, and 1 near the base of the inferior.

The *abdomen* is ovate, pointed at the posterior end, with downlying short hairs all over. The inferior spinnerets are conical, 2-jointed, the 2nd short and hemispherical, one-third of their diameter apart, with a small colulus in front. The superior pair are cylindrical, with a similar short 2nd joint.

The measurements (in millimetres) are as follows: Cephalothorax, $4\frac{1}{4}$ mm. long, $3\frac{1}{4}$ mm. broad (2 mm. in front); abdomen, $6\frac{1}{2}$ mm. long, 4 mm. broad; mandibles, 2 mm. long. Palpal tibia longer than patella.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$1\frac{1}{4}$	4	$4\frac{1}{4}$	5	=	$14\frac{1}{2}$
2	1	$3\frac{1}{2}$	4	4	=	$12\frac{1}{2}$
3	1	3	3	3	=	10
4	$1\frac{1}{4}$	5	5	6	=	$17\frac{1}{4}$
Palpi	$\frac{1}{2}$	2	$1\frac{1}{2}$	$1\frac{1}{4}$	=	$5\frac{1}{4}$

One female (not quite adult), from the Snares Islands.

This solitary female is not quite through her last moult, but it is interesting to find two species of this genus on the one small island, so I have described it and named it after Professor H. B. Kirk, who discovered it.

Myro ovalis, nov. sp. (Plate VIII, figs. 6*a*, 6*b*.)

Female.—Cephalic part of cephalothorax yellow-grey, with a dark-brown median longitudinal stripe, and 2 fainter curved brown stripes at the sides, reaching from the rear row of eyes to the rear of the cephalothorax. On the sloping sides of the cephalic part, and on the median area of the thoracic, are transverse dark-grey mottled stripes. The lower half of the sides of the thoracic part are pale yellow. The eyes are dark yellow with black centres, and there are long brown bristles in the eye-area. The abdomen has a broad black median stripe at the anterior end, with yellow stripes on each side of it; beyond these, mottled yellow and brown. There are patches of white plumose hairs on the posterior half. The spinnerets and epigyne are yellow. The legs yellow, ringed with grey on the femora, tibiae, and metatarsi. The palpi yellow, without stripes.

Male.—Cephalic part yellow, the grey streaking on the sides and rear being much less pronounced than in the female, though there are faint traces of it. The mandibles are yellow; the fangs yellow-brown; sternum, lip, and maxillae yellow, with fine brown hairs. Legs yellow, ringed with grey, with brown hairs and spines; bristles on the metatarsus grey. Palpi yellow. The abdomen on the upper side is black-brown, slightly mottled with yellow, with pale yellow hairs; underneath yellow-grey and black, with similar pale-yellow hairs. Spinnerets dingy yellow-grey.

Male and Female.—The raised-up part of the cephalothorax is rather narrow, sloping steeply to the edges all round. The eyes of the rear row and laterals of the front row form an oval ring, the front laterals lying nearly under the rear median. The 2 quite small front median, their diameter apart, are just above the space between the laterals. The 6 large eyes of the female are $1\frac{1}{2}$ times the diameter of those of the male, and consequently nearer together. The maxillae, lip, and sternum are as in *M. kirki*, above described, the sternum being convex. There is a space between coxae ii and iii in both sexes, but in the male the rear coxae are quite contiguous. The legs are long and fine, with about 6 pectinations on the superior claws, and numerous long spines on the tibiae and metatarsi, with bunches of spines at the end of the latter. There are 2 spines on the upper side of each femur. The mandibles are as long as the cephalothorax is broad in front. They are kneed, conical, and divergent, with 2 or 3 small and 2 larger teeth on the inner edge of the falx-sheath, and 1 large between 2 small on the outer. The palpi are $1\frac{1}{2}$ times the length of the cephalothorax, the tibial joint being equal to the patellar.

The measurements (in millimetres) are as follows:—

Female.—Cephalothorax, $2\frac{1}{2}$ mm. long, 2 mm. broad ($1\frac{1}{2}$ mm. in front); abdomen, $2\frac{1}{2}$ mm. long, $1\frac{1}{2}$ mm. broad; mandibles, $1\frac{1}{2}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	1	3	3	4	=	11
2	$\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	3	=	$9\frac{1}{4}$
3	$\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	=	$8\frac{3}{4}$
4	1	3	3	4	=	11
Palpi	$\frac{1}{4}$	$1\frac{1}{2}$	1	1	=	$3\frac{3}{4}$

Male. — Cephalothorax, $2\frac{1}{2}$ mm. long, 2 mm. broad ($1\frac{1}{2}$ mm. in front); abdomen, $2\frac{1}{2}$ mm. long, 1 mm. broad; mandibles, $1\frac{1}{2}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	1	3	3	4	=	11
4	$\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	3	=	$9\frac{1}{4}$
3	$\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	3	=	$8\frac{3}{4}$
4	1	$3\frac{1}{2}$	$3\frac{1}{2}$	4	=	12
Palpi	$\frac{1}{4}$	$1\frac{1}{2}$	1	1	=	$3\frac{3}{4}$

Besides being very much smaller, this differs from *M. kirki* in having legs i and iv equal in length, instead of the 4th pair considerably the longer. The palp is longer in proportion, the tibial joint of same being equal to the patellar instead of longer. The pattern on the cephalothorax alone identifies it, and the eyes are dull and dingy instead of bright topaz-yellow.

The eyes in both of these species from the Snares Islands seem more closely to resemble those of M. Simon's *M. caffer* than do those of *M. hamiltoni*, while the latter, in their greater procurvature, are more like those of *M. kerguelenensis*, Cambr. The male palp, pattern of abdomen, and other points are like *M. kerguelenensis*.

One male and one female, from the Snares Islands.

Genus Pacificana, H. R. Hogg.

Pacificana, H. R. Hogg, Ann. & Mag. Nat. Hist., ser. 7, vol. xiii, p. 65, 1904.

Pacificana cockayni, H. R. Hogg.

Pacificana cockayni, H. R. Hogg, Ann. & Mag. Nat. Hist., ser. 7, vol. xiii, p. 66, text-figure 1, 1904.

One male and four females, collected on Bounty Islands by Dr. Cockayne in 1903, and forwarded to me by Professor Charles Chilton, of Canterbury College.

The genus *Pacificana* is known only from the Bounty Islands; it is allied to *Emmenomma*, Simon, founded for a species found on the islands Hoste and Hermite, adjacent to Cape Horn, and to *Ommatauxesis*, Simon, from Tasmania.

Fam. SALTICIDAE.

Group MARPISSEAE.

Genus Clynotis, E. Simon.

Clynotis, E. Simon, Hist. Nat. des Ar., vol. ii, p. 611, 1901. *Icius*, L. Koch, Ar. Austr., 1879, p. 1127.

Clynotis barresis, nov. sp. (Plate VIII, figs. 6*a*–6*g*.)

M. Simon states (*loc. cit.*, p. 600) that the species described by L. Koch as of the genus *Icius* do not belong to his genus, widely spread as it is over Europe, Asia, and Africa. He therefore formed for them the new genus *Clynotis*.

The specimens here described (one male and two females, from Campbell Island, collected by Messrs. Des Barres and Chambers) appear to belong to the genus in question. The front row of eyes are not quite so much recurved as described in some of the species. They are rather close to *C. semiater*, L. Koch, but, except in the legs, differ in their brighter colouring, and the 3rd pair of legs shorter than the 2nd, instead of being equal to them.

Male.—The cephalothorax is dark orange, with large black blotches between the small eyes, round the rear eyes, and over the rear slope, black all round the sides, with pale-yellow hair. At the sides of the eye-space the hairs are bright yellow, inclining to red. The eyes are all yellow, the rear pair on black rims. The clypeus overhangs the point of insertion of the mandibles, and in the space between are long stout bristly hairs. The mandibles are dark yellow-brown; fangs yellow-brown. The lip and maxillae are dark yellow-brown. The front pair of legs have the femur, patella, tibia, and metatarsus dark (but not black) brown, with dark-brown upstanding and pale-yellow downlying hair. The tarsal joint is paler yellow-brown, with pale bristles at the anterior end. The spines are black. The other legs are

similar, but not so dark. The coxae and trocanters yellow-brown. The sternum black-brown. The abdomen dingy yellow-brown, without recognisable pattern. The *cephalothorax* is highest one-third of the distance from the posterior end, and slopes to the rear and forward, the rear pair of *eyes* being about half-way between the highest point and the front row of eyes. The small second row of eyes are slightly nearer to the front row than to the rear row. The front row of eyes are level along the top line, the large median, close together, being twice the diameter of the side pair, which are about a third of their diameter away. The median do not quite reach down to the margin of the clypeus. The *mandibles* are broader at the base than at the apex, where they are rather flat, the fangs being short, weak, and almost straight. The *lip* is slightly longer than broad, straight in front. The maxillae are rounded at the outer side, hang over the lip on the inside, with a short sloping cut. The front coxae almost touch the lip, and cut across the base of the maxillae.

The rear coxae are contiguous in the female, but not quite so in the male. In the female the cephalothorax is orange-yellow, with the similar dark-brown patches; the sides dark brown, with pale-yellow hair; but the rear slope dingy yellow. The mandibles, palpi, legs, sternum, lip, and maxillae are yellow, with pale hairs. The abdomen, which is a long oval, is dingy yellow-grey, with downlying pale-yellow hair. The yellow, rather long, cylindrical, 1-jointed spinnerets are quite terminal.

The male and females were found in the same locality, but the legs of the male are much darker than those of the female; the rear coxae are not so close together, the front pair are more over the maxillae, and the front pair of legs longer. They might turn out eventually to belong to different species, but I have taken them for the same.

The measurements (in millimetres) are as follows:—

Male.—Cephalothorax, $2\frac{1}{2}$ mm. long, $1\frac{3}{4}$ mm. broad ($1\frac{1}{4}$ mm. in front); abdomen, $2\frac{1}{2}$ mm. long, $1\frac{3}{4}$ mm. broad; mandibles, $\frac{3}{4}$ mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$1\frac{3}{4}$	=	$6\frac{3}{4}$
2	$\frac{1}{2}$	$1\frac{1}{2}$	2	$1\frac{1}{4}$	=	$5\frac{1}{4}$
3	$\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	1	=	$4\frac{1}{2}$
4	$\frac{3}{8}$	2	2	$1\frac{1}{2}$	=	$5\frac{7}{8}$
Palpi	..	1·1	0·5	0·6	=	2·2

Female.—Cephalothorax, $2\frac{1}{2}$ mm. long, $1\frac{3}{4}$ mm. broad (1·4 mm. in front); abdomen, 3 mm. long, $1\frac{3}{4}$ mm. broad; mandibles, 0·7 mm. long.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.	Met. and Tars.		
1	$\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{1}{4}$	=	5
2	$\frac{3}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$	1	=	$4\frac{3}{8}$
3	$\frac{1}{4}$	$1\frac{1}{2}$	1	$1\frac{1}{2}$	=	$4\frac{1}{4}$
4	$\frac{3}{8}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$1\frac{3}{4}$	=	$5\frac{5}{8}$
Palpi	..	1	1	$\frac{3}{4}$	=	$2\frac{3}{4}$

One male and two females, from Campbell Island (Des Barres and Chambers). Named after Mr. Des Barres.

Order OPILIONES, Sund.

Suborder MECOSTETHI.

Group INSIDIATORES, Loman.

Fam. TRIOENONYCHIDAE.

Genus TRIOENONYX, Sorensen.

Trioenonyx, W. Sorensen, Arach. Austr. Zweiter Theil, p. 58, 1886 ; Dr. J. C. C. Loman, Zool. Jahrb., band xvi, 1902 ; R. I. Pocock, Ann. & Mag. Nat. Hist., ser. 7, vol. x, December, 1902, pp. 511 *et seq.* ; R. I. Pocock, Proc. Zool. Soc., 1902, p. 392 *et seq.*

Trioenonyx enderbei, nov. sp. (Plate VIII, figs. 7*a*–7*c*.)

Carapace.—Black-brown, with dingy yellow median stripe extending from the eye tubercle half-way to the posterior edge. From this emanate side scrolls of same colour on each side, the whole forming a shield-shape pattern. Behind this again, and along the sides, are numerous faint yellow patches. The segmental area is black-brown above, with small faint yellow spots round each segment ; on the underside the segmental spots are very clearly defined bright-yellow lozenges on a black ground. As far as the sternum the black-brown is mottled with yellow ; the edges are yellow. Over the coxal area the yellow colour prevails, mottled with black, while the maxillary processes are wholly yellow.

The *legs* are yellow, ringed with brown from the trochanter to the anterior end of the metatarsus, the tarsus being brown.

The *palpi* are black, mottled with clearly defined small yellow spots.

The *mandibles* similarly are black, with a network of yellow spots.

The dorsal carapace is very finely granulated, almost smooth, without tubercles or spines, with the exception of a few short white bristles on the segments, and at the sides close to the posterior end, and a tubercular projection on the front edge each side of the eye tubercle.

The *eye* tubercle is not quite marginal ; although enlarged at the base, it is cylindrical, with a hemispherical top, the whole tubercle pointing forwards. It is smooth, and the small yellow eyes on black rims are placed two-thirds of the length from the base up the tubercle.

The maxillary processes are triangular or pyramidal, higher at the end than the nearly rectangular second piece, from which it is divided by a sulcus.

Palp. — Trochanter : One spinous tubercle above. Femur : A longitudinal median row of spinous tubercles on upper side, 1 very high round-headed on underside, 2 large and 3 smaller along the middle at base, and 1 at the inner side. Patella smooth. Tibia : Two large and 1 smaller on the inner side, 3 large on the outer. Tarsus : Four large and 1 small on the outer edge, 3 large and 3 small on the inner. Rough tubercles on trochanter and femur.

Coxae ii and iii roughly tubercled all over, but none on trochanter or femur.

Coxae iv twice as broad as the others, a few scattered small tubercles and bristles.

Tarsal segments 4, 10, 5, 5.

The measurements (in millimetres) are as follows: Cephalothorax, 4 mm. long, 4 mm. broad (3 mm. in front); abdomen, 2 mm. long, 4 mm. broad; mandibles, $1\frac{1}{4}$ mm. long, $1\frac{3}{4}$ mm. broad.

Legs.	Coxae.	Tr. and Fem.	Pat. and Tib.		
1	$1\frac{1}{2}$	$1\frac{1}{2}$	2	=	5
2	$2\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	=	$8\frac{1}{2}$
3	2	2	$2\frac{1}{2}$	=	$6\frac{1}{2}$
4	$2\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	=	$8\frac{1}{2}$
Palpi	2	$1\frac{3}{4}$	1	=	$4\frac{3}{4}$

One female (?) from Enderby Island; one non-adult from Auckland Islands.

In conclusion, I have to thank Mr. A. S. Hirst, of the British Museum, for kindly allowing me to refer to specimens of the *Arachnida* in his charge.

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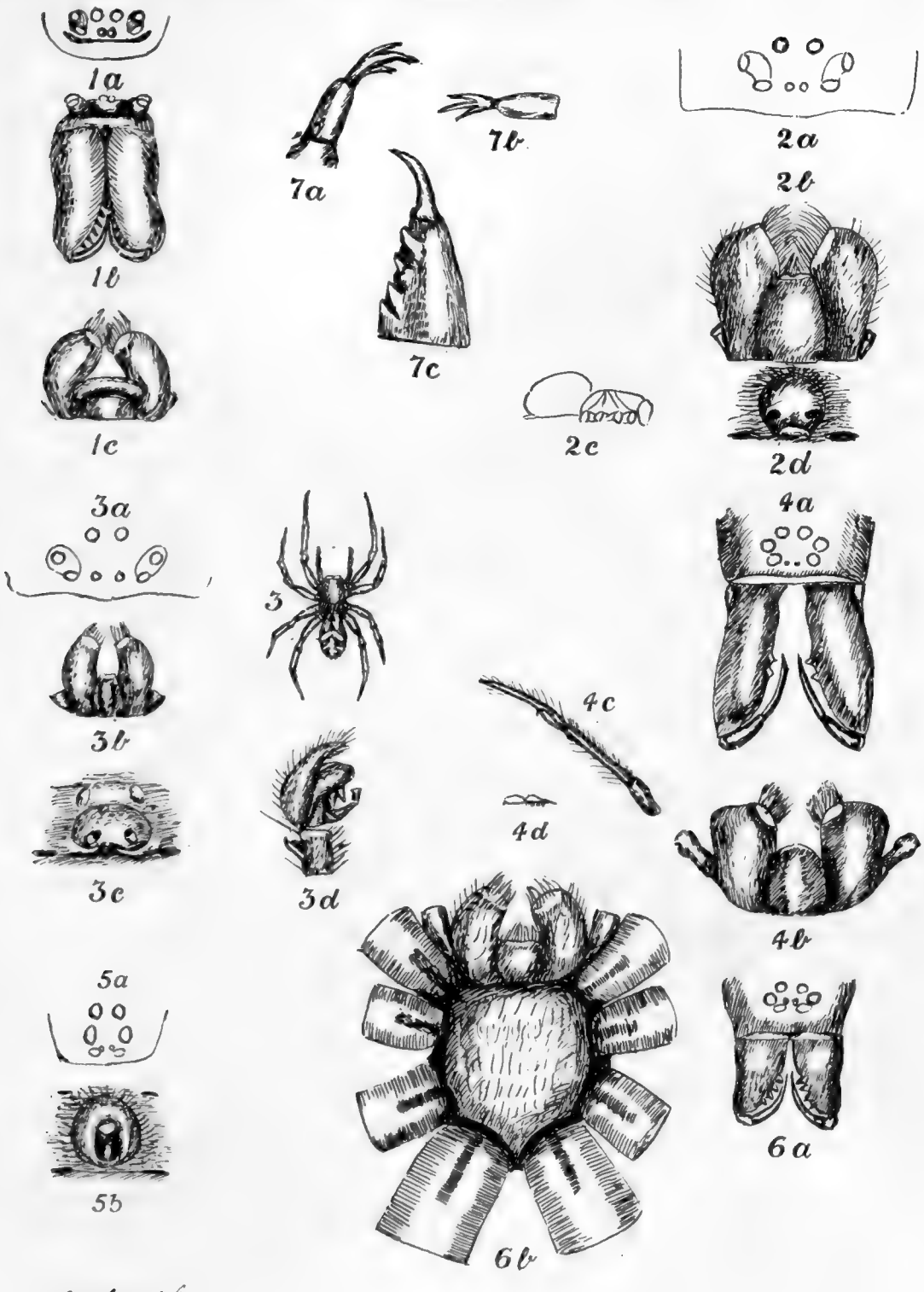
EXPLANATION OF PLATES VII AND VIII.

Plate VII.

Fig. 1. *Stiphidion minutissimum*, sp. nov. *a*, eyes; *b*, leg of 4th pair from inner side; *c*, epigyne; *d*, underside of abdomen.
Fig. 2. *Amaurobius rubrioides*, sp. nov. *a*, eyes; *b*, lip and maxillae.
Fig. 3. *Badumna scylla*, sp. nov. *a*, eyes; *b*, epigyne; *c*, lip and maxillae.
Fig. 4. *Amaurobioides piscator*, sp. nov. Upper side of body (× 2). *a*, eyes; *b*, epigyne; *c*, lip and maxillae.
Fig. 5. *Myro kirki*, sp. nov. *a*, epigyne; *b*, male palp.
Fig. 6. *Clynotis barresis*, sp. nov. *a*, lip, maxillae, sternum, and coxae; *b*, eyes, from in front, with mandibles; *c*, eyes, from above; *d*, profile (× 2); *e*, male palp (all joints), from side; *f*, male palp (patella and tarsus), from in front; *g*, epigyne.

Plate VIII.

Fig. 1. *Mynoglenes marrineri*, sp. nov. *a*, eyes, from above; *b*, eyes, from in front, with mandibles; *c*, lip and maxillae.
Fig. 2. *Rubrius nummosus*, sp. nov. *a*, eyes; *b*, lip and maxillae; *c*, profile (nat. size); *d*, epigyne.
Fig. 3. *Rubrius cruciferus*, sp. nov. (nat. size). *a*, eyes; *b*, lip and maxillae; *c*, epigyne; *d*, male palp.
Fig. 4. *Rubrius falxiatus*, sp. nov. *a*, eyes and mandibles; *b*, lip and maxillae; *c*, male palp; *d*, profile (nat. size).
Fig. 5. *Myro hamiltoni*, sp. nov. *a*, eyes; *b*, epigyne.
Fig. 6. *Myro ovalis*, sp. nov. *a*, eyes; *b*, lip, maxillae, sternum, and coxae.
Fig. 7. *Trioenonyx enderbei*, sp. nov. *a*, last joint and claw of 4th pair of legs (from side); *b*, last joint and claw of 4th pair of legs (from above); *c*, last joint and claw of left palp (from outer side).


1a
1b
1c
7a
7b
7c
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4c
4d
4b
5a
5b
6a
6b
H. R. Hogg. del.

PLATE VIII.

ARTICLE X.—THE ECOLOGICAL BOTANY OF THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By L. Cockayne, Ph.D. (Munich).

Contents.

1. Introduction.

This paper must not be looked upon as in any degree exhaustive, but be considered merely as a series of extended notes. Ecological studies must be prosecuted in the field from living plants; herbarium material is of but little moment. Notwithstanding the two excursions I have made to the region under consideration, when the bad weather, difficult country, and time occupied in getting to the plant formation, or plant to be examined, are considered, only a few hours have been spent in actual field observations. All that is sought here is to give some general idea of the aspect and distribution of the vegetation, together with certain details regarding the plants themselves, leaving abundant gaps to be filled up and corrections made by future observers.

Between floristic and ecological botany no hard-and-fast line can be drawn. Long before the latter term was coined, any botanist visiting a new country would be almost certain to give some general account of the plant-covering, while usually the details supplied in the extended description of the species would contain facts having a bearing on the relation of the organism to its environment. Thus, in the writings of nearly all the botanists who have visited the islands here dealt with is more or less matter of ecological interest, but it is generally buried amongst floristic particulars.

First and foremost comes the magnificent work of Sir Joseph Hooker. In the "Flora Antarctica"* is a vivid picture of the rata forest, while, taken in conjunction with the coloured plates, a very fair idea may be gained from the descriptions of the species regarding the appearance of the meadow of herbaceous plants. Also, in the critical remarks are many details of ecological importance.

Dr. J. H. Scott's paper on Macquarie Island,† published in 1883, contains some interesting matter regarding the vegetation of that little-known and remote spot.

Mr. T. Kirk examined portions of all the islands botanically, except Macquarie, in 1890, publishing the next year his well-known paper entitled "On the Botany of the Antarctic Islands,"‡ which, although floristic for the most part, gives some important particulars both as to the vegetation as a whole and regarding certain species. Mr. Justice Chapman, who visited the islands at the same time as Kirk, published a valuable paper§ in which the flowering of some of the plants is noted, the manner of growth of *Olearia Lyallii* described, and a fine picture given of the remarkable plant formation on which was bestowed the appropriate name of "Fairchild's Garden."

In 1904 Mr. A. Hamilton explored Macquarie Island, undergoing considerable hardships and danger during the voyage. In his "Notes on a Visit to Macquarie Island"‖ he supplements Scott's work, furnishing an excellent account of the swamp formation, and also of what must be an upland wind-desert.

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* This is quoted in Mr. Cheeseman's memoir in this volume.
† Trans. N.Z. Inst., vol. xv, p. 484; 1883.
‡ Rep. Aus. Assoc. Adv. Sci., vol. iii, p. 213; 1891.
§ Trans. N.Z. Inst., vol. xxiii, p. 91; 1890.
‖ Trans. N.Z. Inst., vol. xxvii, p. 559; 1895.

Dr. L. Diels's memoir on the ecology of New Zealand flowering-plants as a whole appeared in 1896,* and here for the first time the species are dealt with on modern ecological lines, special attention being paid to their leaf-anatomy.

In June, 1903, I visited all the islands, excepting the Snares and Macquarie, publishing a paper† in which an attempt is made to classify the vegetation, describe its winter aspect, and deal with the species ecologically rather than floristically.

Miss E. M. Herriott, in 1906, using as material a number of living plants growing in the experimental garden of Canterbury College, describes their leaf-anatomy, and seeks to show its relation to the natural environment of the plants, transverse sections of the leaves being figured in each case.‡

Finally, a short popular account of some of the botanical work of the present expedition appeared in the Kew Bulletin,§ compiled from a letter of Captain A. Dorrien-Smith, and from articles written by myself for various New Zealand newspapers.‖

Certain explorations of recent years, partly in connection with the Antarctic Expeditions, have thrown a flood of light upon the ecology of other subantarctic lands. Alboff,¶ Dusén,** and Skottsberg†† have respectively published many important facts regarding Fuegian vegetation, and the latter most enthusiastic explorer has also investigated South Georgia.‡‡ Recently the plant formations of the Falklands have been described by S. Birger.§§ Finally, in a most comprehensive work, illustrated with admirable photographs and many figures, Dr. H. Schenck has brought up to date the present knowledge of the whole subantarctic botanical dominion,‖‖ publishing at the same time many of the facts observed and conclusions arrived at by the late Professor Schimper as botanist to the German Deep-sea Expedition.

2. Leading Physiognomic Plants.

The leading plants of any region have by no means an equal physiognomic value; some few will probably dominate the landscape as a whole, while others may be confined to a special station—in other words, the first is primarily a *climatic*

* "Vegetations-Biologie von Neu-Seeland"; Engl. Bot. Jahr., bd. xxii; 1896.

† Trans. N.Z. Inst., vol. xxxvi, p. 225; 1904.

‡ Trans. N.Z. Inst., vol. xxxviii, p. 377; 1905.

§ Kew Bull., No. 6, p. 237; 1908.

‖ *Lyttelton Times*, Nov. 6th, Dec. 2nd, 3rd, 5th, 1907.

¶ "Flore raisonnée de la Terre de Feu"; Ann. de Museo de la Plata; 1902.

** "Die Gefässpflanzen der Magellansländer"; Wiss. Ergebn. der Schwed. Exp., bd. iii, 1900: and "Die Pflanzenvereine der Magellansländer"; *ibid*, 1903.

†† "Feuerländische Blüten"; Wiss. Ergebn. d. Schwed. Südp. Exped., bd. iv, lief. 2, 1905: and "Some Remarks upon the Geographical Distribution of Vegetation in the Colder Southern Hemisphere"; Ymer, p. 402, 1905: also "Zur Flora des Feuerlandes"; Wiss. Ergebn. d. Schwed. Südp. Exped., bd. iv, lief. 4, 1906.

‡‡ "The Geographical Distribution of Vegetation in South Georgia"; Geog. Journ., Nov., 1902.

§§ "Die Vegetation bei Port Stanley auf den Falklandinseln"; Engl. Bot. Jahrb., bd. 39, heft 2, p. 275; 1906.

‖‖ "Vergleichende Darstellung der Pflanzengeographie der subantartischen Inseln insbesondere uber Flora und Vegetation von Kerguelen"; Wiss. Ergebn. der deut. Tiefsee Exped., bd. ii; 1905.

and the second an *edaphic* physiognomy. Thus, in the Auckland Islands the widespread distribution of *Metrosideros lucida* and *Danthonia antarctica* is climatic, while that of the large-leaved plants, or of *Marsippospermum gracile*, treated of further on, is edaphic.

It is not easy to draw the line as to what is of physiognomic importance. Here the treatment is brief, and plants are omitted which perhaps should have received mention, but in such cases these are dealt with under other heads.

One point must be especially noted—namely, that, with few exceptions, the physiognomic plants are endemic. The following are the plants treated of: *Metrosideros lucida* (*Myrtaceae*); *Danthonia antarctica*, *Poa litorosa* (*Gramineae*); the three species of *Pleurophyllum*, *Celmisia vernicosa* (*Compositae*); *Bulbinella Rossii* (*Liliaceae*); the two species of *Aciphylla* (*Umbelliferae*); *Stilbocarpa polaris* (*Araliaceae*); *Suttonia divaricata* (*Myrsinaceae*); *Dracophyllum* sps. (*Epacridaceae*).

Metrosideros lucida (southern rata, ironwood).—Although in New Zealand this is usually an upright though irregularly shaped tree, 12 m. or so tall, in the subantarctic province it has a more or less prostrate trunk, far-spreading, twisted horizontal branches which finally branch vertically, and, through repeated branching, form, with the leaves, dense rounded or flattened masses, looking dark-coloured in the distance (fig. 2). The leaves are of the lanceolate type, taper at base and apex, about 5 cm. by 2 cm. in size; thick, stiff, coriaceous, bright glossy green on upper but paler on under surface, and have a yellow midrib. The flowers are bright crimson, very numerous, and arranged in short terminal cymes.

Danthonia antarctica is a tall tussock-grass, 110 cm. tall, more or less, and 85 cm. in diameter at the base, made up of numerous stout leafy culms, and long, coriaceous, thick, involute leaves of a rather pale- or yellowish-green colour, which taper into long filiform points. Most frequently there is a short but massive and irregular trunk.

Poa litorosa is also a tussock-grass, which grows on taller and more cylindrical trunks than the above, and is made up of numerous leafy culms, and long, rather stiff, coriaceous, filiform, closely involute leaves of the steppe-grass character, which, at first erect and bunched together, finally curve drooping on all sides of the trunk in great shock-headed masses. The upper part of the trunk is surrounded with a thick mantle of dead leaves and culms, which in its interior is quite decayed (fig. 1).

Pleurophyllum speciosum is a semi-summer-green herb of great size, having 4 or 5 bright-green, fleshy, coriaceous, ovate leaves, about 57 cm. long by 39 cm. broad, given off from a short, stout rootstock, and which, pointing upwards, but much more outwards, form either a wide cup or a rosette pressed almost to the ground (fig. 14). On the under-surface of a leaf, at about 10 mm. apart, are more or less parallel, stout, but rather brittle ribs which are connected by a network of raised, stout veins, forming shallow lacunae in the deep furrows between the ridges, which are filled with loosely entangled cobwebby hairs. The upper surface of the leaf above the veins is sunken, and the intermediate parallel spaces are raised, giving a "corrugated" appearance to the leaf. The very stout flowering-stems, 80 cm. or more tall, bear 15 heads, more or less, each about 5 cm. in diameter, having dark-purple disc and pale-purple ray-florets. The roots are stout, fleshy, and long.

FIG. 1.—PORTION OF SWAMP FORMATION, EWING ISLAND.
Poa litorosa in centre, showing habit when furnished with a trunk.
In foreground, *Carex ternaria*: *Olearia Lyallii* in background.

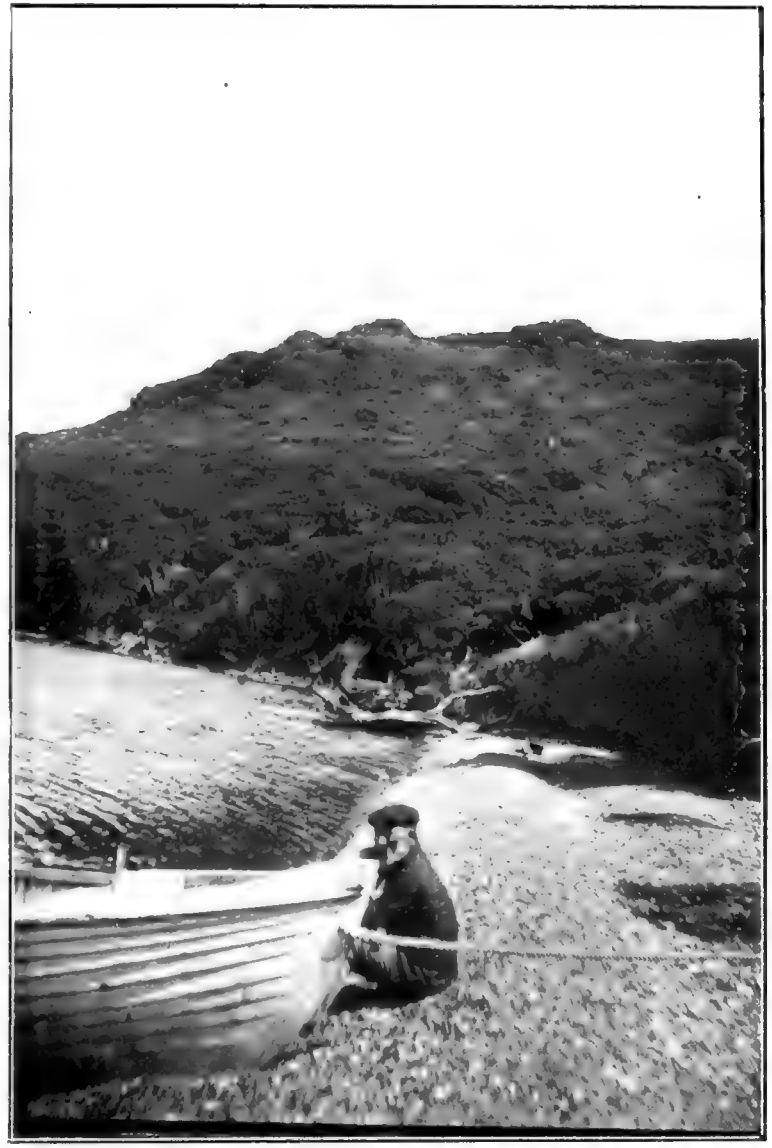

FIG. 2.—RATA FOREST OF THE AUCKLAND ISLANDS, SHOWING FLAT ROOF AND CLOSE GROWTH OF THE ULTIMATE TWIGS.

Pleurophyllum criniferum is a true summer-green herb. The leaves are thinner and much more erect than those of *P. speciosum*. They are pale but bright green, soft, only moderately thick, and covered on the under-surface with a loose, silky tomentum, through which the chlorophyl is dimly visible. They are ribbed on the under-surface, the ribs being stout, flexible, and 3 mm. or 4 mm. broad, and the intervening spaces about 2 cm. across. The ribs hold the leaf erect, and their flexibility keeps it from tearing. The base is narrowed into a stout petiole, the margins of which are so strongly incurved as to touch, or nearly so, at the base of the blade, making a channel 2·5 cm. deep. The massive flowering-stem is 1 m. tall, or more, and bears numerous globose heads in a raceme, each about 4 cm. in diameter, and with the florets purplish-brown in colour, but not showy (fig. 16). The roots are very numerous, stout, fleshy, and long.

Pleurophyllum Hookeri is a semi-summer-green herb, and a much smaller plant than the two preceding. The leaves are in loose rosettes, those of the centre being erect, and the outer ones semi-erect or pressed to the ground. The leaves are of the obovate type, about 29 cm. long by 6·5 cm. broad, and have a short, thick, juicy petiole. They are rather thin in texture, and covered on both surfaces with silvery, adpressed silky hairs, this covering being the special physiognomic mark of the plant. The flowering-stems are about 40 cm. tall, and bear some 20 subglobose heads in a raceme.

Celmisia vernicosa is a suffruticose plant, with numerous branching, woody, prostrate stems, which are sometimes subterranean, and furnished at their extremities, which bend upwards, with close rosettes of leaves. The leaves are linear, about 8·2 cm. long by 5 mm. broad, dark green, excessively glossy, stiff, coriaceous, and extremely flexible. The rosettes vary much in size, being from 16·5 cm. to 4·5 cm. in diameter. The dead leaves turn into peat, and nearly equal the living portion of the rosette. The plant as a whole forms a round raised mat 93 cm. or so in diameter, or the rosettes may be pressed together so closely that a cushion results. The flower-heads are numerous, 3 cm. to 4 cm. in diameter, and the scapes are about 13 cm. tall. The flower-buds are closely protected by the involucral bracts, and are also hidden by the stiff inner leaves of the rosette. At night the flower-heads partially close, the ray-florets becoming vertical and close together.

Bulbinella Rossii is a summer-green perennial herb, with leaves somewhat after the manner of a garden hyacinth. The leaves are numerous, about 29 cm. long by 9 cm. broad, and given off from a short, stout rootstock. They are bright green and fleshy. The outer leaves are curved, but the inner nearly erect, and all are bent so as to form channels down which water can flow to the roots. The flowers are dioecious, orange-coloured, in dense racemes on rather long pedicels. The scapes are stout, and 30 cm. or more long. The male inflorescence is larger and more showy than the female, and may be 10 cm. by 5 cm.

Aciphylla latifolia and *A. antipoda* are stately, umbelliferous, evergreen herbs (fig. 6). The leaves are large, erect, very thick, coriaceous, long-petioled, dark green, and pinnate. The inflorescence consists of compound umbels forming a head, which is frequently of great size, and borne on a stout yellowish-green flower-stalk, 73 cm. tall by 3·5 cm. in diameter, more or less. The two species are closely related, *A. antipoda* having the leaves much more finely divided than *A. latifolia*. Further details are given when dealing with the special ecology of the plants.

Stilbocarpa polaris is a far-spreading evergreen herb. It has a very stout rhizome, 6 cm. (more or less) in diameter, which creeps along the surface of the ground, giving off numerous orbicular-reniform leaves. These are bright green,

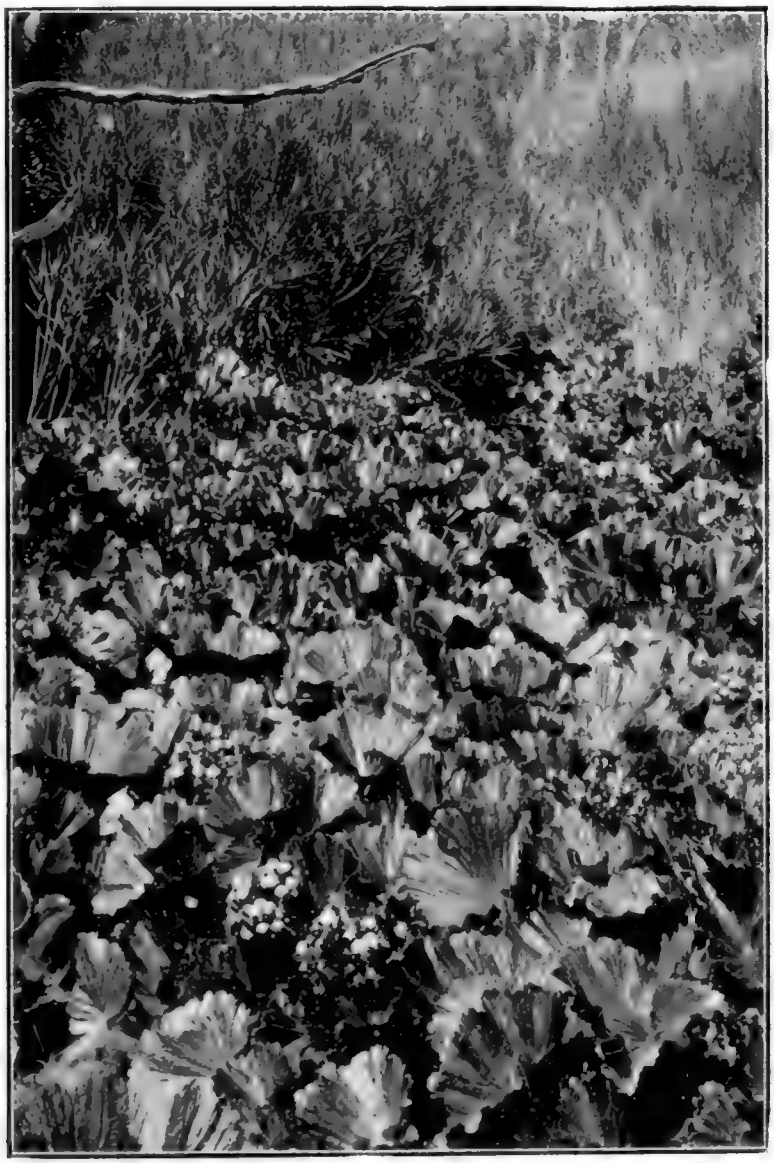

FIG. 3.—*Stilbocarpa polaris* FORMING A CLOSE-GROWING MASS IN THE *Pleurophyllum* MEADOW, ADAMS ISLAND.

Juvenile *Dracophyllum longifolium* in the background.

fleshy, coriaceous, about 20 cm. long by 30 cm. broad, strongly ribbed beneath, and raised on stout, hollow petioles about 50 cm. long (fig. 3). The flowers are small, fleshy, greenish in colour with a brown centre, very numerous, and arranged in

compound umbels joined together into a globose head which is about 12 cm. deep and 19 cm. across, and terminates a pale-green fistular stem about 32 cm. in length.

Suttonia divaricata is a typical example of the divaricatingly branched shrubs dealt with at some length further on. It is sometimes almost a small tree, in which case there is a naked main stem or stems and a flattened head of interlacing but somewhat weeping twigs. The leaves are small, obovate or obcordate, about 1·3 cm. long, dark- or yellowish-green, coriaceous, dotted with glands. The flowers are minute. The fruit is small, globose, fleshy, and purple.

The species of *Dracophyllum* are specially dealt with further on.

3. The Ecological Factors.

It is only possible at present to speak in most general terms of those agents on which the presence of the various life-forms and their distribution depends. It is premature to attempt the reduction into its constituents of that general condition known as "climate"; nor is this so necessary as in those regions where there are great extremes of heat, light, and so on.

The subantarctic climate, owing to latitude and the position of the islands in a great body of water, is a most equable one. Between the mean temperature of summer and winter, or even between their extremes, there is little difference. A sky constantly cloudy, rain for a longer or shorter period almost daily, an atmosphere ever saturated with moisture, brief periods of sunshine, a general average low temperature with but slight frosts at sea-level during winter, constant cold and violent winds, accompanied with showers of rain, or sleet, or snow, even in summer—such is the general climate of the islands under consideration. There are no records as to the climate of the hills, which in the Aucklands rise to a height of 600 m., but undoubtedly they experience in winter a good deal of frost. The ground near the summit of Mount Honey, in Campbell Island, was frozen hard at the time of my visit in June, 1903, whereas at sea-level on the same day there was little or no frost. But even on the hills I doubt much if the cold is ever very severe, or of long duration, or that it falls below −9° C. at most.

If we must separate from the remainder one factor, it will be the wind, whose mark is on the vegetation everywhere, both with regard to form and distribution. Especially is constant wind antagonistic to tree-growth, and these islands strikingly bear out this statement. Low forest, composed, however, of but few species of trees and shrubs, forms in many parts of the Auckland Group a belt along the shore, most luxuriant where there is most shelter, but wanting in especially exposed situations. Moreover, this forest, as is seen further on, has adapted itself to the wind-conditions. On Campbell Island, where the smaller land-surface and general configuration affords less shelter, there is no forest, its place being taken by a dense growth of shrubs analogous to a similar formation on the Aucklands above the forest-line. On Antipodes, a smaller island still, the scrub is stunted to an extreme degree, and is found only in sheltered gullies, or hidden by the tall tussock-grass. Finally, on Macquarie Island, at a latitude corresponding with that of north Yorkshire, woody plants are altogether wanting.

The moisture-laden atmosphere and lack of sunshine at all seasons strongly favours the formation of peat.* The dead leaves and stems of the herbaceous plants slowly rotting remain attached to the living plants; bryophytes on the ground, on tree-trunks, on rock-faces build thick layers and cushions of peat, the outer shoots alone alive; so, too, with the spermaphytic cushion plants. The ferns *Blechnum durum* and *Asplenium obtusatum*, so common on the coastal cliffs, form from their dead rhizomes masses of peat 30 cm. or much more in depth, which completely cover the flatter rocks, and even at times the almost vertical faces of coastal cliffs, so that a luxuriant plant-covering exists. Indeed, the whole soil of the islands, sometimes for a depth of 30 ft. or more, is made up altogether of plant-remains, and contains no outward sign of mineral matter.† Such a soil becomes extremely wet, being frequently quite saturated; in many places pools of water lie upon its surface, and holes, masked by the vegetation, but full of water, are everywhere on the open hillsides. Even during the brief periods of sunshine, tussock meadow and scrub are dripping wet, so that one's clothes quickly become saturated.

The saturation of the soil, its very imperfect drainage, the scarcity of free oxygen, and the absence of micro-organisms lead to an abundance of humous acids in the substratum. These acids on the one hand, and the coldness of the soil on the other,‡ a matter due not to frequent and long-enduring frosts, but to the ever-present wind acting on a wet soil, lead to a marked physiological dryness which is clearly reflected in the xerophily of so many of the life-forms. The vegetation is, generally speaking, more or less of a moorland character, the maximum being exhibited by the mountain bogs, and the minimum by the rata forest and *Pleurophyllum* meadow; indeed, this latter term is by no means ecologically appropriate, but is used throughout this paper rather to keep the nomenclature in line with my former writings than because any natural New Zealand plant formation is truly a meadow in the European signification.

The plants themselves—that is, more especially the life-forms evoked by the climate—are not without considerable influence on distribution. The interior of the rata forest is markedly hygrophytic; the robust tussocks of the meadows shelter ground-plants, and even shrubs, providing an almost wind-still atmosphere. On Antipodes Island, whilst a fierce gale was in progress, seated beside a tussock on the exposed summit of a ridge, all was calm and still, though overhead the raging of the storm could be heard (Cockayne, "Botanical Excursion," p. 293).

The indigenous animals, especially the penguins and albatroses, have, particularly in some of the smaller islands, a good deal to do with plant-distribution, through destroying the existing vegetation and preparing new ground for plant-colonisation and rearrangement of the species. This interesting matter is gone into at some length under another head.

* See also Darwin, "A Naturalist's Voyage," pp. 286–87 (edition of 1889).

† The nitrogen content is usually very great, according to Aston (Annual Report Department of Agriculture for 1908, "Soils from the Southern Islands," pp. 310-11; 1909), reaching in one case 2·92 per cent.; but probably the amount available for the plants is in many places quite small.

‡ Dachnowski (Bot. Gaz., vol. xlvii, p. 389; 1909) is of opinion that xerophily in bog-plants is in part due, at any rate, to the presence of certain deleterious substances, which he calls "bog toxins," produced in the soil as the result of a number of chemical and physical factors. See also Livingstone, B.E., "Physiological Properties of Bog Water," *ibid.*, vol. xxxix; 1905.

4. Special Ecology of the Plants.

(A.) GENERAL.

So far as the various vegetative features of the New Zealand subantarctic province go, there is not one, unless we except the great leaves of *Pleurophyllum*, which is not to be found in one or other of the floristic provinces. The most striking peculiarities—the peat-forming and -utilising habit, prostrate tree-trunks, dense foliage of the forest-roof, divaricatingly branched shrubs, cushion and rosette plants—all these are to be met with in the mountains of New Zealand. In fact, as Drude has pointed out, but from a study of floristic rather than ecological relationships, the high mountain flora, and, to add to his statement, vegetation, is subantarctic, and distinct from the ordinary forest vegetation of New Zealand.*

To the same category belong many of the lowland bog formations of the southern floristic province of New Zealand.† This subantarctic vegetation is in many respects a reflection of the climate, and wherever that climate exists, no matter what the altitude, subantarctic life-forms occur. The low summer temperature is antagonistic to the unmodified subtropical vegetation ; the wet climate, which otherwise would be favourable, is opposed by the wind factor, which, together with the peaty, sour soil, favours xerophytic structure.

(B.) LIFE-FORMS.

(*a.*) Trees.

The plants which may finally possess a trunk, and become tall enough to be designated trees, are : *Metrosideros lucida* (*Myrtaceae*) ; *Olearia Lyallii*, *Senecio Stewartiae* (*Compositae*) ; *Nothopanax simplex* (*Araliaceae*) ; *Dracophyllum longifolium* (*Epacridaceae*). None of these, as shown further on, occur exclusively as trees, all varying excessively according to their environment.

The most important "adaptation" is the semi-prostrate habit of growth, shown especially in *M. lucida*, *O. Lyallii*, and *S. Stewartiae*. The trunks of these, equalling in every way those of erect trees, generally lie for more than half their length either prone upon the ground or but slightly raised above it, and horizontal in direction. Such trunks are by no means straight, but usually curved, arching or twisted in an irregular manner. In the case of *O. Lyallii* the trunks may be from 7 m. to 9 m. in length, and 50 cm. or more in diameter near the base ; those of *S. Stewartiae* are similar ; and those of *M. lucida* are generally longer, thicker, and more irregular in shape, arch to a greater degree, and extend more or less horizontally to the surface of the ground perhaps even more frequently than they lie prostrate (fig. 4).

The prostrate trunks of *O. Lyallii*, and probably of *S. Stewartiae*, are firmly anchored to the ground by means of adventitious roots, any part touching the substratum being able to put forth roots. In the case of *Metrosideros lucida*, roots are also produced from the trunk, but these do not function as in the above case. Such

* "Manuel de Géographie botanique," p. 504 ; 1897.

† See Cockayne, "Report on a Botanical Survey of Stewart Island" ; 1909.

aerial roots of the *Metrosideros* frequently arise from near the upper branching of the tree. They may measure 3 cm., 4 cm., or even more in diameter. They pass downwards along the trunk, often twining round it, and giving off in many places a network of considerable size, made up of slender lateral roots, which ramify in the bryophyte mantle covering the bark. The main roots sometimes quite surround the trunk, and may finally reach and even penetrate into the ground. Where they are numerous, they closely overlie one another, looking not unlike liane-stems. On some trunks the network of aerial roots may extend for many metres, and be 17 cm. or more in depth. It is plain that these aerial roots of *M. lucida* are not

Fig. 4.—Interior of the Rata Forest, showing Prostrate Habit of Growth of *Metrosideros lucida*, Camp Cove, Carnley Harbour, Auckland Island.

On the forest-floor the ferns *Blechnum durum* and *Asplenium obtusatum*.

positively geotropic, or they would turn from the leaning trunk and descend vertically to the ground, while much less would they, liane-like, coil round it. At the same time there is a general positive geotropic tendency, as shown by the roots occasionally penetrating the ground. They are undoubtedly in harmony with the moist atmosphere, but are not an "adaptation," though, all the same, they must utilise the abundant water of the moss mantle or liverwort cushions within which they are stimulated to excessive branching, and so supply no inconsiderable amount of moisture to the leaves, which will decidedly benefit during the abnormal transpira-

tion of a clear but boisterous day. That roots are specially developed in a saturated atmosphere was well illustrated by certain whipcord *Veronicas* which I cultivated in a moist chamber, and which put forth numerous positively geotropic roots from the upper branches, some penetrating the ground.*

The prostrate habit of the trunks is evidently caused by the constant wind exerting a pressure upon the crown of the tree greater than the trunk can support. On the west coast of Wellington Province, willows exposed to the gales exhibit a similar form. At the same time, there is some evidence in the case of *Olearia Lyallii* that the above habit is more or less hereditary, since quite young seedlings growing within the shelter of the forest have very frequently the stems prostrate for more than half their length.

Dracophyllum longifolium and *Nothopanax simplex* have frequently comparatively short trunks, more or less erect, which are generally much branched from the base. But, perhaps, on the whole they are more treelike than is usually the case in the other floristic provinces.

The leaves of the trees are thick, coriaceous, stiff (except in *S. Stewartiae*), and glossy (except in *D. longifolium*). Those of *Olearia Lyallii* and *Senecio Stewartiae* are much the largest, these being about 20 cm. by 13 cm., and 18 cm. by 4·5 cm. respectively; also, they are closely covered with tomentum on the under-surface, that of *O. Lyallii* being flannelly and thick. This covering not only checks transpiration, and permits a large leaf-surface under strong xerophytic conditions, but it protects the closely rolled leaf-buds. The leaves of *O. Lyallii* are further provided with a covering of tomentum on their upper surface when young, and when first unrolled are white and soft like a piece of flannel.

The dimensions of the leaves of the other forest-trees are as follows: 5 cm. by 1·9 cm. (*M. lucida*), from 6·5 cm. by 2 cm. to 10·5 cm. by 3 cm. (*Nothopanax simplex*), 16 cm. by 3 mm. (*Dracophyllum longifolium*). The last named has long, narrow, linear leaves tapering to a fine point, sheathing at the base, concave on the upper surface, and bunched together, 15 or more, the sheaths closely overlapping, and borne at the apices of the ultimate branchlets, after the manner of a tufted grass. They are usually vertical or semi-vertical, and through their arrangement the inner leaves are much sheltered. This strongly xerophytic form and arrangement leads to *D. longifolium* occupying the exposed seaward position in a rata forest, or to its being a member of the mountain-meadow formation, where the less xerophytic members are confined to the sheltered gullies.

(β.) Shrubs.

The shrubs are twelve in number. Two (*Veronica elliptica* and *Coprosma foetidissima*) not infrequently attain the size of trees, and have a distinct trunk. The *divaricating form*, so common in New Zealand generally, is the most important physiognomically. This consists of a close growth of stiff, interlacing branches, which are given off at more or less of a right angle, the whole forming flattened or rounded bushes of the most extreme density. The leaves are small, thick, coriaceous, and confined to the periphery of the plant. The life-form is a strongly

* "On the Seedling Forms of New Zealand Phanerogams"; Trans. N.Z. Inst., vol. xxxiii, p. 291; 1901.

marked xerophytic adaptation, and in *Suttonia divaricata* reaches about its climax. It seems quite out of place in a rain-forest climate, but it is above all else a powerful adaptation against violent winds, and, although equally suited to a dry climate and porous soil, *it might well be considered, along with the peat-forming habit of other plants, a special subantarctic characteristic* were it not for other considerations connected with the general geological history of New Zealand. The early seedling form of *Suttonia divaricata* shows the divaricating characteristic in a marked degree even when growing under shade-conditions.

The *Dracophyllum form* of upright, close, naked branches, bearing numerous needlelike vertical leaves at their extremities, the shrubs themselves of a fastigiate habit, is characteristic of the scrub of Campbell Island. The sub-final twigs of the Campbell Island species are 10 cm., more or less, in length, extremely slender, and given off in abundance at a very narrow angle from a much thicker branch (6 mm. or so in diameter), and in their turn giving off similarly the final twigs, which are only about 1 cm. long, and bear the bunch of short leaves just at their apex. All these branchlets being closely pressed together make close, erect masses of foliage.

Styphelia empetrifolia is a prostrate heathlike shrub, with wiry, slender, flexible, leafy branches, forming a more or less reddish-coloured mat upon the ground. The root is stout, woody, and deeply descending. The leaves are very small, linear, short, dark green or reddish-brown, waxy on under-surface, and bent at right angles to the red petioles, which are pressed almost to the stem. The margins are recurved.

The endemic *Veronica Benthami* is an erect, loosely branching shrub, 20 cm. to 40 cm. tall, but more in diameter. The branches are naked, terete, and very flexible, marked with old leaf-scars, and branching near their extremities into short branchlets covered with close-set, horizontal, coriaceous, thick, bright-green leaves, 2·5 cm. long by 1 cm. broad, more or less.

Cassinia Vauvilliersii is an upright closely branched shrub, 1 m. or more tall, of a dense habit of growth. The leaves are small, obovate, about 7 mm. long, stiff, coriaceous, and covered with a close, very dense, yellow tomentum on the under-surface, as are also the ultimate branchlets, giving a general yellowish colour to the shrub. The final twigs are quite straight, given off at an angle of about 45°, are spirally arranged, and decrease regularly in size from base to apex of the sub-tending branch.

(γ.) Herbaceous Plants.

(i.) *General.*

The herbaceous plants are nearly all perennials, the exceptions being *Gentiana concinna* and *G. antarctica* (annuals) and *G. antipoda* (perhaps biennial). According to whether the aerial portions die down to the ground annually, or the contrary, so may the herbaceous perennials be divided into *summer-green* or *evergreen herbs.* Between these two categories there are transitions, the evergreen portion becoming much reduced, as in the cases of *Gentiana cerina* and *Pleurophyllum speciosum.*

Summer-green Herbs.—The following die to the ground in winter: *Pleurophyllum criniferum, Bulbinella Rossii,* and most of the terrestrial orchids. *Bulbinella* and *Pleurophyllum criniferum* have in winter well-developed leaf-buds, which are enclosed and protected by the decaying leaves of previous years. *P. Hookeri* is semi-summer-green.

Evergreen Herbs.—This category is not very clearly defined, as it is rather hard to draw the line as to a woody stem. In point of fact, such plants as *Celmisia vernicosa*, *C. campbellensis*, *Helichrysum bellidioides*, and *Coprosma repens* should rather be considered suffruticose.

(ii.) *Special Life-forms.*

* *The Rosette Form.*

Short internodes, and consequent crowding of leaves at the ends of the stems, leads to this common form. The rosettes may be more or less open, and with few leaves, as in *Pleurophyllum Hookeri*, *P. speciosum*, and *Plantago aucklandica ;* or be close and of the typical form, as in *Celmisia vernicosa* (round rosette), *Plantago* species of coastal rocks (flat rosette).*

Fig. 5.—Close View of Cushion of *Phyllachne clavigera*, showing Dense Habit of Growth and Numerous Flowers.

** *The Cushion Form.*

Here there is finally abundant branching into very short branches, the ultimate branchlets becoming pressed so closely together that cushions are formed, leafy only just on the outside, and the whole structure of such density that no trace of branching is outwardly visible. The solidity of the subantarctic cushions

* Quite distinct from the so-called *P. Brownii* of the mainland of New Zealand.

is increased through the decay of the older branches, &c., which build up a peaty water-holding mass, into which the ultimate leaf-bearing shoots finally root. *Azorella Selago*, of Macquarie Island, alone assumes those gigantic dimensions which can vie with the species of *Raoulia* or *Haastia* of the Southern Alps; still, the smaller cushions of the following are of considerable density, especially those of the last named, which are quite hard: *Gaimardia ciliata* (*Centrolepidiaceae*), *Oreobolus pectinatus* (*Cyperaceae*), *Colobanthus muscoides* (*Caryophyllaceae*), *Phyllachne clavigera* (*Stylidiaceae*). (Fig. 5.)

The form under consideration is a distinctly powerful xerophytic adaptation, transpiration not only being reduced to a minimum, but the peaty mass holding a constant water-supply, an "adaptation" analogous to that of succulence in a desert. The permanence of this form is discussed under another head.

Fig. 6. *Aciphylla latifolia* growing in *Pleurophyllum* Meadow, Adams Island. *Stilbocarpa polaris* in left-hand corner, and *Polystichum vestitum* in background.

**** The Large-leaved Form.*

The possession of large leaves, though a common and most remarkable attribute of certain of the plants, cannot really be considered a life-form, though, as it is one of the most striking features of the vegetation, it is convenient to consider it as such. Here belong all the species of *Pleurophyllum*, the two species of *Stilbocarpa*, the three species of *Aciphylla* (fig. 6), and *Bulbinella Rossii*. That so many plants can exhibit

such luxuriance of growth when the wind factor is considered is indeed remarkable; but it must be remembered that the leaves of several are only summer-green, while those of others are specially strengthened by powerful veins. The leaves of the three species of *Aciphylla* are remarkably thick, stiff, and xerophytic in their inner structure; all are divided, and those of *A. antipoda* and *A. acutifolia* very considerably. Also, where these plants grow luxuriantly there is considerable shelter, and they decrease in size and become more prostrate or are altogether absent in the most wind-swept stations. *Pleurophyllum Hookeri* flattens its leaves to the ground (fig. 13), and they are covered densely on both surfaces with a mat of silky hairs. The other two species of *Pleurophyllum* are tomentose on the under-surface.

******** *The Tussock Form.* (Figs. 1 and 11.)

Equally with the cushion habit is the tussock, a well-known subantarctic life-form, one particular species (*Poa flabellata*, of the Falklands) being known as the "tussock-grass." The form consists of the bunching-together of numerous grass-like leaves or rigid stems, which, extremely close at the base, spread out above, the apical portions frequently drooping to some extent. In the subantarctic province the tussocks are confined to grasses and sedges (*Carex*), but in other parts of the New Zealand region *Restionaceae*, several genera of *Cyperaceae*, and even *Liliaceae* have this habit. Usually the grass and sedge tussocks build up stout trunks out of their dead culms, leaves, rhizomes, and roots, on the summit of which they grow under a special edaphic condition of their own providing. These trunks may be cylindrical or quite irregular in shape, and may reach a height of 1·5 m. *Poa foliosa*, *Poa litorosa*, *Danthonia antarctica*, *Carex trifida*, and *Carex appressa* are all trunk-builders, but this habit is not invariable with them by any means.

********* *The Mat Form, the Creeping Form.*

The plants belonging to this life-form have spreading stems, which creep either on the surface of the ground or just beneath it, in the former case giving off short roots at the internodes. In some cases the plants form either spreading mats, differing much in closeness, or dense patches. Examples are: *Coprosma repens*, *Nertera depressa*, the species of *Cotula*, the two *Asteliads*, the *Epilobia*, *Pratia arenaria*, *Callitriche antarctica*, and *Poa ramosissima*. Plants in which the creeping form is well developed have an advantage over those which are spot-bound, in rapidly occupying new ground.

********** *The Tufted Form.*

This consists of stems given off from near one another and either erect or creeping. Between erect tufts and tussocks, and indeed rosettes, it is only a question of degree. The species of *Scirpus* and *Gentiana cerina* are examples.

(iii.) *Vegetative Parts.*

* *Leaf.*

The great size of leaf of some of the most characteristic plants has been already discussed. *Urtica australis*, virtually a subantarctic species, and the endemic *U. aucklandica** are also large-leaved. Many species have quite small leaves—*e.g.*,

* I am by no means sure that this is distinct from *Urtica australis*.

Colobanthus muscoides, Abrotanella rosulata, Phyllachne clavigera, Epilobium confertifolium, Coprosma repens, Nertera depressa, Ranunculus acaulis, Montia fontana, Callitriche antarctica, Crassula moschata. Generally speaking, the leaves are more or less xerophytic. Thus they are :—

Coriaceous and thick (*Pleurophyllum speciosum, Ranunculus pinguis, R. aucklandicus, Phyllachne clavigera, Bulbinella Rossii, Celmisia vernicosa, Gentiana cerina*, and the species of *Stilbocarpa, Aciphylla*, and *Plantago*);

Tomentose or strongly hairy (the species of *Pleurophyllum, Myosotis capitata, M. albiflora, Astelia linearis, A. subulata, Helichrysum bellidioides, Senecio antipoda, Acaena Sanguisorbae* var. *antarctica*);

Stiff or rigid (*Marsippospermum gracile, Rostkovia sphaerocarpa, Aciphylla latifolia, A. antipoda, Poa litorosa, Danthonia antarctica, Oreobolus pectinatus, Colobanthus subulatus, Celmisia vernicosa*);

Succulent or soft and fleshy (*Crassula moschata, Myosotis capitata, M. albida, Epilobium confertifolium, Cotula lanata*);

Margins incurved, recurved, &c. (*Poa litorosa, Oreobolus pectinatus, Danthonia antarctica, Celmisia vernicosa*).

Notwithstanding the above, the leaves of *Pleurophyllum speciosum, P. criniferum, Bulbinella Rossii*, the species of *Stilbocarpa*, and *Poa foliosa* must be considered mesophytic, while certain of the plants (*e.g., Poa ramosissima, Epilobium linnaeoides*) have quite thin leaves.

** *Stem.*

The stems of the herbaceous plants are not of special interest as a whole. A considerable number have creeping stems, which may be slender (as in *Coprosma repens* and *Nertera depressa*), or stout and succulent (*Cotula lanata, C. plumosa*, and *C. propinqua*). Some are subterranean, and may be stout (*Rumex neglectus*), wiry (the species of *Astelia*), slender and delicate (*Ranunculus acaulis*). The two species of *Stilbocarpa* have massive, half-buried, far-spreading, and much-branched rhizomes. The species of *Pleurophyllum* have short but thick rootstocks. *Ranunculus pinguis* has a branching, subterranean, rather slender rhizome. *Celmisia vernicosa* has creeping woody stems, which turn upwards at the apex, where the rosette is formed.

*** *Root.*

The roots of the species of *Pleurophyllum* and *Aciphylla* and *Bulbinella Rossii* are long, numerous, thick, and fleshy. *Plantago carnosa, P. aucklandica, Ranunculus pinguis*, and *Cardamine glacialis* var. *subcarnosa* have deeply descending long roots. The cushion plants have frequently a deeply descending tap-root, but the ultimate shoots also put forth short roots into the internal peat of the plant, the tap-root functioning chiefly as an anchor, but sometimes the primary tufted stems creep on the ground and emit numerous long roots.

(C.) FLOWERS.

Leaving out of consideration the non-endemic species, the remainder show a much larger percentage of colours, other than white or yellow, than do the related plants of New Zealand in general. The following are the colours of the endemic species, omitting *Gramineae, Cyperaceae*, &c. : *Pleurophyllum speciosum* (disc dark purple ; rays pale purple, whitish-purple) ; *P. criniferum* (disc brown or purplish-

brown); *P. Hookeri* (possibly similar in colour to *P. criniferum*); *Myosotis capitata* (brilliant dark blue); *M. antarctica* (blue, according to the plate in the "Flora Antarctica"); *Veronica Benthami* (blue); *Epilobium confertifolium* (pink); *Gentiana concinna* (white, with reddish or purplish lines); *G. cerina* (white to crimson); *G. antarctica* (colour ?, perhaps white, with reddish lines); *G. antipoda* (white, white with red lines); *Celmisia vernicosa* (disc purple, rays white, occasionally purple throughout); *C. campbellensis* (disc purple, rays white); *Aciphylla latifolia* (pale lilac, rosy lilac, rosy purple, occasionally white); *Aciphylla antipoda* (bright purple, usually more brilliant in colour than *A. latifolia*); *A. acutifolia* (white ?); *Ranunculus pinguis* (yellow); *R. aucklandicus* (yellow); *R. subscaposus* (yellow, with broad band of brown on back of petals); *Stilbocarpa polaris* (yellowish-green, with ring of brown at base); *S. robusta* (pale yellow, according to Kirk); *Bulbinella Rossii* (yellowish-orange); *Geum albiflorum* (white); *Colobanthus subulatus* (green).

(D.) POLLINATION.

As for the fertilisation of the plants, I can give but few particulars. Insects are not numerous, if we except the blowflies. Many of the flowers, particularly the endemic species, are very conspicuous. The wind most likely plays an important *rôle*. *Veronica elliptica* and the subantarctic species of *Cotula* are sweet-scented. *Bulbinella Rossii* is dioecious, and the male has much larger and more showy racemes than the female. *Metrosideros lucida* and perhaps *Dracophyllum longifolium* are fertilised by the bell-bird (*Anthornis melanura*). *Cardamine hirsuta* var. *corymbosa* has cleistogamic flowers. These are described at length by Cheeseman in his memoir in this volume.

(E.) SEED-DISSEMINATION.

Almost all the plants have "seeds" suitable for spreading by means of wind or birds.* *Metrosideros lucida* and *Dracophyllum longifolium* have minute seeds, and the remainder of the rata forest and scrub trees or shrubs have succulent fruits. So, too, have the two *Asteliads*, *Coprosma repens*, *Nertera depressa*, and *Pratia arenaria*. The *Uncina* and *Acaena* species have barbed fruits. Specially adapted for wind carriage are the fruits of the *Compositae* and seeds of the *Epilobia*. The grass "seeds" will be eaten by birds, and perhaps also those of the *Veronica* species, though I have never noted birds so doing on the New Zealand mainland. So, too, with the *Umbelliferae* and *Ranunculi*. But careful investigations are required in this matter, and speculations, even from what appears obvious, are of little moment.

(F.) VARIATION ACCORDING TO ENVIRONMENT.

Change of position with regard to wind and altitude in many cases brings about an alteration in form. Thus the whole of the forest-trees are to be found also as shrubs a few feet tall in the mountain scrub, or in shallow gullies on the hillsides.

On the open mountain-slopes, at an altitude of 300 m., on Adams Island, *Dracophyllum longifolium* forms small bushes only 22 cm. tall and 15 cm. through, whereas in the forest it is a tree 9 m. tall, having a stout trunk. The case of *Coprosma*

* This is by no means saying that they could be so spread over wide areas of water. The stations of species with regard to wind, the germinating-power of seeds, and many other ecological matters, usually quite neglected in discussing seed-dissemination, must be considered before the likelihood, or the contrary, of a plant being carried by wind or birds be decided on.

foetidissima, also at times a forest-tree, is still more striking, since in the wind-swept open it becomes a prostrate plant, creeping on the ground beneath the shelter of the tussocks. So, too, on the Auckland Islands do *Coprosma parviflora* and the stiff-stemmed, tomentose-leaved *Cassinia Vauvilliersii*, both xerophytes, form mats upon the ground. Finally, on Antipodes Island, small plants, 20 cm. tall and less, of the divaricatingly branched xerophyte *Coprosma cuneata* are common.*

A somewhat similar case to the above is that of *Ranunculus pinguis*. On the Auckland Islands this plant varies so greatly according to station that it was only by finding a series of intermediate forms that I could believe there were not two distinct species in question. Even Hooker described two varieties as well as the type. But if we consider a systematic variety as an hereditary entity—and any other definition would frequently lead to the making of dozens of varieties—then these distinctions of Hooker's are incorrect. Where there is perfect shelter, as in small open spaces in the subalpine scrub, *R. pinguis* may have a far-spreading and branching rhizome, a 1- or 2-flowered scape more than 28 cm. tall, furnished with long-petioled bracts, and leaves 6 cm. by 7 cm., with petioles 23 cm. or more in length; but on the open wet peaty or stony ground this same species may consist of a small rosette of leaves each 1 cm. by 9 mm., with petiole 5 mm., and a virtually sessile flower in its centre.

The cushion form, so characteristic of the subantarctic islands, seems at first thought one of extreme stability, and yet in certain instances it is little more "fixed" than the tree form cited above. Thus, Professor C. Chilton brought back from Campbell Island a cushion of *Phyllachne clavigera*, which he put in the moist chamber attached to his laboratory. Within a few weeks merely, a remarkable change came about: the shoots lengthened, the internodes became longer, and a plant of quite a loose habit and an altogether different appearance from the normal was produced. And yet this moist-air form must be considered just as much a specific form as the dense cushion of the subantarctic bog, which latter is evidently little more fixed than is the wind-shorn *Metrosideros lucida* or the mat form of the mesophytic forest-shrub *Coprosma foetidissima*.

