The Echinozoan Fauna of the New Zealand Subantarctic Islands, Macquarie Island, and the Chatham Rise

by

DAVID L. PAWSON

New Zealand Oceanographic Institute
Memoir No. 42

April 1968
THE ECHINOZOAN FAUNA OF THE NEW ZEALAND
SUBANTARCTIC ISLANDS, MACQUARIE ISLAND,
AND THE CHATHAM RISE
HMNZS *Endeavour* trawling off Stars Gulch, Macquarie Island.

*Photograph: R. J. Singleton*
The Echinozoan Fauna of the New Zealand Subantarctic Islands, Macquarie Island, and the Chatham Rise

by

DAVID L. PAWSON

New Zealand Oceanographic Institute
Memoir No. 42

Price 65c

April 1968
This publication should be referred to as:


Received for publication 17 December 1965

© Crown Copyright 1968

R. E. OWEN, GOVERNMENT PRINTER, WELLINGTON, NEW ZEALAND—1968
FOREWORD

During the Antarctic seasons of 1958–59 to 1960–61, extensive collections were made by Institute staff of the benthos of the Ross Sea area. In the summer seasons that have followed detailed collections have been made on the Campbell Plateau and along Macquarie Ridge both north and south of Macquarie Island. Some initial collections were made by Institute staff from HNZS Rotoiti and from USS Wilhoite, but the principal sampling was carried out during four major cruises made as part of the New Zealand Antarctic programme from HNZS Endeavour. The first of these carried out in October 1959 was led by D. E. Hurley; the second in April 1963 led by E. W. Dawson; the third in January 1964 led by E. W. Dawson, and the fourth in January 1965 led by I. N. Estcourt. Some additional collections in the New Zealand subantarctic were made from MV Taranui on Campbell Plateau and around the Bounty and Antipodes Islands. Over the years since 1954, when the Chatham Islands Expedition occupied a number of benthic stations on the Chatham Rise, the Institute has sampled extensively in this area, so that materials are now available for faunal distribution and zoogeographic studies covering the area around southern New Zealand and the adjacent subantarctic region. Dr Pawson's contribution in the present memoir is the initial detailed study of the echinozoa from these collections.

The planning and principal collecting has been carried out by E. W. Dawson, who has also supervised sorting of the material.

The manuscript has been prepared for publication by Dr D. E. Hurley.

J. W. BRODIE, Director,
New Zealand Oceanographic Institute,
Wellington

Inset 1*
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>9</td>
</tr>
<tr>
<td>Introduction</td>
<td>9</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>10</td>
</tr>
<tr>
<td>Station Data</td>
<td></td>
</tr>
<tr>
<td>Bounty Islands Stations</td>
<td>10</td>
</tr>
<tr>
<td>Antipodes Islands Stations</td>
<td>11</td>
</tr>
<tr>
<td>Auckland Islands Stations</td>
<td>11</td>
</tr>
<tr>
<td>Campbell Island Station</td>
<td>12</td>
</tr>
<tr>
<td>Macquarie Island Stations</td>
<td>12</td>
</tr>
<tr>
<td>Stations NNE of Macquarie Island</td>
<td>12</td>
</tr>
<tr>
<td>Chatham Rise Stations</td>
<td>12</td>
</tr>
<tr>
<td>Systematics</td>
<td></td>
</tr>
<tr>
<td>Class Echiinoidea</td>
<td>13</td>
</tr>
<tr>
<td>Class Holothuroidea</td>
<td>18</td>
</tr>
<tr>
<td>Echinozoan Faunas of Auckland, Campbell, Bounty, and Antipodes Islands</td>
<td>25</td>
</tr>
<tr>
<td>Composition</td>
<td>26</td>
</tr>
<tr>
<td>Relationships</td>
<td>26</td>
</tr>
<tr>
<td>Echinozoan Fauna of Macquarie Island</td>
<td></td>
</tr>
<tr>
<td>Composition</td>
<td>26</td>
</tr>
<tr>
<td>Relationships</td>
<td>27</td>
</tr>
<tr>
<td>Echinozoan Fauna of the Chatham Islands</td>
<td></td>
</tr>
<tr>
<td>Relationships</td>
<td>27</td>
</tr>
<tr>
<td>Echinozoan Fauna of the Chatham Rise</td>
<td></td>
</tr>
<tr>
<td>Composition</td>
<td>30</td>
</tr>
<tr>
<td>References</td>
<td>31</td>
</tr>
<tr>
<td>Index</td>
<td>33</td>
</tr>
</tbody>
</table>

## FIGURES

Frontispiece: HMNZS *Endeavour* trawling off Stars Gulch, Macquarie Island.

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>Goniocidaris umbraculum</em> Hutton, various parts</td>
<td>14</td>
</tr>
<tr>
<td>2. <em>Psolus antarcticus</em> (Phillipi), various parts</td>
<td>20</td>
</tr>
<tr>
<td>3. <em>Bathyplotes natans</em> (Sars), various parts</td>
<td>23</td>
</tr>
<tr>
<td>PLATE</td>
<td></td>
</tr>
<tr>
<td>1. <em>Apatopygus reencens</em> (M. Edwards), abnormal specimens <em>Brisaster</em> ? n.sp.</td>
<td>29</td>
</tr>
</tbody>
</table>
The Echinozoan Fauna of the New Zealand Subantarctic Islands, Macquarie Island, and the Chatham Rise

by DAVID L. PAWSON
Smithsonian Institution, Washington, D.C., U.S.A.

Abstract

New Zealand Oceanographic Institute collections from the area include seven genera and seven species of echinoids and eight genera and nine species of holothurians. In the latter group is a new species of the genus *Placothuria* Pawson and Fell, 1965. New records are the echinoid genera *Brisaster* and *Austrocidaris*. The known echinozoan fauna of the southern islands of New Zealand now comprises 13 genera and 15 species. The fauna shows a strong affinity with that of New Zealand. Six species are now known from Macquarie Island, and close relationships between Macquarie Island fauna and that of New Zealand are evident. Though the west-wind-drift has apparently contributed no external elements at the species level to the present-day fauna of the southern islands, it has probably functioned as an effective agent in establishing continuity in the faunas of the individual islands. The fauna of the Chatham Islands is closely related to that of Cook Strait, New Zealand, but is markedly dissimilar to that of the southern islands of New Zealand. The Chatham Rise bathyal echinozoan fauna has a cosmopolitan to Indo-west-Pacific facies.

INTRODUCTION

The isolated groups of islands to the south and southeast of New Zealand, namely the Auckland, Campbell, Bounty, and Antipodes Islands, have been visited by several scientific expeditions over the past 60 years. The marine faunas of these islands are rich and diverse, and at the present time they are not particularly well known. Our knowledge of the echinoderm faunas of the islands stems largely from the publications of Farquhar (1898), Dendy (1909), Mortensen (1921, 1924, 1925), and Fell (1953). Up to the time of writing this paper, 26 species of echinoderms were known from the southern islands of New Zealand, and of these eight were holothurians and echinoids (collectively termed echinozoans). These are listed here:

- *Pseudechinus novaezealandiae* (Mortensen)
- *Cirridota brevidentis* (Hutton)
- *Pseudechinus amokurae* (Mortensen)
- *Cirridota carmelyensis* (Mortensen)
- *Apatopygus recens* (M. Edwards)
- *Pseudechinus leoninoides* (Mortensen)
- *Cirridota nigra* Mortensen
- *Cirridota dunedinensis* (Parker)

Four echinozoan species were known from Macquarie Island, which lies some 330 miles south-west of the nearest southern island (Auckland Island) of New Zealand. Mortensen (1925) listed three echinozoans from there, namely *Pseudechinus novaezealandiae* (Mortensen), *Oenus calcareaus* (Dendy), and *Pseudopsolus macquariensis* (Dendy). Recently, Pawson (1962) described a new species, *Trachythone macphersonae*, from the intertidal zone.
In recent years the New Zealand Oceanographic Institute has conducted a programme of intensive benthic sampling operations in the vicinity of the southern islands of New Zealand, Macquarie Island, and the Chatham Rise (Dawson, 1965). During the course of these investigations, the Institute not only discovered a series of hitherto unknown, extensive submarine ridges and pinnacles, but collected rich hauls of marine animals. The present paper describes the large collections of echinozoans which were kindly entrusted to the writer. These collections have proved to be of major importance, greatly adding to our knowledge of the echinozoan fauna of the area. The faunal list for the southern islands of New Zealand may now be enlarged to include 15 species. The number of species known from Macquarie Island is now six.

ACKNOWLEDGMENTS

I am particularly grateful to Mr J. W. Brodie, director of the N.Z. Oceanographic Institute, for making this material available to me, and to Mr E. W. Dawson of the same institution for many kindnesses. I also thank Professor H. B. Fell for fruitful discussions and the loan of comparative material of several species.

STATION DATA

The collection includes 476 specimens and fragments collected from a total of 54 stations. Where possible, details of associated benthic animals and the type of bottom are given in the list below.

Abbreviations: fm, fathoms; m, metres; Mrtsn, Mortensen; spec., specimens.

Bounty Islands Stations
(Sta. A 701–A 717, A 746–A 753)

<table>
<thead>
<tr>
<th>Station</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Date</th>
<th>Depth (fm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pseudochinus novaezelandiae (Mrtsn)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Apatopygus recces (Milne-Edwards)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Spatangus thor Fell</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Placothuria squamata n.sp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pseudochinus novaezelandiae (Mrtsn)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brisaster ? n.sp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brisaster ? n.sp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pseudochinus novaezelandiae (Mrtsn)</td>
</tr>
<tr>
<td>Sta. A 705</td>
<td>47° 41.6' E, 179° 05.1' E</td>
<td>4/11/1962</td>
<td>26 fm (48 m)</td>
<td>Rocks, encrusted by sponges and hydroids.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pseudochinus novaezelandiae (Mrtsn)</td>
</tr>
<tr>
<td>Sta. A 706</td>
<td>47° 42.7' S, 178° 43' E</td>
<td>4/11/1962</td>
<td>170 fm (311 m)</td>
<td>Rocks, dead shell.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pseudochinus novaezelandiae (Mrtsn)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Apatopygus recces (Milne-Edwards)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Brisaster ? n.sp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Paramareia peloria Clark</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pseudochinus novaezelandiae (Mrtsn)</td>
</tr>
</tbody>
</table>

STATION DATA
Sta. A 747 47° 40.9' S, 179° 03.1' E, 16/11/1962, 62 fm (113 m).

*Pseudechinus novaezelandiae* (Mtsn) fragments
*Apatopygus recens* (Milne-Edwards) fragments
*Brisaster* ? n.sp.

Sta. A 748 47° 41.2' S, 179° 03.5' E, 16/11/1962, 34 fm (62 m).

*Pseudechinus novaezelandiae* (Mtsn) 13 spec.
*Apatopygus recens* (Milne-Edwards) 1 spec.

Sta. A 749 47° 42.3' S, 179° 04' E, 16/11/1962, 34 fm (62 m).

*Apatopygus recens* (Milne-Edwards) 4 spec. + fragments

Sta. A 751 47° 44.6' S, 179° 07.4' E, 16/11/1962, 85 fm (155 m), grey coarse biotite granite.

*Pseudechinus novaezelandiae* (Mtsn) 27 spec.

Sta. A 753 47° 55' S, 179° 35' E, 17/11/1962, 100 fm (183 m), fine pale sand.

*Brisaster* ? n.sp. fragments

**Antipodes Islands Station**
(Sta. A 722-A 745)


*Pseudechinus novaezelandiae* (Mtsn) fragment
*Spatangus thor Fell* fragment

Sta. A 723 49° 42' S, 178° 50.3' E, 7/11/1962, 67 fm (123 m), brachiopods.

