

NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

BULLETIN 187

**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

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SUBANTARCTIC ISLANDS, MACQUARIE ISLAND,
AND THE CHATHAM RISE



Photograph: R. J. Singleton

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

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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 HMNZS *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 HMNZS *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

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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 south-east 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 Farguhar (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)
Ocnus brevidentis (Hutton)

Trachythyone amokurae (Mortensen)
Chiridota carnleyensis (Mortensen)
Apatopygus recens (M. Edwards)
Pseudocnus leoninoides (Mortensen)
Chiridota nigra Mortensen
Trochodota 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), *Ocnus calcareus* (Dendy), and *Pseudopsolus macquariensis* (Dendy). Recently, Pawson (1962) described a new species, *Trachythyone 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 ani-

mals. 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)

Sta. A 701 47° 41' S, 179° 23' E, 3/11/1962, 87 fm (159m), *Chlamys*, brachiopods, polychaete tubes.

Pseudechinus novaezealandiae (Mrtsn) 6 spec.
Apatopygus recens (Milne-Edwards) fragments
Spatangus thor Fell fragments
Placothuria squamata n.sp. 1 spec. + fragments

Sta. A 702 47° 41' S, 179° 31' E, 3/11/1962, 92 fm (168 m), pebbles, *Chlamys*, brachiopods.

Pseudechinus novaezealandiae (Mrtsn) 1 spec.
Brisaster ? n.sp. fragments

Sta. A 703 47° 42' S, 179° 39' E, 3/11/1962, 100 fm (183 m), broken shell, pebbles.

Brisaster ? n.sp. fragments

Sta. A 704 47° 42' S, 179° 27' E, 4/11/1962, 84 fm (154 m), pebbles, shell, polychaetes.

Pseudechinus novaezealandiae (Mrtsn) 1 spec. + fragments

Sta. A 705 47° 41.6' E, 179° 05.1' E, 4/11/1962, 26 fm (48 m), rocks, encrusted by sponges and hydroids.

Pseudechinus novaezealandiae (Mrtsn) 2 spec.

Sta. A 706 47° 42.7' S, 178° 43' E, 4/11/1962, 170 fm (311 m), rocks, dead shell.

Pseudechinus novaezealandiae (Mrtsn) 8 spec. + fragments
Spatangus thor Fell fragments
Paramaretia peloria Clark fragments

Sta. A 710 47° 32' S, 177° 14' E, 5/11/1962, 449 fm (913 m).

Brisaster ? n.sp. fragments

Sta. A 712 47° 47' S, 178° 42' E, 5/11/1962, 178 fm (326 m).

Brisaster ? n.sp. fragments
Spatangus thor Fell fragments

Sta. A 713 47° 45' S, 178° 52.5' E, 5/11/1962, 110 fm (201 m).

Pseudechinus novaezealandiae (Mrtsn) 2 spec.

Sta. A 714 47° 43.5' S, 179° 04' E, 5/11/1962, 90 fm (165 m), white shelly sand and pebbles.

Pseudechinus novaezealandiae (Mrtsn) fragments
Apatopygus recens (Milne-Edwards) fragments
Brisaster ? n.sp. fragments
Placothuria squamata n.sp. 1 spec. + fragments

Sta. A 715 47° 41' S, 179° 03' E, 5/11/1962, 66 fm (121 m), cobbles, pebbles, shell brachiopods, bryozoans.

Placothuria squamata n.sp. fragments

Sta. A 716 47° 49' S, 179° 04' E, 5/11/1962, 88 fm (161 m), fine shell sand with large molluscs and starfish.

Apatopygus recens (Milne-Edwards) fragments

Sta. A 717 47° 55' S, 179° 04' E, 5/11/1962, 112 fm (205 m), fine white sand with *Chlamys*.

Pseudechinus novaezealandiae (Mrtsn) 167 spec. + fragments

Sta. A 746 47° 30' S, 179° 30' E, 15/11/1962, 87 fm (159 m), *Chlamys*, sponges, bryozoans.

Pseudechinus novaezealandiae (Mrtsn) 18 spec. + fragments

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

Pseudechinus novaezealandiae (Mrtsn) fragments
Apatopygus recens (Milne-Edwards) fragments
Brisaster ? n.sp. fragment

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

Pseudechinus novaezealandiae (Mrtsn) 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 novaezealandiae (Mrtsn) 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)

Sta. A 722 49° 40.25' S, 178° 51' E, 7/11/1962, 26 fm (48 m), dark "volcanic" sand and gravel, worms, small molluscs.

