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COLLECTING STATIONS, MOLLUSCA, BRACHIOPODA, AND WORMS.

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LIST OF COLLECTING STATIONS

BY

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INTRODUCTION.

THE greater number of the localities referred to in the following list are places where specimens were collected by the party on board the "Terra Nova"; a large proportion of them being Plankton-stations. To these localities have been added a certain number of places where specimens were obtained by members of the Shore Party, particularly by Surgeon E. L. Atkinson, R.N., and Mr. E. W. Nelson. The list has been verified by Commander H. L. L. Pennell, R.N., who was in charge of the log of the "Terra Nova."

In sorting the collection a system of numbering was adopted which has not proved suitable for more permanent use. These "provisional station-numbers" are indicated in the third column of the list, but the numbers in the second column, corresponding with the maps, are those which should alone be used in recording results and in labelling the specimens.

The Plankton-nets are described according to the number of meshes to one linear inch. The "Full speed" net had 180 meshes to the inch. "Bucket" indicates that the specimens were caught by means of a bucket lowered over the ship's side.

The meaning of a nautical method of indicating the position which has been used in certain cases may not be clear without a word of explanation. Station 80, for instance, is given as "From Summit, Gt. King, N. 87° W., 11 miles." This indicates a point 11 miles from Summit, Gt. King, in a direction 87° from the *North*, on its Western side; and is in fact almost due West. Similarly, Station 82, which is recorded as "S. 40° E., 29 miles," indicates a point 29 miles from the same place along a line 40° from the *South*, on its Eastern side, and is thus not very far from South-East. The bearings are all true.

LIST OF COLLECTING STATIONS

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
Map 1. (Plate I.) 1910.							
June 17	1	1	48° 21′ N., 9° 58′ W.	Surface	Bucket	6.30 p.m.	Plankton
,, 18	2	2	46° 21′ N., 11° 45′ W.	,,	Full speed	5.30–6.30 p.m.	,,
,, 19	3	3	43° 54′ N., 12° 48′ W.	,,	,,	3–3.30 p.m.	,,
,, 20	4	4	41° 20′ N., 13° 45′ W.	,,	,,	6.30–6.45 p.m.	,,
,, 21	5	5	38° 37′ N., 14° 42′ W.	,,	,,	12.30–1.45 p.m.	,,
,, 22	6	6	35° 47′ N., 15° 31′ W.	,,	,,	11.45–Noon	,,
,, 23	7	7	Flora light, Madeira, N. 60° E. 7 miles	,,	,,	3.15–3.45 p.m.	,,
,, 25	8	8	Man-o'-War's Anchorage Funchal, Madeira	0—25 metres	Apstein	1 p.m.	,,
,, 25	9	9	Do.	,,	Nansen	,,	,,
,, 26	10	10	32° 23′ N., 17° 5′ W.	Surface	Full speed	12.45–1 p.m.	,,
,, 27	11	11	30° 21′ N., 18° 14′ W.	,,	,,	12.30–12.45 p.m.	,,
,, 27	12	12	,, ,,	,,	,,	3.45–4.15 p.m.	,,
,, 28	13	13	28° 13′ N., 19° 40′ W.	,,	,,	11.40–Noon	,,
,, 29	14	14	27° 10′ N., 20° 21′ W.	,,	,,	12.25–12.45 p.m.	,,
,, 29	15	15	,, ,,	,,	50-mesh	10.40–10.50 a.m.	,,
,, 30	16	16	26° 17′ N., 20° 54′ W.	,,	,,	6.40–7.0 a.m.	,,
,, 30	17	17	,, ,,	10 metres	,,	7.30–7.50 a.m.	,,
July 1	18	18	25° 18′ N., 21° 32′ W.	Surface	Full speed	4.30–4.40 a.m.	,,
,, 1	19	19	,, ,,	,,	,,	11.40–Noon	,,
,, 1	20	—	,, ,,	,,	—	—	Flying fish with parasites
,, 2	21	20	24° 08′ N., 22° 13′ W.	,,	Full speed	12.15–12.40 p.m.	Plankton
,, 2	22	—	,, ,,	,,	—	—	Flying fish with parasite (dried up)
,, 3	23	21	22° 28′ N., 23° 5′ W.	,,	Full speed	12–12.45 p.m.	Plankton
,, 3	24	22	,, ,,	,,	,,	2–2.10 p.m.	,,
,, 4	25	23	20° 47′ N., 24° 6′ W.	,,	,,	12–1 p.m.	,,
,, 5	26	24	18° 59′ N., 24° 56′ W.	,,	,,	2–2.30 p.m.	,,
,, 6	27	25	17° 8′ N., 25° 41′ W.	,,	,,	2.30–4.30 p.m.	,,
,, 6	28	26	,, ,,	,,	Hand-net	10 a.m.	,,
,, 7	29	27	15° 38′ N., 25° 24′ W.	10 metres	Full speed	2–3.30 p.m.	,,
,, 8	30	28	13° 56′ N., 25° 8′ W.	2 ,,	,,	1.10–3.15 p.m.	,,
,, 9	31	29	11° 20′ N., 24° 37′ W.	2 ,,	,,	2.30–3.30 p.m.	,,
,, 10	32	30	9° 0′ N., 24° 17′ W.	Surface	,,	1.30–3 p.m.	,,
,, 11	33	31	7° 0′ N., 23° 43′ W.	,,	,,	2–3.30 p.m.	,,
,, 14	34	32	2° 38′ N., 21° 16′ W.	1 metre	,,	2–3 p.m.	,,
,, 21	35	33	11° 7′ S., 25° 49′ W.	Surface	Bucket	Noon	,,

Map 1.

Map 1.

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
1910.							
July 26–30	**36**	—	South Trinidad Island	—	—	—	Birds and other land - animals ; shore-collecting
,, 28	**37**	—	Off S. Trinidad Island, 20° 28′ S., 29° 25′ W.	—		—	Small shark with parasites
1913.							
Apr. 13	**38**	H.V. 1 *or* H. 1	52° 23′ S., 63° 50′ W.	125 fath. (229 m.)	Agassiz trawl	—	Bottom fauna
,, 27	**39**	H. 10	Six miles off mouth of Rio de Janeiro Harbour	2 metres	50-mesh	11 p.m.–1.30 a.m.	Plankton
,, 27	**40**	,, 11	Do.	,,	,,	2.30–5 a.m.	,,
May 2	**41**	,, 11 (a)	22° 56′ S., 41° 34′ W.	Surface	,,	8 a.m.	,,
,, 2	**42**	H.V. 2 *or* H. 2	,, ,,	40 fath. (73 m.)	Agassiz trawl	—	Bottom fauna (sand)
,, 3	**43**	H. 12	22° 6′ S., 39° 40′ W.	Surface	50-mesh	12.30–1 a.m.	Plankton
,, 4	**44**	,, 13	21° S., 37° 50′ W.	,,	,,	12.50–1.30 a.m.	,,
,, 4	**45**	,, 14	,, ,,	,,	7-mesh	,, ,,	,,
,, 4	**46**	,, 15	20° 30′ S., 36° 30′ W.	,,	Do.	10.30–11 p.m.	,,
,, 4	**47**	,, 16	,, ,,	,,	50-mesh	,, ,,	,,
,, 6	**48**	,, 17	18° 51′ S., 33° 40′ W.	,,	,,	4.30–5 a.m.	,,
,, 6	**49**	,, 18	,, ,,	,,	7-mesh	,, ,,	,,
,, 7	**50**	,, 19	18° S., 31° 45′ W.	,,	50-mesh 3 nets out	12.35–1.15 a.m.	,,
,, 12	**51**	,, 20	5° S., 27° 15′ W.	,,	50-mesh	3–3.30 p.m.	,,
,, 12	**52**	,, 21	,, ,,	2 metres	,,	4–6 p.m.	,,
,, 12	**53**	,, 22	,, ,,	2 ,,	,,	6–7 p.m.	,,
,, 12	**54**	,, 23	4° 45′ S., 27° 20′ W.	4 ,,	24-mesh	9 p.m.–Midnight	,,
,, 13	**55**	,, 24	4° 30′ S., 27° 16′ W.	2 ,,	50-mesh	1–3 a.m.	,,
,, 13	**56**	,, 25	,, ,,	2 ,,	,,	10–11.30 a.m.	,,
,, 13	**57**	,, 26	,, ,,	Surface	,,	1.15–3 p.m.	,,
,, 16	**58**	,, 27	0°, 25° 15′ W.	,,	,,	1–1.30 a.m.	,,
,, 16	**59**	,, 28	,, ,,	,,	,,	,, ,,	,,
,, 17	**60**	,, 29	2° N., 24° 45′ W.	,,	,,	,, ,,	,,
,, 17	**61**	,, 30	,, ,,	,,	,,	,, ,,	,,
,, 18	**62**	,, 31	4° 50′ N., 24° W.	,,	,,	,, ,,	,,
,, 19	**63**	,, 32	6° 10′ N., 24° 5′ W.	,,	50-mesh 2 nets out	2–2.30 a.m.	,,
,, 26	**64**	,, 33	23° 28′ N., 34° 45′ W.	,,	50-mesh	1.30–2 a.m.	,,
,, 26	**65**	,, 34	,, ,,	,,	,,	,, ,,	,,
,, 27	**66**	,, 35	25° 35′ N., 34° 10′ W.	,,	,,	,, ,,	,,
,, 27	**67**	,, 36	,, ,,	,,	,,	,, ,,	,,
,, 28	**68**	,, 37	27° 22′ N., 33° 40′ W.	,,	,,	,, ,,	,,
,, 29	**69**	,, 39	29° 10′ N., 33° 36′ W.	,,	,,	,, ,,	,,
June 3	**70**	,, 40	Off Horta Harbour, Fayal, Azores	12 metres	24-mesh	6 p.m. – 8 a.m. June 2 June 3	,,

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
Map 2. (Plate II.) 1911.							
July 16	71	W. C. 5	34° 13′ S., 172° 17′ E.	4 metres	180-mesh	11 a.m.–1 p.m.	Plankton
,, 17	72	,, 6	From Three Kings Islands, New Zealand, W.N.W., 4¾ miles	2 ,,	50-mesh	10–10.30 a.m.	,,
,, 17	73	,, 7	From Summit, Gt. King, W. by N., 5½ miles	2 ,,	180-mesh	11–11.15 a.m.	,,
,, 17	74	,, 8	From Summit, Gt. King, W., 5½ miles	0–120 ,,	Apstein	Noon	,,
,, 17	75	,, 9	From Summit, Gt. King, W., 8 miles	Surface	50-mesh	3–3.30 p.m.	,,
,, 17	76	,, 10	Do.	,,	180-mesh	,, ,,	,,
,, 18	77	,, 11	34° 5′ S., 171° 48′ E.	,,	,,	5–7 p.m.	,,
,, 21	78	,, 12	34° 39′ S., 171° 6′ E.	,,	50-mesh	10.30–11 a.m.	,,
,, 21	79	,, 13	34° 35′ S., 171° 16′ E.	,,	,,	1 p.m.	,,
,, 22	80	,, 14	From Summit, Gt. King, N. 87° W., 11 miles	0–100 metres	24-mesh	5 p.m.	,,
,, 23	81	,, 15	From Summit, Gt. King, S. 60° E., 28 miles	0–100 ,,	Nansen	9 a.m.	,,
,, 23	82	,, 16	From Summit, Gt. King, S. 40° E., 29 miles	0–100 ,,	Apstein	1 p.m.	,,
,, 23	83	,, 17	Do.	2 ,,	50-mesh	1–4 p.m.	,,
,, 23	84	,, 18	From C. Maria van Diemen Light, S.W. by W., 15 miles	2 ,,	,,	8–9 p.m.	,,
,, 24	85	,, 19	From C. Maria van Diemen Light, W.N.W., 24 miles	2 ,,	,,	1–5 a.m.	,,
,, 25	86	,, 20	Off Three Kings Islands	3 ,,	,,	8 p.m.–5 a.m. 24th 25th	,,
,, 25	87	,, 21	From Summit, Gt. King, S. ½° W., 10 miles	30 ,,	,,	Noon	,,
,, 25	88	,, 22	Do.	1 ,,	,,	Noon	,,
,, 25	89	,, 23	Off Three Kings Islands	Surface	24-mesh	8–10 p.m.	,,
,, 25	90	New Zealand Benthos, 1	From Summit, Gt. King, Three Kings Islands, S. 14° W., 8 miles	100 fathoms (183 metres)	Dredge	—	Bottom fauna (rock)
,, 26	91	Do., 2	From Summit, Gt. King, Three Kings Islands, S. 10° W., 25 miles	300 fathoms (549 metres)	Dredge	..	,, ,,
,, 27	92	W. C. 24	From Summit, Gt. King, S. by W., 24 miles	Surface	24-mesh	9 p.m.–4 a.m. 26th 27th	Plankton
,, 28	93	,, 25	From Summit, Gt. King, S.E. by S., 13 miles	,,	,,	9 p.m.–4 a.m. 27th 28th	,,
,, 30	94	,, 26	Off Mongonui, Doubtless Bay	18 metres	50-mesh	2–4 p.m.	,,
Aug. 2	95	New Zealand Benthos, 3	1 mile S. of North Cape, New Zealand	10–30 fathoms (18–55 metres)	Otter trawl	—	Bottom fauna (sand)
,, 3	96	Do., 4	7 miles E. of North Cape, New Zealand	70 fathoms (128 metres)	Agassiz trawl	..	,, ,, (sand and rock)
,, 3	97	W. C. 27	Anchorage, North Cape	20 metres	50-mesh	9 p.m.–8 a.m. 2nd 3rd	Plankton

Map 2.