*Pseudechinus novaezelandiae* (Mtsn) 9 spec. + fragments

Sta. A 724 49° 43' S, 178° 50' E, 7/11/1962, 110 fm (201 m), coarse bryozoan sand, brachiopods.

*Pseudechinus novaezelandiae* (Mtsn) 2 spec. + fragments

Sta. A 727 49° 38.7' S, 178° 52' E, 7/11/1962, 82 fm (150 m), bryozoans, hydroids, gastropods.

*Pseudechinus novaezelandiae* (Mtsn) 1 spec.

Sta. A 728 49° 38.4' S, 178° 48.7' E, 7/11/1962, 52 fm (95 m), black pebbly “volcanic” sand with shell fragments.

*Pseudechinus novaezelandiae* (Mtsn) 1 spec. + fragments

Sta. A 729 49° 38.2' S, 178° 47.3' E, 7/11/1962, 42 fm (77 m), bryozoans, sponges.

*Pseudechinus novaezelandiae* (Mtsn) 1 spec.
*Oenus brevidens* (Hutton) 1 spec.

Sta. A 730 49° 40.3' S, 178° 53.3' E, 7/11/1962, 168 fm (307 m).

*Pseudechinus novaezelandiae* (Mtsn) 2 spec.

Sta. A 734 49° 42' S, 178° 44.3' E, 8/11/1962, 82 fm (150 m), rock, shelly shingle, gravel.

*Pseudechinus novaezelandiae* (Mtsn) 3 spec. + fragments

Sta. A 738 49° 40.1' S, 178° 47.3' E, 9/11/1962, 34 fm (62 m), bryozoan, red algae, molluscs.

*Pseudechinus novaezelandiae* (Mtsn) 3 spec. + fragments
*Oenus brevidens* (Hutton) 5 spec.

Sta. A 739 49° 40.2' S, 178° 44.3' E, 9/11/1962, 62 fm (113 m), coarse white shell sand with molluscs.

*Pseudechinus novaezelandiae* (Mtsn) 2 spec. + fragments

Sta. A 740 49° 41' S, 178° 40.2' E, 9/11/1962, 172 fm (315 m), rocks, Chlamys, corals, ophiuroids, brachiopods.

*Pseudechinus novaezelandiae* (Mtsn) fragments
*Austrocidarlis* sp. 2 primary radiolids

Sta. A 741 49° 41.5' S, 178° 51.5' E, 9/11/1962, 72 fm (132 m), shelly sand, pebbles.

*Pseudechinus novaezelandiae* (Mtsn) 3 spec. + fragments

Sta. A 743 49° 39.8' S, 178° 50.2' E, 9/11/1962, 22 fm (40 m), hard calcareous bottom with *Macrocystis* holdfasts, green algae.

*Oenus brevidens* (Hutton) 1 spec.

Sta. A 745 49° 36.7' S, 178° 50.5' E, 9/11/1962, 218 fm (399 m), coarse shell sand with small volcanic pebbles.

*Austrocidarlis* sp. fragments and radiolids

**Auckland Islands Stations**
(Sta. B 175-B 184, D 47-D 83)

Sta. B 175 50° 26.5' S, 166° 37.5' E to 50° 25.5' S, 166° 35.5' E, 9/10/1959, 52 fm (95 m), yellow mud, shell fragments, corals.

*Chiridota carneyleensis* Mtsn 21 spec.

Sta. B 183 52° 34.3' S, 168° 49' E, 11/10/1959, 115 fm (210 m), very rocky bottom.

*Chiridota carneyleensis* Mtsn 9 spec.

Sta. B 184 52° 36.9' S, 169° 07' E, 11/10/1959, 103 fm (188 m), rocky bottom, sponges, brachiopods.

*Chiridota carneyleensis* Mtsn 1 spec.

Sta. D 47 50° 52.4' S, 166° 16' E to 50° 51.8' S, 166° 15.6' E, 8/5/1963, 44 fm (81 m), mass of large broken shell fragments

*Apatopygus recens* (Milne-Edwards) 2 spec.

Sta. D 52 50° 40.09' S, 166° 13.4' E, 9/5/1963, 37 fm (68 m), muddy medium fine sand with shell fragments

*Pseudechinus novaezelandiae* (Mtsn) 2 radioles
Sta. D 55 50° 38.7' S, 166° 03.8' E, 9/5/1963, 27 fm (49 m), shell.

*Chiridota carneyensis* Mrtsn 1 spec.

Sta. D 74 50° 55.65' S, 165° 54.8' E, 12/5/1963, 92 fm (168 m), molluscs, starfish, brachiopods

*Placothuria squamata* n.sp. fragment

Sta. D 83 49° 53' S, 167° 09' E, 13/5/1963, 82 fm (150 m), masses of sponge, crabs.

*Apatopygus recens* fragments

**Campbell Island Station**

Sta. D 35 52° 56.4' S, 169° 33' E, 5/5/1963, 103 fm (188 m), shell sand with brachiopods and *Chlamys*.

*Pseudochinus novaeezalandiae* (Mrtsn) 64 spec.

*Trochodota dunedinensis* (Parker) 1 spec.

**Macquarie Island Stations**

(Sta. B 339, D 6–D 10)

Sta. B 339 54° 33' S, 158° 55' E, 15/12/1960, 50 fm (91 m).

*Psolus antarcticus* (Philippi) 2 spec.

Sta. D 6 55° 29' S, 158° 31.5' E, 20/4/1963, 227 fm (415 m), dense volcanic rocks, little fine sediment.

*Psolus antarcticus* (Philippi) 13 spec. + fragments


*Psolus antarcticus* (Philippi) 7 spec.

Sta. D 8 54° 52' S, 158° 39' E, 20/4/1963, 77 fm (141 m).

*Psolus antarcticus* (Philippi) 5 spec.

Sta. D 9 54° 52' S, 158° 50' E, 20/4/1963, 62 fm (113 m).

*Pseudochinus novaeezalandiae* (Mrtsn) 1 spec.

*Psolus antarcticus* (Philippi) 2 spec.

Sta. D 10 54° 40' S, 159° 01' E, 21/4/1963, 39 fm (71 m).

*Trochodota dunedinensis* (Parker) 6 spec.

**Stations NNE of Macquarie Island**

(Sta. D 17–D 20)


*Gonioicidaris umbraculum* Hutton 5 spec.


*Gonioicidaris umbraculum* Hutton 18 spec.

*Pseudocrus leoninoides* (Mrtsn) 1 spec.

Sta. D 20 49° 39.8' S, 164° 02.2' E, 24/4/1963, 69 fm (126 m), large rounded boulders with bryozoan shell sand.

*Trochodota dendyi* Mrtsn fragment

**Chatham Rise Stations**

(Sta. A 759, A 760, D 1)

Sta. A 759 43° 16' S, 176° 11' E, 21/11/1962, 190 fm (348 m), fine glauconitic sand.

*Pentadactyla longidenti* (Hutton) 22 spec.

*Bathyplote nitans* (Sars) fragments


*Pentadactyla longidenti* (Hutton) 2 spec.

Sta. D 1 44° 18' S, 176° 10' E, 12/4/1963, 52 fm (95 m).

*Pseudochinus novaeezalandiae* (Mrtsn) 7 spec.

*Spatangu thor* Fell fragments
SYSTEMATICS

Class ECHINOIDEA
Order CIDAROIDA Claus, 1880
Family CIDARIDAE Gray, 1825

The two cidarid genera now known to occur in waters south of New Zealand may be distinguished by the shape of their primary radioles.

Primary radioles tapering, smooth, slender, cylindrical Austracidaris

Primary radioles coarse or coarsely thorny, basal spurs present. Adapical primaries with distal cups. Gonioicidaris

Genus Austracidaris Clark, 1907


TYPE SPECIES: Austracidaris canaliculata (A. Agassiz)

REMARKS: This genus is represented only in subantarctic seas according to Mortensen (1928). Two of the 3 included species, A. canaliculata (A. Agassiz) and A. spinulosa Mortensen, are known from the Magellanic region of South America, and the Falkland Islands to depths of ca. 270 m, and the third species, A. gigantea Clark, is known from off Coulman Island, South Victoria Land, Antarctica, 180 m.

Austracidaris sp.

MATERIAL EXAMINED: Sta. A 740, 2 primary radioles; Sta. A 745, test fragments and fragment of a primary radiole.

DESCRIPTION: The two test fragments each consist of 2 inter-ambulacral plates; one fragment with 7 ambulacral plates attached. Both fragments overgrown by bryozoans. Test approximately 1 mm thick. Interamb plates with large, perforate, non-crenulate, primary tubercles; boss arises smoothly from floor of areole. Areole deep, approximately circular, surrounded by complete ring of scrobicular tubercles. In horizontal sutures scrobicular tubercles reduced in size, on one fragment lacking altogether, so that areoles broadly confluent. Fragment with confluent areoles probably from adoral portion of test; other fragment probably ambital. Secondary tubercles numerous, of same size as scrobicular tubercles, almost filling admedian and adradial areas of each plate. Apparently a sunken and median furrow present in interambs.

Ambs narrow (approximately 22% of interambs), pores slightly sunken, oblique. Pores and pore-pairs separated by a more or less conspicuous ridge. Marginal tubercles large, in vertical linear series; small internal tubercle present, median to and above marginal tubercle on each plate. Sunken median furrow present in ambs. Two primary radioles 52 mm and 46 mm in length; both lack distal extremities; original length probably did not exceed 65 mm. Diameter at neck 2.3 mm. Shaft straight, approximately cylindrical, gently tapering from midpoint towards distal extremity, bearing 12 straight ridges, broken into spinules. Milled ring conspicuous, 3.6 mm in diameter. Neck and collar 1.2 mm in length.

REMARKS: From the characters of the test, and more particularly of the spines, these fragments appear to belong to a representative of the genus Austracidaris, but there is insufficient material to enable a specific determination. A comparison of these radioles with those of the monotypic genus Ogmoci­daris known from the north of the area shows that they do not belong to that genus, as the radioles of O. ben­hami Mortensen scarcely exceed 40 mm in length, and also their milled rings are quite inconspicuous.

DISTRIBUTION: If the present material does in fact represent Austracidaris, then the range of distribution of that genus is considerably enlarged, to include the Antipodes Islands, at depths of 172–220 fm (309–396 m). The genus probably has a circumpolar distribution, on the shelf and slope.

Genus Gonioicidaris Agassiz and Desor, 1846

DIAGNOSIS: Apical spines in adult specimens widened distally to form a crown or disc. Often a basal disc present.

TYPE SPECIES: Gonioicidaris tubaria (Lamarck).

Gonioicidaris umbraculum Hutton

Fig. 1 (1)

Gonioicidaris umbraculum Hutton, 1878, p. 306; Mortensen, 1928, p. 164, pls. XII, figs. 10–12, LXIX, fig. 15, LXXIX, fig. 1 (complete list of references); Fell, 1952, p. 33; 1954, p. 40; 1958, p. 32.

MATERIAL EXAMINED: 23 specimens from the following stations: Sta. D 15, 5 specimens; Sta. D 18, 18 specimens.

DESCRIPTION: Largest specimen in collection with horizontal diameter of 19 mm; small specimen (juvenile), with horizontal diameter of 1.23 mm. Test and secondary radioles dark brown, primary radioles dirty white. Most primary radioles carry numerous epithe­liac tubicolous anellids. Primary radioles of juvenile specimen well formed but dissimilar to those of adult. Adapical primaries short and thick (fig. 1 (1c)), approximately 0.75 mm in average length.
Sta. D 55 50° 38.7’ S, 166° 03.8’ E, 9/5/1963, 27 fm (49 m), shell.