Hymenophyllum multifidum is a case similar to the last. This excessive hygrophyte, when growing on subalpine cliffs or wet peaty ground, has its fronds arching, and their segments all closely curled together; nor does it in those stations at any time assume any other habit. Yet when brought into a moist chamber, as I have already shown†, it puts forth new fronds of the typical open form, resembling exactly those of the interior of any New Zealand rain forest.

A rather different case to any of the above is that of *Poa litorosa*. Where this grass occurs in wet peaty meadows or swamps it builds up a tall trunk of its dead roots, leaves, and stems; but on rock-faces near the shore the grass grows in abundance, but the trunk-building habit is wanting, and the leaves droop down the rock like long coarse locks of loose hair. *Poa foliosa* behaves in a similar manner, both on cliffs and on flat ground, in either of which stations trunkless plants may occur (fig. 7).

* So far as the Antipodes plant goes, the stimulus derived from its environment seems deep-seated, since a plant in the experiment plot at Canterbury College, planted by me in 1903, at the present time (August, 1909) has hardly increased in size, though in robust health.

† Cockayne, "Botanical Excursion," p. 267.

Besides cases of variation according to environment, there are others where distinct variations occur which cannot be referred to such, new characters appearing in certain individuals which may be hereditary. The case of *Celmisia vernicosa* might belong either to this class or to the foregoing. It exhibits two distinct forms growing in close juxtaposition—the one, roughly speaking, has an open rosette with long flat leaves; and the other a close rosette with shorter thicker leaves, having a knobby apex and thickened incurved margins. Certainly, shade-conditions modify the rosettes. My notes are somewhat contradictory: *e.g.*—Adams Island: "There are certainly two forms, the one with narrow leaves (*i.e.*, I suppose, the

Fig. 7.—Drooping Habit of the Tussock-Grass *Poa foliosa*.

knobby-apex form) being the plant *par excellence* of the highest points." Hills at head of Carnley Harbour, on Auckland Island: "This plant varies so much according to station as to look like different species, and, as the smaller and wind-swept are the more frequent, it is the large specimens which appear abnormal."

There are a number of interesting colour-variations. Some of the species are well known to be variable in this regard; in others the colour is considered one of the specific marks, and the variations have not been recorded previously.

Gentiana cerina, well known as variable in colour, was noted with the following variations: (1) White ground-colour, stained rosy-purple at base, and with lines of this colour extending upwards; (2) white ground-colour, unstained at base, and

marked as in (1); (3) almost pure white; (4) violet over most of under-surface of leaf, and white upper surface marked with rather brighter lines of same colour; (5) crimson on under-surface, and upper surface a pale-purple ground-colour marked with crimson lines. All the above variations were observed in plants growing side by side in an exposed situation near the western entrance to Carnley Harbour, on Adams Island. A sixth variation, but noted in a specimen from another locality, was: Ground-colour rosy lilac, deeply marked at base with bright purple, which was continued in thin lines to the apex of the leaf.

Veronica Benthami is normally blue. One or two white-flowered plants were noted, and one plant having the flowers rosy-purple or almost carmine when just opening, and fading to a paler colour when fully expanded, on the outer parts of the corolla. *Celmisia vernicosa* has normally a purple disc and white ray-florets, but a variety is fairly common with the rays also purple. *Aciphylla latifolia* is normally rosy lilac, but occasionally white flowers occur. *Myosotis capitata* in Fairchild's Garden appeared to be bluish-purple, and not brilliant dark blue as at the higher levels.

(G.) HETEROPHYLLY.

Another kind of variation is where more than one very distinct form of leaf occurs on the same plant. *Polypodium diversifolium* has a marked leaf-variation, some leaves being entire and others more or less deeply and irregularly cut. They also vary greatly in width and in the number and shape of the leaf-segments. These variations seem quite without rule, and without reference to the environment. This is quite a different heterophylly to that where the seedling and adult leaf-forms are distinct from one another, and especially where the juvenile form remains persistent for a number of years. Of such variation, so common in New Zealand generally, there are only a few examples in the subantarctic province.

The juvenile form of *Dracophyllum longifolium* persists, at any rate in many instances, until the plant is 3·6 m. tall, or even taller. The juvenile leaves differ from the adult in that they are much broader, while the blade is not held vertically, but horizontally. These wide leaves and their orientation not only give the young plants a most distinct appearance, but they are ecologically different from the adult. Frequently a tree is adult in its upper and juvenile in its lower parts.

Nothopanax simplex, with which I have already dealt on several occasions, is especially noteworthy, as in the Auckland Islands it very rarely indeed has the cut-leaved seedling form; nor has an extreme case of such been recorded, as is so common in the subalpine forests of the central and southern floristic provinces of New Zealand. In the Auckland Islands the seedling has first of all simple leaves, variable in shape and in size and number of teeth. Then may come the first stage of a compound leaf, with one full-sized and one minute leaflet at the base. Finally, trifoliate leaves appear, with the ultimate leaflet the largest. The adult leaves are simple and toothed, but vary a good deal in size, thickness, and so on. The climate should favour the cut-leaved form, since this is at its maximum development in the wettest forests, and, as I have shown elsewhere, the occasionally pinnatifid juvenile leaflets of the related *Schefflera digitata* are associated with specially moist soil-conditions.*

* "Report on a Botanical Survey of the Waipoua Kauri Forest," p. 28; 1908.

The divaricatingly branched shrubs have usually seedlings of a much more hygrophytic character than the adult. *Suttonia divaricata* is a case to the contrary, it being so frequently a plant of moist forests; and yet its seedling is of the adult type, and cannot be modified by moist-air culture. The endemic *Coprosma ciliata*, on the other hand, when in sheltered situations, may put forth reversion shoots with thinner, broader, and more strongly ciliated leaves than those of the adult.*

(H.) PERSISTENT DEAD LEAVES.

The peat-making habit has been already referred to as one of the most common characteristics of the subantarctic climate. Did the vegetative parts of the plants merely turn into peat this feature could hardly be called ecological, but the peaty remains persist attached to the plants, and play a more or less important ecological part. Thus, it has already been shown how the peat of the cushion plants becomes a water-storage apparatus, and this is especially advantageous for the cushion-building bryophytes. The "trunk" of the tussock plants raises them from the wet ground or swamp, and catches pure water free from humous acids. Even round a living stem the dead and decaying leaves form a covering of surprising size. Thus, *Celmisia vernicosa*, a rosette 5 cm. tall, had its stem beneath covered for 4 cm. with a thick decaying mass of leaves. The leaf-sheaths of *Pleurophyllum Hookeri* are more than equalled in bulk by the dead, rotting sheaths of previous years.

(I.) SEASONAL CHANGES.

The seasonal changes are of a twofold character, concerning on the one hand the vegetative and on the other the reproductive parts. So far as the former go, little can yet be said. On the appearing and opening of buds, the fall of leaves, the growing of new shoots, &c., virtually no information is available. Generally speaking, as the forest and scrub are evergreen, the winter aspect is much the same as the summer; even the ferns still retain their leaves, excepting *Histiopteris incisa*, whose dead and half-dead fronds mark its presence. But in the *Pleurophyllum* meadow and the highest zone of vegetation—indeed, everywhere where tussock does not dominate—there is a good deal of difference in the winter, the great leaves of *Pleurophyllum criniferum* and *Bulbinella Rossii* being wanting, their place only marked by the rotting leaves on the ground. On the meadow of Antipodes Island the tender green of the two ferns *Hypolepis millefolium* and *Histiopteris incisa* will be absent, and on the stony *débris* of the Auckland Island hills the leaves of *Polystichum cystotegia.*

At about the middle of November the herbaceous plants of the Auckland Islands are just coming into bloom. On the 21st November the following were noted:—

Numerous blooms: *Celmisia vernicosa, Ranunculus pinguis, R. aucklandicus, Veronica Benthami, Phyllachne clavigera, Myosotis capitata.*

Occasional blooms: *Aciphylla latifolia, A. antipoda, Bulbinella Rossii, Stilbocarpa polaris, Epilobium confertifolium, Poa litorosa, P. foliosa, P. ramosissima, Astelia linearis, A. subulata, Acaena Sanguisorbae* var. *antarctica, Danthonia antarctica, Hierochloe Brunonis, Cotula plumosa, C. propinqua, C. lanata, Pleurophyllum*

* Cockayne, "Botanical Excursion," p. 276.

criniferum, P. Hookeri, Crassula moschata, Scirpus aucklandicus, Gentiana cerina, G. crinita, Plantago aucklandica, Geum aucklandicum, Cardamine uniflora, C. glacialis var. *subcarnosa, Coprosma ciliata, Coprosma foetidissima.*

Judging from the accounts of previous botanical visits, the full blooming of most of the herbaceous plants is in December, though the magnificent *Pleurophyllum speciosum* is at its best perhaps early in January. According to Chapman (Trans. N.Z. Inst., vol. xxiii, p. 506), on the 5th January *Celmisia vernicosa* was in bloom on the hills, but not at a low elevation; *Bulbinella* and *Stilbocarpa polaris* were in fruit. *Metrosideros lucida* during January will turn the forest into a blaze of crimson. *Olearia Lyallii* and *Senecio Stewartiae* were in bud during the visit of the expedition, and would be in full bloom by the middle of December, or even earlier.

More or less of a floral display extends till March. During the beginning of that month the French Expedition, judging from the plates in the "Voyage au Pôle sud," collected in blossom *Stilbocarpa polaris, Aciphylla antipoda, Colobanthus muscoides, Dracophyllum longifolium, Bulbinella Rossii, Pleurophyllum criniferum, Metrosideros lucida, Cassinia Vauvilliersii*, and *Nothopanax simplex;* but probably some of these were virtually out of flower, and merely bore a late bloom or two.

(J.) LEAF-ANATOMY.

The minute structure of the leaves shows the plants to be partly mesophytes and partly xerophytes, some plants, of course, showing structures to be referred to both categories. The xerophytes are plants of special xerophytic stations, usually such as rocks or bogs, or of special exposure, such as a forest-roof, or an erect habit in wind-swept meadow. To be sure, there are plants which show little or no suitability for their environment, judging by their anatomy. Thus, *Myosotis albida*, a plant of spray-swept rocks, should, at any rate, have as xerophytic a structure as the *Plantago* of similar stations, whereas it has a non-cuticularized, thin-walled epidermis, 2-layered palisade, and abundant open pneumatic tissue, while the latter has a thick-walled strongly cuticularized epidermis, 5–6-layered palisade, and small pneumatic tissue of closely arranged cells. But it must be remembered the structure of the *Myosotis* is somewhat counterbalanced by its hairy (not tomentose) covering.

As Schenck has shown for Kerguelen Land that on account of the cloudy skies palisade-parenchyma is often feebly developed ("Pflanzengeographie der subantarctischen Inseln," p. 56), so, too, does this hold for no few of the plants under consideration, some, of course, being identical species for both regions. The following are examples: *Astelia subulata, A. linearis, Phyllachne clavigera, Scirpus aucklandicus, Carex trifida, Poa foliosa, Luzula crinita, Cotula plumosa* (virtually no difference in form between the cells of the chlorenchyma, though near the periphery they may be arranged a little more densely); *Ranunculus aucklandicus, R. subscaposus, Pratia arenaria* (palisade of one row of cells only); *Epilobium linnaeoides* (1–2-layered palisade); *Senecio antipodus, Coprosma repens, Helichrysum bellidioides* (2-layered palisade, the pneumatic in first named making up the bulk of the leaf); *Ranunculus pinguis, Coprosma cuneata* (3-layered palisade, equalling one-half pneumatic); *Gentiana cerina* (3-layered, equalling one-fifth pneumatic); *Myosotis capitata* (3-layered, equalling one-third the pneumatic); *Aciphylla latifolia* (3–4-layered, equalling one-half the pneumatic).

Another remarkable character is the presence of special extensive air-chambers in certain species. *Stilbocarpa polaris*, as I originally showed, possesses such chambers (" Botanical Excursion," p. 261). Attached to the lower epidermis is a row of colourless, rounded, parenchymatous cells ; then comes a large air-chamber, equalling the remaining chlorenchyma, which abuts on it above, and is made up of 4–6 rows of palisade and 2–3 rows of pneumatic tissue, some of the cells of which jut into the air-chamber. Somewhat similar structure occurs in *Azorella Selago* and *Carex trifida*, and again, but more modified, in *Luzula crinita*, *Scirpus aucklandicus*, and *Pleurophyllum speciosum*. Schenck also shows the same structure to occur in *Colobanthus kerguelensis*.

Certain species exhibit the structure of aquatic plants such as seen in *Brasenia peltata*—*i.e.*, the interior and greater part of the leaf is made up of chains of cells cutting off extensive air-spaces. Such structure is shown in *Cotula lanata* and *Cotula propinqua* (plants of coastal rocks on peat or rock). Perhaps *Myosotis capitata* and *Ranunculus pinguis* (plants frequently of wet peat) could be here included, though both have a well-defined 3-layered palisade. *Pringlea antiscorbutica*, the well-known Kerguelen cabbage, is also an excellent example of this type.

The most marked xerophytic structure of the New Zealand subantarctic plants is shown in the following : *Colobanthus subulatus* (small cushion plant of subalpine rocks), thick unwrinkled cuticle, very thick-walled epidermal cells, chlorenchyma of close cells, those near periphery elongated but central ones rounded ; *Aciphylla latifolia* (tall herb exposed to wind), thick wrinkled cuticle, thick-walled epidermal cells, strong development of stereome below epidermis and continuing through leaf to the vascular bundles, stereome at margin of leaf, 4-layered palisade ; *Aciphylla antipoda* (plant of similar station to last, but also in more exposed position on rocks and *débris*), thick wrinkled cuticle, epidermis of thick-walled cells, stomata both surfaces, stereome round periphery under epidermis, palisade dense but of similar cells to the very open pneumatic tissue in centre of leaf. *Olearia Lyallii* (tree of coastal forest), thick smooth cuticle of upper surface, thick-walled upper epidermal cells, irregular lower epidermis of small thin-walled cells drawn out into mat of long hairs protecting the many stomata ; *Abrotanella rosularis* (tiny rosette, rock-plant), thick wrinkled cuticle, thick-walled epidermis, stomata slightly sunken, no cuticle on under-surface, 3–4-layered palisade, dense pneumatic tissue of rounded cells ; *Phyllachne clavigera* (moderate-sized hard cushion plant of bogs and rocks), thick wrinkled cuticle, stomata in all parts, closely packed chlorenchyma of round cells.

The following are examples of plants with mesophytic structure : *Ranunculus subscaposus* (plant of wet ground, near streams, in shade), no cuticle, 1-layered palisade, shallow open pneumatic tissue ; *Ranunculus aucklandicus* (plant of wet ground, near sea), almost similar to last, but with stomata on both surfaces) ; *Acaena Sanguisorbae* var. *antarctica* (plant of meadows, coastal cliffs—almost everywhere, in fact), no cuticle, 2-layered palisade, 2-layered pneumatic tissue ; *Pratia arenaria* (plant of dunes, forest, meadow), thin-walled epidermis, no cuticle, stomata both surfaces, 1-layered palisade, rather close, round-celled pneumatic tissue for greater part of leaf ; *Coprosma foetidissima* (shrub of forest, scrub, and meadow floor), very open pneumatic tissue.

Certain peculiarities are exhibited by some of the species. *Astelia subulata* has a wedge-shaped (in section) mass of colourless water-tissue penetrating to centre

of the leaf, which otherwise is made up of a homogeneous tissue of close rounded cells. *Pleurophyllum speciosum* has no cuticle. Numerous jointed hairs are developed from epidermal cells of both surfaces. Beneath the upper epidermis is a 2-layered water-tissue of large colourless cells, and beneath these is the chlorenchyma, made of square cells (in section) of uniform size, 2 layers having the cells close and acting as palisade, and the remainder in superimposed vertical rows separating large air-cavities. The lower epidermal cells are very small, and give rise to numerous hairs. The ribs are made of rounded collenchyma. *Helichrysum bellidioides* (creeping suffruticose plant of wettish ground) has a thin-walled epidermis of large colourless cells, 2-layered palisade of rather short cells, the second row the shorter, large-celled water-tissue in centre of leaf, and small-celled open pneumatic tissue with abundance of chlorophyll. The lower epidermis is small-celled, with dense mass of hairs protecting the numerous stomata.*

5. The Plant Formations.

(A.) GENERAL.

With regard to the plant formations, those of each group of islands are considered separately, except those of Campbell Island, which are dealt with by Mr. Laing in a separate memoir in this volume. Ecologically certain of the formations of the different groups are identical, while floristically the differences are but slight. The *Danthonia* meadows† of the Auckland and Campbell Islands are the same, and so are the *Olearia Lyallii* formations of the Snares and Ewing Island; so, too, though differing floristically, the *Pleurophyllum Hookeri* formation of the subalpine zone of Auckland, Adams, and Campbell Islands is ecologically identical for all the islands. As with most plant formations elsewhere, these under consideration merge gradually into one another, and the description refers to what I take to be characteristic portions. It will be seen that the "*Pleurophyllum* meadow" is a much more uncommon formation than I had previously conjectured (Cockayne, "Botanical Excursion," p. 257), while the *Pleurophyllum Hookeri* formation of the Aucklands has not been described previously.

(B.) THE SNARES.

(*a.*) General.

Seen from the sea are precipitous cliffs, white in places with guano, and marked here and there with yellow and green patches of vegetation. Above is a low, close covering of greyish-looking shrubs, which give the special character to the scene; while in the narrow space on the upper margin of the cliffs is a belt of grass with occasional bright-green patches of *Veronica elliptica*. A closer view shows the general grey colour to be modified here and there at its outskirts, especially near the sea, by small green patches denoting the presence of *Senecio Stewartiae*. A more detailed examination proves that the vegetation is not so uniform as appears at first sight, and that, though the indigenous species number but twenty-three, climate, soil, and birds have sorted them out into well-defined plant formations.

* For special details *re* anatomy and numerous figures see Herriott, Trans. N.Z. Inst., vol. xxxviii, p. 377; 1905.

† The meadows might probably be termed "moors," according to Warming's classification.

(β.) The Plant Formations.

(i.) Olearia Lyallii *Forest.*

This formation, which perhaps might be designated "scrub," on account of the general lowness of its roof, covers the greater part of the island, extending in places to the margin of the cliffs, and occupying the gullies and most sheltered slopes. It consists almost altogether of *Olearia Lyallii*, but on its eastern margin are small colonies or individual plants of *Senecio Stewartiae*.

Fig. 8.—Roof of *Olearia Lyalii* Forest, Ewing Island, Auckland Group.
The flower-buds protected by bracts and leaves in rosettes.

The dominant tree generally has a fairly thick trunk, covered with a pale-grey deeply furrowed bark, and lies prostrate for half its length or more. A few horizontal or semi-horizontal branches are given off, which, branching sparingly, finally bend upwards, and, again branching several times into twos or threes, bear on the ultimate stiff white tomentose branchlets rosettes of dark-green very thick and coriaceous large leaves, glossy green above and white beneath with tomentum, and so close together as to touch one another (fig. 8). Seen from within, the low forest is about 4·5 m. tall; thick trunks sprawl over the ground, sometimes for a distance of 9 m.; and everywhere is a close and rigid tangle of stiff grey branches, while above are naked stems and a close roof of white foliage. In most places

the floor is bare, except for dead leaves and branches and occasional patches of seedlings. Usually there is no undergrowth, unless in the bottom of a gully, where there will be a few plants of the dark-green ferns *Polystichum vestitum* and *Blechnum durum*. *Senecio Stewartiae* has much the same habit as the *Olearia*, but its leaves are bright green, and so break the monotone of the formation; but it becomes a still more striking feature when in December and January it is loaded with its great panicles of golden flower-heads.

(ii.) *Meadow Formations* (*Tussock Meadow*).

There are two distinct meadow formations, one where *Poa foliosa* and the other where *P. litorosa* is dominant. Warming ("Oecology of Plants," pp. 199, 200; 1909) points out that these subantarctic tussock formations differ widely from and cannot be grouped with any of the Northern Hemisphere.

* Poa foliosa *Meadow.*

This formation stands out conspicuously through its bright-green colour. The grass has the tussock form; the plants grow so closely as to make a closed formation, and the broad leaves droop somewhat. *Stilbocarpa robusta** grows occasionally as an isolated specimen, but in other places there are broad patches, mixed perhaps, but sparingly, with the ferns *Asplenium obtusatum* and *Blechnum durum*. The darker green of the large orbicular leaves contrasts with the paler and brighter-coloured grass. Its stout rhizomes, when once it can gain a foothold, give it an advantage over the competing plants.

This formation, either pure grass or grass with the *Stilbocarpa*, occupies the hollows and sheltered places, but where the westerly wind strikes with full power it is replaced by *Poa litorosa*, a grass of stronger xerophytic structure and life form.

** Poa litorosa *Meadow.*

This formation is browner in colour than the last described. The plants are rounded, close-headed tussocks growing on trunks 57 cm. or more tall, the heads of filiform involute leaves touching, and bare ground between the trunks. The leaves are erect and extremely dense, and their withered extremities give the formation as a whole a yellowish-green colour.

The endemic *Stilbocarpa robusta* also grows in this formation to some extent, but its real station is in sheltered spots, where it luxuriates, forming an almost pure growth many square metres in extent.

(iii.) *Coastal Formations.*

On the rocks are many vivid-green cushions of *Colobanthus muscoides*, some quite 41 cm. in diameter and 5 cm. or 6 cm. high, but the greater number much

* For this very distinct species, which bears but little resemblance to *S. Lyallii*, of which Kirk made it the variety *robusta*, I proposed while on the Snares the name of *Bollonsii*, as a small tribute to what the expedition owed to the enthusiastic captain of the "Hinemoa," Captain J. Bollons. This manuscript name has already been used in England (W. Watson, "Gardeners' Chronicle," vol. xlv, p. 2), but in accordance with the rules of the Vienna Congress I am here calling it *S. robusta*. In general habit and appearance it resembles *S. polaris*, never increasing by means of runners like *S. Lyallii*.

smaller. The rock-crevices are filled with the succulent *Crassula moschata*, which also forms bright-green mats on the adjacent wet peaty ground, where also is much *Callitriche antarctica*.

Near the edge of the cliffs, or on the flat ground near rocks, are many fine bushes of a large-leaved variety of *Veronica elliptica*,* 75 cm. tall and 1·10 m. in diameter, the leaves a rather dark but shining green, and the branches close and erect. As elsewhere in these subantarctic islands, Macquarie excepted, the ferns *Blechnum durum* and *Asplenium obtusatum*, dark green and very thick-leaved, are abundant both on the rocks and the peat. Tussocks of *Poa litorosa* frequently border the cliffs. Finally, *Lepidium oleraceum* and *Myosotis albida* occur in a few places on the rocks.

(C.) THE AUCKLAND ISLANDS.

(*a.*) General.

The vegetation of the Auckland Islands appears, so far as present investigations go, to be of a very uniform character. With the exception of those noted below, the species are evenly distributed throughout the group. Where cliffs, high or low, do not interfere, a belt of forest usually follows the coast-line, extending up the hills to a varying height, while above this are comparatively gentle slopes, brown at a distance, from their covering of tussock-grasses. On the cliffs themselves, contrasting with the dark rock or white or yellow lichens painting it, are masses, large or small, of greenery. The proximity of forest to the shore is frequent in other parts of the New Zealand biological region, and is in close relation with the humidity of the atmosphere. Although there is a well-marked zonal distribution of the vegetation, the majority of the species may occur at any altitude, from sea-level to the highest summits. Thus, on the loftiest peak of the group is *Pleurophyllum criniferum ;* or on the summit of the western cliffs of the main island, at 330 m. altitude, the *Plantago* of the coastal rocks is growing, mixed with the usual subalpine meadow plants. *It is the formations*—i.e., *the distinct physiognomic combinations—which mark the zones, and not the occurrence of special species for the first time.* Such, however, are not wanting. *Polypodium pumilum* is confined on the Aucklands and Campbells to subalpine cliffs, *Plantago aucklandica* and *Marsippospermum gracile* belong to the "*Pleurophyllum Hookeri* formation," and *Ranunculus aucklandicus* is found only on ground near the shore.

The species which appear to be of very limited distribution are : *Hemitelia Smithii* (rata forest, Norman's Inlet) ; *Blechnum Patersoni* (wet floor of scrubby forest, head of North Arm of Carnley Harbour) ; *Veronica odora ?* (near shore, Norman's Inlet, and neighbourhood of Port Ross) ; *Halorrhagis micrantha* (near shore, Norman's Inlet) ; *Fuchsia excorticata* (forest, neighbourhood of Port Ross) ; *Celmisia campbellensis* (occasionally on rocks near western cliffs, or on adjacent slopes) ; *Rumex neglectus* (dunes, Enderby Island) ; *Samolus repens* (ground reached by spray near western passage of Carnley Harbour, and on Enderby Island) ; *Cotula dioica* (Ewing Island) ; low-growing plant with silvery(?) leaves, perhaps *Gnaphalium* sp., which Captain Dorrien-Smith and I found in stony bed of creek on Adams Island

* The typical form does not appear to occur on the Snares.

near camp, but the only plant collected was unfortunately lost. Probably these rare plants, and others not specified, were once much more common, and denote a more extensive flora in the past, decrease in land-surface having caused extinction of species.*

(β.) The Plant Formations.

(i.) *Dunes.*

Dunes occur only on the north coast of Enderby Island. These I had not time to visit, and can only reproduce here briefly the main points regarding their vegetation from my former paper ("Botanical Excursion," p. 236).

The most important ecological feature is a negative one—the absence of special sand-binding plants, the common sand-sedge of New Zealand, *Scirpus frondosus*, being wanting, although common in Stewart Island, and even in the Chathams (Cockayne, "Plant-covering of Chatham Island," p. 261). The fact is—though, of course, this does not explain the absence of the above plant—that the wet climate is quite sufficient to keep the dunes stable, and plants unadapted to a loose and easily moved substratum can exist quite well. Thus there is in some places a close low growth of *Pratia arenaria*,† its green creeping stems rooting at the nodes. Of a similar habit are *Lagenophora pumila*, but its stems are beneath the sand, and the less-spreading and closer-growing *Epilobium confertifolium*. With these is a moss of dense habit. The close growth is chiefly on the sheltered side of the dune gullies, the patches of vegetation in exposed places being far apart. *Ranunculus acaulis* and *Crassula moschata* are also common plants.

On some parts of the dunes, particularly where they are drifting inland, *Rumex neglectus* is the dominant plant. Elsewhere in the New Zealand region it is a plant of gravelly beaches or coastal moors. Its stout far-creeping stems, however, fit it admirably for spreading in sand, and where, through what is most probably the action of cattle, the dunes have been disturbed, and are spreading inland, a pure formation of the *Rumex*, absent in the primitive vegetation, has been produced.‡

(ii.) *Coastal-rock Formations.*

The rocks may be more or less flat and raised but little above the water-surface, or there may be cliffs varying much in height.

On flat rocks green cushions of *Colobanthus muscoides* dominate, and in crevices are lines of *Crassula moschata* and small tufts of *Scirpus aucklandicus*, both of which also frequently grow upon the *Colobanthus* cushions. Generally there are a few stunted plants of *Blechnum durum* and *Asplenium obtusatum*, depauperated *Cotula plumosa* and *C. lanata*, and frequently abundant, though not everywhere, are the dark-green glossy flat rosettes of the endemic coastal *Plantago*.

On stony beaches the vegetation is scanty, and consists of a few patches of *Crassula moschata* and *Scirpus aucklandicus*, except where a grassy or *Pleurophyllum*

* This matter is gone into at some length in my recently published report on Stewart Island.

† The specific name is quite misleading, since in Chatham Island it grows in abundance on all kinds of soils, and in both wet and dry stations.

‡ Undoubtedly the *Rumex* can grow upwards as it is buried, and this gives it, ready-made, a sand-binding adaptation.

meadow comes to the shore, when, in the latter case, a line of *Aciphylla latifolia* may grow just above high water, in company with straggling patches of *Cotula lanata* or *C. plumosa*.

FIG. 9.—THE GRASS *Poa ramosissima* GROWING ON COASTAL CLIFF, MASKED ISLAND, CARNLEY HARBOUR. Above, the fern *Blechnum durum*.

Where sheltered, the cliffs may be cloaked with greenery. If wet or dripping with water, the endemic grass *Poa ramosissima* (fig. 9) hangs in thick, broad, pale bluish-green sheets, the slender, rather wiry stems entangled together, while near by

will be a luxuriant growth of *Montia fontana* and *Callitriche antarctica*, forming thick green mats perhaps a square metre in area, together with the long depending shoots of *Cotula lanata*.

The vegetation of sheltered drier cliffs may be nearly equally luxuriant, and this depends upon the peat-forming capabilities of the two maritime ferns. On low cliffs just outside the rim of the forest there may be a belt of *Stilbocarpa polaris* growing intermixed with masses of *Asplenium obtusatum*, 40 cm. tall, over which, and contrasting with the very dark leaves, may straggle the bluish-green *Acaena Sanguisorbae* var. *antarctica*. A second zone will probably be of *Poa litorosa*, its filiform leaves, a metre or so long, draping the cliff-face, and when massed together looking like a huge beard.

Where a cliff is more sheltered, *Poa foliosa* of similar habit is the grass covering. But the most common plants of this formation are *Blechnum durum* and *Asplenium obtusatum*, both very dark green in colour, their leaves at times 60 cm. to 80 cm. long, and beneath their massive rhizomes is peat 60 cm. or so in depth (see fig. 9, left-hand top corner).

Where the adjacent ground is flat, or where a grass meadow comes to the shore, there is generally a belt of *Poa foliosa* mixed with *Carex trifida*, and in many places *Poa litorosa* also. In such places *Veronica elliptica*, *Blechnum durum*, *Asplenium obtusatum*, *Acaena Sanguisorbae* var. *antarctica*, *Histiopteris incisa*, *Epilobium confertifolium*, *Nertera depressa*, *Carex appressa*, and *Polystichum vestitum* are usually more or less common.

(iii.) *The Rata Forest.*

* *General.*

Wherever there is sufficient shelter to permit tree-growth there is usually a belt of trees round the shore. Within Carnley Harbour, Port Ross, and the inlets of the east coast there is nearly everywhere a continuous forest-mass extending for a varying distance up the hills. On the east of the main island, facing the actual sea, is also a certain amount of forest-growth.

The trees vary in size according to the degree of exposure, so that in many places the forest is little more than scrub, while in others the roof may be from 6 m. to 12 m. above the ground. Near the shore the formation frequently comes to the margins of the cliffs or to the stony shore, while its upper portion, at a height of some 150 m., gradually gives place to scrub.

** *Composition.*

The rata forest consists chiefly of the following species: Trees—*Metrosideros lucida* (*Myrtaceae*); *Dracophyllum longifolium* (*Epacridaceae*); *Nothopanax simplex* (*Araliaceae*). Shrubs—*Coprosma foetidissima*, *C. ciliata*, *C. parviflora*, *C. cuneata* (*Rubiaceae*); *Suttonia divaricata* (*Myrsinaceae*). Ferns — *Polystichum vestitum*, *Polypodium diversifolium*, *Blechnum durum*, *Asplenium obtusatum*, *Hymenophyllum multifidum*, and a number of other species of the same genus. Mosses—*Dicranoloma Billardieri*, *D. Menziesii*, *D. setosum*, *Campylopus introflexus*, *Macromitrium longirostre*, *Leptostomum gracile*, *Rhizogonium bifarium*, *Breutelia pendula*, *B. comosa*, *Ptychomnium aciculare*, *Lembophyllum cochlearifolium*, *Distichophyllum pulchellum*, *Cyathophorum bulbosum*, *Campylium relaxum*, *Stereodon chrysogaster*, *Acrocladium chlamydophyllum*, *Mniodendron comosum*, *M. Kroneanum*, *M. Sieberi*, *M. arbuscula*,

Hypopterygium tamariscinum. Liverworts—*Tylimanthus saccatus, Marsupidium Urvilleanum, Plagiochila ramosissima, P. strombifolia, Leioscyphus chiloscyphus, Lophocolea pallida, L. lenta, L. allodonta, L. fulva, Cheiloscyphus Menziesii, C. Billardieri, C. fissitipus, C. sinuosus, Mastigobryum involutum, M. novae-hollandiae, M. anisostomum, Trichocolea tomentilla, Schistochila Lehmanniana, Gottschea pinnatifida, G. Balfouriana, Frullania congesta, F. scandens, Madotheca Strangeri, Radula uvifera, Podomitrium Phyllanthus, Symphiogyna flabellata, Aneura multifida.* Lichens—*Sticta Freycinetii, S. filicina, S. orygmaea, S. fragillima.* Fungi—*Antennaria scoriadea.**

Fig. 10. Interior of the Rata Forest of the Auckland Islands, showing Tangle of Branches. Here the usually dense undergrowth is almost wanting, except for a few ferns.

**** Physiognomy, &c.*

Seen from a distance, the rata forest appears as a close, homogeneous, somewhat dull-coloured covering, resembling a mass of shrubs rather than trees (fig. 2). A closer view shows a flat or often slightly undulating green roof of extreme density, which in some places is pierced by the upmost branches of the upright-growing *Dracophyllum longifolium.*

Within, the general view is remarkable enough. Everywhere are the massive prostrate and semi-prostrate trunks of the southern rata (*Metrosideros lucida*), sometimes lying close to the ground, at other times forming great arches, or at others again

* This list of cryptogams does not pretend to any degree of completeness; only the most striking are mentioned.

natural bridges over the deep depressions of the forest-floor. From these trunks, which are quite irregular in form, pass off others twisted in every way conceivable, and frequently forming a complete and rigid tangle (fig. 10). Ultimately certain branches arise, which, bending upwards, sometimes at a right angle, rise to a variable height, and, branching again frequently, the erect stems become closer and closer, and at the same time more and more twiggy. Wide spaces extend between the spreading and diverging branches, but above, where the growth is erect as in any normal tree, only small patches of light are visible, each primary branch having its own set of twigs and leaves, but the whole coming together and making a continuous and flat roof.

The trunks are reddish-brown in colour, and long strips of papery bark depend from them. Sometimes there is little undergrowth, and nothing meets the eye save the horizontal or arching trunks and the bewildering network of twisted branches (fig. 10). At other times there is a close undergrowth. Here may be a colony of the fern *Polystichum vestitum*, the dark-green coriaceous fronds 1 m. or more in length spreading outwards from the summit of a stout trunk 1 m. to 1·5 m. or more tall. Near the shore many metres of the forest-floor will be covered with close masses of the ferns *Blechnum durum* and *Asplenium obtusatum*, and a few plants of *Stilbocarpa polaris* will be present. In other parts the various forest trees and shrubs may occur in plenty, and then, particularly when *Suttonia divaricata* is abundant, the formation, what with the obstacles offered by the prostrate trunks and divaricatingly branched shrubs, becomes almost impenetrable. The floor, too, is rarely level; usually there are deep hollows and depressions everywhere, and these increase the difficulties of progress, which is best made along the paths formed by the hair-seals.

The close roof leads, even during the most boisterous days, to a comparatively wind-still atmosphere beneath, in consequence of which marked hygrophytic conditions prevail. Without, transpiration may be intense; within, all is suitable for the most pronounced moisture-demanding plants. And so there is a wonderful wealth of filmy ferns, mosses, liverworts, and great foliaceous lichens. The first named form sheets of delicate green both on the ground and the tree-trunks. The bryophytes build up cushions both on forest-floor and tree-trunk, or cover the latter with a close thick mantle, through which the slender rhizomes of the filmy ferns ramify, and which can be stripped off in compact sheets. The yellowish moss *Dicranoloma Billardieri*, and the liverworts *Plagiochila ramosissima* and *Mastigobryum involutum* are conspicuous cushion-builders. The dark-green *Aneura multifida* forms many extensive flat patches on the forest-floor. The beautiful *Schistochila Lehmanniana* and the handsome yellowish *Trichocolea tomentilla* make extensive colonies in moist places. On the trunks the mosses *Ptychomnium aciculare*, *Lembophyllum cochlearifolium*, and *Stereodon chrysogaster* occur in large masses. Usually the various bryophytes grow so mingled together that in gathering a specimen a number inextricably mixed are collected, some of the more minute living on the larger ones or on the moss cushions.

To the peat-forming capacity of the mosses and liverworts during the course of many generations is due much of the irregularity of the forest-floor, and even the deep hollows may be attributed to this cause rather than to the action of water. *Polypodium diversifolium*, with its dimorphic, coriaceous, broad, green leaves, and thick moisture-holding rhizome, is very abundant both as a ground-plant and a liane,

and eventually as an epiphyte. *P. Billardieri* and *P. grammitidis* are also frequent epiphytic ferns. The fine foliaceous lichens *Sticta Freycinetii*, *S. filicina*, *S. orygmaea*, and *S. fragillima* are abundant on trees, logs, or the ground, lending a special character to the vegetation.

In many parts of Adams Island the forest is so low as to be a transition to scrub. My notes say, "There is here little actual forest, the taller arborescent plants being confined to the gullies. The trees are not especially of the wind-swept character; there is but little undergrowth, and the customary moss or liverwort cushions and mats are wanting on the trunks, while even on the ground are but few. *Metrosideros lucida* and its associated plants make up the bulk of the forest. Noteworthy is the form of *Suttonia divaricata*, which has slender twisted naked stems and a flat tablelike top of closely interwoven and twisted wiry twigs. On the floor are many 'needles' of the *Dracophyllum*. As the trees are not especially prostrate, one walks on the ground, not on tree-trunks. In open places is a good deal of *Astelia linearis* and *Uncinia riparia* var. *Hookeri*. Looking at the forest-roof, is to be noted the shining green *Metrosideros* and the erect yellowish-green *Dracophyllum longifolium*, the former with a rounded head; the paler green *Coprosma foetidissima* and *Nothopanax simplex*, its shining green leaves tinged with yellow."

Near the shore *Dracophyllum longifolium* is frequently a most abundant plant, and it often forms a belt at the forest's outskirts, jutting over the cliffs or the stony shore; very frequently, indeed, its stems are quite covered with sooty masses of *Antennaria scoriadea*. Where the forest-roof is for some reason more open, there may be a pure undergrowth of *Nothopanax simplex*, having numerous stems from the ground. *Epilobium confertifolium*, *Stellaria decipiens*, and *Epilobium linnaeoides* are common forest herbs, but they play little part in the physiognomy.

The rata forest is closely related to the forest of Stewart Island near the sea, to portions of the forests of the Sounds of Otago, and to one phase of the subalpine forest of Westland.

(iv.) *Mountain Scrub* (Suttonia *Formation*) (fig. 11).*

At a variable height above the forest comes the mountain scrub. No hard-and-fast line can be drawn between the two formations, the one merging into the other, while even the principal species are identical, though their proportions are very different, as is also the physiognomy and ecology of the two formations.

The chief peculiarity of this formation is its astonishing density. The shrubs are so rigid, much-branching, and interlaced that it is frequently quite impossible to force a passage through, or even to crawl beneath them; the only mode of progression is to roll over their top.

Suttonia divaricata is dominant, and to this especially is the extreme density owing. *Cassinia Vauvilliersii* is very much commoner than in the forest, and its sage-green colour, or the whitish-yellow of a strongly marked variety, strikingly contrasts with the darker green of the other shrubs.

According to the exposure, so does the scrub vary in height; in some places it may be 2 m. tall, or taller, but in others only 1 m. or less, but with a closeness of growth almost incredible.

* This picture gives no idea of the formation; unfortunately, no photograph of typical scrub was secured by the expedition.

Its upper surface is uneven, this depending upon the habit of the individual species. Thus the dark-coloured but reddish *Suttonia* has a flat top, the green *Metrosideros* is rounded, and the brownish *Dracophyllum* raises aloft its erect fastigiate shoots above the general foliage-level.

At its upper limit the scrub merges into the *Danthonia* meadow, certain of its more xerophytic members being dotted over that formation—*e.g.*, *Cassinia Vauvilliersii* and *Dracophyllum longifolium;* but the scrub as a whole is confined to the numerous gullies and hollows, where there is still abundance of stunted *Metrosideros* and *Nothopanax simplex*, these more mesophytic plants being absent on the meadow proper, as I have shown previously ("Botanical Excursion," p. 267).

Fig. 11.—Mountain Scrub, consisting chiefly of Stunted Rata (*Metrosideros lucida*).
In foreground, commencement of tussock meadow of *Danthonia antarctica*.

Where there are openings in the scrub, or where there is space beneath the gnarled and closely interwoven branches, are a few of the meadow plants, or a scanty undergrowth of the fern *Blechnum capense*.

The formation is closely related to the *Dracophyllum* scrub of Campbell Island; also, it has affinities with the subalpine scrub of New Zealand, but especially that of *Veronica*, *Coprosma*, *Dracophyllum*, and other xerophytes to be found on the sides of river-terraces in the drier portions of the Southern Alps and elsewhere.

Genetically, the scrub is merely rata forest modified by more extreme conditions, especially wind, altitude playing a minor part (fig. 11).

(v.) Olearia Lyallii *Forest* (fig. 12).

This formation occupies a small portion of Ewing Island, and there are a few trees in the neighbourhood of the Port Ross depot. The description already given for the same formation on the Snares is also generally applicable here, except that a considerable proportion of the trees are less prostrate, and the forest, 6 m. to 9 m., is taller. Much of the forest-floor is bare except for a covering of fallen leaves. In other places are seedlings of all sizes by the hundred, the ground-surface being glaucous-green from their presence; also, the horizontal trunks are similarly occupied, thanks to the crevices in the damp bark, in which the seed is caught and can

Fig. 12.—General View of *Olearia Lyallii* Formation, Ewing Island, Auckland Group.

germinate. Shrubby undergrowth is altogether wanting; here and there alone are a few colonies of the ferns *Blechnum durum*, *Polystichum vestitum*, and *Asplenium obtusatum*. Probably the lack of undergrowth is due in part to the large number of hair-seals frequenting this special forest.

(vi.) Danthonia *Meadow.*

This formation succeeds the mountain scrub, at a distance giving a brown colour and quite smooth appearance to the hillside. But a close acquaintance shows the smoothness to be non-existent. The surface of the ground is most uneven, and cut likewise by many gullies, which, full of scrub, make a great obstacle to progress. The grass itself is of the tussock habit, and usually is raised aloft upon peaty trunks

of irregular shape. Nor is the zone of meadow uniform throughout. On Adams Island at first, to be sure, the tussock is dominant, but the meadow is dotted everywhere with low shrubs of *Cassinia Vauvilliersii*, sage-green or whitish-yellow, according to the variety, and close-stemmed plants of *Dracophyllum longifolium*, just raised above the level of the grass; whilst hidden amongst the tussocks is a good deal of prostrate *Coprosma foetidissima*, and, where there are hollows, rounded, extremely dense, low bushes of *Metrosideros lucida*. Where between tussocks or shrubs the ground is open, or on old grass trunks, are sheets of the shining-green suffruticose *Coprosma repens* hugging the peaty soil, and probably covered with the large orange-red drupes. At a higher altitude the tussocks are closer, their leaves mingle, the trunks are almost wanting; indeed, the formation is virtually pure, the whole yellow surface, when in flower, waving in the breeze like a field of corn.

Higher still, at first sight the composition of the meadow is apparently the same, and one might very well think there would be nothing but grass. On the contrary, there is an almost continuous wiry undergrowth of shrubs, though these are quite hidden, consisting of *Coprosma cuneata*, *C. parviflora*, and *C. foetidissima*.

Danthonia meadow is very frequently not nearly so uniform in composition as described above, but varies much in its composition according to the average moisture in the soil, until finally bog conditions prevail, the grass becoming much stunted or almost wanting, and another formation appears.

The *Danthonia* meadow from the low scrub-line at the head of the North Arm of Carnley Harbour up to the summit of the western cliffs is similar to that described in the preceding paragraphs. Generally the tussock is dominant, but the individual plants are frequently some distance apart, and on the wet and semi-boggy ground of the intermediate spaces is an abundance of *Celmisia vernicosa*, the stiff glossy dark-green rosettes forming round mats or semi-cushions 93 cm. in diameter. The principal ground-plant of this wet station is *Carpha alpina*, its pale-green leaves in low tufts, and mixed with a yellow-coloured moss (? *Campylopus introflexus*). At the period of our visit—21st November—the boggy meadow was dotted everywhere with the lovely flowers of the *Celmisia*, the white rays chiefly giving the colour. The straggling shrub *Veronica Benthami*, about 37 cm. tall, is very frequent, sometimes mingling its branches with the tussock. There are also stunted shrubs of *Coprosma cuneata*, *C. parviflora*, and *Cassinia Vauvilliersii*, 25 cm. tall or thereabouts. Other plants of this formation, and in places abundant, are *Helichrysum bellidioides*, *Acaena Sanguisorbae* var. *antarctica*, *Ranunculus pinguis*, and *Bulbinella Rossii*; in fact, almost all the herbaceous plants of the Aucklands may be present in numbers, including the smaller grasses,* with the exception of the species of *Pleurophyllum*, the *Aciphyllae*, *Stilbocarpa*, and a few plants confined, or nearly so, to the highest zone of vegetation—the *Pleurophyllum Hookeri* formation. Within the meadow areas actual bog produces another combination of plants; but here, as usual, are transitional stages.

(vii.) *Transition from Meadow to Forest.*

Seen from some distance, in many places the forest has a curious appearance, the general uniformity being broken by raised parallel lines of vegetation. A close acquaintance shows that such are made by long natural "lanes" of grassy meadow cutting into the forest parallel to one another. The trees (*Metrosideros lucida*)

* *Hierochloe Brunonis*, *Calamagrostis setifolia*, *Deschampsia Chapmani*, *Agrostis magellanica*, &c.

separating these "lanes," where examined, were in straight belts 4 m. or 5 m. wide, and parallel to the direction of the prevailing wind. A "lane" would be about 12 m. across, and its vegetation consist of *Danthonia antarctica* tussocks, cushions of *Oreobolus pectinatus*, mats of *Coprosma repens* and *Styphelia empetrifolia*, and other meadow plants. Down the "lane" the full violence of the wind can be felt.

It is not easy to account for the presence of these "lanes." Perhaps they are the remains of *Danthonia* meadow in process of invasion by rata forest. Thus, let a rata bush once become established, then on its leeward side another individual could gain a footing, and so on until long files parallel to the wind result. But between these the hemmed-in wind will have redoubled power, and the capture of a "lane" by trees be a very slow and uncertain process.* Juvenile rata-trees occur in fair abundance in these grassy openings, and it looks as if they finally would change into forest.†

(viii.) Pleurophyllum Hookeri *Formation* (fig. 13).

Near the summits of the hills, in sopping wet though frequently stony ground, is a plant formation of a more or less open character, made up of many species which grow close to the surface of the ground. First and foremost, and giving a most striking appearance to the landscape, come the silvery-green rosettes of *Pleurophyllum Hookeri*, which may be solitary or several together from a branching stem. Frequently the plants grow closely together, and many square metres glisten with the silvery covering. Generally *Carpha alpina* mixed with *Astelia linearis* forms the groundwork of the formation, or in other places this may be the filmy fern *Hymenophyllum multifidum*, its fronds closely curled, and reddish or brown in colour. In some places the glistening green mats of *Celmisia vernicosa* are as numerous as the plants of *P. Hookeri*. *Veronica Benthami*, and the two cushion plants *Oreobolus pectinatus* and *Gaimardia ciliata* are extremely common. Everywhere are the arching, rather large green leaves tinged with brown of patches of *Bulbinella Rossii*. Where the ground is especially stony, right under the rocky summits, are quantities of the green rosettes of broad leaves of *Plantago aucklandica*. Also, this is the especial station of the small and most common form of *Ranunculus pinguis*, the diameter (2 cm.) of the glistening canary-yellow subsessile flower being out of all proportion to the size of the small rosettes (3·2 cm. diameter) of moderately dark-green glossy leaves flattened to the ground. Very abundant, too, is *Myosotis capitata*, with perhaps the most lovely flower of the islands, its blossoms a brilliant dark blue, 5 or so crowded into a head 2·1 cm. broad, and each about 11 mm. in diameter. Noteworthy on the stony ground in some places is *Cardamine glacialis* var. *subcarnosa*,‡ its small dark-green rather fleshy pinnate leaves in rosettes, each 7 cm. in diameter, given off from a rather stout rootstock, and its root penetrating very deeply.

* Such a condition of affairs would be analogous to the wind-channels of a dune area, where without shelter it is impossible to establish even sand-binding grasses. (Cockayne, L., "Report on Sand Dunes of New Zealand," 1909.)

† Since I wrote the above Professor C. Chilton has called my attention to J. E. S. Moore's explanation of certain African "park" lands ("To the Mountains of the Moon"; fig. p. 4, and p. 320–326), where a desert xerophyte (*Euphorbia*) encourages plants of more mesophytic structure to settle in its shade, just as does the wind-tolerating *M. lucida* allow settlement in its lee.

‡ This is the only plant analogous to those of shingle slips in the Southern Alps.

Quite confined to this formation is *Marsippospermum gracile*, the erect, terete, slender leaves crowded together, reddish-brown in colour, or in some places green, and forming sometimes pure masses some square metres in extent, or at other times growing amongst and through the *Celmisia* cushions, the gentian, and the *Ranunculus*.

The following plants are frequently important members of the formation: *Gentiana cerina*, *Abrotanella spathulata*, *Phyllachne clavigera*, *Luzula crinita*, *Coprosma repens*, *Agrostis magellanica*, *Veronica Benthami*, an occasional stunted *Danthonia antarctica*, small *Aciphylla antipoda*, *Stilbocarpa polaris*, *Pleurophyllum speciosum*, and *Aciphylla latifolia*, but the latter three much dwarfed.

Fig. 13.—General View of *Pleurophyllum Hookeri* Formation, South of Auckland Island.

There is no other formation in New Zealand that can be exactly compared with this. The stony substratum at once recalls the shingle slips of the Southern Alps; but in these islands the superabundant moisture, and the peat-making habit of the plants conditional thereon, does away altogether with the need for "shingle-slip adaptations," and special wind-resisting power, here attained by lowness of stature, cushion form, and creeping habit, is the chief desideratum.

(ix.) Poa litorosa *Formation.*

On Disappointment Island, and to a limited extent so far as I observed on Auckland Island, is a meadow of *Poa litorosa*, and in some places *P. foliosa*, similar to that of the Snares, Antipodes, and Campbell Islands in its general physiognomy. The

last-named grass is the much less abundant plant, and occurs generally in pure patches of small area.

The meadow of Disappointment Island,* owing to its excessively wind-swept character, possesses certain features of its own, and merits special description. *Poa litorosa* is dominant, but there are sheets of *P. foliosa* all through the formation. *Danthonia antarctica* also occurs in some places. A rather striking feature are small dark-coloured, almost black, clumps of *Polystichum vestitum*. Quite hidden by the tussocks is, in places, a low scrub, made up of *Coprosma parviflora*, *C. cuneata*, *C. foetidissima*, *Suttonia divaricata*, *Cassinia Vauvilliersii*, and *Dracophyllum longifolium*. *Acaena Sanguisorbae* var. *antarctica* occurs here and there climbing over

Fig. 14.—Rosettes of *Pleurophyllum speciosum* flattened to Ground.

the tussock. Where streams and swampy ground occur *Carex appressa* is present. In some places the formation is invaded by *Pleurophyllum criniferum*, *Stilbocarpa polaris*, and other plants of the *Pleurophyllum* meadow; in fact, there are transitions between the two formations. Other plants of the formation are *Nertera depressa* and *Blechnum durum*.

* This island had not been previously visited by a naturalist. I noted about thirty-one species of spermophytes and pteridophytes. Bryophytes and lichens are poorly represented. There is no forest, but a good deal of scrub of *Veronica elliptica* and species of *Coprosma* existed before it was cut down by the unfortunate castaways from the "Dundonald." New Zealand readers may see a popular account of the vegetation, by myself, in the *Lyttelton Times* for the 3rd December, 1907.

(x.) Pleurophyllum *Meadow* (see figs. 3, 6, 7, 14, 15, and 16).

This formation, with its wonderful collection of stately herbs with immense leaves, and in some cases masses of showy flowers, would be remarkable enough anywhere in the world, but how much more so at no great distance from the limit of flowering-plants in the Southern Hemisphere. The whole of its members, as seen by what has gone before, occur in other formations. Here, however, they have gathered together into one whole, and much of the magnificent endemic flora can be seen in all its glory at a glance. The formation is by no means common, and is probably limited to certain spots near sea-level in Carnley Harbour, to some

Fig. 15.—General View of a Piece of *Pleurophyllum* Meadow.

Poa foliosa on right, *Stilbocarpa polaris* and *Aciphylla latifolia* on left, and colony of *Pleurophyllum criniferum* in centre.

of the slopes of Disappointment Island (but there modified), and to various places in Campbell Island.

"Fairchild's Garden," the most striking example of the formation, is on a sloping piece of ground on Adams Island, near the Western Channel. The meadow as a whole presents a rather irregular surface of varied greens. The pinnate and lobed leaves of *Aciphylla latifolia*, darker than those of most of its associates, dominate near the sea. The great corrugated, pale-green, broad-ovate leaves of *Pleurophyllum speciosum*, arranged in loose rosettes, are everywhere (fig. 14), and in December the massive flower-stalks, bearing the numerous aster-like purple flower-

heads, rise up in hundreds. The bright-green drooping leaves of *Poa foliosa* and the brownish ones of *Carex appressa* are scattered through the whole. Isolated plants, or colonies, of *Stilbocarpa polaris*, their great round hairy leaves bright vivid-green in colour, abound. *Pleurophyllum criniferum* raises up its immense

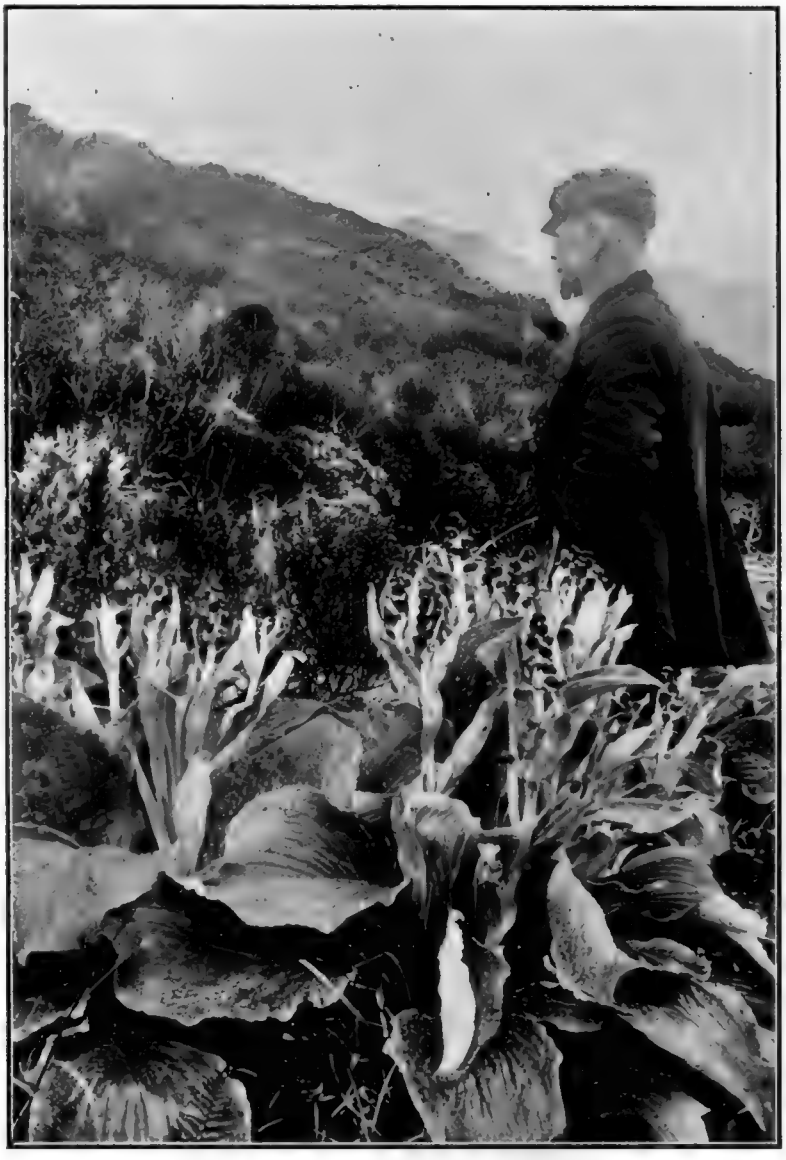

Fig. 16.—*Pleurophyllum criniferum* in Bloom and Bud, Adams Island, Auckland Group.

leaves in great abundance, and its flowering-stems 1½ m. tall (fig. 16). Blackish patches of the fern *Polystichum vestitum* add a contrast to the prevailing greens. Here and there at first, but higher up the slope in great quantity, are the orange-coloured blossoms of *Bulbinella*.

Where the large-leaved plants are not as close as usual the smaller herbs cover the ground, and in such places are *Gentiana cerina*, *Cotula plumosa*, *Nertera depressa*, *Epilobium confertifolium*, *E. linnaeoides*, *Coprosma repens*, *Acaena Sanguisorbae* var. *antarctica*, *Scirpus aucklandicus*, and *Helichrysum bellidioides*.

Proceeding up the slope, *Aciphylla latifolia* becomes less common, *Danthonia* tussock appears, and finally the formation shades off into *Danthonia* meadow. But before doing so there are vast numbers of plants of *Pleurophyllum speciosum*, dozens occurring at a time, their leaves flattened to the ground, and so close as to touch, so that one has, most regretfully, to trample them underfoot. *Bulbinella* also becomes very common, and the inflorescences, 40 cm. tall, with closely packed racemes of orange-coloured flowers, are extremely showy. *Hierochloe Brunonis* and various small grasses occur in some places, as also in the *Danthonia* formation.

The *Pleurophyllum* meadow of Disappointment Island is similar in many respects to that just described, but the individuals are hardly as luxuriant or in such great numbers. There are acres of *Aciphylla latifolia*, knee-deep or deeper, and mixed with it much *Poa foliosa*. Next in abundance is *Stilbocarpa polaris*,* a form seemingly much less hairy than that usually met with. *Aciphylla antipoda* is not mentioned in my notes, so, although most probably on the island, it can hardly be very common.

(xi.) *Swamps and Bogs.*

* *General.*

In a region where, owing to the frequent downpour, the surface of the ground is never dry, where the peat is of great depth, and where every hole and hollow contains more or less water, it would be thought that bog conditions would be everywhere. And, from what has gone before, there seems ample reason for such a conclusion. Nevertheless, certain spots are much wetter than the average ground-surface, and there definite species exist, in combinations not seen on the drier ground, which have a distinct physiognomy dependent on the abundance of certain life-forms.

Between bogs and swamps no hard-and-fast line can be drawn. The extreme cases are distinct enough, but intermediates exist which can be referred to either class.

** *Swamps.*

Swamp formations are distinguished by the presence of an extreme development of the "trunked-tussock" form. On Ewing and Enderby Islands, where the ground is flat and low and the drainage bad, are well-marked swamps where water lies all the year round. Here the dominant plant of the wettest ground is *Carex trifida*, and where slightly drier *Poa litorosa*, on trunks 1·5 m. tall, is plentiful (see fig. 1, p. 187.)

At the head of the North Arm of Carnley Harbour there is a swamp where water lies. Here *Carex appressa* is dominant. On the wet floor is much *Montia fontana* and *Juncus antarcticus*. Here and there growing through the former is *Ranunculus aucklandicus*. *Epilobium linnaeoides* is common. A few stunted bushes of *Suttonia*

* It much resembles the Snares species—*i.e.*, so far as I could judge by a cursory examination under adverse conditions.

divaricata and *Cassinia Vauvilliersii* rise above the *Carex* tussock. Other plants noted were *Hierochloe Brunonis*, *Carpha alpina*, *Bulbinella Rossii*, *Blechnum capense*, and *Celmisia vernicosa* of loose habit of growth.

Near streams and in wet ground in *Danthonia* meadow may be *Polystichum vestitum*, almost pure or in company with *Poa litorosa* and *Carex appressa*.

*** *Bogs.*

The bogs owe their physiognomy to the cushion form, as exemplified in the stiff cushions of *Oreobolus pectinatus*, the hard green ones of *Phyllachne clavigera*, and the circular soft ones of *Gaimardia ciliata*. *Astelia subulata*, spreading far vegetatively, makes a kind of turf, as does the rather taller *Astelia linearis* and the far-spreading *Coprosma repens*.

The small *Drosera stenopetala* is here and there, and there are occasional plants of the strongly xerophytic small fern *Schizaea fistulosa* var. *australis*, its rushlike, slender fronds, 9 cm. tall or less, given off from a rather thick rhizome, and crowded together. Certain of the meadow plants will be present, especially *Bulbinella Rossii*, *Coprosma repens*, and *Celmisia vernicosa*. In fact, it is hard to say where meadow begins or bog ends, much of the former being semi-bog, and perhaps the bog is best defined by the presence of an abundance of cushion plants, especially of *Phyllachne clavigera*, whose cushions, bright green at one season and at another begemmed with multitudes of pure-white flowers, are very striking (see fig. 5, p. 196).

At lower levels, sometimes at sea-level, and also forming open spaces amongst the mountain scrub or following the bank of a creek, are bogs or swamps where the ground is sopping wet, and there is a close growth of *Carex appressa*, while growing through this are usually many fine specimens of *Stilbocarpa polaris* and especially *Pleurophyllum criniferum*. *Blechnum capense* is also abundant. In places the vegetation is 1 m. in depth. The *Stilbocarpa* forms close green patches, contrasting with the dull-coloured fern or straw-coloured *Carex*, and the huge pale-green *Pleurophyllum* leaves stand out above the whole. Where there is less water the *Carex* is reduced in quantity and the *Pleurophyllum* much increased.

From the above paragraphs it may be seen that bog is rather more xerophytic than tussock meadow, and that the selective power of the substratum increases in proportion to increase in its water-content.

(xii.) *Subalpine Rocks.*

It is usually only near the shore and on the actual summits of the hills that rock crops out. Crevices and hollows are generally filled with peat, or this may cover the entire surface. On the bare rock is the fine suffruticose lichen *Stereocaulon ramulosum* and several crustaceous species. Here also are black patches of the small mosses *Andreaea subulata*, *A. nitida*, and *A. mutabilis*. The chasmophytes are the creeping *Azorella reniformis*, the small cushions of the needle-leaved *Colobanthus subulatus*, *Geum albiflorum*, *Cardamine depressa*, *C. glacialis* var. *subcarnosa*. *Polypodium pumilum* and *Hymenophyllum multifidum* form lines in the crevices or extensive sheets on the peaty covering. On wet rocks and on the peat certain mosses are common—*e.g.*, *Braunia Humboldtii*, *Lophiodon strictus*, *Conostomum australe*, *Hypnum hispidum*. Growing in the largest *débris* beneath the cliffs is the

summer-green alpine fern *Polystichum cystotegia.* Where the rocks are flat, or even on their steep faces, where there is a considerable thickness of peat, this may be extremely wet, and bog plants such as *Oreobolus pectinatus*, *Phyllachne clavigera*, and *Coprosma repens* grow abundantly; in fact, almost every meadow plant occurs not infrequently in such a situation, not excluding *Pleurophyllum speciosum* and *Aciphylla antipoda.*

The formation is related to similar ones in the Southern Alps, the *Polypodium* and *Hymenophyllum* being common in both, while there are also closely related species of *Colobanthus* and *Azorella.*

With the weathering of the rocks comes the *Pleurophyllum Hookeri* formation, which with accumulation of peat gives place to *Danthonia* meadow. The rock vegetation is thus the beginning of a series of vegetation-forms which may culminate either in meadow or forest according to exposure and altitude.

(D.) ANTIPODES ISLAND.

(*α.*) General.

The Subantarctic Expedition did not visit this small and isolated island. I can only, then, supply an account drawn from my former paper, but in imagination dressing the meadows in their summer garb.

(*β.*) The Plant Formations.

(i.) *Coastal Rocks and Cliffs.*

The precipitous cliffs, which form virtually the whole coast-line, are for the most part bare, except for certain crustaceous lichens which paint portions a distinct white.

Where there are crevices and hollows the plant-life is much the same as elsewhere in the botanical province, certain plants of the Auckland Group being absent, while the common New Zealand wild celery (*Apium prostratum*), found also on the Snares, is present.

The plants of the formation are: *Colobanthus muscoides*, *Crassula moschata*, *Scirpus aucklandicus*, *Apium prostratum*, *Cotula plumosa*, *Poa litorosa*, and in the very wettest spots—and "the cliffs are quite glistening with moisture" (Cockayne, "Botanical Excursion," p. 288)—cushions of a dark-green shining moss, which are wringing wet.

Where there is sufficient soil for larger plants a zone of *Poa foliosa* and *Carex trifida* may succeed the pure rock-dwellers, merging finally into the tussock meadow.

(ii.) *Tussock Meadow.*

It is the tussock meadow which gives the special vegetation-character to the whole island. Seen from the sea or from an eminence, a brown covering appears to occupy the whole surface of the land, save where it is traversed by irregular dark lines, these denoting the presence of low scrub or of the tall semi-tree fern *Polystichum vestitum.* In my former paper the formation is subdivided under three heads. Further consideration leads me to the conclusion that, although the meadow

is by no means uniform in its composition, such distinctions are somewhat artifical, and that it is best to consider the formation as one whole.

On the slopes from the shore near the landing-place great tussocks, 1·5 m. tall, of *Poa litorosa* with thick trunks grow so closely together out of the wet peaty soil that it is hardly feasible to force a passage between them, and it is much more easy to walk upon their tops, stepping from tussock to tussock. *Poa foliosa* and *Carex trifida* also occur to a limited extent.

Proceeding inland, by degrees the tussock-trunks become lower, while much *Polystichum vestitum* enters in, so that at first glance it might appear that these two species alone were present. But this is not so, for where the tussock and fern are less dense, and as the distance from the sea increases, both decrease in size, and there enters into the formation much bright-green *Aciphylla antipoda*, pale bluish-green *Acaena Sanguisorbae* var. *antarctica* (climbing over the tussocks), and the tender green fern *Histiopteris incisa*.

The soil consists of a rather loose brown peat, so soft that a stick can be thrust deeply into it. Even in winter water cannot be wrung out of the surface soil, but this can be quickly kneaded into the consistency of porridge. The surface of the ground is most uneven, owing partly to the dead trunks of grass or fern forming mounds, and partly to hollows of varying depth. It can easily be seen that the tussocks and *Polystichum* afford a considerable amount of shelter for low-growing plants, so that in the numerous spaces there is a rich vegetation, made up, however, of but few species, of which the following are the most important members: The ferns—*Blechnum penna marina*, *B. capense*, *Asplenium bulbiferum* (a small, thick-leaved endemic form which might perhaps be referred to *A. flaccidum*), *Hypolepis millefolium*, *Pratia arenaria*, *Luzula crinita*, *Epilobium linnaeoides*, *E. alsinoides* (hitherto so referred, but most likely some other species), *Stellaria decipiens* var. *angustata*, *Lycopodium fastigiatum*, *L. varium* var. *polaris*, *Helichrysum bellidioides*, *Coprosma repens*, *C. cuneata* (very stunted plants), the filmy fern *Hymenophyllum multifidum* forming large mats upon the ground, and growing in company with the liverwort *Tylimanthus homomallus* (?) and certain mosses, frequently burying its curled-up fronds amongst their leaves. Lichens are an especial feature of this formation; the following are common: *Sticta Freycinetii*, *S. orygmaea*, *S. filicina*, *Cladonia aggregata*, *C. verticillata*, *C. pycnoclada*, *C. gracilis* var. *campbelliana*, *Stereocaulon argodes*, and *Usnea articulata*. Liverworts and a few mosses are abundant on the surface of the ground—*e.g.*, *Pallavicinia connivens*, *Lepidolaena Menziesii*, *Lophocolea pallida*, *Metzgeria glaberrima*, *Tylimanthus homomallus*, and *Leptostomum inclinans*.

The flat meadow is not one unbroken formation, but all over its surface are small bogs, more or less circular in outline.

The upper slopes of the island are covered with immense tussocks of *Poa litorosa* and *Polystichum vestitum*, as elsewhere; but where the shelter is greater the following distinct combination enters in, which may be called the *Coprosma-Stilbocarpa* association. This, as just stated, occupies the more sheltered positions. *Stilbocarpa polaris*, usually quite pure, is dominant, the associated plants being *Urtica australis*, *Poa foliosa*, *Polystichum vestitum*, and *Coprosma ciliata*, this last frequently with a semi-spherical leafy crown about 1·8 m. in diameter, the ultimate twigs close together

and quite leafy. The different greens of the *Stilbocarpa*, nettle, fern, and grass offer considerable contrast.

On ground which has been manured by the giant petrel (*Ossifraga gigantea*) grows the remarkable *Senecio antipodus*, a plant peculiar to the Antipodes Group, and not related to any New Zealand species. It is an erect, branching, perennial herb with a thick main stem, rather large, irregularly pinnatifid, green, membranous leaves, furnished with a prominent midrib, and tomentose with loose cobwebby hairs on the under-surface. The flowers are yellow, and not showy, and the rayless heads are in terminal corymbs.

(iii.) *Scrub.*

This occurs in the sheltered gullies, but the patches are quite small and narrow. It attains a height of 1·5 m. or thereabouts—*i.e.*, it is at best but little taller than the tussock. It consists of *Coprosma ciliata* and *C. cuneata*, the plants having slender thin main stems and flat crowns of very dense leafy twigs. On the ground is a little *Epilobium linnaeoides* and *Lagenophora pumila*, and on the stems are a few mosses and lichens. It is quite probable that there are other species of shrubs on the island, since this formation has only been most hurriedly examined both by Kirk and myself.*

(iv.) *Bog.*

The bog is perhaps the most interesting formation on Antipodes Island, since it shows clearly the selective power of water-saturated ground, *the choice of plants having, of course, been limited to the small flora of the island.* Even in winter these bogs have a physiognomy distinct from the meadow, and in summer this is much intensified. They consist of slight circular depressions in the flat meadow, the soil so wet that water can be wrung out of it, while in places there may be actual shallow pools.