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
1911.							
Aug. 4	98	W. C. 28	From West Island, Three Kings Islands, S.W., 5 miles	0–45 metres	Apstein	Noon	Plankton
.. 4	99	.. 29	Do.	0–70 ,,	,,	,,	..
.. 4	100	.. 30	Do.	Surface	50-mesh	1–2 p.m.	..
.. 4	101	.. 31	Do.	,,	,,	4–5 p.m.	..
.. 4	102	.. 32	Do.	,,	,,	3–4 p.m.	..
.. 4	103	.. 33	Do.	,,	,,	5–6 p.m.	..
.. 4	104	.. 34	Do.	0–25 metres	Apstein	4.30 p.m.	..
.. 4	105	.. 35	Do.	0–80 ,,	,,	,,	..
.. 4	106	.. 36	Do.	Surface	50-mesh	7–8 p.m.	..
.. 4	107	.. 37	Do.	,,	24-mesh	8 p.m.–5.30 a.m. 4th 5th	..
.. 5	108	.. 38	34° 15′ S., 172° 0′ E.	,,	50-mesh	Noon–4 p.m. at intervals	..
.. 5	109	.. 39	,, ,,	3 metres	24-mesh	8 p.m.–8 a.m. 5th 6th	..
.. 6	110	.. 40	34° 4′ S., 171° 55′ E.	Surface	,,	9 p.m.–4 a.m. 6th 7th	..
.. 7	111	.. 41	Off Three Kings Islands	,,	,,	10 a.m.–1 p.m.	..
.. 8	112	.. 41 (a)	33° 37′ S., 171° 30′ E.	3 metres	50-mesh	Noon–4 p.m.	..
.. 9	113	.. 42	33° 12′ S., 171° 05′ E.	3 ,,	,,	9 a.m.–Noon	..
.. 10	114	.. 43	32° 55′ S., 170° 38′ E.	Surface	,,	10 a.m.–4 p.m.	..
.. 16	115	.. 44	34° 32′ S., 172° 20′ E.	,,	Full speed	3–5 p.m.	..
.. 16	116	.. 45	,, ,,	0–50 metres	Apstein	5.30 p.m.	..
.. 16	117	.. 46	,, ,,	0–150 ,,	,,	5.45 p.m.	..
.. 17	118	.. 47	,, ,,	Surface	50-mesh	9 p.m.–5 a.m. 16th 17th	..
.. 17	119	.. 48	,, ,,	,,	Full speed	9 a.m.–5 p.m.	..
.. 18	120	.. 49	34° 26′ S., 172° 14′ E.	,,	50-mesh	9 p.m.–5 a.m. 17th 18th	..
.. 18	121	.. 49 (a)	Off C. Maria v. Diemen	,,	Full speed	Unrecorded	..
.. 19	122	.. 50	From C. Maria van Diemen, S. 80° W., 21 miles	,,	50-mesh	9 p.m.–5 a.m. 18th 19th	..
.. 19	123	.. 51	Between North Cape and Doubtless Bay	,,	Full speed	11 a.m.–4 p.m.	..
.. 23	124	.. 52	Do.	,,	,,	9 a.m.–1 p.m.	..
.. 23	125	.. 53	Do.	,,	Square 18-mesh	2–4 p.m.	..
.. 24	126	.. 54	34° 13′ S., 172° 15′ E.	,,	Do.	9 a.m.–Noon	..
.. 25	127	.. 55	Off Three Kings Islands	,,	50-mesh	9 p.m.–5 a.m. 24th 25th	..
.. 26	128	.. 56	Do.	,,	100-mesh	9 p.m.–6 a.m. 25th 26th	..
.. 26	129	.. 57	Do.	,,	Square 18-mesh	6 p.m.–6 a.m. 25th 26th	..
.. 27	130	.. 58	Do.	,,	Do.	8 p.m.–6.30 a.m. 26th 27th	..
.. 27	131	.. 59	Do.	,,	Do.	9 a.m.–5 p.m.	..

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
Map 2. 1911.							
Aug. 29	132	W. C. 60	Spirits Bay, near North Cape	10 metres	50-mesh	9 a.m.–Noon	Plankton
,, 30	133	,, 61	,, ,,	20 ,,	Square 18-mesh	8 p.m.–6 a.m. 30th 31st	,,
,, 31	134	New Zealand Benthos, 5	,, ,,	11–20 fathoms (20–37 metres)	Dredge	—	Bottom fauna (shelly)
Sept. 1	135	W. C. 62	,, ,,	3 metres	Square 18-mesh	9 p.m.–6.30 a.m. 31st 1st	Plankton
,, 2	136	,, 63	,, ,,	Surface	Do.	9 p.m.–6.30 a.m. 1st 2nd	,,
,, 4	137	,, 64	34° 2′ S., 172° 40′ E.	,,	50-mesh	9 a.m.–Noon	,,
,, 5	138	,, 65	Off Three Kings Islands	,,	,,	2–3.30 p.m.	,,
,, 6	139	,, 66	34° 30′ S., 171° 53′ E.	,,	Square 18-mesh	9 p.m.–6.30 a.m. 5th 6th	,,
,, 6	140	,, 67	Do.	,,	50-mesh	10 a.m.–4 p.m.	,,
,, 7	141	,, 68	34° 37′ S., 171° 19′ E.	,,	Square 18-mesh	11 a.m.–9 a.m. 6th 7th	,,
,, 8	142	,, 69	34° 45′ S., 170° 45′ E.	2 metres	Do.	9 a.m.–9 a.m. 7th 8th	,,
,, 9	143	,, 70	34° 58′ S., 170° 12′ E.	Surface	50-mesh	4 p.m.–9 a.m. 8th 9th	,,
,, 13	144	New Zealand Benthos, 6	From Cape Maria van Diemen, W. by S., 7 miles (true bearing)	35–40 fathoms (64–73 metres)	Dredge	..	Bottom fauna (rock)
,, 15	145	W. C. 71	Anchorage, North Cape	24 metres	50-mesh	1.30–3.30 p.m.	Plankton
,, 18	146	,, 72	,, ,,	5 ,,	,,	11.30 a.m.–1 p.m.	,,
,, 24	147	,, 74	Between Doubtless Bay and Bay of Islands	Surface	Full speed	11 a.m.–4 p.m.	,,
1912.							
Aug. and Sept.	148	(None)	Bay of Islands, 35° 15′ S., 174° 10′ E.	0–24 metres	50-mesh	..	,,
,,	149	—	,, ,,	—	—	—	Parasites from Whales
July–Oct.	150	—	,, ,,	—	—	—	Whale material
Map 3. Map 3. (Plate III.) 1910.							
Sept. 8	151	—	39° 56′ S., 32° 12′ E.	—	—	—	2 Birds
,, 9	152	..	39° 38′ S., 34° 52′ E.	..	..	..	1 Bird
,, 10	153	—	38° 58′ S., 35° 24′ E.	—	—	—	1 Bird
,, 11	154	..	39° 50′ S., 37° 56′ E.	..	..	..	1 Bird
,, 12	155	—	39° 57′ S., 40° 34′ E.	—	—	—	1 Bird
Oct. 3	156	..	42° 17′ S., 111° 18′ E.	..	..	..	1 Bird with parasites
,, 4	157		42° 5′ S., 114° 41′ E.	—	—	—	1 Bird
,, 5	158	..	41° 49′ S., 118° 01′ E.	..	..	..	3 Birds
,, 6	159		41° 46′ S., 121° 39′ E.	—	—	—	Parasites, from an Albatros

Map 3.

Date.	Station-number (to be used in recording results).	Provisional Station-number	Locality.	Depth.	Net.	Time.	Nature of Catch.
1910.							
Oct. 8	160	..	41° 08′ S., 128° 43′ E.	..	..		1 Bird
October	161	..	Melbourne Harbour, Australia	12 metres	Young fish trawl		Plankton
Oct. 21	162	—	43° 40′ S., 157° E.	—	—	—	2 Birds
,, 22	163	..	44° 25′ S., 160° E.	..	..	..	3 Birds
Nov. 30	164	A. 1	47° 34′ S., 170° 38′ E.	Surface	Full speed	4 p.m.	Plankton
(Unknown)	165	—	Off Campbell Islands, 52° 20′ S., 167° 30′ E.	—	—	—	Parasites from a Bird
Dec. 5	166	A. 2	56° 41′ S., 176° 23′ E.	Surface	Full speed	5 p.m.	Plankton
,, 7	167	,, 3	61° 22′ S., 179° 56′ W.	,,	,,	4 p.m.	,,
,, 8	168	,, 4	63° 20′ S., 177° 22′ W.	,,	,,	,,	,,
,, 8	169	—	,, ,,	..	..	..	1 Bird
,, 9	170	A. 5	65° 8′ S., 177° 40′ W.	Surface	Full speed	4 p.m.	Plankton
,, 10	171	,, 6	66° 38′ S., 178° 47′ W.	0–150 metres	Apstein	10 a.m.	,,
,, 10	172	,, 7	,, ,,	0–400 ,,	Nansen	,,	,,
,, 10	173	—	66° 38′ S., 179° 04′ W.	..	..	..	3 Birds (just after the first ice was seen)
,, 13	174	—	67° 28′ S., 177° 58′ W.		—	—	1 Bird
,, 14	175	A. 8	67° 28′ S., 177° 59′ W.	0–400 metres	Nansen	Noon	Plankton
,, 15	176	,, 9	67° 23′ S., 177° 59′ W.	0–250 ,,	Apstein	11 a.m.	,,
,, 15	177	,, 10	,, ,,	0–500 ,,	Nansen	,,	,,
,, 15	178	,, 11	,, ,,	0–500 ,,	24-mesh	9 p.m.	,,
,, 15	179	—	67° 23′ S., 177° 58′ W.	..	..	..	2 Birds
,, 22	180	A. 12	68° 26′ S., 179° 08′ W.	100 metres	24-mesh	5 p.m.	Plankton
,, 22	181	—	68° 41′ S., 179° 28′ W.	—	—	—	8 Birds (in pack-ice)
,, 24	182	A. 13	69° 01′ S., 178° 29′ W.	2 metres	180-mesh	2 a.m.	Plankton
,, 25	183	,, 14	69° 1′ S., 178° 28′ W.	Surface	Hand	1 a.m.	,,
,, 26	184	—	69° 09′ S., 178° 13′ W.	..	..	..	Parasites, from an Adélie Penguin
,, 30	185	A. 15	72° 17′ S., 177° 09′ E.	1 metre	24-mesh	Noon	Plankton
,, 31	186	,, 16	72° 51′ S., 174° 55′ E.	Surface	,,	Midnight	,,
,, 31	187	,, 17	,, ,,	1 metre	180-mesh	,,	,,
1911.							
Jan. 1	188	,, 18	73° 5′ S., 174° 11′ E.	Surface	Full speed	11 a.m.	,,
,, 29	189	B. 3	78° 16′ S., 175° 55′ E.	3 metres	,,	3 p.m.	,,
,, 31	190	,, 4	78° 30′ S., 170° 35′ W.	Surface	,,	2.30 p.m.	,,
Feb. 4	191	Antarctic Benthos, 2	Bay of Whales, Great Ice Barrier	194–250 faths. (355–457 m.)	Dredge	..	Bottom fauna (mud and stones)
,, 18	192	(None)	Robertson's Bay	Surface	Bucket	—	Plankton
,, 22	193	B. 5	69° 23′ S., 163° 59′ E.	1 metre	Full speed	6 p.m.	,,
,, 22	194	Antarctic Benthos, 4	Off Oates Land, 69° 43′ S., 163° 24′ E.	180–200 faths. (329–366 m.)	Agassiz trawl	..	Bottom fauna (undecomposed animal débris)
Mar. 6	195	B. 6	65° 14′ S., 161° 24′ E.	2 metres	50-mesh	5 p.m.	Plankton
,, 11	196	,, 7	61° 10′ S., 163° 01′ E.	1 metre	,,	6 p.m.	,,
,, 14	197	,, 8	58° 30′ S., 161° 35′ E.	Surface	Full speed	3 p.m.	,,
,, 17	198	,, 9	56° 14′ S., 163° 48′ E.	,,	100-mesh	2 p.m.	,,

Map 3.

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
1911.							
Mar. 17	199	B. 10	56° 14′ S., 163° 48′ E.	Surface	180-mesh	2 p.m.	Plankton
July 11	200	W. C. 1	42° 06′ S., 175° 13′ E.	,,	Full speed	1 p.m.	,,
,, 12	201	,, 2	40° 12′ S., 177° 57′ E.	,,	,,	5 p.m.	,,
,, 13	202	,, 3	38° 12′ S., 178° 56′ E.	,,	,,	3.30 p.m.	,,
,, 14	203	,, 4	36° 33′ S., 177° 0′ E.	,,	,,	Noon	,,
Dec. 15	204	D. 1	43° 52′ S., 173° 12′ E.	,,	,,	11 a.m.–Noon	,,
,, 15	205	,, 2	,, ,,	,,	,,	1–4 p.m.	,,
,, 16	206	,, 3	45° 25′ S., 172° 28′ E.	,,	,,	9 a.m.–1 p.m.	,,
,, 17	207	,, 4	47° 44′ S., 173° 2′ 5″ E.	,,	,,	9 a.m.–4 p.m.	,,
,, 18	208	,, 5	49° 40′ S., 171° 45′ E.	,,	,,	Noon–4 p.m.	,,
,, 19	209	,, 6	51° 48′ S., 172° 18′ E.	,,	,,	9 p.m.–9 a.m. 18th 19th	,,
,, 20	210	,, 7	53° 35′ S., 173° 06′ E.	,,	,,	9 a.m.–Noon	,,
,, 21	211	,, 8	55° 16′ S., 173° 02′ E.	,,	,,	Noon	,,
,, 23	212	,, 9	59° 6′ S., 177° 55′ E.	,,	,,	9 a.m.–Noon	,,
,, 24	213	,, 10	60° 39′ S., 178° 40′ W.	,,	,,	,, ,,	,,
,, 24	214	,, 11	,, ,,	,,	,,	1–4 p.m.	,,
,, 25	215	,, 12	62° 10′ S., 175° 38′ W.	,,	,,	11 a.m.–2 p.m.	,,
,, 27	216	,, 13	64° 56′ S., 175° 30′ W.	,,	,,	Noon–1 p.m.	,,
,, 29	217	,, 14	66° 46′ S., 177° 48′ W.	10 metres	50-mesh	10.30 a.m.–Noon	,,
Nov. and Dec.	218	—	Cape Adare	—	—	—	8 Birds
1912.							
Jan. 3	219	D. 15	Robertson's Bay	10 metres	50-mesh	5–6.30 p.m.	Plankton
,, 3	220	Antarctic Benthos, 5	Off Cape Adare, mouth of Robertson's Bay	45–50 fathoms (82–92 metres)	Agassiz trawl	..	Bottom fauna (shingle)
,, 9	221	D. 16	North (True) of Drygalski Glacier Tongue, Terra Nova Bay	10 metres	50-mesh	1–2 p.m.	Plankton
,, 10	222	,, 17	76° 3′ S., 165° 55′ E.	10 ,,	,,	,,	,,
,, 11	223	,, 18	76° 2′ S., 165° 55′ E.	10 ,,	,,	9–11 a.m.	,,
Mar. 9	224	,, 33	60 miles E. of Cape Adare	1 ,,	,,	7–9 p.m.	,,
,, 11	225	,, 34	69° 45′ S., 177° 19′ E.	20 ,,	,,	2–4 p.m.	,,
,, 12	226	,, 35	69° 23′ S., 177° 52′ E.	10 ,,	,,	9–11 a.m.	,,
,, 15	227	,, 36	68° 03′ S., 169° 45′ E.	Surface	Full speed	1–2 p.m.	,,
,, 18	228	,, 37	64° 3′ S., 160° 12′ E.	,,	,,	9 p.m.–4 a.m. 17th 18th	,,
,, 18	229	,, 38	,, ,,	80 metres	50-mesh	8.30–9 a.m.	,,
,, 18	230	,, 39	,, ,,	80 ,,	,,	11 a.m.–12.30 p.m.	,,
,, 18	231	,, 40	,, ,,	80 ,,	24-mesh	1.30–4.30 p.m.	,,
,, 24	232	,, 41	55° 51′ S., 165° 49′ E.	Surface	Full speed	10–11 a.m.	,,
,, 26	233	,, 42	52° 41′ S., 168° 15′ E.	,,	,,	Noon	,,
,, 26	234	,, 43	,, ,,	3 metres	24-mesh	2–5 p.m.	,,
,, 26	235	,, 44	,, ,,	10 ,,	,,	7–10 p.m.	,,
,, 27	236	,, 45	52° 11′ S., 167° 25′ E.	80 ,,	,,	6–8 p.m.	,,
,, 27	237	,, 46	,, ,,	10 ,,	,,	Midnight–8 a.m. 27th 28th	,,

