

HOLOTHUROIDEA FROM CHILE

REPORT NO. 46 OF THE LUND UNIVERSITY CHILE EXPEDITION 1948-1949

By

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ABSTRACT

A total of 509 specimens, representing 11 genera and 12 species, were collected by the Lund University Chile Expedition 1958-59, and are described here. There are no new taxa or new records but the collection affords valuable new data on the distribution of several species, their bathymetric range and habitat preference. A key to the Chilean holothurians is given, together with a checklist of the 27 species now known from the area. A second small collection of 13 specimens from another source includes two specimens of *Ypsilothuria bitentaculata* (LUDWIG), a new record for the Chilean region.

The holothurian fauna of Chile is notable in that it appears to include no members of the Order Aspidochirotida in shallow water, although one species is common at Juan Fernandez. Less than 15 per cent of the species are endemic, about 50 per cent are shared with Argentina, and about 33 per cent are more or less widely distributed in the subantarctic islands. It is likely that a significant part of the fauna was derived from a pool of circumpolar species; at the generic level, some relationships with the Indo-west-Pacific generally are evident.

INTRODUCTION

This paper comprises an account of the holothurians collected in Chile by the Lund University Chile Expedition 1948—1949. In addition, a small collection of some six species, sent to me by Mr. JORGE CASTILLO A. of the University of Concepción, Chile, is also described. The collections proved to contain no new taxa, but they included 16 of the 27 species now known from Chile, and supplied interesting new data on distribution and ecology of several species.

The holothurian fauna of Chile is now quite well known. The most recent papers on the fauna are those of DEICHMANN (1947) and PAWSON (1964). DEICHMANN (1947) published an important paper on the shallow water holothurians of the vicinity of Cape Horn, with keys and diagnoses for all species; her report did not include any of the species known from the northern part of Chile. PAWSON (1964) described the ten species of holothurians collected by the Royal Society of London Expedition to southern Chile, 1958—1959.

The Lund University Chile Expedition 1948—49 made extensive collections of marine organisms between September 1948 and July 1949. A detailed general account of the Expedition was published by BRATTSTRÖM & DAHL (1952). The collection of holothurians was entrusted to me for study by Professor HANS BRATTSTRÖM and Professor ERIK DAHL, through the kind intercession of Dr. F. JENSENIUS MADSEN of the Zoological Museum, Copenhagen, Denmark. Dr. MADSEN had already made some preliminary identifications of several of the specimens in the collection, and very generously made available to me some of his rough notes, and translations from the Swedish of field notes which were made by biologists during the course of the expedition. I am very grateful to Drs. BRATTSTRÖM, DAHL, and MADSEN for giving me access to this interesting collection, and to Mr. CASTILLO for his generous cooperation.

SCOPE OF THIS REPORT

It has not been considered necessary to include diagnoses and descriptions of all species; these can be found in DEICHMANN (1947) and PAWSON (1964). However, a general key to the Chilean species is given here, and should prove to be an aid in routine identifications. Several name changes have occurred since the publication of DEICHMANN's paper. These stem largely from the work of PANNING (1949 et al.) and PAWSON & FELL (1965). To avoid possible future confusion, a checklist of the Chilean holothurians, giving names used by DEICHMANN (1947) and those in current use is included here.

Under descriptions of species, the color notes from life and some ecological data were extracted from diaries maintained by the biologists on the expedition; these notes afforded hitherto unknown information on the color and habits of several species. The distribution, habitat, and bathymetric range of each species is discussed.

Checklist of Chilean holothurians

| As cited in DEICHMANN (1947) | Currently accepted name |
|--------------------------------------|--|
| <i>Cucumaria crocea</i> LESSON | <i>Cladodactyla crocea</i> (LESSON) |
| <i>Thyone spectabilis</i> LUDWIG | <i>Hemioedema spectabilis</i> (LUDWIG) |
| <i>Cucumaria leonina</i> SEMPER | <i>Pseudocnus dubiosus leoninus</i> (SEMPER) |
| <i>Cucumaria laevigata</i> (VERRILL) | <i>Pseudocnus perrieri</i> (EKMAN) |
| <i>Cucumaria godeffroyi</i> SEMPER | <i>Cucumaria godeffroyi</i> SEMPER |
| <i>Cucumaria chiloensis</i> LUDWIG | <i>Pentamera chiloensis</i> (LUDWIG) |
| Not listed | <i>Athyonidium chilensis</i> (SEMPER) |
| Not listed | <i>Pattalus mollis</i> SELENKA |
| <i>Cucumaria parva</i> LUDWIG | <i>Trachythone parva</i> (LUDWIG) |
| <i>Thyone lechleri</i> Lampert | <i>Trachythone lechleri</i> (LAMPERT) |
| <i>Psolidium dorsipes</i> LUDWIG | <i>Psolidium dorsipes</i> LUDWIG |
| <i>Psolidium disciformis</i> (THEEL) | <i>Psolidium disciformis</i> (THEEL) |
| <i>Psolidium convergens</i> HEROUARD | <i>Neopsolidium convergens</i> (HEROUARD) |
| <i>Psolus antarcticus</i> (PHILIPPI) | <i>Psolus antarcticus</i> (PHILIPPI) |
| <i>Psolus squamatus</i> (MÜLLER) | <i>Psolus squamatus</i> (MÜLLER) |
| <i>Psolus patagonicus</i> EKMAN | <i>Psolus patagonicus</i> EKMAN |
| Not listed | <i>Ypsilothuria bitentaculata</i> (LUDWIG) |

The following names remain unchanged: *Molpadia musculus* (Risso), *Molpadia amorphia* CLARK, *Molpadia antarctica* (THEEL), *Paracaudina chilensis* (MÜLLER), *Hedingia planapertura* (CLARK), *Chiridota marenzelleri* PERRIER, *Chiridota pisanii* LUDWIG, *Taeniogyrus contortus* (LUDWIG), *Trochodota purpurea* (Lesson), *Anapta fallax* LAMPERT.

No species in the Order Aspidochirotida have been reported with certainty from Chilean waters. Three species, *Stichopus fuscus* LUDWIG, *Holothuria patagonicus* PERRIER, and *Holothuria pardalis* SELENKA have been recorded from southern Chile or Argentina, but it has been shown that in the case of all of these species the records are unreliable, and probably the specimens involved were incorrectly labelled (DEICHMANN 1947). SEMPER's (1868) species *Holothuria chilensis* was based on a large single specimen 30 cm long, supposedly collected from "Chile". The species has not been collected since, and I suspect that the labelling of the specimen was also incorrect.

COMPOSITION AND RELATIONSHIPS OF THE CHILEAN FAUNA

Composition. A notable feature of the Chilean fauna is the apparent absence of shallow water members of the Order Aspidochirotida; in this respect Chile parallels New Zealand, where only two shallow water aspidochirotids occur. It is also notable that about 60 percent of the Chilean holothurians are dendrochirotids.

A study of the distribution of the holothurians along the coast of Chile gives no definite evidence of provincial patterns of distribution, although there is a

dramatic increase in number of species south of 52–53°S. This has already been noted by PAWSON (1964). The presence of the Straits of Magellan in these latitudes undoubtedly has a strong influence on the composition of the fauna in that area. Around 40–42°S, one finds the northern limit of the distribution of *Chiridota pisanii* and *Anapta fallax* and the southern limits of *Athyonidium chilensis* and *Cucumaria godeffroyi*. Future investigations in these two areas should be rewarding.

Relationships. The relationships of the Chilean fauna have been discussed by DEICHMANN (1947) and PAWSON (1964), and a lengthy discussion here is not necessary. The distribution of the 27 known species is as follows:

1. Endemic—4 (*Psolidium disciformis*, *Cucumaria godeffroyi*, *Molpadia amorphia*, *Hedingia planapertura*). It is probable that all except *Cucumaria godeffroyi* will prove to be widely distributed, as they are relatively deep water forms. At least they should be discovered off Peru and Argentina.

2. Also in Peru—4 (*Pattalus mollis*, *Athyonidium chilensis*, *Cucumaria godeffroyi*, *Pentamera chiloensis*).

3. Also in Argentina—13 (*Psolus patagonicus*, *Psolidium dorsipes*, *Hemioedema spectabilis*, *Cladodactyla crocea*, *Pseudocnus dubiosus leoninus*, *Pseudocnus perrieri*, *Neopsolidium convergens*, *Trachythyone lechleri*, *Trachythyone parva*, *Chiridota marenzelleri*, *Chiridota pisanii*, *Trochodota purpurea*, *Anapta fallax*).