The great pale-green leaves and tall erect flowering-stem of *Pleurophyllum criniferum* and the rather broad, grasslike leaves of *Carex ternaria*, this latter the dominant plant, clearly mark off bog from meadow. The tussock-grass is almost or quite wanting, while *Aciphylla antipoda*, *Stilbocarpa polaris*, *Coprosma repens*, and *C. cuneata* are much more abundant than on the adjacent formation. The filmy fern *Hymenophyllum multifidum* and *Coprosma repens* form close patches, but not mixed with one another. Other plants of the formation are *Luzula crinita*, *Gentiana antipoda*, and *Uncinia riparia* var. *Hookeri*. The frondose liverwort *Marchantia cephaloscypha* forms flat green patches on the bare wet peat.

(v.) *Swamp.*

Swampy ground is distinguished, as on the Aucklands, by the great size of *Poa litorosa*. Where the soil is wettest there is much *Carex appressa*, also of the trunked-tussock habit. In the most extensive swamps *Polystichum vestitum* is abundant, and gives a special character, its leaves showing black at a distance. Such swamps much impede progress, the close-growing fern being difficult to penetrate.

* Since the above was written, Mr. B. C. Aston, F.C.S., a member of the expedition, has visited Antipodes Island and collected a few plants previously unrecorded, for which see the memoirs of Petrie and Cheeseman in this volume.

(vi.) *Inland Rocks.*

The lichen *Stereocaulon ramulosum* is abundant and luxuriant on rock-faces, *Aciphylla antipoda*, *Lycopodium fastigiatum*, *Hymenophyllum multifidum*, and other meadow plants being also met with.

(E.) MACQUARIE ISLAND.

From the writings of Scott and Hamilton a good deal can be learnt as to the vegetation of Macquarie Island. On sea-cliffs, where they must frequently be drenched with salt water, are cushions of *Colobanthus muscoides* (Hamilton, Trans. N.Z. Inst., vol. xxvii, p. 566). There, too, will be *Crassula moschata*. *Cotula plumosa* occurs in plenty along the shore, and probably on the cliffs, where also in places is a luxuriant growth of *Stilbocarpa polaris*.

Where the ground is flat, between the slopes of the hills and the shore, are swamps with a close growth of *Poa foliosa* on tall trunks, "around which is usually a muddy pool, more or less deep, into every one of which you plunge with unerring certainty when trying to cross the belt of tussock swamp, the only way to avoid this unpleasantness being to jump from the top of one tussock to another" (Hamilton, *loc. cit.*, p. 564). Where there is wet ground near the sea not occupied exclusively by tussock are *Cardamine corymbosa*, *Montia fontana*, and *Callitriche antarctica*.

The slopes of the hills are occupied by a close growth of *Poa foliosa* tussock, *Stilbocarpa*, and the silvery rosettes of *Pleurophyllum Hookeri*. Here, too, will be *Acaena adscendens** and the other species recorded, which is probably *A. Sanguisorbae* var. *antarctica*. According to Scott (Trans. N.Z. Inst., vol. xv, p. 486), this formation occupies a considerable area, and is characterized by long stretches of yellowish tussock, with occasional great patches of the bright-green *Stilbocarpa polaris*, or of the peculiar sage-green *Pleurophyllum*.

So far the physiognomy of the vegetation is distinctly that of the New Zealand subantarctic islands in general, but on the exposed hill-tops all is changed; the wind here has the mastery, and the formation is allied to the wind-desert (Schenck, "Pflanzengeographie der subantarctischen Inseln," p. 39) of Kerguelen Land. Here is Hamilton's vivid description: "At about 300 ft. you gain a plateau so swept by the antarctic gales that vegetation is reduced to compact closely growing mosses, small *Uncinias*, and the conspicuous cushion-like masses of *Azorella Selago*. In the hollows of the uplands are countless little tarns or lakes, some of considerable extent. Round the tops of the hills the wind has cut out wonderful terraces from a few inches to a foot or two in height, with completely bare rock, much disintegrated by the weather on the top. In some of the more sheltered places or gullies stunted plants of *Stilbocarpa* and *Pleurophyllum* cover the ground" (Trans. N.Z. Inst., vol. xxvii, p. 564).

* I pointed out in my "Botanical Excursion," p. 319, that this was distinct from the New Zealand species hitherto called by the same name. Specimens of the Kerguelen Land plant kindly given me by Professor Dr. H. Schenck strongly support this view. The New Zealand plant, then, requires another name.

6. Introduced Plants.

Non-indigenous plants are naturalised only near the depots, or where settlement of some sort has taken place. In the Auckland Group the neighbourhood of the former Enderby Settlement is their headquarters. Near the depots or boat-sheds at Norman's Inlet and Carnley Harbour the naturalised plants are fewer. The following is a list, but probably there are a few more unnoted: *Poa annua, P. pratensis, Dactylis glomerata, Holcus lanatus, Avena fatua, Agrostis alba, Phormium tenax, Rumex acetosella, Cerastium triviale, C. glomeratum, Stellaria media, Sagina procumbens, Ranunculus repens, Brassica oleracea, Acaena Sanguisorbae, Fragaria chiloensis, Trifolium repens, Ulex europaeus, Mentha piperita, Bellis perennis, Sonchus oleraceus.*

Only one or two of the above call for any comment. *Phormium tenax,** according to information given to me by Mr. Walter Joss, of the Neck, Stewart Island, was introduced by the sealers in order to furnish them with footwear suitable for walking on the slippery rocks when sealing. Mr. Joss remembers the time when there were only three plants of this species near the Port Ross depot, but now the rejuvenating forest, cut down during the days of the Enderby Settlement, is invaded, and the plant is evidently slowly increasing. It will be interesting to note the future increase of this common New Zealand plant, and to see if it can, unaided, gain a footing in the actual virgin vegetation.

Bellis perennis has become extremely abundant on the flat open ground of Enderby Island near the boat-shed, and the plants exhibit surprising luxuriance.

Brassica oleracea will be an escape from the cultivated plants of the Enderby Settlement.

I have included *Acaena Sanguisorbae* amongst the naturalised plants, since it does not appear to occur in the virgin vegetation.

Finally, *so far as the primitive formations are concerned, there are no introduced plants of any kind whatsoever.*

7. Reproduction of the Plant-covering after Fire.

On the Auckland Islands fires have been set alight from time to time. Hooker records how, near the observatory established by Ross's expedition, the forest was set on fire, and the whole country "appeared in a blaze of fire at night" ("Flora Antarctica," p. 151). The following are a few notes taken where fire† had quite destroyed the vegetation: On Adams Island, at about 100 m. altitude, where the scrub or scrubby forest had been burned—"Here are plants of *Cassinia Vauvilliersii, Coprosma foetidissima, C. cuneata, Dracophyllum longifolium* (in abundance). *C. foetidissima* is the tallest, making spreading bushes 60 cm. tall and as much through. Also some *Styphelia empetrifolia* and *Suttonia divaricata.*" . . . "In other parts of the 'burn' are some of the herbaceous plants, especially *Gentiana concinna, Caladenia bifolia, Oreobolus pectinatus,* and an abundance of the shrub *Styphelia empetrifolia.*" Where tussock had been burned at the North Arm of Carnley Harbour—"*Dracophyllum longifolium* easily dominant; also, *Coprosma repens, Styphelia empetrifolia, Suttonia divaricata, Danthonia antarctica, Coprosma foetidissima, C. cuneata.*"

* This is also naturalised in Campbell Island.

† This refers to burning by the shepherds at the time when sheep were put on to the southern end of the Auckland Group.

8. Effect of Animals upon the Vegetation.

(A.) SEALS.

Before the coming of the white man, seals were extremely numerous. The fur-seal (*Arctocephalus forsteri*), which is now almost extinct except on the Bounty Islands, existed in enormous numbers; but, as its home was on exposed rocks, it would have little effect on the vegetation. The hair-seal (*Arctocephalus hookeri*), on the contrary, is abundant even yet in the sheltered harbours, and may be frequently met with at 50 m. or more inland, within the forests or the meadows, which it reaches by means of well-beaten tracks. It is easy to see that where these animals are numerous the undergrowth of the forest may be destroyed, as is the case on Ewing Island, or the great herbaceous plants of a *Pleurophyllum* meadow flattened to the ground. They frequently lie amongst the *Poa foliosa* tussocks, which latter will undoubtedly benefit from the manure thus received. On Enderby Island the hair-seals may in some small degree disturb the equilibrium of the dunes. According to Hamilton, sea-elephants on Macquarie Island wallow amongst the tussocks near the sea-beach.

(B.) BIRDS.*

Sea-birds play a very important part with regard to the vegetation of certain parts of the islands. One class, the petrels, honeycomb the soft peat with their nesting-burrows, and thus assist considerably in draining its surface. Also, the whole of the birds—and these are in their millions, if the whole area be considered—supply immense quantities of manure, not a product of the vegetation itself, but a distinct addition to the soil. This fertilising, together with that from the seals noted above, doubtless much favours the luxuriant growth of *Poa foliosa*, which is such a marked characteristic of the shore vegetation. On the Snares all the streams are veritable liquid manure—a fact which speaks volumes as to the fertilising action of the birds on a peaty soil, whose abundant nitrogen cannot be utilised by the plants. Excessive manuring may, indeed, lead to the presence of some special plant, as *Senecio antipodus* of Antipodes Island and *Cotula Featherstonii* of the Chathams.

But the chief effect of the birds, where they are present in vast numbers, is the complete or partial destruction of the vegetation. On the Bounty Islands, beyond a green alga on some of the rocks, there is no visible plant-life, the islands being packed in the breeding season with millions of penguins and large numbers of molly-mawks.

It is on the Snares especially that the effect of the penguins may be studied. These colonies of birds, varying in numbers from a dozen or two to many thousands crowded together in one place (fig. 17), exercise a profound influence upon the vegetation. Not merely are the rookeries situated near the shore, but also within the *Olearia Lyallii* forest and on the tussock meadows all over the island. Where a rookery has existed for some time the ground is devoid of visible plant-life, becoming a mass of mud and filth within an encircling wall of tussocks. Rookeries at all stages of development may be seen, from those in which the tussocks are being flattened down to those of bare ground as just described. Ultimately these

* Ostenfeld ("The Land-vegetation of the Faeröes," p. 894, 1908) gives some interesting details regarding the effect of sea-birds, especially how certain species determine the presence of special plants.

latter are abandoned, and new ground is ready for plant-colonisation. This is evidently a fairly rapid process. The first plant to settle down on the wet and heavily manured ground, with its guano, feathers, and rotted birds and eggs, is the succulent-leaved *Crassula moschata*,* which soon may form great patches 3 m. or 4 m. across. Where the ground is wet and strongly manured this plant grows with an astonishing luxuriance. Occasionally there may be a cushion or two of the coastal-rock plant *Colobanthus muscoides*.† Then, as the manure becomes less powerful,

FIG. 17.—PENGUIN ROOKERY ON THE SNARES KILLING THE VEGETATION.
Tussock meadow in front, *Olearia Lyallii* forest in background.

the grass *Poa foliosa* gains a footing, and in course of time there is once more a meadow.

If the enormous number of penguins be taken into consideration, there can be little doubt that through their agency the plant-covering of the Snares has been

* Normally a halophyte.

† This is an excellent example of a plant apparently limited to and specially adapted for an abnormal station being able to establish itself under absolutely different circumstances, which, also abnormal, and severe in a quite different direction, at first forbid the presence of other plants, but which latter, arriving as the conditions become normal, quickly oust the plant in question, not because its life-form is unsuitable, but because the new-comers are more in harmony with the environment, and yet have not nearly the capability for enduring extremes as the plant which they replace.

destroyed again and again, always to quickly reinstate itself. Even the forest can have no chance of renewal when once the old trees die, so long as the birds are present.

On certain of the islands albatroses or mollymawks are extremely abundant. I had especial opportunity of noting their effect on the vegetation of Disappointment and Antipodes Islands, but it may well be concluded that on all islands where extensive bird-colonies exist analogous results must follow.

Disappointment Island, as has been seen, is closely covered with a brown tussock meadow, or else a formation of the large-leaved herbs similar to Fairchild's Garden, but with fewer members. Also in many places are areas, large or small, of a vivid green. The tussock meadow is dotted at a certain season of the year for acre upon acre with the nesting mollymawks, which, when seen from the sea, look like innumerable great white flowers amongst the brown tussocks. Each of these birds sits on its cheese-shaped nest hatching the egg during November and part of December. Finally, the chick, fed for many months by the parent bird, remaining all this long time upon the nest, leaves it at last, and, walking for some weeks longer in a narrow circle round the nest, quite kills out the vegetation. Thus in course of time, on this island, on the Antipodes, and elsewhere where albatroses are numerous, arise many bare patches, and these, as there is no longer shelter for the birds, are abandoned, a piece of untouched tussock meadow being invaded by the birds and the bare ground being available for reoccupation by plants. Various stages of such new settlements may be seen, and every phase is present, from quite bare ground to rejuvenated tussock meadow. In all probability, owing to the smallness of the island and the immense number of birds, a constant change must be going on, and the whole of the vegetation has been destroyed and reconstructed again and again.

The first plant to appear is *Acaena Sanguisorbae* var. *antarctica*, which forms sheets over the ground and gives the distinguishing pale-green colour noted above. Then there will soon be abundance of a species of gentian, its spreading stems making a glossy dark-green mat. Here and there will be small plants of the dark-green *Blechnum durum*, small straggling *Veronica Benthami*, small mats of bright but rather pale-green *Epilobium confertifolium*, a few dark-green plants of *Polystichum vestitum*, and, growing through the mats of *Acaena*, a little *Bulbinella Rossii*, and perhaps some *Stilbocarpa polaris* here and there. *But easily dominant, and at a distance the sole plant apparently, is the Acaena.* Ultimately, such a piece of regenerated vegetation as described above, and which represents quite a late stage, will be in process of occupation by tussocks of *Poa litorosa*, which it is easy to see will, as they grow up, destroy, or at any rate thin out, the present plants; but the *Acaena* will finally, liane-like, in many cases climb over the tussock, gain the light, and preserve itself from destruction, a proceeding most common, too, on Antipodes Island.

This regeneration of the meadow—a quite natural process depending upon the presence of the sea-birds—is especially interesting, in that the *Acaena*—a plant of limited distribution in the original formation, where it is altogether kept in check—becomes at once what is virtually a "weed" upon new ground being prepared; in other words, *we have in this wild plant a potential weed* (see Cockayne, "New Zealand Indigenous Plants as Weeds"; Journ. Canterbury A. and P. Assoc., vol. vii, p. 115; 1905).

On Antipodes Island I noted no such wholesale changes in progress as on the Snares and Disappointment Island, nevertheless brief mention of the effect of sea-birds must be made. Old nests of albatroses are about 39 cm. in diameter and 23 cm. in height. Growing on the nest itself may be *Stellaria decipiens* var. *angustata* and *Luzula crinita*, while on the ground may be *Acaena Sanguisorbae* var. *antarctica* and the *Stellaria*, these two latter being always the first plants to put in an appearance. The young albatroses have much to do with spreading the *Acaena*, since its fruits, according to Chapman (Trans. N.Z. Inst., vol. xxiii, p. 516), are attached in quantity to their breasts, and they do not fly from the nesting-place, but walk over the meadows, &c., to the sea.

As for the part played by insects, as said before, no observations as to their visiting the flowers have been made as yet, nor is anything known as to the insects of the summer and autumn.

(C.) INTRODUCED ANIMALS.

As to the dates of the introduction of various animals, I must refer the reader to my former paper (" Botanical Excursion," pp. 300–302).* So far as my observations go regarding Auckland Island and Adams Island, the sheep and pigs do not appear to have brought about any appreciable change. Mr. Tennant, who alone of the botanists of the expedition visited the hills in the south of Auckland Island, where Hooker had originally made his famous collections, reports that the pigs have worked much havoc since Hooker's time, and that the vegetation is not so luxuriant as in the south of the island, the plants being more or less eradicated where the pigs have access.

On Enderby Island the cattle have also brought about a good deal of change, especially not far from the depot. The effect of sheep-farming on Campbell Island was dealt with in my former paper, and further very interesting details are given by Mr. Laing in his memoir in this volume.

* In addition to the cases noted in the " Botanical Excursion," some hundreds of sheep were placed on the southern part of Auckland Island a few years ago, but almost all appear to have died.

ARTICLE XI.—REPORT ON THE POLYCHAETA OF THE SUB-ANTARCTIC ISLANDS OF NEW ZEALAND.

By W. B. Benham, D.Sc., F.R.S., University of Otago.

PLATE IX.

The collection of marine annelids is a small one, and must not be taken as indicating any poverty in this group of animals, for during my stay at the Auckland Islands I paid special attention to the terrestrial annelids and other invertebrates, and only collected very casually on the sea-shore. I saw many species, such as Serpulids, which I neglected to gather: these can be easily obtained by future naturalists during any brief stay at the locality.

The general facies of the annelid fauna is, if one may judge from the few representatives herein recorded, similar to that of the shores of New Zealand, of which Ehlers (2, p. 4) writes, "The general facies of the [New Zealand] fauna must clearly be termed 'Pacific-notial'; and thus serves as a link with the west coast of South America on the one hand, and with the southern extremity of Africa on the other. Whether, and how far, a notial marine area of the Pacific can be separated from that of the Atlantic is not yet apparent." Possibly, when the results of the recent Antarctic expeditions have been worked out more light will be shed on this problem.

In his memoirs on the annelids of New Zealand, Ehlers has pointed out that many of our commonest *Polychaeta* are identical with those of the Magellan Strait, Fuegia, and Chili; some, like *Nereis australis* and *Arenicola assimilis* var. *affinis*, are found also at Kerguelen and the Falkland Islands, and thus repeat in their distribution that of *Notiodrilus* amongst the earthworms. Others, like *Syllis closterobranchia* and *Thelepus plagiostoma*, occur on the African coast. A few are very widely distributed, as *Arabella iricolor*, and *Onuphis tubicola*, both of which are inhabitants of the British seas; while *Polydora polybranchia*, originally described from Port Jackson, though chiefly antarctic, has been found in the Mediterranean and the Strait of Dover.

Only two of the species in this collection are endemic to New Zealand, *Lepidasthenia comma* and *Timarete anchylochaeta* (the latter of which, however, if the synonymy is correct, was found at Port Jackson by Kinberg).

Perhaps the most interesting result of my study is the identification of our common *Nereis*, named by Schmarda *N. australis*, with the South American *N. magalhaensis*; while the discovery of a species of the peculiar Nereid genus *Lycastis* in our area adds a new genus to our fauna and another common link with South America.

No doubt the laws governing the distribution of marine and terrestrial annelids are very different. Most, if not all, of the polychaets give origin to a pelagic larva, which will be affected by the "West-wind Trift," and so spread round the antarctic seas; yet certain resting-places would be necessary, one would imagine, for the completion of their development.

How long can a pelagic larva live before it undergoes metamorphosis? Can it withstand for any period of time the buffeting of the tempestuous southern seas, or escape for long the attacks of fishes and other enemies during its floating existence on the surface of the sea? When answers to these questions are available we shall be better able to utilise these annelids in any discussion on the previous existence of an Antarctic continent.

I have not thought it necessary to give a detailed account of the species, for the majority have been fully described and figured by Ehlers in the two contributions on "Neuseelandische Anneliden" published in 1904 and 1907; and to any one studying this group of animals these memoirs are indispensable. I have confined myself, therefore, to measurements and details of coloration, with a note on the habitat, and so on.

For the same reason, I have not in all cases given an absolutely complete synonymy or bibliography, but have included all that is essential for identification and reference.

Fam. APHRODITIDAE.

Lepidasthenia, Malmgren, 1867.

Lepidasthenia comma, Thomson.

1901. *Polynoe comma*, Thomson, Trans. N.Z. Inst., xxxiv, p. 241. 1907. *Lepidasthenia comma*, Ehlers, Neuseel. Annel., ii, p. 6.

This long, narrow, scale-covered worm measures 73 mm. in length by 4·5 mm. over the body and 8·5 mm. across the parapodia, with 84 segments. The elytra cover the dorsal surface of the body completely in the present specimen; they are grey, darker at the mediad margins, fading towards the outer, with scattered darker spots; the anterior ones are suffused with russet near the mediad margin.

The species has only been found in the tubes of Terebellids; in this case *Thelepus plagiostoma* was its protector.

Locality. — Auckland Island: shore of Masked Island, Carnley Harbour; (W. B. B.).

Distribution.—The species is confined to New Zealand shores.

Fam. SYLLIDAE.

Syllis (Savigny, 1809), emend. Ehlers.

Syllis closterobranchia, Schmarda.

1861. *S. closterobranchia*, Schmarda, "Neue Wirbellose Thiere," I, ii, p. 72. 1904. *S. closterobranchia*, Ehlers, Neuseel. Annel., p. 19, pl. iii, figs. 1–4.

This small worm was found under stones, amongst the tubes of *Nereis australis*. The dorsal surface of the body is now a pale yellowish-brown anteriorly,

fading to white further back; the tentacles and cirri are white. The hinder segments are longer than those in front, owing to the contained eggs, which distend the body.

Length, 15 mm.; breadth, 1 mm.; with 85 segments.

Ehlers states that the dorsal cirri are somewhat spindle-shaped in the individuals examined by him, owing to 2 or 3 joints in the middle being wider than the rest. I do not detect this in the specimen at my disposal; the joints are widest at the base of the cirri, and the organ tapers slightly, and is composed of some 13–15 annuli.

In the parapodia the 6 or 8 chaetae are all alike in form, but the appendix of the upper ones is twice the length of that of the lower ones, and there is a gradual decrease in its length from above downwards; this is true not only for the posterior but for the anterior feet.

In view of Ehlers' remarks on the variability of the length of the appendix in different specimens from Christchurch and from Chatham Island and from the Cape of Good Hope this seems worthy of mention.

Locality.—Campbell Island: Perseverance Harbour; (T. J. Parker, 1895). Antipodes Island; (L. Cockayne, 1903).

Distribution.—New Zealand and Chatham Island; Cape of Good Hope.

Fam. LYCORIDAE.

Nereis, Cuvier, 1817.

Nereis australis, Schmarda.

1861. *Heteronereis australis*, Schmarda, N.W.T., I, ii, p. 101, pl. xxxi, fig. 242. 1865. *Platynereis magalhaensis*, Kinberg, Annulata nova. Ovfers., K. Vet. Akad. Forhand, No. 2, p. 177. 1865. *P. antarctica*, Kinberg, *loc. cit.* 1865. *P. patagonica*, Kinberg, *loc. cit.* 1876. *Nereis eatoni*, McIntosh, Ann. Mag. Nat. Hist., xvii, p. 320. 1879. *N. eatoni*, McIntosh, Phil. Trans. (extra vol.), clxviii, p. 260, pl. xv, figs. 10–12. 1885. *N. eatoni*, McIntosh, "Challenger" Rep., xii, p. 223, pl. xxxv, figs. 5, 6. 1897. *N. magalhaensis*, Ehlers, Polychaeten Hamburg. Magalhaens. Sammelreise, p. 64, pl. v, figs. 106, 107. 1901. *N. magalhaensis*, Ehlers, Die Polychaeten magel. u. chilen. Strandes, p. 104. 1904. *N. australis*, Ehlers, Neuseel. Annel., p. 26, pl. iii, figs. 16–20; pl. iv, figs. 1, 2. 1907. *N. australis*, Ehlers, Neuseel. Annel., ii, p. 11.

A single specimen of a large Nereid was forwarded to me by Professor H. B. Kirk, who collected it on the shore of Perseverance Harbour, where it occupied "a tube of sand on the underside of a stone at low-water mark." The colour is thus noted on the label: "Dorsal vessel deep red; notopodia and neuropodia pink; general effect red, with iridescence in which purple predominates."

The animal is preserved in formol, and now is of a dull fleshy brown; the anterior end has a greenish tint, and the median line is dark. There are dark-grey-coloured glands at the bases of the parapodia, which become much pronounced towards the hinder end of the worm.

The length of the worm is 200 mm.; diameter of the body at about one-quarter of its length, 5·5 mm.; and over the parapodia, 9 mm. There are 150 segments.

The extenal anatomy and form of the chaetae agree precisely with Ehlers' account (1904) of this species. The pharynx, however, has the structure described by McIntosh for *N. eatoni*. In the maxillary ring, as seen when the organ is slit up along the ventral mid-line and spread out (Plate IX, fig. 1), there is, on the right and left, a more or less triangular patch of quite small paragnaths, apex forwards; this consists of 6 or 7 transverse rows of minute denticles, very closely set, so that each row almost appears as a continuous line. The most anterior line is short, but the lines gradually increase in length till the 7th, which is situated just behind the spot from which the jaw protrudes. Behind this are 3 pairs of short lines, the outer ends, as it were, of long lines which are imperfect in the middle. The extent of the imperfection increases, so that the short lines decrease in length backwards. This triangular patch occupies area IV; areas I and II are naked; but in the median ventral area (III) are 4 or 5 transverse lines of still smaller denticles, each line being interrupted at two points by two furrows traversing the area longitudinally.

In the buccal ring the dorsal area (V) is naked; it is limited on either side by a prominent rounded ridge (VI), on which is a small patch of 3 or 4 imperfect lines of much smaller denticles than those in IV. On the ventral surface, which is divided by several furrows lengthwise, there are 5 little groups of minute denticles; the 3 central groups (probably belonging to area VII) consists of 3 lines, the hinder line being imperfect; while the lateral group on each side (part of VIII, right and left) present only a single line.

All these denticles are very small, pale brown in colour, and, with the exceptions of III and IV, require a magnification of 16 diameters for their clear study.

Localities.—Campbell Island; (T. J. Parker, 1895; H. B. Kirk, 1907). Auckland Island; 2 fathoms: Carnley Harbour; (W. B. B., 1907). Macquarie Island; (A. Hamilton, 1894).

Distribution.—Shores of the North and South Islands of New Zealand; also Magellan Strait, south coast of Chili, Falkland Islands, Kerguelen, Marion Island, and Fernandho Noronha.

Remarks.—The only member of the genus *Nereis* found on our shores which exhibits the habit of forming a tube such as that described above is one that has been identified by Ehlers from specimens sent to him by Mr. Suter, and later by myself, collected at several stations, as *N. australis*, Schmarda. Ehlers, from a comparison of our specimens with Schmarda's type, was able to add considerably to the short account of the epitokous condition given by Schmarda, and for the first time to describe and illustrate the structure of the atokous phase.

This Campbell Island individual exceeds considerably the dimensions of the specimens sent to Ehlers; but it agrees precisely with the descriptions of *N. magalhaensis*, Kinberg, so far as McIntosh's account of *N. eatoni* allow me to judge, not only in the dentition, but in all the other features referred to by him, and Ehlers recognises this species as synonymous with Kinberg's. I therefore proceeded to look through my stock of *australis*, for in my MS. account of the worms which I had

prepared before communicating them to Ehlers I had identified them with Kinberg's species from the similarity in dental formula.

I have examined a considerable number of this common tube-forming species, of different sizes, from different localities, and amongst them duplicates of those forwarded to Ehlers, and without exception I find that they all present the group of denticles in area III of the maxillary region of the pharynx, although in poorly preserved specimens, where the cuticle is loosened from the epidermis, and in some individuals where the colour of denticles is very faint, they may easily be overlooked unless one is on the look-out for them and a suitable magnification is used for their study.

So far as the dentition is concerned, *N. australis* is said to differ from *N. magalhaensis*, according to the description of the former by Ehlers, in having *no denticles* in this area III. I thus had my suspicions aroused as to the distinction of these two species, and carefully compared the accounts of the anatomy given by McIntosh and Ehlers respectively, and I can detect no other differences in these accounts than the one relating to the dentition.

The relative lengths of the peristomial cirri are, to some degree, a specific difference in *Nereis;* and, as McIntosh says of his Kerguelen specimen that the longest cirrus, which is the posterior superior cirrus, reaches to the 14th foot, while Ehlers in his account of *N. australis* gives the 9th foot as the length, I thought that possibly this feature might serve to distinguish them. I therefore paid attention to this character, and have come to the conclusion, founded on the figures detailed below, that there is a great range of variation in this character, not due to difference of species, nor only, if at all, to different methods of preservation, nor to locality, nor depending on the length or breadth of the body. All one can say is that the two upper peristomial cirri are much longer than the two lower ones, and that the superior is the longest.

Other specific characters depend on the structure of the parapodia, their condition in different regions of the body, and the microscopic details presented by the chaetae; but in all these points the New Zealand worms agree precisely with McIntosh's account of *N. eatoni* (that is, *N. magalhaensis*) and with Ehlers' account of *N. australis*. I conclude, therefore, that the two species are identical.

It is curious to note that both McIntosh, for *N. eatoni*, and Ehlers, in his account of *N. magalhaensis*, compare and contrast the species described with the European *N. dumerilii;* yet Ehlers, when discussing the differences between *N. australis* on the one hand, and *N. dumerilii* and *N. agassizi* on the other, makes no mention of any similarity to *N. magalhaensis*, nor suggests in any way that Kinberg's species is synonymous with Schmarda's.

I give below a series of measurements of a number of specimens, to illustrate the range in dimensions and the relative lengths of the peristomial cirri. The length of body varies from 200 mm. (which appears exceptional, and partly due to careful preservation in formol) to 40 mm.; the number of segments from 150 to 62; the diameter of body from 5·5 mm. to 3 mm. Of the score or so measured, the majority are 60–65 mm. in length, which may be regarded as the average, with 95–120 segments.

Measurements of N. australis (*in millimetres*).

	Locality.	Length.	Diameter of Body.	Diameter across Parapodia.	Number of Segments.
A	Campbell Island	200	5·5	9	150
B	Magellan Strait*	110	..	..	127
C	Campbell Island	95	5·5	8	125 (?)
D	Magellan Strait*	89	..	..	114
E	Moeraki..	85	..	6	120
F	Port Chalmers	80	4	6·5	120
G	Otago Harbour†	75	..	6	(?)
H	Campbell Island	65	4·5	6	125
I	„	65	4·5	6	115
J	Kaipara, North Island, N.Z.†	65	3	5	95 (?)
K	Auckland Island	62	..	4·5	100
L	Blueskin Bay, Otago† ..	60	4	5·5	120
M	Campbell Island	60	5	6·5	84 (?)
N	Otago Harbour†	60	..	4	..
O	Dunedin	60	3	5	95
P	Blueskin Bay†	50	3	5·5	95
Q	Sumner‡	47	..	..	104
R	Port Chalmers	43	3	4	118
S	Macquarie Island ..	40	..	4·5	62

C, J, and M are imperfect.

Length of Peristomial Cirri and Breadth over Parapodia.

	Breadth, in Millimetres.	Foot to which the Longest Cirrus extends.		Breadth, in Millimetres.	Foot to which the Longest Cirrus extends.
A ..	9	7th	L ..	5·5	11th
C ..	8	8th	U§ ..	5	8th
T ..	6·5	6th	V§ ..	4·5	7th
M ..	6·5	8th	N ..	4	7th
I ..	6	6th	W‖ ..	4	7th
H ..	6	4th	X‖ ..	4	8th
G ..	6	11th	Y‖ ..	4	12th
P ..	6	10th	R ..	4	16th¶

* Described by Ehlers as *N. magalhaensis* (*loc. cit. supra*, 1897).
† Duplicates of the specimens sent to Ehlers, and identified by him as *N. australis* (1907).
‡ Sent by Mr. Suter to Ehlers, who described it as *N. australis* (*loc. cit.*, 1904).
§ Otago Harbour. Duplicates sent to Ehlers, and recorded as *N. australis*.
‖ Blueskin Bay. Duplicates sent to Ehlers, and recorded as *N. australis*.
¶ This is very exceptional.

Length of Body and of Peristomial Cirrus.

	Length, in Millimetres.	Foot to which the Longest Cirrus extends.		Length, in Millimetres.	Foot to which the Longest Cirrus extends.
A ..	200	7th	L ..	60	11th
C ..	95	3rd	P ..	50	10th
G ..	75	11th	Q ..	47	9th
N ..	60	7th	R ..	43	16th

It will be seen that there is no apparent relation between the longest peristomial cirrus and either the length of body or the diameter across the parapodia. The latter measurement was taken at about one-quarter of the body-length. The cirri were pressed gently back (not stretched), and the body kept horizontal.

Unfortunately, McIntosh does not give measurements of either of his specimens of *N. eatoni*, and Ehlers, though noting the length, does not state the breadth of the specimens of *N. australis* nor of *N. magalhaensis*.

Lycastis (Sav.), Audouin and Milne-Edwards, 1833.

Lycastis quadraticeps, Gay. (Plate IX, figs. 2–10.)

1849. *Lycastis quadraticeps*, Gay, Historia fisica y politica de Chile, Zool., iii, p. 25; Atlas Annelid, pl. 1, fig. 7. 1901. *L. quadraticeps*, Ehlers, Polychaeten magel. u. chilen. Strandes, p. 121.

It is with some degree of doubt that I refer the specimens described below to this species.

With regard to the author of the specific name, I have followed Ehlers (1) and Johnson (4), both of whom write "Gay" after it; but St. Joseph, when comparing his species *L. senegalensis* with *L. quadraticeps* (1901, Ann. Sci. Nat., Zool. (8), xiii, p. 222) gives "Blanchard in Gay's Historia" as the author, as also did Ehlers in his "Die Borstenwurmer" (1868), while Quatrefages (Hist. Nat., i, p. 200) writes "Blainville," without any mention of Gay whatever. The literature at my disposal is insufficient to enable me to explain this discrepancy.

The species, originally discovered in 1849, was rediscovered by Michaelsen during the Hamburg Expedition, and mentioned, but unfortunately not redescribed, by Ehlers in his memoir on the Magellan Polychaetes.

As I have not access to Gay's work, my thanks are due to Mr. A. R. McCulloch, of the Australian Museum, Sydney, for kindly making tracings of the figures in Gay's "Historia." These figures would not enable one to identify the species, so that I am not certain that my identification is correct; but an outline figure given by Johnson (5) agrees well with my specimens both in general proportional size of the head and peristomial cirri, in the relative size of the parapodia, and in the existence of the funnel-shaped pygidium.

The two lots of individuals in my collection are in different conditions of preservation, and give rather different figures when measured. Those in strong alcohol

(Marriner) are smaller and contracted; while those in weaker spirit (Benham), being softer, are longer and broader. The former are from 20 mm. to 35 mm. in length, the latter reach 42 mm. The diameter is 2 mm., and the number of segments is from 70 mm. to 80 mm. This agrees pretty well with the dimensions of *L. quadraticeps* given by Quatrefages (*loc. cit.*).

The colour in spirit is dead-white, without any markings, though the dark-brown chaetae projecting from the parapodia are particularly conspicuous.

The following account is founded on an examination of one of Marriner's well-preserved specimens:—

The dorsal surface of the body is much arched, the ventral nearly flat; the parapodia spring from the angle formed by the junction of the two surfaces, and project laterally in a somewhat downward direction. They are about the same size throug out the worm, but diminish slightly towards the hinder end.

The breadth of the segments is about four times their length, and the parapodium is about one-eighth of this breadth when the body is viewed in a flattened state; but as seen in section only one-third, for the base is overlapped by a fold of the body-roof.

The prostomium is almost quadrate in outline (Plate IX, fig. 2); the anterior margin is nearly straight; the two sides slope outwards and backwards, so that the posterior margin is about twice the width of the anterior.* The two eyes of each side are close together, and the area on which they lie is extended outwards; the eyes are without lenses; the anterior is the larger, and placed somewhat more laterally than the posterior. The upper face of the prostomium is traversed by a broad, shallow, longitudinal groove.

The tentacles are very small, no longer than the terminal joint of the palp, conical in form, and widely separated, springing from the rounded corners of the prostomium. On the other hand, the palps are of great size, adherent to the sides of the prostomium, except the terminal portion, and under a low-power dissecting-lens their outline is readily mistaken for that of the prostomium itself, so that the quadrate appearance of the head is increased. So close are they on the ventral surface that they touch one another in median line. (Plate IX, fig. 3.)

The peristomium is not longer than the first chaetigerous segment; it is, indeed, somewhat shorter in these well-preserved specimens. It carries the 4 pairs of peristomial cirri characteristic of the family. These are quite short; the uppermost and longest extends slightly further outwards than the anterior feet.

The pygidium is much narrower than the preceding segment, is funnel-shaped, and bears 2 short conical cirri. (Plate IX fig 5.)

The parapodia are rounded and simple, without the ligules and prominent lips so characteristic of the Nereids. The base of the parapodium is hidden, when viewed from above, by the lateral margin of the dorsal surface of the body, which overhangs it like the eaves of a house. (Plate IX, figs. 2–8.)

The dorsal cirrus, which is shorter on the anterior feet than on those of the mid and hind body, is conical, and borne by a cylindrical peduncle. In the greater part of the body the dorsal cirri are longer than the chaetigerous lobe, but in the

* In one soft individual the prostomium is almost triangular, as the anterior end is roundly pointed.

anterior segments they scarcely reach the tip. St. Joseph has drawn attention to the fact that the chaetigerous lobe is highly retractile, so that its length, relatively to the dorsal cirrus, is variable. (*Cf.* Plate IX, figs. 6, 7.)

The ventral cirrus is quite short.

The notopodium is represented by a black aciculum with 2 very delicate colourless aristate homogomphs, in which, however, there is a very slight inequality in the height of the lips of the articular cup.

The neuropodial bundle contains the aciculum with 1 or 2 pale slender heterogomphs, with a very finely toothed "arista."* Below these are about 8 stout dark-brown falcate heterogomphs, the appendix of which is fringed with coarse blunt teeth, closely set along the whole length. (Plate IX, fig 9.)

The posterior lip of the chaetigerous lobe, which is the longer, is bluntly conical; the anterior lip is rounded.

The dorsal cirrus in the greater part of the body is well provided with blood-vessels, as described by St. Joseph (1903) and by Johnson. The vascular supply is more complex than would be gathered from these accounts. I find, in addition to the plexus of finer vessels which ramify near the surface of the cirrus, a coil of larger vessels in a cavity at the base of it; but I have not traced the matter further.

The pharynx has no paragnaths, and in this respect *Lycastis* again differs from the typical condition of *Nereis*. The jaw is dark brown in colour. The part which protrudes from the muscular wall has 4 or 5 teeth in addition to the terminal point; the imbedded part has indications of several other teeth, but they are all united by chitinous material.

Locality.—Campbell Island: Perseverance Harbour, on shore near the exit of a creek from the flank of Mount Honey; the shore above high-water mark is traversed by numerous little watercourses oozing through the earth above (W. B. B., February, 1907): also, in sea-pools; (G. Marriner, November, 1907).

Distribution.—Magellan Strait; Fuegia; Chili.

Ehlers (Polychaeten: Hamb. Magalhaens. Sammelr., 1897, p. 70) states that this species "is very euryhaline, in that it was found on the sea-floor at 7 fathoms, on the sea-shore below stones and in the sand, as well as under stones at the mouth of a stream, and in fresh-water ponds" Most of the species of *Lycastis* occur in fresh or brackish water. For an account of this habit, see Johnson (4).

Fam. EUNICIDAE.

Marphysa, Quatrefages, 1865.

Marphysa aenea, Blanchard.

1849. *Eunice aenea*, Blanchard, in Gay's Hist. fis. y polit. de Chile, Zool., iii, p. 19. 1864. *Nauphanta corallina*, Kinberg, Annulata nova. Ofvers. K. Vet. Akad., p. 564. 1865. *Marphysa peruviana*, Quatrefages, Hist. Nat. Annel., i, p. 336. 1901. *M. corallina*, Ehlers, Die Polychaeten magel. u. chilen. Strandes, p. 131, pl. xv, figs. 13–18 (gives full synonymy and

* This term is suggested by Johnson (5) for the long appendix of those chaetae called by Ehlers "gratenborsten"; and such chaetae he terms "aristate."

literature). 1904. *M. corallina*, Ehlers, Neuseel. Annel., p. 31, pl. iv, figs. 8–12. 1907. *M. aenea*, Ehlers, Neuseel. Annel, ii, p. 12.

This handsome iridescent copper-coloured Eunicid, with white tentacles and cirri, lives in a thin-walled tube below stones, and often wedged among rocks at low water.

Locality.—Auckland Island : Masked Island, Carnley Harbour ; (W. B. B.).

Distribution.—New Zealand and Chatham Island ; Chili ; Peru ; Juan Fernandez ; Honolulu.

ONUPHIS, Audouin and Milne-Edwards, 1833.

Onuphis tubicola, O. F. Müller.

1833. *Onuphis tubicola*, Aud. and M.-Edw., Ann. Sci. Nat., Zool., xxviii, p. 225. 1865. *Northia tubicola*, Johnston, Cat. Brit. Mus., Worms, p. 136. 1867. *Hyalinoecia tubicola*, Malmgren, Ann. Polych., &c., p. 67, pl. viii, fig. 49. 1885. *H. tubicola*, McIntosh, " Challenger " Rep., xii, p. 335. 1907. *Onuphis tubicola*, Ehlers, Neuseel. Annel, ii, p. 11.

The synonymy of this worm is given fully by Ehlers in his " Die Borstenwurmer," p. 297, whom I have followed in the use of the generic name.

The single individual which came into my hands has the usual transparent horn-coloured tube, incomplete at its lower end, measuring 40 mm. by 2·5 mm. At about half-way along its length there is a thickened ring or " node " (like that in a bamboo rod), and the distal portion starts with a slightly less diameter ; this is apparently an indication of the cessation of growth. The enclosed animal is incomplete posteriorly.

Locality.—Bounty Islands ; (Captain Bollons).

Distribution.—This species has already been recorded from the New Zealand coast by Ehlers, from specimens sent him by myself. Ehlers writes (Neuseel. Annel., ii, p. 12), " This species, widely distributed outside the arctic and antarctic areas, has here [New Zealand] probably its most southern limit." This new locality extends this limit some distance eastward, but the Bounty Islands are at about the same latitude as the southernmost portion of New Zealand.

ARACODA, Schmarda, 1861.

Aracoda iricolor, Montague, var. **coerulea**, Schmarda.

1802. *Nereis iricolor*, Montague, Trans. Linn. Soc., vii, p. 82. 1861. *Aracoda coerulea*, Schmarda, N.W.T., I, ii, p. 115, pl. xxxii, fig. 253. 1865. *Lumbrinereis tricolor*, Johnston, Cat. Brit. Mus., Worms, p. 142. 1885. *Notocirrus capensis*, McIntosh, " Challenger " Rep. xii, p. 236, pl. xxxvi, figs. 3, 4 ; pl. xviiiA, fig. 15. 1888. *Maclovia gigantea*, St. Joseph, Ann. Sci. Nat., Zool. (7), v, p. 230, pl. ix, figs. 92–95. 1901. *Aracoda coerulea*, Ehlers, Die Polychaeten magel. u. chilen. Strandes, p. 143, pl. xix, figs. 1–6. 1903. *Arabella iricolor*, McIntosh, " Marine Annelids of South Africa," p. 46, pl. iv, figs. 16, 17. 1907. *Aracoda iricolor*, Ehlers, Neuseel. Annel., ii, p. 13.

A single individual of this very widely distributed species was obtained.

Locality.—Campbell Island; under stones; (T. J. Parker, 1895).

Distribution.—" It stretches from Britain to Japan on the one hand, and from South Africa to Juan Fernandez on the other." Thus McIntosh, from whom the above series of synonyms is quoted.

Fam. GLYCERIDAE.

Hemipodus, Quatrefages, 1865.

Hemipodus simplex, Grube.

1857. *Glycera simplex*, Grube, " Annulata Oerstediana," in Vid. Meddl. naturh. Foren. Kjobenhavn, p. 177. 1901. *Hemipodus simplex*, Ehlers, Die Polychaeten magel. u. chilen. Strandes, p. 155, pl. xviii, figs. 11–15. 1904. *H. simplex*, Ehlers, Neuseel. Annel., p. 37.

In the memoir by Ehlers (1901) a full synonymy is given. He remarks (1904), " The presence of *Hemipodus* in New Zealand is of special interest, as the genus has hitherto been found only on the South American coast. It is probably a Pacific-notial form."

Locality.—Auckland Island: Masked Island, Carnley Harbour; (W. B. B.).

Distribution.—New Zealand; Magellan Strait; west coast of South America.

Fam. SPIONIDAE.

Polydora, Bosc, 1802.

Polydora polybranchia, Haswell.

1886. *Polydora polybranchia*, Haswell, Proc. Linn. Soc. N.S.W., x, p. 273. 1893. *Boccardia polybranchia*, Carazzi, Mitth. Zool. Stat. Neapel, xi, p. 15. 1896. *Polydora polybranchia*, Mesnil, Bull. Sci. France et Belge, xxix, p. 221, pl. xiv, figs. 9–21. 1901. *P. polybranchia*, Ehlers, Die Polychaeten magel. u. chilen. Strandes, p. 164. 1904. *P. polybranchia*, Ehlers, Neuseel. Annel., p. 44.

For a species of *Polydora* this is of rather large size, attaining a length of 18 mm. by 1·5 mm.

The anterior end is dark olive-green; the rest of the body is pale yellowish-brown. The long tentacles, characteristic of the genus, are present in several of the individuals, but they readily drop off on handling.

Locality.—Auckland Island: Erebus Cove, Port Ross; under stones, in mud, at or near high-water mark; (W. B. B.)

Distribution.—New Zealand; Australia; Magellan Strait; Falkland Island; Mediterranean (Carazzi); Strait of Dover (Mesnil).

Fam. TELETHUSIDAE.

Arenicola, Linnaeus.

Arenicola assimilis, Ehlers, var. **affinis,** Ashworth.

1897. *Arenicola assimilis*, Ehlers, Polychaeten Hamburg. Magalhaens. Sammelreise, p. 103. 1901. *A. assimilis*, Ehlers, Die Polychaeten magel. u. chilen.

Strandes, p. 177. 1903. *A. assimilis*, var. *affinis*, Ashworth. Quart. Journ. Micros. Sci., xlvi, p. 737, pls. xxxvi, xxxvii. 1907. *A. claparedi*, Ehlers, Neuseel. Annel., ii, p. 21.

This variety, whose anatomy is fully described by Ashworth, differs but slightly from Ehlers' species, and it appears that both the species and its variety overlap in their distribution.

In his memoir on New Zealand Annelids, above quoted, Ehlers identifies the New Zealand species, although with some hesitation, as *A. claparedi ;* but in a letter to me, after he had examined a well-preserved specimen which I forwarded to him, he writes, " The animal possesses otocrypts with foreign bodies," and acknowledges the correctness of Ashworth's conclusions.

The possible identity with some of the species described by Grube and by Schmarda is dealt with by Ehlers and by Ashworth.

Locality.—Campbell Island ; (G. R. Marriner, 1907). Macquarie Island ; (A. Hamilton, 1894).

Distribution.—The variety occurs on the coast of New Zealand and Falkland Islands, and its post-larval stages have been detected off Tierra del Fuego.

Fam. CIRRATULIDAE.

Timarete, Kinberg, 1865 (emend. Ehlers).

Timarete anchylochaeta, Schmarda.

1861. *Cirratulus anchylochaetus*, Schmarda, N.W.T., I, ii, p. 58. 1865. *Timarete fecunda*, Kinberg, Ofvers. K. Vet. Akad. Forhand., No. 4, p. 254. 1904. *T. anchylochaeta*, Ehlers, Neuseel. Annel., p. 53.

This common cirratulid, which is fully described by Ehlers, lives in mud at and below low water. The body is orange or brown in colour, and measures about 75 mm. in length.

Locality.—Auckland Island : Carnley Harbour ; (W. B. B.).

Distribution.—Commonest cirratulid on the shores of New Zealand ; it also occurs at Chatham Island, and is said to occur in Port Jackson, Australia (Kinberg).

Fam. TEREBELLIDAE.

Thelepus (Leuckart, 1840), emend. Malmgren, 1865.

Thelepus plagiostoma, Schmarda.

1861. *Terebella plagiostoma*, Schmarda, N.W.T., I, ii, p. 41, pl. xxiv, fig. 196. 1861. *T. heterobranchia*, Schmarda, *loc. cit.*, p. 42, pl. xxiv, fig. 197. 1897. *Neottis rugosus*, Ehlers, Zur Kenntniss Ost-africanischen Borstenwurmer, in Nachrichten d. K. Ges. d. Wiss. Gottingen, p. 171. 1901. *Thelepus rugosus*, Ehlers, Die Polychaeten magel. u. chilen. Strandes, p. 211. 1904. *T. rugosus*, Ehlers, Neuseel. Annel., p. 59.

Although Ehlers in his last memoir points out that Schmarda's two species above included in the synonymy are identical with one another, and are synonymous with

his species, nevertheless he retains the later specific name. When I was studying these annelids some years ago, with the purpose of publishing an account of them, before Ehlers had done so, I had come to the same conclusion without having had the opportunity of examining Schmarda's types; hence, Schmarda's description of *T. plagiostoma* is a recognisable diagnosis, and ought to be retained as the name of this common worm.

The worm forms a tube of fine gravel and fragments of shells. It was in the tube of this species that the specimen of *L. comma* was found.

Locality.—Auckland Island: Masked Island, Carnley Harbour; (W. B. B.).

Distribution.—New Zealand; east coast of Africa; Chili.

Leprea, Malmgren, 1864.

Leprea haplochaeta, Ehlers

1904. *Leprea haplochaeta*, Ehlers, Neuseel. Annel., p. 59, pl. viii, figs. 13–18.

A small species of from 20 mm. to 30 mm. in length. Lives under stones in a tube covered with sand-grains; frequently these tubes are built in empty gastropod-shells.

Locality.—Campbell Island; (T. J. Parker, 1895; W. B. B., February, 1907; C. Chilton, November, 1907). Auckland Island: Carnley Harbour; (W. B. B., 1907).

Distribution.—New Zealand; Chatham Islands.

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2. Ehlers. 1904. "Neuseelandische Anneliden." Abhandl. d. K. Gesell. Wiss. Gottingen.
3. Ehlers. 1907. "Neuseelandische Anneliden," ii. *Loc. cit.*
4. Johnson, Herbert P. 1903. "Fresh-water Nereids from the Pacific Coast, Hawaii, &c." "Mark Anniversary Volume."
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EXPLANATION OF PLATE IX.

Nereis australis.

Fig. 1. The pharynx has been slit along the ventral surface and spread open to show the arrangement of the paragnaths. B, the buccal ring; M, the maxillary ring. The compartments are indicated by roman numerals. The cut muscles are represented diagrammatically.

Lycastis quadraticeps.

Fig. 2. The anterior end of the body. (Enlarged about 15 times.)

Fig. 3. Ventral view of the head. (Enlarged about 15 times.)

Fig. 4. Lateral view of the head. (Enlarged about 15 times.)

Fig. 5. Posterior end of the body. (Enlarged about 15 times.)

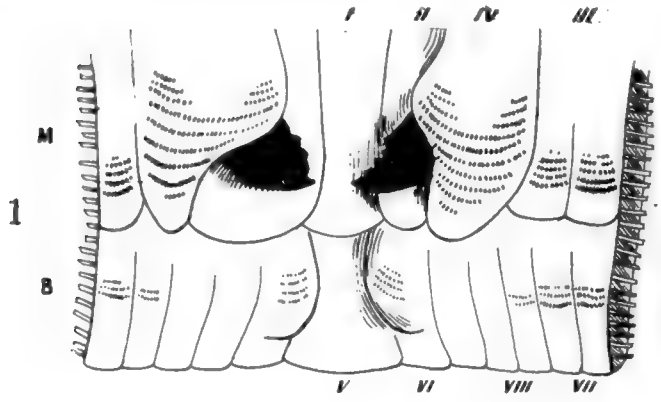
Fig. 6. A parapodium from the middle of the body. The chaetigerous lobe is withdrawn so that the dorsal cirrus projects far beyond it. *l*, eave-like lobe of the body overhanging the base of the foot. (Camera, × 40.)

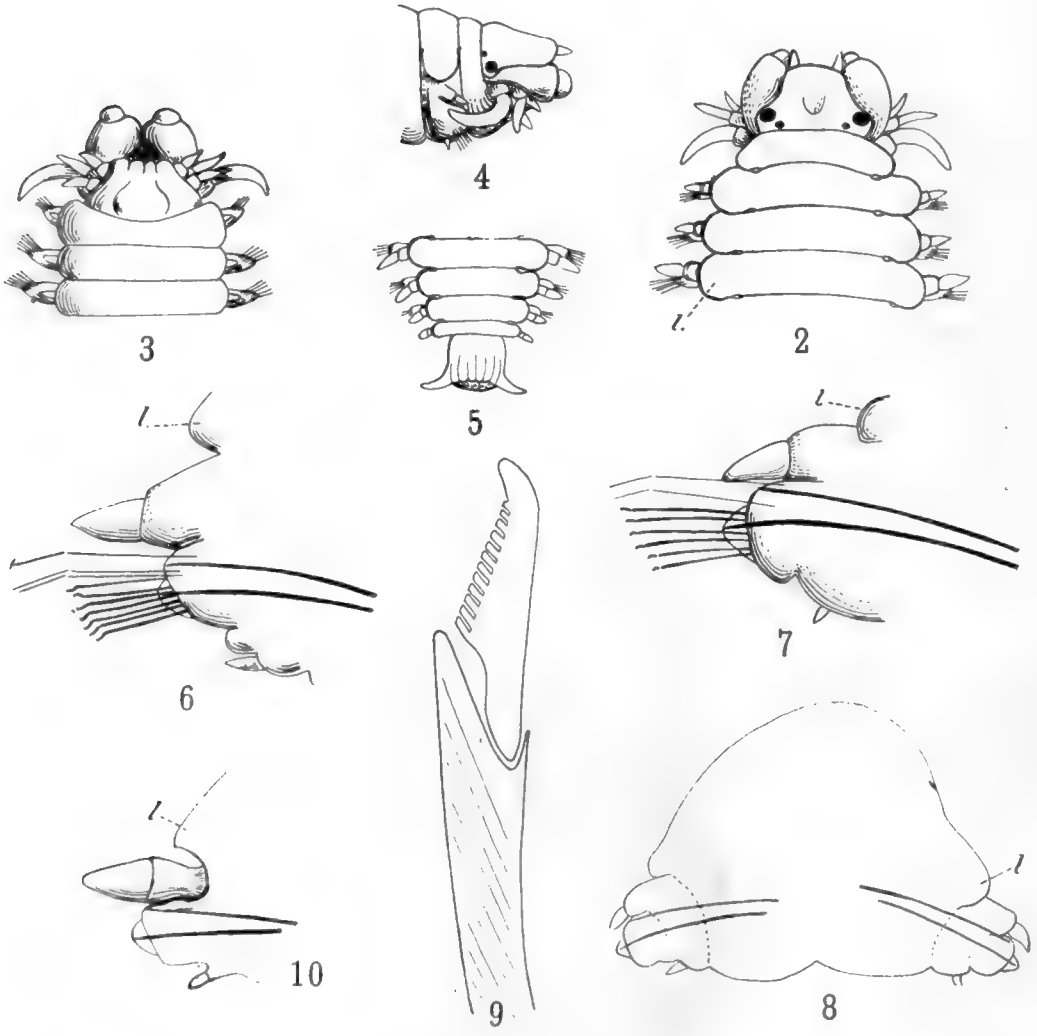
Fig. 7. A similar parapodium, in which the chaetigerous lobe is extended, and the dorsal cirrus does not project beyond it.

Fig. 8. A transverse section of the body, showing the proportion of the parapodia. The thick section, cut by hand, is a little distorted dorsally. (Camera, × 25.)

Fig. 9. A falcate heterogomph. (Camera, × 500.)

Fig. 10. A posterior parapodium. (× 40.)





W. B. Benham del.

PLATE IX.

ARTICLE XII.—REPORT ON OLIGOCHAETA OF THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By W. B. BENHAM, D.Sc., F.R.S., University of Otago.

PLATES X AND XI.

THE earthworms described in this report may be regarded as fairly representative of the Oligochaet fauna of these southern islands—at any rate, of the Auckland Island group, on which the majority were collected.

Since the stay of the "Erebus" and "Terror" at Port Ross in 1840, no naturalist has been able to spend more than a few hours at each of the islands. The usual opportunity afforded him is the occasion of the annual visit in search of shipwrecked mariners when the New Zealand Government steamer makes a tour of inspection of the islands and the depots. On these occasions the naturalist has only a few hours in which to make a collection, and that only in the immediate proximity of the landing-place. I have been more fortunate, as on the occasion of each of my two visits the circumstances have been such as to permit a more prolonged investigation of the fauna.

In February, 1907, I had the honour of being invited by His Excellency the Governor of New Zealand (Lord Plunket) to accompany him on his visit to these distant parts of the Dominion under his charge, and I had every opportunity, commensurate with the time allotted to the trip, to collect. While at the Auckland Islands we spent one morning at Port Ross, an afternoon on Enderby Island, and a whole day on Adams Island. Our stay at Campbell Island covered two days, and I had time to ascend Mount Honey; another day was occupied in traversing the Antipodes Island; while at the Snares we spent a few hours. Both at the Auckland and Campbell Islands I collected a considerable number of earthworms, but at the Antipodes I found none, chiefly, I think, because I had no spade with me, for we had landed at a spot where we had to climb up a very steep face of smooth slippery rock through a penguin-rookery, where it was inadvisable to hamper one's-self with unnecessary gear. I have since regretted this lack of a spade.

My second visit was paid in November, 1907, and was confined to the Auckland Islands, except for some hours on the Snares, at each of which a good number of earthworms were obtained. At the Aucklands ten days were spent, and here I paid attention not only to the *Oligochaeta*, but also to all groups of invertebrates, except *Lepidoptera*, both terrestrial and marine. Those members of the expedition —viz., the botanists and geologists—whose work necessitated their going to the more distant parts of the islands, brought earthworms from all their excursions, and I owe many thanks to Dr. Cockayne and Messrs. Aston, Speight, and Tennant,

as well as to other members of our party, for their kind and willing help in getting together so good a series of earthworms from the Auckland Group. Only a few worms were forwarded to me from Campbell Island, collected by Messrs. Mayne and Marriner and Professors Chilton and Kirk.

I have not included in this report the earthworms from Stewart Island, of which I have a good number, but as yet unidentified. They are nearly all members of the *Acanthodriline* genera, common in the South Island of New Zealand, none of which were, however, collected during this expedition.

LIST OF OLIGOCHAETA.

Fam. PHREODRILIDAE.

Phreodrilus campbellianus, sp. nov.
Campbell Islands.

Fam. TUBIFICIDAE.

Rhizodrilus aucklandicus, sp. nov.
Auckland Islands.

Fam. ENCHYTRAEIDAE.

Lumbricillus intermedius, sp. nov.
Auckland and Campbell Islands.

* *Lumbricillus macquariensis*, Benham.
Macquarie Island.

* *Marionina antipodum*, Benham.
Antipodes Island.

* *Enchytraeus albidus*, Henle.
Campbell and Macquarie Islands.

Fam. HAPLOTAXIDAE.

Pelodrilus tuberculatus, sp. nov.
Auckland and Campbell Islands.

Pelodrilus aucklandicus, sp. nov.
Auckland Islands.

Fam. MEGASCOLECIDAE.

Subfam. ACANTHODRILINAE.

Notiodrilus haplocystis, Benham.
Snares Island.

* Those marked with an asterisk were not obtained during the expedition.

Notiodrilus fallax, sp. nov.
Snares Island.

Notiodrilus aucklandicus, Benham.
Auckland Group.

Notiodrilus campbellianus, Benham.
Auckland and Campbell Islands.

* *Notiodrilus macquariensis*, Beddard.
Macquarie Island.

Plagiochaeta plunketi, sp. nov.
Auckland Islands.

Rhododrilus cockayni, Benham.
Auckland and Campbell Islands.

Leptodrilus leptomerus, Benham.
Auckland and Campbell Islands.

Leptodrilus magneticus, sp. nov.
Auckland Islands.

Subfam. MEGASCOLECINAE.

Plutellus aucklandicus, sp. nov.
Auckland Islands.

Diporochaeta heterochaeta, sp. nov.
Snares Island.

Diporochaeta brachysoma, sp. nov.
Auckland Islands.

Diporochaeta helophila, sp. nov.
Auckland Islands.

Diporochaeta perionychopsis, sp. nov.
Auckland Islands.

Fam. LUMBRICIDAE.

Helodrilus constrictus, Moore.
Introduced. Campbell Island.

GEOGRAPHICAL RELATIONS.

The only endemic genus is *Leptodrilus*, which is closely related to a purely New Zealand genus, *Rhododrilus*, in which, indeed, I formerly included it. This new genus, represented by two species, occurs both on the Auckland and on the Campbell Islands, as does also *Rhododrilus*.

* Those marked with an asterisk were not obtained during the expedition.

Plagiochaeta, represented by a single species on the Aucklands, is peculiar to New Zealand, and hitherto has not been found in the North Island; in the South Island it is represented by several species, from Nelson to Invercargill and from the east coast to the west; and it also occurs on Stewart Island.

The occurrence, then, of these three genera evidently indicates a former land continuity between the mainland and these subantarctic islands.

Notiodrilus (*s.l.*) is a genus which is found in New Zealand and its southern outliers, as well as at Kerguelen, Marion Island, the Crozets, South Georgia, Falkland Islands, Patagonia, Tierra del Fuego, and Cape of Good Hope—in other words, it is circumpolar—and to its importance I have already called attention in my address to Section D at the meeting of the Australasian Association for the Advancement of Science, at Hobart, 1902. It may be remarked, however, that further research has shown that the genus occurs elsewhere, as in Mexico, Madagascar, Guatemala, Cameroon, and north-west Australia. I have some remarks on this matter under the account of *N. fallax*. Three species of this genus were already known from these subantarctic islands of New Zealand, and I now add a fourth from the Snares.

The genus *Phreodrilus* is characteristically Antarctic, with nine hitherto-described species; it is represented in New Zealand by at least three—perhaps four—species, the remaining species occurring on Kerguelen, Crozets, Falkland Islands, and Tierra del Fuego. The majority of the species are found on the sea-shore.

Although this subantarctic distribution of *Notiodrilus* and *Phreodrilus* seems to be best explained by the supposition of a larger tract of land in these regions, as was first indicated by Beddard and later dealt with by me at some length in 1902, yet the leading authority on *Oligochaeta* is entirely opposed to this suggestion. Michaelsen, in 1902, and again in 1907, having noted that many of the species of *Notiodrilus* (and of some others) can and do live on the sea-shore, and, using the term "euryhaline" to express this mode of life, says, "Through their euryhaline nature one easily explains this wide distribution of the genus across the seas, which in consequence of the 'West-wind Trift'—a current present in the circumpolar subantarctic seas—can be carried from station to station, and thus come to have a circumpolar distribution" (1907, *a*, p. 144). He supposes that the worms or their cocoons may be carried in seaweed from island to island. Any one who has had experience of the size and tremendous power of the waves in these southern latitudes, and of the terrific wind-storms that constantly rage over these seas, will be in a position to recognise the high degree of improbability that seaweed could be carried from island to island by the "West-wind Trift" without being torn into fragments. *Oligochaeta* or their cocoons would soon be wrenched from the plant, and their arrival at any distant land-surface—say, from Marion Island to Kerguelen—is, in my opinion, quite outside the realm of probability. When I stood at the top of the sheer cliffs, some 500 ft. to 1,000 ft. in height, which form the whole of the west coast of Auckland Island, and saw the tremendous breakers which even in moderately calm weather dash with incredible force against the rocks, I was more than ever convinced that the "West-wind Trift" cannot account for the transference of *Oligochaeta* from the various land-surfaces of this subantarctic region. It is also extremely likely that the worms would fall a prey to fishes, or be engulphed by whales while feeding, long ere they would reach another land-surface. Even if it be within the bounds of possibility to explain the distribution of *Notiodrilus* and

certain Enchytraeids in this way, it will not, I think, commend itself to the students of other groups of animals and of plants. The evidence in favour of a circumpolar continent or shifting archipelago is much stronger now than when I discussed the matter in 1902.

The subfamily *Megascolecinae* is Australian in its origin, but representatives of it have been recorded by myself from the North Island—species of *Megascolecides* (= *Tokea*, Benham) and *Spenceriella* (= *Diporochaeta*)—and it is only very sparsely represented by *Diporochaeta* in the South Island and Stewart Island—so far, at least, as our knowledge allows me to state. But, as I mentioned in 1904, while the common earthworms of the South Island are Acanthodrilines, these are less numerous in the North Island, where they are replaced by Megascolecines. It is therefore surprising to find that the larger and commoner worms at the Auckland Islands belong to this subfamily—viz., *Plutellus* (one species) and *Diporochaeta* (four species).

Lumbricologists are agreed that the Megascolecines are derived from Acanthodrilines—that, indeed, *Notiodrilus* (*s.l.*) is the most archaic of the family, from which *Maoridrilus*, *Plagiochaeta*, *Rhododrilus*, and *Leptodrilus* have been developed, in somewhat that order. The *Megascolecinae* have, in the same way, been derived from *Notiodrilus* through *Plutellus*, the most archaic of its subfamily; and *Diporochaeta* is a descendant of it. (I am omitting reasons for these views, for they have been fully dealt with by their author, Michaelsen, in a recent work, 1907, *a*.)

The discovery of *Plutellus* on the Auckland Islands is, perhaps, the most astonishing outcome of this expedition, so far as the earthworms are concerned. Characteristically Australian, and chiefly Tasmanian and Victorian, its occurrence in this southern outlier of New Zealand is difficult of explanation, for the genus has not yet been recorded from the mainland nor from any of the islands in this area. It is true that in 1904 I attributed a lacustrine species to this genus, but Michaelsen regards it as belonging to *Pontodrilus*. In order to account for the presence here of this genus, the following alternatives occur to me: (1.) It was introduced into the islands at the time of the Enderby Settlement, from New South Wales. (2.) It passed into and remained in the islands from New Zealand when this land had its great extension southwards. (3.) It arrived from Tasmania, *via* the Antarctic Continent. The last view seems to me the least probable. There is evidence that Tasmania became separated from the Antarctic Continent before New Zealand did—*i.e.*, previous to the evolution of the *Megascolecinae*, at a time when *Notiodrilus* and its immediate allies were the predominant genera of the family. *Plutellus*, indeed, is a direct descendant of this genus, and no doubt appeared early. Again, if *Plutellus* entered from the north, how is it that we do not find it on the mainland? Its descendant *Diporochaeta* is here, alongside the more archaic Acanthodrilids; and it is clear that climatic and edaphic conditions of New Zealand are not antagonistic to the Megascolecines. On the whole, I am inclined to take the view that the worm was introduced by man (see below), for it is allied to certain of the New South Wales species, such as *P. tuberculatus*.

The family *Haplotaxidae* is richly represented in the Southern Hemisphere, for, with the exception of two or three species of *Haplotaxis* and one of *Pelodrilus* in the Northern Hemisphere, the rest are known from the following places: In New Zealand—two species of *Haplotaxis*, one species of *Pelodrilus*; in Western Australia—

two species of *Pelodrilus ;* at the Cape of Good Hope—one species of *Pelodrilus.* The genus is a lover of moist earth.

The new species of *Lumbricillus* is closely related to *L. verrucosus* and *L. maximus,* both of which occur in subantarctic regions ; but the genus is found all over the Northern Hemisphere.

The genus *Marionina,* although of northern origin, has several species in the subantarctic region—viz., on Tierra del Fuego, South Georgia, Kerguelen, and Crozet Island.

The genus *Enchytraeus* is a European one, and the species *E. albidus* has been recorded from south Patagonia, Tierra del Fuego, and the Crozets, as well as from the main islands of New Zealand.

Fam. PHREODRILIDAE.

Phreodrilus, Beddard, 1891.

Phreodrilus campbellianus, n. sp. (Plate X, fig. 1.)

A considerable number of this worm were collected in February, 1907, but are poorly preserved.

Colour (in alcohol) white anteriorly, while the translucent body-wall posteriorly leads to a greyish tint ; the clitellum is pale brown.

Dimensions.—As the worms are a good deal twisted, it is difficult to give accurate figures, but they are approximately 18 mm. by 1 mm., with about 60 segments. Except for the 3 anterior segments, they are each biannulate, consisting of a very short anterior annulus and the chief posterior annulus.

The *prostomium* is short, blunt, with a broad base ; it is nearly as long as the first 2 segments together.

The *chaetae* are arranged as in *P. lacustris ;* the ventral couple are of two kinds, a simple sigmoid and a notched chaeta, though in some segments both are notched. The dorsals are solitary, capilliform, and commence on the 3rd segment.

The *clitellum,* which is yellowish-brown in colour, covers segments $\frac{1}{2}$ 12, and 13 ; and extends all the way round the body.

The *male pore* is on a slight prominence at the anterior margin of 12, from which in one specimen at least a penis protrudes.

The *spermathecal pore* is of large size, near the anterior margin of 13. Both these pores are in line with the ventral chaetae, which, however, are absent in 12, 13 ; and there are no penial chaetae, as in *P. lacustris.* The female pore at 12/13 is invisible externally.

Internal Anatomy.

Septal glands lie on each side of septa 4/5, 5/6, and at the anterior face of 6/7.

There are no enlarged hearts, though the dorsal blood-vessel is enlarged in 5, 6, 7.

There is no gizzard ; the oesophagus is narrow up to the 10th, then suddenly opens into the intestine.

The first pair of *nephridia* is in 7, of rather large size; the next pair in 10; then in 14, 15, 17, 18, 19, &c. I was unable to detect any nephridia in 16 on either side of the body in the specimen sectionised.

The *testes* and *funnels* are in 11, in the usual positions. The sperm-duct is slightly convoluted immediately behind the septum, and receives a long convoluted prostate just before entering the copulatory apparatus. The prostate fills the segment; it is surrounded by a refringent sheath, which may be muscular; but there is no common sac, such as exists in *P. beddardi* and *P. subterraneus*. The penial sac contains a long penis, which is protruded on one side of the worm. The whole apparatus closely resembles that of *P. lacustris*.

Segments 8, 9, 10, 11, are more or less occupied by masses of developing spermatozoa, but there is no definite sperm-sac.

The *ovary* is small, in 12, but there are large ova free in this segment. The oviduct is quite small, and opens at 12/13.

The *spermatheca* has the usual elongated form characteristic of the genus; it extends back to the 14th, or on one side to the 15th, segment. The narrow muscular duct, which passes through the septum 13/14, is constricted sharply from the ampulla, and enters, in 13, the apex of a large atriumlike invagination of the body-wall of about the same size as the penis-sac.