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
1912.							
Mar. 27	238	D. 46 (a)	52° 11′ S., 167° 25′ E.	30 metres	24-mesh	10–10.30 a.m.	Plankton
,, 27	239	—	,, ,,	—	—	—	4 Birds
,, 28	240	D. 47	51° 57′ S., 167° 38′ E.	4 metres	180-mesh	8.30–9 a.m.	Plankton
,, 28	241	,, 47 (a)	,, ,,	Surface	24-mesh	9 p.m.–4 a.m. 27th 28th	,,
April 2	242	,, 48	Off Akaroa Heads, New Zealand	10 metres	50-mesh	10 a.m.	,,
July–Oct.	243	..	Neighbourhood of Admiralty Bay, Nelson, New Zealand	..	..	..	Land and littoral fauna
Dec. 15	244	E. 1	45° 42′ S., 174° 43′ E.	0–200 ..	Apstein	8 p.m.	Plankton
,, 16	245	,, 2	46° 58′ S., 176° 3′ E.	0–100 ..	,,	10 am.	,,
,, 16	246	,, 3	,, ,,	0–200 ,,	,,	,,	,,
,, 18	247	,, 4	51° 22′ S., 179° 18′ W.	0–200 ..	,,	10.30 a.m.	,,
,, 18	248	,, 5	,, ,,	Surface	Large full speed	7 p.m.	,,
,, 18	249	,, 6	,, ,,	0–400 metres	Apstein	8 p.m.	,,
,, 20	250	,, 7	54° 2′ S., 177° 0′ W.	Surface	50-mesh	Noon–1 p.m.	,,
,, 20	251	,, 8	,, ,,	,,	,,	8–8.30 p.m.	,,
,, 21	252	,, 9	54° 33′ S., 176° 55′ W.	,,	,,	4–5 p.m.	,,
,, 21	253	,, 10	54° 38′ S., 176° 24′ W.	0–400 metres	Apstein	8 p.m.	,,
,, 21	254	,, 11	,, ,,	0–200 ,,	,,	,,	,,
,, 21	255	,, 12	,, ,,	0–100 ,,	,,	,,	,,
,, 21	256	,, 13	,, ,,	20 ,,	50-mesh	10 p.m.	,,
,, 22	257	,, 14	55° 34′ S., 174° 35′ W.	0–200 ,,	Apstein	9 p.m.	,,
,, 22	258	,, 15	,, ,,	0–400 ,,	,,	,,	,,
,, 22	259	,, 16	,, ,,	20 ,,	50-mesh	,,	,,
,, 25	260	,, 17	62° 20′ S., 167° 45′ W.	0–360 ,,	Apstein	8 p.m.	,,
,, 25	261	,, 18	,, ,,	0–544 ,,	,,	,,	,,
,, 26	262	,, 19	64° 33′ S., 166° 30′ W.	0–330 ,,	,,	,,	,,
,, 26	263	,, 20	,, ,,	0–200 ,,	,,	,,	,,
,, 26	264	,, 21	,, ,,	20 ,,	50-mesh	9 p.m.	,,
,, 27	265	,, 22	66° 30′ S., 166° 8′ W.	0–800 ,,	Apstein	8 p.m.	,,
,, 27	266	,, 23	,, ,,	0–600 ,,	,,	,,	,,
,, 27	267	,, 24	,, ,,	Surface	24-mesh	8–8.30 p.m.	,,
,, 28	268	,, 25	68° 37′ S., 166° 14′ W.	0–400 metres	Apstein	8 p.m.	,,
,, 28	269	,, 26	,, ,,	Surface	Young fish trawl	6–8 p.m.	,,
,, 29	270	,, 27	69° 51′ S., 166° 17′ W.	0–600 metres	24-mesh	8 p.m.	,,
,, 31	271	,, 28	71° 23′ S., 166° 3′ W.	Surface	,,	,,	,,
1913.							
Jan. 1	272	,, 29	71° 35′ S., 166° 01′ W.	80 metres	,,	4 p.m.	,,
,, 2	273	,, 30	,, ,,	20 ,,	,,	10–11.30 p.m.	,,
,, 3	274	,, 31	71° 29′ S., 166° 0′ W.	80 ,,	,,	9 a.m.–Noon	,,
,, 3	275	,, 32	,, ,,	160 ,,	,,	1–5 p.m.	,,
,, 5	276	,, 33	71° 41′ S., 166° 47′ W.	0–1750 ,,	,,	10.30–11.30 p.m.	,,
,, 6	277	,, 34	,, ,,	0–200 ,,	Apstein	11 a.m.–Noon	,,

Map 3.

Map 3.

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
1913.							
Jan. 6	278	E. 35	71° 41′ S., 166° 47′ W.	0–400 metres	Apstein	11 a.m.–Noon	Plankton
,, 6	279	,, 36	,, ,,	0–600 ,,	,,	,, ,,	,,
,, 6	280	,, 37	,, ,,	0–800 ,,	,,	,, ,,	,,
,, 6	281	,, 39	,, ,,	80 ,,	24-mesh	5.30–8 p.m.	,,
,, 7	282	,, 38	,, ,,	0–1000 ,,	,,	8 p.m.–8 a.m. 6th 7th	,,
,, 7	283	,, 40	71° 39′ S., 166° 47′ W.	80 ,,	,,	1–3 p.m.	,,
,, 8	284	,, 41	71° 49′ S., 167° 32′ W.	80 ,,	,,	5.15–7.30 p.m.	,,
,, 8	285	,, 42	,, ,,	0–600 ,,	,,	8–10 p.m.	,,
,, 9	286	,, 43	71° 44′ S., 167° 57′ W.	10 ,,	50-mesh	11 a.m.–12.30 p.m.	,,
,, 9	287	,, 44	,, ,,	80 ,,	24-mesh	9 a.m.–7 p.m.	,,
,, 11	288	,, 45	71° 59′ S., 168° 43′ W.	60 ,,	,,	8 p.m.–9 a.m. 10th 11th	,,
,, 12	289	,, 46	72° S., 168° 17′ W.	24 ,,	,,	8 p.m.–9 a.m. 11th 12th	,,
,, 12	290	,, 47	,, ,,	60 ,,	,,	9 a.m.–3 p.m.	,,
,, 14	291	,, 48	72′ 41′ S., 172° 37′ W.	0–600 ,,	Apstein	10 a.m.	,,
,, 14	292	,, 49	,, ,,	0–300 ,,	,,	,,	,,
,, 15	293	,, 50	73° 41′ S., 177° W.	0–370 ,,	,,	,,	,,
,, 15	294	Antarctic Benthos, 12	Ross Sea, 74° 25′ S., 179° 3′ E.	158 fathoms (289 metres)	Agassiz trawl	—	Bottom fauna
,, 27	295	Antarctic Benthos, 15	73° 51′ S., 172° 57′ E.	190 fathoms (348 metres)	Agassiz trawl	,,	,,
Feb. 1	296	E. 53	63° 11′ S., 158° 52′ E.	0–400 metres	Apstein	8.30 p.m.	Plankton
,, 1	297	,, 54	,, ,,	0–200 ,,	,,	,,	,,
,, 1	298	,, 55	,, ,,	12 ,,	24-mesh	,,	,,
,, 2	299	,, 56	61° 18′ S., 157° 33′ E.	0–200 ,,	Apstein	10 p.m.	,,
,, 2	300	,, 57	,, ,,	0–140 ,,	24-mesh	,,	,,
,, 3	301	,, 58	58° 21′ S., 158° 5′ E.	0–200 ,,	Apstein	8.30 p.m.	,,
,, 3	302	,, 59	,, ,,	20 ,,	24-mesh	,,	,,
Mar. 14	303	H. 1 (p)	45° 24′ S., 174° 55′ E.	Surface	Full speed	11 a.m.–Noon	,,
,, 16	304	,, 2 (p)	48° 33′ S., 178° 28′ E.	4 metres	24-mesh	2–2.30 p.m.	,,
,, 21	305	,, 3	56° 41′ S., 162° 05′ W.	Surface	50-mesh	9–9.30 p.m.	,,
,, 24	306	,, 4	55° 55′ S., 152° 39′ W.	,,	Young fish trawl	10 a.m.–1 p.m.	,,
April 1	307	,, 5	55° 16′ S., 120° 3′ W.	6 metres	24-mesh	6.15–8.45 p.m.	,,
,, 9	308	,, 6	55° 29′ S., 78° 54′ W.	4 ,,	,,	9.30–11 a.m.	,,
,, 19	309	,, 7	40° 05′ S., 54° 39′ W.	4 ,,	,,	10.30 a.m.–12.30 p.m.	,,
,, 21	310	,, 8	36° 57′ S., 51° 21′ W.	Surface	50-mesh	3.30–3.50 p.m.	,,
,, 22	311	,, 9	35° 29′ S., 50° 26′ W.	2 metres	Young fish trawl	8–10 a.m.	,,

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
Map 4. (Plate IV.)							**Map 4.**
1911.							
Jan. 19	312	..	77° 38' S., 166° 24' E.	..	..	..	Parasites, from McCormick's Skua
.. 21	313	B. 1	Off Cape Barne, Ross Island	1 metre	24-mesh	11–11.15 a.m.	Plankton
.. 23	314	Antarctic Benthos, 1	5 miles N. of Inaccessible Island, McMurdo Sound	222–241 faths. (406–441 m.)	Agassiz trawl	—	Bottom fauna (mud)
.. 28	315	B. 2	E. of Cape Bird, Ross Island	5 metres	Full speed	5.30 p.m.	Plankton
Feb. 9	316	Antarctic Benthos, 3	Off Glacier Tongue, about 8 miles N. of Hut Point, McMurdo Sound	190–250 faths. (348–457 m.)	Agassiz trawl	..	Bottom fauna (undecomposed animal remains and mud)
June 7–Oct. 14	317	—	Hole in ice between Cape Evans and Inaccessible Island	175 metres	Townets	—	Plankton
June 13–Sept. 16	318	..	Do.	175 metres	Traps and tangles on bottom	..	Bottom fauna
Aug. 7	319	—	In contraction - crack between Inaccessible Island and Barne Glacier	—	Fish-trap	—	Fishes
.. 14	320	..	Inaccessible Island	150 fathoms (275 metres)	..	..	Free Nematodes
.. 13–17	321	—	In contraction - crack between Inaccessible Island and Barne Glacier	180–250 metres	7-mesh	—	Bottom fauna
Sept. 3, 4	322	..	Do.	20 metres	Fish-trap, dredge	..	.. ..
Oct. 16–Dec. 23	323	—	Hole in ice between Cape Evans and Inaccessible Island	168 ,,	Townets	—	Plankton
1911, 1912	324	..	Hut Point	..	..	..	Shore collecting
..	325	—	Cape Evans	—	—	—	Miscellaneous collections
.. ..	326	..	Cape Evans and immediate neighbourhood, various cracks and holes through the ice	4–40 metres	Fish-trap	..	Bottom fauna and fishes
.. ..	327	—	Cape Royds	—	—	—	1 Bird
.. ..	328	..	..	..	..	..	Shore collecting
1912.							
Jan. 13	329	D. 19	Near Beaufort Island	10 metres	50-mesh	11–p.m.	Plankton
.. 13	330	.. 20	,, ..	10 ,,	,,	3–4 p.m.	,,
.. 14	331	Antarctic Benthos, 6	Off Cape Bird Peninsula, entrance to McMurdo Sound	250 fathoms (457 metres)	Dredge	—	Bottom fauna (mud)

Map 4.