4. Also in Antarctica—4 (*Psolus antarcticus*, *Hemioedema spectabilis*, *Trachythyone parva*, *Taeniogyrus contortus*).

5. Also at one or more subantarctic islands—9 (*Psolus antarcticus*, *Hemioedema spectabilis*, *Cladodactyla crocea*, *Pseudocnus perrieri*, *Neopsolidium convergens*, *Trachythyone lechleri*, *Trachythyone parva*, *Taeniogyrus contortus*, *Trochodota purpurea*).

6. Elsewhere in the Pacific Ocean or cosmopolitan—6 (*Psolus squamatus*, *Pentamera chiloensis*, *Ypsilothuria bitentaculata*, *Molpadia musculus*, *Molpadia antarctica*, *Paracaudina chilensis*).

7. Also in New Zealand—none. *Ocnus calcareus* (DENDY) occurs in New Zealand and at Juan Fernandez Is., but is as yet unknown from the Chilean mainland.

It can be seen from the above table that the holothurian fauna of southern Argentina is very closely related to that of southern Chile; this is to be expected in view of the close proximity of these two countries. It is notable that nine species occur in the subantarctic islands. There is no tangible evidence that the Chilean fauna was derived from further north, and it seems most likely that a significant part of the fauna was derived from a pool of southern circumpolar species. At the generic level, some relationships with New Zealand and the Indo-west-Pacific generally are evident.

Key to the Chilean holothurians

- 1 (34) Tube feet present on body wall (sometimes inconspicuous). Body approximately cylindrical, sometimes U-shaped, never long and wormlike.
- 2 (13) Body partly or completely invested by overlapping scales, forming a test.
- 3 (4) Body completely invested by scales. Tentacles digitiform. *Ypsilothuria bitentaculata* (LUDWIG)
- 4 (3) Body partly invested by scales. Tentacles dendritic.
- 5 (8) Dorsal surface with tube feet. Midventral radius with numerous tube feet.
- 6 (7) Deposits of sole four-holed buttons with marginal knobs . . . *Psolidium dorsipes* LUDWIG
- 7 (6) Deposits of sole four-holed buttons with marginal knobs and also thin, smooth oval plates with few perforations or none *Psolidium disciformis* (THEEL)
- 8 (5) Dorsal surface without tube feet. Midventral radius with few tube feet or none.
- 9 (12) Five subequal oral valves, with or without radial valves internal to them.
- 10 (11) No radial valves. Large species (up to 55 mm) *Psolus antarcticus* (PHILIPPI)
- 11 (10) Five small radial valves. Small species (up to 20 mm) *Psolus patagonicus* EKMANN
- 12 (9) Oral valves irregularly developed; more than five in adult specimens. Large species (up to 80 mm). *Psolus squamatus* (MÜLLER)
- 13 (2) Body without overlapping scales. Calcareous deposits generally reduced to microscopic spicules.
- 14 (15) Calcareous ring with posterior projections on radial pieces; body wall deposits as tables *Pentamera chilensis* (LUDWIG)
- 15 (14) No posterior projections on calcareous ring. Deposits do not include tables.
- 16 (29) Calcareous deposits merely plates or rods and/or buttons; no cups.
- 17 (26) Tentacles ten.
- 18 (21) Plates or rods smooth, without knobs or superficial secondary network.
- 19 (20) Tube feet scattered all over body surface; deposits rods *Hemioedema spectabilis* (LUDWIG)
- 20 (19) Tube feet mostly restricted to radii; deposits plates . . . *Cladodactyla crocea* (LESSON)
- 21 (18) Plates with small or large knobs or with a secondary superficial network.
- 22 (25) Plates usually pine-cone shaped, with conspicuous knobs; usually one end of plate denticulate.
- 23 (24) Four-holed knobbed buttons present *Pseudocnus dubiosus leoninus* (SEMPER)
- 24 (23) No four-holed knobbed buttons *Pseudocnus perrieri* (EKMANN)
- 25 (22) Plates not pine-cone shaped; knobs usually inconspicuous. Plates with spinous edge and surface *Cucumaria godeffroyi* SEMPER
- 26 (17) Tentacles 20.
- 27 (28) Five large outer pairs and five smaller inner pairs of tentacles *Athyonidium chilensis* (SEMPER)
- 28 (27) Tentacles approximately of equal size, arranged in a single ring *Pattalus mollis* SELENKA
- 29 (16) Calcareous deposits include plates and cups.
- 30 (31) Cups restricted to dorsal surface of body *Neopsolidium convergens* (HEROUARD)
- 31 (30) Cups not restricted to dorsal surface of body.
- 32 (33) Deposits include rudimentary cups and small round plates with few perforations or none *Trachythone lechleri* (LAMPERT)
- 33 (32) Deposits include well developed cups and perforated plates *Trachythone parva* (LUDWIG)
- 34 (1) No tube feet on body wall. Body either cylindrical, wormlike, or stout with a distinct tail, but never U-shaped.
- 35 (44) Body stout anteriorly, tapering to a distinct tail region. Tentacles 15, short, with simple finger-like processes.

- 36 (41) Tentacles with 1—3 pairs of digits and a terminal digit. Deposits include tables, fusiform perforated rods, anchors, and associated plates. Body wall often red, due to presence of numerous phosphatic deposits.
- 37 (38) Deposits include fusiform rods with 3—6 central perforations, and tables with single pillar. *Molpadia musculus* (Risso)
- 38 (37) No fusiform rods; tables (when present) with three pillars.
- 39 (40) Tables deformed; phosphatic deposits always present *Molpadia amorphia* CLARK
- 40 (39) Tables normal, tending to disappear in large specimens; phosphatic deposits extremely rare or absent *Molpadia antarctica* (THEEL)
- 41 (36) Tentacles with two pairs of digits and no terminal digit. Deposits large tables or plates or small crossed cups. Phosphatic deposits, anchors, and anchor plates absent.
- 42 (43) Deposits crossed cups. *Paracaudina chilensis* (MÜLLER)
- 43 (42) Deposits large tables with high spires *Hedingia planapertura* (CLARK)
- 44 (35) Body cylindrical, wormlike. Tentacles 10—12, either pinnate or bearing finger-like processes.
- 45 (52) Deposits include wheels.
- 46 (49) No sigmoid bodies present. Wheels aggregated into papillae.
- 47 (48) Skin with stellate perforated plates *Chiridota marenzelleri* PERRIER
- 48 (47) No stellate plates in skin *Chiridota pisanii* LUDWIG
- 49 (46) Sigmoid bodies present. Wheels aggregated into papillae or scattered in body wall.
- 50 (51) Wheels aggregated into papillae *Taeniogyrus contortus* (LUDWIG)
- 51 (50) Wheels scattered *Trochodota purpurea* (LESSON)
- 52 (45) Wheels absent *Anapta fallax* LAMPERT

STATION DATA

St. M6. Canal Chacao, Bahía de Ancud, Playa Brava, between Punta San Antonio and Punta Colorada, 41°51'35"S, 73°49'20"W, tidal belt, rocks and boulders, 16 Oct. 1949. *Athyonidium chilensis* (1).¹

St. M14. Seno Reloncaví, the bay off Puerto Montt, between Isla Tenglo and Punta Pilluco, 41°30'05"S, 72°56'22"W, 225 m, small stones and boulders in fine sand, Agassiz trawl, 1 Dec. 1948. *Psolus squamatus* (36).

St. M16. Seno Reloncaví, Piedra Azul, NW of Punta Quillaiepe, 41°31'30"S, 72°48'15"W, 40—55 m, sand and small stones, commercial fish trawl, 4 and 10 Dec. 1948. *Psolus squamatus* (6), *Paracaudina chilensis* (1 fragment).—30 m, hard, grey coarse sand, Agassiz trawl, van Veen grab, circular dredge, 14 Dec. 1948. *Paracaudina chilensis* (3 fragments).

St. M17. Golfo de Ancud, Canal Calbuco, E of church in Calbuco, 41°46'30"S, 73°06'45"W, 30 m, grey sand and small stones, Agassiz trawl, triangular dredge, 14 Dec. 1948. *Cucumaria godeffroyi* (9), *Pseudocnus dubiosus leoninus* (4).

St. M20. Golfo de Ancud, Estero Huito, central part, 41°43'50"S, 73°10'15"W, 15 m, very fine sand mixed with mud, triangular and circular dredges, Agassiz trawl, 15 Dec. 1948. *Paracaudina chilensis* (6 fragments).

St. M21. Golfo de Ancud, Canal Calbuco, between Punta Meimen and Punta Pinto, 41°48'50"S, 73°09'40"W, 25 m, small stones, triangular dredge, Agassiz trawl, 15 Dec. 1948. *Cucumaria godeffroyi* (1), *Pseudocnus dubiosus leoninus* (15).