  *Chiridota carneyensis* Mrtsn 1 spec.

*Sta. D 74 50° 55.65’ S, 165° 54.8’ E, 12/5/1963, 92 fm (168 m), molluscs, starfish, brachiopods

  *Placothuria squamata* n.sp. fragment

*Sta. D 83 49° 53’ S, 167° 09’ E, 13/5/1963, 82 fm (150 m), masses of sponge, crabs.

  *Apatopygus recens* fragments

**Campbell Island Station**

*Sta. D 35 52° 56.4’ S, 169° 33’ E, 5/5/1963, 103 fm (188 m), shell sand with brachiopods and *Chlamys*.

  *Pseudechinus novaezelandiae* (Mrtsn) 64 spec.

  *Trochodota dunedinensis* (Parker) 1 spec.

**Macquarie Island Stations**

(Sta. B 339, D 6–D 10)

*Sta. B 339 54° 33’ S, 158° 55’ E, 15/12/1960, 50 fm (91 m).

  *Psolus antarcticus* (Philippi) 2 spec.

*Sta. D 6 55° 29’ S, 158° 31.5’ E, 20/4/1963, 227 fm (415 m), dense volcanic rocks, little fine sediment.

  *Psolus antarcticus* (Philippi) 13 spec. + fragments


  *Psolus antarcticus* (Philippi) 7 spec.

*Sta. D 8 54° 52’ S, 158° 39’ E, 20/4/1963, 77 fm (141 m).

  *Psolus antarcticus* (Philippi) 5 spec.

**Sta. D 9 54° 52’ S, 158° 50’ E, 20/4/1963, 62 fm (113 m).

  *Pseudechinus novaezelandiae* (Mrtsn) 1 spec.

  *Psolus antarcticus* (Philippi) 2 spec.

*Sta. D 10 54° 40’ S, 159° 01’ E, 21/4/1963, 39 fm (71 m).

  *Trochodota dunedinensis* (Parker) 6 spec.

**Stations NNE of Macquarie Island**

(Sta. D 17–D 20)


  *Goniocidaris umbraculum* Hutton 5 spec.


  *Goniocidaris umbraculum* Hutton 18 spec.

  *Pseudechinus leontoides* (Mrtsn) 1 spec.

*Sta. D 20 49° 39.8’ S, 164° 02.2’ E, 24/4/1963, 69 fm (126 m), large rounded boulders with bryozoan shell sand.

  *Trochodota dendyi* Mrtsn fragments

**Chatham Rise Stations**

(Sta. A 759, A 760, D 1)

*Sta. A 759 43° 16’ S, 176° 11’ E, 21/11/1962, 190 fm (348 m), fine glauconitic sand.

  *Pentadactyla longidentis* (Hutton) 22 spec.

  *Bathyplotes natans* (Sars) fragments


  *Pentadactyla longidentis* (Hutton) 2 spec.

*Sta. D 1 44° 18’ S, 176° 10’ E, 12/4/1963, 52 fm (95 m).

  *Pseudechinus novaezelandiae* (Mrtsn) 7 spec.

  *Spatangus thor* Fell fragments
SYSTEMATICS

Class ECHINOIDEA

Order CIDAROIDA Claus, 1880
Family CIDARIDAE Gray, 1825

The two cidarid genera now known to occur in waters south of New Zealand may be distinguished by the shape of their primary radioles.

Primary radioles tapering, smooth, slender, cylindrical

Primary radioles coarse or coarsely thorny, basal spurs present. Adapical primaries with distal cups.

Genus Austrocidaris Clark, 1907


TYPE SPECIES: Austrocidaris canaliculata (A. Agassiz).

REMARKS: This genus is represented only in subantarctic seas according to Mortensen (1928). Two of the 3 included species, A. canaliculata (A. Agassiz) and A. spinulosa Mortensen, are known from the Magellan region of South America, and the Falkland Islands to depths of ca. 270 m, and the third species, A. gigantea Clark, is known from off Coulman Island, South Victoria Land, Antarctica, 180 m.

Austrocidaris sp.

MATERIAL EXAMINED: Sta. A 740, 2 primary radioles; Sta. A 745, test fragments and fragment of a primary radiole.

DESCRIPTION: The two test fragments each consist of 2 inter-ambulacral plates; one fragment with 7 ambulacral plates attached. Both fragments overgrown by bryozoans. Test approximately 1 mm thick. Interamb plates with large, perforate, non-crenulate, primary tubercles; boss arises smoothly from floor of areole. Areole deep, approximately circular, surrounded by complete ring of scrobicular tubercles. In horizontal sutures scrobicular tubercles reduced in size, on one fragment lacking altogether, so that areoles broadly confluent. Fragment with confluent areoles probably from adoral portion of test; other fragment probably ambial. Secondary tubercles numerous, of same size as scrobicular tubercles, almost filling admedian and adradial areas of each plate. Apparently a sunken and median furrow present in interambas.

Ambs narrow (approximately 22% of interambas), pores slightly sunken, oblique. Pores and pore-pairs separated by a more or less less conspicuous ridge. Marginal tubercles large, in vertical linear series; small internal tubercle present, median to and above marginal tubercle on each plate. Sunken median furrow present in ambas. Two primary radioles 52 mm and 46 mm in length; both lack distal extremities; original length probably did not exceed 65 mm. Diameter at neck 2.3 mm. Shaft straight, approximately cylindrical, gently tapering from midpoint towards distal extremity, bearing 12 straight ridges, broken into spinelets. Milled ring conspicuous, 3.6 mm in diameter. Neck and collar 1.2 mm in length.

REMARKS: From the characters of the test, and more particularly of the spines, these fragments appear to belong to a representative of the genus Austrocidaris, but there is insufficient material to enable a specific determination. A comparison of these radioles with those of the monotypic genus Ogmociaris known from the north of the area shows that they do not belong to that genus, as the radioles of O. benthami Mortensen scarcely exceed 40 mm in length, and also their milled rings are quite inconspicuous.

DISTRIBUTION: If the present material does in fact represent Austrocidaris, then the range of distribution of that genus is considerably enlarged, to include the Antipodes Islands, at depths of 172–220 fm (309–396 m). The genus probably has a circumpolar distribution, on the shelf and slope.

Genus Goniocidaris Agassiz and Desor, 1846

DIAGNOSIS: Apical spines in adult specimens widened distally to form a crown or disc. Often a basal disc present.

TYPE SPECIES: Goniocidaris tubaria (Lamarck).

Goniocidaris umbraculum Hutton

Fig. 1 (1)

Goniocidaris umbraculum Hutton, 1878, p. 306; Mortensen, 1928, p. 164, pls. XII, figs. 10–12, LXIX, fig. 15, LXXIX, fig. 1 (complete list of references); Fell, 1952, p. 33; 1954, p. 40; 1958, p. 32.

MATERIAL EXAMINED: 23 specimens from the following stations: Sta. D 15, 5 specimens; Sta. D 18, 18 specimens.

DESCRIPTION: Largest specimen in collection with horizontal diameter of 19 mm; small specimen (juvenile), with horizontal diameter of 1.23 mm; Test and secondary radioles dark brown, primary radioles dirty white. Most primary radioles carry numerous epipores: particlarly turboculous annelids. Primary radioles of juvenile specimen well formed but dissimilar to those of adult. Adapical primaries short and thick (fig. 1 (1c)), approximately 0.75 mm in average length.
Fig. 1—Goniocidaris umbraculum Hutton. (1) Primary radioles; a, oral, b, ambital, c, adapical. Pseudocheirus novazealandiae (Mortensen). (2) Abnormal apical system. Brisaster n.sp. (3) Valves of tridentate pedicellariae. (4) Valve of globiferous pedicellaria. (5) Deposits from stem of tube foot. (6) Terminal portions of valves of globiferous pedicellaria. (7) Calcareous lamella from disc of tube foot.
At ambitus primaries reach greatest length (ca. 1.31 mm), most slightly curved in an adoral direction. Oral primaries very small, widened distally (fig. 1 (1a)). All radioles with spines; ambital primaries have about 6 whorls of larger spines scattered along their length (fig. 1 (1b)). Globiferous pedicellariae present in small numbers (10 observed on specimen). Test about 6 whorls of larger spines scattered along their length (fig. 1 (1 b)). Globiferous pedicellariae present in small numbers (10 observed on specimen). Test about 6 whorls of larger spines scattered along their length (fig. 1 (1 b)).

Remarks: The single juvenile specimen is of special interest. Mortensen (1927, p. 384) described an embryo of this species with a horizontal diameter of 0.9 mm, and noted that it was unique in that each plate carried “... instead of a single spine, a bundle of slender, embryonal spines, all attached to the same tubercle ... “. The present specimen is somewhat larger than Mortensen’s, and no trace of such bundles of spines is evident. Apparently, at some stage in the development of this species (between 0.9 mm h.d. and 1.23 mm h.d.) the bundles of spines are either transformed into single spines or replaced by them.

In an earlier paper, Mortensen (1926) concluded that *G. umbraculum* is a brood-protecting species, for he found a single adult specimen carrying several juveniles on the peristome, covered by the oral primary radioles. The presence of a juvenile specimen in the present collection prompted a search of the peristomes of all the adult specimens, but no further juveniles were found. Fell (pers. comm.) has examined large numbers of specimens of this species, and has never found any brooding young. Mortensen (1926, 1927) unfortunately gave no indication of the time of the year at which his brooding specimen was collected. It is quite possible that the juveniles are carried on the peristome for only a short time, and then liberated.

Distribution: *G. umbraculum* was previously known to range from Cook Strait to Foveaux Strait in depths of 40–300 fm. Such a bathymetric range permits a wide distribution, but until the present time the species was unknown from elsewhere but the New Zealand shelf. This discovery of *G. umbraculum* at a latitude of 52° S is of importance, for this is the most southern record for the genus *Goniocidaris* which is centered in the Indo–West-Pacfic.

Order TEMNOPLEUROIDA Mortensen, 1942
Family TEMNOPLEURIDAE Agassiz, 1872
Genus PSEDECHINUS Mortensen, 1903

Description: A single specimen has been examined. In all specimens but one, ocular I is absent, and the other 4 ocular plates, especially oculars III and IV, are exposed. It is not known if the species is brooding.

Order TEMNOPLEUROIDA Mortensen, 1942
Family TEMNOPLEURIDAE Agassiz, 1872
Genus PSEDECHINUS Mortensen, 1903

Diagnosis: Test of small to moderate size, lacking angular pores. Sculpture indistinct, radiating about primary tubercles, present in juveniles. Primary tubercles non-crenulate or weakly crenulate. Apical system dicyclic or with 1 or 2 oculars insert. Suranal plate distinct. Radioles without thorns.

Type species: *Pseudechinus albocinctus* (Hutton).

**Pseudechinus novaeseelandiae** (Mortensen)

Fig. 1 (2)

*Echinus angulosus*: Farquhar, 1898, p. 319; Hutton, 1904, p. 289; Benham, 1909, p. 25, pl. XI, fig. 5.
*Notoechinus novaeseelandiae* Mortensen, 1921, p. 153, pl. VI, figs. 7–10, pl. VII, figs. 4, 5, 7–11; Koehler, 1926, p. 36, pl. 54.