Date.	Station-number (to be used in recording results).	Provisional Station-number.	Locality.	Depth.	Net.	Time.	Nature of Catch.
1912.							
Jan. 16	332	D. 21	77° 15′ S., 166° 0′ E.	0–550 metres	Agassiz trawl	2 a.m.	Plankton
,, 17	333	,, 22	77° 22′ S., 165° 22′ E.	80 metres	Square 18-mesh	1–5 a.m.	,,
,, 19	334	(None)	Near Granite Harbour	Surface	Hand-net	..	,,
,, 20	335	D. 23	,, ,,	0–300 metres	Nansen	10 a.m.	,,
,, 20	336	,, 24	,, ,,	10 metres	50-mesh	2 p.m.	,,
,, 22	337	,, 25	Off Cape Bird Peninsula	80 ,,	Square 18-mesh	10.30 a.m.–Noon.	,,
,, 23	338	Antarctic Benthos, 7	77° 13′ S., 164° 18′ E.	207 fathoms (379 metres)	Agassiz trawl	—	Bottom fauna (mud)
,, 24	339	Do., 8	77° 5′ S., 164° 17′ E.	140 fathoms (256 metres)	Do.	..	,, ,,
,, 25	340	Do., 9	76° 56′ S., 164° 12′ E.	160 fathoms (293 metres)	Do.	—	,, ,,
,, 25	341	(None)	Off Cape Bird Peninsula	80 metres	Square 18-mesh	7 p.m.–Noon 24th 25th	Plankton
,, 31	342	D. 26	Off Cape Royds	0–350 metres	Nansen	4 p.m.	,,
Feb. 1	343	,, 27	,,	0–600 ,,	,,	Noon	,,
,, 1	344	,, 28	,,	0–400 ,,	,,	3 p.m.	,,
,, 2	345	,, 29	McMurdo Sound	0–500 ,,	,,	8.30–9.30 a.m.	,,
,, 3	346	,, 30	,,	0–450 ,,	,,	9 a.m.–5 p.m.	,,
,, 4	347	,, 31	Off Cape Barne	0–150 ,,	,,	,, ,,	,,
,, 13	348	Antarctic Benthos, 10	Off Barne Glacier, McMurdo Sound	200 fathoms (366 metres)	Agassiz trawl	—	Bottom fauna (mud)
,, 15	349	Do., 11	Off Butter Point, Western Shore of McMurdo Sound	80 fathoms (146 metres)	Do.	..	,, ,, (large catch of glassy sponges)
Mar. 4	350	D. 32	Off Glacier Tongue, McMurdo Sound	250 metres	24-mesh	2–4 p.m.	Plankton
Apr. 26–June 7	351	—	Hole in ice between Cape Evans and Inaccessible Island.	205 ,,	Townets	—	,,
Aug. 29–Sept. 26	352	..	Do.	112 ,,	,,	..	,,
Dec. 4–13	353	—	Cape Royds	—	—	—	13 Birds
1913.							
Jan. 20	354	E. 51	77° 46′ S., 166° 8′ E.	12 metres	24-mesh	11 a.m.–2 p.m.	Plankton
,, 20	355	Antarctic Benthos, 13	,, ,,	300 fathoms (547 metres)	Agassiz trawl	..	Bottom fauna
,, 22	356	Do., 14	Off Granite Harbour, entrance to McMurdo Sound	50 fathoms (92 metres)	Do.	—	,, ,, (mud)
,, 22	357	E. 52	77° 1′ S., 163° 22′ E.	12 metres	24-mesh	2–6 p.m.	Plankton

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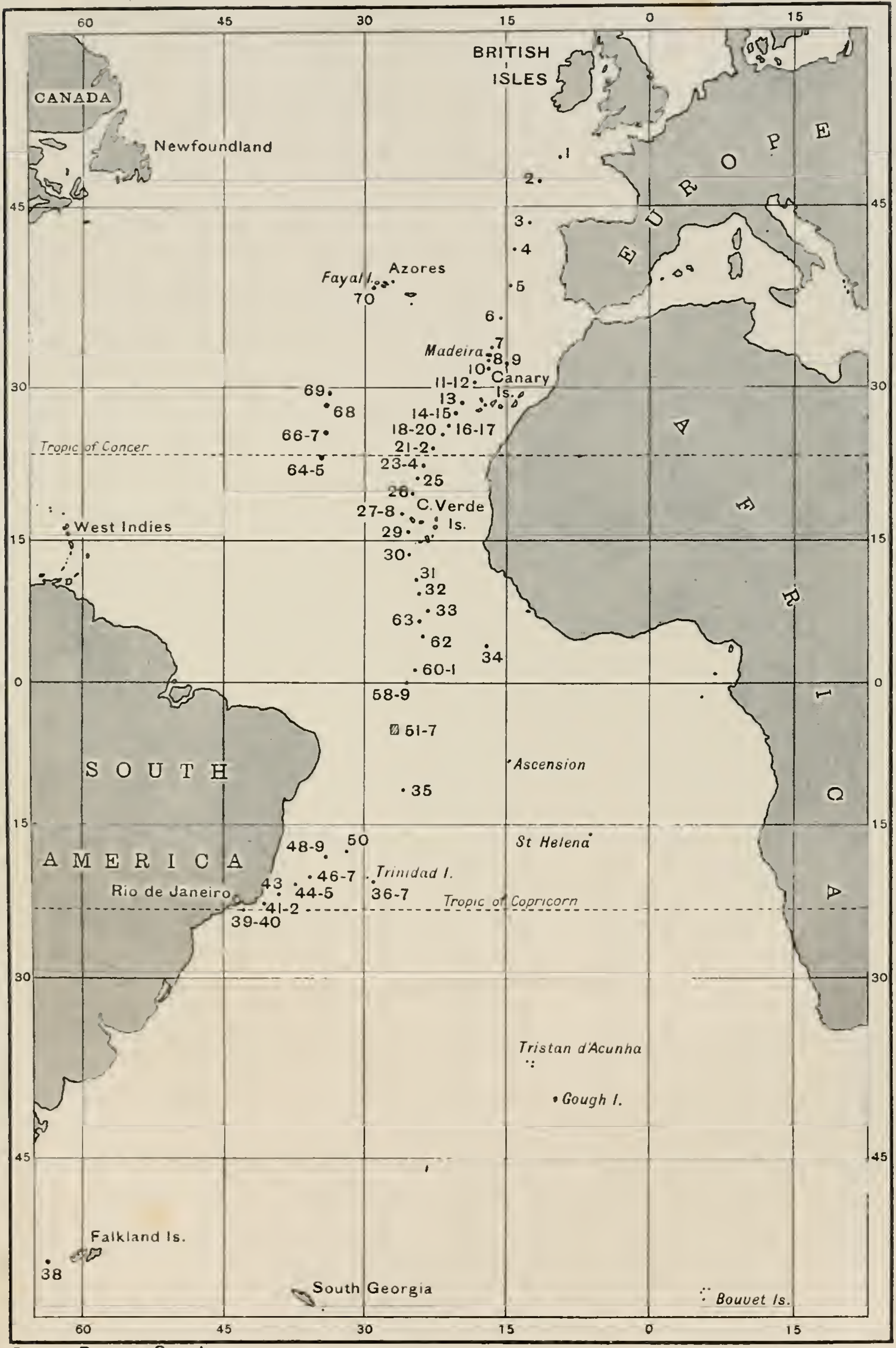
Collecting Stations, Pl. I.



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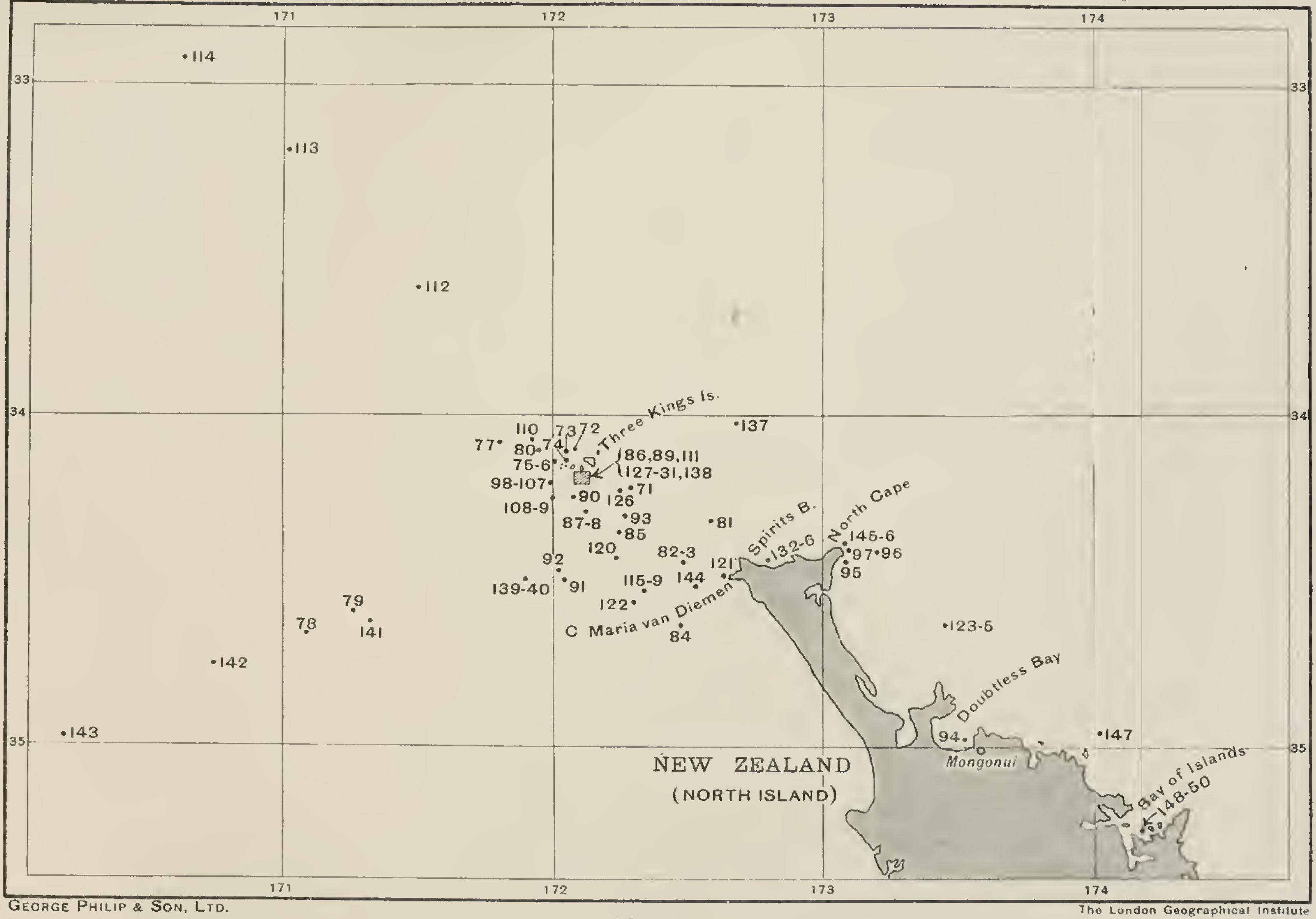
Map 1.



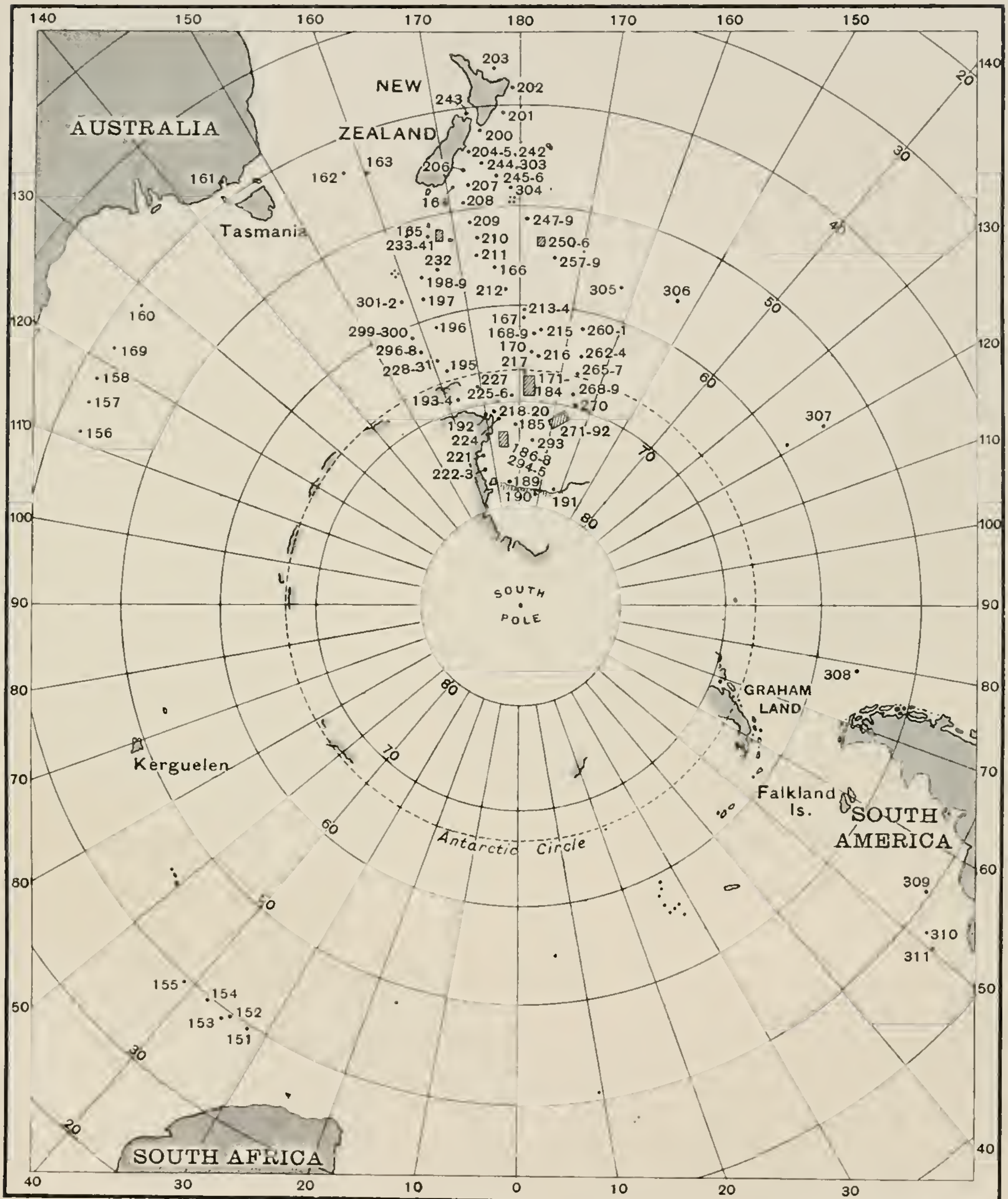
Map 2.

Collecting Stations, Pl. II.