¹) The number in brackets refers to the number of specimens.

St. M22. Golfo de Ancud, Isla Quenu, Punta Pinto, western side, $41^{\circ}49'15''\text{S}$, $73^{\circ}10'15''\text{W}$, tidal belt, rather exposed, boulders and stones in sand, 16 Dec. 1948. *Cucumaria godeffroyi* (2), *Chiridota* sp. (2).

St. M24. Seno Reloncaví, S of Isla Guar, W of Bajo Pucari, $41^{\circ}44'25''\text{S}$, $72^{\circ}55'45''\text{W}$, ca. 70 m, sand with shells, Agassiz trawl, 16 Dec. 1948. *Pseudocnus dubiosus leoninus* (9).

St. M25. Seno Reloncaví, S of Isla Guar, SW of Bajo Pucari, $41^{\circ}44'45''\text{S}$, $72^{\circ}55'\text{W}$, ca. 150 m, probably hard sand, hand line, 16 Dec. 1948. *Psolus squamatus* (1) (specimen possibly incorrectly labelled).

St. M27. Golfo de Ancud, between Isla Quenu and Isla Chidguapi, $41^{\circ}49'40''\text{S}$, $73^{\circ}08'\text{W}$, 45 m, coarse sand with shells, Agassiz trawl, triangular dredge, 3 May 1949. *Cucumaria godeffroyi* (4), *Psolus squamatus* (1), *Pseudocnus perrieri* (1), *Pseudocnus dubiosus leoninus* (5), *Dendrochirote* juvenile (1).

St. M38. Golfo de Ancud, SW of Isla Quellín, $41^{\circ}55'\text{S}$, $72^{\circ}58'\text{W}$, 300 m, fine clay with fragments of polychaete tubes, Agassiz trawl, triangular dredge, Petersen grab, 22 Jan. 1949. *Anapta fallax* (75 specimens and fragments).

St. M40. Seno Reloncaví, N of Isla Quellín, $41^{\circ}51'\text{S}$, $72^{\circ}55'\text{W}$, 100 m, small stones, probably on hard sand, Agassiz trawl, triangular dredge, 23 Jan. 1949. *Psolus squamatus* (1), *Pseudocnus dubiosus leoninus* (2).

St. M41. Golfo de Ancud, ESE of Isla Tac, $42^{\circ}26'40''\text{S}$, $72^{\circ}59'\text{W}$, 250–300 metres, sand and clay with small stones and shells, triangular dredge, 23 Jan. 1949. *Psolus squamatus* (20), *Pseudocnus dubiosus leoninus* (4).

St. M42. Golfo de Ancud, Paso Tenaun, S of Punta Tenaun, $42^{\circ}20'50''\text{S}$, $73^{\circ}22'\text{W}$, ca. 70 m, hard bottom, triangular dredge, 24 Jan. 1949. *Taeniogyrus contortus* (13).

St. M44. Golfo de Ancud, SW of Isla Tabon, $41^{\circ}58'\text{S}$, $73^{\circ}18'\text{W}$, ca. 200 m, fine sand mixed with clay, triangular dredge, 24 Jan. 1949. *Psolus squamatus* (3).

St. M47. Seno Reloncaví, Paso Maillén, between Punta Panitao and Punta Puchegui, $41^{\circ}33'45''\text{S}$, $73^{\circ}02'05''\text{W}$, ca. 22 m, coarse sand with *Chaetopterus* tubes, small stones with calcareous algae, triangular dredge, 25 Jan. 1949. *Pseudocnus dubiosus leoninus* (18).

St. M65. Golfo Corcovado, Bajo Vettor Pisani, $42^{\circ}46'30''\text{S}$, $73^{\circ}28'10''\text{W}$, 8 m, rather coarse clean sand, circular dredge, 17 Feb. 1949. *Chiridota* sp. (1).

St. M74. Archipiélago de los Chonos, Canal Moraleta, Puerto Lagunas, $45^{\circ}17'\text{S}$, $73^{\circ}45'\text{W}$, 5–7 m, stones with algae and Mytilidae, diving, 22 Feb. 1949. *Pseudocnus dubiosus leoninus* (5).

St. M80. Estero Reloncaví, outer part, midwaters, $41^{\circ}43'18''\text{S}$, $72^{\circ}38'15''\text{W}$, ca. 470 m, grey mud, Agassiz trawl, circular and triangular dredges, 30 Mar. 1949. *Molpadia antarctica* (1).

St. M83. Estero Reloncaví, central part, W of Río Puelo, $41^{\circ}38'05''\text{S}$, $72^{\circ}20'45''\text{W}$, ca. 170 m, very fine mud mixed with sand, Agassiz trawl, circular and triangular dredges, 31 Mar. 1949. *Molpadia antarctica* (1), *Molpadia* species A (1).

St. M91. Seno Reloncaví, Ensenada de Guatral, SW of Punta Guatral, $41^{\circ}43'\text{S}$, $73^{\circ}03'15''\text{W}$, tidal belt, rather sheltered, boulders and stones on sand, sampling by hand, 13 April 1949. *Cucumaria godeffroyi* (22), *Pseudocnus dubiosus leoninus* (5), *Chiridota pisanii* (1).

St. M95. Canal Chacao, Golfo de Quetalmahué, SW of Punta Aucan, $41^{\circ}51'\text{S}$, $73^{\circ}57'10''\text{W}$, 6–7 m, muddy sand covered with dead algae and shells, triangular and rectangular dredges, 4 May 1949. *Pseudocnus dubiosus leoninus* (1).

St. M98. Canal Chacao, Bahía de Ancud, SE of Punta Ahui, $41^{\circ}50'10''\text{S}$, $73^{\circ}51'20''\text{W}$, 8 m, small stones with algae, triangular and rectangular dredges, 5 May 1949. *Pseudocnus dubiosus leoninus* (2).

St. M99. Canal Chacao, E of Punta Corona, $41^{\circ}47'12''\text{S}$, $73^{\circ}52'23''\text{W}$, 25 m, small stones with calcareous algae, rectangular dredge, 5 May 1949. *Anapta fallax* (1).

St. M103. Canal Chacao, N of Punta Soledad, 41°48'50"S, 73°31'30"W, 40 m, stones and polychaete tubes, triangular dredge, 5 May 1949. *Cucumaria godeffroyi* (1), *Pseudocnus dubiosus leoninus* (22).

St. M104. Golfo de Ancud, SE of Punta Tres Cruces, NE of Punta Piedras, 41°50'30"S, 73°28'30"W, 50–60 m, stones, clinkers, triangular dredge, 5 May 1949. *Cucumaria godeffroyi* (42), *Pseudocnus perrieri* (2).

St. M106. Golfo de Ancud, between Punta Abtao and Isla Abtao, 41°48'40"S, 73°21'W, 36 m, coarse sand and shells, triangular dredge, 5 May 1949. *Psolus squamatus* (5).

St. M107. Golfo de Ancud, N of Punta Barranco at Isla Abtao, 41°47'18"S, 73°20'55"W, 60 m, coarse sand with mud and dead algae, Agassiz trawl, circular and triangular dredges, Petersen grab, 5 and 6 May 1949. *Paracaudina chilensis* (1+22 fragments).

St. M108. Golfo de Ancud, Canal San Antonio, 41°44'10"S, 73°15'15"W, 15 m, coarse shell sand and dead algae, triangular dredge, 6 May 1949. *Pseudocnus dubiosus leoninus* (1), *Paracaudina chilensis* (3 fragments).

St. M113. Estrecho de Magallanes, Punta Santa María, near Agua Fresca, 53°22'S, 70°57'W, tidal belt, exposed, sand gravel and muddy clay covered with boulders, sampling by hand, 2 May 1949. *Chiridota pisanii* (1), *Trochodota purpurea* (1).

St. M115. Estrecho de Magallanes, near estuary of Río Los Ciervos, S of Punta Arenas, 53°11'S, 70°55'W, tidal belt, exposed, gravel and clay, mixed with mud and covered with boulders, sampling by hand, 3 May 1949. *Pseudocnus dubiosus leoninus* (37), *Chiridota pisanii* (5).

St. M120. Bahía San Vicente, the Ramuntcho Bay, SE of Punta Gualpén, 36°44'54"S, 73°11'02"W, tidal belt, hard rock and boulders on coarse sand, sampling by hand, 8 June 1949. *Athyonidium chilensis* (10).

St. M121. Bahía San Vicente, Punta Liles just W of San Vicente, 36°43'36"S, 73°08'10"W, tidal belt, rocks with small rock pools, sampling by hand, 9 June 1949. *Athyonidium chilensis* (1).