The "antrum" of the spermatheca is lined by tall granular cells, surrounded by a coat of circular muscles, covered by coelomic epithelium. The lining epithelium becomes lower as it approaches the pore, and is there continuous with the epidermis.

Locality.—Campbell Island. Under stones, sea-shore, near exit of a stream from the flanks of Mount Honey; (W. B. B.).

Remarks.—The present species of *Phreodrilus* agrees most nearly with *P. lacustris*, Benham,* from Lakes Wakatipu and Manapouri, from which it differs in—(*a*) the presence of the large muscular sac at the exit of the spermatheca; (*b*) the absence of copulatory chaetae near the aperture; and in the minor fact that the duct of the spermatheca is in *P. lacustris* much shorter, in that it does not enter the 14th segment. The new species agrees with *P. albus*, Beddard,† from the Falkland Islands, in the possession of the spermathecal sac referred to, but the male apparatus in that species is much less extensive; and it differs in other details. The great interest of the genus is its circumpolar Antarctic distribution, for all the species are limited to the extreme southern lands; at least three (perhaps four) species occur in New Zealand, one species in Kerguelen,‡ one species on Crozet Island,§ two species on the Falkland Islands, and two species in the extreme south of the American Continent.‖ The present species thus forms a geographical link with that of Kerguelen.

* Benham, "On some New Species of the Genus *Phreodrilus*," Quart. Journ. Micr. Sci., xlviii, p. 271, 1904.

† Beddard, "Naiden, Tubificiden, und Terricolen," in Hamb. Magalhaens. Sammelreise, p. 11, 1896.

‡ Michaelsen, 1902 (*P. kerguelarum*), p. 136.

§ Michaelsen, 1905 (*P. crozetensis*), p. 5.

‖ Beddard, *loc. cit.*

Fam. TUBIFICIDAE.

Rhizodrilus, F. Smith, 1900.

Rhizodrilus aucklandicus, sp. nov. (Plate X, figs. 2–7.)

Of this littoral worm I obtained several.

Colour, as in Tubificids generally, red, owing to the blood in the integument and elsewhere showing through the transparent skin.

Dimensions.—Long, narrow, with feebly expressed segments, due perhaps to the condition of preservation. Length, 29 mm. by 0·5 mm., with 80 segments, which are triannulate—anteriorly, at least.

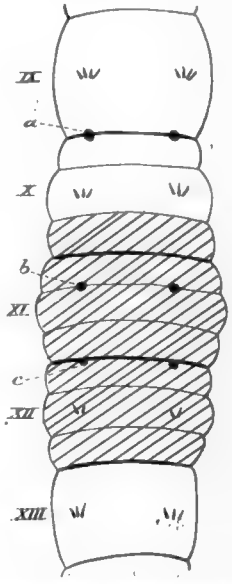
Prostomium rather long, greater than the length of segments 1 and 2 together.

Chaetae.—Two bundles of forked sigmoids on each side of each segment; the two prongs are of equal length and of comparatively large size. Dorsals, 3 or 4, in the anterior part of the body; 1 or 2 posteriorly. Ventrals, anteriorly 3 or 4, occasionally 5; but posteriorly 2, or rarely 1. The chaetae are absent in 11 and 12. In some of the segments long fine hairs have become entangled with the chaetae, which at first examination were mistaken for capilliform chaetae.

Dorsal pores commence at the anterior end of the 4th segment; they are not really intersegmental, as they lie behind the first annulus, while the septum is inserted in front of this annulus.

Clitellum on dorsal and lateral surface of 10, and surrounding the body of 11, 12.

Genital Pores.—The male pores are paired on 11, at the junction of annuli *a*, *b*, at the position of the absent ventral chaetae. Spermathecal pores also paired at 9/10, in line with ventral chaetae. Oviducal pores at 11/12, in the same line.



Rhizodrilus aucklandicus.

Ventral view of the genital region, showing the annulation of the clitellar segments, the actual number of chaetae, and the genital pores. *a*, spermathecal pore; *b*, male pore; *c*, oviducal pore.

Internal Anatomy.

There is an elaborate integumental blood-plexus, but I did not work out the details, nor am I able to state whether the characteristic moniliform structure of these vessels, as described by Goodrich and others, is or is not present. I did not detect any "hearts."

The pharynx is very feebly developed. The roof is recessed, but has only an extremely slight musculature, either intrinsic or extrinsic. This recess is lined by tall ciliated cells, which take the stain but feebly. The nuclei are basal in position. On the floor is a well-defined pad of high ciliated cells of quite a different character, more triangular in form, with distal or central nuclei and deeply staining cytoplasm; amongst them are a few large gland-cells. This pharynx lies in the 3rd segment. The ciliated pad and the ciliated cells of the recess are very sharply

marked off from the cuticulated and much lower cells of the buccal region. I do not recall any pharynx having this simple structure.

The narrow oesophagus passes gradually into the intestine, which is only dilated behind the ovisac in the 24th segment.

The *nephridia* are small, and recall those of Enchytraeids in structure. A small preseptal region; a more or less triangular post-septal region, as seen in longitudinal sections, with a wide but short duct leading from the posterior end. The lumen passes in an undulating course through a mass of cells, few in number. The first pair lies in segment 7, the next in 9, the third in 13, and then they occur in each of the following segments.

Testes.—One pair in 10. Large wide funnels lie on the hinder septum; each leads into a short straight sperm-duct, which passes directly backwards along the ventral body-wall, below the ovary, to enter the apex of a penial apparatus (Plate X, fig. 7). The wall of the duct is covered with groups of gland-cells, as described and figured by Goodrich for *R. pilosus*, and such as are familiar in prostates. This covering commences immediately behind the septum 10/11, and ceases as the duct curves upwards at the hinder end of the segment to enter the penial sac. The thin muscular wall of this sac is attached to the dorsal body-wall of segment 12 by a group of retractor muscles arising from its apex, which pushes the posterior septum of segment 13 backwards; the cavity of the sac, close to its proximal extremity, is traversed by a few bundles of fibres of, apparently, connective tissue. The sperm-duct passes through the sac, and is divisible into two regions which differ structurally from each other: first it dilates into an ovoid glandular bulb; then the wall becomes thin and folded to form the penis, which opens into a small penial chamber unprovided with any chitinous lining; this in its turn communicates with the exterior by a comparatively small pore in segment 11. It is to the wall of this chamber that the fibres above mentioned are attached. The structure of the duct alters as it traverses this sac. At first, just after entering the sac, the wall is formed of small ciliated cells of the usual type; after reaching the interior of the sac the cells elongate considerably, so that the diameter is now more than twice what it is outside the sac, but the lumen remains small: the cells are still ciliated (Plate X, fig. 4). This region forms a large bulb or swelling in the course of the duct. Further down, the cells decrease in height, and lose their cilia and granulation, so that at the lower end they are quite low, and the lumen becomes much wider (Plate X, fig. 6). This region is somewhat folded, indicating its protrusibility. The duct opens on a slight papilla into a small penial chamber, an invagination of the epidermis.

There are *sperm-sacs* in 9, and an unpaired one passing through segments 11 to 19.

The *ovaries* and *oviduct* lie in the normal positions. An unpaired ovisac extends through segments 19 to 23.

Spermathecae.—A pair in segment 10, with widely separated pores. Each spermatheca (Plate X, fig. 3) is distinctly divided into two parts, a smaller and a larger; the larger is posteriorly directed, somewhat ovoid in shape, with a pointed end and wide base, which is deeply constricted from the smaller globular anteriorly situated portion; the latter communicates by a very small aperture with an invagination of the epidermis, which has the form of a short tube, into which the pore of the globular sac projects slightly. The ovoid ampulla is lined by low cells, except at its

proximal region, where they resemble the higher cells of the globular sac, which corresponds to the diverticulum of higher worms. This sac has an epithelium of tall gland-cells, and the whole organ is enveloped in a thin muscular coat.

The ampulla is filled with spermatozoa, without any arrangement or order; but in the globular sac the sperms are orientated, so that the heads are towards the epithelial cells, and it appears that each cell has many sperms associated with its end. Hence I conclude that spermatophores are formed.

Locality.—Auckland Islands (Erebus Cove, in Port Ross). Under stones on the sea-shore.

Remarks.—The only genus that has a sperm-duct covered with gland-cells, and is of short extent without any convolutions, is *Rhizodrilus*. It appears to me that the brief diagnosis of *Monopylephorus* given given by Levinsen* is insufficient to enable one to identify his worm. Beddard and Michaelsen, in their systematic treatises, have regarded it as, possibly, synonymous with Stolc's *Bothrioneuron;* while Ditlevsen† believes it to be identical with Goodrich's *Vermiculus*‡, as he found this worm (*V. pilosus*) in abundance on the stretch of shore on which Levinsen collected his *M. rubroniveus*.

In view of the meagre diagnosis given by Levinsen, one is still in doubt as to whether this is the case, and it seems to me better, and more in accordance with a common-sense interpretation of the Rules of Nomenclature, to place Levinsen's generic name as a *nomen nudum*.

There may be a great probability that *Monopylephorus rubroniveus* is identical with *Vermiculus pilosus*, but, as all sorts of changes in environment lead to disappearances of worms from a given locality, this is by no means beyond the region of doubt. Then, since *Vermiculus* was used by Dalyell (*fide* Michaelsen) for a Nematode, we must fall back on Smith's generic name, *Rhizodrilus*.

The present species differs from the other species of the genus in the wide separation of the paired pores of sperm-duct and spermathecae, for in all but *R. trichochaetus*, Ditl., these organs open by median pores—that is, into a median invagination of the epidermis—which Goodrich has shown to be a secondary condition, attained at maturity. The new worm also differs in having a distinct penis.

In *R. limosus*, Hatai§, and *R. glaber*, Moore‖, the lower end of the sperm-duct is widened out to form an atrium, but there appears to be no penial sac or penis in any of the species, though one regrets that Ditlevsen has not given more details about *R. trichochaetus*. Moore speaks of *R. glaber* having an "eversible median bursa which probably acts to some extent as a substitute for a penis."

The seven species hitherto described have been found in Europe and North America (east coast). It is therefore difficult to explain the presence of the genus in these antipodal shores; but, as practically nothing is known of the "Microdrili" of places outside these two continents, no suggestion as to the manner of the occurrence here is possible.

* Levinsen, in Vid. Medd. Nat. Foren., 1883.

† Ditlevsen, Zeit. fur Wiss. Zool., lxxvii, p. 423, 1904.

‡ Goodrich, Zool. Anz., xv, p. 476, 1892; and Quart. Journ. Micr. Sci., xxxvii, p. 253, 1895.

§ Hatai, "On *Vermiculus limosus*," Annot. Zool. Japon., ii, p. 103, 1898.

‖ Moore, "Some Marine *Oligochaeta* of New England," Proc. Acad. Nat. Sci., Philadelphia, 1905, p. 378.

Fam. ENCHYTRAEIDAE.

Lumbricillus, Oersted, 1844.

Lumbricillus intermedius, sp. nov. (Plate X, figs. 8–11.)

A littoral species, dull opaque-white in formol, with pinkish clitellum. The worm is relatively stout, with well-marked segments, The body-wall is thick, owing to the depth of the longitudinal muscles, which are about three or four times as thick as the rest of the wall. The cuticle is thin.

Dimensions.—From 10 mm. to 20 mm. in length, with a diameter of 1–1·25 mm.

Prostomium rather long, about equal to the first 2 segments together; with blunt rounded tip, and broad base.

The *chaetae* are in groups of 4–5 dorsally and 5–7 ventrally in the fore part of the body; one less—*i.e.*, 3–4 and 4–5 respectively—in the hinder segments. Feebly sigmoid.

Clitellum completely surrounds the segments (½ 11), 12, 13. These latter are longer than the neighbouring segments.

Genital pores in the usual position.

Internal Anatomy.

The longitudinal muscle-layer of body-wall is about four times as thick as the epidermis + the circular muscles.

The *dorsal vessel* rises far back, at the 17th segment. I made no observations on the distribution of the anterior vessels, this being a very difficult matter to study in sections or preserved worms.

Coelomic corpuscles are spindle-shaped.

The oesophagus passes quite imperceptibly into the intestine. Septal glands lie in the 4th, 5th, 6th, and 7th segments. The presence of the glands in the last appears unusual; but I examined and found them in several specimens, both in section and in entire worms.

Nephridium with a somewhat ovoid post-septal body, with duct rising from the posterior end, and passing sharply forwards below it to the pore (Plate X, fig. 11).

The *genital organs* lie in the usual segments. The testes are digitiform, and of large size. The long funnel occupies the entire segment; its length is about five times its diameter; it is bent slightly at its hinder end (Plate X, fig. 10). The penis has the typical structure, a gland with muscular wall, opening by a wide mouth on 12; the sperm-duct enters this on its median side. Retractor muscles also pass from it to the body-wall.

Sperm-sacs in 10, 12.

The *ovary* is also lobulated, and large ova occupy the 13th. The oviduct is out of all proportion small—little more than a pore in the ventral wall of 12—with scarcely any funnel.

The *spermatheca* in 5 has a wide duct, not marked off distinctly from the ampulla, opening through a group of glands at 4/5. The pyriform ampulla narrows as it approaches the oesophagus, and then is suddenly constricted, entering the gut by a very small pore provided with a sphincter muscle (Plate X, fig. 8).

Subneural *copulatory glands* in 14, 15, 16, and 17 in all the four mounted specimens. The gland extends up the side of the nerve-cord to reach the level of its upper surface; the "wing" on each side is rather greater than the width of the cord.

Locality.—Campbell Island: (*a.*) Perseverance Harbour; shore; a considerable number collected in February, 1907, under stones, sea-shore, near exit of a stream from the flanks of Mount Honey; (W. B. B.). (*b.*) Collected in November; (J. B. Mayne).—Auckland Islands: Norman's Inlet, on the east coast; (H. B. Kirk).

Remarks.—This new species is intermediate in most characters between *L. maximus*, Mich.,* and *L. verrucosus*, Clap., both of which have been recorded from Antarctic shores. In size it is about half that of the former, and twice that of the latter. The number of chaetae agrees with *L. maximus*,† as do also the copulatory glands. With *L. verrucosus*‡ it agrees in the enveloping clitellum, the length of the sperm-funnel, and the form of the spermatheca; but from both it differs in the backward point of origin of the dorsal vessel, which is further back than in any species of that group of species to which it belongs, as well as in the presence of a septal gland in the 7th segment.

It is quite distinct from *L. macquariensis*, Benham,§ which belongs to another group of this genus, in which the spermathecal duct is sharply marked off from the ampulla.

Lumbricillus macquariensis, Benham.

1905. Trans. N.Z. Inst., xxxvii, p. 295.

The species, as I remarked in my description of it, is nearly allied to Ude's‡ *L. maritimus*, from Tierra del Fuego.

Enchytraeus, Henle, 1837.

Enchytraeus albidus, Henle.

1904. *Enchytraeus simulans*, Benham, Proc. Zool. Soc., 1903, ii, p. 219. 1904. *E. albidus*, Benham, Trans. N.Z. Inst., xxxvii, p. 295.

This species was recorded by me from the Campbell and Macquarie Islands; but I did not meet with it during this expedition. It has also been recorded by Michaelsen from the Crozets,‖ and is found on Tierra del Fuego and south Patagonia.

Marionina, Michaelsen, 1890.

Marionina antipodum, Benham.

1905. Trans. N.Z. Inst., xxxvii, p. 294.

I did not meet with this species during the present expedition, but it was collected by Dr. Cockayne on Antipodes Island. It is related to certain Fuegian species¶ and to those on Kerguelen and the Crozets.**

* Michaelsen, "Die Oligochaeten v. Sud-Georgien," Mt. Mus. Hamburg, 1888, p. 56.
† Michaelsen, Die Oligoch. Deutsch. Sud-polar Exped. 1901–3, p. 10, 1905.
‡ Ude, "Enchytraeiden," Hamb. Magalhaens. Sammelreise, 1896, p. 3.
§ Benham, Trans. N.Z. Inst., xxxvii, p. 295, 1905.
‖ Michaelsen, *loc. cit.*, 1905, p. 17.
¶ Ude, *loc. cit.*, 1896, p. 17.
** Michaelsen, *loc. cit.*, 1905, p. 13.

Fam. HAPLOTAXIDAE.

Pelodrilus, Beddard, 1891.

Pelodrilus tuberculatus, sp. nov. (Plate X, figs. 12–14.)

A considerable number of these small and characteristically coloured worms were collected both on the Auckland and on the Campbell Islands.

Dimensions.—Length, from 40 mm. to 70 mm., by 2 mm. in diameter. The segments are well marked, and number from 100 to 110 in those examined. The body is somewhat flattened, especially towards the posterior end. A lateral line is very evident.

Colour.—Except for the anterior preclitellian end, which is opaque-white, the body is bluish-grey, owing to the transparent wall allowing the intestinal contents to be seen. The clitellum is pale yellowish-brown in preserved worms, though in life it is yellow. A remarkable feature about the body-wall is the thick cuticle, which gives a shining appearance to the worm, so that it bears a resemblance to certain Enchytraeids. In specimens preserved in alcohol the wall is less translucent, but in formol this character is retained.

The *prostomium* is small and rounded, not as long as the segments 1 and 2 together.

The *chaetae* are in four couples, all sigmoid. The individual chaetae are, of course, quite close together. The dorsal gap (*dd*) is less than the ventral gap (*aa*), which is in its turn less than the lateral gap (*bc*). In the anterior part of the body the dorsal and ventral chaetae are of the same size, but in the mid and hind body the dorsals are only two-thirds the length of the ventrals.

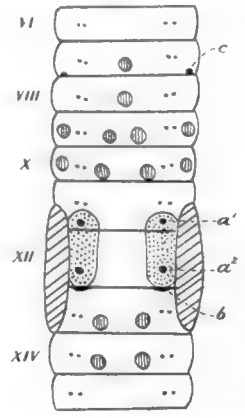
The ventrals are absent from the 12th segment in the mature worm.

The *clitellum* is confined to the dorsal and lateral portions of the segments ½ 11, 12, and 13, though in some cases nearly the whole of the 11th is glandular dorsally. On the ventral surface of 12 is a pair of latero-ventral glandular ridges in line with the ventral chaetae; these ridges are broad and low, and may extend slightly on to 11 as far as the chaetae. These ridges carry the two pairs of male pores, and no doubt function as prostate glands; they may be termed the copulatory glands (text figure, p. 264, and Plate X, fig. 12).

Tubercula pubertatis are present in several segments. They have the form of paired or median, rounded, slightly prominent papillae, which are very evident as white spots in specimens preserved in alcohol. They are somewhat variable in number, but are usually situated as follows: Segment 7, a pair of closely approximated or even median papillae; segment 8, a pair of closely approximated or even median papillae (these are placed behind the chaetal zone); segment 9, paired, mediad and posterad of ventral chaetae, also a pair dorsad of the chaetae in the chaetal zone; segment 10, paired, mediad and posterad of ventral chaetae, also a pair dorsad of the chaetae in the chaetal zone; segment 13, pair, mediad of the chaetae; segment 14, pair, mediad of the chaetae. More rarely there is a median papilla on the 15th segment also. In one specimen the number was greater, as a series of post-chaetal papillae of smaller size, close to the posterior margin of 10, 13, and 14, were present. I am not aware that such tubercula have been recorded in the genus.

Genital Pores.—There are two pairs of male pores, the anterior pair on the hinder margin of 11, the posterior pair a little behind the middle of 12. These pores are situated on the glandular copulatory ridge, and therefore are in line with the ventral chaetae. The single pair of female pores are at 12/13, in the same line. They are slitlike, and visible under a pocket-lens in some individuals.

The single pair of spermathecal pores are rather high up the side of the body, at about the lateral line, at 7/8.



PELODRILUS TUBERCULATUS.
View of genital region.

a^1, a^2, the two pairs of male pores, situated on a glandular pad or copulatory organ; *b*, the oviducal pore; *c*, spermathecal pore. The circular, vertically striated areas are the tubercula pubertatis.

Internal Anatomy.

The epidermis consists almost entirely of very large gland-cells, opening through the very thick cuticle by distinct pores. The cuticle is nearly as thick as the epidermic layer. Squeezed between the gland-cells are a few columnar cells (Plate X, fig. 13).

The *septa* behind 6, 7, 8, 9, and 10 are thickened.

The *dorsal vessel* contains a large "cardiac body" in the 14th and some segments anteriorly. Free commissural vessels, more or less undulating, are visible in each segment, though they were not followed out in detail.

The *nephridia* are of large size in proportion to the size of the worm. They are present in 6, 7, 8, 9, 13, 14, &c. I am not satisfied as to their occurrence in the 10th; they are certainly absent in 11 and 12.

The *pharynx* occupies 2, 3, and 4, and has the typical dorsal pad. There is no gizzard. The oesophagus is narrow, has folded walls from the 7th to 14th; the intestine commences in the 15th.

Septal glands lie in 5, 6, and 7.

There are two pairs of *testes* and *sperm-funnels* in the normal position in segments 10 and 11. They are, in opposition to Beddard's statement for *P. violaceus*, not contained in sperm-bladders; segments 11 and 12 are, however, filled with developing sperms.

There is a paired *sperm-sac* in 9, and the segments 10–16 are filled with developing spermatozoa.

The sperm-funnel is large and flat, with the lower margin upturned; the greater part of it is free from the septum, to which it is attached by only quite a small area; its margin is somewhat folded.

Each sperm-duct is a delicate tube, coiling immediately after perforating the septum, and opens independently by a very fine pore through the glandular ridge on segments 11 and 12 respectively (Plate X, fig. 14). The histology of this ridge or copulatory gland is quite distinct from that of the clitellum, where the epithelium consists of small ovoid cells filled with large refringent spherules, which are not stained by borax-carmine, though they take carm-alum powerfully. The cells of the copulatory gland, however, are long, club-shaped, and filled with very fine granules that are stained in borax-carmine, and recall those of a prostate.

Each of the *tubercula pubertatis* is a spherical mass of club-shaped cells, filled with smaller spherules than the clitellar cells, but highly refringent, and unstained in borax-carmine as they are; they are about one-quarter the diameter of the clitellar spherules. All the cells are of the same length, the necks or ducts being convergent, and are usually deeply stained.

The single pair of *ovaries* lies in the usual position in the 12th segment; and a paired ovisac, containing large ova, passes through 13, 14, and 15.

The single pair of *spermathecae* lies in the 8th; each is a long club-shaped sac, confined to this segment, and opening by a short narrow duct at the anterior margin of the segment.

Localities.—Auckland Islands: (*a.*) Camp Cove magnetic station; (two specimens). (*b.*) 200 ft. above the Watering Creek; (five). (*c.*) Masked Island; (one). (*d.*) Under logs, near camp; (several). (*e.*) Soil, North Arm, Carnley Harbour; (one). (*f.*) Port Ross; (two). (*g.*) Fairchild's Garden, Adams Island; (thirteen).—Campbell Island: (*h.*) Several; (W. B. B. and W. K. Chambers).

Remarks.—This new species agrees with *P. ignatovi*, Mich.,* *P. darlingensis*, Mich.,† and *P. africanus*, Mich.,‡ in (1) having the male pores on successive segments 11, 12, as in the genus *Haplotaxis*, and (2) a single pair of oviducal pores at 12/13; and it agrees with *P. violaceus*, Bedd.,§ *P. darlingensis*, and *P. africanus* in having a single pair of spermathecal pores at 7/8. But from all the previous species it differs in various ways: the Western Australian species (*P. darlingensis*) is smaller, and the dorsal chaetal gap (*dd*) is about equal to half the circumference of the body, while it is much less in this new species; but in none of the species is any mention made of the glandular copulatory ridge on the 11th segment. Further, the position of the male pores on the segment is different: in the Western Australian species they are outside the chaetae, whereas in this they are in line with them.

Pelodrilus aucklandicus, sp. nov. (Plate XI, fig. 15.)

This is apparently a rarer worm, for only three individuals were collected. The segments are well defined by deep intersegmental furrows.

Dimensions.—The length is 55 mm. by 1·25 mm., with 140 segments in the fully mature specimens.

Colour.—Grey (in alcohol), the body-wall translucent, except the anterior end, which is opaque-whitish; the cuticle is thinner than in the preceding species, and somewhat less shiny.

Prostomium short, conical, rather more pointed than in the previous species, with a narrower base.

Chaetae in couples, all sigmoid, the dorsal and ventral being of equal length throughout the body—*aa* is less than *bc*, which is less than *dd*.

* Michaelsen, Verhandl. Naturwiss. Vereins. in Hamburg, 3, folge x, p. 3, 1903.
† Michaelsen, Die Fauna S.W. Austral., bd. i, Oligochaeta, p. 134, 1907.
‡ Michaelsen, Die Oligoch. Deutsch. Sud-polar Exped. 1901–3, p. 19, 1905.
§ Beddard, Trans. Roy. Soc. Edinburgh, xxxvi, p. 292, 1891.

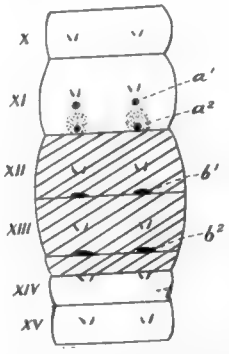
The dorsal gap (*dd*) is about one-third the circumference of the body.

The *clitellum* covers the whole surface of segments 12, 13, and ½ 14; its boundaries are quite sharply marked, and are especially well seen when the body-wall is stained and mounted entire. The anterior margin crosses behind the male pores.

There are two pairs of *male pores*, both on the 11th segment, on a low papilla. The anterior are immediately behind the ventral chaetae; the posterior are quite close to the hinder margin of the segment.

There are two pairs of *oviducal pores*, large and slitlike, in line with the ventral chaetae at 12/13, 13/14, as in the genus *Haplotaxis*.

The single pair of *spermathecal* pores is at the side of the body, at 6/7.



PELODRILUS AUCKLANDICUS.
View of the genital region.

a^1, a^2, the male pores; b^1, b^2, the two pairs of oviducal pores. a^2 lies in a dotted area, which represents the openings of an internal copulatory gland or prostate.

Internal Anatomy.

The *septa* behind 7, 8, 9, 10, and 11 are slightly thicker than the posterior ones.

The short *pharynx* occupies 2, 3. There is no gizzard; this I specially looked for, since Michaelsen has pointed out that the only difference between *Pelodrilus* and *Haplotaxis* is the presence of a gizzard in the latter.

The oesophagus is straight, and has no dilatations. The intestine commences in 17.

Septal glands in 5, 6, 7, and 8.

There are no enlarged hearts, though vascular loops are present as usual.

The *nephridia* commence in 8, occur in 9, 10, are absent in 11, 12, 13, 14, and resume in 15, 16, &c.

The two pairs of *testes* and *funnels* are in 10, 11. The funnels are large and flat, except at the ventral margin, which is curled upwards below the exit of the duct. In contrast with the preceding species, the whole back of the funnel is attached to the septum. The sperm-ducts are not convoluted (Plate XI, fig. 15). The anterior duct, after perforating the septum, passes obliquely upwards and backwards in a straight line, so that it is cut for nearly its entire length in a longitudinal section; then it forms two or three small undulations before returning parallel to its former course downwards and forwards along the posterior surface of the chaetal muscles to the body-wall, to open by a small pore just behind the ventral chaetae of segment 11. The posterior sperm-duct, after perforating the septum 12/13, takes a similar course, and opens to the exterior close in front of the intersegmental furrow 11/12. The septum 11/12 is here in front of this furrow, so that internally the pore would be said to belong to the 12th segment, but externally the furrow, though but slight just here, can be traced across the ventral surface, and becomes quite deep. There is no doubt that this pore lies in front of this furrow.

In segments 11 and 12—*i.e.*, on each side of the septum separating them—is a great gland on each side of the body, opening on to the flat papilla mentioned in the account of the external anatomy. This copulatory gland, like that in *P. ignatovi*

and *P. hologynus*, consists of several groups of long club-shaped cells, whose necks pass through the epidermis in separate bundles. It is no doubt functionally a prostate gland. The anterior sperm-duct opens in front of it, the posterior duct near its hinder margin.

There is a paired *sperm-sac* in 9; a second pair arises as an evagination of septum 11/12, and extends through at least segments 12 to 19, the last segment to be included in the series of longitudinal sections.

There are two pairs of *ovaries*—in 12, 13—and the oviducts are provided with large funnels, opening at 12/13, 13/14. A pair of ovisacs lies in 13 and 14, which are occupied by large eggs.

A pair of *spermathecae;* each is a long pyriform sac, which starts from the pore at 6/7 as a narrow short muscular duct, but soon widens out into the ampulla, which curves backwards as it passes below the oesophagus into segment 8; here it crosses over to the opposite side, and ends in an enlargement.

Localities.—Auckland Islands: (*a.*) Camp Cove magnetic station; two; (W. B. B.). Adams Island: one; (Speight). [I have also a specimen which I collected some years ago on Stewart Island.]

Remarks.—The species is so similar to *P. hologynus*, Mich.,* from Western Australia, that were it not that the second male pore, which is undoubtedly on the 11th segment in this new species, is according to Michaelsen on the 12th, close to the anterior margin, I should have placed it in that species. It agrees with it and with *P. ignatovi*† in possessing the copulatory gland inside the 11th and 12th segments. In this genus we have exemplified a most interesting shifting of the male pores, so that the difference between it and *Haplotaxis* is reduced to a minimum. In the typical species, *H. gordioides*, the male pores are on successive segments, and the two pairs of female pores are at 12/13, 13/14, as in *P. hologynus* and *P. aucklandicus;* but the remaining species of *Pelodrilus* have only one pair of female organs, while *Haplotaxis heterogyne*, Benham,‡ has also but one pair of ovaries. As to the male pores, in *P. violaceus* they are both on 12—the anterior at the front, the posterior at the back of the segment. In *P. ignatovi* and *P. africanus* the anterior pore is in 11, at the front margin, the posterior at the front of 12; in *P. darlingensis* the anterior pore has moved back to the middle of the 11th; in *P. hologynus* it has reached the hinder margin of the segment; while in *P. aucklandicus* the posterior pore has moved forwards into the 11th segment, so as to be quite near the anterior pore.

The study of this genus seems to be opposed to the Mutationists, for there is quite a gradual transition—no sudden jump from one condition to another. I am almost inclined to unite the two genera, *Pelodrilus* and *Haplotaxis*, as I lay less stress upon the importance of the gizzard than does Michaelsen: surely it is one of those characters that are readily affected by the habits of life.

* Michaelsen, Die Fauna S.W. Austral., bd. i, Oligochaeta, p. 136.

† Michaelsen, Verhandl. Naturwiss. Vereins, 1903, p. 3.

‡ Benham, "On a New Species of the Genus *Haplotaxis*" Quart. Journ. Micr. Sci., xlviii, p. 299, 1904.

Fam. MEGASCOLECIDAE.

Subfam. ACANTHODRILINAE.

Notiodrilus, Michaelsen, 1899.

Notiodrilus fallax, sp. nov. (Plate XI, figs. 16, 17.)

Three individuals.

Colour.—Dark chocolate-brown (in formol); pigment extends over the ventral surface.

Dimensions.—The largest, which is a good deal contracted, is 175 mm. in length and 11 mm. in diameter; no doubt, in life it would have reached at least 200 mm.

The *prostomium* is epilobic about half, with a transverse groove, but no marginal extensions backwards. The anterior segments are biannulate, the limits quite distinct; the post-clitellar segments are triannulate.

Chaetae.—In the mid-body $ab = cd$; bc about $1\frac{1}{2}\ ab$; $dd = 6\ ab$; $aa = 2\ ab$—that is, $> bc$. In the preclitellar region $ab < cd$; $aa = bc$.

The *clitellum*, which is very dark brown in colour, is saddle-shaped, and ceases at line *b*; it covers segments 14–19, the ventral surface of which is pale yellowish.

Genital Pores, &c.—The spermatic groove is concave ventrally, and allows both chaetae *a* and *b* to be seen in each of the segments 17, 18, and 19. Spermathecal pores are invisible externally, but lie in the usual position. Nephridiopores, as seen in section, are just below chaeta *c*.

Internal Anatomy.

The *septa* behind segments 9–12 are very thick, and that of 13 nearly as thick.

The *dorsal vessel* is double throughout; hearts in 10–13.

The *gizzard* is large, in the 6th segment; oesophageal glands in 13 and 14.

Nephridia very small, in a single row; extend only from *b* to *c*; those of the 4th segment are large pepto-nephridia, but whether they open into the gut or not I did not ascertain, as the body is too contracted to allow me to trace them by dissection.

The *testes* and *ovaries* are on the anterior wall of their segments: sperm-sacs in 9 and 12; both are large, saclike, and but feebly racemose; there are none in the intervening segments.

Prostates compressed, the tube being a good deal contorted, so as to form a more compact mass than is common in the genus (Plate XI, fig. 17). Each is limited to its own segment; has a narrow duct, which passes transversely across the body-wall for a distance equal to about half the breadth of the gland, to open to the exterior in the line *b*. No penial chaetae are recognisable, and no "arcuate" muscles are present in these segments

Spermathecae.—Two pairs, in the 8th and 9th segments; each has a couple of glomerulate diverticula opening into the duct, close to the body-wall, on the anterior and posterior aspects respectively (Plate XI, fig. 16).

Locality.—Snares Island; in company with *N. haplocystis.*

Remarks.—In an important monograph of the earthworms of south-west Australia, Michaelsen* proposes to subdivide the older genus *Notiodrilus* into two genera, one of which has a well-developed gizzard, and the other has it in a vestigial condition. To the former he gives the name *Eodrilus;* the latter group of species he places in the genus *Microscolex*, for which he gives an amended diagnosis.

His diagnosis of *Eodrilus* only differs from that of *Notiodrilus*† in the words "gizzard well developed." In it he includes three New New Zealand species—*E. annectens*, *E. haplocystis*, and *E. paludosus*.

The amended genus *Microscolex* (= *Notiodrilus*, Mich. + *Microscolex*, Rosa) contains species in which there are two pairs of prostates, on segments 17 and 19, with the male pore on the 18th (the characteristic old Acanthodriline condition), as well as species with only one pair of prostates and male pores, both on the 19th segment (the typical *Microscolex* condition). He separates the former from *Eodrilus* merely on account of the minute gizzard. It seems to me that the double prostate pair is a more important feature than the size of gizzard, which may, one would imagine, readily be associated with the nature of the food. The only recommendation for the union of the old genera *Notiodrilus* and *Microscolex* is that by the removal of those species which he includes in *Eodrilus* he obtains a group of species which has an antarctic circumpolar distribution; whereas *Eodrilus* is more diffusely distributed, but at the same time contains several species found in the southernmost lands—indeed, half the species are subantarctic.

I regret that I cannot follow him in thus rearranging these species. It seems to me that on grounds of convenience and evolution‡ the name *Notiodrilus* should be retained for the worms with the two pairs of prostates, and that to make use of the name *Microscolex* for the mixed set of species is undesirable, quite apart from the insufficient grounds for such a grouping as he proposes. In this paper, therefore, I shall retain the name *Notiodrilus* as defined by Michaelsen§ in 1899.

I may point out that Michaelsen does not seem quite consistent in the value he puts upon this gizzard-character. He uses it also to distinguish the genus *Perionyx* from *Perionychella*, the former having a vestigial gizzard, the latter a more or less well-developed one. Yet in an account of some new species of these genera from India, 1907 ("Neue Oligochaten von Vorder-Indien," &c.), he describes species of both in almost identical terms: thus, several species of *Perionychella* are stated to have "very small gizzards, only a little thicker than the neighbouring part of the oesophagus." For instance (p. 156), *P. sikkimensis:* "Ein kleiner cylindrischer Muskelmagen in 6 (?) Segment, kaum dicker als die benachbarten Oesophaguspartien, aber nicht eigentlich rudimentar." Of *Perionyx himalayanus* he writes of the gizzard, "Derselbe ist kaum dicker als die benachbarten Partien des Oesophagus und hat kaum dickere Wande." What remains of the distinction between the two genera?

* Michaelsen, Die Fauna S.W. Austral., bd. i, Oligochaeta, p. 138.

† Michaelsen, "Das Tierreich: Oligochaeta," 1900, p. 128.

‡ According to Michaelsen, species of *Microscolex* may arise at different times, in different parts of the world, from different species of *Notiodrilus*. This thesis involves so profound a modification in the accepted ideas of evolution that space will not permit me to discuss the problem here.

§ Michaelsen, Zool. Jahrb. Syst., xii, 1899, p. 239.

It is true that in some of the species of *Perionychella* he writes that the testes and sperm-funnels are "apparently free," while for the species of *Perionyx* he states that they are enclosed in "testikelblasen."

Notiodrilus haplocystis, Benham.

1901. *Acanthodrilus haplocystis*, Benham, Trans. N.Z. Inst., xxxiii, p. 130.
1907. *Eodrilus haplocystis*, Michaelsen, Die Fauna S.W. Austral., Oligochaeta, p. 141.

I obtained a number of individuals on the occasion of each of my visits to the Snares, in February and November, 1907. I am thus able to add the following facts to my original account.

It is very common under stones and in the soil.

Colour.—Orange-brown; the darker segmental ring referred to in my former account is not so striking in fresh as in preserved specimens, nor so marked in those in formol as in those in alcohol, but when fully extended a paler band is recognisable in the anterior region of each segment.

Dimensions.—The largest individual measures 460 mm. by 6 mm.; the smallest is 220 mm. by 9 mm.; this is, however, much contracted, so that it is unusually thick. The average seems to be about 360 mm. by 7 mm. The worm is thus of considerable length and stoutness.

The anterior segments are quadriannulate; the post-clitellar segments are triannulate.

Clitellum.—When fully developed the clitellum is dark brown, and extends over segments (13) 14–19 (20). Of the five individuals collected in February only two have the clitellum well developed; while of the seven obtained in November it is present in three, but in only two of these is it fully developed. Hence it appears that there is no seasonal difference in regard to the maturity of the reproductive organs, and that, like the European worms, the breeding season is not confined to any particular period of the year.

Internal Anatomy.

The large *gizzard* is not wholly confined to the 6th segment, but the anterior third lies in the 5th, the septum 5/6 being inserted round it at this point. The oesophagus has thick longitudinally folded—*i.e.*, "lamellate"—walls in segments 9–13; it becomes much narrower in 14–19, but is somewhat dilated in each of the segments 14, 15, and 16, though no distinct glands exist. The intestine commences in the 20th.

The *nephridia* are, in proportion to the diameter of the body, of very small size, extending from chaeta *a* to *c*, lying close to the wall, as a fine slightly convoluted tube, without a muscular bladder or duct. The tube can be traced through the wall at the level of *c*.

Of the three pairs of *sperm-sacs*, those in segments 9, 10, are long, narrow, and far apart, while those in the 12th are close together.

The simple form of the spermatheca which characterizes the species is exhibited by all the individuals dissected.

Notiodrilus aucklandicus, Benham.

1903. Trans. N.Z. Inst., xxxv, p. 275. 1905. Trans N.Z. Inst., xxxvii, p. 287. 1907. *Microscolex aucklandicus*, Michaelsen, Die Fauna S.W. Austral., Oligochaeta, p. 143.

This species was originally collected by the late Captain Hutton on the Auckland Islands, probably at Fairchild's Garden, on Adams Island, which is usually visited by the Government steamer. Later, Dr. L. Cockayne brought me specimens from the same spot and also from Campbell Island, and an injured specimen from the Antipodes Island. During the stay of the expedition on the Aucklands I obtained specimens from several more or less widely separated spots, enumerated below; I am therefore able to give a more detailed account of this species than was possible in my former paper.

Colour.—The general colour, when alive, is brown, though it offers variations in the depth of tint—for instance, that from Disappointment Island is much paler than the typical form. The preclitellar region is normally reddish-brown to sienna. Those preserved in formol appear rather greyish posteriorly, owing to the intestine being filled with earth, which shows by transparency through the body-wall and tones down the brown tint. Those preserved in alcohol have a yellowish tint.

Dimensions.—The length varies from 72 mm. to 118 mm.; naturally, the size depends on the state of preservation, some being killed in an extended condition, either well preserved and firm or ill-preserved and soft; others are killed in a state of contraction. The average length seems to be about 90 mm. to 110 mm., with a diameter of 3 mm. These have about 100 segments. The number of segments is not proportional to the length: thus, the greatest number is 112 for a worm 95 mm. in length; the least number is 84, measuring only 72 mm., though another has 94 segments in the same length of body; while the longest specimen (118 mm.) has only 108 segments. Owing to the different conditions of preservation, these numbers have but little value.

Chaetae.—Each individual chaeta is usually surrounded at its base by a pale ring, so that their position is very evident in the anterior region. The chaetal formula is somewhat variable, but the three intervals *aa*, *bc*, *dd*, are essentially equal; *ab* is a very little less than *cd*, which is considerably less than *bc*; *ab* is approximately equal to two-thirds *aa*; the slight differences observable on careful examination may be due to the differences in preservation—whether soft or firm—as well as to the study of different parts of the body, as towards the hinder end of the worm the intervals all become practically equal. The method followed in measuring these intervals was as follows: I examined individuals from various localities, cutting through the body-wall along one side and flattening out the skin after removing the intestine; the chaetal intervals were then measured with the ocular micrometer. A comparison with the type, which I re-examined, shows that the formula given in my paper (1903) is not correct, for I seem to have confused the line of nephridiopores which occurs *a little below* the line of *c* with that line, so that the formula gave $bc = cd$. I also measured the intervals on the "round" without slitting the body up; and in other cases, as a confirmation, I measured them in transverse sections. As a result of these varied measurements, I now find the chaetal formula to be $aa = bc = dd$; $ab = cd = \frac{2}{3}\, aa$.

The *clitellum* usually covers segments 14–17, though in one case the 13th segment was glandular, while in others the 17th was not.

There is a considerable amount of variation in the number and position of the *tubercula pubertatis*; though typically they are paired, yet often only one of a pair is present. The typical arrangement seems to be as follows: A pair on each of the segments 17, 18, 19, and 20, sometimes also on 16 and 21; these are in the neighbourhood of chaeta *a*, usually prechaetal in 17, 18, 19, and 20, post-chaetal in 16; but these positions are not quite constant. In addition, there are preclitellar tubercles on segment 10, and in one case on 8 as well; these are post-chaetal.

The *dorsal pores* commence at 11/12; and the *nephridial pores*, instead of being in line with chaeta *c*, as I described in 1902, are in reality a little distance below this line, as can be seen both in trans-sections and on the flattened skin.

Internal Anatomy.

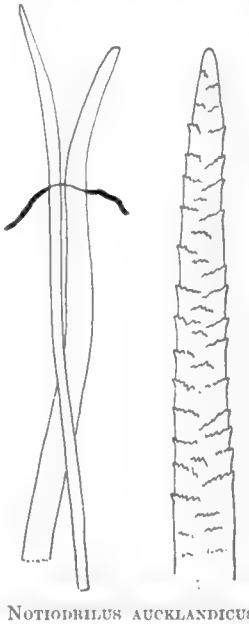
I must add to the facts recorded in my previous paper the following:—

A small *gizzard* is present in the type, which I overlooked till I had noted it in the new specimens. It is situated in the 5th segment, and is concealed by the dorsal wall of the pharynx. Being no broader than the oesophagus, it was only in bisected worms that the thick cuticle and compact musculature became evident; of course, in longitudinal sections it is readily recognisable.

The oesophageal glands in the 13th and 14th segments are not always definitely rounded, but the tube is here somewhat dilated and the walls lamellate; it narrows in the 15th, and the intestine commences in the 17th segment.

I have also to note that there is a third *sperm-sac* in the 9th, of small size.

The two *penial chaetae* in each bundle are slightly different from one another—one (*a*) is broader, of deeper colour, and bluntly pointed (this was figured in 1903, pl. xxvi, fig. 10); the second (*b*) is rather finer, tapering, and more sharply pointed. Both are slightly bent at about the level of the surface of the body. The ornamentation extends nearly to the apex, though in those which have been worn it ceases some little way below the end.



NOTIODRILUS AUCKLANDICUS.

The pair of penial chaetae; the curved transverse line represents the surface of the body (× 100); and the tip of slender chaeta enlarged (× 250).

Localities.—Adams Island; on the *Pleurophyllum* meadow, or Fairchild's Garden, as it is usually termed. Camp Cove magnetic station; a flat piece of grassy ground just about a foot or so above sea-level. Masked Island; among the roots of *Stilbocarpa polaris* (Aston). Under logs in various parts of Auckland Island.

Var. **bollonsi**, n. v.

Two worms were collected for me on Disappointment Island by members of the expedition.

One of them is a variety of *N. aucklandicus*. It is paler than the majority of the typical individuals, and has a different spacing of the chaetae, in that *aa* is less than

dd, so that the formula is $aa < ab < bc$; $bc = cd$; $aa = \frac{3}{4}\, dd$. In this respect it is intermediate between a typical *N. aucklandicus* and *N. campbellianus*. It has tubercula on 9 and 10, median in position ; while those of 17, 18, 19, and 20 are paired. The spermathecal duct is much wider and the ampulla less dilated than in the typical specimens, although the organ is filled with spermatozoa. These differences are, however, overshadowed by the undoubted agreements in such matters as the size and shape of the penial chaetae and other diagnostic features ; so that, while not deserving specific separation, it seems desirable to distinguish it by a name. I therefore associate with the variety the name of Captain Bollons, of the Government steamer " Hinemoa," a keen naturalist himself, who did all in his power to further our aims and to assist us in every way during the expedition.

Var. **pallidus**, n. v.

Other divergent individuals were found in logs on Enderby Island, in company with *N. campbellianus*.

This variety is a minute, colourless form, only 23 mm. in length by 3·25 mm. in diameter ; contains only 76 segments, though it is quite mature, with a half clitellum covering segments 14–16, and tubercula pubertatis as follows : Paired on 10, 20 ; median on 16 and 18. It agrees in its chaetal formula and in its general anatomy, including the penial chaetae and spermatheca, with *N. aucklandicus*.

Notiodrilus campbellianus, Benham.

1905. Trans. N.Z. Inst., xxxvii, p. 288. 1907. *Microscolex campbellianus*, Michaelsen, Die Fauna S.W. Austral., p. 143.

Like the foregoing, this species was originally collected by Dr. Cockayne, who discovered it on the sea-shore on Campbell Island.

It is much smaller than the foregoing, and appears to be less common ; perhaps this is only because its colour, being darker and harmonizing more nearly with the logs under which it is usually found, renders it less noticeable. The dark chocolate-brown pigment is distributed almost over the entire body, the lower side being nearly as dark as the upper, and the hinder as the anterior end. The chaetae are set in white spots, which are much more conspicuous and are absolutely larger than in *N. aucklandicus*.

The length varies from 23 mm. to 45 mm., while one well-preserved specimen extended to 52 mm. The number of segments varies from 65 to 85.

The *chaetal formula* differs from that of the preceding species chiefly in the much greater separation of the dorsal chaetae (*dd*), the remaining spaces being approximately equal, though *ab* is less than *cd*.

The *tubercula pubertatis* exhibit the same sort of variability as before. It appears that a pair on 17 and 19 are constant. An additional pair often occurs on the 21st, and more rarely on the 22nd. In one individual they are also present on 14th and 16th, and in one case the 8th and 9th also bear tubercles.

The *nephridiopore* is in the same position as in the preceding.

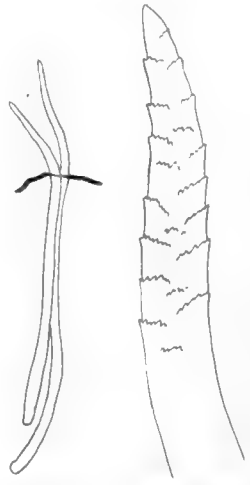
Internal Anatomy.

Although I can detect no gizzard, yet in sections there is visible a small one in the 6th segment, concealed by the pharyngeal muscles and glands. The oeso-

phagus is dilated in 11 and 12, with lamellate walls; in 13, which is constricted from the last, the wall has the same structure, but the tube is much compressed; it narrows in the 14th; and in the next segment, the 15th, the tube widens to become the intestine.

As in the preceding species, there is a small *sperm-sac* in the 9th segment, as well as in the 11th and 12th.

The *penial chaetae* differ from those of *N. aucklandicus*. The two chaetae of a bundle are about equal in length and thickness, but exhibit a difference in curvature, one being more sharply bent than the other. Both are finely pointed, and herein I was in error in my original account, where I stated that "the tip is blunt." I find that I had mistaken a chaeta from a specimen of *N. aucklandicus*, collected on the Campbell Island, for that of the present species. A re-examination of the type and of other individuals shows that both are finely pointed, and the ornamentation extends nearly to the tip, but, being much finer than in the preceding species, is easily overlooked in a worn bristle



NOTIODRILUS CAMPBELLIANUS.

The pair of penal chaetae. The curved transverse line represents the surface of the body (×100); also the tip of the chaetae further enlarged (×250).

In my original account of this species (1904, p. 289) I indicated the slight amount of difference between it and *N. aucklandicus* and *N. macquariensis*. After a renewed study of each of them I am convinced that they are distinct, as indicated by differences (slight perhaps, yet constant) in chaetal formula, penial chaetae, &c. Apparently *N. campbellianus* is more nearly allied to *N. macquariensis* than to *N. aucklandicus*, as seen in the size of the worm, the chaetal formula, penial chaetae, and spermatheca.

A comparison of the chaetal formula of *N. aucklandicus* and *N. campbellianus* can be made by reducing the interchaetal spaces to some common term. These spaces were measured on the flattened skin by means of an eye-piece micrometer in a number of specimens of each species. Taking *dd* equal to 24, the spaces are,—

Interchaetal Space.	*N. aucklandicus.*	*N. campbellianus.*
aa	24	15
ab	16	12
bc	24	15
cd	17	15
dd	24	24

There is no doubt that *N. macquariensis* differs from both the others in having the nephridiopore in the same line as chaeta *c*—not below it, as in the other two; also, the dorsal vessel is double up to the 11th; the oesophagus is dilated in the 16th segment.

Localities.—Campbell Island; (W. B. B.; February, 1907). Auckland Island; in logs; and bush soil on shore of Carnley Harbour; (W. B. B.; November, 1907). Enderby Island; in logs; (W. B. B.).

Notiodrilus macquariensis, Beddard.

1896. *Acanthodrilus macquariensis*, Beddard, Proc. Zool. Soc., p. 208. 1900. *Notiodrilus macquariensis*, Michaelsen, "Oligochaeta." 1901. Benham, Trans. N.Z. Inst., xxxiii, p. 132. 1907. *Microscolex macquariensis*, Michaelsen, Die Fauna S.W. Austral., p. 143.

I gave a detailed account of this species in 1900. Although the Macquaries were not included in our expedition, as it is not under the Government of New Zealand, yet I include it in this report as a link with the other subantarctic islands.

Plagiochaeta, Benham, 1892.

Plagiochaeta plunketi, sp. nov. (Plate XI, figs. 18–20.)

A single individual.

Colour dark violet, even after eighteen months in formol. Each of the preclitellar segments has a pale chaetal ring round it. The clitellum is uniformly violet-grey posteriorly; a narrow line of bluish-grey runs along the median dorsal line. This pigment is situated in the connective tissue of the circular and longitudinal muscle-layers, not in the epidermis, except in the clitellum, where it appears in amongst the gland-cells.

Dimensions.—The worm is 70 mm. by 1·75 mm., and consists of 112 segments.

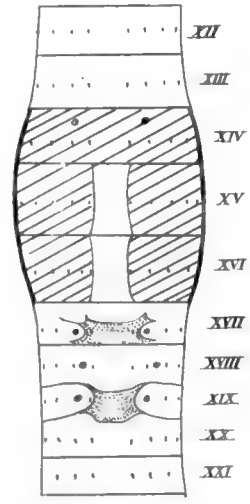
The *prostomium* is epilobic, $\frac{3}{4}$, without transverse groove.

The *clitellum*, though not fully developed, as the chaetae are still visible, covers segments 14–16 (17); it extends over the ventral surface in the anterior portion, but leaves the middle of the 15th and following segments free from glandular tissue.

The *chaetae* are 16 in each segment, 8 on each side, throughout the worm. The spaces $ab = cd = fg = \frac{3}{4}\ bc$; $bc = de = ef = gh$; $aa = 2\ bc$; $hh = 2\ ab$ — that is, the dorsal gap is rather greater than the ventral.

Dorsal pores commence at 12/13 segments.

Nephridiopores in line with *d* or *e*.



Plagiochaeta plunketi.
Ventral view of the genital segments. (× 10.)

Genital Pores.—The single specimen was studied by means of longitudinal sections, for it was so bent at the critical point that it was impossible to make out accurately the arrangement of the genital pores. The "porophores," or papillae carrying the prostate pores, on segments 17 and 19 are in a deep depression, owing to the contraction of strong dorso-ventral muscles of these segments.

The two most ventral chaetae are present on the median side of the pores. There is no apparent ornamentation; at any rate, none is visible in Canada-balsam mounts. The lowest, *a*, is normal, but *b* is enlarged, and by no means so much modified as usual. Each penial chaeta is stouter and longer than an ordinary locomotor chaeta, and is hooked terminally (Plate XI, fig. 19).

The male pore is on a slight papilla on the 18th, just outside chaeta *b*.

The oviducal pores are clearly visible in line *b*, on the usual segment.

Spermathecal pores, two pairs, at 7/8, 8/9, are also very distinct, owing to their pale colour, just outside *b*.

Internal Anatomy.

The *dorsal vessel* is double; the last heart in the 13th segment.

The *nephridium* is small and difficult to trace in sections; it is entirely limited to the prechaetal portion of the segment, and the tube is "tufted" at the level of *d* and *e*; but I am not quite sure at which level it opens.

The *gizzard* may be said to be "absent," and in a dissection would be overlooked; but in sections one may detect a minute vestige in the 6th segment. The wall is no thicker than that of the oesophagus immediately behind it, but the musculature is slightly better developed, and it is recognisable by the absence of villi on the inner surface (Plate XI, fig. 18).

The oesophagus is dilated in segments 14, 15, and its wall lamellate; it is also thick-walled; though narrow in 17th to 19th, the gut suddenly dilates again, the wall becomes thin, and the intestine commences in the 20th segment.

Testes and *ovaries* in the usual position; two pairs of sperm-sacs, in 9 and 12, racemose. The prostates are tubular. The ovary large.

Two pairs of *spermathecae*, in 8, 9. The ampulla is more or less ovoid; the duct wide and short, and receives two diverticula, tubular in form—one comes off anteriorly, close to the body-wall, the other posteriorly, a little further from it (Plate XI, fig. 20).

Locality.—Snares Island.

Remarks.—The occurrence of so typical a New Zealand genus on the Snares is, of course, just what one would expect. The species comes near *P. lateralis*, Benham,* from which it differs in the practical absence of a gizzard and in the less number of chaetae.

I cannot here discuss Michaelsen's recent proposal (1909) to subdivide this genus.

LEPTODRILUS, gen. nov.

In 1904 I described a species of worm from one of the southern islands under the name *Rhododrilus leptomerus*,† which, resembling *R. cockayni* in most of its anatomical features, presents the very remarkable character of having the male pores on the 16th segment instead of on the 17th, which is the generic character for *Rhododrilus*. In order to emphasize this fact, I deem it desirable to separate this and another species from *Rhododrilus* as a new genus.

Leptodrilus leptomerus, Benham. (Plate XI, fig. 21.)

1905. *Rhododrilus leptomerus*, Benham, Trans. N.Z. Inst., xxxvii, p. 291.

Of this species, which was originally collected by Dr. Cockayne, I have now a good series, both from the Auckland Islands and from Campbell Island. In the latter place it seems very common, judging from the number received by me since

* Benham, Trans. N.Z. Inst., xxxv, p. 282, 1903.

† Benham, Trans. N.Z. Inst., xxxvii, p. 291, 1905.

the return of the expedition. Some two or three dozen were collected by Mr. Chambers, who lived on the island for some months in the early part of 1908. I will, therefore, add a few notes to my original account.

Colour.—The anterior, preclitellar, region is whitish, or very pale grey; there is no pigment, but the thick wall is opaque; posteriorly, where the wall is thin, the intestinal contents are visible through it, so that a grey colour results (in formol), as in life. The clitellum is pale orange-brown, the colour being retained in formol better than in alcohol, in which the type was preserved.

The *dimensions* of the mature worm vary from 50 mm. by 2·75 mm. to 85 mm. by 2 mm.; the number of segments from 45 to 122; but, as in other cases, the longest worm has not necessarily the most segments, partly, no doubt, owing to differences in the method of killing and preservation. Thus: Length 80 mm., 90 segments; length 75 mm., 122 segments (and this is soft, so that it is really shorter); length 65 mm., 118 segments.

Of the internal anatomy, the only organ to which I will draw attention is the *spermatheca*, the diverticulum of which is, in several individuals, roughened at its apex, from the number of chamberlets which beset it; this is especially well seen in empty spermathecae.

Localities.—Auckland Islands: (*a.*) Bush soil; North Arm of Carnley Harbour; (W. B. B.). (*b.*) 300 ft. above sea-level; (W. B. B.). (*c.*) Adams Island; Fairchild's Garden; (Aston). (*d.*) Adams Island; 2,000 ft. above sea-level; (Speight). (*e.*) Enderby Island; near shore; (W. B. B.).—Campbell Island: (W. K. Chambers).

Leptodrilus magneticus, sp. nov. (Plate XI, fig. 22.)

A solitary individual was collected, with several other species, at the magnetic station No. 1, at Camp Cove. It differs from the preceding in the following points:—

The dimensions are greater, the length being 133 mm. by 2 mm., with 130 segments.

Chaetal formula: $bc = 2\,ab < aa$; *bc* slightly greater than *cd*.

The clitellum occupies segments 13 to $\frac{1}{2}$ 16.

Small paired tubercula pubertatis on the 13th and 14th segments, post-chaetal in position; and a median one on the 19th.

There is but one pair of spermathecae, in the 8th segment.

The penial chaetae are more strongly bent than in the preceding, and resemble those of *Rhododrilus cockayni*.

RHODODRILUS, Beddard, 1889.

Rhododrilus cockayni, Benham.

1905. Trans. N.Z. Inst., xxxvii, p. 289.

The distribution of this species, which occurs both on the Auckland and Campbell Islands, is of interest owing to its "euryhaline" nature, which, being interpreted, means that it can withstand considerable changes in the salinity of the water, and thus may occur on or in the immediate neighbourhood of the sea-shore. I found it in great numbers at the head of the North Arm of Carnley Harbour, below high-water mark; on the other hand, it also occurs on hills, as on Mount Honey, on Campbell Island.

The range in size is greater than that recorded in my original account, the specimens then at my diposal being all in a soft, ill-preserved condition. Those recently collected by me are in a better state, and the worm has a smaller average length than I supposed.

The mature animals vary from 60 mm. to 115 mm., with from 83 to 110 segments.

Localities.—Auckland Islands: (*a.*) Carnley Harbour; sea-shore; (W. B. B.). (*b.*) On plants. (*c.*) Adams Island; Fairchild's Garden (*Pleurophyllum* meadow); (W. B. B.; February, 1907). (*d.*) Top of hill above western entrance to Carnley Harbour; (W. B. B.; February, 1907). (*e.*) Norman Inlet; sea-shore; (G. R. Marriner).

Campbell Island: (*a.*) Mount Honey; (W. B. B.; February, 1907). (*b.*) Monument Harbour; (J. B. Mayne). (*c.*) Sea-shore; (C. Chilton). (*d.*) Tussock, near shore; (H. B. Kirk and W. K. Chambers). (*e.*) Under moss, Monument Harbour; (G. R. Marriner).

Var. **waterfieldi**, nov.

While at the Snares in February four specimens of a *Rhododrilus* were collected which differs only in unimportant details from *R. cockayni*, worthy perhaps of varietal recognition owing to geographical rather than anatomical reasons. I therefore name it after the Private Secretary to His Excellency.

Pale grey in colour, the size varies from 58 mm. to 78 mm., with 90 segments. It is rather curious that the same number of segments occurs in each individual.

The chaetal formula agrees with that of the type, as does the position of the clitellum. There are, however, only two spermathecal pores; and were it not that in some individuals of *R. cockayni* I note this reduced number I should place this variety in a new species.

The tubercula pubertatis occur on the 19th segment, large and paired so as to look like the porophores of *Notiodrilus*, which I at first glance supposed it to be. The papilla possesses three stout chaetae, of which two are "reserves": the third is a normal locomotor chaeta.

There is a second pair of tubercles on the 9th segment, outside the chaeta *b*.

The only internal difference is the existence of only two pairs of spermathecae, in segments 8, 9, each with a tubular diverticulum as long as the ampulla. The other genitals agree with *R. cockayni*.

Subfam. MEGASCOLECINAE.

Plutellus, Perrier, 1873.

Plutellus aucklandicus, sp. nov. (Plate XI, figs. 23–26.)

This worm forms a marked contrast to the rest of the earthworms collected on the Auckland Islands, in being white. Several individuals were obtained, both during the stay of the expedition and in the short visit I paid in February. The specimens at both times of the year were at various degrees of maturity.

The *colour* is white, with orange-brown clitellum, and has quite the appearance of a species of *Octochaetus*, for which I at first mistook it.

Dimensions.—The mature worms vary from 100 mm. to 125 mm., with a diameter of 4 mm. or 5 mm. There are from 126 to 130 segments.

The *chaetae* are, of course, 8 per segment. The ventral chaetae are close together; the dorsals are further apart, the distance being about equal to the lateral space between the two couples. The ventral gap is greater than the lateral, and the dorsal still greater, equal to about $\frac{3}{8}$ of the circumference of the body. The formula, then, reads: $ab = \frac{1}{3}\,cd$; $bc = cd$; $aa = 4\,ab$; $dd = 8\,ab = 2\frac{1}{2}\,bc$. The line *d* is straight—*i.e.*, there is no shifting of the dorsal chaetae, as in certain other species.

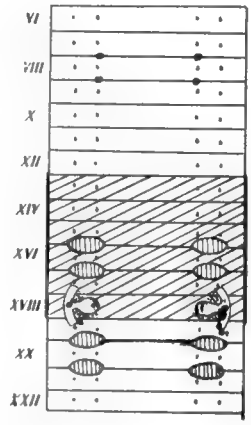
The *clitellum* is saddle-shaped on segments 13–18 (six).

Genital Pores, &c.—On segment 18 is a pair of small papillae, in line with the ventral chaetae, from the outer margin of which a slight longitudinal ridge crosses the segment. The actual male pore is quite minute, in line with *b*.

Tubercula pubertatis are present in all the mature and even in some of the immature worms—*i.e.*, those in which the clitellum is not present (? past the breeding season). There are four pairs of intersegmental tubercles in line with *ab*, at 15/16, 16/17, 19/20, and 20/21. There is also usually a pair at 10/11, and sometimes at 11/12; either of these may be absent. These tubercula have the form of oval depressions, with a raised margin, and a small papilla rising from the centre, which appears to be pitted.

The *spermathecal pores*, though not recognisable on the exterior, lie at 7/8, 8/9, in line of *a*.

Nephridiopores are in line *b*, also unrecognisable from the exterior.



PLUTELLUS AUCKLANDICUS.

Ventral view of the genital segments, somewhat diagrammatic. (× 5.)

The *prostomium* is one-third epilobic, and has no transverse groove. The preclitellar segments are bi- or tri-annulate; the posterior ones are biannulate.

Internal Anatomy.

There are thick septa behind the segments 9–12, while those behind 13 and 14 are somewhat less thick. The last heart is in the 12th segment.

The *gizzard* is in the 6th, and there is a relatively long piece of oesophagus in front of it, a "proventriculus," which is dilated and thrusts the anterior end of the gizzard back to the level of 7/8, while its posterior end is at the level of 9/10, so that its length equals that of two segments. The oesophagus is narrow in 8, 9, and 10, having the usual lamellate wall; in segments 11, 12, it is somewhat dilated, and constricted by the septa; in 13, 14, these lamellae are higher; and in the 15th the tube is enlarged to form a swollen globular "oesophageal gland," though I do not detect any calcareous particles therein. In the 16th and 17th it again narrows, and then opens into the intestine in the 18th segment.

The *nephridia* are small, and without a bladder; the greater part lies at the level *ab*. There is a pair of compact "peptonephridia," one on each side of the pharynx, at its hinder part.

Testes and *ovaries* are normal. Two pairs of *sperm-sacs* lie in 9 and 12, the former small, the latter large; both are lobulated. (In one specimen an additional sperm-sac lies in the 14th.)

The *prostates* are flattened, compact, and lobulated, occupying the lateral part of the 18th segment. The short wide duct, as it passes through the body-wall, retains its own muscular coat, and is thus easily traced to the pore (Plate XI, fig. 24); in this respect it differs much from the prostate duct of *Diporochaeta*.

In spite of the external lobate form, the *prostate* is essentially a cylindrical tube, closely undulating and compressed, so that the waves are in contact. There is a central canal traversing the gland, with a uniform diameter throughout; it is lined by a flat epithelium with large nuclei, and receives short branches at intervals along its course; into these branches the necks of groups of gland-cells discharge their secretion (Plate XI, figs. 25, 26). (*Cf.* Sweet, pl. 15, fig. 17, illustrating *P. intermedius*).

The ventral chaetae are replaced by long slender "penial chaetae."

The *ovaries* are very large and project upwards above the oesophagus, and the strings of ova fully occupy the segment.

The two *spermathecae* lie in segments 8 and 9; each is a somewhat pyriform ampulla, with a duct nearly as long as itself, into which opens, about half-way along its course to the body-wall, a single small subglobular diverticulum (Plate XI, fig. 23). The pore is close to the nerve-cord.

Locality.—Auckland Islands: (*a.*) Adams Island; among the roots of *Pleurophyllum* in Fairchild's Garden; (Aston; W. B. B.). (*b.*) Adams Island; 1,350 ft.; (Speight). (*c.*) Port Ross; (W. B. B.). (*d.*) 200 ft. above the Watering Creek, at Camp Cove; (W. B. B.). Those collected by myself were found both in February and November.

Remarks.—The genus *Plutellus* is a characteristic Australian worm, for about fifty-five out of the sixty species occur on that continent. Possibly the Indian species should be removed from the genus. The present species differs from any of the known species, though it is clearly related to some of the Australian worms. Some years ago I described *P. lacustris** from Lake Manapouri, which Michaelsen† has transferred to the genus *Pontodrilus*, which differs from *Plutellus* only in (*a*) the absence of nephridia from the anterior segments, and (*b*) in the absence of a gizzard, while all the species are littoral with the exception of *P. lacustris*. It was on account of the last peculiarity that I placed the species in *Plutellus*, at the same time noting its resemblance to *Pontodrilus*, and suggesting that its aquatic habit had led to the disappearance of the gizzard and anterior nephridia. However that may be, the present species is the first terrestrial species of *Plutellus* that has been recorded from the New Zealand area. It appears to be allied pretty closely to *P. tuberculatus*, Fletcher,‡ from New South Wales, from which it differs, however, in the disposition of the tubercula pubertatis, which in that species are stated to be on the first annulus of segments 17–22; also in the chaetal formula.

In discussing the geographical relations of the earthworm fauna of these islands (p. 255), I have suggested the manner in which this species may have been introduced into the Auckland Islands.

* Benham, "Some New Species of Aquatic *Oligochaeta* from New Zealand," Proc. Zool. Soc., 1903, ii, p. 228.

† Michaelsen, Die Fauna S.W. Austral., p. 160.

‡ Fletcher (*Notoscolex tuberculatus*), Proc. Linn. Soc. N.S.W., ser. 2, vol. ii, p. 611, 1887.

Diporochaeta, Beddard, 1890.

Diporochaeta heterochaeta, sp. nov. (Plate XI, figs. 27–29.)

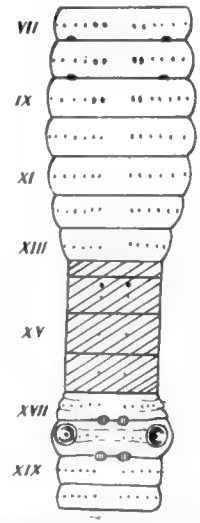
Colour.—Rich red-brown, paler posteriorly and ventrally; the chaetae are surrounded by white areas, so that in the hinder region of the body, as the pigment gets less, each segment appears to be marked by a white line; hence the worm as a whole has a striped appearance. The clitellum is pale brown.

The average *size* is somewhere about 125 mm. in length, with a diameter of 3 mm.; but there is a good range even among mature forms—thus, one extreme is 50 mm., the other is 170 mm.; in both cases the specimens are soft, so that the true length is not represented by these figures. Whereas in a group of well-preserved specimens the numbers run from 65 mm. to 135 mm. for mature ones, several immature individuals are longer than the smallest mature ones. The number of segments ranges from 85 to 140. In this instance there is a direct relation between the length of body and the number of segments.

The *prostomium* is half epilobic.

The *clitellum* covers the three segments 14, 15, and 16; it is very well marked, and surrounds the body.

The *chaetae* are 32 per segment in the post-clitellar region, though in the anterior segments the number is less. The dorsal gap equals the ventral, which is about twice the ordinary interchaetal space. The chaetae on the lower surface are rather longer and stouter than those on the upper, there being a gradual transition from below upwards. The most noticeable external feature of the species is the large size of the two ventral chaetae. In segments 5, 6, 7, 8, and 9 these are very greatly enlarged, so as to be relatively of enormous size as seen in section (Plate XI, figs. 27, 28). Those of segments 3, 4, 10, 11, 12, 13, and 14 are also enlarged, though not to such a noticeable degree as the former. It is the remarkably stout chaetae in the preclitellar segments to which the specific name refers. The number of chaetae seems to increase with age, or at least with size, for an individual of about 70 mm., with 100 segments, has in the hinder segments 28 chaetae; in the 3rd, 20; in the 7th, 24; in the 9th, the full number, 28. On the other hand, a specimen measuring about 120 mm., with 130 segments, bears 32 on the hinder segments; the 3rd has 26; the 7th, 28; the 21st, 30; while the 23rd has 32. This number is not invariable, as some segments bear as many as 34.