Pseudechinus novaezealandiae (Mrtsn) fragment
Spatangus thor Fell fragment

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

Pseudechinus novaezealandiae (Mrtsn) 9 spec. + fragments

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

Pseudechinus novaezealandiae (Mrtsn) 2 spec. + fragments

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

Pseudechinus novaezealandiae (Mrtsn) 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 novaezealandiae (Mrtsn) 1 spec. + fragments

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

Pseudechinus novaezealandiae (Mrtsn) 1 spec.
Ocnus brevidentis (Hutton) 1 spec.

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

Pseudechinus novaezealandiae (Mrtsn) 2 spec.

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

Pseudechinus novaezealandiae (Mrtsn) 3 spec. + fragments

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

Pseudechinus novaezealandiae (Mrtsn) 3 spec. + fragments
Ocnus brevidentis (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 novaezealandiae (Mrtsn) 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 novaezealandiae (Mrtsn) fragments
Austrocidaris sp. 2 primary radioles

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

Pseudechinus novaezealandiae (Mrtsn) 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.

Ocnus brevidentis (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.

Austrocidaris sp. fragments and radiole

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 carnleyensis Mrtsn 21 spec.

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

Chiridota carnleyensis Mrtsn 9 spec.

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

Chiridota carnleyensis Mrtsn 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 novaezealandiae (Mrtsn) 2 radioles

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

Chiridota carnleyensis 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 novaezealandiae (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

Sta. D 7 55° 11.4' S, 158° 43' E, 20/4/1963, 132 fm (241 m), rocks.

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 novaezealandiae (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)

Sta. D 17 52° 31' S, 160° 31' E, 23/4/1963, 68 fm (124 m).

Goniocidaris umbraculum Hutton 5 spec.

Sta. D 18 52° 31' S, 160° 31' E, 23/4/1963, 70 fm (128 m).

Goniocidaris umbraculum Hutton 18 spec.
Pseudocnus 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 longidentis (Hutton) 22 spec.
Bathyploetes natans (Sars) fragments

Sta. A 760 43° 14' S, 176° 09' E, 21/11/1962, 202 fm (369 m).

Pentadactyla longidentis (Hutton) 2 spec.

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

Pseudechinus novaezealandiae (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
..... **Austrocidaris**

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

Genus *Austrocidaris* Clark, 1907

DIAGNOSIS: Test low. A sunken median furrow in both ambis and interambis. Pores oblique, close together. Areoles deep, well separated, sometimes confluent adorally. Secondary tubercles of same size as scrobicular tubercles. Apical system less than $\frac{1}{2}$ h.d. Primary radioles cylindrical, slender, fairly smooth. Oral primaries simple, not specialised. Secondary spines flattened, somewhat appressed. (After Mortensen, 1928.)

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 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.

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 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 interambis.

Ambis narrow (approximately 22% of interambis), 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 ambis. 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 *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 *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 epizoans, particularly tubicolous 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.

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

Chiridota carnleyensis 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

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Pseudechinus novaezealandiae (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

Sta. D 7 55° 11.4' S, 158° 43' E, 20/4/1963, 132 fm (241 m), rocks.

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 novaezealandiae (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)

Sta. D 17 52° 31' S, 160° 31' E, 23/4/1963, 68 fm (124 m).

Goniocidaris umbraculum Hutton 5 spec.

Sta. D 18 52° 31' S, 160° 31' E, 23/4/1963, 70 fm (128 m).

Goniocidaris umbraculum Hutton 18 spec.
Pseudocnus 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 longidentis (Hutton) 22 spec.
Bathyplores natans (Sars) fragments

Sta. A 760 43° 14' S, 176° 09' E, 21/11/1962, 202 fm (369 m).

Pentadactyla longidentis (Hutton) 2 spec.

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

Pseudechinus novaezealandiae (Mrtsn) 7 spec.
Spatangus thor Fell fragments

SYSTEMATICS

Class ECHINOIDEA

Order CIDAROIDA Claus, 1880

Family CIDARIDAE Gray, 1825

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..... **Goniocidaris**

Genus *Austrocidaris* Clark, 1907

DIAGNOSIS: Test low. A sunken median furrow in both ambis and interambis. Pores oblique, close together. Areoles deep, well separated, sometimes confluent adorally. Secondary tubercles of same size as scrobicular tubercles. Apical system less than $\frac{1}{2}$ h.d. Primary radioles cylindrical, slender, fairly smooth. Oral primaries simple, not specialised. Secondary spines flattened, somewhat appressed. (After Mortensen, 1928.)