St. M122. Golfo de Arauco, Bahía de Lota, small promontories SE of Punta Fuerte Viejo, 37°06'17"S, 73°09'15"W, tidal belt, extremely exposed, hard rocks and boulders in coarse sand, sampling by hand, 10 June 1949. *Athyonidium chilensis* (1).

St. M131. Iquique, southern part of town, 20°13'10"S, 70°10'19"W, tidal belt, extremely exposed, red rocks with rock pools, sampling by hand, 1, 4, and 6 July 1949. *Pattalus mollis* (4), *Athyonidium chilensis* (1).

St. M135. Cavancha, S of Iquique, 20°14'07"S, 70°10'05"W, tidal belt, rocks with rock pools, sampling by hand, 5 June 1949. *Pattalus mollis* (8+8 juveniles).

St. M141. Seno Reloncaví, W of Punta Metri, 41°36'15"S, 72°48'45"W, ca. 260 m, clay with fragments of polychaete tubes, triangular dredge, 14 July 1949. *Molpadia* species B (1).

St. M144. Seno Reloncaví, E of Isla Guar, 41°41'S, 72°47'W, ca. 250 m, coarse black sand with clay and fragments of polychaete tubes, triangular dredge, 15 July 1949. *Anapta fallax* (13 specimens and fragments).

St. M145. Seno Reloncaví, Bahía Chincui, 41°32'S, 73°01'30"W, 70–80 m, fine soft grey sand with small stones, Agassiz trawl, triangular dredge, 16 July 1949. *Psolus squamatus* (2), *Anapta fallax* (1) (*A. fallax* is from Seno Reloncaví, probably St. M145).

St. M148. Seno Reloncaví, S of Punta San Pedro at Isla Maillén, 41°35'35"S, 72°58'20"W, 20–25 m, coarse sand, triangular dredge, 16 July 1949. *Anapta fallax* (1).

St. M149. Seno Reloncaví, E of Isla Maillén, 41°35'35"S, 72°53'W, ca. 270 m, small stones and gravel, triangular dredge, 16 July 1949. *Psolus squamatus* (30).

Order DENDROCHIROTIDA GRUBE, 1840

Family Psolidae PERRIER, 1902

Psolus OKEN, 1815*Psolus squamatus* (KOREN, 1844)

Cuvieria squamata KOREN 1844, p. 211, pls. 2, 3.

Psolus squamatus: EKMAN 1923, pp. 1—59, 37 figs. (analysis and discussion).

Psolus squamatus var. *segregatus* PERRIER 1905, p. 59; EKMAN 1925, p. 136, text-fig. 33; DEICHMANN 1941, p. 147, pl. 30 fig. 7; 1947, p. 340.

Psolus segregatus: VANEY 1906, p. 27.

(This is a partial synonymy, dealing chiefly with southern representatives of this species).

Material examined. 105 specimens. *M14* (36)¹, *M16* (6), *M25* (1), *M27* (1), *M40* (1), *M41* (20), *M44* (3), *M106* (5 juveniles), *M145* (2), *M149* (30).

Description. Total length of sole 10—46 mm. Colour in life light brown to light red; tentacles light red with darker red spots, more densely aggregated near tentacle bases. Specimens greatly variable in shape. Some almost flat, with almost circular soles; others up to 25 mm high at anterior end, with sole elongate, rectangular.

Most specimens with no tube feet in midventral radius; some with few (3—4) at each end; rarely a continuous row of about eight feet occurs. Dorsal scales generally thin, and either smooth or more or less completely covered in small numerous granules. Various intermediate stages between completely smooth and completely granuliferous occur. Variation appears not be correlated with depth, habitat or latitude.

Numerous oral and anal valves. Calcareous deposits variable within narrow limits. Specimens typical of southern representatives of species.

Distribution. The southern "form" of this species occurs around the southern part of South America from 41°30'05"S in the west to about 42°S in the east. Also Burdwood Bank and the Falkland Islands. The species is known from the Eastern Pacific Ocean (Bering Sea to Cape Horn), and the North Atlantic Ocean.

Habitat. At all stations but two (*M25* and *M44*) the substrate included either stones (gravel) or shells. At *M14*, specimens were noted to be very common on stones. Psolids are well adapted to living attached to a hard substrate, and it would appear that *P. squamatus* almost invariably lives attached in this way.

Depth. 7—1,087 m. EKMAN (1925) gives the bathymetric range of the southern form as 7—207 m. In northern waters, the range is approximately 279—1,087 m (DEICHMANN 1947).

Psolus patagonicus EKMAN, 1925

Psolus patagonicus EKMAN 1925, p. 140, text-figs. 35, 36; DEICHMANN 1941, p. 148, pl. 30, fig. 8; 1947, p. 339, figs. 1, 2; PAWSON 1964, p. 463, text-fig. 3, 1—7.

Material examined. Tierra del Fuego, 5 May, 1962, coll. A. GALLARDO, 3 specimens.

¹) The numbers in brackets refer to the number of specimens.

Remarks. Three typical members of this small species; total length 2.5 and 6 mm.

Distribution. Known from the Patagonia Bank at 45° S (EKMAN 1925) and the vicinity of the Straits of Magellan (DEICHMANN 1941, 1947; PAWSON 1964, and present record).

Habitat. Rocks, *Macrocystis* fronds and holdfasts.

Depth. Intertidal to about 110 m.

Psolus antarcticus (PHILIPPI, 1857)

Holothuria antarctica PHILIPPI 1857, p. 133.

Psolus antarcticus: LUDWIG 1898, p. 53, pl. 3, figs. 34–36 (complete synonymy); EKMAN 1923, p. 42, figs. 31–33; 1925, p. 139, text-fig. 34; DEICHMANN 1947, p. 339; PAWSON 1968a, p. 19, fig. 2 (1–4).

Material examined. Cabo Valentin, Isla Dawson, Estrecho de Magallanes, 135 m, 26 Sept. 1965, coll. A. GALLARDO, 1 specimen.

Remarks. Total length 52 mm. Specimen typical of the species, differing conspicuously from *P. squamatus* (the only other species in the area with which it can be confused) in having only five large and distinct interrational oral valves.

Distribution. Magellanic region (PHILIPPI 1857; DEICHMANN 1947), Antarctic Peninsula (VANEY 1906; EKMAN 1925) and near Macquarie Island (PAWSON 1968a). A circumpolar species in cold temperate and presumably also in Antarctic waters.

Habitat. Rock.

Depth. 35–1,080 m.

Family Cucumariidae LUDWIG, 1894

PAWSON & FELL (1965) revised the classification of the dendrochirote holothurians, and referred three subfamilies to the Cucumariidae. These were the Cucumariinae LUDWIG, 1894; Thyonidiinae HEDING & PANNING, 1954, and Colochirinae PANNING, 1949.

All three subfamilies are represented in Chilean waters. They may be distinguished as follows:

- 1 (4) Ten tentacles. Calcareous deposits of body wall plates and often cups.
- 2 (3) Calcareous deposits plates only, often knobbed Cucumariinae LUDWIG, 1894
- 3 (2) Calcareous deposits plates and cups [Colochirinae PANNING, 1949, not in present collections]
- 4 (1) More than ten tentacles (15–20). Calcareous deposits of body wall plates or tables Thyonidiinae HEDING & PANNING, 1954

Subfamily *Cucumariinae* LUDWIG, 1894*Cucumaria* BLAINVILLE, 1834*Cucumaria godeffroyi* SEMPER, 1868

Cucumaria godeffroyi SEMPER 1868, p. 53, pl. 15 fig. 12, 14; LAMPERT 1885, p. 144; THEEL 1886, p. 99; CLARK 1910, p. 352; DEICHMANN 1941, p. 83; PANNING 1955, p. 43, figs. 8, 9.

Material examined. 81 specimens. *M17* (9), *M21* (1), *M22* (2), *M27* (4), *M91* (22), *M103* (1), *M104* (42).

Description. Total length (excluding juveniles) 13–50 mm. Colour in life and in alcohol, yellow; tentacles yellowish white with dark brown patches on oral surfaces at tentacle bases and at major bifurcations.

Body more or less cylindrical; when contracted, many specimens almost spherical. Tube feet confined to radii, in two rows, giving impression that several rows are present when specimen is contracted. Tentacles subequal. Calcareous ring simple, no posterior projections. Single large polian vesicle.

Juvenile specimens (*M17*) 3.3–7.5 mm in total length, light grey-yellow. In largest specimen two ventral tentacles only very slightly smaller than others. Tube feet confined to radii; on smallest specimens tube feet virtually absent from dorsal radii.