Diporochaeta heterochaeta. Ventral view of the genital segments. (× 4.)

Genital and other Pores.—The *male pore* is carried on a papilla in the 18th, in line with the chaeta *d* or *e*. The papilla is not very evident, as it is only on the mesial side that it rises above the level of the body; on this aspect there is a slight groove, in which lies the actual pore, which is microscopic.

In only two specimens are *tubercula pubertatis* present, as a pair of intersegmental structures, close to the median line at 18/19 in one case, or 19/20 in the other.

Two *spermathecal* pores, apparently at 7/8, 8/9, are seen in well-extended specimens to be really on the hinder margins of segments 7, 8, in line with *de.* In one case I note three pairs of these pores; in another, three on one side and two on the other side, the extra one being anterior.

The *nephridiopores* are at the level of the 7th chaeta (*g*) or the 8th (*h*).

Internal Anatomy.

None of the septa are noticeably thickened. The dorsal vessel is single, and the last heart is in the 12th segment. There are some rather interesting facts about the relations of the hearts, but in the present communication I will confine myself to those characters which are diagnostic.

The *gizzard* is vestigial in the 6th segment; it appears in sections as a short muscular ring, whose length is about equal to half the length of the segment; it does not project beyond the outline of the oesophagus, and is about as thick as one of the villi that line this part of the tract. Behind the gizzard the oesophagus is a narrow tube with the usual villous epithelium; in the 12th and 13th it is dilated, and the epithelium is raised into a series of lamellae; in the 14th it again narrows; it is dilated once more in each of the segments 15 and 16, still being lamellate; and the same structure is retained in the 17th–20th, when the epithelium alters its character and puts on the ordinary appearance of intestinal epithelium. In a dissection, one would say that the intestine commences in the 17th, judging merely from the diameter, but the limitations of the regions of the enteron in these and most worms, other than the European Lumbricids, deserve further study, especially from the histological point of view.

The *nephridium* is limited to the lower half of the body-wall, extending up to the 8th chaetae, where the large pyriform bladder is seen to penetrate the wall to open to the exterior. The tubule of the organ is compactly coiled.

The *testes* and *ovaries* are in the normal position. There are two *sperm-sacs*, in the 9th and 12th, large and lobulate.

The *prostate* is long, extending from the 18th segment to the 28th or 29th segment; the tip is recurved sharply, and runs forward, in the specimens dissected, to the 26th. The narrow duct, limited to the 18th, is transversely directed towards its pore; as it passes through the body-wall it is excessively fine, so that it is not easy to trace. The united sperm-ducts open into the prostate in the 19th segment, passing through the gland-cells obliquely to enter the lumen of the gland.

The lumen, which in section is wide, is lined by tall narrow cells, between which the delicate necks of the gland-cells pass to open into the central canal. Outside the epithelium is a finely granular region, which appears to be due to the sections of the necks in all planes as they approach the canal.

The *spermatheca* (two pairs, in the 8th and 9th) has a small diverticulum joining the duct close to the ampulla (Plate XI, fig. 29).

Locality.—Snares. Several specimens were collected both in February and in November, so that it is a common worm.

Remarks.—Hitherto five species of worms have been described from New Zealand area as belonging to the genus *Diporochaeta*—indeed, the type of the genus is one

of them, viz., *intermedia*, Beddard*—but the genus also includes numerous species from Australia. Two of the New Zealand species, *D. gigantea* and *D. shakespeari*, Benham,† have recently been removed from this genus by Michaelsen,‡ owing to their micronephric character, and placed in a new one, *Spenceriella*, with two or three Australian species; but, as I noted in my account of the species, the nephridial funnel of the meganephridium still remains, and it does not seem to me at all a satisfactory feature to adopt as a generic character. Most of our species of *Diporochaeta*, in having only two pairs of spermathecae, differ from the Australian species, which have four or five pairs.

Diporochaeta helophila,§ sp. nov. (Plate XI, figs. 30–33.)

This small species is remarkable for the very dark chocolate-brown coloration of the skin, and for the peculiar distribution of the pigment. The usual position of the pigment in earthworms is in the connective tissue of the circular muscle-layer; but in this worm, in addition to this, there is a fine brown pigment amongst the epidermal cells, close to the surface, and apparently in the columnar cells. The pigment in the circular muscles consists of black granules, and is especially abundant in the anterior 11 segments. Thirdly, and posteriorly to the 11th segment, there is a peculiar flaky brown pigment in the somatic coelomic epithelium. This extends all the way round the body in these segments, whereas the other pigments are confined to the dorsal half of the body (Plate XI, figs. 30, 31). This flaky pigment appears to lie in the superficial portion of the vesicular cells, and in segments 13–18 there are three to five rows of cells forming a very conspicuous layer in sections (Plate XI, fig. 32). The colour is not, therefore, limited to the anterior portion of the body nor to the dorsal region, but is only a little paler in the hinder end and on the ventral surface. The chaetae are set in pale spots, which may be almost white. The clitellum is uniformly paler brown.

Dimensions.—The length of the mature worm varies from 26 mm. to 47 mm., with a diameter of 1 mm.; there are from 47–98 segments, an unusually wide range.

The *chaetae* are 24 per segment, though in the hinder part of the body I counted only 20 in a trans-section. They are very noticeable, owing to the white dots that surround their bases. The interchaetal spaces are somewhat irregular, but subequal; the dorsal gap is greater than the ventral, in the proportion of 5 to 3, the latter about twice an interchaetal gap.

The *clitellum* occupies the 14th to 17th segments, the anterior two of which are completely encircled.

Genital Pores, &c.—The *male* pore, on the 18th, is in line with chaetae *bc* (in reality, it is in the line of *b*, but, as in other species, the ventral chaetae are thrust outward in these segments to the level of *c* in neighbouring segments); being white in colour, it is more readily recognisable than usual. The *oviducal* pore, likewise white, is in front of chaeta *a*.

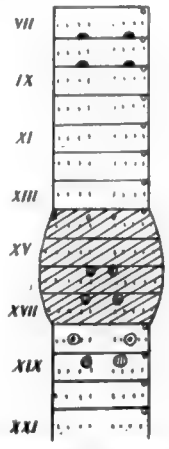
* Beddard, Proc. Zool. Soc., 1890, pp. 55, 56.

† Benham, "An Account of some Earthworms from Little Barrier Island," Trans. N.Z. Inst., xxxviii, p. 252, 1906.

‡ Michaelsen, Die Fauna S.W. Austral., p. 161.

§ Swamp-lover.

The two *spermathecal* pores, at 7/8, 8/9, are in the same line as the male pores. *Tubercula pubertatis* are present as white paired glands on segments 10, 11, 16, 17, and 19, in line *ab*, prechaetal and median of the genital pores. In one specimen additional glands are on the 9th and 12th. The *nephridial* pores are in line *d*.



DIPOROCHAETA HELOPHILA.
Ventral view of the genital segments. (× 12.)

Internal Anatomy.

The pharynx extends back into segment 6. There is no gizzard; not even the usual vestige could be detected in sections.

The oesophagus extends from the 7th to the 12th as a straight tube of nearly uniform diameter; it widens in 13 and 14, the walls becoming lamellate; the gland is not constricted by the septum. The tube now narrows in the 15th, widens again in the 16th, and enters the intestine in the 17th, when the wall becomes thin and the lumen wide.

The nephridia are relatively large, extending round the wall from the 2nd to about the 9th chaeta, so that they reach the dorsal surface.

Testes and ovaries in the normal position, the latter very large. Two pairs of *sperm-sacs*, in the 9th and 12th segments.

The *prostates* are tubular, reaching from the 18th to the 20th. The duct is minute, and there are no penial chaetae.

Two pairs of *spemathecae* lie in 8 and 9; each has a subspherical ampulla, with a short thick duct into which opens a single tubular diverticulum close to the base of the ampulla; it is about as long as the diameter of the latter (Plate XI, fig. 33).

Locality.—Auckland Islands: (*a.*) Bush soil, North Arm of Carnley Harbour; (W. B. B.). (*b.*) At mouth of fresh-water creek, as it falls into a pool; (Page). (*c.*) 200 ft. above Watering Creek, Camp Cove, in somewhat swampy ground; (W. B. B.). (*d.*) Enderby Island; in a log near a pool; (W. B. B.).

Remarks.—This species agrees in several features with *D. aquatica*, Benham,* which I described from Lake Manapouri, but from it is readily distinguished by the thick body-wall and abundant pigment, as well as by fewer chaetae per segment. It is, however, clearly related to it in its general structure and habits.

Diporochaeta brachysoma, sp. nov. (Plate XI, figs. 34, 35.)

Five specimens of this striking worm were obtained – striking from its stout short form of body and from its very dark colour. The following note was made of the living animal: "A very dark purplish-brown, nearly black, worm, with orange clitellum and pale-brown under-surface. The general facies reminds me of *Plagiochaeta sylvestris*." In formol the colour is dark purplish-grey, paler below, with a narrow dark band along the entire ventral surface, occupying the interchaetal area, this being absent only on the clitellar segments. The clitellum is now brown,

* Benham, Proc. Zool. Soc., ii, 1903, p. 226.

with a greyish tint. The chaetae are inserted in pale spots. The pigment, appearing brown in sections, is densely aggregated in the connective tissue of the circular musculature, but there is also a little black pigment in streaks amongst the longitudinal muscles. There is none in the epidermis.

Dimensions.—The worm is remarkable for the breadth of the short body. Its length is from 30 mm. to 35 mm.; diameter, 4 mm. The body contains 60 to 70 segments.

DIPOROCHAETA BRACHYSOMA.
Natural size.

Chaetae.—There are about 40–50 chaetae on each segment; they are of the same size, but unequally spaced, those near the dorsal surface being rather further apart than those on the ventral region; the spaces bear the proportion of 3 to 2 respectively. The ventral gap is greater than the dorsal, as 5 to 4, the former being about three times larger than the neighbouring interchaetal space, the latter four times the nearest space.

The *clitellum* covers segments 14–17, and completely encircles the body.

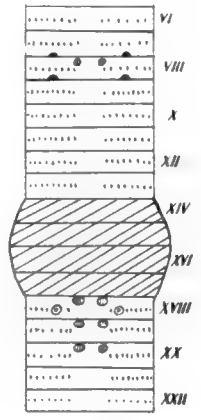
Genital Pores, &c.—The *male* pore is in a depression on each side of the 18th, in line of chaeta *b*, which, as usual, is thrust outwards; both chaetae *a* and *b* are present, but are smaller than those of other segments.

The *spermathecal* pores are at 7/8, 8/9.

On the anterior margin of segments 18, 19, and 20 there is a pair of circular admedian *tubercula pubertatis;* there is, however, some variability, especially in regard to the tubercula in the neighbourhood of the spermathecal pores; in one individual there is a pair at the anterior margin of the 8th, in another at the anterior margin of the 9th, in others none are present in this region.

The *nephridiopores* are, I think, in line with the 14th chaeta—*i.e.*, are high up on the body.

The *prostomium* is half epilobic; there is a transverse groove, from which short longitudinal furrows pass back.



DIPOROCHAETA BRACHYSOMA.
Ventral view of genital segments. (× 4.)

Internal Anatomy.

The septa behind segments 10–13 are thickened.

The dorsal vessel, as it passes through 9–13, is narrow, owing to the thick muscular wall; in the 14th it loses most of this muscular coat, and dilates to form the usual wide vessel. The hearts are in the 10th, 11th, and 12th, arising not from a supra-enteric vessel, but directly from the enteric blood-plexus, with which the dorsal vessel is connected in the 14th by four short vertical vessels.

The pharynx is very powerfully developed, the retractor muscle and the glands extending as far back as the 10th segment. I see no gizzard, even in sections. The oesophagus in 10, 11, is narrow; it dilates in 12, 13, and 14 successively, being constricted by the septa through which it passes, and, as the wall is lamellate here, these dilations may be regarded as glands; it narrows again in 15, and widens into the intestine in the 16th segment.

The nephridia are small.

Testes and ovaries are normal. There are two *sperm-sacs*, in 9 and 12, small and much lobulated. In the series of longitudinal sections I see a third pair in the 13th, of small size, but whether this is normal I cannot say.

The *prostate* is a curved, subcylindrical gland, confined to its segment, rising up so as to overarch the intestine (Plate XI, fig. 34). Its surface is rough, and the lumen is simple—*i.e.*, does not branch—though at intervals it receives the necks of groups of gland-cells, which open into slight diverticula, which, however, cannot be traced as definite lumina.

The epithelium lining the very narrow lumen of the prostate consists of tall, narrow columnar cells, beyond which is a layer of fibres of extreme fineness, due either to a connective tissue or, more probably, to the necks of the gland-cells being cut across at various planes as they curve towards the canal.

In the neighbouring segments there are well-developed dorso-ventral muscles (" arcuate muscles "), but there are no penial chaetae.

Two pairs of *spermathecae* lie in segments 8 and 9, opening at the level of chaeta *e*. The ampulla is large ; the diverticulum single and small, on the anterior median side of the duct (Plate XI, fig. 35).

Locality.—Adams Island ; 2,000 ft. ; under stones ; (Speight).

Diporochaeta perionychopsis, sp. nov. (Plate XI, figs. 36–39.)

About eighteen specimens were collected from various parts of the Auckland Islands. The greater number are immature.

Colour.—In life the worm is " deep crimson-red," but in formol the colour has changed to a reddish-purple, and even brown later, with paler clitellum.

The *dimensions* of mature individuals reach a maximum of 225 mm. in length, with a diameter of 6 mm., and contains 200 segments. Others are slightly smaller.

Prostomium half epilobic, without a transverse groove. The preclitellar segments are not annulated ; the posterior ones are triannulate.

The *chaetae* are about 50 to 60 per segment, with a small ventral and smaller dorsal gap. They are similar in size all round the body. The chaetae are more numerous in the preclitellar than in the postclitellar segments, thus:—

Number of Chaetae in corresponding Segments in Three Individuals.

——	A.	B.	C.
Segment III	32	30	30
,, VIII	36	42	30
Mid-body	30	28	26
Tail	25	24	—

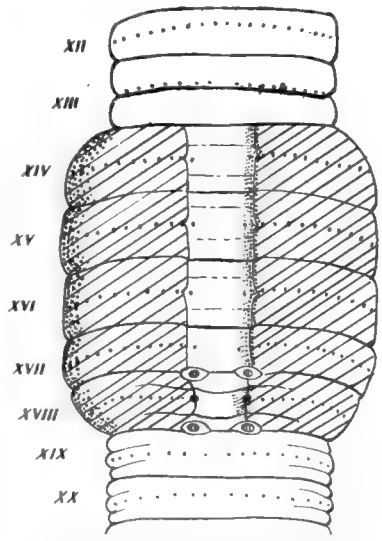
The *clitellum* is saddle-shaped, and covers segments (13), 14–18, but it is not developed in the majority.

Genital Pores, &c.—In the most fully developed specimen I see no papilla on the 18th. This segment is grooved transversely in its middle, and I believe I can detect a minute pore at the lateral margin of the groove on each side, in line with the chaetal row, just mediad of chaeta *a*.

Tubercula pubertatis are present as small paired oval papillae, each with a depression in its centre, at the intersegmental furrows 17/18, 18/19. These are present even in specimens in which the clitellum is not developed. Further, on the anterior margins of 10 and 11 there are paired projections which may be also tubercula; they are in line with chaetae *cd*; in one case they are also on the 9th.

There are three pairs of *spermathecal pores* (invisible externally), at 6/7, 7/8, and 8/9, in line with chaeta *b*.

The *nephridial* pores, though likewise invisible, are at the level of about the 15th or 16th chaeta.



DIPOROCHAETA PERIONYCHOPSIS.
Ventral view of the genital segments.
(× 4.)

Internal Anatomy.

The posterior septa of segments 10–15 are thick, especially the last four.

There is no gizzard; not even a trace of it is recognisable in a dissected worm. The oesophagus is thin-walled as it passes through 7 and 8, becomes thick-walled in the 9th to 16th, then it narrows in the 17th, and the intestine commences in the 18th as the usual wide thin-walled tube. There are no oesophageal glands.

The dorsal vessel is single; the last heart lies in the 12th segment.

The worm is meganephric; the coiled tubule forms a compact mass in the ventral portion of the body, but the large muscular bladder passes upwards to open rather above the lateral line at the level of about the 15th chaeta.

The testes and ovaries are normal. There are two *sperm-sacs*, in the 9th and 12th. The *prostate*, in contrast to the form it has in the preceding species, is a flattened compact mass, somewhat lobulated on its inner margin, and with a quadrate outline (Plate XI, fig. 36). Its short duct arises from its under-surface, and is thus invisible from above.

Sections show that the duct contains three or more channels when it leaves the gland (Plate XI, fig. 38); these unite as the body-wall is approached. The sperm-duct joins this prostate duct after it has left the gland, but does not enter the lumen at once; it runs alongside the three channels for some distance, and enters the lumen after they have united, and, indeed, after the prostate duct has entered the body-wall. The three or four channels above mentioned pass up into the gland and diverge, each giving rise to a few branches as it traverses the substance of the prostate (Plate XI, fig. 37)—in other words, the prostate has a character which Michaelsen assigns to the genus *Perionyx*, and which does not occur, according to his diagnosis, in *Diporochaeta*.

The ventralmost chaetae, *a*, *b*, on this segment are slightly longer than the rest, as 4 to 3, but scarcely deserve to be termed "penial"; they do not differ in form.

The *spermathecae* occur in segments 7, 8, and 9. In one individual I find an asymmetry, in that on one side the three spermathecae are in these segments,

on the other they lie in 8, 9, and 10, with the pores at the anterior margin of the segment in each case. Each spermatheca has a large subspherical ampulla, a short thick duct, which receives at about the middle of its length a pair of small ovoid diverticula (Plate XI, fig. 39).

Localities.—Auckland Islands: (*a.*) Magnetic station, Camp Cove; (W. B. B.). (*b.*) North Arm, Carnley Harbour; (Captain Dorrien-Smith). (*c.*) Magnetic station, Musgrave Harbour; (W. B. B.). (*d.*) Masked Island, Carnley Harbour; among the roots of *Stilbocarpa polaris*; (Aston). (*e.*) Adams Island; at roots of *Pleurophyllum*, Fairchild's Garden; (W. B. B., February; Aston, November). (*f.*) 2,000 ft.; under stones; (Speight). (*g.*) Disappointment Island; fragmentary; (Kirk).

Remarks.—Anatomically, this species appears to differ from the rest of the species of *Diporochaeta* in having a branched lumen to the prostate, and on that account should perhaps be placed in the genus *Perionyx*, according to Michaelsen's most recent views on the diagnostic characters of the genera of the subfamily *Megascolecinae*.* But, considered from a geographical aspect, this seems an impossible view to take. I cannot persuade myself that it can belong to this genus, which is confined to the Oriental region. This species (*D. perionychopsis*) is, as has been noted above, widely distributed over the Auckland Group. It lives all round Carnley Harbour, at all heights, from sea-level to the topmost altitude; is to be met with in soil at roots of plants and under stones; and it is extremely interesting that of the two worms obtained on Disappointment Island one is of this species. These islands have no commercial intercourse with the Orient—they are, in fact, uninhabited, and, except for a brief period, have always been without inhabitants but for unwilling, shipwrecked mariners. In the year 1850 a small settlement of Europeans was established by Governor Enderby on what is now known as Enderby Island; the settlers came from New South Wales, and broke up in 1852; at the same time a number of Maoris lived on the main island at Port Ross. But this species of earthworm could not have been introduced by these immigrants, for the genus *Perionyx* is unknown either in Australia, or the Chatham Islands, whence these Maoris came. Nor could it have arrived there at the time when New Zealand was of continental dimensions, when the country was probably in some connection with the Oriental region, otherwise one would expect to find the genus represented to-day in New Zealand. I do not see how one can explain the occurrence of the genus at these southern islands. It seems to me more easy to imagine that the slight branching of the prostate lumen has arisen within the genus *Diporochaeta*. Had it not been for the emphasis which Michaelsen places on the point it would not have occurred to me to discuss any other probability.

The microscopic structure of the prostate of *Pheretima* (*Perichaeta*) was described by Beddard, and later Miss Sweet† investigated the lobate prostate of some of the Australian genera, while Michaelsen‡ has given an account of that of *Perionychella dendyi*, a species formerly included in the genus *Diporochaeta*. From these the prostate of the present species differs in that there are three or more canals in the prostate

* Michaelsen, Die Fauna S.W. Austral., p. 152.

† Sweet, Linn. Soc. Journ. (Zool.), xxviii, p. 109, 1900.

‡ Michaelsen, "Oligochaeten von Australien," in Abhandl. aus dem Gebiete Naturwiss, Hamburg, xix, p. 12, 1907.

duct, which pass up into the gland and there branch, whereas apparently in those just referred to the single lumen in the duct does not begin to branch till the gland has been entered. In the structure of the prostate, *Woodwardia callichaeta* appears, from Michaelsen's account,* to resemble this new species. But in spite of this small difference there is no doubt that this species has what Michaelsen terms a "*Pheretima* prostate." He is strongly of opinion that the "*Pheretima* prostate" has been evolved only once—from the "*Plutellus*" form of prostate (p. 152); nevertheless, on p. 158, he admits that this is not absolutely without doubt—*i.e.*, there is a possibility of the branched lumen having arisen more than once. It seems to me that the present species is a case in point.

Fam. LUMBRICIDAE.

Helodrilus, Hoffmeister, 1845, em. Michaelsen, 1900.

Subgen. Bimastus, H. F. Moore, 1893.

Helodrilus constrictus, Rosa.

1884. Rosa, Lumbric. Piemonte, p. 38.

The occurrence of this common European species on Campbell Island is clearly related to the habitation and cultivation of a patch of garden by the shepherds at the island. Only two specimens were forwarded to me.

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* Michaelsen, Die Fauna S.W. Austral., p. 189.

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EXPLANATION OF PLATES X AND XI.

Plate X.

Phreodrilus campbellianus.

Fig. 1. Longitudinal section through the sperm- and spermathecal pores, combined from two consecutive sections. (Camera outline, × 100; details somewhat diagrammatically sketched in.) *a*, spermiducal pore in xii; *b*, penis in its sac; *c*, prostate, in transverse section; *d*, neck of prostate entering penis; *e*, spermathecal pore in xiii; *f*, spermathecal antrum, surrounded by muscles; *g*, narrow duct of spermatheca.

Rhizodrilus aucklandicus.

Fig. 2. Transverse section through the paired male pores. (Camera, × 60; details of body-wall diagrammatically sketched.) *a*, male pore; *b*, penis-sac, with sperm-duct above; *c*, nerve-cord; *d*, intestine, to the left of which are the dorsal and ventral blood-vessels; *e*, sperm-sac.

Fig. 3. Spermatheca, from a transparent specimen. *a*, ampulla; *b*, globular, glandular sac; *c*, epidermal pit; *d*, spermatozoa projecting from the pore.

Fig. 4. Base of the penis, in transverse section (*cf. d* in fig. 7). (× 370.)

Fig. 5. Sperm-duct, in transverse section, with prostate glands surrounding it. The groups of glands are confined to the dorsal and lateral surfaces, each group being enveloped in a sheath of coelomic epithelium. (Camera, × 370.)

Fig. 6. The lower part of the penis, in transverse section (at about the level of *c* in fig. 7); the wall is a good deal folded. *d*, lumen. (Camera, × 370.)

Fig. 7. Longitudinal section through the male apparatus. (Camera, × 250.) The region from the funnel to the upward curve of the duct lies in one section, the posterior part was contained in several consecutive sections. *a*, male pore; *b*, muscular penis-sac; *c*, penis, folded protrusible portion; *d*, glandular bulb; *e*, sperm-duct; *f*, prostate glands enveloping the duct for the greater part of its length; *g*, retractor muscles of penis; *g'*, retractors of the sac; *s*, *s'*, septa 10/11 and 11/12.

Lumbricillus intermedius.

Fig. 8. Spermatheca, from a bisected specimen. (Camera × 60.) *a*, pore, surrounded by a rosette of glands; *b*, aperture into oesophagus. The thicker portion of the wall is the muscular duct.

Fig. 9. Subneural gland. (Camera, × 185.)

Fig. 10. Sperm-funnel, from a longitudinal section, which cuts it lengthwise. (Camera, × 100.)

Fig. 11. Nephridium, combined from two consecutive sections. (Camera, × 370.)

Pelodrilus tuberculatus.

Fig. 12. Transverse section of the body, at the level of the copulatory gland, showing the circumferential extent of the clitellum and the position of the gland through which the sperm-ducts open (*cf.* fig. 14). *a*, copulatory gland; *b*, clitellum; *c*, large ovum. (Camera outline, × 35.) The chaetae are inserted on one side only, and the body-wall is represented diagrammatically.

Fig. 13. Portion of the body-wall, enlarged. (Camera, × 370.) The cuticle (*a*) is remarkably thick; *b*, goblet cells; *c*, circular muscles; *d*, longitudinal muscles.

Fig. 14. Longitudinal section through the genital segments, which are numbered above in roman numerals. (Camera, × 100.) a^1, a^2, the male pores; *b*, female pore; *c*, c^2, the sperm-ducts; *d*, oviduct; *e*, the copulatory (? prostate) gland.

Plate XI.

Pelodrilus aucklandicus.

Fig. 15. Longitudinal section through the genital segments, which are marked in roman numerals below. (Camera, × 60.) The two limbs of the sperm-duct lie almost wholly in two consecutive sections. a^1, a^2, the male pores; b^1, b^2, the female pores; *c*, testis; *d*, sperm-funnel; *e*, sperm-duct; *f*, copulatory (? prostate) gland; *g*, oviduct; *h*, ovary (the other ovary is omitted for sake of clearness); *j*, base of chaetae (the entire chaeta is represented in segment x).

Notiodrilus fallax.

Fig. 16. Spermatheca. (× 6.)
Fig. 17. Prostate of the same. (× 6.)

Plagiochaeta plunketi.

Fig. 18. Longitudinal section of vestigial gizzard, with neighbouring portion of oesophagus. (Camera, × 30.)
Fig. 19. Penial chaeta of segment 17, and normal locomotive chaeta of 20th segment. (× 60.)
Fig. 20. Spermatheca ; figure compiled from sections.

Leptodrilus leptomerus.

Fig. 21. Spermatheca. (× 18.)

Leptodrilus magneticus.

Fig. 22. Spermatheca. (× 18.)

Plutellus aucklandicus.

Fig. 23. Spermatheca. (× 12.)
Fig. 24. Prostate of left side *in situ*, and the arcuate muscles (*m*) of the 19th segment. *a*, *b*, *c*, *d*, the four chaetal rows, indicated by their gaps in the longitudinal muscular layer of the body-wall (the prostate duct perforates the wall in line with chaeta *b*) ; *n*, nerve-cord.
Fig. 25. Plan of the course of the lumen of the prostate, compiled from a series of sections. (× about 30.) Only a few of the bunches of glands are shown opening into the little diverticula of the central lumen.
Fig. 26. Portion of the foregoing, enlarged. *a*, main lumen of prostate ; *b*, diverticula ; *c*, bunch of gland-cells.

Diporochaeta heterochaeta.

Fig. 27. Portion of the ventral surface of segment 7, showing the two much enlarged chaetae on each side of the middle line. (Camera, × 30.)
Fig. 28. Ventral chaeta of segment 6 (*a*) and of segment 14 (*b*) from a transverse section. (Camera, × 30.)
Fig. 29. Spermatheca. (× 8.)

Diporochaeta helophila.

Fig. 30. Transverse section, to show the peculiar arrangement of the pigment (*a*) on the coelomic epithelium all round the body, (*b*) in the epidermis on the dorsal surface only. (Camera, × 30.)
Fig. 31. Portion of the preceding, enlarged. (Camera, × 185.) *a*, flaky pigment in somatic coelomic epithelium ; *b*, longitudinal muscles ; *c*, circular muscles, with granular pigment between the fibres ; *d*, epidermis, with very fine granules of pigment apparently inside the cells.
Fig. 32. Portion of the somatic coelomic epithelium on dorsal wall, from a longitudinal section. (Camera, × 185.) The pigment lies at the surface of vesicular cells. *a*, pigmented cells ; *b*, longitudinal muscles ; *c*, nuclei of pigment-cells.
Fig. 33. Spermatheca, as compiled from a series of longitudinal sections.

Diporochaeta brachysoma.

Fig. 34. Prostate, *in situ*, from a bisected specimen. D, dorsal wall, nearly in the median line ; V, ventral wall ; *a*, arcuate muscles.
Fig. 35. Spermatheca. (× 30.)

Diporochaeta perionychopsis.

Fig. 36. Prostate. (× 6.)
Fig. 37. Horizontal section of prostate, showing the branching of the lumen. The gland-cells are not indicated. (Camera outline.)
Fig. 38. Transverse section of the prostate duct. (Camera outline.) The sperm-duct (*a*) lies in the muscular wall. The three lumina (*b*) do not unite till close to the external pore.
Fig. 39. Spermatheca. (× 12.)

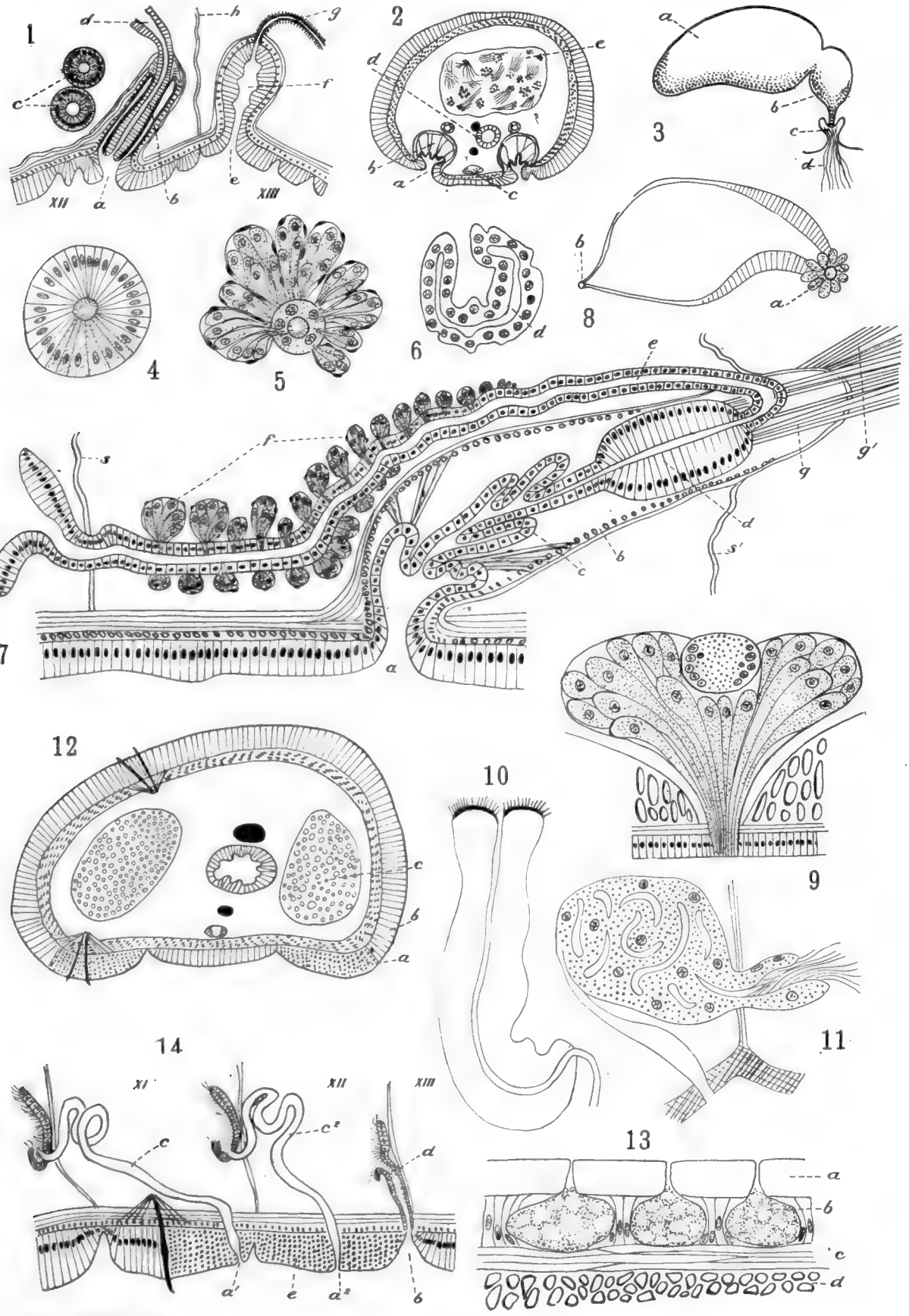

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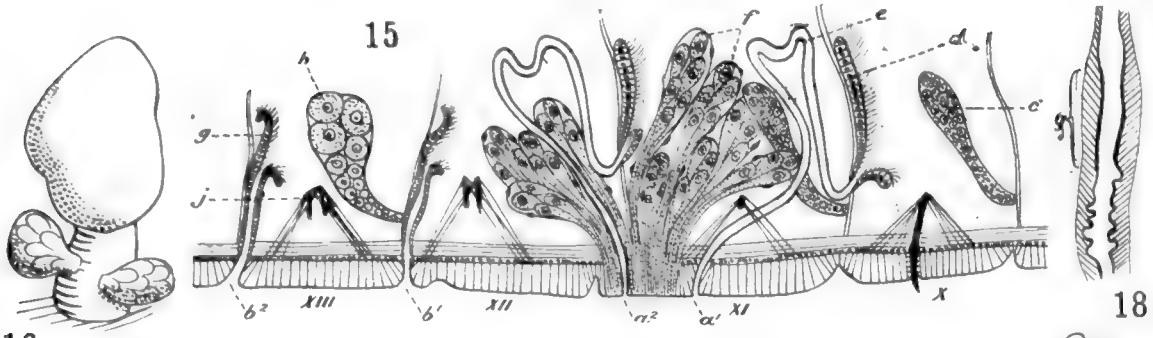
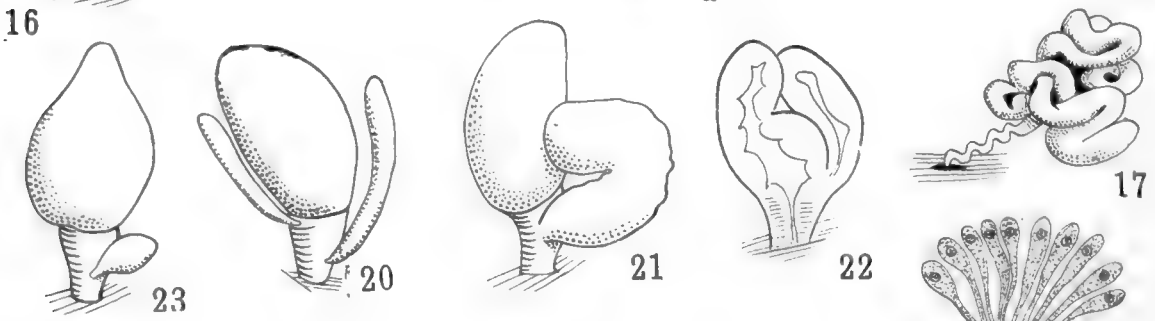
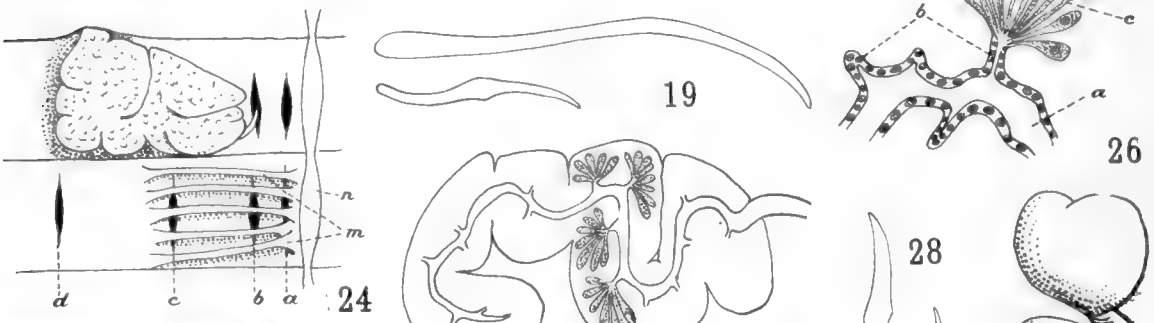
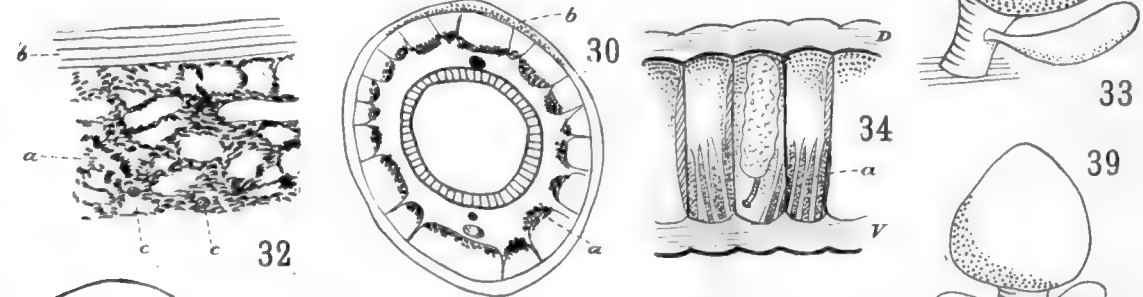
PLATE X.









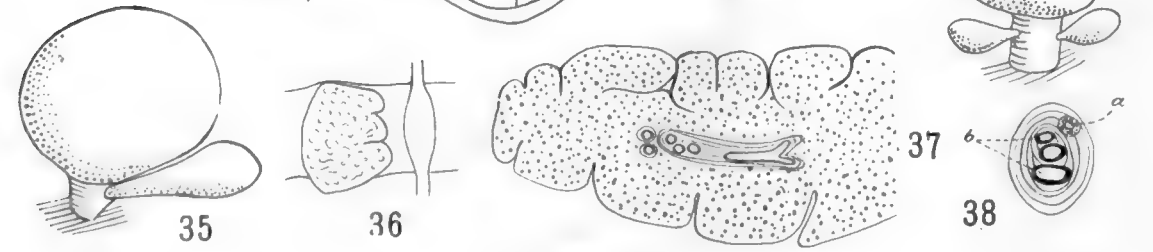


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PLATE XI.

ARTICLE XIII.—THE ECHINODERMS, OTHER THAN HOLOTHURIANS, OF THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By W. B. Benham, D.Sc., F.R.S., University of Otago.

This small collection of Stellerids, containing but four species,* includes one that is new to our fauna, *Asterina fimbriata*, which provides another link with the South American fauna, for, as in the case of *Odontaster grayi*, which was obtained off Otago and recorded in the "Scientific Results of the 'Nora Niven' Trawling Expedition," its occurrence has hitherto been limited to the region of the Falkland Islands and Magellan Strait.

I have been able to submit to a comparative examination a number of specimens of *Henricia* (*Cribella*) *ornata*, which was recorded years ago at Campbell Island by Filhol, and to identify with it Mr. Farquhar's *C. lukinsii* from the Aucklands. The distribution of this species round a good portion of the Subantarctic Ocean is already known, and a discussion as to the possible identity of certain other antarctic species indicates its possible circumpolar extension. The comparison of specimens of *Amphiura squamata* (*elegans*) with Hutton's type of *A. parva* has revealed the identity of the latter with this little British Ophiurid, which had already been recorded from our shores by Mr. Farquhar.

Incidentally, a perusal of the literature has enabled me to rectify, as I believe, the nomenclature of the last two species.

I desire to acknowledge the ready help given to me by Mr. Farquhar, by the loan of papers and otherwise.

I. ASTEROIDEA.

Fam. ASTERINIDAE.

Asterina, Nardo, 1834.

Asterina fimbriata, Perrier.

1875. Perrier, "Revision de la Collection des Stellerides du Museum d'Histoire naturelle de Paris," p. 307.

On the rocks of Masked Island, in Carnley Harbour, I observed numbers of an orange-red or reddish-brown *Asterina* which I supposed to be small individuals

* In addition to the starfishes recorded below, I must mention that Filhol records the presence of *Ophidiaster campbelli*, Perrier, at Campbell Island, but no specimens were obtained during this expedition, nor, so far as I am aware, has the species been obtained since the Transit of Venus Expedition in 1874. Indeed, I can find no reference to the original account of it, and suppose that the name is only a MS. one. No mention of any such species is made by Sladen, nor in Bronn's "Thierreichs"; nor can I find any record of it in the "Zoological Record" for the period of the issue of the "Mission de l'Île Campbell." I suspect that it is a *nomen nudum*.

of *A. regularis*, so common on our coasts, so that I collected only three specimens; but on examining these in my laboratory I perceived at once that they present several important differences from this species, and I believe them to belong to Perrier's species, for reasons that will be mentioned below.

Dimensions.—The dimensions are given below, in millimetres:—

	R.	*r.*	*r* : R.
A	17	12	1 : 1·416
B	10	7	1 : 1·43
C	6	4	1 : 1·5
Ludwig's largest ..	6·5	4·5	1 : 1·44

In shape they are pentagonal, with well-rounded angles and slightly excavated sides, thus differing from *A. regularis*, in which the tip of the arm is much more acute and the excavation relatively greater. They also differ in the following details: (*a*) The arrangement of the plates and spines on the abactinal surface, (*b*) and on the actinal surface, (*c*) and in the adambulacral armature.

The abactinal surface is covered with nearly regularly distributed rounded or oval plates, each bearing a compact group of many small spines, some 30 to 40 in a group; the plates are separated by isolated large papulae (fig 2). In the smaller individuals, at any rate, there is, nearly in the centre of the disc, a circle of 5 curved somewhat crescentic plates, radial in position, alternating with 5 smaller rounded interradial plates (fig. 3). On the median portion of the ray the plates are arranged in longitudinal series, diminishing in size towards the tip; but in the largest specimen the 4 median rows of plates are slightly transversely extended and feebly curved. This arrangement is in marked contrast to the distinct crescentic plates, each bearing only a few marginal spines, of the arm of *A. regularis*.

Each of the actinal plates bears in its centre a group of 8 or 10 or more long slender spines, leaving the rest of its surface bare (figs. 4, 5). These plates are regularly arranged in regard to the ambulacral groove; they form curved rows, starting at right angles to the groove and curving gently outwards as the interbrachial area is reached, and getting smaller as the margin is approached. The plates, and, of course, the groups of spines, are also in rows parallel to the groove (fig. 1).

The margin of the disc is fringed with similar groups of spines.

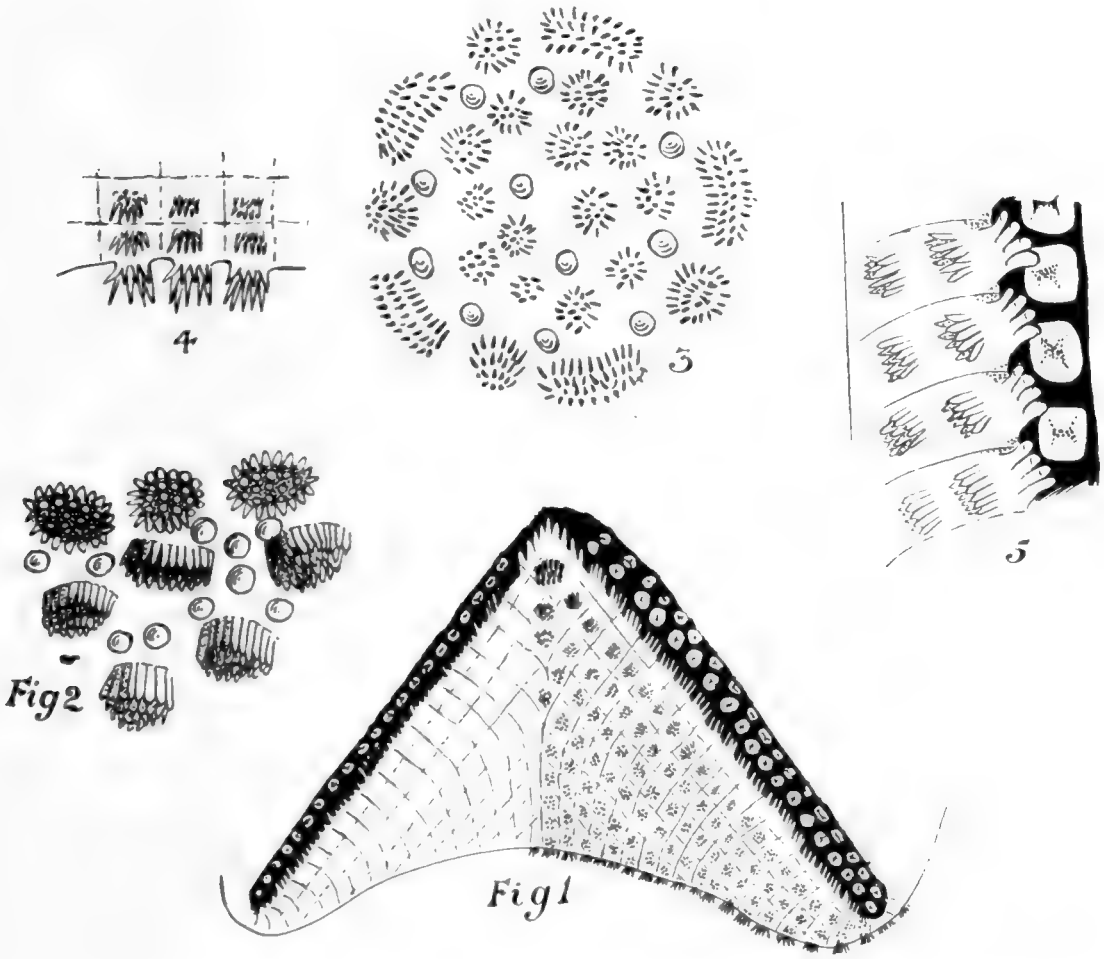
The adambulacral armature is formed of a row of 4 spines in a longitudinal row on each plate, set slightly obliquely to the groove (fig. 5). These spines are stouter and longer than those of the actinal plates, and differ entirely from the adambulacral spines of *A. regularis*.

So far as the limited literature allows me to judge (for I have been unable to obtain from the libraries of New Zealand or Sydney several of the works enumerated in the bibliography at the end of this article), this little starfish

appears to agree with *A. fimbriata* in the following features: Colour, shape and proportions (Ludwig's largest specimen is nearly the same size as my smallest), the fringed margin, and the actinal and abactinal spinulation—as seen in the photogravure illustrating Ludwig's paper (1905), pl. v, figs. 4, 5.

Locality.—Auckland Island.

Distribution.—Falkland Island; Magellan Strait; south coast of Tierra de Fuego; west coast of Patagonia; Chili.



ASTERIA FIMBRIATA.

Fig. 1. An interradius with 2 radii. (× about 8.) Details illustrating the more striking features indicated only on the right portion.

Fig. 2. Portion of the abactinal region, showing groups of spines and the intervening papulae. (× about 24).

Fig. 3. Apical region. (× about 20.)

Fig. 4. Portion of an actinal interradius, showing marginal spines. (× about 24.)

Fig. 5. Portion of ambulacral groove, four adambulacrals, and neighbouring region. (× about 24.)

Fam. ECHINASTERIDAE.

Henricia, Gray, 1840.

Henricia ornata, Perrier.

1869. *Echinaster* (*Cribella*) *ornatus*, Perrier, Ann. Sci. Nat. (Zool.), (5), xii, p. 251. 1898. *Cribrella lukinsii*, Farquhar, Trans. N.Z. Inst., xxx, p. 190. 1908. *Henricia ornata*, Bell, Nat. Antarct. Exped. Nat. Hist., iv, p. 10. 1908. *Cribrella ornata*, Koehler, Trans. Roy. Soc. Edin., xlvi, p. 629, pl. xii, figs. 105, 106.

Of this starfish I have before me fourteen specimens, of which two are labelled by the late Professor Parker as from Campbell Island. The majority of the remainder were collected by myself on the shore of Masked Island. They are bright orange in colour while alive, but when dried become a dark coffee-brown; in spirit they are soon bleached, though in the case of some a pale-brown tinge still remains. Amongst them are two individuals exhibiting regeneration of two and three arms respectively, which in the latter case are mere stumps of different sizes.

The dimensions, in millimetres, of a few specimens are here given :—

R.	*r.*	Breadth of Arm at Base.	Height of Arm at Base.
42	10	10	10
24	7	8	7
19	6	6	4
14	4	4	3·5
9	3·75	3·75	3·25

The gradually tapering arms are blunt at the extremity, and in the case of the largest individual the tip is 2·5 mm. across.

There can be no doubt, I think, that the orange-coloured species which is so common near low-water mark at Masked Island belongs to the same species as the individual described by Farquhar under the title *C. lukinsii*; but, as I have a greater number of specimens at my disposal—some preserved in alcohol, others dried—it is possible to recognise that in one or two points his account needs amendment. Thus, he speaks of there being "one to three papulae in each area": as a matter of fact, in very young individuals there may be only 1; and in larger ones there are 3, or even 5, or occasionally as many as 6 in each group; so that his statement, though not invariably, is essentially true. Again, although it is correct to say that in some specimens "the spinelets form somewhat irregular double transverse rows" on the lateral surface of the arms, yet it is possible to separate the specimens into two fairly well marked sets, in one of which (B) there is this double row on marginals and adambulacrals, while in the other (A) there is but a single row of spinelets on these plates

(*cf.* Koehler *loc. cit.*, p. 629). Further, the proportion of *r* to R is liable to a considerable degree of variation, for I find the following numbers :—

Set A.

R.	*r*.	*r* : R.	——
Mm.	Mm.		
24	7	1 : 3·42	(*d*) Campbell Island.
19	6	1 : 3·16	(*s*) ,,
14	5	1 : 2·8	(*d*) Auckland Island.
14	5	1 : 2·8	(*s*) ,,
11	4	1 : 2·75	(*s*) ,,
9	3·75	1 : 2·4	(*s*) ,,

d = dried ; *s* = in spirit.

Set B.

R.	*r*.	*r* : R.	——
Mm.	Mm.		
42	10	1 : 4·2	(*d*) Auckland Island.
19	5·5	1 : 3·45	(*s*) ,,
18	6	1 : 3·0	(*s*) ,,
17	4·5	1 : 3·77	(*s*) ,,
16	4·5	1 : 3·55	(*s*) ,,
15	4	1 : 3·75	(*s*) ,,
15	4	1 : 3·75	(*s*) ,,
14	4	1 : 3·5	(*d*) ,,

d = dried ; *s* = in spirit.

It may be noted that the difference in their present condition of preservation does not account for the difference in proportions ; nor does the difference of locality ; but if these specimens be arranged in order of dimension from the largest (R = 42 mm.) to the smallest (R = 9 mm.) it will be evident that, as the animal grows, the arm increases in length at a greater rate than does the disc.

Koehler gives measurements of his specimens, whence it appears that they present the same variation in proportions as above noted—viz., *r* : R varies from 1 : 3·33 to 1 : 3·4 ; and Ludwig (1905) notes the variation for *H. pagenstecheri* as being from 1 : 3·33 to 1 : 4·91.

The various differences led me at first to separate them into what I supposed were two species, since the set A have R = 3*r* (approximately), while in set B R = 4*r* (approximately). Moreover, in series A the arms are somewhat swollen at the base, and an interradial furrow traverses the disc, so that the general outline is rather different from that of B, in which the arms taper gradually, and there is no

furrow at the base. In A the spinelets are usually shorter and somewhat stouter than those of B.

Bell (1892), in the "Catalogue of British Echinoderms," notes the extreme amount of variation in the spininess of *H. sanguinolenta :* "The spinulation of the ossicles of the dorsal surface may be so profuse and the spines so long that the whole surface may seem as if covered by them ; on other specimens there is rather tuberculation than spinulation," &c. This statement is equally true for the present species.

But when the details of external structure were more exhaustively examined I became less inclined to make this separation, and after a careful study of Sladen's accounts of the various species in the "Challenger" Report, some of which are now by various authors regarded as synonyms, I became less and less able to come to any definite conclusion as to the points which should be regarded as specific. My inability to do so is no doubt due in part to lack of experience in this group ; nevertheless, when one finds that skilled specialists, such as Bell, Koehler, Ludwig, and Meissner, take various views as to the validity of the different species described by Sladen and others, I cannot help feeling that it is not altogether my personal equation that is at fault, but that the species of this genus must be highly variable. I conclude, therefore, that all these individuals collected at the Auckland and Campbell Islands belong to one and the same species ; but what the name of that species is seems a matter of some uncertainty, though in all probability Farquhar's species *H. lukinsii* is synonymous with Perrier's *H. ornata.*

Filhol collected specimens of a small starfish at Campbell Island,* where he found it common, on shore and at a depth of 1 metre : these being submitted to Perrier were pronounced to be *Cribrella ornata.*

Now, since the only specimens from this island since that date that have been recorded and examined—viz., those collected by Dr. Parker—agree with the orange-coloured specimens from Auckland Island, we must, I think, come to the conclusion that the latter is the same as the species collected by Filhol, and therefore it is *H. ornata.* And if we compare Farquhar's diagnosis of *H. lukinsii* with Perrier's brief account of *H. ornata,* and bear in mind the great variability of the specimens collected at Carnley Harbour—some with two rows, some with one row of spinelets on the marginals and adambulacrals ; some with longer and finer, others with shorter and coarser spinelets ; that these specimens occur side by side, and are of the same colour, and could only be separated into two sets after careful examination under a lens—I think we are justified in concluding that these two accounts can readily be reconciled, especially in the light of Koehler's recent (1908) re-examination of the specimens in the Museum of the Jardin des Plantes.

Localities.—Auckland Island—Carnley Harbour (W. B. B.), Musgrave Harbour (E. Waite) ; Campbell Island (Parker, 1895) ; Snares Island (A. S. Danby, see Farquhar, 1898).

* Filhol states (p. 572) that he also found this species on Stewart Island and at Cook Strait, where it is said to occur in 25–30 fathoms of water. I have a specimen from Wellington which differs materially from *H. ornata,* and I believe is *H. compacta.* By the courtesy of the Director, I have been able to examine also the specimen in the Dominion Museum, and I agree with Farquhar's identification. I am also of opinion that the scarlet starfish of the Chatham Island belongs to this species.

Distribution.—McMurdo Bay, Coulman Island (see Bell, 1908); Cape of Good Hope (probably also Crozets, Marion Island, Prince Edward Island, Kerguelen, Tristan da Cunha, Falklands, Magellan Strait).

Remarks.—The history of the name *Cribella* (or, as it is frequently spelt, *Cribrella*) is an interesting example of the tenacity with which a name may continue to be erroneously applied to a genus. The whole question was raised and dealt with fully by Bell (1890) in regard to the common English species. He pointed out that Agassiz (1835) used the word as a synonym for *Linckia*, three species of which he enumerated as belonging to the genus, not one of which is a *Cribrella* as usually understood by recent authors; under these circumstances, it should, if the rules of priority are to be obeyed, disappear. It is true that recognised authorities (Koehler and Ludwig, amongst others) still use *Cribrella*, and attribute the name to Agassiz (*vide* Bronn's "Thierreichs"), in spite of the difference of spelling, which seems to have been introduced by Forbes. But the true generic title is not the only matter of difficulty that surrounds this and allied starfishes: a great deal of doubt hangs over the distinction between, or the synonymy of, several of Sladen's "species," as will be illustrated below.

In the list of synonyms at the head of this account I have not included all those that have been suggested. Thus, Bell (1905) has compared specimens of *H. ornata* collected at the Cape of Good Hope with Sladen's type of *H. simplex*, and finds them to be identical. Some writers have suggested that *H. simplex* is the young of some one or other of the subantarctic species. While comparing my specimens with Sladen's account of *H. simplex* and *H. obesa* I found certain resemblances to each of these species, and came to the conclusion that if the Auckland Island specimens are not *H. ornata* they must be *H. obesa*. Koehler (1908, p. 629) has compared *H. ornata* from the Cape with *H. obesa* from the Falkland Islands, and believes that the two species are synoymous, though he does not go so far as to combine the two accounts under one title. Ludwig (1905) and Leipoldt and Meissner believe that *H. obesa* is synonymous with *H. hyadesi*, and the latter with *H. pagenstecheri*. Therefore, since two things which are equal to the same thing are equal to one another, *H. ornata* would appear to be identical with *H. pagenstecheri*. Leipoldt and Meissner have even gone so far as to include Sladen's *H. praestans* in this synonymy. On the other hand, Ludwig does not admit that *H. simplex* is identical with *H. obesa*; so that we are left in considerable doubt as to what differences really exist between them all.

From the above summary we have, then, the following suggested synonymy: *H. ornata* = *simplex* (*fide* Bell) = *obesa* (*fide* Koehler and Ludwig); *H. obesa* = *pagenstecheri* (*fide* Leipoldt, Meissner, Ludwig) = *praestans* (*fide* Leipoldt, Meissner): therefore, *H. ornata* = *H. pagenstecheri* = *H. praestans*. All these "species" occur in subantarctic seas.

Even if we limit the identity of *H. ornata* with *H. simplex*, we have the interesting distribution from the Campbell and Auckland Islands and McMurdo Bay, in the neighbourhood of New Zealand, to the Crozets, Kerguelen Island, Tristan da Cunha, and the Cape of Good Hope; while if it be admitted that it is synonymous with *H. obesa* its area is extended to the Falklands and to Magellan Strait. Nor is this at all unique, for the starfish *Odontaster grayi* is also common to our seas and Magellan Strait.

Fam. STICHASTERIDAE.

Stichaster, Müller and Troschel, 1840.

Stichaster suteri, Loriol.

1894. *Stichaster suteri*, Loriol, Revue Suisse de Zool., xi, p. 477, pl. xxiii, fig. 2. 1879. *Asterias rupicola*, Hutton (non Verrill), Trans. N.Z. Inst., xi, p. 306. 1895. *Stichaster littoralis*, Farquhar, Trans. N.Z. Inst., xxvii, p. 206, pl. xiii, fig. 2. 1897. *S. suteri*, Farquhar, Journ. Linn. Soc. (Zool.), xxvi, p. 197.

To Mr. Farquhar belongs the credit of establishing the identity of Hutton's *A. rupicola* with Loriol's *S. suteri*, which had been fully described by Farquhar under the name *S. littoralis*, in ignorance of Loriol's account. Farquhar's description is illustrated by a good figure.

This species has not been hitherto recorded from these subantarctic islands; but amongst material collected some years ago by Mr. A. Hamilton at the Macquarie Island I find a small specimen which I believe belongs to this species, though it may turn out to be distinct from it.

Dimensions.—R, 8 mm.; *r*, 3·5 mm.; breadth of arm at base, 3·5 mm.; height, 2 mm.

It has six rays, which are flat (? or artificially flattened), and rounded at the ends, covered with small round-topped spines of the characteristic form. Each spine has a rounded top, with radiating ridges and grooves passing from its summit, precisely as is figured by Loriol. But these spines do not exhibit that regularity of arrangement that exists in the typical individuals of the species which I have seen. There is no distinct median or lateral rows, though they are much more densely aggregated down the middle of the arm; and the transverse disposition is not perceptible.

On the removal of the spines the plates are seen to be much coarser and the meshes smaller and less definitely arranged; the appearance of the skeleton is rather "tesselated" than imbricated.

The marginals are well developed, and bear two long obliquely set spines. The adambulacral armature resembles that of *S. suteri*. Owing to the flattening which the specimen has apparently undergone, the ambulacral groove is more "petaloid" than is usual for the species.

Locality.—Macquarie Island (A. Hamilton, 1894).

Distribution.—New Zealand (South Island, Stewart Island).

Stichaster suteri, var. **laevigatus,** Hutton.

1879. *Asterias rupicola*, var. *laevigatus*, Hutton, Trans. N.Z. Inst., xi, p. 343. 1898. *Stichaster suteri*, var. *laevigatus*, Farquhar, Trans. N.Z. Inst., xxx, p. 189.

This is very common on the stony beaches of the harbours of the Auckland and Campbell Islands. Although usually of small size when occurring between tide-marks, attaining a radius of 25–36 mm., I found on the face of rocks dipping straight down into deepish water both on the southern face of Masked Island and at the landing-place of our camp, which faced towards the island, some much larger specimens, in which R = 50 mm. These were obtained at specially low spring tide.

The colour is usually a very dark green, more or less suffused with black or grey. The starfish is so similarly coloured to the stones of the shingle under which it is attached that it is easily overlooked; but the large individuals are of purer green.

This starfish was originally found and recorded by Hutton, who mentioned that one of his specimens had a row of spines along the back, and traces of a lateral row on each side. Amongst my specimens I also find individuals exhibiting this intermediate character between the typical spinose form found on the shores of the main islands of New Zealand and those spineless ones characteristic of the Auckland Islands.

The large specimens alluded to above show the median row of spines very distinctly. In addition there are 10 groups of similar spines, 5 radial and 5 interradial, arranged in a ring on the disc; there may be as many as 4 spines in the radial groups at the commencement of the median-arm row, and 2 or 3 in the interradial groups. Further, there is within this ring, nearer the centre of the disc, a circle, more or less imperfect; while the madreporite is surrounded by a ring of 9 or 10 such spines. The marginal plates, as in the type of the variety and in the smaller individuals, each bear 2 or 3 spines in a slightly oblique line, so as to appear as an almost continuous series; but between them and the adambulacrals are a few irregularly spaced spines. It is not only in these particularly large specimens that the abactinal spines are present, for in quite a small individual (R = 7 mm.) there is a median row of them.

In another feature the large specimens differ from the smaller ones—viz., in the arrangement of the papulae. In the individuals of about R = 17 mm. the papulae are solitary, set in two rows on each side of the upper surface of the arm; but in slightly larger and older specimens (R = 26 mm.) the papulae are in groups of 3, 4, or 5, or even occasionally 6; while in the largest individuals each group contains 10 or 12, or perhaps more: these groups are in the same transverse line as the spines.

My specimens range from R = 7 mm., r = 3 mm., up to R = 50 mm., r = 23 mm. The largest hitherto recorded are those described by Loriol, who gives R = 36 mm.

The relation r : R is as 1 : 2·3 or 1 : 2·17; the width of the arm at its base is about equal to r; the height rather less.

Locality.—Auckland Island, Carnley Harbour (Hutton, W. B. B.); Campbell Island, Perseverance Harbour (Parker, W. B. B., Chilton, W. K. Chambers); Antipodes Island (W. B. B.).

II. OPHIUROIDEA.

Fam. AMPHIURIDAE.

Amphiura, Forbes, 1842.

Amphiura squamata, Delle Chiaje.

1828. *Asterias squamata*, Delle Chiaje, Mem. s. stor. d. Animali senza Vertebre, &c., iii, p. 77. 1879. *Amphiura parva*, Hutton, Trans. N.Z. Inst., xi, p. 305. 1898. *Amphiura elegans*, Farquhar, Journ. Linn. Soc. (Zool.), xxvi, p. 191.*

In 1879 Captain Hutton described a small Ophiurid from Dunedin under the name *A. parva*, the type of which is in the Otago University Museum. From an

* A complete synonymy is given in the "Challenger" Report, Ophiuroidea, vol. v, p. 136, and in Bell's "Catalogue of British Echinoderms" (Brit. Mus.), p. 119. Although Bell uses Leach's specific name *elegans*, most authorities, such as Ludwig, Lyman, &c., use Delle Chiaje's.

examination of it and of other specimens in my collection I am unable to detect any difference, except perhaps that of size, between it and the well-known Atlantic species as described by Bell and Lyman (1865) in considerable detail. The arms of the type are now imperfect, but the diameter of the disc is 4 mm., and this agrees with other individuals, though some are smaller. There is, however, one apparent difference: Hutton says of his species that there is "a single broad tentacle scale"; in reality there are two small scales, the distal one being, no doubt, the "blunt tooth on the latero-anterior margin" of the under arm-plate (Hutton).

It was not unnatural for Hutton to create a new species for this New Zealand *Amphiura*, as at the time he wrote he was probably unacquainted with Lyman's record of *A. squamata* at Chili, or, indeed, in the southern seas; and he would not suspect the occurrence of a British species on our shores. Farquhar recorded it, as *A. elegans*, from Gisborne, in 1898; while Ludwig (1899) examined specimens which were gathered at Gisborne and sent to him by Mr. Suter, and found no difference between them and the European form. He had apparently been in doubt as to the validity of Farquhar's identification, which he thus confirmed.

Of the three specimens collected by me during this expedition, two measure, respectively, R = 10 mm., r = 2 mm.; R = 7 mm., r = 1·25 mm. The third is about the size of the last, but the arms are injured.

Locality.—Auckland Island, Carnley Harbour; shore and 2 fathoms (W. B. B.).

Distribution.—New Zealand; Mediterranean; North Atlantic; Brazil; Cape of Good Hope; south-east Australia ("Challenger"); Chili (Lyman); Gough Island (Koehler).

It is, thus, almost cosmopolitan, and is one of the very few Echinoderms that afford any evidence in support of the bipolar theory. It occurs, as Ludwig has pointed out, both in the Arctic and the Antarctic seas; but this is probably explicable, as suggested by Ludwig, on the view that it has been conveyed on the bottoms of trading-ships from its home in the Atlantic and Mediterranean to the various localities at which it has been recorded.

III. ECHINOIDEA.

Fam. ECHINIDAE.

Echinus, Linnaeus, 1758.

Echinus margaritaceus, Lamarck, 1816.

This species is recorded by Filhol as having been obtained by dredging in Perseverance Harbour, opposite Point Terror (p. 572).

Although this species has been included in the New Zealand fauna (see Farquhar, Proc. Linn. Soc. N.S.W., 1898, p. 320), yet, so far as I can ascertain, there are no specimens of it in any of the collections in the Dominion. I have referred to this matter in my account of *E. angulosus* (see "Report on Echinoderms" in Sci. Results Trawl. Exp. "Nora Niven"). I hesitate to suggest that Filhol has made some error here, but no specimen of this or, indeed, any other Echinid was obtained during our expedition.

It was recorded by Bell from the winter quarters of the "Discovery," and is apparently a circumpolar species; but it appears to live in deep water, so that its absence from our collection during this expedition is not surprising.

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1899. Ludwig. "Ophiuroideen," in Hamburg. Magalhaens. Sammelreise, p. 19.

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* I have not seen this.

ARTICLE XIV.—HYDROMEDUSAE AND SCYPHOMEDUSAE FROM THE AUCKLAND AND CAMPBELL ISLANDS.

By W. B. Benham, D.Sc., F.R.S., University of Otago.

PLATE XII.

As special attention was paid to terrestrial forms of life during this expedition, and no apparatus for exploring the surface or depths of the sea was taken, the four medusae enumerated below may be regarded as merely incidental acquisitions. They are, nevertheless, of interest, for little work has been done on either of the groups. It is true that Coughtrey, Hilgendorf, and Farquhar have studied the hydroids of the New Zealand coast, and Filhol collected a few at Campbell Island, but in none of their articles is there any reference to the medusae. As to the *Scyphomedusae*, no work at all has been done on even the common species which occur off the shores of the Dominion, though Haeckel describes five species from deep water, obtained during the voyage of the "Challenger" in the neighbourhood of New Zealand. It is thus a new field, and one to be recommended to students having any love for beauty or elegance of form. But, while including these four species in this report, they teach us but little or nothing of importance in regard to the problem of former land connections, for although *Hippocrene* is the gonozooid of *Bougainvillea*, which is a littoral hydroid, it, like the other three, is pelagic, and hence may be of wide distribution. It is particularly interesting, however, to come across a species of the subantarctic genus *Phialella*, the only other species to which I can find a reference having been obtained at the Falkland Islands during the recent Scottish Antarctic Expedition.

I have refrained from giving specific names to the two *Hydromedusae*, as I have little of the recent literature on the group. Similar forms may have been met with during the various expeditions to the Antarctic, but those of the "Discovery" have not yet been published, and the reports of the foreign expeditions to these seas are not available in the Dominion.

Class HYDROMEDUSAE.

Order ANTHOMEDUSAE.

Fam. Margelidae.

Hippocrene, Mertens, 1829. (Plate XII, figs. 1, 2.)

While passing up Musgrave Harbour the boat sailed through a shoal of these beautiful little medusae.

The umbrella is much arched, quadrate in section, with rounded exumbrella. At each angle is a U-shaped white thickened cushion bearing numerous long filamentous tentacles, nearly as long as the height of the umbrella; at their bases are numerous red ocelli.

The manubrium extends far down the subumbrella cavity, bearing a quadrate mouth, at each of the perradial corners of which is a much-branched oral tentacle. Each oral tentacle consists of 3 main stems rising from a short base; each stem gives origin to several dichotomous branches, and each final branch terminates in a round knob of cnidoblasts. These oral tentacles spread out in all directions within the subumbrella cavity.

The mouth leads into a short stomach, whence the 4 radial canals originate, at about one-half the height of the bell, and pass obliquely upwards towards the roof of the umbrella, then turn abruptly downwards to the angles.

The gonads lie along the ascending portion of these canals, and in the younger individuals are limited thereto; but in older specimens the gonads are continued down the sides of the stomach as far as the mouth, and the 4 gonads may be so extensive as to surround the stomach on all sides. Each gonad is really a double structure, being traversed by a deep groove along its whole extent, so as to hang down as a pair of lamellae from the underside of the canal.

Dimensions.—Height, 12–14 mm.; breadth, 7–9 mm.

Colour.—The umbrella is transparent and colourless; the gonads a pale pinkish-brown; the tentacles reddish.

Locality.—Auckland Island: Musgrave Harbour (W. B. B.); Norman's Inlet (C. Chilton).

Remarks.—Haeckel* describes and figures *H. macloviana*, which occurs at the Falkland Islands. This differs from the present species in its smaller size, and in the fact that the manubrium originates high up in the cavity of the umbrella, so that the upward course of the radial canals is not nearly so marked.

Agassiz† figures the medusa of *Bougainvillea superciliaris* from the American coastal waters. This resembles the Auckland Island species in the general arrangement of parts, but the shape of the animal is more nearly spherical. It may be mentioned, however, that those of our specimens that are preserved in alcohol have a more spherical form than those in formol.