**Material Examined:** 183 specimens and numerous fragments from the following stations: Sta. A 701, 6 specimens; Sta. A 702, 1 specimen; Sta. A 704, 1 specimen and fragments; Sta. A 705, 2 specimens; Sta. A 706, 8 specimens and fragments; Sta. A 713, 2 specimens; Sta. A 714, fragments; Sta. A 717, A 167 specimens and fragments; Sta. A 722, fragments; Sta. A 723, 9 specimens and fragments; Sta. A 724, 2 specimens and fragments; Sta. A 727, 1 specimen; Sta. A 728, 1 specimen and fragment; Sta. A 729, 1 specimen; Sta. A 730, 2 specimens; Sta. A 734, 3 specimens and fragments; Sta. A 738, 3 specimens and fragments; Sta. A 739, 2 specimens and fragments; Sta. A 740, fragments; Sta. A 741, 3 specimens and fragments; Sta. A 746, 18 specimens and fragments; Sta. A 747, fragments; Sta. A 748, 13 specimens; 13 specimens; Sta. A 751, 27 specimens; Sta. D 1, 7 specimens; Sta. D 9, 1 specimen; Sta. D 35, 64 specimens; Sta. D 52, fragments.

Description: Horizontal diameter ranging from 2-46 mm. Largest specimen (from Sta. A 729) with height of 26 mm, apical system diameter of 9 mm (20% h.d.), and peristome width of 14 mm (30% h.d.). Radioles usually light green with whitish tips, although there is some variation in colour. In several specimens radioles are more or less uniformly grey. Colour of test also subject to considerable variation, but usually greyish with shades of green in median areas of amb and interamb. Some with light brown test, darker brown in median areas of ambs and interamb. Test colours generally dull in comparison with colours in other species of genus.

Material of 50 specimens were examined; in all specimens but one, ocular I insert, and 4 ocular plates, especially oculars III and IV, are exposed. It is not known if the species is brooding.

Order TEMNOPLEUROIDA Mortensen, 1942
Family TEMNOPLEURIDAE Agassiz, 1872
Genus PSEDECHINUS Mortensen, 1903

Diagnosis: Test of small to moderate size, lacking angular pores. Sculpture indistinct, radiating about primary tubercles, present in juveniles. Primary tubercles non-crenulate or weakly crenulate. Apical system dicyclic or with 1 or 2 oculars insert. Suranal plate distinct. Radioles without thorns.

Type species: *Pseudechinus albocinctus* (Hutton).
area. Apical system relatively larger in juveniles (ca.
45% h.d.) than in fully grown specimens (ca.
22% h.d.).

DISTRIBUTION: This species may now be recognised
as the most common of the southern New Zealand
echinoids. Mortensen (1921) reported *P. novaezealan-
diae* from Campbell Island and Macquarie Island, and
Koehler (1926) described material from Macquarie
Island. Fell (1953) noted its presence at Auckland
Islands and Bounty Islands. The present locality rec-
cords cover Macquarie, Auckland, Bounty, Campbell,
and Antipodes Islands, also the Chatham Rise, and
include depths ranging from 43–306 m. The Antipodes
Islands record is new for the species.

Order **CASSIDULOI D** Agassiz and
Desor, 1847

Family **APATOPYGIDAE** Kier, 1962

Genus **Apatopygus** Hawkins, 1920

**Diagnosis:** Test small to medium, of ovoid out-
line, widest posteriorly; aboral side low vaulted, oral
side more or less conspicuously concave, sunken to-
ward the peristome. Ambbs subpetaloid, pores small,
round, of equal size. Bourrelets moderately developed.
No naked granular midline in the posterior interamb.
Apical system anterior; 4 genital pores, genital plates
separate, tending to merge into the madreporite in
adult specimens. Peristome anterior transverse. Peri-
prox in a continuous groove aborally. Tubercles per-
forate, crenulate. Lantern present in young specimens,
resorbed in course of growth.

**Type Species:** **Nucleolites recens** Milne-Edwards.

**Remarks:** This genus embraces 2 extant species,
*A. recens* (Milne-Edwards) (peristome transverse,
broader than long) from New Zealand waters, and
*A. occidentalis* Clark (peristome circular, not broader
than long) from Western Australia.

The collection contains 7 specimens and numerous
fragments of *A. recens*.

**Apatopygus recens** (M. Edwards)

*Pl. 1, (1–4)*

**Nucleolites recens** Milne-Edwards, 1836, pl. XIV, fig. 3.

**Apatopygus recens:** Hawkins, 1920, p. 393; Mortensen, 1948,
p. 181; figs. 158–163 (complete synonymy); Fell, 1952, p.
34; Fell, 1953, p. 107; Fell, 1960, p. 72.

**Material Examined:** Seven specimens and frag-
ments from the following stations: Sta. A 701, frag-
ments; Sta. A 714, fragments; Sta. A 716, fragments;
Sta. A 747, fragment; Sta. A 748, 1 specimen; Sta.
A 749, 4 specimens and fragments; Sta. D 47, 2
specimens; Sta. D 83, fragments.

**Description:** Colour of specimens preserved in
alcohol is, as usual, green. Largest specimen 46 mm
in length, 40 mm wide at broadest part (at level of
anus). This large specimen differs in several respects
from others in collection, which are considered nor-
mal. Oral surface posterior to peristome not as densely
tuberculate, and conspicuous naked areas are pres-
ent (pl. 1 (1)). Also this area is concave, and speci-
men has an arched ventral side when viewed from
posterior end (pl. 1 (2)).

**Remarks:** Within this species deviations from the
normal shape and tuberculation are rare, but it is
interesting to note that the only other abnormal speci-
men of *A. recens* known was possibly collected at the
Auckland Islands (Fell, 1953). The specimen exami-
ned by Fell is illustrated here (pl. 1 (3, 4)); of particular
interest are the very large size of the specimen (length
50 mm), its height (28 mm), and the exceptionally
large gonopores.

**Distribution:** *A. recens* is known from many points
about the South Island of New Zealand but is un-
known from north of Cook Strait. (Pawson (1965a)
described a juvenile *Apatopygus* from near Three
Kings Island north of New Zealand, but the specific
identity of the specimen remains in doubt.) Fell (1953)
recorded the species from the Auckland Islands, but
with some doubt, as the labelling of the specimen
may have been unreliable. The present records show
definitely that *A. recens* is wide-ranging among the
southern islands of New Zealand. It is also known
from the Chatham Islands (Fell, 1960). The known
bathymetric range (10–162 m) is narrow, and
probably the species is restricted to the shelf.

Order **SPATANGOIDA** Gray, 1825

Two families within this order, Family Spatangidae
and Family Schizasteridae, are now known to occur in
waters to the immediate south of New Zealand. They
may be distinguished as follows:

Peripetalous and latero-anal fasciole present ...... Schizasteridae

Subanal fasciole only present ................................ Spatangidae

Family **SPATANGIDAE** Gray, 1825,
emend. Mortensen, 1951

Two genera, *Spatangus* and *Paramareia*, are re-
presented in New Zealand waters by a total of 5 species
(Fell, 1963), of which none have until the present
time been recorded from south of New Zealand, al-
though *Spatangus multispinus* Mortensen and Para-
mareia multituberculata Mortensen occur near the
Chatham Islands (Fell, 1960). These may be distin-
guished as follows:

1 (2) Plastra fully covered by tubercles .......... *Spatangus*

2 (1) Plastra with large naked areas .......... *Paramareia*

Genus **Spatangus** Gray, 1825

**Diagnosis:** Test large, broadly oval in outline, with
depth frontal groove, aboral side arched, high, oral
side flat. Paired ambbs form distinct petals, almost
closed distally, not sunken. Pores of frontal amb small
in regular single series. Apical system ethmolytic, sub-
central, with 4 genital pores. Madreporite extends be-
yond posterior oculars, widening into a conspicuous
plate. Peristome anterior, labrum prominent. Sternum
narrow, often forming a distinct keel, wholly covered
by tubercles. Posterior end truncate, carrying periproct.
Subanal fasciole only present. Colour more or less
dark purplish. (After Mortensen, 1951.)
Type Species: *Spatangus purpureus* O. F. Muller.

Remarks: In a recent paper Fell (1963) gave a key to all known species of *Spatangus*, and diagnosed 3 new species. This genus now contains 13 species. The present collection includes only fragments of one or more species of *Spatangus*. A large fragment which includes portions of the posterolateral interambs undoubtedly belongs to *Spatangus thor* Fell. All of the *Spatangus* fragments in the collection have been provisionally assigned to this species. Further investigations in the area sampled may show that there is more than one *Spatangus* species present in the area.

*Spatangus thor* Fell

*Spatangus thor* Fell, 1963, p. 2, figs. 2, 6, 7, 12.

Material Examined: Fragments from the following stations: Sta. A 701; Sta. A 706; Sta. A 712; Sta. A 722; Sta. A 746; Sta. D 1.

Remarks: Most fragments are very small, and some carry numerous tubercles and are strongly reminiscent of *Spatangus multispinus* Mortensen, but these cannot be placed with any certainty. The largest fragment (Sta. D 1) has a complete apical system together with portions of the paired ambams. The posterolateral interamb of the right side is almost complete and there 5 conspicuous tubercles are carried. Because of the presence of these tubercles in the posterolateral interambs, the specimens cannot be assigned to the Foveaux Strait species *S. beryl* Fell, as that species lacks such tubercles. However, *S. thor* Fell, also from Foveaux Strait, has about 12 tubercles in that area, although this number is rather more than those found in the present material. In the holotype of *S. thor*, the anterolateral petal is 47 mm in length, whereas the corresponding petal in the large fragment in the collection has a length of 30 mm. Thus it is presumed that this fragment is of a specimen of *S. thor* which had not yet reached full size, and possibly the full complement of tubercles in the posterolateral interambs had not as yet been attained. On the other hand, the fragment, with its small number of tubercles, may represent a hybrid *S. thor × beryl*. Possible hybridisation between these 2 species has been discussed by Fell (1963). The material available does not allow a definite answer to this problem, but it is considered to be more likely that these fragments represent *S. thor*, to which species the material is here assigned.

Distribution: The holotype was taken from Foveaux Strait in a depth of 29–34 m (Fell, 1963). The records from the present collections (Bounty and Antipodes Islands, 43–324 m; Chatham Rise, 90 m) establish the presence of spatangids to the east and south of New Zealand, with *Spatangus thor* probably occurring on the Chatham Rise (Sta. D 1, Verry Bank). Fell (1960) has also recorded the presence of *S. multispinus* Mortensen on the Chatham Rise; the species was known from several archibenthal stations occupied by the Chatham Islands 1954 Expedition.

Genus *Paramaretia* Mortensen, 1950

Diagnosis: Test large, aboral side low, arched, oral side concave, edge of test sharp. Petals narrow, not sunken or closed distally. Anterior series of anterior petals rudimentary, pores sometimes totally obliterated. Frontal amb narrow, scarcely sunken. Aboral side more or less densely covered by large non-crenulate primary tubercles, also present in posterior interamb. Plastron tuberculated only posteriorly. Labrum forming prominent lip, carrying long and narrow posterior prolongation. Apical system almost central; 4 genital pores. No peripetalous fasciole. Subanal fasciole distinct in juveniles. (After Mortensen, 1951.)

Type Species: *Paramaretia multituberculata* Mortensen.

*Paramaretia peloria* (Clark)

*Paramaretia peloria* Clark, 1916, p. 121, pl. XLIV, figs. 1–3; 1917, p. 248, pl. 145, fig. 25; Lambert and Thiery, 1924, p. 458; Clark, 1946, p. 380.


Material Examined: Sta. A 706, fragments.