Calcareous deposits common in body wall of smallest (3.5 mm long) specimen, consisting of smooth to tumid plates of varying size, up to about 0.40 mm in greatest length (Fig. 1A). The 7.5 mm long specimen has numerous body-wall deposits of two types. Larger plates average 0.30 mm in greatest length, are tumid to knobbed with one end denticulate and several perforations. Smaller plates have pointed marginal projections, small surface knobs, and one to six perforations; most have four perforations (Fig. 1B). In larger specimens the larger plates have disappeared, and only the smaller plates of average length 0.17 mm with pointed marginal projections remain (Fig. 1C). In present material deposits in larger specimens slightly eroded, so that marginal projections not as sharply pointed as usual.

Tentacles of smaller specimens (7.5 mm long) with perforated rods of two distinct sizes. Larger rods 0.28 mm in average length (Fig. 1D); smaller rods 0.10 mm in average length (Fig. 1F). Supporting rods from tube feet average 0.21 mm in length, have several terminal perforations and a central projection which often carries one or more larger perforations (Fig. 1G). Larger specimens with tentacle rods of one type, averaging 0.31 mm in length, with central and terminal perforations (Fig. 1E).

Remarks. This species was poorly known until PANNING (1955) described a specimen (probably the unique type) from Iquique, Chile. The present specimens, especially the juveniles, provide additional data about the species. It is notable that the larger spicule type found in the 7.5 mm long specimen (Fig. 1B) appears

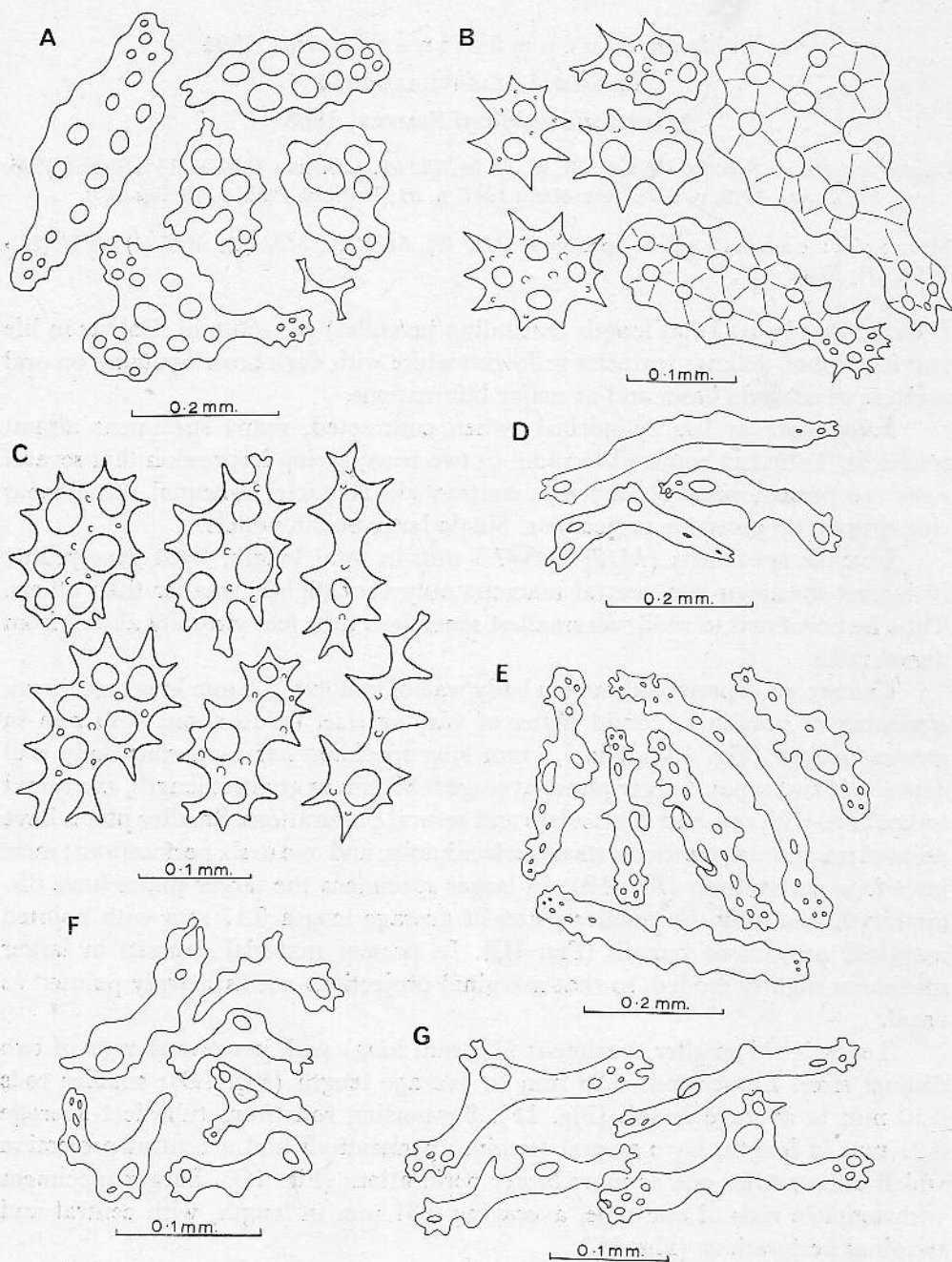


Fig. 1. *Cucumaria godeffroyi* SEMPER. A. Plates from body wall of specimen 3.5 mm in length. B. Plates from body wall of specimen 7.5 mm in length. C. Plates (partly eroded) from body wall of specimen 20 mm in length. D. Larger tentacle rods from 7.5 mm specimen. E. Tentacle rods from 20 mm specimen. F. Smaller tentacle rods from 7.5 mm specimen. G. Supporting rods from tube foot.

to drop out as the animal grows, or perhaps becomes transformed into the typical adult deposit. These larger deposits are strongly reminiscent of those in *Pseudocnus perrieri* (EKMAN) and *P. dubiosus* (SEMPER), which also occur in Chile, but in the case of these two latter species, the deposits are retained as the animal grows.

Distribution. Originally described from Iquique, Chile (SEMPER 1868). DEICHMANN (1947) gives the range as west coast of South America, between 20° and 40°S latitude; probably the two specimens she examined were from the vicinity of Isla Chiloé. Present specimens extend the southern limit of the species to 41°50'30"S, but it is likely that the species ranges the entire Chilean coast.

Habitat. Substrate ranges from coarse sand and shells through stones and polychaete tubes.
Depth. Intertidal to 60 m.

Pseudocnus PANNING, 1949

Pseudocnus dubiosus leoninus (SEMPER, 1868)

Cucumaria leonina SEMPER 1868, p. 53, pl. 15 fig. 9.

Pseudocnus dubiosus leoninus: PANNING 1963, p. 60, figs. 3–4 (synonymy).

Material examined. 131 specimens. *M17* (4), *M21* (15), *M24* (9), *M27* (5), *M40* (2), *M41* (4), *M47* (18), *M74* (5), *M91* (5), *M95* (1), *M98* (2), *M103* (22), *M108* (1), *M115* (37), Isla Talcan, near Chiloé, 25 Mar. 1962, from algae, coll. J. VIDAL and H. MENDOZA (1).

Description. Total length 3–40 mm. Colour in life yellow to white. In alcohol colour yellowish to light brown. Varying degrees of contraction and variation in disposition of tube feet render specimens of this species very dissimilar in external appearance. Calcareous deposits typical of the subspecies; these have been described and illustrated by PANNING (1951, 1963) and PAWSON (1964).

Distribution. *P. dubiosus leoninus* occurs in the southern part of South America, and the Falkland Islands. The northern limit of its range is not well defined (see PANNING 1951, 1963).

Habitat. PAWSON (1964) described material collected from boulder beaches and associated with fronds and holdfasts of the brown seaweed *Macrocystis*. Present material was collected from a variety of habitats, including sand and shell, sand and stones, small stones, muddy sand and shell, gravel and clay mixed with mud, and kelp. Probably the species is a plankton or selective detritus feeder (stomach contents included several species of diatoms), and prefers a hard substrate.

Depth. 0–300 m. Previously recorded as 0–100 m (PAWSON 1964).

Pseudocnus perrieri (EKMAN, 1927)

Cucumaria laevigata: LUDWIG 1898, p. 32, pl. 2 fig. 25; PERRIER 1905, p. 22; HEROUARD 1906, p. 12, pl. 1 fig. 6, pl. 6 figs. 5, 6; VANEY 1909, p. 430; EKMAN 1925, p. 56; DEICHMANN 1947, p. 333.

Cucumaria perrieri EKMAN 1927, p. 403.

Stereoderma perrieri: PANNING 1949, p. 457.

Stereoderma laevigata: PAWSON 1964, p. 457.