It is, of course, impossible to state to what species of hydroid our medusa belongs. The only member of the family that has been recorded from our shores is *Hemitheca*, Hilgendorf,‡ which is represented by a single species, *H. intermedia*; but whether this occurs at the Auckland Islands is unknown.

Order LEPTOMEDUSAE.

Fam. Eucopidae.

Subfam. Obeliinae.

Phialella, Browne, 1902. (Plate XII, figs. 3–6.)

Depressed bell-shaped; the margin of the umbrella bears numerous hollow tentacles, the bases of which are much enlarged, forming spherical bulbs, in which there is no definite ocellus—that is, no pigment is present in the preserved specimens.

* Haeckel, "Das System der Medusen," 1879, p. 90, pl. v, figs. 1, 2.

† A. Agassiz, "The North American Acalephae," Illus. Cat. Mus. Comp. Zool., Harvard, ii, 1865, p. 153.

‡ F. W. Hilgendorf, Trans. N.Z. Inst., xxx, 1898, p. 202.

Some of these tentacles are smaller than others, but there seems to be no constant regularity in their arrangement. One can recognise, however, that the perradial bulbs are larger than the rest, and in a large individual there are about 48 others—*i.e.*, 12 in each quadrant bounded by the perradials. In such a specimen one can distinguish three distinct sizes, which may be termed A, B, C, the last being the smallest. There are three As, three Bs, and six Cs, as in the figure. The largest are nearly as big as the perradials; one of them is interradial in position, the two others are subradial; and generally there is a B between two As, and a C between A and B. In smaller individuals there are fewer tentacles—as few as 24. There are 8 adradial statocysts (or marginal vesicles), situated between 2 tentacles of sizes B and C. Each spherical statocyst is supported on a thickened cushion, which resembles a tentacle-bulb. The outer surface is divided up into a number of hexagonal or polygonal areas, the free ends of the transparent ectoderm cells. There are 4 to 6 statoliths, situated near and limited to the distal half of the interior of the vesicle; each is separated from its neighbour by a membrane (? the cell-membrane of the refringent body).

The manubrium is quite short—2 mm. in length in the larger specimens. It is quadrate at the base. The mouth when closed is cruciform, but when widely opened is more or less circular, and its margin is very delicately folded (fig. 5). On the inner surface of the interradial sides of the stomach are rows or groups of little rounded papillae, which are probably digestive glands. The 4 radial canals arise at the base of this stomach or oral cavity as open grooves, which meet in the centre; each canal presents a short proximal region (about 1 mm. in length, measured from the angle of the manubrium), along which the endoderm is distinctly thicker than in the distal portion (fig. 6).

The festooned and undulating gonads hang down from nearly the entire length of this distal region of the canal, each being 6 mm. in length, and of considerable height.

Dimensions.—From 10 mm. to 20 mm. in diameter; the larger ones about 5 mm. in height.

Colour.—Transparent, colourless (in formol).

Locality.—Auckland Islands: Norman's Inlet (Chilton). Campbell Island: Perseverance Harbour (Chilton).

Remarks.—The genus *Phialella* was created by Browne for a species, *P. falklandica*,* captured in Stanley Harbour. It differs from *Tiaropsis*, Agassiz, in the fact that the statocysts are closed sacs, and in the absence of definite ocelli on the tentacle-bulbs.

The present species may possibly be identical with this, but the height of the Falkland Island species is 11 mm. for a diameter of 17 mm., and there are 60–70 tentacles.

How far these features are of specific value is doubtful. It is known that in this family the number of tentacles increases with age, while the height may depend on the mode of preservation.

The hydroid is unknown, though presumably it belongs to the Campanularians.

* Browne, "A Preliminary Report on the Hydromedusae from the Falkland Islands," Ann. Mag. Nat. Hist. (7), ix, p. 282.

Class SCYPHOMEDUSAE.

Order DISCOMEDUSAE.

Suborder SEMOSTOMEAE.

Fam. CYANEIDAE.

Cyanea, Peron and Lesueur, 1809.

Cyanea annaskala, von Lendenfeld.

1882. Von Lendenfeld, Zeit. Wiss. Zool., xxxvii, p. 46, pls. xvii–xxiv. 1884. Von Lendenfeld, Proc. Linn. Soc. N.S.W., ix, pp. 275, 952.

A fully illustrated account of this southern species is given in the first reference, and a brief diagnosis of the species will be found in the second.

Colour.—The umbrella is colourless, but the general tint of the creature is pale brown, due to the colour of the endodermal canals and of the female gonads, which are orange-brown. (According to von Lendenfeld, the male gonads are rose-coloured, but I have no note as to any of the specimens seen by us being thus tinted.) The oral lobes or arms are " white, with purple margin, or purple throughout."

Dimensions.—Only moderate-sized individuals were captured, measuring about 6 in. in diameter, but I have seen specimens thrown ashore on the beaches near Dunedin which attain a diameter of 15 in., or 375 mm.

The exumbrella is covered with " nettle-warts," which are not limited to the centre, as von Lendenfeld states.

The margin of the umbrella is notched so as to form 16 rounded lobes, in 8 of which notches the tentaculocysts are situated.

The long delicate tentacles in this genus are arranged in 8 groups, at some distance within the margin of the umbrella ; there are about 24 tentacles in each group, arising in 3 or 4 rows from a crescentic or semicircular area.

Locality.—Auckland Island : Norman's Inlet (W. B. B.).

Distribution.—New Zealand, Australia (Port Jackson).

Fam. ULMARIDAE.

Aurelia, Peron and Lesueur, 1809.

Aurelia coerulea, von Lendenfeld.

1884. Von Lendenfeld, Proc. Linn. Soc. N.S.W., ix, p. 280.

Although my specimens do not agree in all points with the diagnosis of this species given by von Lendenfeld, and in several respects resemble *A. aurita*, Lamarck, yet, as the latter species appears to be confined to the Atlantic and European seas, and as *A. coerulea* is the only species to which the present specimens bear any close resemblance, I prefer, in the absence of more certain data, to refer them to this Australian species. At the same time, the difference between the two species appears to be very slight, though I observe that in a recent communication to the Proc. Zool. Soc. (1909, p. 78), Mr. Goodey makes mention of having examined *A. coerulea*, so that I presume the species is valid. But a careful comparison of a good series of specimens may perhaps necessitate their union.

I have been able to compare our jellyfish with specimens of *A. aurita* obtained from Plymouth, England, some years ago. They are not now in such a good state

of preservation as those from the Auckland Islands, so that there are some points of apparent difference, which may, in reality, be due to difference in maturity or condition of preservation. In our specimens the exumbrella is covered with small "nettle-warts." The margin presents 8 rounded velar lobes, separated from one another by 8 pairs of long triangular ocular lappets, which are themselves marked off from each other by deep incisions. Each velar lobe, moreover, has a slight pit-like notch in its middle, at the extremity of the unbranched adradial canal. In one small individual, measuring 16 mm. in diameter, there is a tentaculocyst in each of these pits, making 16 of these sense-organs. The marginal tentacles are somewhat coarser than those of *A. aurita;* but this may be due to the state of preservation. The oral arms are not "rounded" at the tips, as stated by von Lendenfeld; they are rather to be described as "lancet-shaped," and are precisely like those of the European species. The margin of the arm-groove is slightly undulating, and bears closely set short filamentous processes, terminating in a rounded knob: these are also coarser than in the Plymouth specimens. In the largest individual the length of the oral arm is about equal to or rather less than the radius of the umbrella; while in a smaller one, of only 12 mm. radius, the arm is but 7 mm. in length. Von Lendenfeld states in his diagnosis that the arm in *A. coerulea* is "a little longer than [the radius of] the margin of the umbrella." It seems probable, then, that the arms increase in length as the animal grows, so that this can scarcely be regarded as a specific difference. The mode of branching of the canal system is precisely like that in *A. aurita*, and certainly does not exhibit the division "at larger angles" as described for *A. coerulea;* indeed, these angles are somewhat more acute than in the Plymouth specimens. The gonads are not circular, but are incomplete on their mesial side, so as to be "hoof-shaped," as von Lendenfeld notes; nor does this appear to be a matter of size, for in individuals of *A. aurita* of much smaller diameter than ours the gonad is completely circular.

The specific differences, then, seem to be reduced to two—(1) the existence of 16 velar lobes, and (2) the hoof-shaped gonads; and possibly a third, the presence of the nettle-warts on the exumbrella.

Dimensions.—Radius of umbrella, 45 mm.; length of oral arms, 40–45 mm.; radius from mouth to outer margin of gonad, 16 mm.

Colour.—Transparent blue; gonads pale violet.

Locality.—Auckland Islands: Carnley Harbour (W. B. B.).

Distribution.—Australia: Port Jackson.

Remarks.—The only species recorded from the South Pacific in Haeckel's monograph* is *A. clausa*, Lesson, from which ours differs entirely.

EXPLANATION OF PLATE XII.

Fig. 1. *Hippocrene:* Side view. (× 4.)

Fig. 2. *Hippocrene:* Viewed from below. (× 4.)

Fig. 3. *Phialella:* Side view. (× 4.)

Fig. 4. *Phialella:* From below. (× 4.) The tentacles in each quadrant are inserted from four different individuals, to show the slight irregularity in their arrangement.

Fig. 5. *Phialella:* The mouth widely opened, showing the interradial groups of papillae (? digestive glands), and the 4 radial grooves meeting in the centre.

Fig. 6. *Phialella:* View of the stomach from the exumbrellar aspect, showing the 4 radial canals meeting in the centre, and their differentiation into a proximal and a distal region.

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* Haeckel, *loc. cit.*, p. 558.

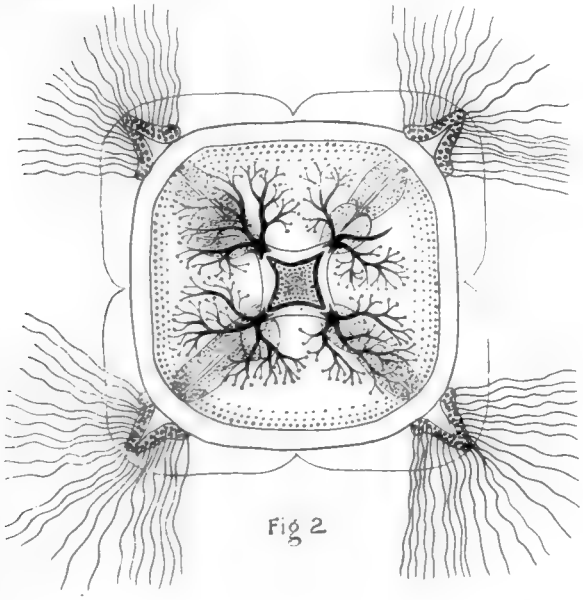


Fig 2

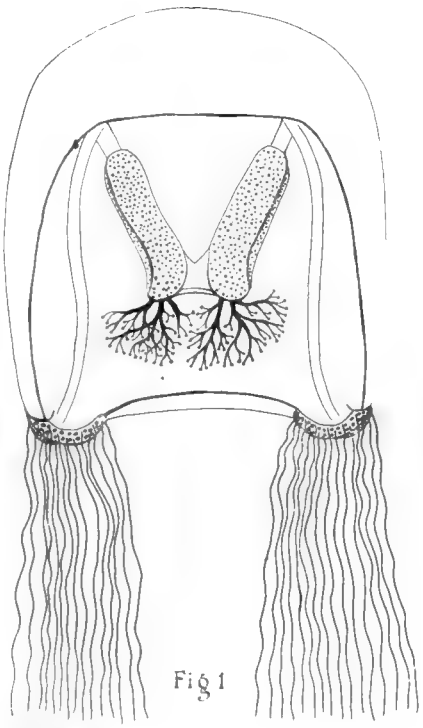


Fig 1

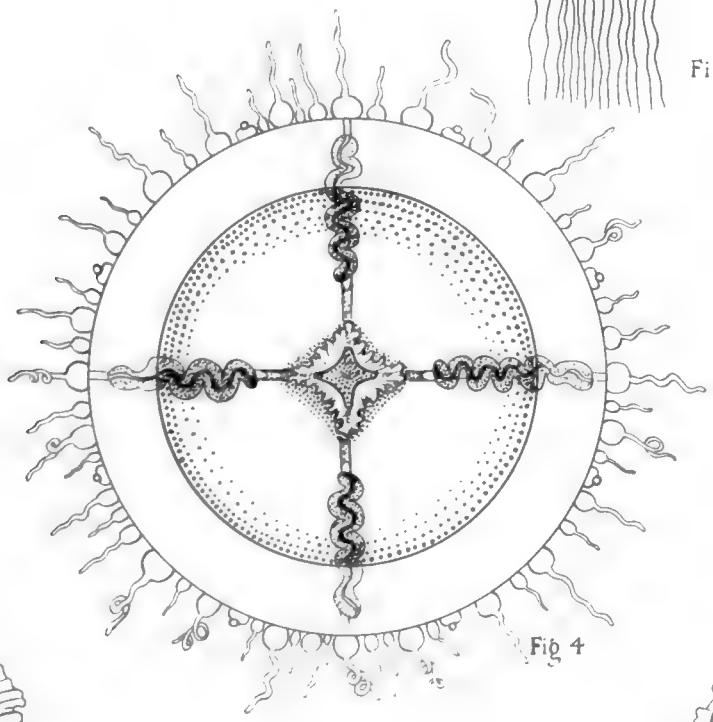


Fig 4

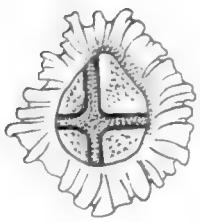


Fig 5

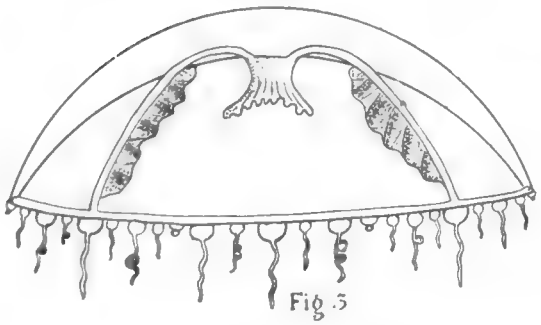


Fig 3

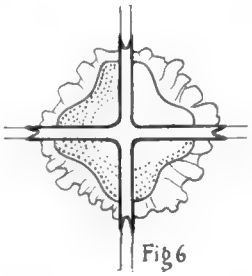


Fig 6

W. B. Benham del.

PLATE XII.

ARTICLE XV.—REPORT ON THE FORAMINIFERA FROM THE SUB-ANTARCTIC ISLANDS OF NEW ZEALAND.

By FREDERICK CHAPMAN, Assoc. Linn. Soc. Lond., F.R.M.S., &c., Palaeontologist to the National Museum, Melbourne.

PLATES XIII, XIV, XV, XVI, AND XVII.

THE first portion of the present material was received from Mr. J. B. Mayne, M.A., of Christchurch, New Zealand, who favoured me with three samples of dredgings collected during the recent Subantarctic Expedition from various stations to the south of New Zealand. One of these samples gave promise of good results in the group of the *Foraminifera*. Shortly afterwards I was requested by Drs. C. C. Farr and C. Chilton, of the Philosophical Institute of Canterbury, to undertake the systematic description of the foraminiferal material dredged by the members of the same expedition, and, upon acceding to their request, Dr. Chilton kindly supplied me with several samples from other localities.

DETAILS OF SAMPLES.

(1.) "Perseverance Harbour, Campbell Islands; 8 fathoms. Bollons." (Suter.)
A fine silty deposit, largely terrigenous. Containing numerous sponge-spicules and minute calcareous-tested *Foraminifera*, together with a few arenaceous forms.

(2.) "One mile and a half north-east of Bounty Island; 50 fathoms. Bollons." (Suter.)
A coarse shelly deposit, consisting largely of calcareous worm-tubes, *Polyzoa*, barnacles, and *Mollusca*. A few specimens of *Foraminifera* present, including some interesting redundant or fistulose forms of *Polymorphina*.

(3.) "No. 2. Off the Snares; 60 fathoms." (Mayne.)
Foraminiferal and shell sand, with *Polyzoa*, *Ostracoda*, and siliceous sponge-spicules. Also numerous crystals of garnet (rhombic dodecahedra) with striated surfaces. A very rich foraminiferal fauna.

(4.) "No. 1. Twenty miles north of Auckland Island; 85 fathoms." (Mayne.)
Shell sand with *Polyzoa* and *Ostracoda*. Rich in *Foraminifera*.

(5.) "Ten miles north of Enderby Island; 85 fathoms." (Waite.)
Shell sand with *Polyzoa* and *Ostracoda*. *Foraminifera* very abundant. The families *Miliolidae* and *Lagenidae* both well represented.

DESCRIPTION OF THE FORAMINIFERA.

Fam. MILIOLIDAE.

Subfam. NUBECULARIINAE.

Genus NUBECULARIA, Defrance, 1825.

Nubecularia lucifuga, Defrance.

Nubecularia lucifuga, Defrance, 1825, Dict. Sci. Nat., vol. xxv, p. 210; Atlas Zooph., pl. xliv, fig. 3. *N. lucifuga*, Defr., Brady, 1884, Rep. Chall., vol. ix, p. 134, pl. i, figs. 9–16. *N. lucifuga*, Defr., Egger, 1893, Abhandl. d. k. bayer. Akad. d. Wiss., cl. ii, vol. xviii, p. 250, pl. xxi, figs. 4–7. *N. lucifuga*, Defr., Millett, 1898, Journ. R. Micr. Soc., p. 261, pl. v, fig. 7.

The example found here almost exactly resembles fig. 3 of the "Challenger" Report, and is of the adherent and spiral type of shell. The attached surface shows very imperfect septation; the upper surface is rugose and pitted.

Distribution.—*N. lucifuga* has been previously recorded (as a variety) from the New Zealand area by Dr. Rudolf Haeusler,* who found it in shallow water at the Hauraki Gulf. The "Challenger" obtained it from one station only, at Tongatabu, Friendly Islands (18 fathoms). It has also been recorded from the shore-sands near Melbourne, Australia, and from the coast of Tripoli; whilst it is abundant on the shores of the Mediterranean (as at Palermo, Sicily, T. Rupt. Jones coll. in the author's cabinet), and in the East and West Indies. Depauperated examples occasionally turn up on the Devonshire coast, in England. Dr. Egger has also recorded it from the neighbourhood of Kerguelen Island, and Mr. Millett from the Malay Archipelago.

Present Occurrence.—Off the Snares; 60 fathoms; one specimen.

Subfam. MILIOLININAE.

Genus BILOCULINA, d'Orbigny, 1826.

Biloculina depressa, d'Orbigny.

Biloculina depressa, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 298, No. 7. *B. depressa*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 145, pl. ii, figs. 12, 16, 17; pl. iii, figs. 1, 2. *B. depressa*, d'Orb., Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 547, pl. ix, figs. 48, 49; woodcuts, figs. 1–5.

A few of our shells exhibit the aboral prolongation which is seen to occur in Recent examples, and so frequently in the Tertiary specimens from Victoria and elsewhere. The deep-water variety, *murrhyna*, appears to be absent from these soundings.

* Trans. N.Z., Inst. vol. xix, 1887, p. 197.

Distribution.—This species has a wide geographical range. The "Challenger" obtained it from the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; very common.

Biloculina serrata, Brady.

Biloculina depressa, d'Orbigny, var. *serrata*, Brady, 1884, Rep. Chall., vol. ix, p. 146, pl. ii, figs. 3 *a–c*. *B. serrata*, Brady, Schlumberger, 1891, Mém. Soc. Zool., France, vol. iv, p. 550, pl. ix, figs. 50, 51; woodcuts, 6, 7. *B. serrata*, Brady, Goës, 1894, Kongl. Svenska Vetenskaps-Akad. Handl., vol. xxv, No. 9, p. 120, pl. xxv, fig. 926.

Our specimens are not so uniformly serrated as Brady's figured example, but they are undoubtedly referable to that form. They more nearly resemble the figures given by Dr. Goës.

Distribution.—This species, curiously, in common with other types here enumerated, occurs at antipodean areas. Brady's examples came from the North Atlantic and South Pacific, and it is recorded from the New Zealand area in the "Challenger's" "Summary of Results." Schlumberger obtained it from the Gulf of Gascony.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Biloculina sarsi, Schlumberger. (Plate XIII, fig. 3.)

Biloculina ringens, Brady (non Lamarck), 1884, Rep. Chall., vol. ix, p. 139. *B. sarsi*, Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 553, pl. ix, figs. 55–59; woodcuts, 10–12. *B. sarsi*, Schlumb., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 14, pl. i, figs. 1, 2.

Distribution.—The original specimens were dredged by M. Sars in the North Sea.

This species has already been described from the Tertiary (Balcombian) clays of Port Phillip, where they attained especially large dimensions.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; frequent; small examples. Ten miles north of Enderby Island; 85 fathoms; rare.

Biloculina bradii, Schlumberger. (Plate XIII, fig. 1.)

Biloculina ringens, Brady (non Lamarck), 1884, Rep. Chall., vol. ix, p. 142, pl. ii, fig. 7. *B. bradyi*, Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 557, pl. x, figs. 63–71; woodcuts, 15–19. *B. bradii*, Schlumb., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 13, pl. i, figs. 7, 8.

A good series of this form was found, and the examples are fairly typical. Schlumberger distinguishes the Eocene *B. ringens* from the living species by the aperture and relative thickness of the walls.

Distribution.—Should Dr. Brady's records of *B. ringens* prove to be referable to the above form, the living representatives are cosmopolitan. Schlumberger records *B. bradii* from the Atlantic (Gulf of Gascony; 1,850 metres). The writer has also recorded this form from the Tertiary (Balcombian) clays of Port Phillip.

Present Occurrence.—Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Biloculina bradii, Schlumberger, var. **denticulata,** Brady. (Plate XIII, fig. 2.)

Biloculina ringens, Lam., var. *denticulata*, Brady, 1884, Rep. Chall., vol. ix, p. 143, pl. iii, figs. 4, 5.

Our figured specimen shows strong denticulations along the lateral edges, but not so well marked at the aboral end as in Brady's example.

Distribution.—Dr. Brady regarded this variety as belonging essentially to the coral-reef fauna. It occurred in the "Challenger" dredgings at several stations in the Pacific.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare.

Biloculina vespertilio, Schlumberger. (Plate XIII, figs. 4 *a*, *b*.)

Biloculina ringens, Brady (non Lamarck), 1884, Rep. Chall., vol. ix, p. 142, pl. ii, fig. 8. *B. vespertilio*, Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 561, pl. x, figs. 74–76; woodcuts, 20–22.

Distribution.—Gulf of Gascony; 1,850 metres (Schlumberger).

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Biloculina pisum, Schlumberger.

Biloculina pisum, Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 569, pl. xi, figs. 81–83; woodcut, 31. *B. pisum*, Schlum., Chapman, 1905, Trans. N.Z. Inst., vol. xxxviii, p. 80.

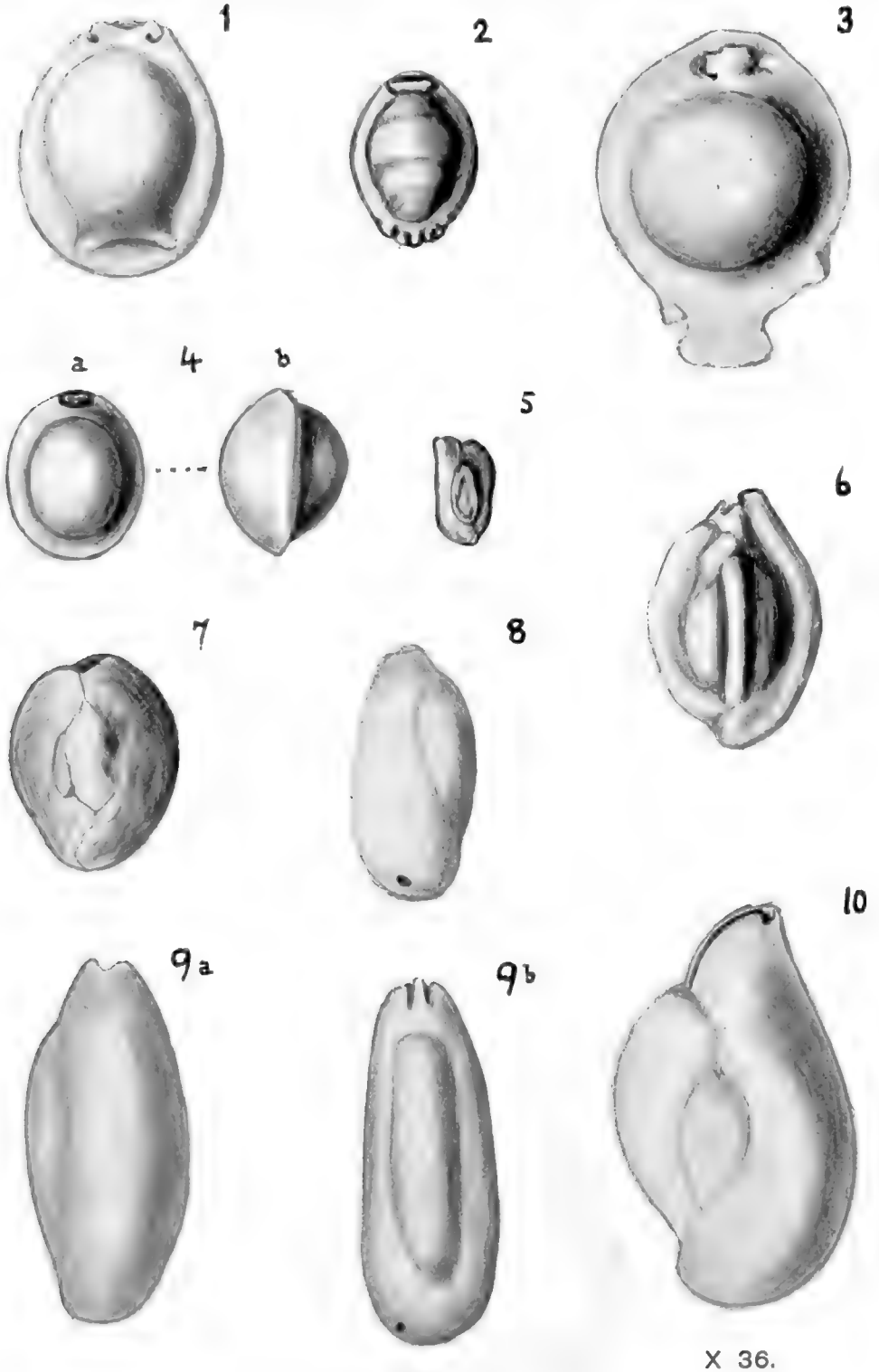
Distribution.—The original specimens were dredged in the Mediterranean. The writer has already noted this species from Great Barrier Island, New Zealand, at 110 fathoms, and it was moderately abundant.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Biloculina lucernula, Schwager.

Biloculina lucernula, Schwager, 1866, "Novara" Exped., geol. Thiel, vol. ii, p. 202, pl. iv, figs. 17 *a*, *b*. *B. bulloides*, Brady (non d'Orbigny), 1884, Rep. Chall., vol. ix, p. 142, pl. ii, figs. 5, 6. *B. lucernula*, Schwager, Schlumberger, 1891, Mém. Soc. Géol. France, vol. iv, p. 572, pl. xii, figs. 90–96; woodcuts, 37–41.

Distribution.—This is a common form in the North Atlantic, and is only occasionally found in the Southern Hemisphere.



X 36.

PLATE XIII.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Biloculina elongata, d'Orbigny.

Biloculina elongata, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 298, No. 4. *B. elongata*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 144, pl. ii, figs. 9 *a*, *b*. *B. elongata*, d'Orb., Howchin, 1889, Trans. R. Soc. S. Australia, vol. xii, p. i. *B. elongata*, d'Orb., Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 571, pls. xi and xii, figs. 87–89; woodcuts, 35, 36. *B. elongata*, d'Orb., Millett, 1898, Journ. R. Micr. Soc., p. 263. *B. elongata*, d'Orb., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 15, pl. i, fig. 14.

Distribution.—This species has a wide geographical range. Dr. Brady remarks that it is most abundant in the North Atlantic and South Pacific. Mr. Millett records it from the Malay Archipelago. Mr. Howchin and the writer obtained it as a fossil from the Victorian Tertiaries.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Biloculina irregularis, d'Orbigny.

Biloculina irregularis, d'Orbigny, 1839, Foram. Amér. Mérid., p. 67, pl. viii, figs. 22–24. *B. irregularis*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 140, pl. i, figs. 17, 18. *B. irregularis*, d'Orb., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 216, pl. i, figs. 13–15. *B. irregularis*, d'Orb., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 295, pl. xli, fig. 3. *B. irregularis*, d'Orb., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 15, pl. i, figs. 5, 6.

Our specimens are small, but otherwise typical.

Distribution.—The "Challenger" obtained examples from the New Zealand area, as well as from the Canaries (off Palma), 1,125 fathoms; off Sombrero Island, 450 fathoms; south of Pernambuco, 350 fathoms; South Atlantic, 1,415 fathoms; off Fiji, 610 fathoms; off Tahiti, 620 fathoms; and north of Papua, 1,070 fathoms. Dr. Egger obtained it from "Gazelle" material off Kerguelen, 104 metres, and off the Western Australian coast, 359 metres.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very common.

Biloculina globulus, Bornemann.

Biloculina globulus, Bornemann, 1855, Zeitscher. d. deutsch. geol. Gesellsch., vol. vii, p. 349, pl. xix, fig. 3. *B. globulus*, Born., Schlumberger, 1891, Mém. Soc. Zool. France, vol. iv, p. 575, pl. xii, figs. 97–100; woodcuts, 42–44. *B. globulus*, Born., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 15, pl. i, figs. 17, 18.

Distribution.—In the "Challenger" Report Dr. H. B. Brady unites this species, unfortunately, with *Planispirina* ("*Biloculina*") *sphaera*, so that we cannot follow

the distribution as it there stands. Schlumberger records it from the Atlantic (Azores). It is of frequent occurrence in the Victorian Tertiary clays of Balcombian age; and Bornemann and Reuss have indicated its general distribution in the Oligocene clays of Germany.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; rare; small. Ten miles north of Enderby Island; 85 fathoms; common.

Genus Spiroloculina, d'Orbigny, 1826.

Spiroloculina asperula, Karrer.

Spiroloculina asperula, Karrer, 1868, Sitzungsb. d. k. Ak. Wiss. Wien, vol. lvii, p. 136, pl. i, fig. 10. *S. asperula*, Karrer, Brady, 1884, Rep. Chall., vol. ix, p. 152, pl. viii, figs. ? 11, 13, 14. *S. asperula*, Karrer, Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 225, pl. i, figs. 30–32; pl. xi, figs. 57, 58.

Distribution.—The "Challenger" localities are in the Pacific and the West Indies. Egger obtained it from the "Gazelle" soundings, off west Africa, the Mauritius, and Western Australia.

Present Occurrence.—Off the Snares; 60 fathoms; one example, slightly damaged.

Genus Miliolina, Williamson, 1858.

Miliolina insignis, Brady.

Miliolina insignis, Brady, 1881, Quart. Journ. Micr. Sci., vol. xxi, n.s., p. 45. *M. insignis*, Brady, 1884, Rep. Chall., vol. ix, p. 165, pl. iv, figs. 8, 10. *M. insignis*, Brady, Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 81.

Distribution.—This species has already been recorded, by the writer, from the New Zealand area, off Great Barrier Island, at 110 fathoms. It is a rather widely distributed form, and occurs in shallow water and down to 2,900 fathoms.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; one large example.

Miliolina circularis, Bornemann sp.

Triloculina circularis, Bornemann, 1855, Zeitschr. d. deutsch. Gesellsch., vol. vii, p. 349, pl. xix, fig. 4. *Miliolina circularis*, Born. sp., Brady, 1884, Rep. Chall., vol. ix, p. 169, pl. iv, figs. 3 *a–c*; pl. v, figs. 13, 14(?). *M. circularis*, Born. sp., Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 235, pl. ii, figs. 61–63. *M. circularis*, Born. sp., Millett, 1898, Journ. R. Micr. Soc., p. 499, pl. xi, figs. 1–3. *M. circularis*, Born. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 298, pl. xliv, fig. 1.

Distribution.—Originally described as a fossil from the Oligocene of Hermsdorf, this species has been recorded in recent deposits off Prince Edward Island, 50–150

fathoms; off Christmas Harbour, Kerguelen Island, 120 fathoms; and Bass Strait, 38 fathoms (Brady): from Cape Verde, Mauritius, west and east Australia (Egger): from the Malay Archipelago (Millett): Cuba and Trinidad (Flint): Great Barrier Island, New Zealand (Chapman): Hauraki Gulf, New Zealand (Haeusler).

Present Occurrence.—Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very common.

Miliolina circularis, Born. sp., var. **sublineata**, Brady. (Plate XIII, fig. 7.)

Miliolina circularis, Bornemann sp., var. *sublineata*, Brady, 1884, Rep. Chall., vol. ix, p. 169, pl. ix, figs. 7 *a–c*. *M. circularis*, Born. sp., var. *sublineata*, Brady, Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 237, pl. ii, figs. 78, 79. *M. circularis*, Born. sp., var. *sublineata*, Brady, Millett, 1898, Journ. R. Micr. Soc., p. 501, pl. xi, fig. 4.

This is a rare variety. Our example is fairly typical, with the exception that the striae are somewhat stronger and more irregular than usual.

Distribution.—Off the Admiralty Islands (Brady); coast of Mauritius (Egger); Malay Archipelago (Millett).

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Miliolina subrotunda, Montagu sp.

"Serpula subrotunda dorso elevato," Walker and Boys, 1784, Test. Min., p. 2, pl. i, fig. 4. *Vermiculum subrotundum*, Montagu, 1803, Test. Brit., pt. ii, p. 521. *Miliolina subrotunda*, Montagu sp., Brady, 1884, Rep. Chall., vol. ix, p. 168, pl. v, figs. 10, 11. *M. subrotunda*, Walker and Boys sp., Goës, 1894, Kongl. Svenska Vet.-Akad. Handl., vol. xxv, p. 109, pl. xix, figs. 846, 847.

Distribution.—A shallow-water form, with a wide geographical range.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; very common.

Miliolina seminulum, Linné sp.

Serpula seminulum, Linné, 1767, Syst. Nat., 12th ed., p. 1264, No. 791; 1788, 13th (Gmelin's) ed., p. 3739, No. 2. *Miliolina seminulum*, Linné sp., Brady, 1884, Rep. Chall., vol. ix, p. 157, pl. v, figs. 6 *a–c*. *M. seminulum*, L. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 297, pl. xliii, fig. 2.

Distribution.—One of the most ubiquitous of the genus, occurring commonly in the shore-sand of nearly every coast-line, and more sparingly at greater depths. Strangely enough, it was extremely rare in the Great Barrier Island dredgings.* Haeusler has noted its occurrence in the Hauraki Gulf.

* Chapman, Trans. N.Z. Inst., vol. xxxviii, 1905, p. 81.

Present Occurrence.—Off the Snares; 60 fathoms; common, and generally small. Twenty miles north of Auckland Island; 85 fathoms; very common, and small. Ten miles north of Enderby Island; 85 fathoms; common, and typical.

Miliolina oblonga, Montagu sp.

Vermiculum oblongum, Montagu, 1803, Test. Brit., p. 522, pl. xiv, fig. 9. *Miliolina oblonga,* Mont. sp., Brady, 1884, Rep. Chall., vol. ix, p. 160, pl. v, figs. 4 *a, b.* *M. oblonga,* Mont. sp., Goës, 1894, Kongl. Svenska Vet.-Akad. Handl., vol. xxv, p. 110, pl. xx, figs. 850–850*f.* *M. oblonga,* Mont. sp., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 17, pl. ii, fig. 26.

Distribution.—Common in almost all shallow-water deposits. It has been recorded from the Hauraki Gulf, New Zealand (Haeusler).

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares; 60 fathoms; frequent; rather small. Twenty miles north of Auckland Island; 85 fathoms; rare; small. Ten miles north of Enderby Island; 85 fathoms; common; small.

Miliolina trigonula, Lamarck sp.

Miliolites trigonula, Lamarck, 1804, Ann. du Muséum, vol. v., p. 351, No. 3. *Miliolina trigonula,* Lam. sp., Brady, 1884, Rep. Chall., vol. ix, p. 164, pl. iii, figs. 14–16. *M. trigonula,* Lam. sp., Goës, 1894, Kongl. Svenska Vet.-Akad. Handl., vol. xxv, p. 115, pl. xxii, fig. 870.

Distribution.—Rather widely dispersed, and commoner in temperate seas.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Miliolina tricarinata, d'Orbigny sp.

Triloculina tricarinata, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 299, No. 7. *Miliolina tricarinata,* d'Orb. sp., Brady, 1884, Rep. Chall., vol. ix, p. 165, pl. iii, figs. 17 *a, b.* *M.* (*Triloculina*) *tricarinata,* d'Orb. sp., Egger, 1893, Abhandl. d. k. bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 234, pl. ii, figs. 35–37.

It is of interest to note that this species is often found of large dimensions, especially in the neighbourhood of coral reefs. In certain Tertiary deposits also, as in those of Victoria, very large examples are met with.

Distribution.—This species has a very wide range. Its bathymetrical limits, as given by Dr. H. B. Brady, are from 6 to 2,350 fathoms.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare, and rather small.

Miliolina vulgaris, d'Orbigny sp.

Quinqueloculina vulgaris, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 302, No. 33. *Miliolina auberiana,* d'Orb. sp., Brady, 1884, Rep. Chall., vol. ix, p. 162, pl. v, figs. 8, 9. *M. vulgaris,* d'Orb. sp., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 18, pl. ii, fig. 32.

This form appears to graduate into *M. seminulum* by elongation, and into *M. circularis* by a shortening and depression of the test.

Distribution.—North Atlantic; West Indies; Mediterranean; Great Barrier Island, New Zealand.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very common.

Miliolina angulata, Williamson. (Plate XIII, fig. 5.)

Miliolina bicornis, Walker and Jacob sp., var. *angulata*, Williamson, 1858, Recent Foram. Gt. Brit., p. 88, pl. vii, fig. 196. *M. angulata*, Williamson, Goës, 1894, Kongl. Svenska Vet.-Akad. Handl., vol. xxv, No. 9, p. 113, pl. xx, fig. 858; pl. xxi, figs. 859–859*e*.

This species is a small, contracted, and angulated form of the *M. seminulum* type.

Distribution.—*M. angulata* has been recorded from the shores of Great Britain and Scandinavia.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; common.

Miliolina polygona, d'Orbigny sp. (Plate XIII, fig. 6.)

Quinqueloculina polygona, d'Orbigny, 1839, Foram. Cuba, p. 198, pl. xii, figs. 21–23. *Miliolina polygona*, d'Orb. sp., Goës, 1894, Kongl. Svenska Vet.-Akad. Handl., vol. xxv, No. 9, p. iii, pl. xx, figs. 854–854*g*.

Distribution.—The original specimens were from Cuban shore-sand. Goës has recorded this species from the Caribbean Sea.

Present Occurrence.—Off the Snares; 60 fathoms; frequent. Twenty miles north of Auckland Island; 85 fathoms; rare; typical. Ten miles north of Enderby Island; 85 fathoms; rare; typical.

Miliolina venusta, Karrer sp.

Quinqueloculina venusta, Karrer, 1868, Sitzungsb. k. Akad. Wiss. Wien, vol. lviii, p. 147, pl. ii, fig. 6. *Miliolina venusta*, Karrer sp., Brady, 1884, Rep. Chall., vol. ix, p. 162, pl. v, figs. 5, 7. *M. venusta*, Karrer sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 235, pl. ii, figs. 56–58. *M. venusta*, Karrer sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 298, pl. xliv, fig. 2.

Distribution.—Found in the North and South Atlantic and the North and South Pacific (Brady); west coast of Patagonia and Gulf of Tokyo (Flint). This species is most at home in deep water, but is occasionally found in moderately shallow seas. Egger records it off the coast of Western Australia.

Present Occurrence.—Off the Snares; 60 fathoms; frequent. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Miliolina ferussacii, d'Orbigny sp.

Quinqueloculina ferussacii, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 301, No. 18 ; modèle No. 32. *Miliolina ferussacii*, d'Orb. sp., Brady, 1884, Rep. Chall., vol. ix, p. 175, pl. cxiii, figs. 17 *a*, *b*.

Distribution.—This is a widely distributed form. Parker and Jones record it from Baffin's Bay. Brady notes it from the shores of Great Britain, Belgium, and France, the Canaries, and the West Indies. In the Southern Hemisphere it has been noted from Torres Strait.

Present Occurrence.—Off the Snares ; 60 fathoms ; frequent; typical. Twenty miles north of Auckland Island ; 85 fathoms; rare. Ten miles north of Enderby Island ; 85 fathoms ; very rare.

Miliolina chrysostoma, sp. nov. (Plate XIII, figs. 8–10 ; Plate XIV, figs. 1 and 4.)

Description.—Test moderately large, elongately oval, compressed ; two to three chambers visible on each side, the penultimate well inflated, and sometimes even globose. Aboral end rounded, oral end blunt ; aperture laterally compressed, and divided by a prominent septum which extends down to the suture of the penultimate chamber, and sometimes projects beyond the orifice. Septum generally a simple lamina, but sometimes feebly T-shaped. Oral extremity usually stained of a deep-orange tint.

Measurements.—Length of a typical specimen, 1·6 mm. ; greatest breadth, 0·94 mm.

Observations.—This species is given to extreme variation, some tests being laterally compressed and triloculine, whilst others are subglobose and externally biloculine. Certain malformations occur, wherein the penultimate chamber is not completely enclosed by the last chamber but has its oral aperture extruding from what is normally the aboral end of the test. In vertical section the test is seen to consist of few chambers, the later of which possess a prominent and characteristic form of aperture ; and in each chamber the orange tint of the buccal area can be seen.

Affinities.—This species calls to mind *Miliolina* (*Adelosina*) *laevigata*, d'Orbigny,* but is distinguished by the rounded periphery and the prominent and persistent septum. In general contour, however, the present species bears relationship with Brady's *M. valvularis* (Reuss),† figured from " Challenger " specimens dredged off the north-east coast of New Zealand at 1,100 fathoms. Although related, our specimens are specifically distinct, since not one of them shows the characteristic aperture with the puckered lips as figured by Dr. Brady.

Occurrence.—Off the Snares ; 60 fathoms ; frequent. Twenty miles north of Auckland Island ; 85 fathoms ; very rare. Ten miles north of Enderby Island ; 85 fathoms ; common.

* Foram. Foss. Vienne, 1845, p. 302, pl. xx, figs. 22–24. Schlumberger, Bull. Soc. Zool. France, 1886, vol. xi, p. 549, pl. xvi, figs. 19–21 ; woodcut, fig. 6.

† Rep. Chall., vol. ix, 1884, p. 161, pl. iv, figs. 4, 5.

Genus SIGMOÏLINA, Schlumberger, 1887.

Sigmoïlina schlumbergeri, Silvestri.

Planispirina celata (non Costa sp.), Brady, 1884, Rep. Chall., vol. ix, p. 197, pl. viii, figs. 1–4. *Sigmoïlina schlumbergeri*, A. Silvestri, 1904, Mem. dell' Pontif. Acc. Romana d. Nuovi Lincei, vol. xxii, p. 267. *S. schlumbergeri*, Silvestri, Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 21, pl. ii, fig. 42.

The young forms of this species are pellucid, the incrustation of the test being apparently a character appertaining to the more fully grown shell.

Distribution.—The species has a wide range, and is not restricted to any particular depth. It is also found fossil in the Australian Tertiary beds.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Sigmoïlina celata, Costa sp.

Spiroloculina celata, Costa, 1856, Atti Acc. Pontan., vol. vii, pt. 1*a*, pl. xxvi, fig. 5. *Sigmoïlina celata*, Costa sp., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 21, pl. ii, fig. 41.

The present example is the broader form, as distinct from *S. schlumbergeri*. It is more usually found in late Tertiary deposits.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Subfam. HAUERININAE.

Genus ARTICULINA, d'Orbigny, 1826.

Articulina funalis, Brady. (Plate XIV, fig. 3.)

Articulina funalis, Brady, 1884, Rep. Chall., vol. ix, p. 185, pl. xiii, figs. 6–11. *A. funalis*, Brady, Egger, 1893, Abhandl. d. k. bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 242, pl. iii, fig. i. *A. funalis*, Brady, Millett, 1898, Journ. R. Micr. Soc., p. 513. *A. funalis*, Brady, Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 22, pl. ii, fig. 44.

Distribution.—This is a rare form, having occurred only at Kerguelen Island; off Prince Edward Island; Humboldt Bay, north coast of Papua; the Malay Archipelago; the Mauritius; and off Western Australia. The writer recorded it fossil from the Tertiary beds of Grice's Creek, Port Phillip.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms. A single example, fortunately showing the initial series and about 4 succeeding segments.

Genus PLANISPIRINA, Seguenza, 1880.

Planispirina exigua, Brady

Planispirina exigua, Brady, 1884, Rep. Chall., vol. ix, p. 196, pl. xii, figs. 1–4; woodcut, 5*b*. *P. exigua*, Brady, Egger, 1893, Abhandl. d. k.

bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 53, pl. iii, figs. 11, 12. *P. exigua*, Brady, Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 21, pl. ii, fig. 43.

This species is usually of shallow-water habitat. The specimens noted here have the central series of chambers unusually distinct.

Distribution.—Common in tropical seas. Egger records it from the west African coast, the Mauritius, and off Western Australia.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Planispirina sphaera, d'Orbigny sp.

Biloculina sphaera, d'Orbigny, 1839, Foram. Amér. Mérid., p. 66, pl. viii, figs. 13–16. *B. sphaera*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 141, pl. ii, figs. 4 *a*, *b*. *Planispirina sphaera*, d'Orb. sp., Schlumberger, Mém. Soc. Zool. France, p. 577; woodcuts, 45, 46.

Distribution.—A well-distributed species, although never very abundant. Previously recorded from the New Zealand area by the "Challenger" (H. B. Brady), and from Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Planispirina bucculenta, Brady sp. (Plate XIV, fig. 2.)

Miliola (*Triloculina*) *cryptella*, Parker and Jones (non d'Orbigny), 1865, Phil. Trans., vol. clv, p. 410, pl. xv, figs. 39 *a*, *b*. *Miliolina bucculenta*, Brady, 1884, Rep. Chall., vol. ix, p. 170, pl. cxiv, figs. 3 *a*, *b*. *Planispirina bucculenta*, Brady sp., Schlumberger, 1892, Mém. Soc. Zool. France, vol. v, p. 194, pl. viii, figs. 6, 7; woodcuts, 2–4.

Distribution.—The "Challenger" records are three localities in the North Atlantic. Dr. Egger found it in "Gazelle" soundings between New Amsterdam and Australia.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; frequent.

Planispirina bucculenta, var. **placentiformis** Brady, var.

Miliolina bucculenta, var. *placentiformis*, Brady, 1884, Rep. Chall., vol. ix, p. 171, pl. iv, figs. 1, 2.

Distribution.—This variety has been dredged off Culebra Island, at 490 fathoms; and from Balfour Bay, Kerguelen Island, from 20 to 50 fathoms.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Planispirina antarctica, sp. nov. (Plate XIV, figs. 5 *a*, *b*.)

Description.—Test subdiscoidal, compressed, slightly concave in median area. The outer three chambers nearly covering the test. Sutures not distinctly marked. Periphery rounded. Aperture a curved slit extending slightly over the lateral faces. Surface polished. Greatest diameter of type specimen, 0·8 mm.; thickness, 0·25 mm.

Observations.—This species resembles a greatly compressed form of the preceding variety, *placentiformis*. It is, however, more regular in outline, and has the aperture limited almost to the periphery.

Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Subfam. PENEROPLIDINAE.

Genus CORNUSPIRA, Schultze, 1854.

Cornuspira involvens, Reuss sp.

Operculina involvens, Reuss, 1850, Denkschr. k. Akad. Wiss. Wien, vol. i, p. 370, pl. xlvi, fig. 20. *Cornuspira involvens*, Rss. sp., Brady, 1884, Rep. Chall., vol. ix, p. 200, pl. xi, figs. 1–3. *C. involvens*, Rss. sp., Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 246, pl. iii, figs. 18, 19. *C. involvens*, Rss. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 303, pl. xlviii, fig. 3.

Distribution.—This species has an unrestricted range. It has been recorded from the Southern Ocean, but the present appears to be its first occurrence in the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Fam. ASTRORHIZIDAE.

Subfam. RHABDAMMININAE.

Genus HYPERAMMINA, Brady, 1878.

Hyperammina ramosa, Brady.

Hyperammina ramosa, Brady, 1884, Rep. Chall., vol. ix, p. 261, pl. xxiii, figs. 15–19. *H. ramosa*, Brady, Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 255, pl. iv, fig. 15.

A single example of a test formed of cemented sponge-spicules and small foraminiferal shells (*Globigerina*, &c.).

Distribution.—This species appears to be more frequent in the Northern Hemisphere. Dr. Egger records it from a Western Australian station, at 4,298 metres. It occurred in the "Challenger" dredgings from the New Zealand area.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms.

Genus RHIZAMMINA, Brady.

Rhizammina indivisa, Brady.

Rhizammina indivisa, Brady, 1884, Rep. Chall., vol. ix, p. 277, pl. xxix, figs. 5–7. *R. indivisa*, Brady, Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 256, pl. iv, fig. 17.

The specimens from north of Enderby Island differ from those described by Dr. Brady in having numerous siliceous sponge-spicules firmly cemented into the

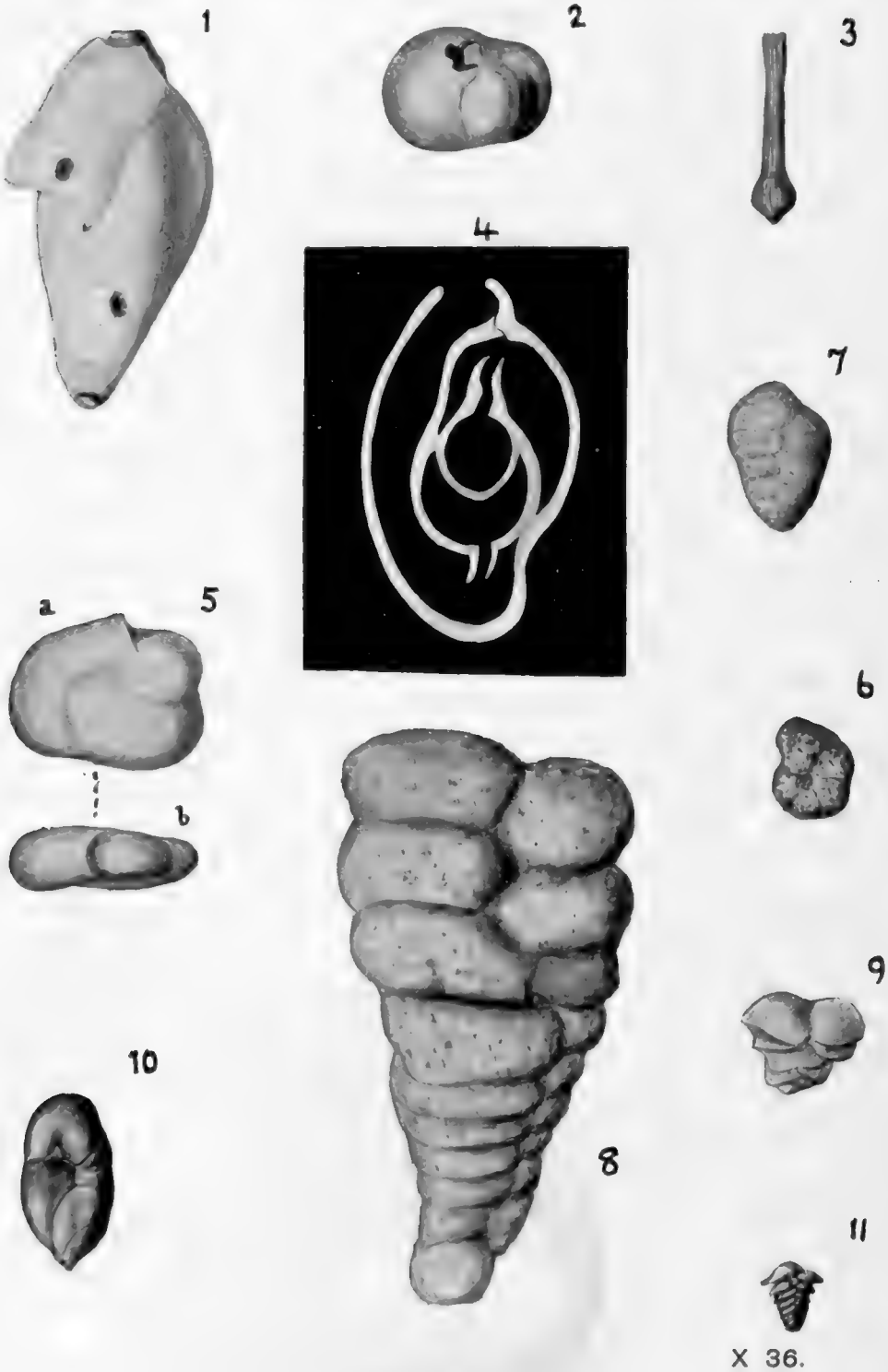


PLATE XIV.

test. The tube is flexible and wrinkled in other examples as in typical specimens, and the tube is composed of fine sand without spicules.

Distribution.—The Faroe Channel; off the Cape of Good Hope; and off Kandavu Island (Brady). Cape Verde (Egger).

Present Occurrence.—Perseverance Harbour, Campbell Island; 8 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Fam. LITUOLIDAE.

Subfam. LITUOLINAE.

Genus REOPHAX, Montfort, 1808.

Reophax scorpiurus, Montfort.

Reophax scorpiurus, Montfort, 1808, Conchyl. Systém., vol. i, p. 330, 83e genre. *R. scorpiurus*, Montf., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 273, pl. xvi, fig. 3.

The tests of the present examples are white, and composed chiefly of small foraminiferal shells.

Distribution.—This species has a wide geographical range, and frequents shallow water down to 3,950 fathoms (Brady). It has been recorded from the New Zealand area by Dr. Brady; from the Hauraki Gulf by Dr. Haeusler; and from Great Barrier Island by the writer.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; rare.

Reophax nodulosa, Brady.

Reophax nodulosa, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix, n.s., p. 52, pl. iv, figs. 7, 8. *R. nodulosa*, Brady, 1884, Rep. Chall., vol. ix, p. 294, pl. xxxi, figs. 1–9.

Distribution.—Like the preceding, this form is widely distributed. It was found in the "Challenger" series from the New Zealand area.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; a fragmentary example.

Genus HAPLOPHRAGMIUM, Reuss, 1860.

Haplophragmium canariense, d'Orbigny sp. (Plate XIV, fig. 6.)

Nonionina canariensis, d'Orbigny, 1839, Foram. Canaries, p. 128, pl. ii, figs. 33, 34. *Haplophragmium canariense*, d'Orb. sp., Brady, 1884, Rep. Chall., vol. ix, p. 310, pl. xxxv, figs. 1–5.

A single specimen, of a neat, compressed variety, was found in the present series of gatherings.

Distribution.—A cosmopolitan species. Recorded by Dr. Haeusler from the Hauraki Gulf, New Zealand; and from Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms.

Fam. TEXTULARIIDAE.

Subfam. TEXTULARIINAE.

Genus TEXTULARIA, Defrance, 1824.

Textularia agglutinans, d'Orbigny.

Textularia agglutinans, d'Orbigny, 1839, Foram. Cuba, p. 136, pl. i, figs. 17, 18, 32–34. *T. agglutinans*, d'Orb., Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv, p. 35, pl. vii, figs. 300–303.

Distribution.—Unrestricted as to geographical range and depth. Previously recorded from New Zealand by the "Challenger."

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; a single depauperated specimen.

Textularia gibbosa, var. **tuberosa**, d'Orbigny. (Plate XIV, fig. 7.)

Textularia tuberosa, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 263, No. 26. *T. aspera*, Brady, 1882, Proc. R. Soc. Edin., vol. xi, p. 715; *id.*, 1884, Rep. Chall., vol. ix, p. 367, pl. xliv, figs. 9–13. *T. gibbosa*, var. *tuberosa*, d'Orb., Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 26, pl. iv, fig. 76.

The tests in the present specimens are not dark-coloured like the usual Recent specimens; they are also undersized.

Distribution.—Previously found in the New Zealand area, and off Great Barrier Island.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; rare.

Textularia concava, Karrer sp.

Plecanium concavum, Karrer, 1868, Sitzungsb. d. k. Ak. Wiss. Wien, vol. lviii, p. 129, pl. i, fig. 3. *Textularia concava*, Karrer sp., Brady, 1884, Rep. Chall., vol. ix, p. 360, pl. xlii, figs. 13, 14; pl. xliii, fig. 11.

Our specimens are very typical.

Distribution.—Brady records this species from seven localities in the South Pacific, as well as from other widely separated areas. It has previously occurred in the New Zealand area.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares, 60 fathoms; frequent; rather small examples. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; common.

Textularia gramen, d'Orbigny. (Plate XIV, fig. 8.)

Textularia gramen, d'Orbigny, 1846, Foram. Foss. Vienne, p. 248, pl. xv, figs. 4–6. *T. gramen*, d'Orb., Haeusler, 1890, Abhandl. Schweizer. Pal. Gesellsch., vol. xvii, p. 71, pl. xi, figs. 26, 27, 37. *T. gramen*, d'Orb., Fornasini, 1891, Foram. Plioc. del Ponticello di Savena, pl. ii, fig. 6. *T. gramen*, d'Orb., Millett, 1899, Journ. R. Micr. Soc.,

p. 563. *T. gramen*, d'Orb., Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 87; *id.*, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 25, pl. iii, fig. 53.

There is a wide amount of variation among the examples of the above species in the present series. Typical short and broad forms are common, but the tendency is for the test to continue to develop far beyond the ordinary adult form, and to put on a lengthy series of chambers, which in their greater inflation resemble those of *T. agglutinans*. This feature was also noticed by Mr. Millett (*loc. supra cit.*) in regard to the Malay specimens; and he says in regard to them, "In the majority the earlier-formed portion of the test resembles *sagittula*, the later portion *agglutinans*." In all three soundings in which this species occurs a large proportion of the shells have a *Spiroplecta*-like commencement—*i.e.*, with a 1-whorled spiral having a central megalosphere, and thus belonging to form A.

Distribution.—Widely dispersed. Common in moderately shallow water. Recorded by the writer from Great Barrier Island, at 110 fathoms.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very common.

Textularia gramen, d'Orbigny, var. **jugosa**, Jones. (Plate XIV, fig. 9.)

Textularia sagittula, Defrance, var. *jugosa*, Brady, Jones, 1895, Pal. Soc. Mon., Crag. Foram., p. 145, pl. v, fig. 19. *T. gramen*, d'Orb., var. *jugosa*, Jones, Millett, 1899, Journ. R. Micr. Soc., p. 561, pl. vii, fig. 8.

An arenaceous variety, corresponding in external form with the hyaline *jugosa* of Brady.

Distribution.—Fossil in the Pliocene of England and Italy. Found recent only by Mr. Millett in the Malay Archipelago.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Textularia candeina, d'Orbigny.

Textularia candeina, d'Orbigny, 1839, Foram. Cuba, p. 143, pl. i, figs. 25–27. *T. sagittula*, Defr., var. *candeina*, d'Orb., Millett, 1899, Journ. R. Micr. Soc., p. 562, pl. vii, fig. 12.

Distribution.—The type example came from the West Indies. Some allied forms, as pointed out by Millett, occur in Oolitic and Tertiary strata.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare.

Genus SPIROPLECTA, Ehrenberg, 1844.

Spiroplecta sagittula, Defrance sp.

Textularia sagittula, Defrance, 1824, Dict. Sci. Nat., vol. xxxii, p. 177; Atlas Conch., pl. xiii, fig. 5. *T. sagittula*, Defr., Brady, 1884, Rep. Chall., vol. ix, p. 361, pl. xlii, fig. 17. *Spiroplecta sagittula*, Defr. sp., Wright, 1902, Irish Nat., vol. xi, p. 211, pl. iii, figs. A–E. *S. wrighti*, Silvestri, 1903, Atti Accad. Nuovi Lincei, Ann. 56, Sessione 3, p. 59.

Some of our specimens have a nearly parallel-sided test, resembling d'Orbigny's *Textularia nussdorfensis.*

Distribution.—A well-known form in temperate seas, and more abundant at moderate depths. Recorded from the New Zealand area by the "Challenger" (Sta. 169), and off Great Barrier Island, 110 fathoms, by the writer. Dr. Egger records this species from the Western Australian coast.

Present Occurrence.—Off the Snares; 60 fathoms; frequent. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; frequent.

Subfam. BULIMININAE.

Genus BULIMINA, d'Orbigny, 1826.

Bulimina elegantissima, d'Orbigny.

Bulimina elegantissima, d'Orbigny, 1839, Foram. Amér. Mérid., p. 51, pl. vii, figs. 13, 14. *B. elegantissima,* d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 402, pl. l, figs. 20–22.

Distribution.—This species is widely dispersed. It has been recorded in the Southern Hemisphere from the Falkland Islands, the east coast of Australia, the South Pacific, and west coast of South America ("Challenger"). Dr. Egger records it off Western Australia.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Bulimina elegantissima, d'Orb., var. **apiculata,** Chapman.

Bulimina elegantissima, d'Orb., var. *apiculata,* Chapman, 1907, Journ. Linn. Soc. Lond., Zool., vol. xxx, p. 31, pl. iv, fig. 77.

It is of much interest to note the occurrence in the subantarctic material of this variety, which was previously described from the Tertiary beds of Victoria.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Bulimina subteres, Brady. (Plate XIV, fig. 10.)

Bulimina subteres, Brady, 1881, Quart. Journ. Micr. Sci., vol. xxi, n.s., p. 55; *id.,* 1884, Rep. Chall., vol. ix, p. 403, pl. l, figs. 17, 18. *B. subteres,* Brady, Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, p. 289, pl. viii, figs. 73, 74.

Distribution.—This species has a wide range. Egger records it from the east and west coast of Australia.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Bulimina marginata, d'Orbigny.

Bulimina marginata, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 269, No. 4, pl. xii, figs. 10–12. *B. marginata,* d'Orb., Goës, 1894, K. Svenska Vet.-

Akad. Handl., vol. xxv, p. 46, pl. ix, figs. 439–444. *B. marginata*, d'Orb., Wright, 1900, Geol. Mag., Dec. 4, vol. vii, p. 100, pl. v, fig. 4. *B. marginata*, d'Orb., Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 89.

Distribution.—This species has a wide range, and is unrestricted as to depth. It has already occurred in the New Zealand area, off Great Barrier Island.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Bulimina contraria, Reuss.

Rotalina contraria, Reuss, 1851, Zeitschr. d. deutsch. Gesellsch., vol. iii, p. 76, pl. v, fig. 37. *Bulimina contraria*, Reuss sp., Brady, 1884, Rep. Chall., vol. ix, p. 409, pl. liv, figs. 18 *a–c*.

Distribution.—This is a rather rare species. The "Challenger" obtained it from nine stations. It appears to be new to the New Zealand area.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare, and of small size.

Genus Bolivina, d'Orbigny, 1839.

Bolivina robusta, Brady.

Bolivina robusta, Brady, 1884, Rep. Chall., vol. ix, p. 421, pl. liii, figs. 7–9. *B. robusta*, Brady, Egger, 1893, Abhand. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 294, pl. viii, figs. 31, 32.

Typical examples occur here, having a short aboral spine.

Distribution.—Dr. Brady states that out of twenty-two localities where this species occurs thirteen are in the South Pacific. Egger records it from the Mauritius, New Guinea, Western Australia, and New Amsterdam. Millett records it as occurring sparingly in the Malay Archipelago. The writer has already noted it from the New Zealand area, at Great Barrier Island.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Bolivina pygmaea, Brady. (Plate XIV, fig. 11.)

Bolivina pygmaea, Brady, 1884, Rep. Chall., vol. ix, p. 421, pl. liii, figs. 5, 6. *B. pygmaea*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 295, pl. viii, figs. 48–50.

Distribution.—This rare little form was noted by Dr. Brady from the Canary Islands; off Prince Edward Island; off Nightingale Island, Tristan da Cunha; and in the Faroe Channel. The Rev. A. M. Norman had it from near Bergen, Norway. Egger records it from Cape Verde, off west Africa, off Western Australia, and New Guinea. This is its first occurrence in the New Zealand area.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare.

Subfam. CASSIDULININAE.

Genus CASSIDULINA, d'Orbigny, 1826.

Cassidulina laevigata, d'Orbigny. (Plate XV, fig. 1.)

Cassidulina laevigata, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 282 (No. 1), pl. xv, figs. 4, 5; modèle No. 41. *C. laevigata*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 428, pl. liv, figs. 1–3. *C. laevigata*, d'Orb., A. Silvestri, 1896, Pontif. Accad. Nuovi Lincei, vol. xii, p. 103, pl. ii, fig. 10.

Distribution.—A very widely distributed species, found as far south as the antarctic ice-barrier; also recorded by the writer from Great Barrier Island, New Zealand.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares; 60 fathoms; rare and small. Twenty miles north of Auckland Island; 85 fathoms; frequent; typical. Ten miles north of Enderby Island; 85 fathoms; common; typical; one example with dentate margin (figured).

Cassidulina oblonga, Reuss.

Cassidulina oblonga, Reuss (non d'Orb. emend P. J. and B.), 1850, Denkschr. k. Ak. Wiss. Wien, vol. i, p. 376, pl. xlviii, figs. 5, 6. *C. crassa*, d'Orbigny (pars), Brady, 1884, Rep. Chall., vol. ix, pl. liv, fig. 4. *C. oblonga*, Rss., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 303, pl. vii, figs. 33, 34.

This form is distinguished from *C. subglobosa*, Brady, by its distinct sutures and slit-like aperture; and from *C. crassa*, d'Orb., by the more elongate test.

Distribution.—Dr. Egger records this species from west Africa, off Cape Town, the Mauritius, Kerguelen Island, and off Western Australia.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Cassidulina subglobosa, Brady.

Cassidulina subglobosa, Brady, 1884, Rep. Chall., vol. ix, p. 430, pl. liv, figs. 17 *a–c*. *C. subglobosa*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 304, pl. vii, figs. 41, 42, 52, 53.

Distribution.—Dr. Brady regards this as a deep-water species. It is widely distributed. It has been recorded from Great Barrier Island, in the New Zealand area; and also from the "Challenger" dredgings.

Present Occurrence.—Off the Snares; 60 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; common.

Genus EHRENBERGINA, Reuss, 1849.

Ehrenbergina serrata, Reuss. (Plate XV, fig. 2.)

Ehrenbergina serrata, Reuss, 1849, Denkschr. d. k. Akad. Wiss. Wien, vol. i, p. 377, pl. xlviii, figs. 7 *a–c*. *E. serrata*, Rss., Brady, 1884, Rep. Chall., vol. ix, p. 434, pl. lv. figs. 2–7.

This is a rather variable species, and the only example found is by no means typical. The aperture is situated on an inclined facet, and is distinctly pear-shaped,

as compared with the usual semicircular slit. The concave face of the test bears a single row of short spines.

Distribution.—A well-distributed form, but never abundant. Brady records it from the North and South Atlantic; from the North Pacific; and from ten stations in the South Pacific, from 150 to 2,075 fathoms. It is recorded from the New Zealand area in the "Challenger" summary.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; one example.

Fam. LAGENIDAE.

Subfam. LAGENINAE.

Genus LAGENA, Walker and Boys.

Lagena globosa, Montagu sp.

Serpula (*Lagena*) *laevis globosa*, Walker and Boys, 1784, Test. Min., p. 3, pl. i, fig. 8. *Vermiculum globosum*, Montagu, 1803, Test. Brit., p. 523. *Lagena globosa*, Montagu sp., Brady, 1884, Rep. Chall., vol. ix, p. 452, pl. lvi, figs. 1–3.

Distribution.—Found in every latitude. Recorded previously from the New Zealand area by the "Challenger."

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare (compressed var.). Ten miles north of Enderby Island; 85 fathoms; very rare.

Lagena gracilis, Williamson.

Lagena gracilis, Williamson, 1848, Ann. Mag. Nat. Hist., ser. 2, vol. i, p. 13, pl. i, figs. 3, 4. *L. gracilis*, Will., Reuss, 1862, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlvi, p. 331, pl. iv, figs. 58–61; pl. v, fig. 62. *L. gracilis*, Will., Egger, 1893, Abhandl. d. k. bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 328, pl. x, figs. 25, 33, 49.

A typical example, having a moderately short neck and delicately costulate body which is feebly apiculate, occurs here.

Distribution.—Extensive; more abundant in the Southern Hemisphere, and affecting deep water (Brady). The "Gazelle" specimens were found off west Africa, Western Australia, and between Fiji and South America (Egger). Recorded previously from the New Zealand area by the "Challenger."

Present Occurrence.—Off the Snares; 60 fathoms.

Lagena sulcata, Walker and Jacob sp. (Plate XV, fig. 4.)

Serpula (*Lagena*) *striata sulcata rotundata*, Walker and Boys, 1784, Test. Min., p. 2, pl. i, fig. 6. *Lagena sulcata*, W. and J. sp., Brady, 1884, Rep. Chall., vol. ix, p. 462, pl. lvii, figs. 23, 26, 33, 34; pl. lviii, figs. 4, 17, 18. *L. sulcata*, W. and J. sp., Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 91.

One of the examples found (here figured) has a feeble spiral ornament on the tubular neck.

Distribution.—Dr. H. B. Brady remarks that this is "one of the most abundant and most generally diffused of all the members of the genus." It has occurred in the Southern Ocean—at Heard Island, among other localities. Previously recorded from the New Zealand area, off Great Barrier Island, by the writer.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Lagena lineata, Williamson sp. (Plate XV, fig. 3.)