Remarks: Several completely white fragments of a species of *Paramaretia* were taken from Sta. A 706. One fragment includes a portion of a posterolateral interamb, in which 16 tubercles are scattered irregularly. Such a small number of tubercles in the posterolateral interamb is a character of *P. peloria*. The only other species in the genus, *P. multituberculata*, has according to Mortensen “in the youngest specimens . . . ca. 150 such tubercles in the lateral interambulacra”. In all probability then, these fragments represent *P. peloria*.

Distribution: Clark (1916) described the species from material collected by the *Endeavour* in Bass Strait, at a depth of *ca.* 165 m. Fell (1963) first recorded the presence of *P. peloria* in New Zealand waters, noting that it ranges the south-eastern and southern coasts of the South Island in 30–75 m. The present record, Bounty Islands, 170 fm (306 m), further extends the known range of this species.

Family S C H I Z A S T E R I D A E Lambert, 1905

Genus *Brisaster* Gray, 1885

Diagnosis: Test of moderate size, of more or less elongate ovoid outline, low, vertex posterior. Frontal amb forming deep notch in anterior end of test; pores in frontal amb in single regular series. Posterior petals considerably shorter than anterior. Three genital pores. Latero-anal fasciole well developed, reduced, or lacking. Globiferous pedicellariae characteristic, valves terminating in a single tooth, with opening of poison gland on one side. (After Mortensen, 1951.)

Type Species: *Brisus fragilis* Düben and Koren.
Remarks: Mortensen (1951) lists 7 species in this genus. Four species have a northern distribution in the Atlantic and Pacific Oceans, and 3 are known from isolated subantarctic localities.

Northern Species:
B.fragilis (Duben and Koren): Norway, Faroe Channel, south of Iceland, east coast of North America as far south as Florida, 40°-1,300 m.
B. townsendi (Agassiz): West coast of North America, from Alaska to the Gulf of Panama, 35°-1,900 m.
B. latifrons (Agassiz): West cost of North America, from Alaska to southern California. Type specimen from ca. 1,800 m.
B. owstoni Mortensen: Sagami Sea and Gulf of Tokyo, 10°-530 m.

Southern Species:
B. capensis (Studer) : off Cape Peninsula, South Africa, 215°-350 m.
B. moseleyi (Agassiz): Magellanic region, 110°-1,240 m.
B. kerguelensis Clark: Kerguelen Island, 130°-215 m.

What may possibly be a new species is described here, from near the Bounty Islands. Thus now perhaps 4 southern species are known, each from isolated localities, as also are the northern species (except B. townsendi and B. latifrons, which occur together). This southern distribution apparently represents the result of a west-wind-drift dispersal, as described by Fell (1962). Isolation with severely reduced facilities for gene flow may have resulted in the eventual formation of 4 separate species.

Brisaster ? n.sp.
Fig. 1 (3-7), Pl. 1 (5, 6).

Material Examined: Fragments from the following stations: Sta. A 702; A 703; A 710; A 712; A 714; A 747; A 753.

Description: Material comprises fragments of dorsal side of body of approximately 8 specimens. Largest fragments illustrated here (pl. 1 (5, 6)). Test apparently ovoid, approximately 70 mm long, 60 mm broad, low, vertex posterior. Frontal amb forms deep notch, with pores in single series. Anterolateral petals slightly sunken, long (27 mm), narrow (4 mm), widely divergent, angle between them approximately 90°. Petals straight to sinuate (pl. 1 (5, 6)), broadening gradually towards distal extremities, almost touching well marked peri-petalous fasciole. Posterior petals small, 10-13 mm in length (ca. ½ length of anterolateral petals), sunken, slightly sinuate, widely divergent (angle between them ca. 100°). Small keels developed between petals, that between posterior petals prominent. Peripetalous fasciole typical, not running to ventral side anteriorly, but traversing frontal notch. Latero-anal fasciole present; its course cannot be determined because of fragmentary material. In all specimens apical systems missing; fragments indicate presence of 3 genital pores. Ocular pores enlarged, closely resembling genital pores. Colour when dried light purplish to brown; petals light purple or brown.

Fragment of frontal notch with 2 types of pedicellariae and several tube feet. A single globiferous pedicellaria found. Valves enclosed by thick coat of skin, which extends down to upper part of stalk. Each valve broad, elongate (0.65 mm), curved, (fig. 1 (4, 6)). Point of valve lacks terminal teeth; no evidence of teeth ever having been present. Tridentate pedicellariae numerous, apparently all of same type, with broad leaf-like blade, narrow at base, becoming wider distally. Edges of blade with numerous serrations (fig. 1 (3)). No rostrate or ophicephalous pedicellariae found. Tube feet each with a large terminal crown supported by calcareo lamellae (fig. 1 (7)) radiating from a central point. Deposits in stems of tube feet simple rods with a small number of branches (fig. 1 (5)). Rods of average length 0.08 mm, very closely aggregated, transverse to longitudinal axis of tube foot stem.

Remarks: There is little doubt that these fragments are of a species of the genus Brisaster, but certain specific determination is impossible. The single globiferous pedicellaria is remarkable in lacking terminal teeth altogether; it is quite likely that this is an abnormal pedicellaria, for globiferous pedicellariae cannot perform their normal functions without terminal teeth. Mortensen (1951, p. 294) notes that in Brisaster kerguelensis Clark the single terminal tooth is often very short; he further states that this condition may also be found in the other species of this genus.

In the characters of the test and in the presence of a latero-anal fasciole, the present species most closely resembles B. fragilis (Duben and Koren) of the North Atlantic Ocean and B. capensis (Studer) of South Africa. On the basis of the distribution patterns of the 2 latter species, and differences in tridentate pedicellariae, petals and test shape, Mortensen (1951) regards the species as distinct, contrary to the opinion of Clark (1923) that they are identical. B. fragilis has an elongate, oval test, with petals which are curved, slightly sinuate, whereas B. capensis has a broadly rounded test and straight petals. (These characters are subject to some variation within a species, as Mortensen freely admits.) In possessing sinuate petals, the present species most closely resembles B. fragilis.

A richer material may establish the status of this species with certainty. The record of the genus Brisaster from near the Bounty Islands is of importance from the point of view of zoogeography, and establishes the fact that this genus is truly circum-polar in distribution.

Class HOLOTHUROIDAEA
Order DENDROCHIROTIDA Grube, 1835

Four of the 6 families in this order (rewised by Pawsorn and Fell, 1965) are represented in the New Zealand region. To the south of New Zealand, 3 families are represented.
Family Placothuridae Pawson and Fell, 1965

Genus Placothuria Pawson and Fell, 1965

Diagnosis: Tentacles 10, richly branched. Body U-shaped. Calcareaous ring long, with posterior processes composed of mosaic of small pieces.

Type Species: Cucumaria huttoni Dendy.

Remarks: A second species of this genus may now be recorded from south of New Zealand.

Placothuria squamata n.sp.

Fig. 2 (5-9)

Diagnosis: Like P. huttoni (Dendy), but possessing anal teeth and lacking the numerous perforated buttons in the body wall.

Material Examined: Sta. A 701, 1 specimen and 4 fragments; A 714, 1 specimen and 6 fragments; A 715, 2 fragments; D 74, fragment.

Description: Complete specimen approximately U-shaped, mouth and anus placed at ends of long "tubes". Total length measured about greater curvature 45 mm. Body rough to touch owing to presence of large overlapping scales which form a complete investing layer. Colour in alcohol—white. Tube feet poorly developed, present on ventral side of body in very small numbers; their arrangement cannot definitely be determined. Anal aperture guarded by 5 large teeth, interradial in position (fig. 2(8)), conspicuous in dried material.

Internal anatomy similar to that of P. huttoni (see Pawson, 1963). Two Polian vesicles; gonad a bunch of sparse unbranched caeca. Tentacles (retracted) white, with very small number of reddish brown spots. Radial longitudinal muscles thin straps; retractor muscles well developed.

Calcareaous deposits of body wall—large scales of average length 1.2 mm. Scales elongate, with one end rounded and other tending to be pointed (fig. 2(5)), overlapping in body wall with rounded end projecting (fig. 2(6)). Scales composed of several layers of calcareaous material, which forms a complicated network. Intermingled with scales, but occurring only in very small numbers, are perforated buttons with some irregular knobs and numerous perforations (fig. 2(9)). Average length of buttons 0.13 mm. Tentacles contain very sparsely scattered perforated rods (fig. 2(7)) of average length 0.6 mm, usually perforated at extremities. These deposits more closely aggregated at base of tentacle stem than elsewhere.

Holotype: The holotype (Reg. No. 13) and a para-type (Reg. No. P 13) are lodged in the collection of the N.Z. Oceanographic Institute, Wellington.

Remarks: This species very closely resembles the New Zealand mainland species P. huttoni in body shape, internal anatomy and poorly developed tube feet, but the presence of anal teeth and absence of small glassy buttons serve to separate the southern species from its congener. It may be argued that the specimens of P. squamata are small, and that the glassy buttons develop with growth, but this cannot be said for the anal teeth, and on the basis of these differences a new species is proposed for the southern material. As the species is here recorded from the Auckland and Bounty Islands, it may be widespread in depths of approximately 100 m.

Family Psolidae Perrier, 1902

Genus Psolus Oken, 1815

Diagnosis: Tentacles 10. Dorsal surface of body lacking tube feet, invested in scales. Mouth and anus dorsal.

Type Species: Holothuria phantapus Strussenfeldt.

Remarks: Only 1 species of this genus has been recorded from New Zealand, and that is P. neozelanidus Mortensen, an apparently rare species known on off North Cape, at a depth of 55 fm. Several psolids were dredged by the N.Z. Oceanographic Institute from near Macquarie Island. They prove to be representatives of Psolus antarcticus (Philippi).

Psolus antarcticus (Philippi)

Fig. 2(1-4)

Holothuria antarctica Philippi, 1857, p. 133.

Psolus antarcticus: Ludwig, 1898, p. 53, pl. 3, figs. 34-36 (complete list of references); Ekman, 1923, p. 42, figs. 31-33; 1925, p. 139, text-fig. 34; Deichmann, 1947, p. 339.

Material Examined: Sta. B 339, 2 specimens; D 6, 13 specimens and fragments; D 7, 7 specimens; D 8, 5 specimens; D 9, 2 specimens.

Description: Colour in alcohol light brownish yellow, sole slightly darker. Largest specimen 35 mm in total length, greatest breadth 28 mm. Dorsally body invested in large imbricating scales (Fig. 2(1)), and margin of dorsal side carries 2 to 3 rows of smaller scales. Introvert retracted, guarded by 5 triangular oral valves (fig. 2(1)). Anus placed near small marginal plates at posterior end of body, also covered by 5 valves (fig. 2(1)). Thin ventral sole bordered by 2 rows of tube feet; tube feet of inner row considerably larger than those of outer row (fig. 2(2)). These tube feet carried on ventrolateral radii; midventral radius naked, except at anterior and posterior ends, where it carries about 5 tube feet.