Pseudocnus perrieri: PANNING 1963, p. 71, figs. 15, 16.

Material examined. 3 specimens. *M27* (1), *M104* (2).

Description. Total length 6, 10, 19 mm. Colour in life white; in alcohol white to light yellow. Calcareous deposits typical.

Remarks. EKMAN (1927) has shown that the South American cucumariids previously referred to as *Cucumaria laevigata* do not in fact belong in that species, but should be regarded as a distinct species, which he named *C. perrieri*. Neither DEICHMANN (1947) nor PAWSON (1964) were aware of the step taken by EKMAN, and they described the South American forms as *laevigata*. The species *P. laevigatus* is now regarded as being restricted to several subantarctic islands, namely Prince Edward Is., Crozet Is., Kerguelen, and Heard Is. (PANNING 1963). More recently (PAWSON 1968b) the species has been recorded from Macquarie Island.

Distribution. EKMAN (1927) stated that *P. perrieri* ranges from 44°S on the west coast of South America to 43°S on the east coast, and also occurs at the Falkland Islands. He also suspected that material from South Georgia identified by LAMPERT (1886) as *Cucumaria crocea* also belongs to this species. PANNING (1963) has confirmed the occurrence of *P. perrieri* at South Georgia. The present records extend the known range of the species further north along the west coast of South America to 41°49'40"S (M27).

Habitat. Sand, rock, shell.

Depth. 0–197 m.

Subfamily Thyonidiinae HEDING & PANNING, 1954

Pattalus SELENKA, 1868

Pattalus mollis SELENKA, 1868

Pattalus mollis SELENKA 1868, p. 113, pl. 8 figs. 4–5; HEDING & PANNING 1954, p. 34, fig. 1 (full synonymy).

Material examined. 20 specimens. M131 (4), M135 (8 + 8 juveniles).

Description. Total length (excluding juveniles) 66–157 mm. Colour in alcohol light brown to almost black. Typical specimens of this species. Juveniles (M135) probably of this species, total length 4–14 mm. Colour in alcohol greyish-brown, tentacles with brownish yellow tinge. Largest specimen with 14 tentacles. Stone canal single, several polian vesicles. Apart from endplates in tube feet, no calcareous deposits found anywhere in body wall or tentacles.

Remarks. DEICHMANN (1941) has clarified the systematic position of this species, which is common in both Peru and Chile.

Distribution. Peru and Chile. The record from station M121 (36°43'36"S) appears to be the southernmost for the species. It is unlikely that *P. mollis* extends very much further to the south, for it is a conspicuous species and not easily overlooked by shore collectors.

Habitat. Generally found clinging to rocks in exposed localities. At M135, specimens were buried in cracks, and some had pieces of shell attached to the body wall, presumably held there by numerous tube feet.

Depth. Known from the intertidal zone to about 45 m (DEICHMANN 1941), but apparently common near shore.

Athyonidium DEICHMANN, 1941*Athyonidium chilensis* (SEMPER, 1868)

Thyone (Stolus) chilensis SEMPER 1868, p. 241, pl. 40, figs. 3–6.

Athyonidium chilensis: PAWSON 1964, p. 455 (synonymy).

Material examined. 14 specimens. *M6* (1), *M120* (10), *M121* (1), *M122* (1), *M131* (1).

Description. Total length 30–200 mm. Colour in alcohol usually dark brown to blackish dorsally, lighter ventrally. Body cavity of female specimen 195 mm long filled with transparent genital ducts containing bright yellow eggs 0.5 mm in diameter. Small specimen 30 mm in length (*M120*) resembles larger specimens in having no deposits in body wall. Only radial pieces developed in calcareous ring, but widely separated; probably they grow together as animal grows.

Remarks. This well-known species (DEICHMANN 1941; PAWSON 1964) is quite distinct and cannot be confused with any other of the common Chilean holothurians.

Distribution. From Ancon Peru to Chile (DEICHMANN 1941). In Chile, the southernmost record is from Punta Gaviota, 42°03'50"S (PAWSON 1964).

Habitat. *A. chilensis* has been collected from the *Macrocystis* zone, immediately below lowtide level (PAWSON 1964). The present material was collected from the intertidal zone in very exposed localities from rocks, rock pools, and boulders. In only one case the rocks were lying in coarse sand. Conversely, DEICHMANN (1941) noted that this species lives buried in the sand with its tentacles extending flatly on the surface. It is apparent that *A. chilensis* can tolerate a variety of habitats on the exposed coast. These specimens described by PAWSON (1964) had large pieces of *Macrocystis* sp. in their intestines, indicating an active vegetarian browsing method of feeding. Specimens buried in the substrate would probably feed on planktonic organisms or selected detritus.

Depth. Apparently restricted to the shore; not found much below lowtide level.

Family Phyllophoridae ÖSTERGREN, 1907

Subfamily Thyoninae PANNING, 1949

Pentamera AYRES, 1852*Pentamera chiloensis* (LUDWIG, 1886)

Cucumaria chiloensis LUDWIG 1886, p. 12, pl. fig. 4; 1898, p. 38; EKMAN 1925, p. 97, fig. 21; DEICHMANN 1947, p. 334.

Cucumaria tabulifera PERRIER 1904, p. 14; 105, p. 17, pl. 1 figs. 4–5, pl. 3 figs. 1–15.

Pentamera chiloensis: DEICHMANN 1941, p. 88, pl. 13 figs. 15–18, text-fig. 1; PANNING 1949, p. 465.

Material examined. Golfo de Arauco, near Concepción, Sept. 1962, coll. A. GALLARDO, 3 specimens.

Description. All specimens 20 mm in total length. Colour in alcohol light brown. Body fusiform, tube feet restricted to radii, arranged in crowded rows. Calcareous deposits of body wall exclusively tables (Fig. 2A) with oval to squarish disc, perforated by 4–16 holes; four holes are central. Disc surmounted by complex spire (Fig. 2D) made up of two rods joined by 1–4 crossbars. Average