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 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.

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 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 interambis.

Ambis narrow (approximately 22% of interambis), 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 ambis. 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 spines. 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 *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 *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 epizoans, particularly tubicolous 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.

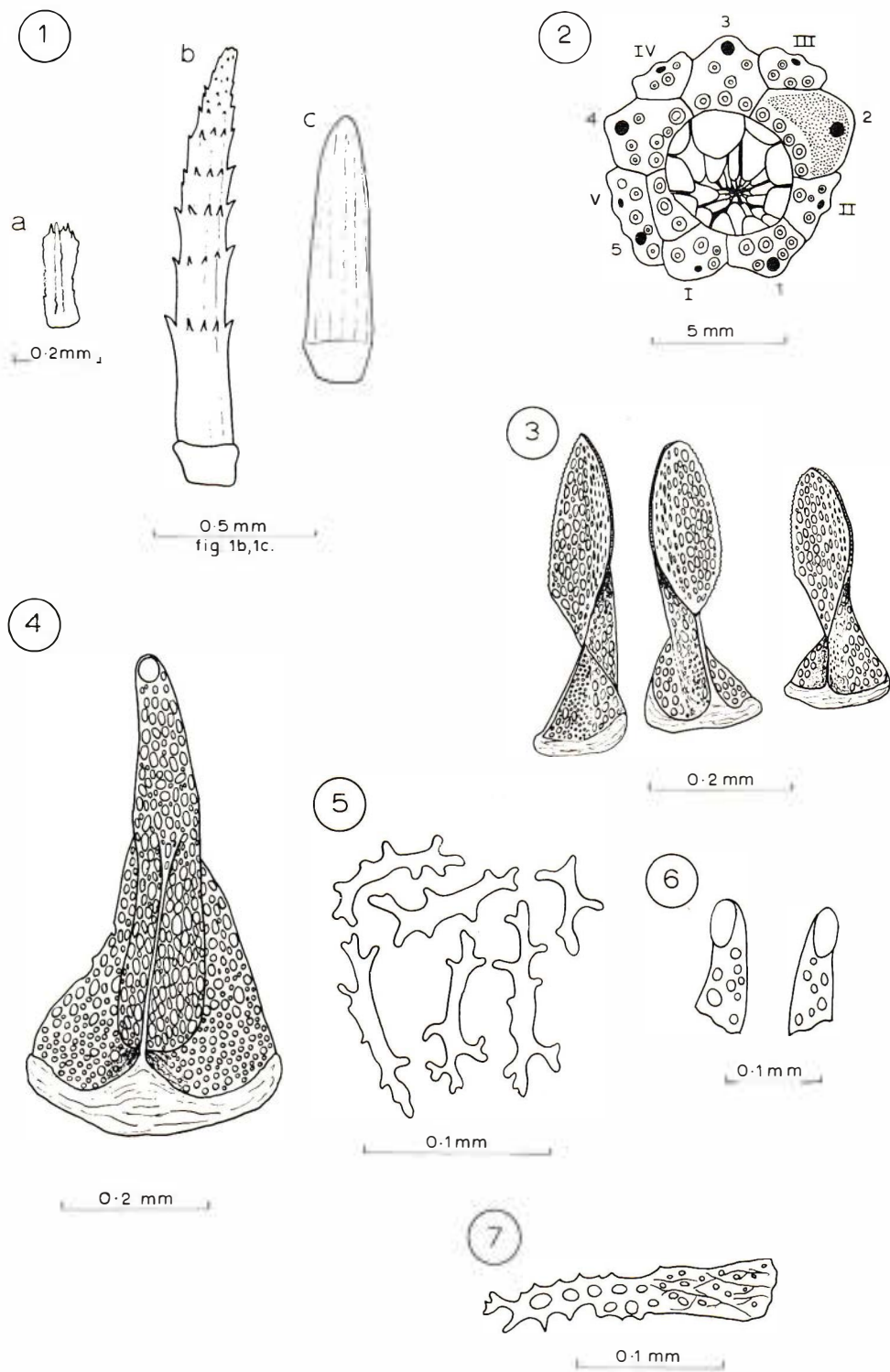


FIG. 1—*Goniocidaris umbraculum* Hutton. (1) Primary radioles; a, oral, b, ambital, c, adapical. *Pseudechinus novaezealandiae* (Mortensen). (2) Abnormal apical system. *Brisaster* ? n.sp. (3) Valves of tridentate pedicellariae. (4) Valve of globiferous pedicellaria. (5) Deposits from stem of tube foot. (6) Terminal portions of valves of globiferous pedicellaria (7) Calcareous lamella from disc of tube foot.

Pseudechinus novaezealandiae (Mortensen)

Fig. 1 (2)

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 broken; tubercles poorly developed simple circular elevations, with no distinct areoles. When dried, test very light brown. Above ambitus, primaries uniformly dark brown, as also are oral primaries. Ambital primaries light green for most of their length, brown distally.

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-Pacific.

Order TEMNOPLEUROIDA Mortensen,
1942

Family TEMNOPLEURIDAE Agassiz,
1872

Genus **Pseudechinus** 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).

Echinus angulosus: Farquhar, 1898, p. 319; Hutton, 1904, p. 289; Benham, 1909, p. 25, pl. XI, fig. 5.

Notechinus novaezealandiae Mortensen, 1921, p. 153, pl. VI, figs. 7–10, pl. VII, figs. 4, 5, 7–11; Koehler, 1926, p. 36, pl. 54.

Pseudechinus novaezealandiae: Clark, 1925, p. 119; Lambert and Thiery, 1925, p. 572; Mortensen, 1943, p. 237; Fell, 1952, p. 33; Fell, 1953, p. 105.

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 ambs and interambs. Some with light brown test, darker brown in median areas of ambs and interambs. Test colours generally dull in comparison with colours in other species of genus.

Apical systems of 50 specimens were examined; in all specimens but one, ocular I insert, and other 4 ocular plates, especially oculars III and IV, widely exsert. Anus always placed posteriorly in periproct. One specimen of 37 mm horizontal diameter has abnormal apical system (fig. 1 (2)) with oculars I and II broadly insert, and genital 5 and ocular V fused together, lying against another plate which adjoins the periproct. Ocular I also of unusual shape. Mortensen (1921) has called attention to an abnormal apical system in a specimen of 28 mm h.d. In his example, genital 4 or ocular V had divided to form 2 plates, a situation somewhat similar to that in present specimen.