Calcareaous deposits of sole knobbed buttons (fig. 2(3)) of average length 0.1 mm. Each button when fully developed usually with 4 large perforations, and occasionally some smaller holes near margin. Stages in development of buttons are common (fig. 2(4)); method of formation of buttons by dichotomous branching of a simple rod can be seen. Small marginal and central knobs develop after 4 large perforations are formed. Deposits closely aggregated in sole, appearing as minute shining grains under low magnification.
Fig. 2—Psolus antarcticus (Philippi). (1) Entire animal, dorsal aspect. (2) Entire animal, ventral aspect (3) Knobbed buttons from the sole. (4) Developing sole deposits. Placothuria squamata n. sp. (5) Scales from the body wall (outline only) (6) Portion of body wall showing overlapping scales. (7) Tentacle deposits. (8) Posterior end of body, showing anal teeth. (9) Buttons from body wall. Abbreviations; a.t., anal tooth; a.v., anal valve; i.r., inter-radius; m.v.r. mid-ventral radius; o.v. oral valve; r., radius; tf., tube foot.
Remarks: The specimens are typical of the species, and cannot be distinguished from the Magellanic form. Compared with other common southern Psolus species, P. antarcticus is distinctive in possessing only 5 oral valves. P. squamatus (Müller) and P. patagonicus Ekman both have radial valves lying below and between the interradial oral valves, and thus at least 10 plates cover the introvert aperture. P. neozelandicus Mortensen, a rare species, has sole deposits which differ from those in P. antarcticus, having more perforations and lacking marginal knobs (Mortensen, 1925). P. spinuliferus Clark has smaller and more numerous dorsal plates than P. antarcticus.

Magellanic, Australasian, and Macquarie Island psolids may be keyed as follows:

1. (4) Midventral radius with tube feet throughout. P. minutus Clark

2. (3) Sole deposits baskets and plates, usually with 4 perforations, 2 large and 2 small. P. spinuliferus Clark

3. (2) Sole deposits merely plates with 4 equal-sized large perforations. P. squamatus (Müller)

4. (1) Midventral radius naked, or with only a small number of tube feet at the anterior and posterior ends.

5. (8) Only 5 inter-radial valves cover the introvert.

6. (7) Anus surrounded by 3-4 circles of small scales. Sole deposits with numerous (up to 15) perforations. P. neozelandicus Mortensen

7. (6) Anus not surrounded by small scales. Sole deposits with few (up to 10 perforations) P. antarcticus (Philippi)

8. (5) More than 5 (usually 10) valves cover the introvert.

9. (10) Oral and anal valves regular in shape. Up to 20 mm total length. P. patagonicus Ekman

10. (9) Oral and anal valves not regular in shape. Up to 80 mm total length. P. squamatus (Müller)

It has already been noted (Deichmann, 1947) that some smaller Psolus specimens from the Magellanic region which have previously been referred to P. squamatus, may possibly belong to P. patagonicus. As a juvenile, P. squamatus bears a strong resemblance to P. patagonicus.

Distribution: Psolus antarcticus is well known from the Magellanic region of South America, where it is commonly found offshore. Vaney (1906) and Ekman (1925) record the species from off Graham Land, Antarctica. Its occurrence at Wireless Bay, Macquarie Island is quite surprising, and serves to indicate that this species is possibly circum-polar in its distribution. Its known depth range is from 35–1,080 m, and it is here suggested in the light of this additional knowledge of its geographic range that P. antarcticus may tolerate depths in excess of 1,080 m.

Family PHYLLOPHORIDAE Östergren, 1907 emend. Pawson and Fell, 1965

No phyllophorids are known from south of New Zealand, although 4 species have been recorded from the New Zealand coast. A single species is here recorded from 2 Chatham Rise stations.

Genus Pentadactyla Hutton, 1879

Diagnosis: Medium-sized dendrochirotes with 20 tentacles in 2 rings. Tube feet distributed evenly over the body. Deposits either spired tables of irregular shape with rough tapered spires or smooth perforated plates.

Type Species: Thyone longidentis Hutton.

Pentadactyla longidentis (Hutton)


Material Examined: Sta. A 759, 22 specimens; Sta. A 760, 2 specimens.

Description: All but one of specimens completely contracted, approximately U-shaped. Total length, measured about greater curvature of body, ranges from 46–84 mm. Colour in alcohol—light brown, posterior end of body greyish white. Tentacles of expanded specimen yellowish white, supported on light yellow introvert. A more complete description of this species is given elsewhere (Pawson, 1963).

Remarks: No differences can be seen between these specimens and those known from the New Zealand coast.

Distribution: This Chatham Rise record of the species is not unexpected in view of its large bathymetric range (3–400 fm). P. longidentis is widespread on the New Zealand shelf and slope.

Family CUCUMARIIDAE Ludwig, 1894

emend. Pawson and Fell, 1965

Two cucumariid genera, Ocnus Forbes and Pseudocenus Panning have been recorded from south of New Zealand. Both are represented in the present collection. They may be distinguished as follows:

1. (2) Deposits plates and cups Ocnus

2. (1) Deposits plates only Pseudocenus

Genus Ocnus Forbes, 1841

Diagnosis: Calcareous ring simple without divided processes. Calcareous deposits include cups and knobbed plates of two types.

Type Species: Ocnus bruneus Forbes.

Remarks: Three species of this genus as emended by Panning (1949) are known from New Zealand waters. One, Ocnus farquhari (Mortensen), is so far known only from off North Cape. O. calcareus (Dendy) ranges the entire coast of New Zealand, and has also been described from Juan Fernandez (Ludwig, 1898). The third species, O. brevidentis (Hutton), also ranges the New Zealand coast, and Mortensen (1925) recorded this species from both the Auckland and Chatham Islands.
Ocnus brevidentis (Hutton)

*Thyane brevidentis*: Hutton, 1872, p. 16.
*Pentadactyla brevidentis*: Hutton, 1878, p. 307.
*Colochirus brevidentis*: Dendy, 1896, p. 40, pl. 5, figs. 54–61; Farquhar, 1898, p. 325.
*Cucumaria brevidentis*: Perrier, 1905, p. 110; Dendy and Hindle, 1907, p. 99; Mortensen, 1925, p. 31, fig. 26 a–b; Dawbin, 1950, p. 38, pl. 2, fig. 10.
*Ocnus brevidentis*: Panning 1949, p. 437, abb. 32.

Non: *Colochirus calceatus* Dendy, 1896; nec *Colochirus brevidentis* Ludwig, 1898, p. 442, Taf. 26, figs. 22–29 (= *Ocnus calceatus* (Dendy)).

**Material Examined**: Sta. A 729, 1 specimen; Sta. A 738, 5 specimens; Sta. A 743, 1 specimen.

**Description**: All specimens completely contracted. Colour in alcohol grey to light brown. One specimen almost black dorsally at anterior end of body. Calcareous deposits exactly similar to those figured by Dendy (1896) and Mortensen (1925).

**Remarks**: Mortensen (1925) has pointed out the differences between this species and *Ocnus calceatus* (Dendy). The knobbed buttons in *O. brevidentis* usually have 10 marginal knobs, whereas those in *O. calceatus* have 12. This difference appears to be quite constant.

**Distribution**: *O. brevidentis* is known from Great Barrier Island, Stewart Island, and the Chatham Islands (Dendy and Hindle, 1907), Cape Maria van Diemen, Slipper Island, and Auckland Islands. The present locality (Antipodes Islands) is a new record for the species, but its occurrence on such southern islands is not unexpected, and further investigations should show that *O. brevidentis* is also represented at the Bounty and Campbell Islands.

Genus *Pseudocnus* Panning, 1949

**Diagnosis**: Deposits in the body wall, a thick layer of knobbed plates, oval in shape, with the narrower ends denticate. Smaller circular knobbed plates may also occur.

**Type Species**: *Cucumaria dubiosa* Semper

**Remarks**: Panning (1949, 1951, 1962) has revised this genus, and in the 1962 paper he incorporated into the genus *Pseudocnus* several of the species he had formerly (1949) referred to *Stereoderma*, including the Auckland and Campbell Islands species *S. leoninoides* (Mortensen). More recently, Panning (1964) declared that *Stereoderma* should be regarded as a monotypic genus, comprising only the North American east coast species *S. unisemita* (Stimpson).

**Pseudocnus leoninoides** (Mortensen)

*Cucumarialeonina* Semper var.: Dendy, 1909, p. 146, pl. VI, fig. 1a–c.
*Cucumaria leoninoides*: Mortensen, 1925, p. 338, fig. 27a–b; Dawbin, 1950, p. 38.
**Pseudocnus leoninoides**: Panning, 1962, p. 74, fig. 17.

**Material Examined**: Sta. D 18, 1 specimen.

**Description**: Specimen well expanded, total length 12 mm. Colour in alcohol grey, tentacles light yellow. Characteristic knobbed perforated plates with one end denticulate completely fill body wall; no other deposits found in association with them.

**Remarks**: Both Dendy (1909) and Mortensen (1925) have given full descriptions of this species, and the present specimen conforms well with these descriptions. This species seems to be most closely related to another southern species, *P. laevigatus* (Verill), but *P. laevigatus* is brood-protecting, whereas *P. leoninoides* is not (Mortensen, 1925).

**Distribution**: *P. leoninoides* is recorded from Carnley Harbour, Auckland Islands (Dendy, 1909; Mortensen, 1925), Campbell Island (Mortensen, 1925), and the Snares (Pawson, 1965c). The present locality (approximately 150 miles NNE of Macquarie Island) somewhat extends the known range of the species.

Order **ASPIDOCHIROTIDA** Grube, 1840

Fragments of a synallactid holothurian were recovered from Sta. A 759 on the Chatham Rise. These are probably fragments of *Bathyplotes natans* (Sars), which has elsewhere (Pawson, 1965b) been recorded from the Chatham Rise.

Family **SYNALLACTIDAE** Ludwig, 1894

*Bathyplotes natans* (Sars)

**Material Examined**: Sta. A 759, fragments.

**Description**: Collection includes fragments of possibly 3 specimens. Colour yellow to white, with brown spots. Tentacles dark brown. Numbers and disposition of papillae on body wall cannot be determined. Calcareous deposits of body wall—exclusively spired tables with four arms (fig. 3 (1)). Spires composed of 4 rods joined by 2 or more crossbars. Extremities of arms perforated; number and size of perforations greatly variable, some arms having one perforation, others having up to 7 or 8. Average width of tables 0.1 mm.

Stems of tentacles, contain prickly rods (fig. 3 (3)), which may be straight, curved, or branched. Average length of rods 0.3 mm. Tentacle discs contain curved or straight rods of an entirely different type (fig. 3 (2)), of average length 0.09 mm, which carry very few small spinous projections.

**Remarks**: Despite slight differences from the specimens of *Bathyplotes* described elsewhere (Pawson, 1965b), present material is apparently *B. natans* (Sars).

**Distribution**: Atlantic and Pacific Oceans in 200–1,600 m.
Order APODIDA Brandt, 1835
Family CHIRIDOTIDAE Östergren, 1898

Three chiridotid genera are known from New Zealand. Kolostoneura Becher may be restricted to the New Zealand coast, but species of Chiridota Eschscholtz and Trochodota Ludwig have also been recorded from the islands to the south of New Zealand (Mortensen, 1925).

Chiridota and Trochodota may be readily distinguished as follows:

1. (2) Deposits include sigmoid hooks and wheels, the wheels are scattered or arranged in loose heaps ------------------------------- Trochodota
2. (1) Deposits wheels aggregated into papillae. Sigmoid hooks lacking ---------------------------------------------------------- Chiridota

Genus Chiridota Eschscholtz, 1829

Diagnosis: Tentacles 12, with 3-10 pairs of digits; the terminal pair being the longest. Deposits in the form of 6-spoked wheels collected into papillae. Sigmoid hooks lacking, but curved rods with enlarged ends may be present.

Type Species: Chiridota discolor Eschscholtz.

Chiridota carnleyensis Mortensen and C. nigra Mortensen have been recorded from the Auckland Islands (Mortensen, 1925), and the former species is restricted to the southern islands of New Zealand.