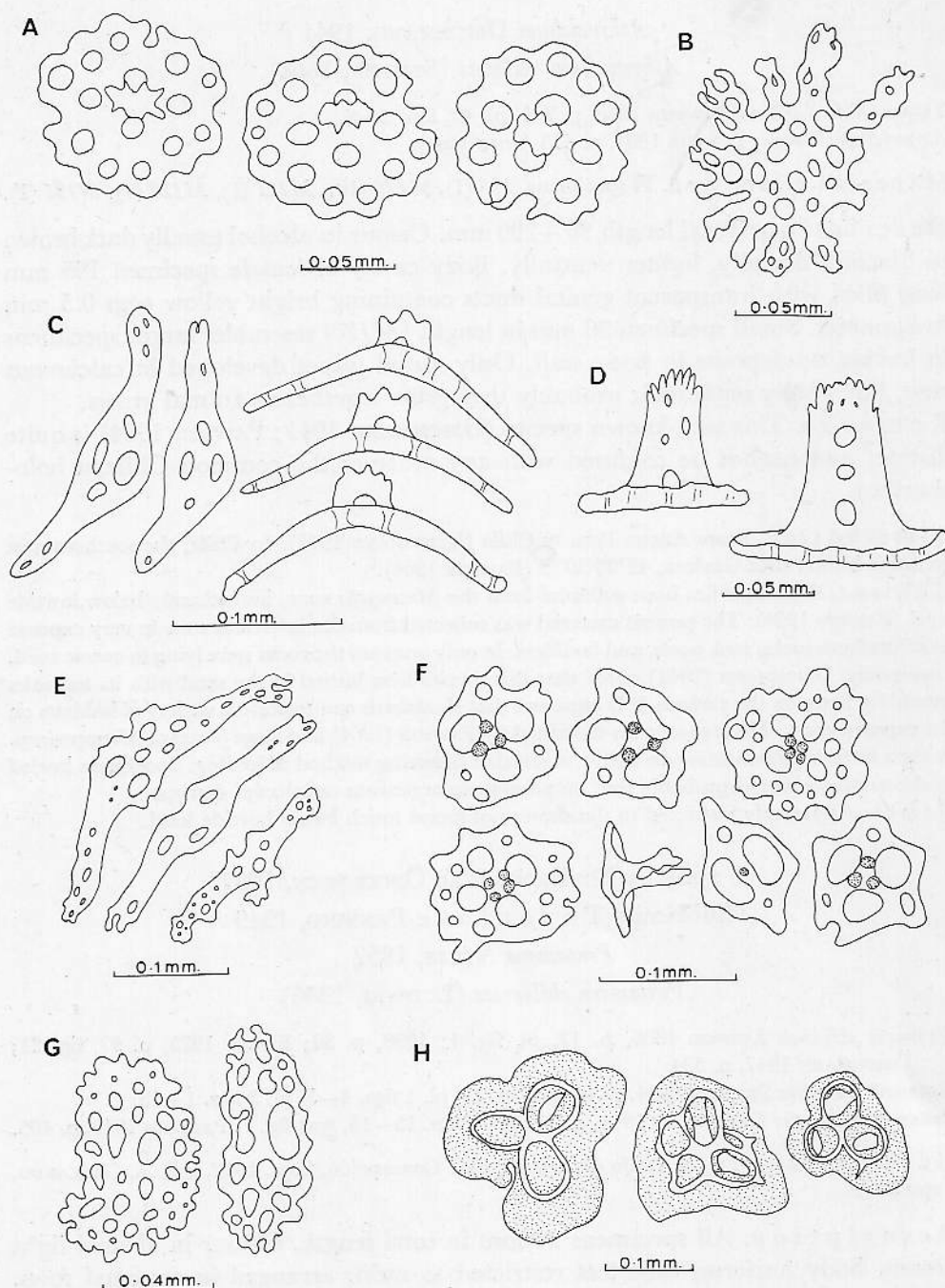


Fig. 2. *Pentamera chiloensis* (LUDWIG). A. Tables from body wall. B. Endplate from tube foot. C. Supporting tables from tube foot. D. Body wall tables, profile view. E. Perforated rods from tentacles. G. Rosettes from tentacles. *Molpadia* species A. F. Tables from tail. H. Calcareous deposits of body wall in process of transformation into phosphatic material (stippled areas represent phosphatic material).

diameter of disc 0.10 mm; average height of spire 0.073 mm. Tube feet with endplates (Fig. 2B) surrounded by curved supporting tables (Fig. 2C) which are elongate and fusiform, with four central perforations and a short two-pillared spire. Average length of tables 0.16 mm; average height of spire 0.02 mm. Tentacles contain perforated rods (Fig. 2E) from 0.16 to 0.29 mm in length and minute rosettes (Fig. 2G) of 0.075 mm average length.

Remarks. The present specimens agree well with those described by earlier authors, although the tables from the body wall appear to have more numerous perforations than those described by DEICHMANN (1941, 1947). However, it would appear that the specimens illustrated here would fall within the range of variation of this species.

Distribution. From Cape Horn to Lower California, and in Argentina to the mouth of the River Plate (see DEICHMANN 1941, 1947).

Habitat. Unknown.

Depth. 14–108 m.

Order DACTYLOCHIROTIDA PAWSON & FELL, 1965

FAMILY YPSILOTHURIIDAE HEDING, 1942

Ypsilothuria PERRIER, 1886

Ypsilothuria bitentaculata (LUDWIG, 1893)

Sphaerothuria bitentaculata LUDWIG 1893, p. 112; 1894, p. 141, p. 12 figs. 16–17, pl. 14 figs. 5–14; MITSUKURI 1897, p. 149; KOEHLER 1898, p. 384; SLUITER 1901, p. 115; OHSHIMA 1915, p. 266; DEICHMANN 1930, p. 152, pl. 19 figs. 4–5; LUDWIG & HEDING 1935, p. 196; BARANOVA 1957, p. 242.

Ypsilothuria bitentaculata: KOEHLER & VAN EY, 1905, p. 87; HEDING, 1942, p. 28; PANNING, 1949, p. 455; PAWSON, 1965, p. 6, text-fig. 1, figs. 2–5.

Material examined. 20°15'5"S, 70°18'0"W, 582 m, triangular dredge, 1962, coll. A. GALLARDO, 2 specimens.

Remarks. Specimens U-shaped, distance between mouth and anus 7, 12 mm. Calcareous deposits typical.

Distribution. *Y. bitentaculata* is presumed to be cosmopolitan (see PAWSON 1965). This is the first record of the species from the southeastern Pacific Ocean.

Habitat. Generally mud.

Depth. 250–4,000 m.

Order MOLPADIDA HAECKEL, 1896

Remarks. The Lund University Chile collections include representatives of four species of molpadids, two of which have been recorded previously from off Chile. The remaining two species are represented by single specimens of the genus *Molpadia*; both may be new, but they have not been described as such here. DEICHMANN (1931, 1940) has demonstrated that for proper identification of molpadids a good series of specimens is required. This is necessary because

molpadids are unique among holothurians in that the calcareous deposits of most of the body wall are transformed with growth of the animal into phosphatic deposits (see PAWSON 1963). Young stages are required for reliable descriptions, and thus no attempt has been made to define the two unusual species in the present collection. It is regrettable that this step must be taken, especially in view of the fact that both EKMAN (1927) and PAWSON (1965) have taken the same step with two other possibly new southern species of *Molpadia*. However, attention has been called to these unusual forms, and future collections may help to resolve the problems in these four species. The collections at present being amassed by the U.S.N.S. *Eltanin* in Antarctic and subantarctic waters at the present time promise to provide a good basis for revision of the Southern Hemisphere molpadids.

F a m i l y Molpadiidae MÜLLER, 1850

Molpadia RISSO, 1826

Molpadia antarctica (THEEL, 1886)

Trochostoma antarcticum THEEL 1886, p. 44, pl. 2 fig. 7; HEROUARD 1901, p. 42; 1906, p. 15; AUGUSTIN 1908, p. 35, text-fig. 22 a-c.

Molpadia antarctica: CLARK 1907, p. 32, 168; OHSHIMA 1915, p. 252; DEICHMANN 1947, p. 342; PAWSON 1965, p. 13, text-fig. 3 figs. 5-7.

M a t e r i a l e x a m i n e d. 2 specimens. *M80* (1), *M83* (1).

D e s c r i p t i o n. Larger specimen 80 mm in total length, tail 10 mm; colour white overall, body wall thin and translucent; no calcareous deposits found anywhere. Smaller specimen 45 mm in total length, tail 9 mm; body wall light brown (possibly due to stain from associated mud); no calcareous deposits found anywhere.

In larger specimen genital caeca filled with eggs of varying size, up to 0.3 mm in diameter.

R e m a r k s. This species is readily recognizable, for red phosphatic deposits are rare or totally lacking from the body wall; the colour is thus usually white or grey.

D i s t r i b u t i o n. Circum-Pacific, known from off Japan (OHSHIMA 1915), New Zealand (PAWSON 1965), the Caribbean (THEEL 1886), Chile, and the Antarctic Peninsula. The northernmost record for the Chilean coast is 38°8'S (Clark 1908).

H a b i t a t. Mud to sand.

D e p t h. 80-1,218 m.

Molpadia species A

M a t e r i a l e x a m i n e d. *M83* (1).

D e s c r i p t i o n. Total length 72 mm, tail 5 mm. Colour mottled red-purple, darker anteriorly; oral disc and tail grey. General body shape typical of molpadids. Deposits of body wall almost exclusively phosphatic deposits in great numbers. Few calcareous deposits remaining almost completely absorbed (Fig. 2H), but

it is apparent that when the animal was smaller, the body wall contained tables approximately 0.11 mm across, with three or more large perforations. No evidence of structure of spire. Tail deposits tables, partly eroded away, exact details difficult to determine. Deposits elongate to circular with two to four (commonly three) large central perforations and up to 20 smaller perforations external to them (Fig. 2F). Average diameter of tail deposits 0.11 mm. Spire composed of three or four rods arises from centre of table; average height of spire 0.04 mm. Tables apparently derived from common molpadid table with three large perforations and three-pillared spire.

Remarks. This species differs from other southern molpadids in the structure of the tail deposits. It may bear some relationship to the northeastern Pacific species *M. intermedia* (LUDWIG), but more material of the species would be required for a definite identification.

Distribution. Estero Reloncaví, 41°38'05"S, 72°20'45"W.

Habitat. Very fine mud mixed with sand.

Depth. ca. 170 m.

Molpadia species B

Material examined. *M141* (1).

Description. Total length 88 mm. Colour grey-white with numerous small light brown spots (phosphatic deposits); anterior and posterior extremities of body uniformly greyish white. Body molpadid in shape, although tail not pronounced.

Calcareous deposits once present in body wall but have completely transformed into phosphatic deposits; latter deposits not numerous. Tail with no calcareous deposits. Other structures apparently typical of family.

Remarks. The present specimen may represent an undescribed species, but no known members of the genus *Molpadia* completely lack deposits in the tail, and it is quite possible that this specimen is an aberrant form. Another molpadid from the same area, *M. antarctica* (THEEL), tends to lose its deposits with growth, but the phosphatic deposits are rare, and the tail deposits are usually numerous.

Distribution. Seno Reloncaví, 41°36'15"S, 72°48'45"W.