Brit. Antarctic (Terra Nova) Exped. 1910.
Zoology, Vol II.

Brit. Mus (Nat. Hist.)

Collecting Stations, Pl. III.



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Map 3.

Collecting Stations, Pl. IV.

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Map 4.

OLIGOCHAETA.

A PARASITIC ENCHYTRAEID.

BY H. A. BAYLIS, B.A.

I.—GENERAL.

The "Terra Nova" was at the island of South Trinidad (Station 36, Lat. 20° 28′ S., Long. 29° 25′ W.) from July 26–30, 1910. During this stay the opportunity of shore-collecting was taken by the naturalists, and Surgeon E. L. Atkinson, R.N., collected some of the Land-crabs (*Gecarcinus lagostoma*), which were taken alive on board ship. On the 30th some of them were dissected, and their gill-chambers were found to contain small worms, which were at first thought to be Nematodes. They prove, however, to be typical Oligochætes, and clearly belong to the family Enchytræidæ.

As records of Oligochæta occurring in association, either as parasites or as commensals, with other animals are by no means frequent, and more especially as only one Enchytræid appears to have been described as occurring in such association, the fact of a member of this family having chosen such a situation is interesting.

The one previous instance known to me is that of *Pachydrilus* [*Epitelphusa*] *catanensis* Drago, occurring in the gill-chambers of the freshwater crab *Telphusa fluviatilis* in Italy.*

It is worthy of remark that the worm seems to have undergone no special modification in structure as the result of its parasitic or semi-parasitic habit, but

* I am indebted to Dr. R. T. Leiper for calling my attention to the preliminary account of this species, in: Bull. Soc. Entom. Ital. Anno XIX., 1887, pp. 81–83. Drago's further account, with figures, in: Ric. Labor. Anat. Roma, vii, Fasc. 1, 1899, I have unfortunately been unable to consult.

remains in every respect similar to its near relatives, nearly all of which are earthworms, or to a certain extent aquatic.

The worms occur in considerable numbers, lying on and among the gills of the crab, and also upon the lining of the dorsal wall of the gill-chambers. The lining is here modified in these crabs into a richly vascular area, or "lung," by means of which oxygen can be absorbed from the air; this adaptation being in accordance with the crab's habit of living on dry land for the greater part of the year. So far as is known from observations in other localities, the land-crabs only repair to the sea for a few days at one period of the year, for the purpose of allowing the larvæ to escape from the eggs into the water. The crabs in which the worms occurred were collected, as Surgeon Atkinson informs me, at "1,500–2,000 feet above sea line," (*i.e.*, within 20 feet of the highest point of the island), and were "feeding on decaying vegetation and perhaps a certain amount of excreta from sea-birds."

It would appear that the worms must be capable of withstanding exposure to sea-water at least for a short time each year, unless they only migrate into the crabs' gill-chambers during the period of terrestrial life. This, however, seems improbable. Worms of various ages and at various stages of development, besides fully adult individuals, occurred in the gill-chambers of a preserved crab in the "Terra Nova" collection,* which, by the kindness of Dr. W. T. Calman, I was permitted to examine. From this fact it may be inferred that they probably spend the whole of their lives in this situation. It would be of the greatest interest to know what advantage they derive from the crab—whether mere protection from enemies, or some special food. It is indeed impossible to state upon what nutriment they subsist; it seems improbable that they are capable of extracting blood from the crab's gills or from the vascular epithelium, their mouths being provided with no hard parts which would enable them to make punctures.

These questions must for the present remain unanswered, since answers to them can hardly be derived from the examination of spirit-specimens.

II.—SYSTEMATIC.

Morphologically, there seems to be no reasonable ground for the erection of a new genus for this worm. It appears to approach closely to the described species of *Enchytræus*, differing only in details of size, arrangement of bristles, and other small points; for the present, therefore, it may be placed in that genus.

* It is also worthy of notice that I found specimens of the same worm in individuals of *Gecarcinus lagostoma* collected in South Trinidad (*a*) by the "Discovery" expedition and (*b*) by the late Major G. E. H. Barrett-Hamilton's expedition to South Georgia. The occurrence of the worms seems, therefore, to be quite common. I have no evidence of the existence of the same worm in crabs from other localities, but a closely-related species occurred in *G. quadratus*, from Clarion Island. Of this species I hope to publish an account elsewhere.

Enchytræus carcinophilus, sp. n.

Diagnosis :—

Length, 30–40 mm. Number of segments, 125. Chætæ, 3 per bundle in front of clitellum; 2 or 3 per bundle behind it. Brain nearly straight behind. Nephridia with funnel only in front of septum. Spermathecæ tubular, with walls expanded and folded at about the middle, and a few gland-cells near the external opening. Sperm-ducts very long and coiled.

Hab.—Stat. 36, South Trinidad Island, S. Atlantic. Living in the interior of the gill-chambers of a land-crab (*Gecarcinus lagostoma*, H. Milne-Edwards).

III.—ANATOMICAL.

Enchytræus carcinophilus, sp. n.

External Features.

The largest specimens measure 30–34 mm. in length, and have a thickness of about 0·6 mm. (In the region of the clitellum the thickness is somewhat greater.) These measurements are taken from specimens fully extended, found in a crab preserved in spirit.

The number of segments, in a large specimen, is about 125.

The preserved specimens are colourless or slightly yellow.

The chætæ are short, simple and pointed; straight, or only to a very slight degree sigmoid. They are arranged in four bundles, or transversely-placed groups, in each segment. In a mature specimen both dorsal and ventral bundles, anterior to the clitellar region, contain three bristles each. Behind the clitellum each bundle (dorsal as well as ventral) contains two or three bristles. In very young specimens, only the first six dorsal bundles contain the full number of three bristles, while in somewhat older individuals, which have as yet no clitellum or genital organs, the first ten bundles were found to be complete. The first segment (peristomium) is devoid of bristles, as are also the segments occupied by the clitellum.

There is a minute "head-pore" in, or immediately behind, the groove which marks off the prostomium from the peristomium on the dorsal side. A series of dorsal pores, however, seems to be absent.

The clitellum, in mature specimens, is a band of thickened epithelium, consisting of a single layer of tall gland-cells, and occupying segments XI.–XIII. At about the middle of its length, on the ventral side, and projecting laterally, are two large spermiducal pores, with thick, fleshy lips (Fig. 8, ♂). These are exceedingly prominent, and conspicuous to the naked eye. They are situated in segment XII.

The oviducal pores are situated shortly behind the male pores, at the septum between segments XII. and XIII. (Fig. 8, ♀). The openings of the spermathecæ, of which there is a single pair (Fig. 1, Sp.), are placed far forward, just in front of the septum separating segments IV. and V.

Internal Anatomy.

Alimentary Canal.—The mouth is on the ventral side, and is, as usual, overhung by the prostomium. It leads into a narrow buccal cavity, whose only peculiarity is the presence of a small, pointed, tongue-like organ on its floor. This "tongue" (Fig. 12, T) lies with its point directed backwards, after the manner of the tongue of a frog. Its point is almost hair-like, and the organ is probably sensory in function.

The buccal cavity is succeeded by a pharynx, whose roof is formed by a very thick muscular pad, provided with strong retractor muscles (Figs. 1 and 12, MPh.). The whole pharynx, with its muscular pad, appears to be capable of eversion, some of the preserved worms having been found in this position. In this case, the little "tongue" on the floor of the buccal cavity is probably also carried to the exterior, and may there come into use as a feeler or gustatory organ.

Just behind the muscular pad of the pharynx the œsophagus commences, and at this point, on the dorsal side, there open into it side by side a pair of short blind tubular organs (Fig. 12, Sal.), which may be the so-called "salivary glands."

Further back, on either side of the œsophagus there are three glandular masses, the "septal glands" (Figs. 1, 10, 11 and 12, Sep.); the first pair attached to the anterior surface of the septum between segment IV. and V., and the second and third pairs attached in a similar manner to the two following septa. The glands thus occupy segments IV., V. and VI.; they are massive and solid, and are L-shaped, each having a dorsal prolongation. They are not, however, continuous over the dorsal side of the œsophagus. This portion of the alimentary canal is richly lined with long cilia (Figs. 10 and 11, Oes). Behind it the intestine is continued without any marked increase in diameter, and passes down the whole length of the worm to the anus, which is terminal.

Circulatory System.—The main reservoir of blood seems to be a large blood-sinus which surrounds the gut, and is most conspicuous (in sections) in the region of the œsophagus (Fig. 11, B S).

In addition to this there is the usual system of vessels characteristic of the Enchytræidæ (Fig. 5). The dorsal vessel (DV) takes its origin at a point on the wall of the intestine at the septum between segments XIII. and XIV. Passing forwards just above the gut, it bifurcates in the first segment, forming the usual pair of lateral vessels (LV), which pass round the pharynx and join just behind it on the ventral side, to form the ventral longitudinal vessel (VV). The dorsal and lateral vessels are connected also by two pairs of commissural vessels (C, C′), which arise from the dorsal vessel close together in the fourth segment. The anterior pair pass forwards and round the pharynx to join the lateral branches a little behind their middle. The second pair spring from the under side of the dorsal vessel, and join the lateral vessels behind the pharynx, just before they unite into the ventral trunk. Behind these commissural vessels, the dorsal vessel also gives off small branches to the viscera.

The blood is of a yellow or very pale orange colour—in living specimens it may perhaps be red.

Nervous System.—The brain (Fig. 4) is of an oblong shape, but slightly broader posteriorly. Its outline behind is nearly straight (very slightly concave). The brain gives off at its two anterior corners the usual pair of circum-pharyngeal connectives, which join below to form the ventral nerve-cord. The first ventral ganglion appears to send out anteriorly a bundle of nerve-fibres to the body-wall. In other respects there is nothing worthy of remark in the nervous system.

Nephridia.—These (Fig. 9) are of the type usual in *Enchytræus*. Only the ciliated funnel projects through the septum into the preceding segment, the main mass of the organ lying horizontally, and its duct to the exterior passing off at a right angle.

Male Genital Organs.—The testes are in segment XI. on the septum X./XI. The large sperm-sacs (Figs. 1 and 8, SS) occupy segments X. and XI., and in the eleventh there is a pair of large sperm-funnels of an elegant urn-shape, for conveying sperm from the sacs to the exterior. These funnels (Fig. 7) are composed of three parts: the "funnel" proper, being a trumpet-like expanded rim lined with long cilia; a thick-walled portion in which the contents of the cells appear granular and deeply-staining, and a wider portion forming the base of the urn, with walls composed of tall cells. From the base of this arises a very long and much convoluted sperm-duct (Fig. 8, SD), which finally opens on segment XII. by the conspicuous fleshy protuberances (Fig. 8, ♂) mentioned among the external features. Just before its external opening (Fig. 6) the duct passes into a small bulbous expansion, and the orifice is surrounded by little groups of glandular cells ("prostate glands"), arranged in transverse rows (Fig. 6, Pr.).

Female Genital Organs.—The ovaries (Fig. 8, Ov.) are in segment XII., and give rise to large eggs with a very abundant supply of yolk.

The oviducts (Fig. 8, ♀) are, as in other Enchytræids, mere funnel-like out-pushings of the septum XII./XIII. to meet the body-wall. The external pores are very minute.

The spermathecæ (Figs. 1 and 10, Sp.) open, as already mentioned, at, or just in front of, the septum IV./V. They pass, as a pair of rather thick-walled tubes, between the first and second septal glands on either side, and their inner ends open, as is (curiously enough) usual in this family, into the œsophagus (Fig. 10). At about the middle of its length each spermatheca becomes somewhat expanded, and its walls, which are ciliated, are at this point thrown into one or more pockets. Near the external opening the ducts are covered externally by a few large, stalked gland-cells (Fig. 10, G.).

PLATE I.

Enchytræus carcinophilus.

Fig. 1. Dorsal view of the anterior end of a specimen in glycerine.
Br, brain; MPh, muscular pad of pharynx; R, retractor muscles of pharynx; Sep, the three pairs of septal glands; Sp, spermatheca; SS, sperm-sac.

Fig. 2. Dorsal view of entire worm, × 3.

Fig. 3. A small portion of the surface of the clitellum, highly magnified, showing the outer ends of the large glandular cells.

Fig. 4. The brain, as seen from above.
Com, root of commissural nerve; M, muscles; NPr, nerve to prostomium.

Fig. 5. Dorsal view of the system of blood-vessels in the anterior region.
C,C′, the two commissural vessels of the left side; DV, the dorsal vessel; LV, the left lateral vessel; VV, the ventral vessel.

Fig. 6. Portion of a longitudinal section, showing the termination of the sperm-duct.
Pr, "prostate glands"; SD, sperm-duct.

Fig. 7. Longitudinal section through a sperm-funnel.
D, commencement of sperm-duct; S, septum.

Fig. 8. Ventral view of the region of the clitellum and genital organs, from a glycerine preparation.
Cl, Cl′, limits of the clitellum; NC, nerve cord; Ov, ovary; SD, coils of sperm-duct; SF, sperm-funnel; SS, sperm-sac; ♂, fleshy lip of spermiducal pore; ♀, oviduct.

Fig. 9. A nephridium.
CF, ciliated funnel; D, duct to exterior; S, septum.

Fig. 10. Transverse section in the region of the spermathecæ.
CM, circular muscles DV, dorsal vessel; G, gland-cells; LM, longitudinal muscles; NC, nerve cord; Oes, œsophagus; Sep, septal gland; Sp, external aperture of spermatheca; VV, ventral vessel.

Fig. 11. Transverse section slightly behind the spermathecæ.
BS, blood-sinus surrounding the œsophagus; other lettering as in fig. 10.

Fig. 12. Approximately median sagittal section of the anterior portion of the body.
Br, brain; G, gland-cells on exterior of intestine; M, mouth; MPh, muscular pad of pharynx; NC, nerve cord; Oes, œsophagus; R, retractor muscles of pharynx; Sal, salivary gland; Sep, septal glands; T, "tongue."