In smallest specimens of h.d. 2–3 mm, spines very light green, test greenish to very light red medially in ambs and interambs, elsewhere greyish white. In apical system, all oculars exsert, and genital pores not developed. Tuberculation of plates in apical system sparse, only 1–2 tubercles to each plate. Suranal plate here conspicuous, virtually filling periproctal

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. novaezealandiae* 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 records 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 CASSIDULOIDA Agassiz and Desor, 1847

Family APATOPYGIDAE Kier, 1962

Genus *Apatopygus* Hawkins, 1920

DIAGNOSIS: Test small to medium, of ovoid outline, widest posteriorly; aboral side low vaulted, oral side more or less conspicuously concave, sunken toward the peristome. Ambis 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. Periproct in a continuous groove aborally. Tubercles perforate, 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 fragments from the following stations: Sta. A 701, fragments; 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 normal. Oral surface posterior to peristome not as densely tuberculate, and conspicuous naked areas are present (pl. 1 (1)). Also this area is concave, and specimen 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 specimen of *A. recens* known was possibly collected at the Auckland Islands (Fell, 1953). The specimen examined 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 unknown 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 *Paramaretia*, are represented 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, although *Spatangus multispinus* Mortensen and *Paramaretia multituberculata* Mortensen occur near the Chatham Islands (Fell, 1960). These may be distinguished as follows:

1 (2) Plastron fully covered by tubercles **Spatangus**

2 (1) Plastron with large naked areas **Paramaretia**

Genus *Spatangus* Gray, 1825

DIAGNOSIS: Test large, broadly oval in outline, with deep frontal groove, aboral side arched, high, oral side flat. Paired ambis form distinct petals, almost closed distally, not sunken. Pores of frontal amb small in regular single series. Apical system ethmolytic, subcentral, with 4 genital pores. Madreporite extends beyond 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 interamb 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 amb. 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 interamb, 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 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 interamb 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, Veryan 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)

Maretia 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.