Habitat. Clay with fragments of polychaete tubes.

Depth. Ca. 260 m.

Family Caudinidae HEDING, 1931

Paracaudina HEDING, 1931

Paracaudina chilensis (MÜLLER, 1850)

Molpadia chilensis MÜLLER 1850, p. 139.

Paracaudina chilensis: PAWSON 1963, p. 18, pl. 4 (synonymy).

Material examined. 35 specimens and fragments. *M16* (3 tail fragments), *M20* (6 tail fragments), *M107* (1 + ca. 22 tail fragments), *M108* (3 tail fragments).

Remarks. Total length of single complete specimen, 54 mm. Color generally greyish white, but some fragments with light brownish tinge. Calcareous deposits typical of this species. Like other molpadids, *P. chilensis* lives buried, with the tail uppermost, near the surface of the substrate, and thus dredging usually produces only the posterior end of the body, leaving the anterior end buried deep in the sea floor.

Distribution. Circum-Pacific, occurring off northwest Australia, Japan, California, Florida, Chile, and New Zealand. For details, see PAWSON 1963, p. 21.

Habitat. Ranges from coarse shell sand to fine sand mixed with mud. Similar habitats are recorded from New Zealand (PAWSON, in press).

Depth. 9–990 m.

Order APODIDA BRANDT, 1835

Family Chiridotidae ÖSTERGREN, 1895

Chiridota ESCHSCHOLTZ, 1829

Chiridota pisanii LUDWIG, 1886

Chiridota pisanii LUDWIG 1886, p. 29, pl. 2 fig. 14; PAWSON 1964, p. 464 (complete synonymy).

Material examined. 7 specimens. *M91* (1), *M113* (1), *M115* (5).

Description. Total length of complete specimens 35–95 mm; specimens in various stages of contraction. Colour in alcohol pale yellow, body wall translucent in expanded areas, so that dark colour of intestine can be seen. Wheel papillae arranged in single rows in each of the three dorsal interradii, more numerous and scattered anteriorly. No papillae found on ventral surface of body. Calcareous deposits typical.

Distribution. The record of the species from *M91*, 41°43'S (Seno Reloncavi) extends its known range some distance to the north, although it was expected to occur there. *C. pisanii* ranges from Seno Reloncavi on the Chilean coast to about 43°S off the coast of Argentina, and also occurs at the Falkland Islands.

Habitat. Has been collected in sandy to muddy areas in the intertidal zone.

Depth. 0–102 m.

Chiridota sp.

Material examined. 3 specimens. *M22* (2), *M65* (1).

Remarks. The specimens from *M22* have wheels aggregated into papillae, but no deposits in the tentacles. Total length of complete specimen 50 mm, colour in alcohol light orange-pink, partly translucent in relaxed areas. The specimen from *M65* is an anterior end of the body only, with wheels aggregated into papillae. Total length 18 mm, colour in alcohol light pinkish red.

These specimens might not represent the same species, but their condition prohibits identification to the species level.

Trochodota LUDWIG, 1892*Trochodota purpurea* (LESSON, 1830)

Holothuria (Fistularia) purpurea LESSON 1830, p. 155, pl. 53 fig. 1.

Trochodota purpurea: PAWSON 1964, p. 466 (complete synonymy).

Material examined. *M113* (1).

Remarks. The single specimen has ten tentacles, is light brown, and is 32 mm in total length. No calcareous deposits were found anywhere in the body wall. The presence of ten tentacles places the specimen into *Trochodota* (no other apodous genus with ten tentacles occurs in Chile). Only one species of *Trochodota* is known from the vicinity of Magellan Straits (where *M113* was occupied), and it is thus assumed that the present specimen represents *T. purpurea*.

Distribution. Known from the southern end of South America, the Falkland Islands, and South Georgia.

Habitat. Sand, shelly bottom, holdfasts and fronds of seaweeds, especially *Macrocystis* (PAWSON 1964).

Depth. 0–36 m.

Taeniogyrus SEMPER, 1868*Taeniogyrus contortus* (LUDWIG, 1874)

Chiridota contorta LUDWIG 1874, p. 80, pl. 6 fig. 6.

Taeniogyrus contortus: PAWSON 1964, p. 466 (synonymy).

Taeniogyrus antarcticus HEDING 1931, p. 686, fig. 15, 1–12.

Taeniogyrus contortus antarcticus: PANNING 1936, p. 17, fig. 8.

Material examined. 16 specimens and fragments. *M42* (13), Tierra del Fuego, 46 m, 5 May 1962, coll. A. GALLARDO, 3 fragments.

Description. Total length of complete specimens 10–31 mm. Colour in alcohol light yellowish, translucent (*M42*) or dark brown (Tierra del Fuego).

Remarks. The specimens are typical of this variable and widely distributed species. The dark brown colour of the specimens from Tierra del Fuego may be an artifact of preservation, for previously recorded specimens of *T. contortus* have usually been light yellow in colour. PANNING (1936) has shown that HEDING's (1931) *T. antarcticus* should be regarded as a subspecies of *T. contortus*, at best.

Distribution. Southern part of South America, from 42°20'50''S (*M42*) in the west to 46°42''S in the east. Most common in vicinity of Magellan Straits. Also occurs at South Georgia, Marion Is., Kerguelen Is., Antarctic Peninsula, and off the coast of Antarctica at 88–89°E.

Habitat. Sand to mud.

Depth. 0–560 m.

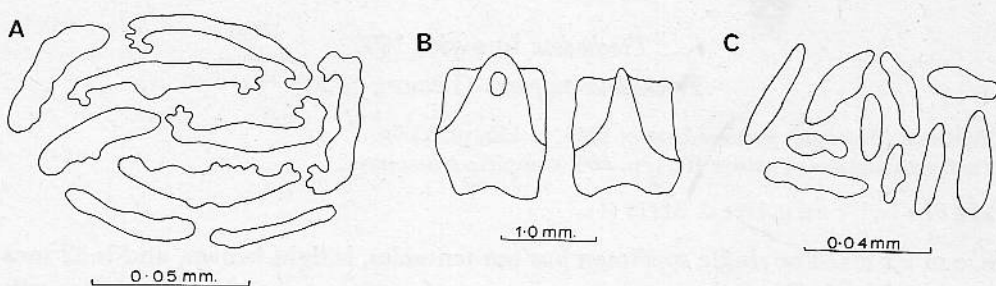


Fig. 3. *Anapta fallax* LAMPERT. A. Rods from tentacles. B. Radial and interradial pieces from calcareous ring. C. Miliary granules from longitudinal muscles.

F a m i l y Synaptidae BURMEISTER, 1837

Anapta SEMPER, 1868

Anapta fallax LAMPERT, 1889

Anapta fallax LAMPERT 1889, p. 848; LUDWIG, 1898, p. 70; CLARK 1908, p. 110; EKMAN 1925, p. 5; DEICHMANN 1947, p. 346.

Material examined. 91 specimens and fragments. *M38* (75 specimens and fragments), *M99* (1), *M144* (13 specimens and fragments), Seno Reloncaví, probably *M145* (1), *M148* (1).

Description. Body cylindrical, total length up to 48 mm. Body wall thin, transparent when expanded, transversely wrinkled and opaque when contracted. Colour in alcohol generally light yellow; in some specimens anterior end with purplish tinge; tentacles light yellow. In life, colour greyish reddish white. Tentacles 12, each with three pairs of digits which increase in length distally, so that terminal pair is longest. No evidence of single terminal digit or gustatory organs.

Calcareous ring of 12 solid pieces; five radials and seven interradials. Radials perforated anteriorly; in some perforation incompletely closed. Both radials and interradials with central anterior projection (Fig. 3B). Posterior margin of ring undulating; some radials with faint posterior process.

Three to six polian vesicles. One stone canal. Gonad a small bunch of tubular caeca, unbranched or sparsely branched.

No calcareous deposits found in body wall, apart from radial longitudinal muscles which contain small numbers of miliary granules (Fig. 3C), elongate oval or rod-like, averaging 0.027 mm in length. Tentacles with numerous rods (Fig. 3A) of varying shape, but generally curved, with expanded, sometimes slightly branched, ends. Rods average 0.05 mm in length. No other deposits found elsewhere in body.

Remarks. The present specimens differ only slightly from those described by LAMPERT (1889). The number of tentacle digits appears to vary between three and five pairs, while there are three to six polian vesicles.

Distribution. Southern end of South America, from about 41°32'S in the west (*M145*) to about 47°1'S in the east. Also known from the East Falkland Islands and (with some doubt—see EKMAN 1925) from South Georgia.

Habitat. Variable, including fine to coarse sand, clay, and small stones.

Depth. 0–350 m.

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