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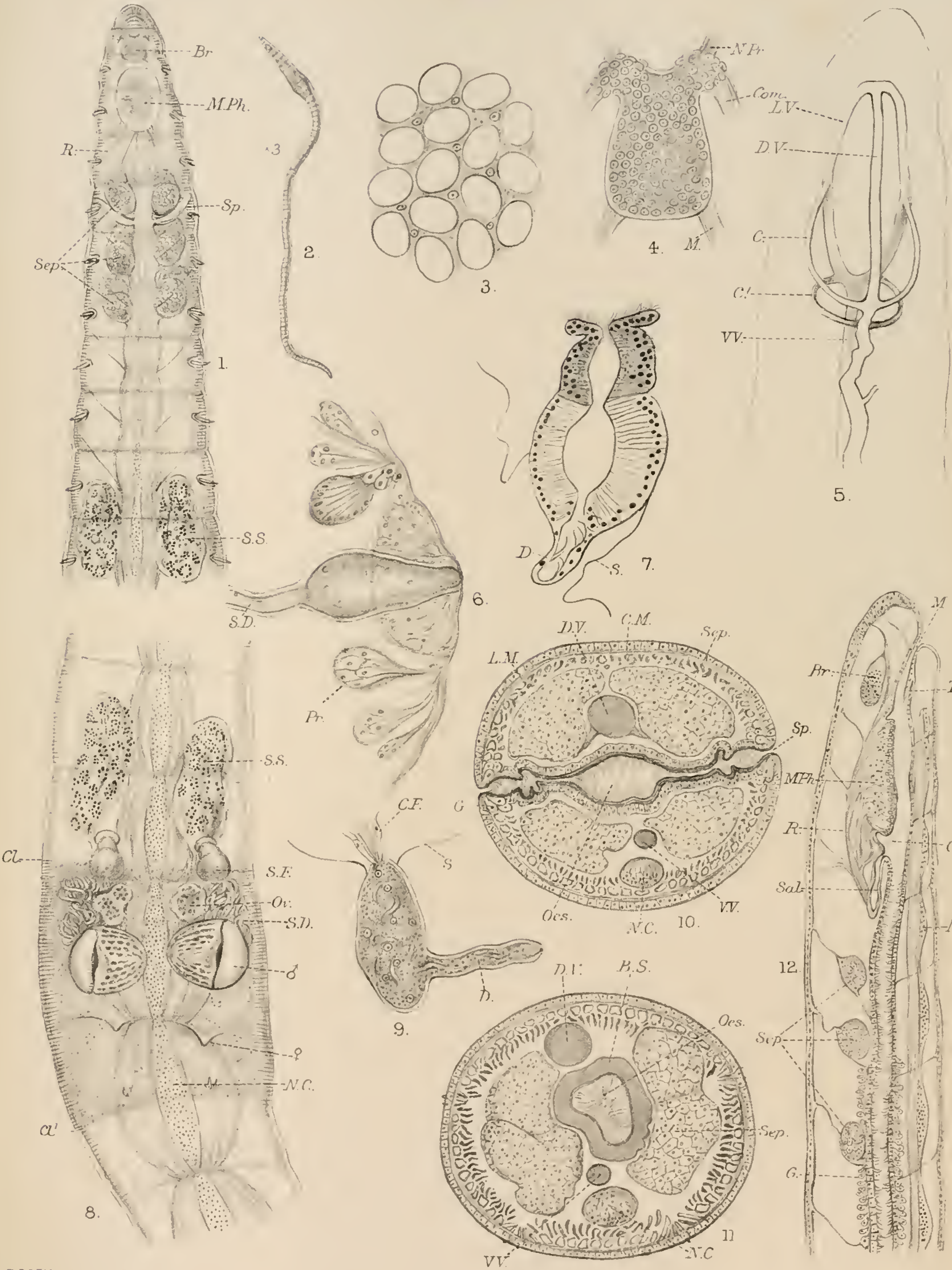

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Enchytraeus carcinophilus

PARASITIC WORMS

WITH A NOTE ON A FREE-LIVING NEMATODE.

BY

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AND

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CONTENTS.

INTRODUCTORY.

The material, comprising in all thirty-eight species, was obtained chiefly within the Antarctic Circle. A certain amount of collecting was done, however, during the outward voyage of the "Terra Nova." A preliminary account is given, therefore, of the various forms and their hosts according to the geographical regions in which they were found.

Tropical Zone.—On July 3rd and 4th, 1910, when the "Terra Nova" was in Lat. 22° 28′ N., Long. 23° 05′ W. (Stat. 23), and Lat. 20° 47′ N., Long. 24° 06′ W. (Stat. 25), two flying fish came aboard. From the contents of the alimentary canal of one a few Trematodes were obtained. In the gall-bladder of the other, a fluke, apparently a form of *Polystomum*, was found. Of these specimens only unrecognizable fragments remain, so that no description of them is given. The flying fish were *Exocœtus spilopus.* On the 27th July, 1910, the "Terra Nova" arrived at S. Trinidad, a desert island in the South Atlantic in Lat. 20° 28′ S., Long. 29° 25′ W. (Stat. 36, 37).

The Staff seized the opportunity afforded by a day's stay to make collections of the fishes, birds and crabs. The parasites obtained were :—

(*a*) Three species of Cestode from the Trinidad petrels (*Œstrelata arminjoniana* and *Œ. trinitatis*) ;

(*b*) One species of Cestode from a Frigate bird (*Fregata aquila* or *F. ariel*) ;

(*c*) Two larval *Tetrarhynchus* from a small shark (*Carcharias* sp.) ;

(*d*) Specimens of an Oligochaete, extracted from Land-crabs (*Gecarcinus lagostoma*, H.M.-E.).

The stay of the ship was so brief that the material collected is in no way indicative of the extent of the parasitic Fauna of the Island.

S. Trinidad would probably afford a rich field for the further investigation of parasites, as many hosts, especially birds and fishes, abound and are easily procurable.

Temperate Zone.—On the 3rd October, 1910, when the "Terra Nova" was in Lat. 42° 17′ S., Long. 111° 18′ E. (Stat. 156), a Great Grey Shearwater (*Puffinus cinereus*) was caught, and provided one species of Cestode, *Tetrabothrius heteroclitus*. On the 6th October, 1910, when the ship was in Lat. 41° 46′ S., Long. 121° 39′ E. (Stat. 159), a Sooty Albatros or Hutton's Albatros (*Phœbetria palpebrata*) was caught. This provided two species of Cestodes, one unfortunately only in fragments and without a head. These proved to be :—

(*a*) *Tetrabothrius nelsoni*, n. sp.

(*b*) Unrecognizable.

The following parasites were collected at the Bay of Islands in New Zealand, in Lat. 35° 15′ S., Long. 174° 10′ E. (Stat. 149), by Mr. D. G. Lillie, Biologist to the Expedition, when he was on a whaling cruise with a Norwegian ship :—

(*a*) From a Humpback Whale (*Megaptera*) numerous specimens of a Filariid Nematode, *Crassicauda crassicauda* (Creplin), from the renal tubules.

(*b*) From a Rorqual (*Balaenoptera borealis*, Lesson) one specimen of a Cestode and some pretty examples of the curious *Pomporhynchus turbinella*.

(*c*) From a Shark (*Mustelus antarcticus*) a Nematode, and

(*d*) From a Barracouta (*Lepidopus caudatus*) some larval Nematodes encysted in the caecum, and with them a larval *Tetrarhynchus*.

In Lat. 52° 20′ S., Long. 167° 30′ E. (Stat. 165), off the Campbell Islands :—

(*e*) A Mollymauk (*Diomedea melanophrys*) was caught and provided some Nematodes.

Antarctic Zone.—The larger portion of the collection of parasitic worms was made, however, in the vicinity of Cape Evans in Lat. 77° 38′ S., Long. 166° 24′ E. (Stations 312, 326, etc.), during the winter months of 1911. In the succeeding year conditions were exceedingly unfavourable, and the collection could only be added to very slightly.

During these winter months, as soon as the hosts were killed or caught outside, their bodies or excised portions froze almost immediately. It was therefore necessary to take them back with us to our hut and thaw them out in order to be able to examine them. In the case of larger animals, like the seals, this proved unpleasant for the other members of the party.

The fishes were caught by digging a hole through the ice, and lowering a trap baited with seal-meat or seal-intestine—the latter being the better bait. The trap was made of rabbit-wire, spread over iron bars, seized to hoops of iron. At either end there was a cone-shaped entrance made of wire. By this method as many as three hundred fishes were caught from one hole.

The fishes were all *Trematomus bernacchii*.* Altogether five species of Trematodes, three of Echinorhynchi, some larval Echinorhynchi, larval Nematodes, and Cestodes, besides parasitic Crustacea and Protozoa, were obtained from these fishes.

The seals were of three kinds:—Weddell's Seals, Crab-eating Seals, and Sea-Leopards.

The Weddell's Seals (*Leptonychotes weddelli*) were for the most part older than the others and seemed more heavily infected; they contained at least six species of Cestodes, one Trematode of special interest, two Nematodes, and one or two species of Echinorhynchi. An encysted *Echinorhynchus* larva is shown later to be the young of *E. hamanni*, which attains maturity in Weddell's Seal. Mr. D. G. Lillie collected two species of Nematodes and two of Cestodes from the Weddell's Seals caught on the Southern voyage of the "Terra Nova," 1911–1912. The Trematode found in the Weddell's and Crab-eating Seals turned out to be *Ogmogaster plicatus*, previously described in 1829 by Dr. Creplin from the intestine of a Rorqual (*Balaenoptera acutorostrata*) in the Arctic regions. In 1891 this form was again described by L. A. Jägerskiöld from the alimentary canal of *B. acutorostrata* and *B. musculus*,† obtained on the Northern shores of Norway. The infection of the alimentary canal of the old Weddell's Seals was a truly wonderful sight. The stomach contained a mass of Nematodes. Immediately after the pyloric opening there was a bunch of large Cestodes with their heads fixed beneath the first few valvulae conniventes. The remainder of the small intestine was one felted mass of Cestodes, large and small.

The Crab-eating Seal (*Lobodon carcinophagus*) supplied one species of larval Nematode, one species of *Echinorhynchus* and *Ogmogaster plicatus*. These seals were small and immature, and were comparatively lightly infected with parasites.

The Sea-Leopard (*Hydrurga leptonyx*) provided one species of larval Nematode and

* Mr. Regan has pointed out that the fishes caught in traps at the Winter Quarters belonged to two species, *Trematomus bernacchii* and *T. hansoni*; as is shown by Dr. E. A. Wilson's drawings and specimens (see Vol. I, No. 1, p. 3, Pl. I). The collectors of the material apparently did not distinguish between these two species.—S.F.H.

† The Common Rorqual.—S.F.H.

one species of *Echinorhynchus*. This seal was young and immature, and comparatively free from parasites.

The birds in the McMurdo Sound Quadrant of the Antarctic Circle appear to have exceedingly few parasites. They were as follows:—The Emperor Penguin (*Aptenodytes forsteri*) provided a very interesting Cestode and several larval forms. In the majority of Emperor Penguins, on opening the abdomen, a considerable degree of peritonitis, both recent and old, was discovered. The peritoneal surface of the alimentary canal was covered in places with hard, elastic and fibrinous cysts containing Cestodes, larval and mature. The walls of these cysts were composed of all the elements of the normal gut-wall. Within these were the heads of the Cestodes, while the strobila of the worm hung within the gut-cavity. The canal connecting the cyst-cavity and the gut varied in length and direction.

The number of the occupants of the cyst varied. If they were immature there were several, if mature only a single worm.

The Adélie Penguin (*Pygoscelis adeliae*) was very disappointing. The many specimens caught provided only a few small Cestodes, otherwise they were free from Entozoa. The range of those caught was from Lat. 69° S. to Lat. 77° 38′ S.

McCormick's Skua (*Megalestris maccormicki*) supplied one Cestode, *Tetrabothrius cylindraceus*. These birds feed largely on the blubber of dead seals, preferring it to any other part. In this blubber there are often cysts of Cestodes. These, unfortunately, could not be brought back, as they were observed when we were away from the base and without facilities, but their occurrence has been noted by Dr. W. S. Bruce, Commander of the Scottish National Antarctic Expedition, 1901–04.

The Giant Petrel (*Ossifraga gigantea*) was only an occasional visitor during the summer, and of those caught and examined none contained parasitic worms.

The method of fixing and preserving the material was as follows:—

Trematodes were placed in a test-tube with water; they were given one or two sharp downward shakes to make them elongate, and then an equal quantity of a saturated solution of corrosive sublimate in water was added rapidly. After washing they were preserved in 70 per cent. alcohol.

Cestodes were fixed by means of Gilson's fluid, and were afterwards washed, and preserved in 70 per cent. alcohol.

Nematodes were killed by dropping into boiling 70 per cent. alcohol, and were afterwards preserved in alcohol of the same strength. By this method good, straight specimens were obtained.

To prevent any damage to the material by the incessant shaking on shipboard, the tubes were filled completely with 70 per cent. alcohol. They were then immersed in large stoppered jars filled also with 70 per cent. alcohol and cotton-wool. The results from these methods have been excellent.

The Expedition is indebted to the Committee of the London School of Tropical Medicine for the opportunity provided by them to Surgeon Atkinson to obtain practical acquaintance with these methods before starting on the Expedition, and for the facilities afforded in the Helminthological Department for working out the material upon his return.

The elucidation of the anatomical structure of the various forms and the descriptive account of the Cestodes are largely the work of Surgeon Atkinson.

NEMATODA.

FREE-LIVING NEMATODES.

Leptosomatum, Bastian, 1865.

1. *Leptosomatum setosum*, v. Linstow, 1896. (Plate I, figs. 3, 6, 9.)

A tube containing a large number of this species occurred in the collection made by Mr. Lillie from a depth of 250 fathoms in McMurdo Sound. Specimens were also collected from a depth of 150 fathoms off Inaccessible Island, Lat. 77° 38′ S. (Stat. 320).

The vitreous appearance of the cuticle distinguishes this species from parasitic forms. The cuticle is not striated, but carries fine acicular spines in longitudinal rows on the anterior part of the body, and, in the male, on the ventral aspect in the region of the genital papillae and the anogenital opening. Both extremities of the worms are bluntly rounded. The head-end is somewhat the more abruptly truncated. The head has a subcuticular shield of chitinous substance which gives these forms an exceedingly characteristic appearance (Pl. I, fig. 3, *a*). This is shown in optical section in Pl. I, fig. 9, *a*. The arrangement of the spines on the head has not been fully elucidated. They extend in linear series from the tip of the head backwards for a distance of about 0·12 mm. (Fig. 9, *b*).