Paramaretia peloria: Mortensen, 1951, p. 51; Fell, 1963, p. 8.

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 SCHIZASTERIDAE 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: *Brisaster 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 (Düben 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 coast 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. kerguelenensis 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 peripetalous fasciole. Posterior petals small, 10–13 mm in length (ca. $\frac{1}{3}$ 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 calcareous 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 kerguelenensis* 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* (Düben 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 HOLOTHUROIDEA

Order DENDROCHIROTIDA Grube,
1835

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

Family PLACOTHURIIDAE Pawson and
Fell, 1965

Genus **Placothuria** Pawson and Fell, 1965

DIAGNOSIS: Tentacles 10, richly branched. Body U-shaped. Calcareous 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, interradiial 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.

Calcareous 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 calcareous 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 paratype (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. neozelanicus* Mortensen, an apparently rare species known only from 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.

Calcareous 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.

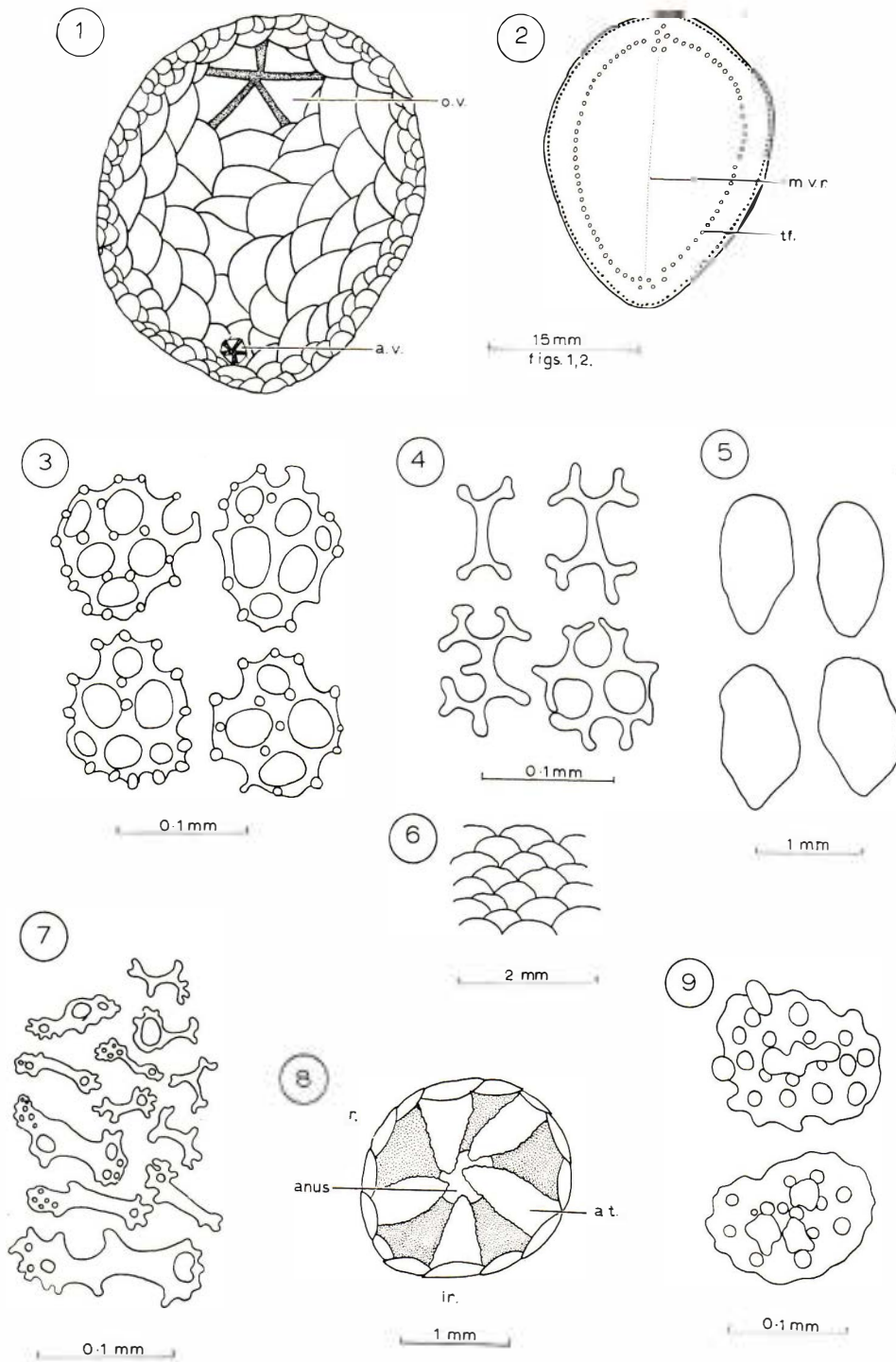


FIG. 2—*Psolus antarcticus* (Philippi). (1) Entire animal, dorsal aspect. (2) Entire animal, ventral aspect (3) Knobbed buttons from the sole. (4) Developing sole deposits. *Placothuria squamata* n. sp. (5) Scales from the body wall (outline only) (6) Portion of body wall showing overlapping scales. (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. neozelanicus* 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.
- 2 (3) Sole deposits baskets and plates, usually with 4 perforations, 2 large and 2 small.
 - *P. minutus* Clark
- 3 (2) Sole deposits merely plates with 4 equal-sized large perforations.
 - *P. spinuliferus* Clark
- 4 (1) Midventral radius naked, or with only a small number of tube feet at the anterior and posterior ends.
 - *P. neozelanicus* Mortensen
- 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. neozelanicus* 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 35-1,080m, and it is here suggested in the light of this additional knowledge of its geographic range that *P. antarcticus* may tolerate depths even in excess of 1,080 m.

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

No phylloporids 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)

Synonymy: See Pawson, 1963, p. 24.

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 *Pseudocnus* 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 **Pseudocnus**