The collection includes several specimens of C. carnleyensis. The 2 species may be distinguished as follows:

1. (2) Colour black with white spots. Deposits present in radial muscles C. carnleyensis Mortensen
2. (1) Colour white transparent. No deposits in radial muscles C. nigra Mortensen

Chiridota carnleyensis Mortensen

Fig. 3 (7-8)

Chiridota carnleyensis Mortensen, 1925, p. 374, figs. 56b, 58; Heding, 1928, p. 283; Dawbin, 1950, p. 40.

Material Examined: Sta. B 175, 21 specimens; Sta. B 183, 9 specimens; Sta. B 184, 1 specimen; D 55, 1 specimen.

Description: All specimens strongly contracted, contorted, total length varying between 21 mm and 63 mm. In all specimens but one, anterior end of body completely lacking. Tentacles pinnate, with seven pairs of digits, increasing in length distally. Body wall thin, transparent; radial muscles and intestine can clearly be seen through it. Ventral inter-radii naked, but 3 dorsal inter-radii each with single row of large irregularly spaced approximately circular white papillae, of diameter 0.6–1.0 mm. Papillae are aggregations of up to ca. 100 wheels.

In all specimens intestine packed with coarse detrital material, comprising mainly small pebbles, fragments of mollusc shells, and byryoans. Ciliated funnels scattered in small clusters in left ventral and left dorsal inter-radii. They are small (0.13 mm in length) with short stalks and narrow opening (fig. 3 (8)). A very small number of large funnels, up to 0.8 mm long, present among more numerous smaller funnels. Deposits in body wall only wheels. Always aggregated into papillae. Wheels typical of those found in other Chiridota species, diameter ranging from 0.08–0.2 mm. No deposits present in radial longitudinal muscles. Tentacle digits with double rows of very closely aggregated and consequently very numerous rods, with dichotomously branched extremities (fig. 3 (7)). These C- to bracket-shaped deposits also found scattered in tentacle stems. Average length of tentacle rods 0.04 mm.

Remarks: Some slight differences between the specimens described by Mortensen and those in the present collection may be noted. Mortensen (1925) described the wheel papillae as "diffuse round heaps ... 2–3 mm in diameter," whereas here the papillae scarcely exceed a diameter of 1.0 mm. Also the ciliated funnels in Mortensen’s material were confined to the mid-dorsal, left dorsal, and right ventral inter-radii, but in the present specimens they were found only in the left ventral and left dorsal inter-radii.

However, there are good reasons for regarding the present specimens as representing C. carnleyensis on the basis of such characters as the transparent body wall, arrangement of wheel papillae, absence of radial muscle deposits, and shape of the ciliated funnels. It is probable that the position of the ciliated funnels is quite variable, as also is the size of the wheel papillae.

Distribution: Mortensen’s (1925) material was collected from Carnley Harbour in the Auckland Islands at a depth of 45 fm. The present specimens were all taken near the Auckland Islands, in depths between 45 and 202 m.

Genus Trochodota Ludwig, 1892

Diagnosis: Tentacles 10. Digits 2–6 on each side. Polian vesicle single. Calcareous ring of 10 pieces, radials not perforated. Calcareous deposits, sigmoid hooks, scattered or arranged into groups, and wheels, scattered, never grouped into papillae (Clark, 1907).

Type Species: Trochodota purpurea (Lesson).

Remarks: Trochodota is represented in New Zealand by 2 species, both of which are now also known from the southern islands. They may be distinguished as follows:

1. (2) Skin smooth, not papillate, with numerous scattered sigmoid hooks and wheels T. dunedinensis (Parker)
2. (1) Skin papillate. Sigmoid hooks arranged into groups in the papillae. Wheels numerous or scarce ------------------------------- T. dendyi Mortensen

Trochodota dunedinensis (Parker)


Material Examined: Sta. D 10, 6 specimens; Sta. D 35, 1 specimen.
DESCRIPTION: Largest specimen of total length 7 mm (contracted). All specimens light brown in alcohol, and agree in all respects with description given by Mortensen (1925) and Pawson (1963).

DISTRIBUTION: This viviparous species is common about the coasts of New Zealand, and has been recorded from the Auckland Islands (Dendy, 1909; Mortensen, 1925) and Campbell Island (Mortensen, 1925). The 2 present records, off Macquarie Island, 67 m, and off Campbell Island, 180 m, are of considerable zoogeographic importance. The species was previously unknown from Macquarie Island, and here it is definitely recorded from that area for the first time. Also T. dunedinensis has not hitherto been taken from below 9 m, and the present depths of 67–180 m indicate that though T. dunedinensis may be restricted to the shelf, it is widespread, especially to the south of New Zealand.

Trochodota dendyi Mortensen

Fig. 3 (4–6)


MATERIAL EXAMINED: Sta. D 20, fragment.

DESCRIPTION: Fragment 9 mm in length, comprising anterior extremity of body. Diameter, 4 mm. Mouth circular, surrounded by 10 tentacles, each of which carries 6–7 pairs of digits; the terminal pair being longest. Colour in alcohol—light purple, with single narrow darker purple band along each radius. Body wall papillate. Small portion of intestine remaining in fragment filled with coarse detrital material, mainly shell and bryozoan fragments.

Deposits in body wall, sigmoid hooks (fig. 3 (4) ), of average length 0.12 mm. Hooks loosely aggregated, lying in groups of 3–6 at bases of papillae. Some also scattered between papillae, more numerous along radii. Wheels absent. Tentacle stems and digits with bracket-shaped rods (fig. 3 (5) ) average length 0.05 mm, with weakly branching ends, which carry 2–5 short, sharp projections (fig. 3 (6) ).

REMARKS: The absence of wheels at first led to the inference that this fragment represented the genus Scoliorhapis Clark. This monotypic genus, consisting of the species S. theeli (Heding), is so far known only from Port Jackson, New South Wales, Australia, and is characterised by the complete lack of wheels in the body wall. Otherwise the genus is very closely allied to Trochodota Ludwig, and is obviously derived from that genus by loss of wheels.

Scoliorhapis theeli is very similar to Trochodota dendyi Mortensen, as has been pointed out by Mortensen (1925) and Heding (1928), and, apart from the invariable absence of wheels in the former species, the 2 are distinguishable chiefly on the basis of their tentacle rods, which are unbranched in the former species and branched in the latter.

In the present material the tentacle rods are definitely branched, and are identical in shape and size to those figured by Mortensen (1925), under his description of T. dendyi. The arrangement of the sigmoid hooks in the body wall of T. dendyi, the relative sizes of the tentacle digits, and to a lesser extent, the colour, are identical to those found in the present specimen.

The absence of wheels from the body wall does not appear important, as Mortensen (1925) found large specimens of T. dendyi at Stewart Island and Auckland Harbour in which wheels are scarce, and in 1 specimen he found only a single wheel, which was abnormal in structure.

DISTRIBUTION: The occurrence of T. dendyi approximately 100 miles north-west of Auckland Island in a depth of 117–126 m is surprising. Formerly, the species was known only from intertidal and shallow localities near Wellington, Auckland, and at Stewart Island. It appears that T. dendyi is a wide-ranging species in New Zealand waters, and may be found to have a wide distribution on the shelf.

COMPOSITION AND RELATIONSHIPS

Auckland, Campbell, Bounty, and Antipodes Islands

COMPOSITION

Auckland Islands—Nine species are now known from the Auckland Islands:

Pseudechinus novaezelandiae
Apatopygus recens
Oenus brevidentis
Psuedocurs leoninoides
Trachythere amokurae
Placothuria squamata
Chiridota nigra
Chiridota carneyensis
Trochodota dunedinensis

The only new record in the above list is the new species, Placothuria squamata.

Campbell Island—Four species are now known from Campbell Island:

Pseudechinus novaezelandiae
Oenus brevidentis
Psuedocurs leoninoides
Trochodota dunedinensis

Trochodota dunedinensis is a new record. All of the Campbell Island species are also known from the Auckland Islands; this is to be expected, for the islands are not far apart. It is probable that most of the species listed for the Auckland Islands will eventually be recorded also from Campbell Island.

Bounty Islands—Six species are now known from this group of small islands:

Pseudechinus novaezelandiae
Apatopygus recens
Spatangus thor
To view a copy of this license, visit http://creativecommons.org/licenses/by-nc-nd/3.0/

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.

Snares Islands (Pawson, 1965), and it is likely that zoan fauna of the southern islands is derived from an assemblage of species common to all parts of the New Zealand plateau, receives ample support from our present knowledge of the echinozoan fauna.

Ten of the 15 species are shared with the New Zealand mainland. Clearly, then, the statement made by Fell (1953) that the echinoderm fauna of these islands is derived from an assemblage of species common to all parts of the New Zealand plateau, receives ample support from our present knowledge of the echinozoan fauna.

There are four endemic species, although one, *Pseudoechinus leoninae*, has been taken from the Snares Islands (Pawson, 1965), and it is likely that the same species occurs in southern New Zealand. Apparently, the west-wind-drift has contributed no elements at the present day species level to the echinozoan fauna of the southern islands of New Zealand, but has only exhibited local influences in establishing continuity among the faunas of these islands. At the generic level the influence is somewhat stronger, several species of the seaweed-inhabiting holothurian genera *Trachythone*, *Pseudocnus*, and *Oenus*, and the echinoid *Pseudoechinus* being distributed about the subantarctic region of the Southern Hemisphere. This influence is, however, greatly overshadowed by that of the more widespread Australian, Indo-Pacific, or cosmopolitan genera such as *Trochodota*, *Chiridota*, *Goniocidaris*, *Spatangus*, *Paramareta*, and *Brisaster*, which have contributed nine species to the fauna.

The bathymetric tolerances of some of the species here considered enable them to achieve a wide distribution without recourse to drift in a pelagic larval stage. Those species which are not known from deeper waters are commonly found living on brown seaweed and may have achieved their distribution in an epipelagic manner.

After a preliminary examination of the Asterozoa from the Campbell Plateau, Fell (pers. comm.) made the following statement about three of the genera taken. “From station D 85 (49° 59' S, 170° 13' E, 330 fm), the asterozoans taken include, apart from genera already known from the New Zealand Plateau, *Lithosoma* and *Ceramaster*, two genera of Asteroidea not previously recorded from Australia. *Lithosoma* is represented by one species, probably new, but related to *L. penicillata* Fisher. The genus comprises five known species, all Indo-west-Pacific forms. This is the first record of the genus south of the tropics, the only other non-tropical species occurring in Japan. *Lithosoma* must be regarded as widely distributed in the western Pacific, and not representing a so-called Indonesian element in the New Zealand fauna.

“Ceramaster is a large genus with numerous representatives in all oceans. The species taken from Sta. D 85 has not yet been identified, but it is clear that it is not closely related to the only other known southern form, *C. patagonicus*.

“The collection also includes from Sta. D 32 (52° 08' S, 158° 50' E, 100 fm) a species of *Sokaster* (s.s.), apparently new. This genus comprises approximately 20 species, with representatives in all seas. The present species is only the second to be recorded from the New Zealand area; its precise identification and relationships have not yet been determined.”

Here, then, is some further evidence in favour of Australian, Indo-Pacific, and cosmopolitan elements contributing to the fauna of the area, whereas subantarctic and Antarctic elements are less frequently encountered.