In a male, 15 mm. long, the nerve-ring (Pl. I, fig. 3, *d*) crosses the oesophagus at 0·65 mm. behind the head. The oesophagus measures 2·3 mm. (Fig. 3, *b*). The testicular tube is a thick solid tube ending anteriorly at 4·6 mm. from the head in a blunt digitate process. It passes directly backwards without coiling to the anogenital aperture, which lies 0·5 mm. in front of the blunt and rounded tail. The spicule is a bent, short chitinous structure not unlike a boot-last in outline (Pl. I, fig. 6, *sp*). There is a well-developed shoe-shaped accessory piece (*ap*).

The genital papillae are sessile and are all preanal. There are four on one side and, usually, five on the other (Pl. I, fig. 6, *p*). On either side of the middle line is a row of acicular spines. In the male there is also a series of diagonal muscular bands which bring about the ventral coiling of the posterior end of the body, extending forward for 1 mm. from the anogenital aperture. In the midventral line there is a curious little chitinous ring surrounding a sunken disc (Fig. 6, *s*), recalling the relatively large sucker seen in *Heterakis*.

In the female the genitalia are very simple. The genital aperture lies 9·8 mm. behind the head. There is a triangular cavity representing the vagina; the apex of this is the vulva, and from each basal angle there proceeds along the body a straight genital tube. The one which proceeds cephalad terminates in a bluntly rounded end at 3·5 mm. from the oesophageal valves, while the caudad tube ends similarly.

Mention must be made of the pair of beautiful ocelli (Pl. I. fig. 3, *c*) which are present on either side of the oesophagus at 0·46 mm. from the head. Each is composed of a number of globules of a deep crimson colour.

PARASITIC NEMATODES.

Fam. ASCARIDAE.

Kathleena,* Leip. and Atk.

Kathleena, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226. Genotype, *Ascaris osculata*, Rud.

An Ascarid with three large fleshy lips and three interlabia. The oesophagus has a solid appendage and the intestine has an anterior caecal prolongation.

In this genus may be placed *K. scotti*, *Ascaris radiata*, and *A. rectangula*.

2. *Kathleena scotti*, Leip. and Atk. (Pl. I. figs. 2, 5, 8. Text-fig. 1.)

Kathleena scotti, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Whitish firm round worms. Male $15 \times 0{\cdot}9$ mm. Female the same size or slightly larger. Interlabia very large, pentagonal. Short curved oesophageal appendage 0·2 mm. Intestinal caecum 1·8 mm. Oesophagus $2{\cdot}53 \times 0{\cdot}4$ mm. Spicules $3 \times 2{\cdot}7$ mm. The tail of the male terminates in a blunt digitate process.

Host.—Several whitish round worms varying from half to three-quarters of an inch in length were obtained from the intestine of a single specimen of the Mollymauk (*Diomedea melanophrys*) killed off the Campbell Islands, Lat. 52° 20′ S., Long. 167° 30′ E. (Stat. 165).

These worms are typical Ascaridea and show several features in common with *Ascaris osculata* Rud., *A. radiata* v. Linst., and *A. rectangula* v. Linst. of Weddell's Seal. They are accordingly grouped with them in a separate genus, of which *A. osculata* Rud. has been designated the type.

Parasite.—A mature and fairly typical male measures 15·3 mm. in length, by 0·9 mm. in greatest breadth. The posterior extremity curves ventrally and tapers to end in a finger-like process. The anterior end is bluntly truncated owing to the presence of three particularly stout interlabia (Pl. I, fig. 8, *b*) in addition to the usual three large fleshy lips (*a*, *a′*, *a″*) found in all Ascaridae. The female is straight and its posterior end is also digitate. The skin is transversely striated. The interlabia are very large and of pentagonal outline, measuring from base to apex 0·08 mm., and

* The diagnoses of the new forms collected by the Expedition have been reprinted from the Proceedings of the Zoological Society, with a few merely verbal alterations, by kind permission of the Committee of Publications of the Society.

at the broadest portion near the base 0·05 mm. The three lips are 0·135 mm. long and 0·13 mm. broad.

The oesophagus is a muscular tube 2·53 mm. long by 0·4 mm. broad (Pl. I, fig. 2, *a*). The terminal portion is slightly differentiated to form a muscular bulb with a glandular appendix (Pl. I. fig. 2. *b*) characteristically short as compared with other forms possessing this structure. It measures 0·55 mm. in length by 0·22 mm. in breadth.

The chyle-intestine is very voluminous and its wall is markedly folded. It has an anterior caecum extending forward for 1·8 mm. to within 0·7 mm. of the head (Fig. 2, *c*). It occupies the whole of the perivisceral space between the oesophageal tube and the body-wall on one side, and attains a breadth of 0·4 mm. These characters are duplicated in the female specimens: the measurements show a slight variation in accordance with the difference in the sizes of the complete worms.

The anogenital aperture lies 0·34 mm. in front of the tip of the tail, and two chitinous spicules are seen extended in many of the specimens. They are unequal in size, but of similar shape (Pl. I, fig. 5, *sp*). At the proximal end these spicules are slightly dilated. They measure 3 mm. by 0·09 mm., and 2·7 mm. by 0·09 mm. The course of the testicular tube is obscured by the folds of the chyle-intestine, but it can be seen extending forwards at least to the level of the oesophageal appendage.

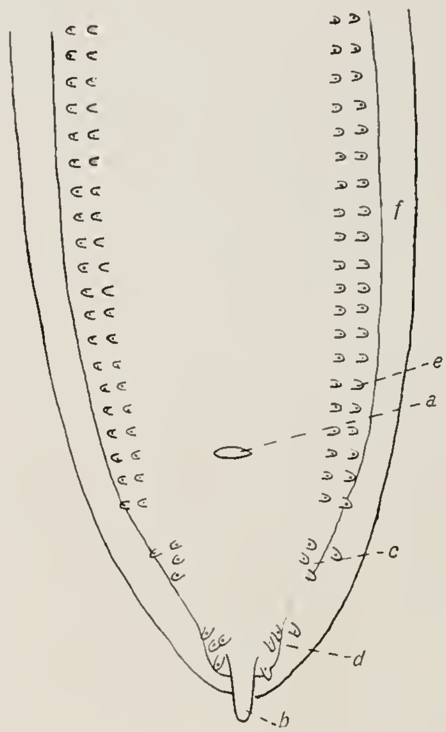

FIG. 1.—*Kathleena scotti*: ventral view of the posterior extremity of the male. *a*, Anogenital aperture; *b*, caudal process; *c*, postanal papillae; *d*, caudal group of papillae; *e*, preanal papillae; *f*, cuticular alae.

The papillae are arranged in three sets. Grouped around the base of the finger-like process (text-fig. 1, *b*) which occupies the posterior end of the body are four pairs of papillae (text-fig. 1, *d*). Half way between these and the anogenital aperture a second set of four pairs (text-fig. 1, *c*) are set on the lateral margins of the ventral aspect of the worms. A long series of papillae then commences, extending to a considerable distance in front of the anogenital aperture (text-fig. 1, *e*). These are arranged in two linear rows on each side. Four double pairs lie behind the level of the anus (*a*), but this number may vary. These papillae, although situated postanally, belong to the preanal series. Twenty double pairs were counted in this series. This number is to be regarded as a minimum, as it was impossible to be certain that the most anterior papillae actually observed were the terminal pairs of the series.

The Females are slightly larger than the males. They present the same characters in the oesophageal and intestinal diverticula, but these are smaller. The vaginal opening is 4 mm. from the head-end, the worm measuring 25 mm. in length. The vagina is strong and muscular, and the uterus runs caudalwards from this as a single narrow tube. The eggs are in very well-marked groups; they measure 0·1 mm. by 0·06 mm. The tail ends in a finger-shaped process, and the anus is 0·4 mm. from its tip.

3. *Kathleena radiata* (v. Linst.). (Text-fig. 2.)

Ascaris radiata, v. Linstow, 1906 (?1907).
" *falcigera*, Railliet and Henry, 1907.

Host.—The Weddell's Seals throughout the Antarctic Zone appear to be heavily infected with this parasite. It has been reported in large numbers by the Scottish National Antarctic Expedition and by the first French Antarctic Expedition. It is suggested by Railliet and Henry that some of the forms collected by the Germans in South Georgia in 1882–3 belonged to this species, although ascribed to *Ascaris osculata*.

Parasite.—The parasites are typical Ascarids when seen with the naked eye; *i.e.*, they are stout wiry round worms of a whitish colour in the preserved state and showing a ventral hook-like twist of the posterior end in the males. There is a wide range of size in the material at our disposal, this being due to the relative maturity of the individual specimens. A mature male measures about 12·0 mm. long, a female 13–20 mm. long. The body has a diameter of from 1·5 mm. to 2·0 mm. The mouth is guarded by three large lips, quadrate in outline and with a lateral cuticular ledge prolonged from the free angle. There are three sickle-shaped interlabia which, in specimens in spirit, showed a fine striation of the internal substance of the cuticle. Upon this feature v. Linstow based the specific name.

The results of our examination confirm in the main the details of structure and the minutiae of measurements given by Railliet and Henry and by v. Linstow. In a small male specimen of 12·0 mm. the oesophagus is 1·6 mm. long and its greatest diameter is 0·19 mm. There is posteriorly an oesophageal appendage containing the dorsal oesophageal gland. This extends 0·7 mm. behind the junction of the oesophagus with the chyle-intestine. This organ is stated by v. Linstow to be of the length of the oesophagus. Railliet and Henry mention the presence of the structure, but give no measurements. From the chyle-intestine there passes forward a blind caecum, 0·9 mm. in length, reaching just beyond the middle of the oesophagus.

The chyle-intestine is very voluminous, and its walls are much folded. At 1·6 mm. behind the oesophageal valves are the closely packed coils of the testicular tube. These coils occupy the succeeding 3·0 mm., and thence the tube runs directly backwards to the anogenital opening (text-fig. 2, *a*), 0·19 mm. from the tip of the tail. The spicules are very similar in size and shape. They are transparent and colourless rods, 2·6 mm. in length, and present somewhat characteristic outlines. There is a solid strengthening portion running along the whole length of the spicule to become the blunt tip. In the spicule there is also a hollow tube, the walls of which taper away towards the tip, thus exposing the lumen.

The arrangement of the papillae agrees exactly with the description of Railliet and Henry. There are four pairs of simple papillae at the base of the acicular tip (text-fig. 2, *d*). After a short interval, and lying well on the ventral surface, there is a pair of large double-headed papillae (text-fig. 2, *c*): alongside these on either side commences a double series of simple papillae, which extends forward to become preanal without a distinct break. These papillae continue still further in single series after about the eighth paired set. On either side the cuticle is raised from the body-wall and flattened dorsoventrally to form a shallow keel (text-fig. 2, *b*) not more than 0·15 mm. deep.

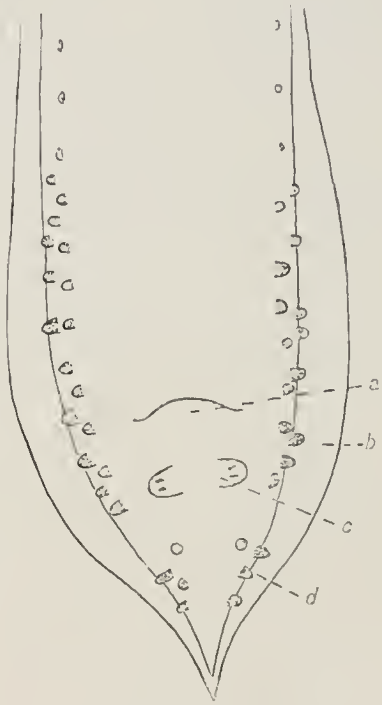

Fig. 2.—*Kathleena radiata* (v. Linst.): ventral view of the posterior extremity of the male, showing the characteristic arrangement of the papillae. *a*, Anogenital aperture; *b*, cuticular alae; *c*, paired double papillae; *d*, caudal group of four papillae.

4. *Kathleena osculata* (Rud.).

Ascaris osculata, Rud. 1802.

A large number of somewhat immature forms of this common species were found in the Sea-Leopard (*Hydrurga leptonyx*) and the Crab-eating Seal (*Lobodon carcinophagus*). Forms which appear to be the larvae of this parasite were encysted in the mesentery and under the peritoneal coats of the pyloric processes and in the liver of *Trematomus bernacchii*. The species has previously been recorded in Antarctic Seals by v. Linstow and by Railliet and Henry.

5. *Kathleena rectangula* (v. Linst.).

Ascaris rectangula, v. Linstow, 1906.
„ *stenocephala*, Railliet and Henry, 1907.

Hosts.—In association with the previously described species, *K. radiata*, in the Weddell's Seal were a number of larger specimens. These have already been recorded by v. Linstow as *Ascaris rectangula*; and about the same time by Railliet and Henry under the name of *Ascaris stenocephala*.

Parasite.—Male measures 2·5 cm. Female 5 cm. Both are stout, opaque and rigid forms. To the naked eye they appear to be large and mature forms of *Kathleena radiata*. The general topography is the same. There are three labia intermedia. The oesophagus has an appendage and the gut has a blind anterior prolongation. The papillae in the tail differ only in detail from those of *K. radiata*.

The spicules are equal and measure 4·4 mm.; they end in a slight dilatation. They are 0·04 mm. across. The anus is 0·27 mm. from the tip of the tail.

The Females generally measure 5 cm. and are larger than the males, which they resemble in most of the characters. The vagina is 5 mm. from the head end. The anus is 0·3 mm. from the tail. The eggs measure 0·09 mm. × 0·06 mm.

Terranova, Leip. and Atk.

Terranova, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226. Genotype, *Terranova antarctica*, Leiper and Atkinson.

An Ascarid with three large simple lips. No interlabia. Oesophagus simple. Gut with anterior caecal prolongation. No oesophageal appendage.

6. *Terranova antarctica*, Leip. and Atk. (Pl. I, figs. 1, 4, 7.)

Terranova antarctica, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226.

Female 32 mm. long. Three squat fleshy lips with paired anterior lobes. No labia intermedia. Oesophagus without appendage. The intestine has a long caecum. The anus lies at the base of a deep sulcus.