Genus *Ocnus* Forbes, 1841

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

TYPE SPECIES: *Ocnus brunneus* 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)

Thyone 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 calcareus* Dendy, 1896; nec *Colochirus brevidentis*: Ludwig, 1898, p. 442, Taf. 26, figs. 22–29 (= *Ocnus calcareus* (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 calcareus* (Dendy). The knobbed buttons in *O. brevidentis* usually have 10 marginal knobs, whereas those in *O. calcareus* 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 denticulate. 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)

Cucumaria leonina Semper var.: Dendy, 1909, p. 146, pl. VI, fig. ia-c.

Cucumaria leoninoides: Mortensen, 1925, p. 338, fig. 27a-b; Dawbin, 1950, p. 38.

Stereoderma leoninoides: Panning, 1949, p. 422; Pawson, 1961, p. 16; 1965c, p.

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* (Verrill), 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 Snarres (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 *Bathyploetes natans* (Sars), which has elsewhere (Pawson, 1965b) been recorded from the Chatham Rise.

Family SYNALLACTIDAE Ludwig, 1894

Bathyploetes natans (Sars)

Fig. 3 (1–3)

Synonymy: See Pawson, 1965b, p. 16.

MATERIAL EXAMINED: Sta. A759, 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 *Bathyploetes* 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 into 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. nigra Mortensen |
| 2 | (1) Colour white transparent. No deposits in radial muscles | C. carnleyensis Mortensen |

Chiridota carnleyensis Mortensen

Fig. 3 (7–8)

Chiridota carnleyensis Mortensen, 1925, p. 374, figs. 56b, 58; Hedging, 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 bryozoans. 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)

Synonymy: See Pawson, 1963, p. 8.

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)

Trochodota dendyi Mortensen, 1925, p. 381, figs. 62, 63a; Dawbin, 1950, p. 40; Pawson, 1963, p. 9.

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 novaezealandiae
Apatopygus recens
Ocnus brevidentis
Pseudocnus leoninoides
Trachythyrone amokurae
Placothuria squamata
Chiridota nigra
Chiridota carnleyensis
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 novaezealandiae
Ocnus brevidentis
Pseudocnus 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 novaezealandiae
Apatopygus recens
Spatangus thor

Brisaster sp.
Paramareia peloria
Placothuria squamata

Of the above, all but *Pseudechinus novaezealandiae* are new records. Such a number of new records is expected, for the benthic fauna in the vicinity of these islands has not been thoroughly investigated.

Antipodes Islands—Four species:

Pseudechinus novaezealandiae
Spatangus thor
Austrocidaris sp.
Ocnus brevidentis

All of the above are new records. The presence of the Magellanic and Antarctic cidarid genus *Austrocidaris* in this fauna is notable.