Entosolenia lineata, Williamson, 1848, Ann. and Mag. Nat. Hist., ser. 2, vol. i, p. 18, pl. ii, fig. 18. *E. globosa*, var. *lineata*, Williamson, 1858, Rec. Foram. Gt. Brit., p. 9, pl. i, fig. 17. *Lagena lineata*, Williamson sp., Brady, 1884, Rep. Chall., vol. ix, p. 461, pl. lvii, fig. 13. *L. lineata*, Will. sp., Egger, 1893, Abhandl. d. k. bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 326, pl. x, figs. 29, 30.

Distribution.—Found in the European area generally. In the Southern Hemisphere Dr. Brady records it from Tristan da Cunha and the Kerguelen Island; also from the latter locality and off Western Australia by Dr. Egger.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Lagena acuticosta, Reuss.

Lagena acuticosta, Reuss, 1861, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xliv, p. 305, pl. i, fig. 4. *L. acuticosta*, Reuss, Egger, 1893, Abhandl. d. k. bayer. Akad. Wiss., cl. ii, vol. xviii, abth. ii, p. 329, pl. x, figs. 80–84. *L. sulcata*, Walker and Boys, Goës, 1894, K. Svenska Vetensk.-Akad. Handl., vol. xxv, No. 9, p. 78, pl. xiii, figs. 742–744.

This species is distinct from *L. sulcata* by having few, elevated costae, and being without a prolonged neck.

Distribution.—According to Brady, the best examples come from deep water in the North and South Pacific. Egger records it from Kerguelen, the Mauritius, and Western Australia. Recorded previously from the New Zealand area ("Challenger").

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Lagena hexagona, Williamson sp.

Entosolenia squamosa, var. *hexagona*, Williamson, 1848, Ann. Mag. Nat. Hist., ser. 2, vol. i, p. 20, pl. ii, fig. 23. *Lagena hexagona*, Will. sp., Brady, 1884, Rep. Chall., vol. ix, p. 472, pl. lviii, figs. 32, 33. *L. hexagona*, Will. sp., Wright, 1900 (in Mellard Reade), Geol. Mag., vol. vii, p. 101, pl. v, fig. 15. *L. hexagona*, Will. sp., A. Silvestri, 1902, Mem. d. Pont. Acc. Rom. d. Nuovi Lincei, vol. xix, p. 26; woodcuts, figs. 44, 44*a*, 45.

Distribution. — Widely dispersed. Generally affecting shallow to moderate depths. Previously dredged from the New Zealand area by the "Challenger."

Also recorded from the Hauraki Gulf by Dr. Haeusler; and by the writer from Great Barrier Island, at 110 fathoms.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; common.

Lagena squamosa, Montagu sp. (Plate XV, fig. 5.)

Vermiculum squamosum, Montagu, 1803, Test. Brit., p. 526, pl. xiv, fig. 2. *Entosolenia squamosa*, Mont. sp., Williamson, 1848, Ann. Mag. Nat. Hist., ser. 2, vol. i, p. 18, pl. ii, fig. 19. *Lagena squamosa*, Mont., sp., A. Silvestri, 1902, Mem. d. Pont. Acc. Rom. d. Nuovi Lincei, vol. xix, p. 23; woodcuts, figs. 38, 38*a*, 39.

Distribution.—Apparently unrestricted. Also having a wide bathymetrical range, but commoner in shallow water. Recorded in the "Challenger" gatherings from the New Zealand area. Haeusler obtained it from the Hauraki Gulf.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very common.

Lagena montagui, Silvestri.

Lagena squamosa (pars) Brady, 1884, Rep. Chall., vol. ix, p. 471, pl. lviii, fig. 31. *L. montagui*, A. Silvestri, 1902, Mem. d. Pont. Acc. Rom. d. Nuovi Lincei, p. 25; woodcuts, figs. 40–43.

This form is distinguished from *L. squamosa* by the spherical body and entosolenian tube.

Distribution.—It is probably coextensive with Dr. Brady's recorded examples of *L. squamosa*.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; rare.

Lagena marginata, Walker and Boys. (Plate XV, fig. 6.)

Serpula (*Lagena*) *marginata*, Walker and Boys, 1784, Test. Min., p. 2, pl. i, fig. 7. *Lagena marginata*, W. & B. sp., Brady, 1884, Rep. Chall., vol. ix, p. 476, pl. lix, fig. 22. *L. marginata*, W. & B. sp., Fornasini, 1900, Mem. R. Accad. Sc. Bologna, ser. 5, vol. viii, p. 376; woodcut, fig. 25. *Fissurina marginata*, W. & B. sp., A. Silvestri, 1902, Mem. d. Pont. Accad. Rom. d. Nuovi Lincei, vol. xix, p. 21; woodcuts, figs. 33–35.

The form here referred to the species *L. marginata* is frequently noted under the synonym of *L. laevigata*, Reuss. On the other hand, the thin-flanged type of *Lagena* with eccentric aperture, which is also commonly referred to *L. marginata*, has been shown by Silvestri to be distinct, and is named by him *L. schlichti*.

Distribution.—*L. marginata* has a very wide range. It has been recorded from the "Challenger" dredgings in the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; common.

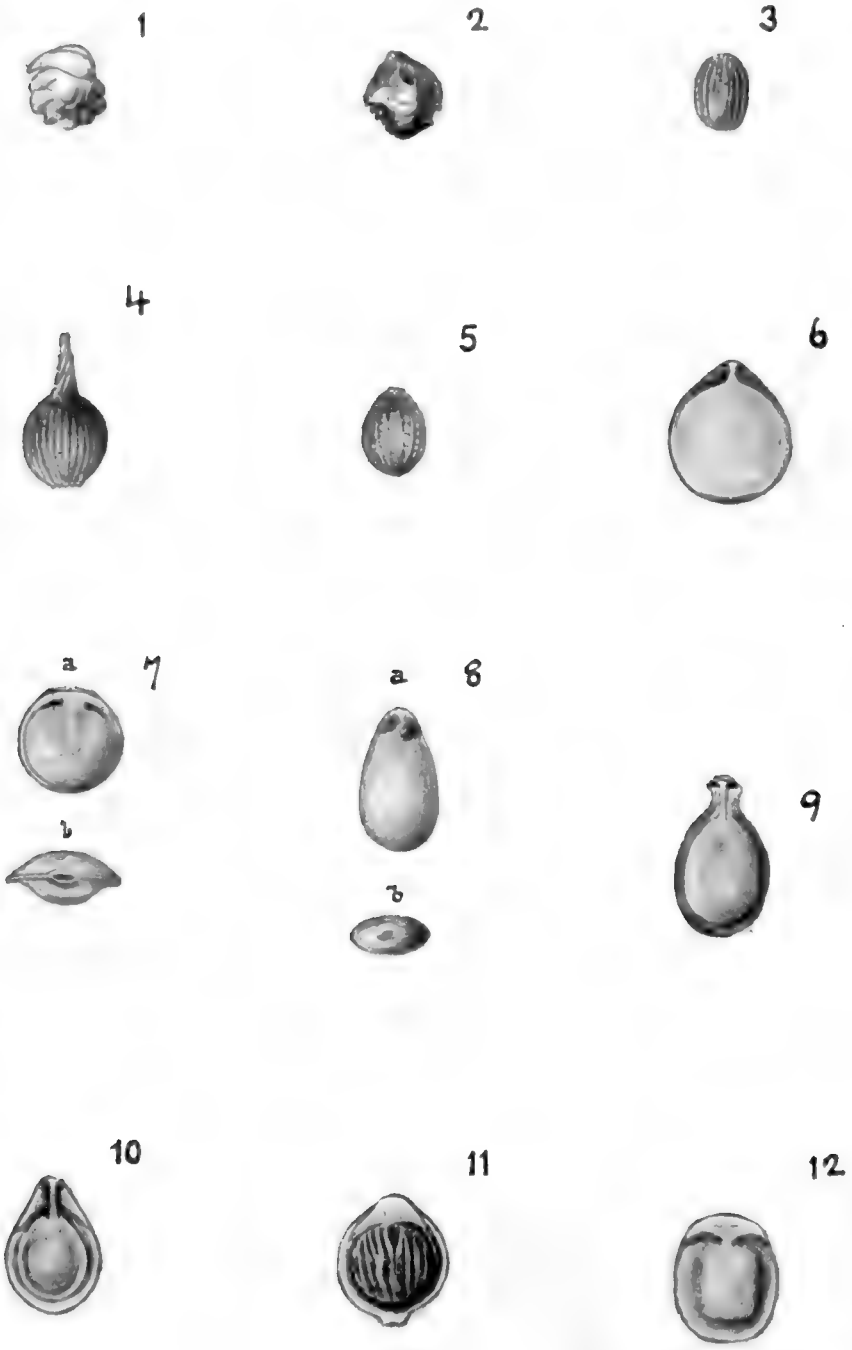


PLATE XV.

X 36.

Lagena marginata, W. & B. sp., var. **semimarginata**, Reuss.

Lagena marginata, W. & B. sp., var. *semimarginata*, Reuss, 1870, Sitzungsb. d. k. Ak. Wiss. Wien, vol. lxii, p. 468 ; Schlicht, 1870, Foram. Pietzpuhl, pl. iv, figs. 4–6, 10–12. *L. marginata*, W. & B. sp., var. *semimarginata* Reuss, Brady, 1884, Rep. Chall., vol. ix, p. 477, pl. lix, figs. 17, 19. *L. marginata*, W. & B. sp., var. *semimarginata*, Rss., Millett, 1901, Journ. R. Micr. Soc., p. 619, pl. xiv, fig. 1.

Distribution.—Brady records this variety from the South Atlantic and the Southern Ocean, and Millett from the Malay Archipelago. In the "Challenger" lists it is included in the New Zealand area. The fossil examples came from the Tertiary clays of Pietzpuhl.

Present Occurrence.—Off the Snares ; 60 fathoms ; frequent. Twenty miles north of Auckland Island ; 85 fathoms ; rare. Ten miles north of Enderby Island ; 85 fathoms ; common.

Lagena schlichti, A. Silvestri sp. (Plate XV, figs. 7 *a*, *b*.)

Fissurina schlichti, A. Silvestri, 1902, Mem. d. Pont. Acc. Rom. d. Nuovi Lincei, vol. xix, p. 14 ; woodcuts, figs. 9–11.

This species is often confused with *L. marginata*, W. & B. It has a distinctive eccentric aperture and a long entosolenian tube. Our specimens differ from Silvestri's Mediterranean form in having the margin entire, instead of denticulate, aborally.

Distribution.—It appears to be widely distributed.

Present Occurrence.—North-east of Bounty Island ; 50 fathoms ; rare. Off the Snares ; 60 fathoms ; frequent. Twenty miles north of Auckland Island ; 85 fathoms ; frequent. Ten miles north of Enderby Island ; 85 fathoms ; common.

Lagena biancae, Seguenza sp. (Plate XV, figs. 8 *a*, *b*.)

Fissurina biancae, Seguenza, 1862, Foram. Monotal. Mioc. Messina, p. 57, pl. i, figs. 48–50. *F. biancae*, Seg., A. Silvestri, 1902, Mem. d. Pont. Acc. Rom. d. Nuovi Lincei, vol. xix, p. 20 ; woodcuts, figs. 29–32.

Distribution.—Previously known from the Mediterranean area.

Present Occurrence.—Off the Snares ; 60 fathoms ; frequent. Ten miles north of Enderby Island ; 85 fathoms ; rare.

Lagena orbignyana, Seguenza sp. (Plate XV, fig. 10.)

Fissurina orbignyana, Seguenza, 1862, Foram. Monotal. Mioc. Messina, p. 6, pl. ii, figs. 65, 66. *Lagena orbignyana*, Seg. sp., Brady, 1884, Rep. Chall., vol. ix, p. 484, pl. lix, figs. 1, and 24–26. *L. orbignyana*, Seg. sp., Egger, 1899, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xxi, p. 104, pl. v, figs. 8, 9.

The majority of our specimens resemble Brady's fig. 25. The example figured by Brady under the same name (fig. 24) has been erected into a new species (*L. bradii*)

by Dr. A. Silvestri.* Some of the specimens met with here resemble that form, with the exception that the orifice is both ecto- and ento-solenian in the same shell—that is to say, the aperture is inverted, and then drawn out to form a tubular neck.

Distribution.—A cosmopolitan species. It is, however, new to the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very rare.

Lagena orbignyana, Seg. sp., var. **clathrata**, Brady. (Plate XV, fig. 11.)

Lagena clathrata, Brady, 1884, Rep. Chall., vol. ix, p. 485, pl. lx, fig. 4. *L. orbignyana*, Seg. sp., var. *clathrata*, Brady, Millett, 1901, Journ. R. Micr. Soc., p. 628, pl. xix, fig. 23. *L. orbignyana*, Seg. sp., var. *clathrata*, Brady, Sidebottom, 1906, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. l, pt. ii, p. 14, pl. ii, fig. 16.

Distribution.—This rare and interesting form has been recorded from the shore-sands of Galway, Ireland (Balkwill and Millett); from the Ki Islands, 580 fathoms, and off Aru Island, south-west of New Guinea, 800 fathoms (Brady); from the Malay Archipelago (Millett); and from the Island of Delos, in the Mediterranean (Sidebottom).

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Lagena fasciata, Egger sp.

Oolina fasciata, Egger, 1857, Neues Jahrb. für Min., p. 270, pl. v, figs. 12–15. *Lagena quadricostulata*, Reuss, Brady, 1884, Rep. Chall., vol. ix, p. 486, pl. lix, fig. 15. *L. fasciata*, Egger sp., Millett, 1901, Journ. R. Micr. Soc., p. 495, pl. viii, fig. 19.

Our specimens are small and very diaphanous in appearance.

Distribution.—Brady records this form (as *L. quadricostulata*) from two localities, both in the Southern Hemisphere—viz., Balfour Bay, Kerguelen Island, 20 to 50 fathoms; and off Sydney, 410 fathoms. Millett obtained it from the Malay Archipelago. In the "Challenger" lists it is also recorded for the New Zealand area (as *L. quadricostulata*).

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Lagena lagenoides, Williamson sp., var. **nuda**, var. nov. (Plate XV, fig. 9.)

Our specimens generally resemble Williamson's fig. 26,† but the peripheral flange, instead of being radiately striated, is quite plain and smooth. The eversion of the neck terminal is very marked in the present examples.

* Mem. d. Pont. Acc. Rom. d. Nuovi Lincei, vol. xix, p. 19; woodcuts, figs. 26–28.

† *Entosolenia marginata*, Williamson, Rec. Foram. Gt. Brit., 1858, p. 11, pl. i, figs. 25, 26.

Distribution of the Type Species.—Occurs on the shores of the British Islands (Williamson); the North and South Atlantic and the South Pacific (Brady); round the Island of Delos (Sidebottom).

Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; common.

Lagena quadrata, Williamson sp.

Entosolenia marginata, var. *quadrata*, Williamson, 1858, Rec. Foram. Gt. Brit., p. 11, pl. i, fig. 27. *Lagena quadrata*, Will. sp., Brady, 1884, Rep. Chall., vol. ix, p. 475, pl. lix, fig. 3. *L. quadrata*, Will. sp., Egger, 1893, Abhandl. d. k. bayer. Ak. Wiss., cl. ii, vol. xviii, abth. ii, p. 331, pl. x, figs. 78, 79. *L. quadrata*, Will. sp., Sidebottom, 1906, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. l, pt. ii, p. 8, pl. i, figs. 21, 22; pl. ii, figs. 1, 2.

Distribution.—Dr. H. B. Brady remarks that this species is influenced more by depth of water than by latitude, being found at depths less than 150 fathoms. Egger records it from west Africa, the Mauritius, New Guinea (from over 1,500 fathoms !), and Fiji; Millett obtained it from the Malay Archipelago, in comparatively shallow water. New to the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; one example.

Lagena quadrata, Williamson sp., var. **carinata,** var. nov. (Plate XV, fig. 12.)

Lagena quadrata, Williamson sp., Brady (pars), 1884, Rep. Chall., vol. ix, p. 475, pl. lix, fig. 16 (partially carinate specimen); pl. lx, fig. 5. *L. quadrata*, Will. sp., Millett, 1901, Journ. R. Micr. Soc., p. 496, pl. viii, fig. 18. *L. quadrata*, Will. sp., Sidebottom, 1906, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. l, pt. ii, p. 8, pl. ii, fig. 3.

Did the carinate form of the above species occur here very rarely it might be passed over as an aberrant form. All the examples, however, which were found in the present series are carinate, with one exception, so that it will serve a useful purpose to distinguish it as a definite variety. Our examples most resemble Brady's pl. lx, fig. 5, but one of the specimens is only partially carinate, as in pl. lix, fig. 16.

Distribution.—Millett finds this variety "in the Malay Archipelago, but only in small numbers." Sidebottom notes the partially carinate variety from the Island of Delos.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Lagena enderbiensis, sp. nov. (Plate XVI, figs. 1 *a*, *b*,)

Description.—Test compressed; subovate, elongate. Shoulders sloping; aboral end often terminating in a blunt point. A submarginal border forming a roundly carinate edge on each side, not extending to oval area nor to the apical point. Orifice entosolenian, with apertural extremity often everted, but short. Length of type, 0·83 mm.; greatest width, 0·44 mm.

Observations.—This form resembles Williamson's original figures of *L. quadrata*, with the exception that the shoulders are more sloping in our examples, and also that the submarginal border is interrupted apically. The form is so constant in the present series that it seems justifiable to regard it as a distinct and new form.

Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; very common.

Subfam. NODOSARIINAE.

Genus NODOSARIA, Lamarck, 1812.

Nodosaria subradicula, Schwager. (Plate XVI, fig. 2.)

Nodosaria subradicula, Schwager, 1866, "Novara" Exped., geol. Theil, vol. ii, p. 222, pl. v, fig. 50.

This is a striate form of *N. radicula*, L. sp., which was originally described by Schwager from the Pliocene of Kar Nicobar. The present occurrence seems to be its first appearance as a Recent form.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; one example.

Nodosaria oligostegia, Reuss.

Nodosaria oligostegia, Reuss, 1845–6, Verstein. böhm. Kreidof., pt. i, p. 27, pl. xii, figs. 19, 20. *N. simplex*, Silvestri, Brady, 1884, Rep. Chall., vol. ix, p. 496, pl. lxii, figs. 4, 5, ? 6.

Several fragmentary specimens, in all probability referable to the above, were found. This species is also common in certain fossil deposits of Cretaceous age.

Distribution.—The "Challenger" examples were dredged off the Ki Islands, and off the west coast of New Zealand.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; rare.

Nodosaria (Dentalina) roemeri, Neugeboren sp.

Dentalina roemeri, Neugeboren, 1856, Denkschr. d. k. Akad. Wiss. Wien, vol. xii, p. 82, pl. ii, figs. 13–17. *Nodosaria (Dentalina) roemeri*, Neug. sp., Brady, 1884, Rep. Chall., vol. ix, p. 505, pl. lxiii, fig. 1.

Distribution.—Most commonly met with in the North Atlantic. It has, however, been previously found in the New Zealand area, off Great Barrier Island, at 110 fathoms, in soundings examined by the writer.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Nodosaria (Dentalina) communis, d'Orbigny.

Nodosaria (D.) communis, ? d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 254, No. 35. *Dentalina communis*, d'Orbigny, 1840, Mém. Soc. Géol. France, vol. iv, p. 13, pl. i, fig. 4.

Only fragmentary specimens were found in the present collection.

Distribution.—A cosmopolitan form.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Nodosaria (Dentalina) consobrina, d'Orbigny sp.

Dentalina consobrina, d'Orbigny, 1846, Foram. Foss. Vienne, p. 46, pl. ii, figs. 1–3. *Nodosaria (D.) consobrina*, d'Orb. sp., Brady, 1884, Rep. Chall., vol. ix, p. 501, pl. lxii, figs. 23, 24.

Distribution.—This form is widely dispersed. It has been previously recorded from the New Zealand area, off Great Barrier Island, by the writer.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Nodosaria (Dentalina) consobrina, d'Orb. sp., var. **emaciata,** Reuss. var.

Dentalina emaciata, Reuss, 1851, Zeitschr. d. deutsch. geol. Gesellsch., vol. iii, p. 63, pl. iii, fig. 9. *Nodosaria (D.) consobrina*, d'Orb. sp., var. *emaciata*, Rss., Brady, 1884, Rep. Chall., vol. ix, p. 502, pl. lxii, figs. 25, 26.

Distribution.—Having a wide range. Previously recorded from the New Zealand area, off Great Barrier Island, by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Nodosaria (Dentalina) pyrula, d'Orbigny.

Nodosaria pyrula, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 253, No. 13. *N. (D.) pyrula*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 497, pl. lxii, figs. 10–12.

Distribution.—Widely dispersed. Previously recorded from off Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Nodosaria (Dentalina) obliqua, Linné sp.

Nautilus obliquus, Linné, 1767, Syst. Nat., 12th ed., pp. 1163, 281; 1788, *ibid.*, 13th (Gmelin's) ed., p. 3372, No. 14. *Nodosaria obliqua*, Linné sp., Goës, 1894, K. Svenska Vetenskaps-Akad. Handl., vol. xxv, No. 9, p. 70, pl. xii, figs. 691–696; pl. xiii, fig. 697.

Distribution.—Found in all seas. Recorded from the New Zealand area by the "Challenger"; and by the writer from Great Barrier Island, where it was very abundant.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare.

Nodosaria (Dentalina) obliqua, L. sp., var. **vertebralis**, Batsch var.

Nautilus (Orthoceras) vertebralis, Batsch, 1791, Conchyl. des Seesandes, p. 3, No. 6, pl. ii, figs. 6 *a*, *b*. *Nodosaria vertebralis*, Batsch sp., Brady, 1884, Rep. Chall., vol. ix, p. 514, pl. lxii, fig. 35; pl. lxiv, figs. 11–14.

Distribution.—Having a fairly wide range, but not usually found in high latitudes. Recorded previously from Great Barrier Island by the writer.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Genus MARGINULINA, d'Orbigny, 1826.

Marginulina costata, Batsch sp.

Nautilus (Orthoceras) costatus, Batsch, 1791, Conchyl. des Seesandes, pl. i, fig. 1. *Marginulina costata*, Batsch sp., Millett, 1902, Journ. R. Micr. Soc., p. 526, pl. xi, fig. 20. *M. costata*, Batsch sp., Sidebottom, 1907, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. li, pt. iii, p. 6, pl. i, figs. 29–32.

Distribution.—This species appears to be rare in the Southern Hemisphere, with the exception of Mr. Millett's record of specimens from the Malay Archipelago. It has previously been found in the New Zealand area by the "Challenger," but is not recorded in Hutton's "Index Faunae Novae-Zealandiae."

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Genus VAGINULINA, d'Orbigny, 1826.

Vaginulina legumen, Linné sp.

Nautilus legumen, Linné, 1767, Syst. Nat., 12th ed., p. 1164, No. 288. *Vaginulina legumen*, L. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 314, pl. lx, fig. 2.

All our examples are typical.

Distribution.—Widely dispersed, and found at all depths down to 2,000 fathoms or more (H. B. Brady).

Present Occurrence.—Off the Snares; 60 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Genus CRISTELLARIA, Lamarck, 1812.

Cristellaria schloenbachi, Reuss.

Cristellaria schloenbachi, Reuss, 1862, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlvi, p. 65, pl. vi, figs. 14, 15. *C. Schloenbachi*, Rss., Egger, 1899, Abhandl. k. bayer. Ak. Wiss., cl. ii, vol. xxi, p. 110, pl. xii, figs. 38–40; pl. xxiv, figs. 30, 31.

Distribution.—A rare form, only found at a few localities in the West Indies and the Pacific. Recorded previously from Great Barrier Island by the writer. This species is not uncommon as a fossil, dating from the Cretaceous.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Cristellaria crepidula, Fichtel and Moll sp.

Nautilus crepidula, Fichtel and Moll, 1798, Test. Micr., p. 107, pl. xix, figs. *g–i*. *Cristellaria crepidula*, F. & M. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 316, pl. lxiii, fig. 2.

Distribution.—This is usually a shallow-water form, but is occasionally met with in moderately deep water. It is widely distributed.

Present Occurrence.—Off the Snares; 60 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Cristellaria tricarinella, Reuss. (Plate XVI, fig. 3.)

Cristellaria tricarinella, Reuss, 1862, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlvi, p. 68, pl. vii, fig. 9; pl. xii, figs. 2–4. *C. tricarinella*, Rss., Brady, 1884, Rep. Chall., vol. ix, p. 540, pl. lxviii, figs. 3, 4. *C. tricarinella*, Rss., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 351, pl. xii, figs. 28, 29. *C. tricarinella*, Rss., Chapman, 1905, Trans. & Proc. N.Z. Inst., vol. xxxviii, p. 96.

Distribution.—As a Recent form this species is comparatively rare. Dr. Brady records it from three localities—viz., off the Philippine Islands, off Raine Island, and off the west coast of New Zealand. Dr. Egger notes it from the Mauritius and off Western Australia. It has also occurred off Great Barrier Island, at 110 fathoms.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Cristellaria lata, Cornuel, sp. (Plate XVI, fig. 4.)

Marginulina lata, Cornuel, 1848, Mém. Soc. Géol. France, sér. 2, vol. iii, p. 252, pl. i, figs. 34–37. *Cristellaria lata*, Cornuel sp., Brady, 1884, Rep. Chall., vol. ix, p. 539, pl. lxvii, figs. 18 *a*, *b*.

Distribution.—The only previously recorded locality for this species as a Recent form is off East Moncoeur Island, Bass Strait; 38 fathoms.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Cristellaria compressa, d'Orbigny. (Plate XVI, fig. 5.)

Cristellaria compressa, d'Orbigny, 1846, Foram. Foss. Vienne, p. 86, pl. iii, figs. 32, 33. *C. compressa*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 538, pl. cxiv, figs. 15, 16.

Distribution.—Recorded from the North Atlantic and the New Zealand area by the "Challenger." Not uncommon as a Tertiary fossil.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Cristellaria variabilis, Reuss.

Cristellaria variabilis, Reuss, 1849, Denkschr. k. Akad. Wiss. Wien, vol. i, p. 369, pl. xlvi, figs. 15, 16. *C. variabilis*, Rss., Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv, p. 62, pl. x, figs. 593–595. *C. variabilis*,

Rss., Millett, 1903, Journ. R. Micr. Soc., p. 256, pl. v, fig. i. *C. variabilis*, Rss., Sidebottom, 1907, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. li, pt. iii, p. 8, pl. ii, fig. 3.

Our specimens show all stages between the extremes, of those with rounded back and those with well-developed carinate periphery.

Distribution.—This species, which is also a Miocene and Pliocene fossil, has been recorded from the North and South Atlantic and the North and South Pacific by Dr. H. B. Brady; Egger had it from the west coast of Africa, the Mauritius, and off Western Australia; Goës, from the Atlantic; Flint, from the Caribbean Sea, North Atlantic, and Gulf of Mexico; Millett, from the Malay Archipelago; and Sidebottom, from the Island of Delos and Palermo.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; very rare.

Cristellaria articulata, Reuss sp.

Robulina articulata, Reuss, 1863, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xlviii, p. 53, pl. v, fig. 62. *Cristellaria articulata*, Rss. sp., Brady, 1884, Rep. Chall., vol. ix, p. 547, pl. lxix, figs. 10–12; wild-growing form, fig. 14.

This species is a fossil in the Oligocene clays of Germany.

Distribution.—Brady records this species from Culebra Island, West Indies, at 390 fathoms; and off Nightingale Island, Tristan da Cunha, 100–150 fathoms. Dr. Flint obtained it from the Gulf of Mexico and the Atlantic, at 169–276 fathoms. It was also found to be rather common in soundings off Great Barrier Island, New Zealand, by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island, 85 fathoms; rare.

Cristellaria gibba, d'Orbigny.

Cristellaria gibba, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 292, No. 17; *id.*, 1839, Foram. Cuba, p. 40, pl. vii, figs. 20, 21. *C. gibba*, d'Orb., Fornasini, 1894, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. iv, p. 221, pl. iii, fig. 20.

Distribution.—North Atlantic and South Pacific (Brady); Mediterranean (Silvestri); the Mauritius, off Western Australia, and New Guinea (Egger); Gulf of Mexico (Flint); Malay Archipelago (Millett).

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Cristellaria reniformis, d'Orbigny.

Cristellaria reniformis, d'Orbigny, 1846, Foram. Foss. Vienne, p. 88, pl. iii, figs. 39, 40. *C. reniformis*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 539, pl. lxx, figs. 3 *a*, *b*.

Distribution.—Brady records this form from the North and South Atlantic and the North and South Pacific, and it was later recorded by the "Challenger" from the New Zealand area. The writer found a single example off Great Barrier Island, New Zealand. It seems to particularly affect moderately deep water.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Cristellaria cultrata, Montfort sp. (Plate XVI, fig. 6.)

Robulus cultratus, Montfort, 1808, Conchyl. Systém, vol. i, p. 214, 54^{e} genre. *Cristellaria cultrata*, Montf. sp., Brady, 1884, Rep. Chall., vol. ix, p. 550, pl. lxx, figs. 4–6; dentate var., figs. 7, 8. *C. cultrata*, Montf. sp., Egger, 1893, Abhandl. k. bayer. Ak. Wiss., cl. ii, vol. xviii, p. 352, pl. xii, figs. 7–10, 24, 25.

Distribution.—Having a very wide range. Recorded by the "Challenger" from the New Zealand area, and by the writer from Great Barrier Island.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares; 60 fathoms; frequent; one specimen with dentate carina. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; common.

Cristellaria rotulata, Lamarck sp.

Lenticulites rotulata, Lamarck, 1804, "Annales du Muséum," vol. v, p. 188, No. 3; Tableau Encycl. et Méthodique, pl. cccclxvi, fig. 5. *Cristellaria rotulata*, Lam. sp., Brady, 1884, Rep. Chall., vol. ix, p. 547, pl. lxix, figs. 13 *a*, *b*. *C. rotulata*, Lam. sp., Flint, 1899, Rep. of U.S. Nat. Mus. for 1897, p. 314, pl. lxiv, fig. 4. *C. rotulata*, Lam. sp., Chapman, 1900, Proc. Calif. Acad. Sci., ser. 3, Geol., vol. i, p. 251, pl. xxx, fig. 4.

Distribution.—A cosmopolitan species. Obtained by the "Challenger" from the New Zealand area, and by the writer from Great Barrier Island.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; very rare.

Cristellaria vortex, Fichtel and Moll sp.

Nautilus vortex, Fichtel and Moll, 1798, Test. Micr., p. 33, pl. ii, figs. *d–i*. *Cristellaria vortex*, F. & M. sp., Brady, 1884, Rep. Chall., vol. ix, p. 548, pl. lxix, figs. 14–16. *C. vortex*, F. & M. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 317, pl. lxv, fig. 1.

Distribution.—Brady records this form from the west coast of Scotland, North Atlantic, and the South Pacific; Dr. Flint had it from the North Atlantic and Caribbean Sea; and Parker and Jones from the Mediterranean.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Cristellaria orbicularis, d'Orbigny sp.

Robulina orbicularis, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 288, pl. xv, figs. 8, 9. *Cristellaria orbicularis*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 549, pl. lxix, fig. 17. *C. orbicularis*, d'Orb. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 317, pl. lxiv, fig. 3.

Distribution.—Dr. Brady notes this form from one station in the North Atlantic, and from five in the South Pacific, including a station off the west coast of New Zealand, at 150 fathoms; Dr. Flint records it from the Gulf of Mexico; also from Great Barrier Island, New Zealand, by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; common.

Subfam. POLYMORPHININAE.

Genus Polymorphina, d'Orbigny, 1826.

Polymorphina lactea, Walker and Jacob sp.

Serpula lactea, Walker and Jacob (*fide* Kanmacher), 1798, "Adams's Essays," 2nd ed., p. 634, pl. xiv, fig. 4. *Polymorphina lactea*, W. & J. sp., Brady, Parker and Jones, 1870, Trans. Linn. Soc. Lond., vol. xxvii, p. 213, pl. xxxix, figs. 1, *a–c*. *P. lactea*, W. & J. sp., Brady, 1884, Rep. Chall., vol. ix, p. 559, pl. lxxi, fig. 11.

Distribution.—A common form in shallow water. Occasionally found at considerable depths, but always of smaller size than in typical specimens. It occurs on nearly all shore-lines. Dr. Brady states that its southern limit appears to be the Cape of Good Hope.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Polymorphina lactea, W. & J. sp., fistulose var. **diffusa,** Jones and Chapman. (Plate XVI, fig. 7.)

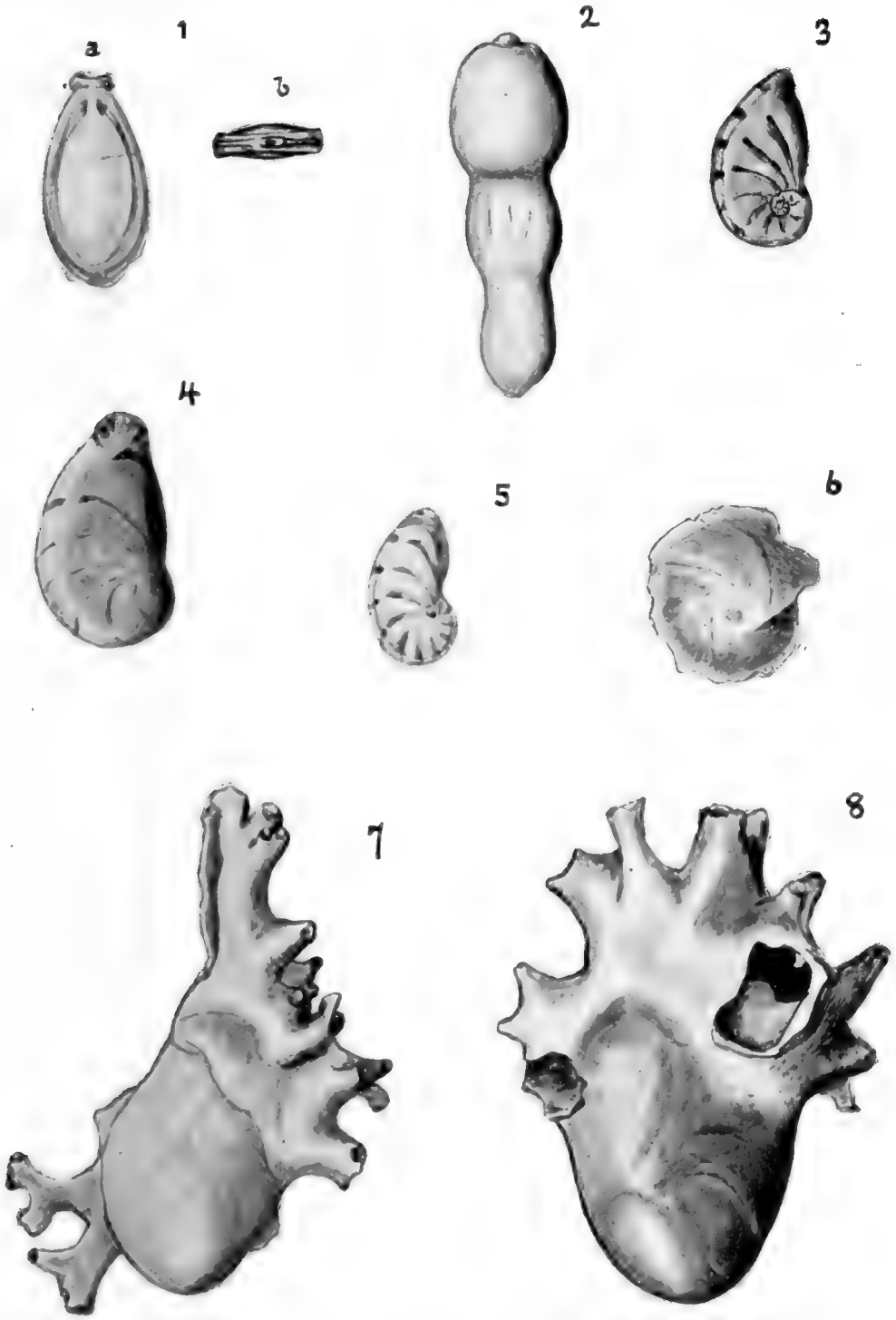
Polymorphina lactea, W. & J. sp., var. *diffusa*, Jones and Chapman, 1896, Journ. Linn. Soc. Lond., Zool., vol. xxv, pp. 499, 505, fig. 28. *P. lactea*, W. & J. sp., var. *diffusa*, Jones & Chapm., Chapman, 1907, Journ. Quekett Micr. Club, p. 131, pl. x, fig. 1.

This is a fistulose variety of the typical form, in which the tubular outgrowths are scattered over the surface of the test. The original figure is based on that of a specimen illustrated by Terquem, and occurring in the Pliocene of the Isle of Rhodes.*

Distribution.—This variety is likely to occur wherever the type form is found. It was recently found by the writer in shore-sand at Torquay, near Geelong, Victoria.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; one example.

* "*Polymorphina solidula*," Mém. Soc. Géol. France, sér. 3, vol. i, No. 3, 1878, p. 40, pl. iii (viii), fig. 33.



X 36.

PLATE XVI.

Polymorphina lactea, W. & J. sp., fistulose var. **racemosa**, Jones and Chapman. (Plate XVI, fig. 8.)

Polymorphina lactea, W. & J., sp., var. *racemosa*, Jones and Chapman, 1896, Journ. Linn. Soc. Lond., Zool., vol. xxv, pp. 497, 504, fig. 20.

This variety has the fistulose outgrowths confined to the oral extremity.
Distribution.—Probably coextensive with the species.
Present Occurrence.—North-east of Bounty Island; 50 fathoms; one example.

Polymorphina gibba, d'Orbigny.

Polymorphina (*Globulina*) *gibba*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 266, No. 20; modèle No. 63. *P. gibba*, d'Orb., Brady, 1884, Rep. Chall., vol. ix, p. 561, pl. lxxi, figs. 12 *a*, *b*.

Distribution.—A widely distributed form.
Present Occurrence.—Off the Snares; 60 fathoms; rare.

Polymorphina gibba, d'Orbigny, fistulose var. **racemosa**, Jones and Chapman. (Plate XVII, fig. 1.)

Polymorphina gibba, d'Orb., var. *racemosa*, Jones and Chapman, 1896, Journ. Linn. Soc. Lond., Zool., vol. xxv, pp. 497, 504, figs. 17, 18.

Distribution.—Probably coextensive with the species.

Present Occurrence.—Off the Snares; 60 fathoms; one example.

Polymorphina communis, d'Orbigny.

Polymorphina (*Guttulina*) *communis*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 266, pl. xii, figs. 1–4; modèle No. 62. *P. communis*, d'Orb., Jones, 1895, Palaeont. Soc. Mon., Crag. Foram., p. 265, pl. v, fig. 24; pl. vi, fig. 16.

Distribution.—A well-known form in almost every recent foraminiferal dredging from shallow water to moderate depths. Dr. Brady records its greatest depth as 155 fathoms. One of Dr. Flint's samples with this species came from off the coast of Georgia, at 276 fathoms.

Present Occurrence.—Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Polymorphina compressa, d'Orbigny.

Polymorphina compressa, d'Orbigny, 1846, Foram. Foss. Vienne, p. 233, pl. xii, figs. 32–34. *P. compressa*, d'Orb., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 309, pl. ix, figs. 11–13.

Distribution.—Dr. Brady mentions this species as of more frequent occurrence in the temperate portion of the North Atlantic. It is occasionally found in the North and South Pacific.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Polymorphina oblonga, d'Orbigny.

Polymorphina oblonga, d'Orbigny, 1846, Foram. Foss. Vienne, p. 232, pl. xii, figs. 29–31. *P. oblonga*, d'Orb., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 319, pl. lxvii, fig. 5. *P. oblonga*, d'Orb., Sidebottom, 1907, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. li, No. 9, p. 12, pl. ii, fig. 20.

Our examples are quite typical.

Distribution.—Widely distributed.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; frequent.

Polymorphina elegantissima, Parker and Jones.

Polymorphina elegantissima, Parker and Jones, 1864, Phil. Trans., vol. clv. table x, p. 438. *P. elegantissima*, P. & J., Brady, Parker and Jones, 1870, Trans. Linn. Soc., vol. xxvii, p. 231, pl. xl, fig. 15.

This species is a typical one in the Australasian Tertiary deposits, and it has persisted in the Southern Ocean to the present time.

Distribution.—Brady states that it appears to be confined to the shores of the Pacific, and is best known from Australian specimens. It has been found as far north as Hong Kong Harbour.

Present Occurrence.—Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very common.

Genus Uvigerina, d'Orbigny, 1826.

Uvigerina angulosa, Williamson.

Uvigerina angulosa, Williamson, 1858, Rec. Foram. Gt. Brit., p. 67, pl. v, fig. 140. *U. angulosa*, Will., Brady, 1884, Rep. Chall., vol. ix, p. 576, pl. lxxiv, figs. 15–18.

The specimens vary greatly. They are generally small. Some of the shorter forms have a few aboral spines, such as distinguish the variety *spinipes* of Brady, and which was recorded from only one station by the "Challenger"—viz., off Nightingale Island, Tristan da Cunha.

Distribution.—Widely dispersed. Ranging from the North Atlantic to the antarctic ice-barrier. Recorded from the New Zealand area in the "Challenger" Reports.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; very rare. North-east of Bounty Island; 50 fathoms; common. Off the Snares; 60 fathoms; frequent. Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; very common.

Fam. GLOBIGERINIDAE.

Genus GLOBIGERINA, d'Orbigny, 1826.

Globigerina bulloides, d'Orbigny.

Globigerina bulloides, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 277, No. 1; modèles Nos. 17 and 76; *idem*, 1846, Foram. Foss. Vienne, p. 163, pl. ix, figs. 4–6.

Some of our specimens resemble *G. dubia* (of Chall. Rep., non Egger) or *G. eggeri* of Rhumbler,* but no sharp distinction can be drawn to separate the two forms in our series.†

Distribution.—A cosmopolitan pelagic form. Obtained by the "Challenger" from the New Zealand area, and off Great Barrier Island by the writer.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; frequent; small. Off the Snares; 60 fathoms; very common Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; frequent

Globigerina triloba, Reuss.

Globigerina triloba, Reuss, 1849, Denkschr. Akad. k. d. Wiss. Wien, vol. i, p. 374, pl. xlvii, fig. 11 *a–e*. *G. bulloides*, var. *triloba*, Rss., Brady, 1884, Rep. Chall., vol. ix, p. 595, pl. lxxix, figs. 1, 2; pl. lxxxi, figs. 2, 3.

Distribution.—Coextensive with the preceding species. Obtained by the "Challenger" from the New Zealand area, and off Great Barrier Island by the writer.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Globigerina dutertrei, d'Orbigny.

Globigerina dutertrei, d'Orbigny, 1839, Foram. Cuba, p. 95, pl. iv, figs. 19–21.

It is remarkable that the above species should only be represented by a few ill-developed examples, seeing that it is a characteristic form in antarctic foraminiferal dredgings.

Distribution.—Although typically an antarctic form, this species has also been recorded from the South Pacific and the West Indies.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares; 60 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Globigerina inflata, d'Orbigny.

Globigerina inflata, d'Orbigny, 1839, Foram. Cuba, p. 134, pl. ii, figs. 7–9. *G. inflata*, d'Orb., Fornasini, 1899, Mem. R. Accad. Sci. Ist. Bologna, ser. 5, vol. vii, p. 577, pl. i, fig. 3.

* In Karl Brandt's "Nordisches Plankton," 1900, heft 14, p. 19, fig. 20.

† See also Millett, 1903, Journ. R. Micr. Soc., p. 686.

Distribution.—Having a wide geographical range. Brady says that it is less common in the Arctic and Southern Oceans than elsewhere. Obtained from the New Zealand area by the "Challenger," and off Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; very rare, small.

Globigerina aequilateralis, Brady.

Globigerina aequilateralis, Brady, 1884, Rep. Chall., vol. ix, p. 605, pl. lxxx, figs. 18–21. *G. aequilateralis*, Brady, Rhumbler, 1900, in Dr. Karl Brandt's "Nordisches Plankton," heft 14, p. 20, figs. 21–23.

Distribution.—Having a fairly wide range. Obtained from the New Zealand area by the "Challenger," and off Great Barrier Island, where it was rare, by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; very rare

Genus ORBULINA, d'Orbigny, 1839.

Orbulina universa, d'Orbigny.

Orbulina universa, d'Orbigny, 1839, Foram. Cuba, p. 3, pl. i, fig. 1. *O. universa*, d'Orb., Rhumbler, 1900, in Dr. Karl Brandt's "Nordisches Plankton," heft 14, p. 27, figs. 27–30.

Distribution.—Widely distributed. Obtained from the New Zealand area by the "Challenger," and off Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; common. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; very common.

Genus SPHAEROIDINA, d'Orbigny, 1826.

Sphaeroidina bulloides, d'Orbigny.

Sphaeroidina bulloides, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 267, No. 1; modèle No. 65. *S. bulloides*, d'Orb., Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv, p. 87, pl. xiv, fig. 770.

The examples here met with are small, and have a peculiarly rough test, almost simulating *Globigerina conglobata*; the aperture, however, serves to distinguish the form generically.

Distribution.—This species has a wide geographical range. The "Challenger" obtained it from the New Zealand area, and it has also occurred off Great Barrier Island at 110 fathoms.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; very rare. Off the Snares; 60 fathoms; very rare.

Genus CANDEINA, d'Orbigny, 1839.

Candeina nitida, d'Orbigny.

Candeina nitida, d'Orbigny, 1839, Foram. Cuba, p. 108, pl. ii, figs. 27, 28. *C. nitida*, d'Orb., Millett, 1903, Journ. R. Micr. Soc., p. 692, pl. vii, fig. 2.

Distribution.—Widely dispersed.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; common.

Fam. ROTALIIDAE.

Subfam. SPIRILLININAE.

Genus SPIRILLINA, Ehrenberg, 1841.

Spirillina vivipara, Ehrenberg.

Spirillina vivipara, Ehrenberg, 1841, Abandl. k. Akad. Wiss. Berlin, p. 422, pl. iii, vii, fig. 41. *S. vivipara*, Ehr., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 326, pl. lxxi, fig. 4.

The present examples are of moderate size, and typical.

Distribution.—Geographically unrestricted. Both Brady and Egger record it as far south as Kerguelen Island. Curiously, no examples of the genus *Spirillina* have hitherto been recorded from the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island, 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; common.

Spirillina obconica, Brady.

Spirillina obconica, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix, n.s., p. 279, pl. viii, figs. 27 *a*, *b*.

The examples found are minute, and beautifully transparent.

Distribution.—Brady gives three localities for this species—viz., off Prince Edward Island, Kerguelen Island, and Admiralty Islands.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Spirillina novae-zealandiae, sp. nov. (Plate XVII, figs. 4 *a*, *b*, and 5.)

Description.—Test thick; suture more or less obscured, according to age; periphery rounded, and often longitudinally lineated with secondary shell-growth; surface abundantly perforated with coarse pores and surrounded with supplementary shell-deposit.

Diameter of larger figured specimen, 1·36 mm.; thickness, 0·28 mm.

Remarks.—This species differs from *S. vivipara* in the thick test, coarse pores, indistinct sutures, and well-rounded periphery. At first sight it might be mistaken for *S. tuberculata*, Brady,* since the pores under certain illumination seem to appear

* Rep. Chall., vol. ix, 1884, p. 631, pl. lxxxv, figs. 12–16.

as tubercles, owing to a thin, irregular deposit of secondary shell-substance around them. This form is by far the commonest of the genus in the present series.

Occurrence.—Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; frequent.

Spirillina inaequalis, Brady.

Spirillina inaequalis, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix, n.s., p. 278, pl. viii, fig. 25. *S. inaequalis*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 394, pl. xviii, figs. 40–42.

Distribution.—Previously recorded from the islands of the Pacific, and from the Mauritius, and Western Australia.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; one example.

Spirillina decorata, Brady.

Spirillina decorata, Brady, 1884, Rep. Chall., vol. ix, p. 633, pl. lxxxv, figs. 22–25. *S. decorata*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 394, pl. xviii, figs. 64, 65.

Distribution.—Brady records this species from the South Pacific, among other localities; Egger obtained it from west Africa, the Mauritius, and Western Australia; Millett found it in the Malay Archipelago.

Present Occurrence.—Off the Snares; 60 fathoms; one fine example.

Spirillina spinigera, Chapman.

Spirillina spinigera, Chapman, 1900, Journ. Linn. Soc. Lond., Zool., vol. xxviii, p. 10, pl. i, figs. 7 *a–c*; *idem*, *ibid.*, 1901, vol. xxviii, p. 188, pl. xix, figs. 9, 10. *S. decorata*, Brady var., Sidebottom, 1908, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. lii, pt. iii, p. 8, pl. ii, fig. 6.

Our specimen bears a few peripheral spines, and is quite typical in other respects. Mr. Sidebottom refers this form to *S. decorata*, to which it certainly bears some alliance; it has, however, the constant character of being plano-convex, whilst *S. decorata* is typically biconvex.

Distribution.—This interesting little form was originally described from Funafuti, where it occurred both in the lagoon (7½ fathoms) and outside the atoll (32 to 200 fathoms). It was also found in the boring in the lagoon at 62 ft. below the floor. Mr. Sidebottom's specimens are recorded from the Island of Delos, and from Raine's Islet, Torres Strait.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; one example.

Spirillina limbata, Brady.

Spirillina limbata, Brady, 1879, Quart. Journ. Micr. Sci., vol. xix, n.s., p. 278, pl. viii, fig. 26. *S. limbata*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 395, pl. xviii, figs. 43, 44.

The examples in the present series are generally typical, but there is a tendency for some of the specimens to vary towards *S. inaequalis*, Brady.

Distribution.—This species has a wide geographical range.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare; small. Off the Snares; 60 fathoms; frequent; of variable size. Ten miles north of Enderby Island; 85 fathoms; very rare; small.

Spirillina limbata, var. **denticulata**, Brady. (Plate XVII, fig. 2.)

Spirillina limbata, var. *denticulata*, Brady, 1884, Rep. Chall., vol. ix, p. 632, pl. lxxxv, fig. 17.

Distribution.—This variety appears to be restricted to the Southern Hemisphere.

Present Occurrence.—Off the Snares; 60 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; rare.

Spirillina denticulo-granulata, Chapman. (Plate XVII, figs. 3 *a*, *b*.)

Spirillina denticulo-granulata, Chapman, 1907, Journ. Quekett Micr. Club, ser. 2, vol. x, p. 133, pl. x, figs. 6 *a–c*.

Distribution.—A form of *Spirillina* probably referable to this species has been recorded by Mr. Millett from the Tertiary (Pliocene) deposits of St. Erth, Cornwall*; and the present writer has described it from shore-sand at Torquay, near Geelong, Victoria.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Subfam. ROTALIINAE.

Genus Patellina, Williamson, 1858.

Patellina corrugata, Williamson.

Patellina corrugata, Williamson, 1858, Rec. Foram. Gt. Brit., p. 46, pl. iii, figs. 86–89. *P. corrugata*, Will., Wright, 1900, Geol. Mag., n.s., Dec. 4, vol. vii, p. 100, pl. v, fig. 20. *P. corrugata*, Will., Chapman, 1907, Journ. Quekett Micr. Club, ser. 2, vol. x, p. 134, pl. x, fig. 7.

Distribution.—Its geographical range is very wide. *P. corrugata* has lately been recorded from the Victorian littoral, and the writer has also found it in several samples of Victorian Tertiary (Miocene) deposits. Haeusler has recorded this species from the Hauraki Gulf, New Zealand.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; common.

Genus Discorbina, Parker and Jones, 1862.

Discorbina turbo, d'Orbigny sp.

Rotalia (*Trochulina*) *turbo*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 274, No. 39; modèle No. 73. *Discorbina turbo*, d'Orb. sp., Jones, 1895, Pal. Soc. Mon., Crag. Foram., p. 291, pl. vii, fig. 29. *D. turbo*, d'Orb. sp., Millett, 1903, Journ. R. Micr. Soc., p. 697.

* Journ. R. Micr. Soc., 1903, p. 694.

The majority of our specimens are typical, but a few form connecting-links with *D. rosacea*, after the manner observed by Mr. Millett in his series from the Malay Archipelago.

Distribution.—The present record is the farthest south of any yet made. The "Challenger" obtained it from the Cape de Verde Islands; off Ascension Island; off the coast of South America, near Pernambuco; and from Port Jackson. Dr. Brady further records it from Bermuda, and Port Stephen, New South Wales. Dr. Egger notes it from the Mauritius. Dr. Haeusler found it in shallow water in the Hauraki Gulf, New Zealand.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; rare. Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; common.

Discorbina globularis, d'Orbigny sp.

Rosalina globularis, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 271, pl. xiii, figs. 1–4; modèle No. 69. *Discorbina globularis*, d'Orb. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 327, pl. lxxii, fig. 2.

Distribution.—Dr. Brady refers to this species as the commonest of the genus. It has a wide distribution, and was recorded as far south as the Magellan Strait by the "Challenger." Dr. Haeusler has noted it from the Hauraki Gulf, New Zealand.

Present Occurrence.—Off the Snares; 60 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; very rare.

Discorbina rosacea, d'Orbigny sp.

Rotalia rosacea, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 273, No. 15. *Discorbina rosacea*, d'Orb. sp., Goës, 1894, K. Svenska Vet.-Akad. Handl., vol. xxv, p. 94, pl. xv, fig. 792.

Distribution.—A common form in shallow to moderately shallow water. It is widely distributed, and was recorded by the "Challenger" as far south as the Straits of Magellan. Dr. Haeusler has obtained it from the Hauraki Gulf, New Zealand.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Discorbina patelliformis, Brady.

Discorbina patelliformis, Brady, 1884, Rep. Chall., vol. ix, p. 647, pl. lxxxviii, fig. 3; pl. lxxxix, fig. 1. *D. patelliformis*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 390, pl. xv, figs. 48–50. *D. patelliformis*, Brady, Sidebottom, 1908, Mem. & Proc. Manch. Lit. & Phil. Soc., vol. lii, p. 14, pl. v, fig. 3.

Distribution.—More numerous in the Southern Hemisphere. Amongst other places, it has been recorded from the islands of the Pacific and off Western Australia.

Present Occurrence.—Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Discorbina bertheloti, d'Orbigny sp.

Rosalina bertheloti d'Orbigny, 1839, Foram. Canaries, p. 135, pl. i, figs. 28–30. *Discorbina bertheloti,* d'Orb. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 327, pl. lxxii, fig. 4.

Distribution.—Widely distributed. Brady records the most southerly locality at the south-east corner of Australia.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; common.

Discorbina bertheloti, d'Orb. sp., var. **baconica,** Hantken.

Discorbina baconica, Hantken, 1875, Mittheil, Jahrb. d. k. Ung. Geol. Anstalt, vol. iv, p. 76, pl. x, figs. 3 *a, b. D. bertheloti,* d'Orb. sp., var. *baconica,* Hantken, Brady, 1884, Rep. Chall., vol. ix, p. 651, pl. xc, figs. 1 *a–c.*

Distribution.—This variety, which was described from a Tertiary fossil example, has been recorded only from two localities, in the North Atlantic.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare; small.

Discorbina araucana, d'Orbigny sp.

Rosalina araucana, d'Orbigny, 1839, Foram. Amér. Mérid., p. 44, pl. vi, figs. 16–18. *Discorbina araucana,* d'Orb., sp., Brady, 1884, Rep. Chall., vol. ix, p. 645, pl. lxxxvi, figs. 10, 11.

Distribution.—Brady states that this form and the nearly related *D. vilardeboana* "occurs in shallow water at almost every latitude from the shores of Japan to Kerguelen Island, and the coast of Patagonia."

Present Occurrence.—Off the Snares; 60 fathoms; one example.

Discorbina parisiensis, d'Orbigny sp. (Plate XVII, figs. 6, 7.)

Rosalina parisiensis, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 271, No. 1; modèle No. 38. *Discorbina parisiensis,* d'Orb. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 391, pl. xv, figs. 25–30.

This is the commonest species of the genus in the present material. More than 50 per cent. of the specimens are in the condition of plastogamic conjugation, forming "double specimens"; as also exemplified in *D. tabernacularis* and *D. pileolus.* Our shells are generally more conical than the usual type of *D. parisiensis,* and in this they resemble the tests of *D. pileolus.* The retrorse form of the sutures, however, show this form to be referable to *D. parisiensis.*

Distribution.—The "Challenger" obtained it from Kerguelen Island, and it has also occurred off the coast of Ireland (Wright), and the Atlantic shores of France (Berthelin). Egger obtained it from Kerguelen, the Mauritius, between New Amsterdam and Australia, and off Western Australia.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; common. Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; very common.

Discorbina allomorphinoides, Reuss. sp.

Valvulina allomorphinoides, Reuss, 1860, Sitzungsb. d. k. Ak. Wiss. Wien, vol. xl, p. 223, pl. xi, fig. 6. *Discorbina allomorphinoides*, Rss. sp., Brady, 1884, Rep. Chall., vol. ix, p. 654, pl. xci, figs. 5, 8.

Distribution.—Brady records this form from three localities—viz., off the Philippines, off Raine Island, and at Port Jackson. Millett mentions it as having occurred in the Malay Archipelago and off Korea. It has also been found off Dunkerque (Terquem), and in the Adriatic (Fornasini).

Present Occurrence.—Twenty miles north of Auckland Island ; 85 fathoms ; one small example.

Discorbina rarescens, Brady.

Discorbina rarescens, Brady, 1884, Rep. Chall., vol. ix, p. 651, pl. xc., figs. 2, 3, ? 4. *D. rarescens*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 388, pl. xv, figs. 45–47.

Distribution.—Raine Island and off the Philippines (Brady) ; west Africa and Western Australia (Egger).

Present Occurrence.—Twenty miles north of Auckland Island ; 85 fathoms ; rare. Ten miles north of Enderby Island ; 85 fathoms ; very rare.

Discorbina biconcava, Parker and Jones. (Plate XVII, figs. 8 *a*, *b*.)

Discorbina biconcava, Parker and Jones, 1865, Phil. Trans., vol. clv, p. 422, pl. xix, figs. 10 *a–c*. *D. biconcava*, P. & J., Brady, 1884, Rep. Chall., vol. ix, p. 653, pl. xci, figs. 2, 3. *D. biconcava*, P. & J., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 393, pl. xviii, figs. 45–47.

Distribution.—Commonest in the Australian area, having been found by the "Challenger" in Bass Strait, Port Jackson, and off Raine Island. Egger found it off New Guinea. It has also been recorded from Melbourne, and from Storm Bay, Tasmania. Of other widely separated localities may be mentioned the Dee Estuary, England (Siddall), and the Gulf of Mexico (Flint).

Present Occurrence.—Off the Snares ; 60 fathoms ; one example.

Genus Truncatulina, d'Orbigny, 1826.

Truncatulina refulgens, Montfort sp.

Cibicides refulgens, Montfort, 1808, Conch. Syst., vol. i, p. 122, 31e genre. *Truncatulina refulgens*, Montfort sp., Egger, 1893, p. 401, pl. xvi, figs. 31–33. *T. refulgens*, Montf. sp., Chapman, 1898, Journ. R. Micr. Soc., p. 1, pl. i, fig. 1.

Distribution.—Found in the North Atlantic ; also in the temperate zone of the Southern Hemisphere (Brady). This is its first occurrence in the New Zealand area.

Present Occurrence.—Twenty miles north of Auckland Island ; 85 fathoms ; rare ; typical. Ten miles north of Enderby Island ; 85 fathoms ; very rare.

Truncatulina lobatula, Walker and Jacob sp.

Nautilus lobatulus, Walker and Jacob, "Adams's Essays," Kanmacher's ed., p. 642, pl. xiv, fig. 36. *Truncatulina lobatula*, W. & J. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 396, pl. xvi, figs. 1–3, 10–12. *T. lobatula*, W. & J. sp., Chapman, 1902, Proc. Roy. Soc. Edin., vol. xxiii, p. 392, pl. i, figs. 2, 3.

Distribution.—A very common form, and most widely distributed. *T. lobatula* was obtained by the "Challenger" from the east coast of New Zealand, and the writer has recorded it from Great Barrier Island.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; frequent. Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; very common.

Truncatulina variabilis, d'Orbigny

Truncatulina variabilis, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 279, No. 8. *T. variabilis*, d'Orbigny, Jones, 1896, Pal. Soc. Mon., Crag. Foram., p. 309, pl. vi, fig. 23.

Distribution.—A well-known wild-growing form in most shallow-water areas, and occasionally found in deeper water. It was recorded for the first time from the New Zealand area by the writer, off Great Barrier Island, 110 fathoms.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; frequent; examples with thin tests. North-east of Bounty Island; 50 fathoms; rare. Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; very common.

Truncatulina tenuimargo, Brady.

Truncatulina tenuimargo, Brady, 1884, Rep. Chall., vol. ix, p. 662, pl. xciii, figs. 2, 3. *T. tenuimargo*, Brady, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 399, pl. xvi, figs. 7–9. *T. tenuimargo*, Brady, Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 102.

Distribution.—This is never a common form. It is known from the South Atlantic and the Pacific. Recorded by Dr. Brady from the shores of New Zealand, but not noted in Hutton's "Index Faunae Novae-Zealandiae." Dr. Egger found it at Kerguelen, amongst other localities. It was also found in dredgings off Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Truncatulina wuellerstorfi, Schwager sp.

Anomalina wuellerstorfi, Schwager, 1866, "Novara" Exped., geol. Theil, vol. ii, p. 258, pl. vii, fig. 105. *Truncatulina wuellerstorfi*, Schw. sp., Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 102.

It was not to be expected that this form would be common here, since it is usually found at a greater depth than 100 fathoms. The examples met with are variable in size and evenness of contour.

Distribution.—It was obtained by the "Challenger" from the New Zealand area, and from Great Barrier Island by the writer.

Present Occurrence.—Off the Snares: 60 fathoms; frequent. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Truncatulina ungeriana, d'Orbigny sp.

Rotalina ungeriana, d'Orbigny, 1846, Foram. Foss. Vienne, p. 157, pl. viii, figs. 16–18. *Truncatulina ungeriana*, d'Orb. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 333, pl. lxxvii, fig. 2.

Distribution.—Previously found off Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; frequent.

Truncatulina reticulata, Czjzek sp.

Rotalina reticulata, Czjzek, 1848, Haidinger's Naturw. Abhandl., vol. ii, p. 145, pl. xiii, figs. 7–9. *Truncatulina reticulata*, Cz. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 334, pl. lxxviii, fig. 3. *T. reticulata*, Cz. sp., Chapman, 1906, Trans. N.Z. Inst., vol. xxxviii, p. 102.

Distribution.—In the Southern Hemisphere it has been found at various stations in the Pacific and off the south coast of Australia. Recorded by the writer from Great Barrier Island, at 110 fathoms. It is also found fossil in the lower and upper beds at Muddy Creek, Victoria.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; one example.

Truncatulina haidingeri, d'Orbigny sp.

Rotalina haidingeri, d'Orbigny, 1846, Foram. Foss. Vienne, p. 154, pl. viii, figs. 7–9. *Truncatulina* (*Rotalina*) *haidingeri*, d'Orb. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 401, pl. xvi, figs. 25–27.

The specimen now found is not typical, having a test more depressed than usual and a larger umbilicus on the inferior face.

Distribution.—Recorded previously from Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; one example.

Genus Anomalina, d'Orbigny, 1826.

Anomalina grosserugosa, Gümbel sp. (Plate XVII, fig. 9.)

Truncatulina grosserugosa, Gümbel, 1868, Abhandl. d. k. bayer. Akad. Wiss., cl. ii, vol. x, p. 660, pl. ii, figs. 104 *a*, *b*. *Anomalina grosserugosa*, Gümbel sp., Brady, 1884, Rep. Chall., vol. ix, p. 673, pl. xciv, figs. 4, 5.

Distribution.—Previously recorded from nearly all areas. It ranges into the South Pacific, but does not appear to have been noticed in the New Zealand region.

Present Occurrence.—Off the Snares; 60 fathoms; one example.

Anomalina coronata, Parker and Jones. (Plate XVII, fig. 10.)

Anomalina coronata, Parker and Jones, 1857, Ann. and Mag. Nat. Hist., ser. 2, vol. xix, p. 294, pl. x, figs. 15, 16. *A. coronata*, P. & J., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 335, pl. lxxix, fig. 2.

Distribution.—It is interesting to note that this species is abundant in the cooler areas of the Northern Hemisphere. It is rare in the tropics, and is again found in the temperate zone of the Southern Hemisphere (Brady). The "Challenger" obtained it off the west coast of New Zealand, but it is not noted in the "Index Faunae Novae-Zealandiae."

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; very rare. Off the Snares; 60 fathoms; very rare. Twenty miles north of Auckland; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; common.

Genus PULVINULINA, Parker and Jones, 1862.

Pulvinulina repanda, Fichtel and Moll sp.

Nautilus repandus, Fichtel and Moll, 1798, Test. Micr., p. 35, pl. iii, figs. *a–d*. *Pulvinulina repanda*, F. & M. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 405, pl. xviii, figs. 28–30, 34, 35.

Our specimens are typical and well developed.

Distribution.—Brady says this form is most abundant in tropical and subtropical latitudes; it is, however, quite at home in our first-recorded locality. Haeusler notes this species from the Hauraki Gulf, New Zealand.

Present Occurrence.—Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; frequent. Ten miles north of Enderby Island; 85 fathoms; frequent.

Pulvinulina repanda, F.M. sp., var. **concamerata**, Montagu var.

Serpula concamerata, Montagu, 1808, Test. Brit., Suppl., p. 160 (*fide* Williamson). *Pulvinulina repanda*, F. & M. sp., var. *concamerata*, Mont. var., Brady, 1884, Rep. Chall., vol. ix, p. 685, pl. civ, figs. 19 *a–c*. *P. concamerata*, Mont. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 405, pl. xviii, figs. 28–30.

Distribution.—Brady records this variety from the coasts of England, Belgium, and France. Egger obtained it from "Gazelle" dredgings off the west coast of Portugal, off Western Australia, and off west Africa. It is new to the New Zealand area.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Pulvinulina concentrica, Parker and Jones.

Pulvinulina concentrica (Parker and Jones MS.), Brady, 1864, Trans. Linn. Soc. Lond., vol. xxiv, p. 470, pl. xlviii, fig. 14. *P. concentrica*, P. & J., Brady, 1884, Rep. Chall., vol. ix, p. 686, pl. cv, figs. 1 *a–c*.

Distribution.—Found at various stations in the North and South Atlantic, and from two stations in the South Pacific (Brady); also from the Malay Archipelago (Millett). The species is new to the New Zealand area.

Present Occurrence.—Off the Snares; 60 fathoms; very rare.

Pulvinulina canariensis, d'Orbigny sp.

Rotalina canariensis, d'Orbigny, 1839, Foram. Canaries, p. 130, pl. i, figs. 34–36. *Pulvinulina canariensis*, d'Orbigny sp., Rhumbler, 1900, in Karl Brandt's "Nordisches Plankton," heft 14, p. 16, fig. 10.

Distribution.—More generally diffused in the north and south temperate zones (Brady). Obtained from the New Zealand area by the "Challenger." Also recorded from Great Barrier Island by the writer.

Present Occurrence.—Off the Snares; 60 fathoms; rare.

Pulvinulina truncatulinoides, d'Orbigny sp.

Rotalina truncatulinoides, d'Orbigny, 1839, Foram. Canaries, p. 132, pl. ii, figs. 25–27. *Pulvinulina truncatulinoides*, d'Orb. sp., Rhumbler, 1900, in Karl Brandt's "Nordisches Plankton," heft 14, p. 17, fig. 16.

Distribution.—Widely dispersed. Already recorded from the New Zealand area by the "Challenger" (as *P. micheliniana*, d'Orb. sp.). It was not uncommon in the dredgings off Great Barrier Island.

Present Occurrence.—North-east of Bounty Island; 50 fathoms; very rare. Off the Snares; 60 fathoms; frequent. Twenty miles north of Auckland Island; 85 fathoms; rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Pulvinulina exigua, Brady.

Pulvinulina exigua, Brady, 1884, Rep. Chall., vol. ix, p. 696, pl. ciii, figs. 13, 14.

Distribution.—A deep-water form, only occasionally found in moderately shallow water. It has a wide distribution, and has already been recorded from the New Zealand area by the "Challenger."

Present Occurrence.—Off the Snares; 60 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

Pulvinulina schreibersii, d'Orbigny sp.

Rotalina schreibersii, d'Orbigny, 1846, Foram. Foss. Vienne, p. 154, pl. viii, figs. 4–6. *Pulvinulina schreibersii*, d'Orb. sp., Brady, 1884, Rep. Chall., vol. ix, p. 697, pl. cxv, figs. 1 *a–c*.

Distribution.—Six out of seven "Challenger" stations were amongst the islands of the South Pacific. Previously obtained from the New Zealand area by the "Challenger," but not noted in the "Index Faunae Novae-Zealandiae"; and also occurring off Great Barrier Island.

Present Occurrence.—Off the Snares; 60 fathoms; very rare; not typical.

Pulvinulina elegans, d'Orbigny sp.

Rotalia (*Turbinulina*) *elegans*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 276, No. 54. *Pulvinulina elegans*, d'Orb. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 331, pl. lxxv, fig. 1.

A carinate variety also occurs here.

Distribution.—It has been previously recorded from the New Zealand area by the "Challenger."

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Genus ROTALIA, Lamarck, 1804.

Rotalia soldanii, d'Orbigny.

Rotalia (*Gyroidina*) *soldanii*, d'Orbigny, 1826, Ann. Sci. Nat., vol. vii, p. 278, No. 5; modèle No. 36. *R. soldanii*, d'Orb., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 332, pl. lxxv, fig. 4.

Distribution.—This species has a wide geographical distribution. Brady states that out of sixty localities for this species only six have a depth of less than 300 fathoms. Recorded previously from the New Zealand area by the "Challenger." It was rare in the Great Barrier Island dredgings.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Rotalia clathrata, Brady.