**Macquarie Island**

**Composition**

Six species are now known from Macquarie Island:

*Pseudoechinus novaezealandiae*

*Psolus antarcticus*

*Psolus macquariensis*

*Oenus brevidensit*

*Trachythone macphersonae*

*Trochodota dunedensis*

Two species, *Psolus antarcticus* and *Trochodota dunedensis*, are new records for the area of Macquarie Island.
RELATIONSHIPS

The N.Z. Oceanographic Institute early in 1963 discovered north of Macquarie Island “a number of high spots, ranging from steep almost pinnacle-like mounts to more gently sloping seamounts, and rising to less than 100 fathoms, . . . on an almost continuous submarine ridge rising to 300 to 400 fathoms from a bottom on each side of 2,000 to 3,000 fathoms” (Dawson, 1963:312-3). Of course the existence of this ridge and its mounts and pinnacles is of great interest, as such structures as these provide ideal “stepping stones” for benthic species which may not be strongly eurybathic, enabling them to have quite a wide distribution (Brodie and Dawson, 1965). During this expedition, several specimens of Goniocidaris umbraculatum were recovered from a shallow mount, approximately 150 miles NNE of Macquarie Island. As has been noted, this is the most southern locality known for any species of Goniocidaris; and the said species, hitherto unrecovered from near the Auckland, Campbell, Bounty, Antipodes, and Chatham Islands, was regarded as having a restricted distribution about the southern coast of New Zealand. This is certainly not the case, and as its known bathymetric range is now 72–540 m, it must be assumed that this brood-protecting species will be taken from other southern localities, especially on the Campbell Plateau.

Knowledge of this newly discovered ridge also prompts a re-examination of the relationships of the echinozoan fauna of Macquarie Island. Four of the six species listed for Macquarie Island are also known from New Zealand coastal waters. Pseudochinus novaeezelandiae has a pelagic larval stage, and thus can achieve a wide distribution as a member of the plankton. Mortenson (1925) accounts for the presence of P. novaeezelandiae near Macquarie Island “through the transport of pelagic larvae”. It may be argued that the west-wind-drift would tend to carry larvae away from the Macquarie Island region rather than towards it, in which case a larva should have to completely circumnavigate Antarctica before it is able to reach Macquarie Island. But there is apparently no evidence to indicate that the west-wind-drift has been constant throughout the Tertiary, and a small recession in the drift with the attendant counter currents might enable larval transport across the relatively short gap between the Campbell Plateau and Macquarie Island. In support of this contention, Finlay (1924) has evidence suggesting that the East Australian current did not operate until the late Pliocene. Fleming (1951) states that the East Australian Current, together with the East Cape Current of New Zealand, “. . . are bodies of water moving polewards in the western south Pacific . . . probably their strength and courses varied under different climatic regimes”. As the East Australian Current impinges upon the west-wind-drift to a varying degree, any variations in the East Australian Current would naturally have some effect on the west-wind-drift, and such local variations as may arise should have some influence on the current flow between the Campbell Plateau and the vicinity of Macquarie Island. Such an influence may enable transport of planktonic larvae from east to west.

It may alternatively be postulated that as its known bathymetric range is 10–306 m, P. novaeezelandiae may have reached Macquarie Island by migration across ridges which are now known to exist. Such a method of achieving distribution is indeed the only one open to Trochodiota dunedinensis, which is a viviparous species, but has a bathymetric range of 0–180 m. Pseudopolius macquariensis is known from Macquarie Island, and is also recorded (with some doubt) from Stewart Island, New Zealand. Oenus brevidentis is also known from Macquarie Island and New Zealand, and is widespread in the southern islands. Mortensen (1925) accounts for the presence of those last two species at Macquarie Island, “through drift with the attendant counter currents might enable transport”. It may be argued that the west-wind-drift has been constant throughout the Tertiary, and a small recession in the drift with the attendant counter currents might enable larval transport across the relatively short gap between the Campbell Plateau and Macquarie Island. Mortenson (1925) has already pointed out the essentially New Zealand character of the Chatham Islands shelf echinoderm fauna, and regards the area as part of the Cook Strait sub-region (between 38°S and 46°S).

Chatham Islands relationships

The echinozoans of the Chatham Islands themselves have been listed by Fell (1960) and no further additions to that fauna have so far been discovered. Four of the echinozoans recorded from the Chatham Islands by Fell (1960), namely Apatopygus recens, Evechinus chloroticus, Chiridota gigas, and Oenus brevidentis, are also known from the New Zealand mainland.

It is also notable that Apatopygus recens and Oenus brevidentis are widespread among the southern islands of New Zealand, whereas the remainder of the species here listed for the southern islands are known from the Chatham Islands. Fell (1960) has already pointed out the essentially New Zealand character of the Chatham Islands shelf echinoderm fauna, and regards the area as part of the Cook Strait sub-region (between 38°S and 46°S).
PLATE I

*Apatopygus recens* (M. Edwards), abnormal specimens.

1. Specimen of 46 mm total length, oral side, showing naked areas posterior to peristome.
2. The same, posterior aspect, showing arched oral surface.
3. Specimen of 50 mm total length, aboral aspect, showing large gonopores (damaged).
4. The same, right lateral aspect, showing height (28 mm) of specimen.

*Brisaster* ? n.sp.

5. Fragments of aboral side of one specimen. Length of antero-lateral petals, 27 mm.
6. Fragments of aboral surfaces of two further specimens, showing sinuate antero-lateral petals, peripetalous and latero-anal fascioles.
The foregoing considerations indicate that though the faunas of both the Chatham Islands and the southern islands of New Zealand are of New Zealand character, they are themselves dissimilar. Several southern island species are represented in southern New Zealand, and a distinct relationship exists between the faunas of these two areas, a relationship paralleled by that between the echinozoans of the Cook Strait region and those of the Chatham Islands. It may therefore be inferred that the Cook Strait echinoderm fauna differs in some important respects from that of the southern part of the South Island; these differences are discussed elsewhere (Pawson, 1961; 1965d).

The differences between the faunas of the southern islands and the Chatham Islands may be due to the interposition of the deep-water Bounty Trough. This trough must hinder northward migration across the sea floor of stenobathic species from the Bounty and Antipodes Islands and the Campbell Plateau, but it presents no barrier to such species as *Apatopygus recens* which has a pelagic larval stage and *Oenus brevidentis* which inhabits seaweeds. It may be expected, therefore, that other southern island species which possess pelagic larval stages, or can adhere to rafts of weed, will be found at the Chatham Islands.

**CHATHAM RISE**

**COMPOSITION**

A revised faunal list is here presented for the Chatham Rise. The list is based on the present collection, as well as results obtained by Fell (1960), and Pawson (1965c). Most of the species listed were recovered from bathyal stations, with the exception of *Pseudechinus novaezealandiae* and *Spatangus thor*, which were taken from N.Z. Oceanographic Institute Sta. D 1 (90m).

Bathymetric ranges are given in metres. Abbreviations: N.Z., New Zealand; S.Is, southern islands of New Zealand.

- *Goniocidaris parasol* (254 m)
- *Ogmocidaris benhami* (99–720 m) N.Z.
- *Pseudechinus flemingi* (90–614 m)
- *Phormosoma bursarium* (170–2,340 m) Pacific.
- *Paramareia multituberculata* (280–600 m) Australia.
- *Bris Hopkins* (75–990 m) Indo–west-Pacific.
- *Spatangus multispinus* (36–783 m) N.Z.
- *Spatangus thor* (29–90 m) N.Z., S. Is.
- *Echinocucumis hispida* (50–1,400 m) N.Z., Atlantic.
- *Pentactocyclus longidentis* (6–720 m) N.Z.
- *Bathyplotes natans* (200–1,600 m) Cosmopolitan.
- *Molpadia antarctica* (80–1,218 m) Indo–west-Pacific, Antarctic.
- *Molpadia muscula* (100–900 m) Cosmopolitan.
- *Enypniastes eximia* (ca. 1,980 m) Pacific.

All of the above species are probably represented off the New Zealand mainland, although *Goniocidaris parasol* is known so far from but a single record. Cosmopolitan and Indo–west-Pacific influences are strongly reflected in the fauna of the Chatham Rise, as they are in the entire New Zealand bathyal echinoderm fauna.
REFERENCES


INDEX

Antipodes Is., 9, 11, 13, 16, 17, 22, 25, 26, 30
Apatopygidae, Family, 16
Apatopygus, Genus, 16
recens, 16, 25, 26, 29
Apodida, Order, 24
Aspidochirotida, Order, 22
Auckland Is., 9, 11, 16, 19, 21, 22, 24–26
Australacanis, Genus, 13
sp., 13, 26
Bathyplotes natans, 22, 23, 30
Bounty Is., 9, 10, 16, 17, 19, 22, 25, 26, 30
Brisaster, Genus, 14, 17, 26
Brisaster, ?n. sp., 18
Brissopsis oldhami, 30
Brodie, J. W., 10
Campbell Is., 9, 12, 16, 22, 25, 26
Campbell Plateau, 27, 30
Cassiduloida, Order, 16
Ceramaster, Genus, 26
patagonicus, 26
Chatham Is., 16, 17, 21, 22, 27, 30
Chatham Rise, 12, 16, 17, 21, 30
Chiridotida, Genus, 24
carnleyensis, 23–26
nigra, 24–26
Chiridotidae, Family, 24
Cidaridae, Family, 13
Cidaroida, Order, 13
Cucumariidae, Family, 21
Dawson, E. W., 10
Dendrochirotida, Order, 18
Echinocucumis hispida, 30
Echinoidea, Class, 13
Enypniastes eximia, 30
Evechinus chloroticus, 27
Fell, H. B., 10, 16, 26, 27
Goniocidarid, Genus, 13
parasol, 30
umbraculum, 13–15, 26, 27
Henricia, Genus, 27
Holothuroidea, Class, 18
Laetmogone violacea, 30
Lithosoma, Genus, 26
penichra, 26
Macquarie Is., 9, 10, 12, 16, 19, 21, 22, 25, 26
Molpadia antarctica, 30
Molpadia musculus, 30
New Zealand, 10, 15–17, 21, 24–27, 30
Oculus, Genus, 21
brevidentis, 22, 25–27, 30
Otmocidarid, benhami, 30
Opioniomys, Genus, 27
Paramaretia, Genus, 16, 17
multituberculata, 30
peloria, 17, 26
Pentadactyla, Genus, 21
longidentis, 21, 30
Phormosoma bursarium, 30
Phyllophorid, Family, 21
Placothuria, Genus, 19
squamata, 19, 20, 25, 26
Placothuriidae, Family, 19
Pseudechinus, Genus, 15
flemingi, 30
novaezeelandiae, 14, 15, 25–27, 30
Pseudocnus, Genus, 21, 22
leoninoides, 22, 25, 26
Pseudopsolus macquariensis, 26, 27
Psolidae, Family, 19
Psolus, Genus, 19
antarcticus, 19, 20, 26, 27
Schizasteridae, Family, 17
Solaster, Genus, 26
Spatangidae, Family, 16
Spatangoida, Order, 16
Spatangus, Genus, 16
multispinus, 17, 30
thor, 17, 25, 26, 30
Synallactidae, Family, 22
Temnopleuroida, Order, 15
Temnopleuridae, Family, 15
Trachythone amokurae, 25, 26
Trachythone bollonsi, 27
Trachythone farquhari, 27
Trachythone macphersonae, 26, 27
Trochodota, Genus, 24
dendyi, 23–26
dunedimensis, 24–27

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.
To view a copy of this license, visit http://creativecommons.org/licenses/by-nc-nd/3.0/
## MEMOIRS OF THE NEW ZEALAND OCEANOGRAPHIC INSTITUTE

<table>
<thead>
<tr>
<th>Memoir No.</th>
<th>Year</th>
<th>Title</th>
<th>Memoir No.</th>
<th>Year</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memoir No.</td>
<td>Year</td>
<td>Title</td>
<td>Memoir No.</td>
<td>Year</td>
<td>Title</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
<td>------</td>
<td>----------------------------------------------------------------------</td>
</tr>
</tbody>
</table>