RELATIONSHIPS

The faunal list which follows includes all echinozoan species known from the southern islands of New Zealand, and their distribution.

Abbreviations employed: N.Z., New Zealand coast; A., Auckland Islands; C., Campbell Islands; B., Bounty Islands; Antip., Antipodes Islands; M., Macquarie Island; Mag., Magellanic region of South America.

Pseudechinus novaezealandiae N.Z., A., C., B., Antip., M.
Apatopygus recens N.Z. A., B.
Spatangus thor N.Z., B.,? Antip.
Paramareia peloria N.Z., B., Australia.
Brisaster ? n.sp. B.
Goniocidaris umbraculum N.Z., 150 miles NNE of M.
Austrocidaris sp. Antip., Mag.
Placothuria squamata A., B.
Pseudocnus leoninoides A., C, Snares Islands, 150 miles NNE of M.
Ocnus brevidentis N.Z., A., C., Antip., M.
Trachythone amokurae N.Z., A.
Chiridota carnleyensis A.
Chiridota nigra N.Z., A.
Trochodota dunedinensis N.Z., A., C., M.
Trochodota dendyi N.Z., 100 miles NW of A.

Thus 15 species may now be recorded from the southern islands.

By far the most widespread of these species is *Pseudechinus novaezealandiae*, which is known from New Zealand and all of the southern islands. *Ocnus brevidentis* is known from all localities except the Bounty Islands, and it is expected that the species also occurs there.

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, *Pseudocnus leoninoides*, 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 *Ocnus*, and the echinoid *Pseudechinus* 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*, *Paramareia*, 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 Australasia. *Lithosoma* is represented by one species, probably new, but related to *L. penichra* 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 *Solaster* (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:

Pseudechinus novaezealandiae
Psolus antarcticus
Pseudopsolus macquariensis
Ocnus brevidentis
Trachythone macphersonae
Trochodota dunedinensis

Two species, *Psolus antarcticus* and *Trochodota dunedinensis*, 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 umbraculum* 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 unrecorded 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. *Pseudechinus novaezealandiae* 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. novaezealandiae* 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. novaezealandiae* 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 *Trochodota dunedinensis*, which is a viviparous species, but has a bathymetric range of 0-180 m. *Pseudopsolus macquariensis* is known from Macquarie Island, and is also recorded (with some doubt) from Stewart Island, New Zealand. *Ocnus 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 by transport on floating algae, a theory which has received considerable support from the observations of Mortensen (1925, 1933) and Fell (1962).

Trachythyone macphersonae Pawson is apparently an endemic species but related species of the same genus, *T. bollonsi* (Mortensen) and *T. farquhari* (Mortensen) are known from New Zealand.

Psolus antarcticus is now known from the southern (Magellanic) portion of South America, Graham Land (Antarctica), and Macquarie Island. The distribution of this virtually sedentary species with a bathymetric range of 35-1,080 m must have been achieved by spreading across the deep sea floor, and *P. antarcticus* should be found in several other subantarctic localities.

On the basis of the new data here presented on the composition of the echinozoan fauna of Macquarie Island, the conclusion can be drawn that the fauna does in fact display a close relationship to that of New Zealand and the Campbell Plateau. There is also a small degree of endemism and some affinities with the Antarctic fauna. However, only six species are being considered here. As the fauna becomes better known, a more definite pattern should emerge. Some of the present data have already been utilised in the most recent consideration of biogeographic problems of this region (Dawson, 1965). The few additional asterozoans collected by the N.Z. Oceanographic Institute from near Macquarie Island have not as yet been described, but they include species of *Henricia* and *Ophiomyxa*: of these, *Ophiomyxa* at least is likely to be a derivative of the adjacent temperate Pacific (Fell, pers. comm.).

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 *Ocnus brevidentis*, are also known from the New Zealand mainland.

It is also notable that *Apatopygus recens* and *Ocnus 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).