R. clathrata, Brady, 1884, Rep. Chall., vol. ix, p. 709, pl. cvii, figs. 8, 9.

Distribution.—Confined to the area between Australia and New Zealand. Recorded previously from the New Zealand area by the "Challenger." It was a rare form in the Great Barrier Island dredging.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; very rare. North-east of Bounty Island; 50 fathoms; rare. Off the Snares; 60 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; common. Ten miles north of Enderby Island; 85 fathoms; common.

Subfam. TINOPORINAE.

Genus GYPSINA, Carter, 1877.

Gypsina vesicularis, Parker and Jones sp.

Orbitolina vesicularis, Parker and Jones, 1860, Ann. and Mag. Nat. Hist., ser. 3, vol. vi, p. 31, No. 5. *Gypsina vesicularis*, Parker and Jones, Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 382, pl. xiv, figs. 20–23. *G. vesicularis*, P. & J. sp., Chapman, 1900, Journ. Linn. Soc. Lond., Zool., p. 198, pl. xix, fig. 12.

Our specimens are rather small, but otherwise typical.

Distribution.—This species is new to the New Zealand area as recorded. It is typically a form inhabiting warm latitudes, being frequent in coral sands. With regard to its occurrence in cold-water areas, Dr. Brady has noted it from the Atlantic

seaboard of Great Britain and from the Irish Sea,* but it is absent from the east coast of England and Scotland; this limited distribution in northern areas may be accounted for by the influence of the Gulf Stream on the west British coast. Dr. Egger obtained it from "Gazelle" dredgings in the Mauritius and at Amboyna.

Present Occurrence.—Off the Snares; 60 fathoms; frequent.

Gypsina inhaerens, Schultze sp.

Acervulina inhaerens, Schultze, 1854, Organ. Polythal., p. 68, pl. vi, fig. 12. *Gypsina inhaerens*, Schultze sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 336, pl. lxxix, fig. 6

One of our specimens is found encrusting a cylindrical adventitious fragment in a manner very typical of this form. The others are explanate and detached, but once adherent.

Distribution.—New to the New Zealand area. The "Challenger" examples came from two stations, both in the Southern Hemisphere—viz., off East Moncoeur Island, Bass Strait, and off Booby Island, near New Guinea. Mr. Millett obtained it from the Malay Archipelago.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; rare.

Fam. NUMMULINIDAE.

Subfam. POLYSTOMELLINAE.

Genus Nonionina, d'Orbigny, 1826.

Nonionina depressula, Walker and Jacob sp.

Nautilus depressulus, Walker and Jacob, 1798, "Adams's Essays," Kanmacher's ed., p. 641, pl. xiv, fig. 33. *Nonionina depressula*, W. & J. sp., Wright, 1900, Geol. Mag., Dec. 4, vol. vii, p. 100, pl. v, fig. 23.

Distribution.—Characteristic of shallow water or estuarine conditions, and generally distributed. Dr. Haeusler records this species from the Hauraki Gulf, New Zealand.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Nonionina umbilicatula, Montagu sp.

Nautilus umbilicatulus, Montagu, 1803, Test. Brit., p. 191; Suppl., p. 78, pl. xviii, fig. 1. *Nonionina umbilicatula*, Mont. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 426, pl. xix, figs. 36, 37.

Distribution.—A cosmopolitan species. Previously recorded from the New Zealand area in the "Challenger" series. Also obtained off Great Barrier Island.

Present Occurrence.—Off the Snares; 60 fathoms; rare. Twenty miles north of Auckland Island; 85 fathoms; very common. Ten miles north of Enderby Island; 85 fathoms; frequent.

* "A Synopsis of the British Recent Foraminifera," H. B. Brady, Journ. R. Micr. Soc., ser. 2, vol. vii, 1887, p. 923.

Nonionina scapha, Fichtel and Moll sp.

Nautilus scapha, Fichtel and Moll, 1798, Test. Micr., p. 105, pl. xix, figs. *d–f*. *Nonionina scapha*, F. & M. sp., Flint, 1899, Rep. U.S. Nat. Mus. for 1897, p. 357, pl. lxxx, fig. 1.

Distribution.—Widely dispersed. Dr. Brady remarks that it does not appear to have been recorded from the Southern Ocean. Haeusler notes it from the Hauraki Gulf.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare.

Nonionina boueana, d'Orbigny.

Nonionina boueana, d'Orb., 1846, Foram. Foss. Vienne, p. 108, pl. v. figs. 11, 12. *N. boueana*, d'Orb., Fornasini, 1900, Mem. R. Acad. Sci. Ist. Bologna, ser. 5, vol. viii, p. 400, fig. 49.

Distribution.—Dr. Brady records this species from seven localities, only one of which is in the Southern Hemisphere—off the west coast of Patagonia. This species is new to the New Zealand area.

Present Occurrence.—Perseverance Harbour, Campbell Islands; 8 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; rare.

Genus Polystomella, Lamarck, 1822.

Polystomella crispa, Linné sp.

Nautilus crispus, Linné, 1767, Syst. Nat., ed. 12, p. 1162, No. 275. *Polystomella crispa*, Linn. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 432, pl. xx, figs. 20, 21. *P. crispa*, L. sp., Rhumbler, 1902, Zeitschr. fur Allgem. Phys., vol. ii, pt. 2, p. 233, fig. 64.

Distribution.—Widely diffused. Recorded by Haeusler from the Hauraki Gulf, New Zealand.

Present Occurrence.—Ten miles north of Enderby Island; 85 fathoms; very rare; typical.

Polystomella macella, Fichtel and Moll sp.

Nautilus macellus, Fichtel and Moll, 1798, Test. Micr., p. 66, pl. x, figs. *e–g*. *Polystomella macella*, F. & M. sp., Brady, 1884, Rep. Chall., vol. ix, p. 737, pl. cx, figs. 8, 9, 11. *P. macella*, F. & M. sp., Egger, 1893, Abhandl. k. bayer. Akad. Wiss., cl. ii, vol. xviii, p. 432, pl. xx, figs. 22, 23.

Distribution.—A widely diffused species. Egger records it, amongst other places, from Kerguelen Island. Recorded previously from the New Zealand area by Dr. Brady, but not noted from the "Challenger" series in the "Index Faunae Novae-Zealandiae." Also by Haeusler from the Hauraki Gulf.

Present Occurrence.—Perseverance Harbour, Campbell Island; 8 fathoms; very common. Twenty miles north of Auckland Island; 85 fathoms; very rare. Ten miles north of Enderby Island; 85 fathoms; very rare.

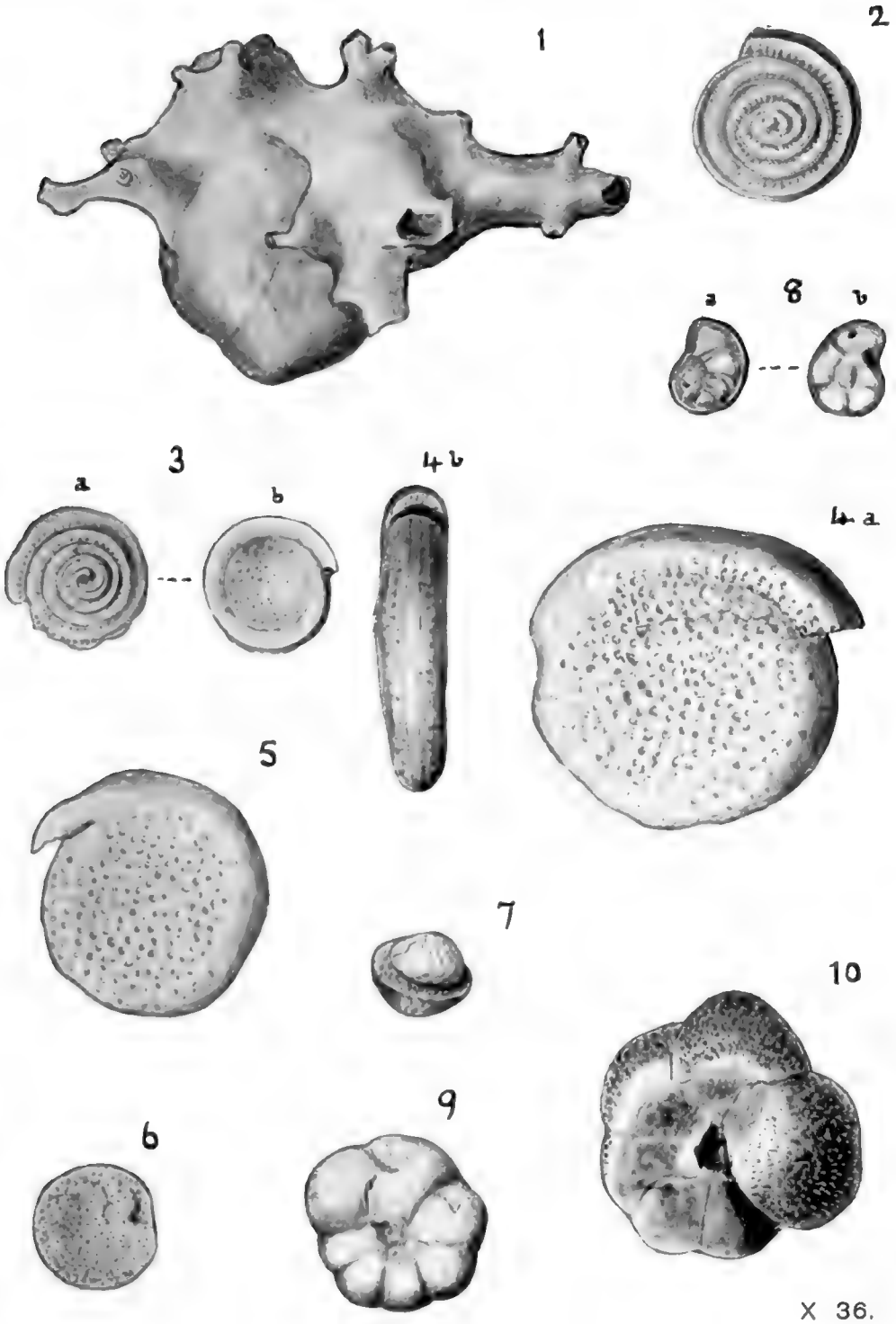


PLATE XVII.

SUMMARY OF RESULTS.

The dredgings on which the foregoing report is based have proved rich beyond expectations, for they have yielded as many as 168 species and varieties of the *Foraminifera*. No doubt additional species could be found by prolonged searching amongst the finer material.

Four new species and two new varieties are herein described, viz.,—

Miliolina chrysostoma.
Planispirina antarctica.
Lagena lagenoides, Williamson sp., var. *nuda.*
„ *quadrata*, Will. sp., var. *carinata.*
„ *enderbiensis.*
Spirillina novae-zealandiae.

Of forms new to the "Index Faunae Novae-Zealandiae" there are 103. As in the Barrier Island dredgings, the present contain a few species until recently only met in high northern latitudes, such as *Biloculina vespertilio*, *B. pisum*, and *Miliolina angulata.*

The most prolific genus is *Lagena*, with nineteen species and varieties. Of the genus *Spirillina* there was no record in the "Index Faunae Novae-Zealandiae"; but the present material contains as many as eight species and a variety.

Textularia gramen is noteworthy as being amongst the commonest forms, and, further, that it shows a remarkable amount of variation.

Another most interesting species is *Discorbina parisiensis*, which here appears to be normally in the condition of plastogamic union, the two shells being frequently so well matched in size and neatly apposed as to almost pass for a biconvex test of *Amphistegina lessoni.*

LIST OF FORAMINIFERA MENTIONED IN THE FOREGOING REPORT.

[Previous records marked thus: Ch. = "Challenger," *fide* H. B. Brady and J. Murray; Br. = H. B. Brady; H. = Dr. Haeusler; F.C. = F. Chapman; * = New to New Zealand area.]

H.	*Nubecularia lucifuga*, Defrance.
Ch.	*Biloculina depressa*, d'Orb.
Ch.	„ *serrata*, Brady.
*	„ *sarsi*, Schlumb.
Ch.	„ *bradii*, Schlumb. (Recorded as *B. ringens* by "Challenger.")
*	„ „ var. *denticulata*, Brady.
*	„ *vespertilio*, Schlumb.
F.C.	„ *pisum*, Schlumb.
*	„ *lucernula*, Schwager.
*	„ *elongata*, d'Orb.
Ch.	„ *irregularis*, d'Orb.
*	„ *globulus*, Born. (Included with *B. sphaera* in Chall. Rep.)
*	*Spiroloculina asperula*, Karrer.

F.C.	*Miliolina insignis*, Brady.
Ch., H., F.C.	„ *circularis*, Born. sp.
*	„ „ var. *sublineata*, Brady.
*	„ *subrotunda*, Mont. sp.
Ch., H., F.C.	„ *seminulum*, L. sp.
Ch., H.	„ *oblonga*, Mont. sp.
*	„ *trigonula*, Lam. sp.
Ch.	„ *tricarinata*, d'Orb. sp.
*	„ *vulgaris*, d'Orb. sp.
*	„ *angulata*, Will.
*	„ *polygona*, d'Orb. sp.
Ch.	„ *venusta*, Karrer sp.
*	„ *ferrussacii*, d'Orb. sp.
*	„ *chrysostoma*, sp. nov.
Ch.	*Sigmoilina schlumbergeri*, A. Silvestri. (Recorded as *Planispirina celata*, Brady non Costa sp.)
*	„ *celata*, Costa sp.
*	*Articulina funalis*, Brady.
*	*Planispirina exigua*, Brady.
Ch., F.C.	„ *sphaera*, d'Orb.
*	„ *bucculenta*, Brady.
*	„ „ var. *placentiformis*, Brady var.
*	„ *antarctica*, sp. nov.
*	*Cornuspira involvens*, Rss. sp.
Ch.	*Hyperammina ramosa*, Brady.
*	*Rhizammina indivisa*, Brady.
Ch., H., F.C.	*Reophax scorpiurus*, Montf.
Ch.	„ *nodulosa*, Brady.
H., F.C.	*Haplophragmium canariense*, d'Orb. sp.
Ch.	*Textularia agglutinans*, d'Orb.
Ch., F.C.	„ *gibbosa*, var. *tuberosa*, d'Orb. (Recorded as *T. aspera*, Brady.)
Ch.	„ *concava*, Karrer sp.
F.C.	„ *gramen*, d'Orb.
*	„ „ var. *jugosa*, Jones.
*	„ *candeina*, d'Orb.
Ch., F.C.	*Spiroplecta sagittula*, Defr. sp.
*	*Bulimina elegantissima*, d'Orb., var. *apiculata*, Chapm.
*	„ *subteres*, Brady.
F.C.	„ *marginata*, d'Orb.
*	„ *contraria*, Rss.
F.C.	*Bolivina robusta*, Brady.
*	„ *pygmaea*, Brady.
F.C.	*Cassidulina laevigata*, d'Orb.
*	„ *oblonga*, Rss.
Ch., F.C.	„ *subglobosa*, Brady.
Ch.	*Ehrenbergina serrata*, Rss.

Ch.	*Lagena globosa*, Mont. sp.	
Ch.	,, *gracilis*, Will.	
F.C.	,, *sulcata*, W. & J. sp.	
*	,, *lineata*, Will. sp.	
Ch.	,, *acuticosta*, Rss.	
Ch., F.C.	,, *hexagona*, Will. sp.	
Ch.	,, *squamosa*, Mont. sp.	
*	,, *montagui*, Silv.	
Ch.	,, *marginata*, W. & B.	
Ch.	,, ,, var. *semimarginata*, Rss.	
*	,, *schlichti*, Silv. sp.	
*	,, *biancae*, Seguenza sp.	
*	,, *orbignyana*, Seg. sp.	
*	,, ,, var. *clathrata*, Brady.	
Ch.	,, *fasciata*, Egger sp. (Recorded as *L. quadricostulata*, Rss.)	
*	,, *lagenoides*, Will. sp., var. *nuda*, nov.	
*	,, *quadrata*, Will. sp.	
*	,, ,, var. *carinata*, nov.	
*	,, *enderbiensis*, sp. nov.	
*	*Nodosaria subradicula*, Schwager.	
Ch.	,, *oligostegia*, Rss. (Recorded as *N. simplex*, Silv.)	
F.C.	,, (*Dentalina*) *roemeri*, Neug. sp.	
Ch.	,, ,, *communis*, d'Orb.	
F.C.	,, ,, *consobrina*, d'Orb. sp.	
F.C.	,, ,, ,, var. *emaciata*, Rss.	
F.C.	,, ,, *pyrula*, d'Orb.	
Ch., F.C.	,, ,, *obliqua*, L. sp.	
F.C.	,, ,, ,, var. *vertebralis*, Batsch var.	
*	*Marginulina costata*, Batsch sp.	
*	*Vaginulina legumen*, L. sp.	
F.C.	*Cristellaria schloenbachi*, Rss.	
*	,, *crepidula*, F. & M. sp.	
Ch., F.C.	,, *tricarinella*, Rss.	
*	,, *lata*, Cornuel sp.	
Ch.	,, *compressa*, d'Orb.	
*	,, *variabilis*, Rss.	
F.C.	,, *articulata*, Rss. sp.	
*	,, *gibba*, d'Orb.	
Ch., F.C.	,, *reniformis*, d'Orb.	
Ch., F.C.	,, *cultrata*, Montf. sp.	
Ch., F.C.	,, *rotulata*, Lam. sp.	
*	,, *vortex*, F. & M. sp.	
Ch., F.C.	,, *orbicularis*, d'Orb. sp.	
*	*Polymorphina lactea*, W. & J. sp.	
*	,, ,, var. *diffusa*, J. & C.	
*	,, ,, var. *racemosa*, J. & C.	
*	,, *gibba*, d'Orb.	

*	*Polymorphina gibba* d'Orb., var. *racemosa*, J. & C.
*	„ *communis*, d'Orb.
*	„ *compressa*, d'Orb.
*	„ *oblonga*, d'Orb.
*	„ *elegantissima*, P. & J.
Ch.	*Uvigerina angulosa*, Will.
Ch., F.C.	*Globigerina bulloides*, d'Orb.
Ch., F.C.	„ *triloba*, Rss.
*	„ *dutertrei*, d'Orb.
Ch., F.C.	„ *inflata*, d'Orb.
Ch., F.C.	„ *aequilateralis*, Brady.
Ch., F.C.	*Orbulina universa*, d'Orb.
Ch., F.C.	*Sphaeroidina bulloides*, d'Orb.
*	*Candeina nitida*, d'Orb.
*	*Spirillina vivipara*, Ehr.
*	„ *obconica*, Brady.
*	„ *novae-zealandiae*, sp. nov.
*	„ *inaequalis*, Brady.
*	„ *decorata*, Brady.
*	„ *spinigera*, Chapman.
*	„ *limbata*, Brady.
*	„ „ var. *denticulata*, Brady.
*	„ *denticulo-granulata*, Chapm.
H.	*Patellina corrugata*, Will.
H.	*Discorbina turbo*, d'Orb. sp.
H.	„ *globularis*, d'Orb. sp.
H.	„ *rosacea*, d'Orb. sp.
*	„ *patelliformis*, Brady.
*	„ *bertheloti*, d'Orb. sp.
*	„ „ var. *baconica*, Hantken.
*	„ *araucana*, d'Orb. sp.
*	„ *parisiensis*, d'Orb. sp.
*	„ *allomorphinoides*, Rss. sp.
*	„ *rarescens*, Brady.
*	„ *concava*, P. & J.
*	*Truncatulina refulgens*, Montf. sp.
Ch., F.C.	„ *lobatula*, W. & J. sp.
F.C.	„ *variabilis*, d'Orb.
Ch., F.C.	„ *tenuimargo*, Brady.
Ch., F.C.	„ *wuellerstorfi*, Schwager sp.
F.C.	„ *ungeriana*, d'Orb. sp.
F.C.	„ *reticulata*, Cz. sp.
F.C.	„ *haidingeri*, d'Orb. sp.
*	*Anomalina grosserugosa*, Gümbel sp.
*	„ *coronata*, P. & J.
H.	*Pulvinulina repanda*, F. & M. sp.
*	„ var. *concamerata*, Mont. var.

*	*Pulvinulina concentrica*, P. & J.	
Ch., F.C.	„ *canariensis*, d'Orb. sp.	
Ch., F.C.	„ *truncatulinoides*, d'Orb. sp.	(Recorded as *T. micheliniana.*)
Ch.	„ *exigua*, Brady.	
Ch., F.C.	„ *schreibersii*, d'Orb. sp.	
Ch.	„ *elegans*, d'Orb. sp.	
Ch., F.C.	*Rotalia soldanii*, d'Orb.	
Ch., F.C.	„ *clathrata*, Brady.	
*	*Gypsina vesicularis*, P. & J. sp.	
*	„ *inhaerens*, Schultze sp.	
H.	*Nonionina depressula*, W. & J. sp.	
Ch., F.C.	„ *umbilicatula*, Mont. sp.	
H.	„ *scapha*, F. & M. sp.	
*	„ *boueana*, d'Orb.	
H.	*Polystomella crispa*, L. sp.	
H.	„ *macella*, F. & M. sp.	

EXPLANATION OF PLATES XIII–XVII.

[All figures magnified 36 diameters.]

Plate XIII.

Fig. 1. *Biloculina bradii*, Schlumberger. Cornute variety. North of Enderby Island.
Fig. 2. *B. bradii*, Schlumb., var. *denticulata*, Brady. Off the Snares.
Fig. 3. *B. sarsi*, Schlumberger. Aberrant form. North of Auckland Island.
Fig. 4. *B. vespertilio*, Schlumb.: *a*, front aspect; *b*, side aspect. Off the Snares.
Fig. 5. *Miliolina angulata*, Williamson. Off the Snares.
Fig. 6. *M. polygona*, d'Orbigny sp. North of Enderby Island.
Fig. 7. *M. circularis*, Bornemann sp., var. *sublineata*, Brady. North of Enderby Island.
Fig. 8. *M. chrysostoma*, sp. nov. Biloculine form. North of Enderby Island.
Fig. 9. *M. chrysostoma*, sp. nov.: *a*, side view of a biloculine form; *b*, front view. North of Enderby Island.
Fig. 10. *M. chrysostoma*, sp. nov. Triloculine form. North of Enderby Island.

Plate XIV.

Fig. 1. *Miliolina chrysostoma*, sp. nov. Biloculine variety with external chamber partly removed, showing opposed aperture. North of Enderby Island.
Fig. 2. *Planispirina bucculenta*, Brady sp. North of Enderby Island.
Fig. 3. *Articulina funalis*, Brady. North of Auckland Island.
Fig. 4. *Miliolina chrysostoma*, sp. nov. Vertical section of test, showing internal arrangement of chambers and characteristic form of aperture. North of Enderby Island.
Fig. 5. *Planisperina antarctica*, sp. nov.: *a*, front aspect; *b*, oral aspect. North of Enderby Island.
Fig. 6. *Haplophragmium canariense*, d'Orbigny sp. Off the Snares.
Fig. 7. *Textularia gibbosa*, var. *tuberosa*, d'Orb. North of Auckland Island.
Fig. 8. *T. gramen*, d'Orb. Senile form. North of Enderby Island.
Fig. 9. *T. gramen*, var. *jugosa*, Jones. Off the Snares.
Fig. 10. *Bulimina subteres*, Brady. North of Enderby Island.
Fig. 11. *Bolivina pygmaea*, Brady. North of Auckland Island.

Plate XV.

Fig. 1. *Cassidulina laevigata*, d'Orbigny. Dentate variety. North of Enderby Island.
Fig. 2. *Ehrenbergina serrata*, Reuss. North-east of Bounty Island.
Fig. 3. *Lagena lineata*, Williamson sp. Off the Snares.
Fig. 4. *L. sulcata*, Walker and Jacob sp. North of Auckland Island.
Fig. 5. *L. squamosa*, Montagu sp. North of Enderby Island.
Fig. 6. *L. marginata*, Walker and Boys. Off the Snares.
Fig. 7. *L. schlichti*, A. Silvestri: *a*, front aspect; *b*, oral aspect. Off the Snares.
Fig. 8. *L. biancae*, Seguenza sp.: *a*, front aspect; *b*, oral aspect. North of Enderby Island.
Fig. 9. *L. lagenoides*, Williamson sp., var. *nuda*, var. nov. North of Enderby Island.
Fig. 10. *L. orbignyana*, Seguenza sp. Off the Snares.
Fig. 11. *L. orbignyana*, Seg. sp., var. *clathrata*, Brady. North of Auckland Island.
Fig. 12. *L. quadrata*, Williamson sp., var. *carinata*, var. nov. Off the Snares.

Plate XVI.

Fig. 1. *Lagena enderbiensis*, sp. nov.: *a*, front aspect; *b*, oral aspect. North of Enderby Island.
Fig. 2. *Nodosaria subradicula*, Schwager. North of Enderby Island.
Fig. 3. *Cristellaria tricarinella*, Reuss. North of Enderby Island.
Fig. 4. *C. lata*, Cornuel sp. North of Auckland Island.
Fig. 5. *C. compressa*, d'Orbigny. Off the Snares.
Fig. 6. *C. cultrata*, Montfort sp. Off the Snares.
Fig. 7. *Polymorphina lactea*, Walker and Jacob sp., var. *diffusa*, Jones and Chapman. North-east of Bounty Island.
Fig. 8. *P. lactea*, W. & J. sp., var. *racemosa*, Jones and Chapman. North-east of Bounty Island.

Plate XVII.

Fig. 1. *Polymorphina gibba*, d'Orbigny, var. *racemosa*, Jones and Chapman. Off the Snares.
Fig. 2. *Spirillina limbata*, var. *denticulata*, Brady. Off the Snares.
Fig. 3. *S. denticulo-granulata*, Chapman: *a*, superior aspect; *b*, inferior, granulate face. Off the Snares.
Fig. 4. *S. novae-zealandiae*, sp. nov.: *a*, lateral aspect; *b*, peripheral and oral aspect. Off the Snares.
Fig. 5. *S. novae-zealandiae*, sp. nov.: lateral aspect of another specimen. Off the Snares.
Fig. 6. *Discorbina parisiensis*, d'Orb. sp.: inferior aspect. Off the Snares.
Fig. 7. *D. parisiensis*, d'Orb. sp. Double specimen. Off the Snares.
Fig. 8. *D. biconcava*, Parker and Jones: *a*, superior aspect; *b*, inferior aspect. Off the Snares.
Fig. 9. *Anomalina grosserugosa*, Gümbel sp. Off the Snares.
Fig. 10. *A. coronata*, Parker and Jones: inferior aspect. North of Auckland Island.

ARTICLE XVI.—PRELIMINARY REPORT ON TWO HIRUDINEA FROM THE SUBANTARCTIC ISLANDS OF NEW ZEALAND.

By W. B. Benham, D.Sc., F.R.S.

Time does not permit me to give a detailed anatomical account of the two leeches collected during the expedition. To await the arrival of the necessary literature from Europe would delay the issue of this volume, in which it has been deemed desirable to include them; so that the present account must be regarded as merely a preliminary one, and the names as provisional, which may need correction in a further article, in which the internal structure will be discussed.

Order RHYNCHOBDELLIDA.

Fam. ICHTHYODELLIDAE.

Notobdella, gen. prov.

Notobdella nototheniae, sp. nov.

It is not without much misgiving that I bestow a new generic name on this little fish-leech, which was collected, while at the Snares, from the skin of *Notothenia microlepidota* which Mr. Waite caught with a line from the rocks; for although this leech agrees generally with *Trachelobdella*, Diesing (*Calliobdella*, v. Beneden), it is totally unprovided with the characteristic vesicular gills, and thus resembles *Piscicola*, Blainville, which, however, occurs as a parasite on fresh-water fishes only. Van Beneden and Hesse* used the title *Ichthyobdella* for leeches of similar form occurring on marine fishes, but Blanchard† points out that this is a synonym of *Piscicola*, and therefore cannot be employed; but he does not suggest any new generic name for gill-less marine fish-leeches—at any rate, in this article. Possibly he has done so in a later paper which is not available here (see Remarks on p. 374). I have therefore given a provisional name to the present species.

Dimensions.—When newly caught I noted that they are, "when fully extended, about 1 in. in length, or rather more." But the largest of them when preserved is only 15 mm. in length, with a greatest diameter of 2·25 mm., and a height of 1·75 mm. at the middle of the trunk. The neck measures 4 mm., the anterior sucker 1 mm., and the posterior sucker 1·75 mm. in diameter.

* P. J. van Beneden and Hesse, "Recherches sur les Bdellodes et les Trematodes marins," 1862.
† R. Blanchard, Boll. Mus. Zool. Torino, ix, 1894.

External Anatomy.

The body, apart from the two terminal suckers, is distinguishable into two well-marked regions—neck and trunk. The anterior or buccal sucker is subcircular, or perhaps rather longer than wide, cup-shaped, and attached excentrically to the neck, from which it is separated by a constriction. It is marked by grooves into 12 annuli, in addition to the prostomial lobe. There is a pair of eyes on the 9th annulus; each is a crescent of black pigment, open posteriorly.

The neck is cylindrical, about one-fourth of the total length of the animal. Its hinder third is very evidently modified as a clitellum; here the annuli are less distinct, the diameter is rather greater, the ground-colour is lighter and without spots.

The trunk (or abdomen) is subcylindrical, rather wider than its height, with rounded sides.

It is absolutely without any trace of gills. My note, written at the time of capture, reads, "I see no gills"; and after a careful examination of the preserved specimens I cannot detect the slightest sign of any being retracted. There is no interruption of the surface of the body, so far as superficial observation allows me to judge; at the same time, I should state that I have not yet cut sections, which alone would be absolutely decisive.

The posterior sucker is circular, not much broader than the body shortly in front of it. There are no "eye-like" marks on it. It is uncoloured.

Colour.—I noted that the leech, in life, is "red-brown, with paired oval black spots at intervals." As preserved in formol, the tint is paler, and the spots are deep reddish-brown, instead of black. Of the three specimens, one is without spots; in the other two they are not quite regular in their distribution, but a comparison of these two enables one to recognise two rows on each side—a dorso-lateral, and a ventro-lateral just below the lateral margin of the body; the latter are less numerous and less regularly arranged. On the trunk the dorso-lateral spots occur on every third annulus, except at the hinder end.

The dorsal face of the buccal sucker presents a diffused pigment, and in one individual there are also two spots of darker brown on each side near the hinder border; these are quite distinct from the eyes.

The clitellum is devoid of spots in all three specimens.

Annulation.—The arrangement of these spots on the trunk indicates that the segments are trimerous; but on the neck the spots do not commence till near the clitellum. In one individual, which is a good deal contracted, there are 18 annuli in the neck; in an extended specimen the limits of these annuli are so indistinct that it is difficult to count them accurately, but a comparison of the three specimens gives the following as the constitution of the body:–

There are 18 annuli in the neck, of which 5 form the clitellum. Each of these latter is apparently biannulate, or even triannulate, in a contracted specimen, so that at first one might suppose that the "annuli" are segments; but the position of the genital pores negatives this suppositon.

Paired spots occur on the following annuli: 7, 10, 13, 19, 22, 25, and on every subsequent third annulus up to the 52nd; then on 54 and 56, beyond which there are three annuli, and an imperfect fourth, without spots. Thus the body, without the suckers, consists of 60 annuli.

The buccal sucker, with 12 annuli, consists of presumably 4 segments; the neck of 6 segments; the trunk of 16 segments, the last two of which have only 2 annuli apiece: this gives a total of 26 segments in the body, without counting the posterior sucker, which I have not attempted to analyse, for the above enumeration agrees with that of the *Hirudinea* in general.

The male pore is situated between the clitellar annuli 2/3—*i.e.*, it is behind the 15th annulus of the neck. The female pore is apparently at 18/19, or it may be on the 19th annulus, for the body is so contracted here that without cutting sections it is impossible to be certain.

From the male pore there projects a small penis; behind the female pore there is on the 19th annulus a pair of white swollen papillae close to the middle line, which partially conceal the actual pore.

I am unable to detect the nephridiopore.

Locality.—Snares Island, on *Notothenia microlepidota.*

Remarks.—Blanchard* has described a marine leech from Uschuaia which in several respects bears a resemblance to the above. But this *Ichthyobdella australis* differs in details of annulation, there being 6 annuli to the trunk segment; the coloration and the position of the genital pores are also different, but, like the above species, it seems to be without the gills. The possession of 11 pairs of vesicular gills is included in the diagnosis of the genus, which precedes the account of the species; yet Blanchard does not mention the gills, nor do either of the figures show them. In the diagnosis it is not stated that these structures may be absent. Hence I have created this new genus.

Order GNATHOBDELLIDA.

Fam. HIRUDINIDAE.

Subfam. HIRUDININAE.

ORNITHOBDELLA, gen. nov

Ornithobdella edentula, sp. nov.

The soil of the Snares under and around the nests of penguins, mollymawks, and mutton-birds contains a great number of leeches of some considerable size. They were familiar to our Maori boat-crew, who stated that they suck the blood of the mutton-birds at night. As the young of these birds are captured by the Maoris for food, their attention would naturally be directed to these particular birds, but there can be no doubt that these leeches also suck the blood of the penguins, for the intestine of the individual dissected, which was collected at a penguin-rookery, was gorged with blood. These birds, it is needless to mention, are the only source of food for the leeches, as, except for the seals, which are not likely to be attacked, they are the only animals on the island. I tried to persuade a leech to bite my finger, but it did not, and the reason became clear on dissection; they are

* Blanchard, "Hirudineen der Magalhaensischen Sammelreise," vol. iii.

without teeth on the jaws, for which reason they are not likely to feed on the thick-skinned seals.

The soil in which the leeches live is moist, and saturated with excrementitious matter from the birds' nests, and, as a rookery contains thousands or, may be, hundreds of thousands of birds, it will be evident that the surroundings are not pleasant to the nose.

It may be that I am not justified in forming a new genus for this leech, but it does not agree with any diagnosis to which I have access.

Dimensions.—The specimens before me measure from 28 mm. by 9 mm. to 95 mm. by 15 mm., but the majority are about 90 mm. by 10 mm. They are much contracted by the preservative, and in life attain a length of 6 in. even when only partially extended. The greatest breadth is near the hinder half of the body. The posterior sucker is of moderate size; in a 90 mm. specimen it is 7 mm. in diameter.

Colour.—In life the ground-colour is a dark cocoa-brown, with black reticular markings on the dorsal and on the ventral surface. In the preserved state (formol) the tint is naturally paler, and the black has become a sienna brown; while in alcohol the ground-colour has changed to a buff.

Along the median dorsal line is a narrow streak deprived of the dark pigment; otherwise the whole dorsal surface is marked with dark network. In some parts of the back the reticulation is fine, with wide meshes; in others coarser, with small meshes; so that the depth of colour varies. The ventral surface is also pigmented in the same manner, but less deeply.

External Anatomy.

The eyes are arranged precisely as in *Hirudo*. The segments of the body are pentamerous, with the usual abbreviations at each end. I am unable to detect any segmental sensillae, each annulus bearing numerous small and large papillae, without any regularity in arrangement; but the 17 pairs of nephridiopores occupy the same position as in *Hirudo*. The 4th and 5th annuli, though distinct dorsally, coalesce at the sides; the same is the case with the 7th and 8th, so as to form in each case a single annulus on the ventral surface. In fact, the only notable difference from *Hirudo*, so far as the external features are concerned, is the shifting of the female pore one annulus further back; the genital pores, being at annuli 30/31 and 36/37 respectively, are thus separated by 6 annuli instead of by 5.

From the male pore there issues a blunt, short, conical penis, quite different from the filamentous cirrus of the common medicinal leech. The clitellum is visible in the largest individual in my collection; it is paler in colour, and the body is here wider than elsewhere; it commences at the 25th, and extends to the 35th annulus—*i.e.*, from the 2nd annulus of segment ix to the end of the 2nd annulus of segment xi.

Internal Anatomy.

The roof of the buccal sucker is deeply grooved; the jaws are small and quite toothless.

The gut and nephridia, so far as is to be seen in the dissected specimen, agree with those of *Hirudo*, but the genital organs present points of difference which are

possibly of generic importance. The epididymis is a large compact mass of coiled tube. The ductus ejaculatorius arises as a thick muscular duct, soon becoming thinner, before entering the anterior face of the rounded muscular penial sac. There is no "cirrus sac" nor prostate gland. The penial apparatus recalls that of *H. antipodum*, Benham.*

The ovisac is large; the wide oviducts open into a small "albumen-gland," whence the long muscular utero-vaginal canal passes backwards in an undulating manner to the female pore.

Locality.—Snares Island (W. B. B.; H. Browne; Professor Kirk).

* Benham, "Two New Species of Leech in New Zealand," Trans. N.Z. Inst., xxix, p. 180.

MYRIAPODA.

Several specimens of Myriapods were obtained under and in logs, &c., at the Auckland Islands, and a few were collected by Dr. Chilton and Mr. Chambers on Campbell Island. These have not yet been identified, but it is intended to ask Professor Sylvestri, of Portici, to examine them.

There is one species of the Chilopod *Cormocephalus*, and one, or perhaps two, species of a Diplopod belonging to the family *Polydesmidae*.

These are all very similar to the New Zealand species, but as the necessary literature for the work is wanting in the Dominion, and much has been done on the group since the paper by Hutton on our Myriapods, it is thought better not to attempt the task of naming them.

W. B. Benham.

ARTICLE XVII.—ON SOME SUBANTARCTIC COLLEMBOLA.

By GEORGE H. CARPENTER, B.Sc. Lond., M.R.I.A., Professor of Zoology in the Royal College of Science, Dublin.

PLATE XVIII.

THE two species of springtails recorded in the present paper were collected on two of the small and remote islands lying in the Antarctic Ocean to the south of New Zealand—Macquarie Island (54° 37′ S. lat., 158° 34′ E. long.) and Campbell Island (52° 26′ S. lat., 169° 20′ E. long.). For the opportunity of examining the specimens from the former locality I am indebted to Mr. C. O. Waterhouse, of the British Museum, while those from Campbell Island have been sent to me by Mr. C. J. Lamb, of Cambridge University. Only one species is represented among the numerous specimens from each island. It is interesting to find that, while one of them is not separable from a common British and European springtail with an immensely wide range, the other is a new species of a characteristically subantarctic genus hitherto known only from Tierra del Fuego. Both species are referable to the same family and subfamily.

Order COLLEMBOLA.

Fam. PODURIDAE.

Subfam. ACHORUTINAE.

Genus ACHORUTES, Templ.*

Achorutes viaticus, Tullberg.

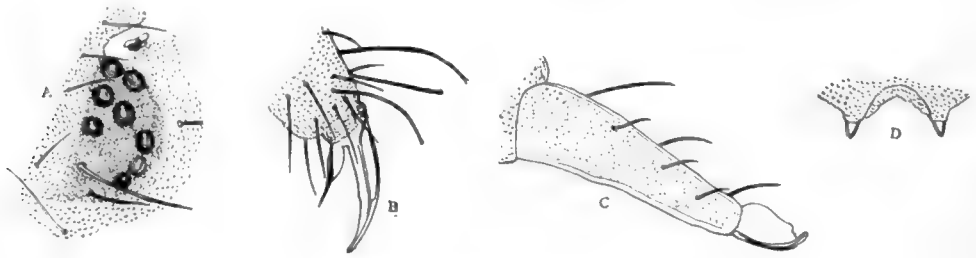
Locality.—Macquarie Island. Numerous specimens collected, November, 1901.

This springtail is probably well-nigh cosmopolitan in its range. Already (Schaeffer, 1897, p. 12) has it been recorded from the subantarctic regions of South America, as specimens were obtained from Punta Arenas, on the continental (Patagonian) shore of the Straits of Magellan, and also from Uschuaia, off Tierra del Fuego. Its wide distribution in the Northern Hemisphere may be inferred from the list of localities compiled by Schaeffer (1897), who mentions Siberia, Spitz-

* I deliberately abstain from following Börner (1906) in transferring this well-known name from the genus to which it has belonged for seventy years to that hitherto universally known as *Anoura* or *Neanura*. Changes like this can only confuse nomenclature without advancing science, and an analogous change previously made by the same author (the substitution of *Podura* for *Tomocerus*) has been subsequently withdrawn as unwarranted.

bergen, Greenland, and California among the countries which it inhabits. In the British Islands it may be found both in inland localities and beneath wrack on the sea-coast.

The accompanying figures of the eyes and post-antennal organ (A), foot (B), extremity of the spring (C), and anal spines (D) show how closely the insects from Macquarie Island agree in structure with European specimens of *A. viaticus*. In colour the Macquarie Island springtails are of a deep blue-black. The constancy in structural features over a range at once so extended and so discontinuous suggests high antiquity for the species.



ACHORUTES VIATICUS, Tullberg.

A. Right ocelli and post-antennal organ. (× 350.)
B. Extremity of hind foot, showing claw, empodial appendix, &c. (× 220.)
C. Dens and mucro of spring, side view. (× 200.)
D. Anal papillæ and spines, dorsal view. (× 220.)

Genus TRIACANTHELLA, Schaeffer.

The genus *Triacanthella* was established by Schaeffer (1897, p. 14) for a single species, *T. michaelseni*, which he described from various localities in Tierra del Fuego. Quite recently Wahlgren (1906, p. 7) has described another nearly allied species (*T. rosea*) from the same district. It is gratifying to be able to add a third very distinct member of this interesting genus from such a distant subantarctic station as Campbell Island. *Triacanthurus* (Willem, 1902, p. 5), with its single Patagonian species, *T. clavatus*, is probably not distinct generically from *Triacanthella* (Börner, 1906).

Triacanthella alba, sp. nov. (Plate XVIII, figs. 1–18.)

Length, 2 mm. Eight ocelli on each side of the head, the 2 inner hinder ones very small (fig. 2). Post-antennal organ rosette-shaped, with (usually) 4 elongate processes (fig. 4), sometimes with 3 (fig. 2) or 5 (fig. 3). Foot (fig. 13) without tenent hairs, its claw without teeth, its empodium with a vestigial appendix ("inferior claw"). Spring (figs. 1, 16, 17) with manubrium twice as long as dentes and mucrones, the dens and mucro being united into a rounded finger-shaped process with granulated cuticle; in some young insects the mucro is almost distinct from the dens, and has a bluntly pointed tip (fig. 18). Colour whitish.

Locality.—Campbell Island: Venus Cove, at high-water mark. Numerous specimens, November, 1907. (Dr. Charles Chilton.)

The above diagnosis serves to distinguish the Campbell Island springtail from other species of the genus. As there is abundant material, I have studied the structure of the insect, especially the jaws, in some detail, and the following features seem worthy of notice, as the genus is as yet very imperfectly known :—

Ocelli and Sense-organs.—The arrangement of the *ocelli* seems much the same in this species as in *Triacanthella rosea*, Wahlgren, and *Triacanthurus clavatus*, Willem, both of which have the corresponding 2 of each 8 very small ; in *T. michaelseni*, Schaeffer, only 1 (the anterior of the corresponding 2) is reduced. Each ocellus has a distinct black pigment spot beneath it, so that the arrangement of the ocelli stands out clearly on the white ground-colour of the head (fig. 1). The *post-antennal* organ is somewhat like that of *T. rosea* as figured by Wahlgren (1906, fig. 11) : usually there are 4 elongate prominences (fig. 4), but these structures vary both in number and form ; in one specimen the right post-antennal organ has only 3 prominences (fig. 2), while the left has 5 (fig. 3).

The *antennal organ* at the extremity of the 4th segment (fig. 6) consists of a large subglobular prominence, with 2 adjacent swellings of the cuticle. At the distal end of the 3rd antennal segment on the outer dorsal aspect there is a sense-organ consisting of 2 short stout peg-like bristles, each with a distinct longitudinal groove (figs. 2, 5).

Jaws.—The *mandibles* (figs. 8, 9) are of the typical collembolar form ; each bears, however, 2 remarkably prominent teeth at the proximal end of its molar area, on the inner anterior aspect. The *maxillulae* occupy the usual position with regard to the tongue (fig. 10, *a*, *b*) ; each maxillula is delicate, but strengthened with various chitinous thickenings, and the teeth along the inner proximal border are relatively stout. Little doubt can be entertained that these structures are a pair of appendages (between the mandibles and maxillae) which become reduced or absent in winged insects.

Each *maxilla* (fig. 10, *c*, 11) has the cardo (*cr*) in its usual relative position to the stipes (*st*) outwardly, and the chitinous foot (*pe*) of the tongue inwardly. In the head of the maxilla the 2 hinder lamellae (*la'*) are remarkable for their excessive length, as they project far beyond the stout two-toothed outer process (*h*) of the maxillary " head." The 2 anterior (dorsal) lamellae (*la*) are of normal appearance. The structure usually known as the " maxillary palp," which Börner (1908) has recently homologised, for the most part, with the outer coxal segment and the galea of the thysanuran maxilla, resembles closely that of an *Achorutes*, having a tuberculate process (the palp proper, according to Börner), with a long bristle at its tip and another near its base, while the distal end of the structure is acuminate.

From my own studies of *Collembola* I believe it at least as likely that this so-called " palp " belongs to the maxillulae as to the maxillae ; both Stummer-Traunfels (1891) and Hansen (1893) refer it positively to the former appendages. In the present genus its inner basal edge is attached to the base of the maxillula, its outer to the stipes of the maxilla (fig. 10).

The *labium* (fig. 12) consists of the usual paired sclerites forming the mentum, fused with the ventral head-skeleton ; and a pair of lobes, each of which has 6 bristle-bearing papillae.

Legs.—The foot of *Triacanthella alba* (fig. 13) is interesting on account of the vestigial empodial appendix (" inferior claw "). The two Fuegian species referred

to this genus —*T. michaelseni* and *T. rosea*—are stated to be without this structure, while in Willem's *Triacanthurus clavatus* it is distinctly present. Its vestigial condition in the present species is therefore intermediate, and warns us against always relying on its presence or absence as a safe generic character.

Catch.—The catch, or retinaculum, on the 3rd abdominal segment (figs. 14, 15), is of the usual form; each of the appendages, fused at their bases, carries on its distal outer edge 4 distinct teeth.

Spring.—The spring in *T. alba* furnishes an interesting stage in the degeneration of that organ. In the adult insect each united dens and mucro usually consists of a finger-shaped process covered to the tip with the characteristic cuticular granulations, except at the proximal anterior region, where 2 curved ridges are visible (fig. 16). At an earlier stage (fig. 17) but little difference can be seen, only a slight constriction, which may indicate the boundary between dens and mucro. But in a young specimen of 0·75 mm. in length the spring (fig. 18) has the mucronal region quite distinct, and ending in a blunt tooth; its condition resembles closely that figured in *T. clavatus* (Willem, 1902, pl. ii, fig. 1). In both *T. rosea* and *T. michaelseni* the mucro is large, with several teeth, and the dens carries a broad scale-like structure at its tip; probably this scale is represented by the small oval process alongside the mucro in the young individual of *T. alba* now figured. In the present species the characters that I have noticed and figured are not constant in individuals of the same age; the mucronal process (fig. 18) cannot be distinguished in all of the very young specimens, while it is quite evident in some nearly full-grown insects.

Musculature.—Several of the specimens afford a good display of the principal muscles. There are dorsal, lateral, and ventral longitudinal strands (fig. 1, *d*, *l*, *v*) in much the same position as described by Lubbock (1873, pp. 94–99) for *Tomocerus*, and in each abdominal segment there are vertical (*p*) and oblique (*o*) muscles running from the tergal to the sternal region. The muscles that work the legs arise from the dorsal aspect of the thoracic segments. Two pairs of extensor and 2 of flexor muscles can be determined in connection with the spring (fig. 1, *e*, *f*).

DISTRIBUTIONAL NOTES.

In a paper on *Collembola* from the South Orkney Islands (1906) I have discussed the bearing that the distribution of these frail insects has on problems of ancient geography. There we have a faunistic group with distinctly northern, even Arctic, affinities, and a characteristically Antarctic group, including some genera apparently unrepresented elsewhere than in the far south. Here again in these islands to the south of New Zealand the two species recorded in the present paper belong to the same two geographical sections. *Achorutes viaticus* is distinctly a link with the Northern Hemisphere, and even with the Arctic regions, while *Triacanthella alba* recalls the subantarctic fauna of South America. Such species as the latter suggest a former wide extension of the Antarctic Continent, perhaps in late Mesozoic times. The existence of the northern *Achorutes viaticus* on these remote southern islets points to a still earlier period of connection with the great continental tracts.

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EXPLANATION OF PLATE XVIII.

Fig. 1. *Triacanthella alba*, side view. Magnified 60 diameters. The head and the 2nd and 6th abdominal segments are shown externally; the rest of the insect in optical section, to display the musculature and portion of the digestive tract. *g*, gullet (fore gut); *s*, stomach (mid-gut); *in*, intestine (hind gut); *d*, dorsal, *l*, lateral, and *v*, ventral, longitudinal muscles; *p*, vertical, and *o*, oblique, dorso-ventral muscles; *e*, extensors, and *f*, flexors, of spring.

Fig. 2. Right half of head, showing ocelli, post-antennal organ, and feeler. Magnified 218 diameters.

Fig. 3. Left post-antennal organ of the same specimen. Magnified 404 diameters.

Fig. 4. Right post-antennal organ of another specimen. Magnified 404 diameters.

Fig. 5. Sense-organ on 3rd antennal segment. Magnified 809 diameters.

Fig. 6. Sense-organ on 4th antennal segment. Magnified 809 diameters.

Fig. 7. The three anal spines, seen from the dorsal aspect, somewhat obliquely. Magnified 121 diameters.

Fig. 8. Right mandible, with its retractor muscle, front view. Magnified 404 diameters.

Fig. 9. Distal part of left mandible, antero-internal view. Magnified 404 diameters.

Fig. 10. Right maxillula (*a*); tongue (*b*); left maxilla and "palp" (*c*): front view, the left maxillula having been removed to expose the tongue. *cr*, cardo; *st*, stipes; *h*, outer process of head; *la*, anterior, and *la'*, posterior, lamellae of head; *li*, ligament uniting maxilla with base of maxillula; *p*, palp; *pe*, foot of tongue. Magnified 404 diameters.

Fig. 11. Distal end and stipes of right maxilla, postero-internal view. References as in fig. 10. Magnified 564 diameters.

Fig. 12. Labium and adjacent cuticle. Magnified 404 diameters.

Fig. 13. Hind leg, tibial segment with claw, empodium, and vestigial appendix (*ap*). Magnified 218 diameters.

Fig. 14. Catch, side view.
Fig. 15. „ front view. } Magnified 564 diameters.

Fig. 16. Spring: lateral view of end of manubrium, and conjoined dens and mucro. Magnified 356 diameters.

Fig. 17. The same from a young individual.
Fig. 18. „ very small specimen. } Magnified 356 diameters.

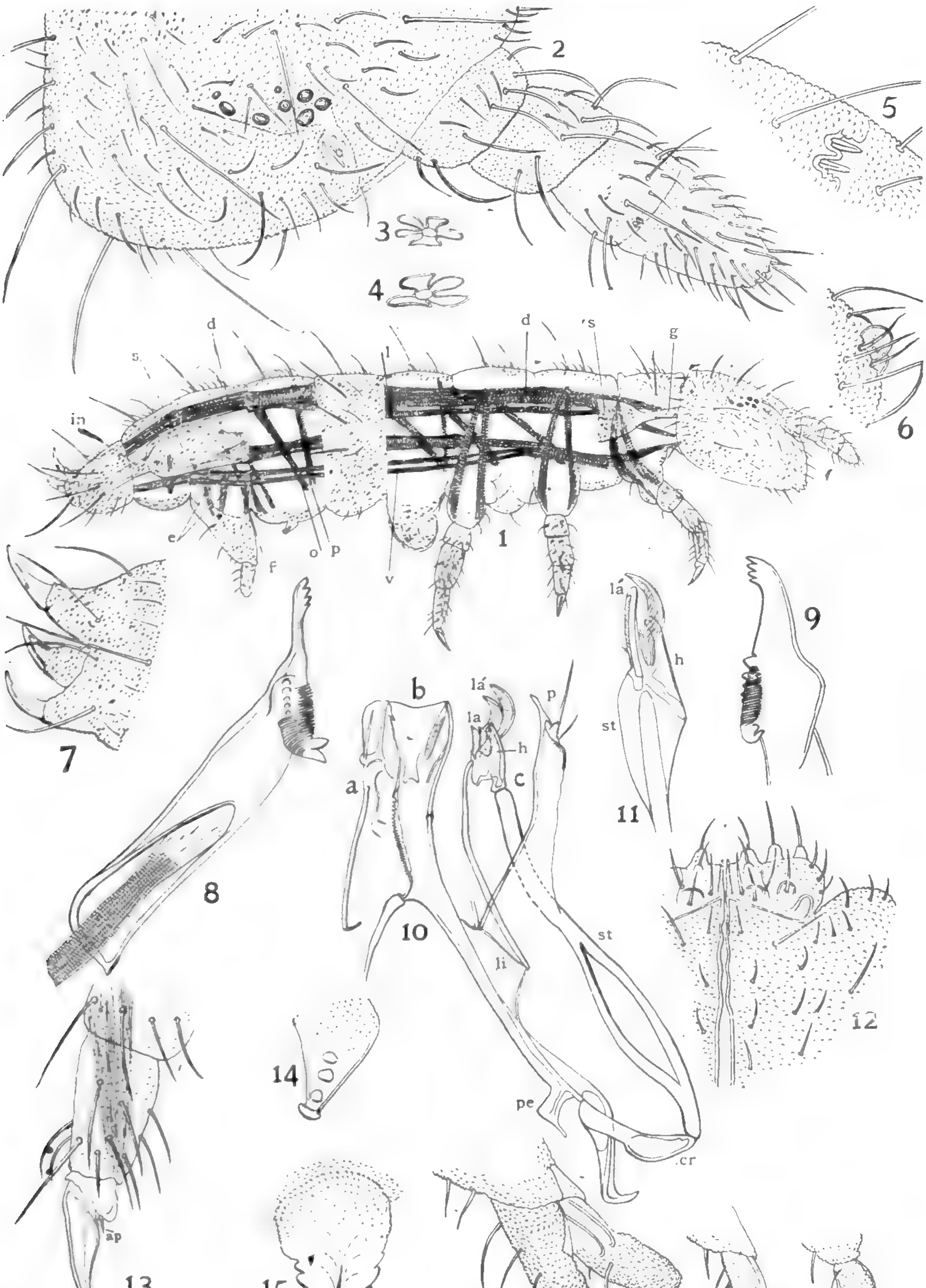
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PLATE XVIII.

ARTICLE XVIII.—TWO SPECIES OF ACTINIARIA FROM CAMPBELL ISLAND.

By H. B. Kirk M.A. Professor of Biology, Victoria College, Wellington, and F. G. A. Stuckey, M.A.

PLATES XIX AND XX.

Fam. ACTINIDAE, Andres ("Fauna und Flora des Golfes von Neapel, 1884").

Anemonia, Risso, Hist. Nat. des Product. Europ. Merid. v, 1826.

Distribution.—Atlantic, Mediterranean, Torres Strait, coast of Argentine, coast of California, New Zealand.

Anemonia dichogama, n. sp. (Plates XIX and XX.)

A white anemone found between the tide-marks on Campbell Island is referred to the genus *Anemonia* in the sense suggested by Mr. Murrich—Antheadae (as characterized by R. Hertwig) without acrorhagi, and without distinct collar and fosse (1).

Seven specimens were obtained by Dr. Chilton and H. B. Kirk. The unfavourable circumstances in which they were collected led to the omission of notes on the living animal, and most of the specimens have shrunk badly in alcohol.

Owing to the absence or feebleness of the sphincter, none completely closed, and two became everted, with the result that the tentacles came to form a corona round the pedal disc.

The anemone appears entitled to specific distinctness, and we propose for it the name *Anemonia dichogama.*

The body-wall in the preserved specimens is marked by closely set longitudinal rugae, each horizontally constricted to form numerous papillae. Each papilla corresponds to a mesogloeal thickening. In many of these papillae, if not in all, there is a pit caused by invagination of the ectoderm.

Height of column, from 1 cm. to 1·5 cm.; diameter, from 0·5 cm. to 1 cm. Colour, dirty white. The tentacles are 42 in number, arranged in two series.

The mesogloea is scanty—more scanty than in the other New Zealand *Anemonia, A. olivacea,* Hutton (3, 4).

In the mesenteries of the higher orders the longitudinal muscle banners are seen in cross-section to occupy most of the face of the mesentery, except when gonads are developed. The banner tapers off to the parietal edge of the muscle. The parietal muscles are well developed, and form a noticeable banner. The free edge usually forms a distinct lobe.

Ninety-two mesenteries can usually be counted, of which 12 are primaries. Probably the normal number is 96; but there is much irregularity, the secondaries sometimes reaching quite to the stomodaeum. Tertiary, and occasionally secondary,

mesenteries may be wanting. It not infrequently happens that the mesenteries of a secondary pair are united near the free edge. Sometimes the adjoining mesenteries of two secondary pairs may be united (Plate XX, fig. 2). The first condition R. Hertwig (2) has noted in the directives of *Phellia pectinata*, the second he has found in *Tealia bunodiformis*. Here, as in Hertwig's cases, mesenterial filaments are wanting along the united edges; but they are not infrequently wanting in other cases also.

From the wall of the stomodaeum there project towards the body-wall unevenly distributed false mesenteries, suggesting the condition of things found in the *Zoanthidae*. Each of these bears its mesenterial filament, giving a trefoil in cross-section (Plate XX, fig. 1). Further investigation is needed to elucidate the origin of these and their relation to the ordinary mesenteries.

From the stomodaeum there are extensive invaginations directed downwards into the gastro-vascular cavity, and frequently piercing several mesenteries. In a cross-section these usually appear as irregular chambers supported by the mesenteries. They are lined by ectoderm without nematocysts, but abundantly ciliated (Plate XIX, and Plate XX, fig. 1).

Spermaries or ovaries occur on several, but apparently not on all, of the secondary mesenteries. Their position is beyond the muscle banner and behind the mesenterial filament. In specimens in which ovaries were found these were enormously developed. There is no clear evidence that the animal is in the ordinary sense hermaphrodite, seeing that ovaries and spermaries have not been found in the same individual; but in two specimens in which there were well-developed spermaries we have found embryos. We think, therefore, that there is reason to suppose that the same individual is alternately male and female. The embyro lies in a distinct brood-pouch occupying the whole thickness of the mesentery, which, beyond the pouch, terminates in a trefoil.

SAGARTIA, Gosse, "Actinologia Britannica," 1858.

Distribution.—World-wide, but chiefly in temperate and colder seas.

Sagartia albo-virdis, n. sp.

The body-wall is green, with vertical white stripes; in the preserved specimens it is much wrinkled. Acontia were protruded from the mouth, but cinclides were not certainly observed. The oral disc is marked with white radiating ridges, about 40 in number. The tentacles number about 42, and are arranged in two series, those of the outer cycle alternating with the white stripes of the body-wall. The tentacles of the inner cycle are for the most part blunt; those of the outer cycle end in a fine point, which springs abruptly from the thick contracted lower part. There is a large pore at the end of each tentacle.

The arrangement of the mesenteries is as follows: First cycle, 6 pairs; second cycle, 6 pairs; third cycle, 12 pairs; and, in addition, many pairs of a rudimentary fourth cycle. All the mesenteries of the first two cycles and most of those of the third reach the stomodaeum. In the specimens examined, none of the mesenteries were fertile. The retractor muscles are strong, generally occupying the inner half of the mesentery. Baso-parietal muscles are well developed.

The body-wall shows in places curious block-like mesogloeal thickenings. There is evidence to show that these represent papillae on which open the cinclides. It should be noted that where these thickenings occur the adjoining mesogloea is otherwise thinner than in other parts. The cinclides appear to be arranged in horizontal lines. The mesogloea of the body-wall contains numerous spaces, and it everywhere presents a wavy appearance.

Sections of the oral disc and the tentacles show them to have strong ectodermal, but weak endodermal, muscles.

The sphincter is mesogloeal, somewhat elliptical in cross-section, and placed high up on the body-wall.

This anemone is closely allied to *Sagartia albo-cincta*, Stuckey (*Gregoria albocincta*, Hutton).

The specimens were collected at Campbell Island by Dr. Chilton and H. B. Kirk. They were, when examined, so strongly contracted, and in some cases so everted, that really satisfactory microscopic preparations could not be made.

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DESCRIPTION OF PLATES XIX AND XX.

Anemonia dichogama.

Plate XIX.

Cross-section, showing pouch invaginated from stomodaeum and traversing directives: 1, wall of stomodaeum; 2, pouch; 3, directive mesenteries.

Plate XX.

Fig. 1. Cross-section, showing false mesenteries from wall of stomodaeum.
Fig. 2. Cross-section, showing fused mesenteries.

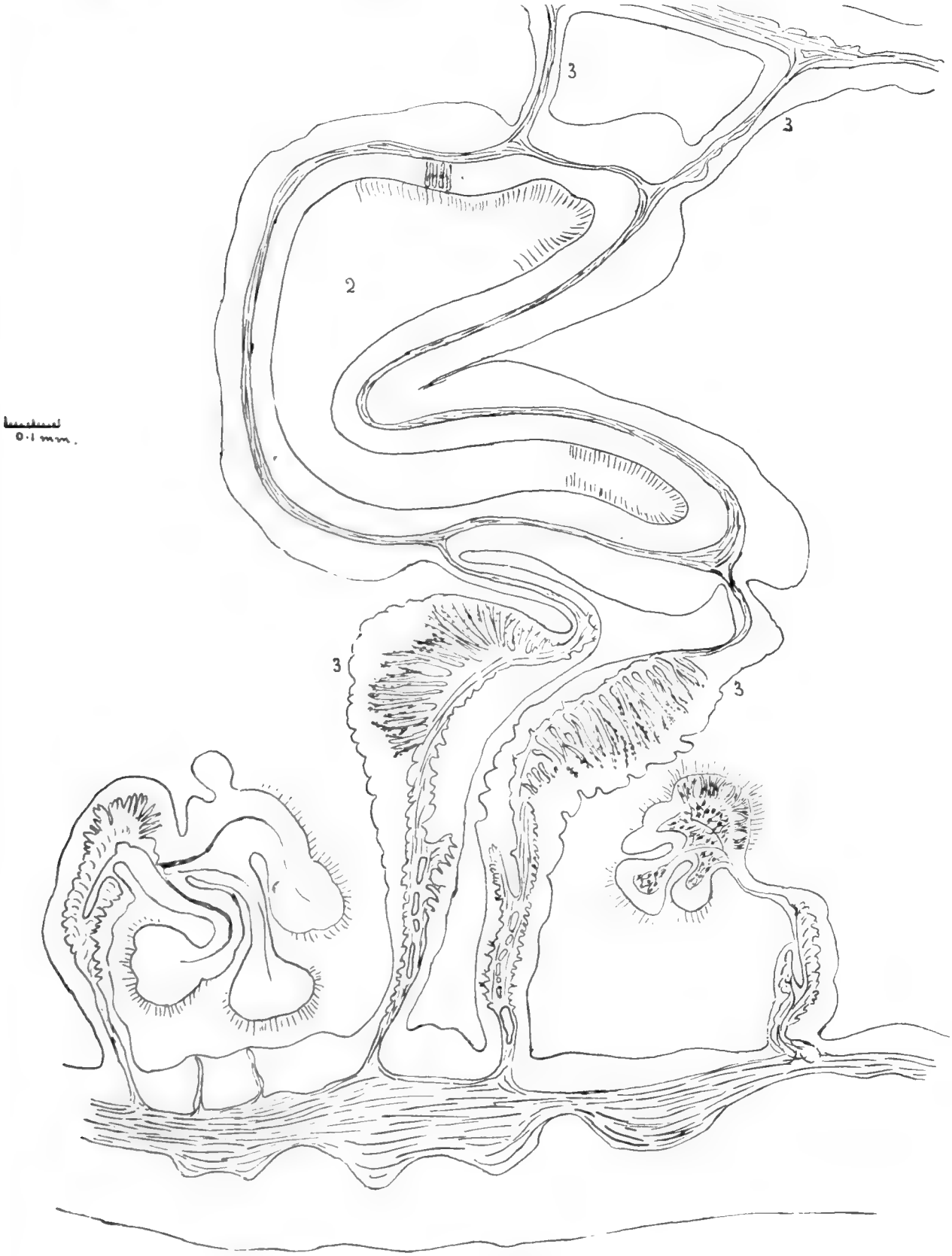

PLATE XIX.

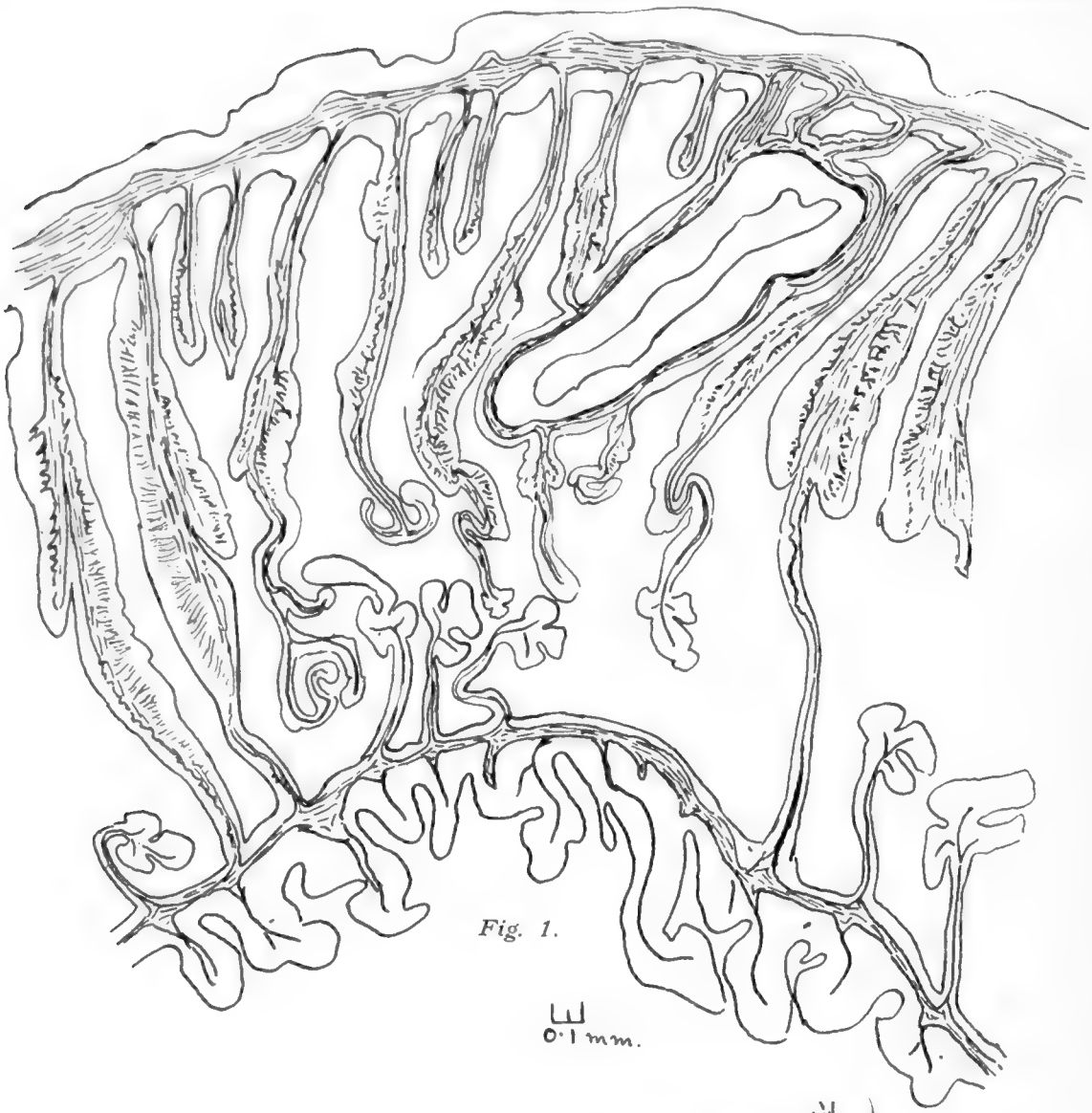

Fig. 1.

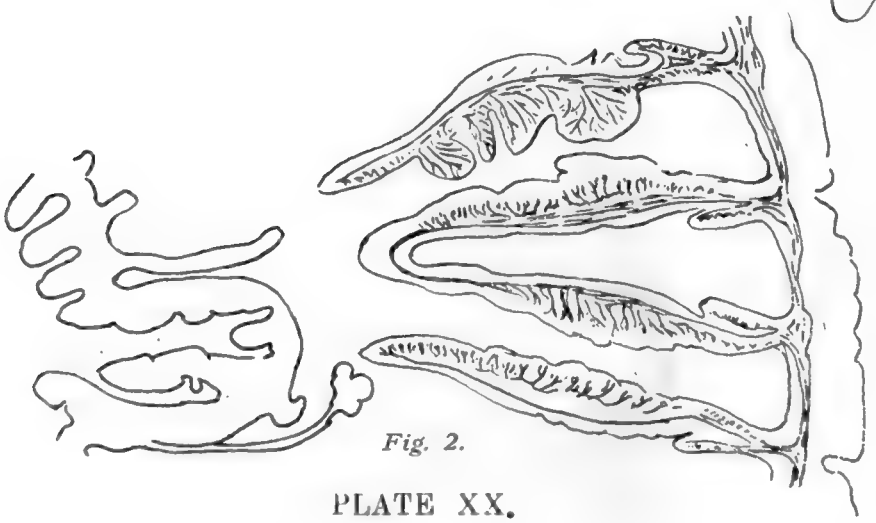

Fig. 2.

PLATE XX.

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[For convenience of reference the Index is given here as well as in its usual place at the end of Vol. II.]

INDEX.

No attempt has been made to index the synonyms. The species in the systematic papers are indexed under their specific names, the name of the genus to which they are referred in this work being placed after the specific name, thus: "*aucklandica*, *Plaxiphora*." The genera are also indexed, and the species of each genus will be found in order after the description of the genus. Species referred to in other papers are indexed under their generic names, thus: "*Stilbocarpa polaris*."

The concluding article, on the "Biological Relations of the Subantarctic Islands of New Zealand," has not been indexed, as it is itself a summary of the results of the preceding articles.

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