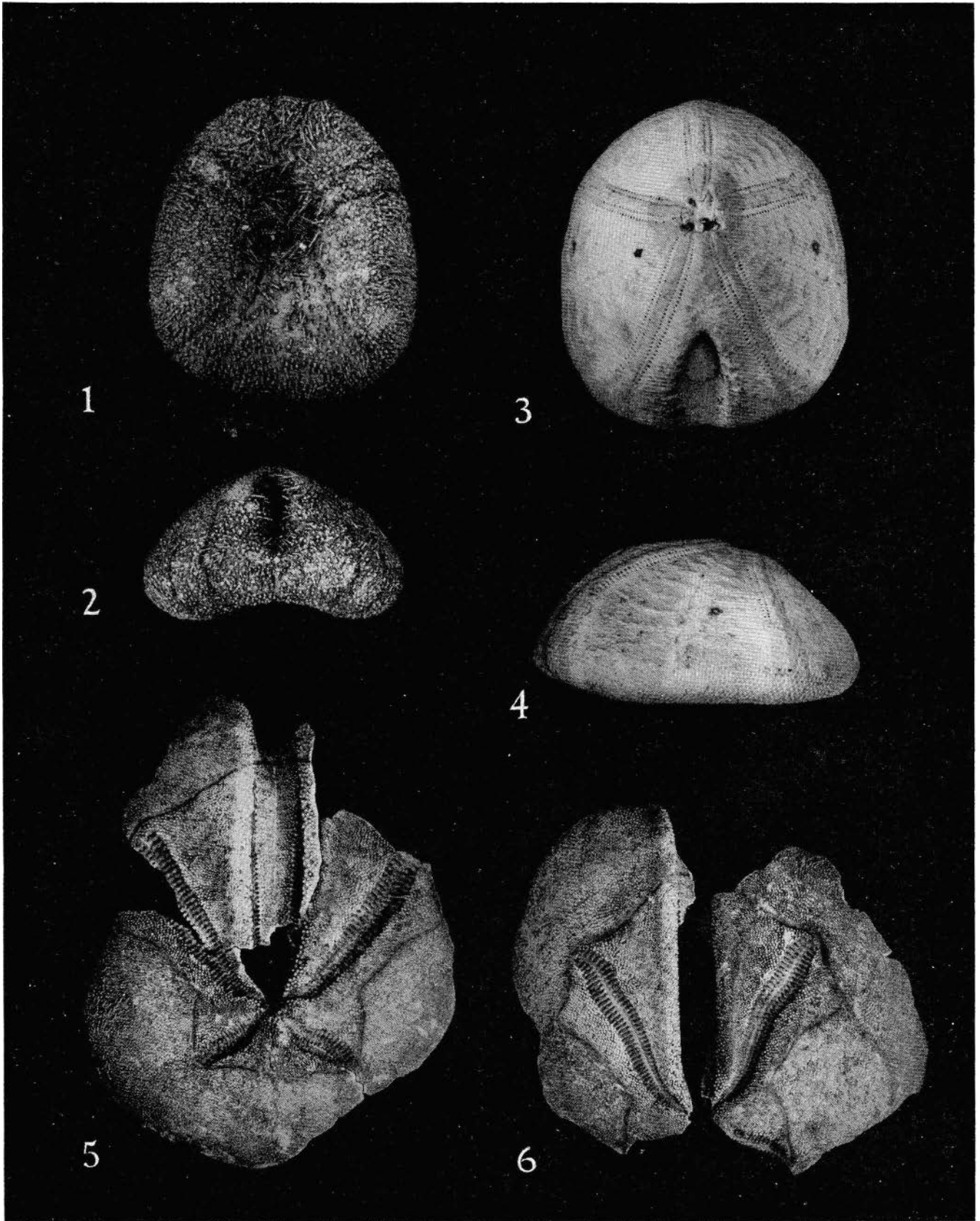
PLATE I

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.



1

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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 *Ocnus 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 novaezealandiae* (10-306 m) N.Z., S. Is.
- Pseudechinus flemingi* (90-614 m)
- Phormosoma bursarium* (170-2,340 m) Pacific.
- Paramaretia multituberculata* (280-600 m) Australia.
- Brissopsis oldhami* (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.
- Pentadactyla longidentis* (6-720 m) N.Z.
- Bathyploetes natans* (200-1,600 m) Cosmopolitan.
- Molpadia antarctica* (80-1,218 m) Indo-west-Pacific, Antarctic.
- Molpadia musculus* (100-900 m) Cosmopolitan.
- Enyppiastes eximia* (ca. 1,980 m) Pacific.
- Laetmogone violacea* (450-3,240 m) Cosmopolitan.

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.

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