Host.—A single female specimen of this Ascarid was found in the stomach of a shark (*Mustelus antarcticus*) in the region of the Bay of Islands, New Zealand.

Parasite.—The specimen measures 32 mm. in length, and is coiled in one and a half spirals. The skin is coarse and striated transversely.

The worm is very thick and opaque, having a diameter of 3 mm. in the middle third of the body, which tapers gradually to end in a rounded head and a somewhat more pointed tail. The anus lies at the base of a deep sulcus which can be seen with the naked eye (Pl. I, fig. 4, *a*). Behind this the tail rapidly tapers with a slight ventral inclination. The chyle-intestine is pigmented with dark brown granules. The characteristic features of the worm are as follows :—

There are three squat, round, fleshy lips, each having a pair of spheroidal lobes projecting forwards (Pl. I, fig. 7). The lips are not markedly separated from the neck.

There are *no* labia intermedia.

The oesophagus is a cylindrical muscular organ *without* oesophageal appendage (Pl. I, fig. 1, *a*). It enters the chyle-intestine laterally.

A large caecal prolongation of the gut extends forwards alongside the oesophagus to 1 mm. from the head (Pl. I, fig. 1, *b*).

The absence of intermediate lips and of an oesophageal appendage necessitates a separation of the species from those which constitute the genus *Kathleena*.

The great opacity of the worm, even after clearing in creosote, obscures the arrangement of the ovarian and uterine tubules. The vulva is 14 mm. behind the head ; from it the vagina passes almost directly backwards. The uterine tubules are filled with eggs apparently of small size, but these could not be measured *in situ*.

FAM. ? FILARIIDAE.

Crassicauda, Leip. and Atk.

Crassicauda, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226. Genotype, *Filaria crassicauda*, Creplin.

7. *Crassicauda crassicauda* (Crepl.).

Filaria crassicauda, Creplin, 1829.

A number of portions of long white *Filaria*-like worms were collected by Mr. Lillie from the renal tubules and from the stomach (wall ?) of the Humpback Whale (*Megaptera*). No complete specimen was recovered ; the portions, in some cases extending to 16 inches in length, belonged to both males and females.

There was upon both male and female portions a curious bulbous dilatation, which appears to have served as a "holdfast," since the worms are almost all severed in the neighbourhood of one of these swellings. The largest worm is the posterior part of a female. This portion measures 45 cm. in length and is torn across at a holdfast. The males are similarly broken, and are likewise entirely posterior parts.

The cuticle is transversely striated, but these striae differ very markedly in various parts of the worm. At some places they appear more like rugae than striae, but in others the cuticular markings are typically striae.

The longest male portion is 28 cm. long, and has a transverse measurement of 3 mm. The posterior end is helicoid in all specimens. The tail tapers in the last half-turn to a blunt tip. There are well-formed nipple-like papillae arranged in paired series and numbering on either side eight.

In no case have we been able to discover any sign of a spicule. In view of the perfect transparency of some of the cleared specimens it must be concluded that in this species the spicules are absent.

The female also has a very peculiar feature in the arrangement of the genitalia. The genital aperture lies just in front of the posterior end of the worm. The vagina is reduced to little more than the site of fusion of the two long uteri, measuring only 0·45 mm. The worm is oviparous. The ovum measures 0·05 × 0·04 mm., has a thick chitinous wall, and contains a coiled embryo.

The alimentary canal discharges into a depression formed by the puckering of the posterior end of the worm. About 3 mm. in front of the tip of the tail the body is constricted. This constriction is figured by Creplin and usually appears just behind the vulvar opening.

The uteri have a transverse diameter of 0·29 mm., extending forwards from the vulva without kink or coil for some distance into the body of the worm.

In spite of some difference in the number of papillae in the male, and certain other minor features, we regard these specimens as of the same species as that described in 1829 by Creplin from a Northern Rorqual. It should be pointed out, however, that the terminal position of the anus, the posterior situation of the vulva, and the production of thick-shelled eggs, necessitate the separation of this form from the genus *Filaria* in its modern acceptation. We regard the present species as the type of a distinct genus, for which we have proposed the name *Crassicauda*.

ACANTHOCEPHALA.

Corynosoma, Lühe.

8. *Corynosoma hamanni* (v. Linst.). (Pl. II, figs. 11, 12.)

> *Echinorhynchus hamanni*, v. Linstow.
> *Corynosoma antarcticum*, Rennie.
> *Echinorhynchus antarcticus*, Rennie.
> ,, *sipho*, Railliet and Henry.

Hosts. These thorn-headed worms were found in considerable numbers in Weddell's Seal, the Crab-eating Seal, and the Sea-Leopard, attached firmly to the mucous membrane of the small intestine.

Parasite. The parasites are pyriform and might in haste be mistaken for Amphistomes. The rostellum (Pl. II, fig. 11, *a*) is partially sunken into the broader and globular end, thus producing some resemblance to the ventral sucker of many of the Paramphistomidae. The species was also found by the Scottish Antarctic Expedition, and has recently been the subject of a monograph by Dr. John Rennie. With his account our findings tally, save in three respects.

(*a*) The number of hooks upon the rostellum is, according to our reckoning, 150 to 170, whereas Rennie states that there are about 28 rows, each having ten hooks.

A re-examination of the type-material of *E. antarcticus* shows that this discrepancy is probably attributable to a different mode of counting. Owing to their peculiar alternating arrangement, the hooks may be counted in a spiral fashion as well as in vertical rows.

(*b*) We have not found any departure from the normal arrangement in the male genital system.

As this has not been previously portrayed, it is illustrated in Fig. 11.

(*c*) In dealing with its systematic position, Rennie contrasts this form with allied forms parasitic in aquatic birds.

The species which Dr. Rennie regarded as new would appear to be even more closely related to *Echinorhynchus semerme* Forskål from *Phoca vitulina*, and to be synonymous possibly with *E. hamanni* v. Linstow from Weddell's Seal. In all three forms the spines on the body extend along the whole of the ventral aspect and envelop the posterior extremity (Pl. II, fig. 11, *b*). The number of longitudinal rows of hooks in *E. semerme* is stated to be twenty-four to twenty-six; v. Linstow gives for

E. hamanni fifteen longitudinal rows and eighteen transverse rows. In *E. antarcticus* (type-material and that in the present collection) the hooks are arranged in ten longitudinal and fifteen to seventeen transverse rows. Through the kindness of Dr. W. Michaelsen, of the Hamburg Museum, we have been able to examine the type-material of *E. hamanni* v. Linstow also. We find that the specimens correspond in every essential with the types of *E. antarcticus* and with our own material.

We therefore ascribe *E. antarcticus* Rennie and *E. sipho* Railliet and Henry to *Corynosoma hamanni*, in addition to the material which forms the basis of the present note. A number of larval stages (Pl. II, fig. 12) of this species were obtained from *Trematomus bernacchii*; in some cases the rostellum was not evaginated.

Pomporhynchus, Porta.

9. *Pomporhynchus turbinella* (Dies.) Porta. (Pl. II, fig. 10.)

Echinorhynchus turbinella, Diesing, 1850.

Host.—Numerous specimens of this curious form were collected by Mr. D. G. Lillie from the Humpback Whale (*Megaptera*) in the Bay of Islands, New Zealand (Stat. 149).

Parasite.—The two sexes are of almost similar size and shape; in some cases the bursa in the male is extruded from the centre of the posterior rounded end as a shallow funnel. The body is cylindrical, of about 1·0 cm. to 1·3 cm. in length and 0·3 cm. in diameter. The body tapers anteriorly to form a narrow neck 2 mm. long (Pl. II, fig. 10, *c*), which terminates in an almost globular head. This spheroid head has an armature of spines set upon coarse chitinous bases on its upper aspect (Fig. 10, *b*). The spines are arranged in somewhat irregular series; there are five distinct rows on the peripheral portion, but those lining the sulcus surrounding the rostellum are very irregular. There are about ten rows in all. Their arrangement is somewhat irregular and the exact determination of their number is difficult. The shape of the head and the roughened appearance, due to the spines, remind one vividly of the rose of a watering-can. At the summit of the head there is a partially retracted rostellum (Fig. 10, *a*), the unarmed base of which extends through the head to the insertion of the neck. The hooks on the rostellum differ markedly from those on the head: they are smaller and more pointed. There are twenty longitudinal rows, each composed of three hooks.

In the male the prostatic glands (Fig. 10, *e*) are greatly elongated and deeply pigmented.

Echinorhynchus, O. F. Müller, 1776.

10. *Echinorhynchus campbelli*, Leip. and Atk. (Pl. II, fig. 13).

Echinorhynchus campbelli, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Male 9 mm. long. Female 10 mm. Thin-walled. 2·5 mm. broad. Proboscis 2 mm. Hook-bearing rostellum 0·5 mm. Hooks 14 linear series of 8 hooks each. Testes oval, occupying the third fifth of the body.

Host.—Among the Echinorhynchi from *Trematomus bernacchii* were a pair of relatively large forms which are the co-types of the present species.

Parasite.—Male 9 mm. long. Female 10 mm. Both are flattened forms, but whether this is due to treatment after death or not cannot be stated. The greatest breadth of both male and female is 2·5 mm. The worms are almond-shaped, the male tapering more rapidly towards the posterior end than the female. The proboscis (Pl. II, fig. 13, *a*) measures 2 mm., the hook-bearing portion being 0·5 mm. long. The hooks on the rostellum are arranged in fourteen linear series, each having eight hooks. There are no cuticular swellings around the hooks. In these features of the proboscis these forms differ from the succeeding species, to which they show considerable resemblance. The lemnisci (*l*, *l′*) are stout and club-shaped, having a length double that of the internal part of the proboscis. The testes (*d*, *d′*) are oval, 0·2 mm. by 0·25 mm., are diagonally situated, and occupy the third fifth of the body. The prostatic glands are aggregated into two large masses.

FIG. 3.—*Echinorhynchus rennicki*: Female, filled with eggs. The cuticular lapels covering the hooks on the proboscis are shown.

11. *Echinorhynchus rennicki*, Leip. and Atk. (Pl. II, fig. 15. Text-fig. 3.)

Echinorhynchus rennicki, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Male 3·7 mm. long. Female 4 mm. Proboscis 1 mm. Hook-bearing rostellum 0·3 mm. Hooks in 12 linear series of 6 each. Those of alternate rows are in line transversely. Each hook protrudes from a transparent cuticular lapel. Lemnisci long and slender.

Host. — These medium sized thorn-headed worms were obtained from *Trematomus bernacchii* at Cape Evans, Lat. 77° 38′ S. (Stat. 326).

Parasite.—The male and female of this species are similar in shape, and can only be differentiated by their internal structure save where, in the male, the bursa is extruded posteriorly. The greatest breadth is quickly attained in the anterior half of the body. The posterior half tapers gradually and uniformly to the tail. The male measures 3·7 mm. in length and 0·8 mm. in breadth. The female averages 4 mm. by 1 mm. The proboscis (Pl. II., fig. 15, *a*), in the male is 1 mm., in the female 1·2 mm. long; the hook-bearing portion being 0·3 mm. by 0·12 mm. There are twelve longitudinal rows of hooks with six hooks in each row. The hooks of every second row are in line transversely. A striking feature of the proboscis is the presence of a transparent cuticular swelling from which each hook protrudes. By this character alone the species can be distinguished readily from the other forms found in the same host. The lemnisci (Fig. 15, *l*, *l′*) are long slender bodies, from the posterior end of which a bundle of muscle-fibres passes backwards and becomes attached to the body-wall half way along its length. These lemnisci are sometimes contracted, but their normal length appears to be about the same as that of the proboscis. The females are filled with eggs. The genital tube, as characteristically illustrated in text-fig. 3, is visible as a rule.

12. *Echinorhynchus debenhami*, Leip. and Atk. (Pl. II, fig. 14. Text-fig. 4.)

Echinorhynchus debenhami, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 223.

Male 2·2 mm. long. Female 2·2 mm. Sickle-shaped. Stout, cylindrical rostellum with hooks in 12 linear series of 6 each. Lemnisci bag-like, extending but little behind proboscis. Testes large, occupying anterior half of body-cavity, deeply lobed. Female crowded with eggs.

Host.—A number of very small but sexually mature and egg-bearing Echinorhynchi, of this species, were found in *Trematomus bernacchii*, in association with the preceding forms.

Parasite. Male 2·2 mm. long. Female 2·2 mm. All the specimens are sickle-shaped, the dorsal aspect being convex. The rostellum is cylindrical and relatively stout. It bears twelve linear rows of six spines each. The proboscis (Pl. II, fig. 14, *a*) measures 0·24 mm. in length, and is 0·14 mm. in diameter; the portion anterior to the attachment of the invagination of the body-wall being twice the length of that which protrudes posteriorly into the body-cavity. The lemnisci (Fig. 14, *l*, *l′*) are bag-like and extend only a slight distance beyond the internal end of the proboscis. In the male there are two large testes (Fig. 14, *d*, *d′*) occupying the anterior half of the body-cavity and reaching the posterior end of the proboscis. The testes are constricted in such a way as to give the impression that there are actually four separate testicular masses; they measure 0·2 mm. by 0·1 mm. There are present in this form, as in *E. rennicki*, cuticular lapels upon the rostellum protecting the hooks: but they are not nearly so well developed. The eggs measure 0·065 mm. in length. Some of the specimens were filled with cell-masses from which the eggs ultimately develop (text-fig. 4, *e*).

FIG. 4.—*Echinorhynchus debenhami*: Female, showing cell-masses (*e*) which eventually form eggs, free in the body-cavity.

TREMATODA.

DISTOMOIDEA.

Fam. HEMIURIDAE.

Hemiurus, Rud. 1809.

13. *Hemiurus oatesi*, Leip. and Atk. (Pl. III. fig. 17.)

Hemiurus oatesi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Length 2 mm. Abdomen present but retracted wholly. Skin sharply striated. Ventral sucker 0·34 mm. in diameter, twice that of the oral sucker. Enormous muscular seminal vesicle. Yolk-masses compact, lobulated. Eggs exceedingly numerous and small.

Host.—Six specimens of this species were collected from the fish *Trematomus bernacchii.*

Parasite.—An average example is 2 mm. long, bluntly rounded at both ends, but tapering more at the anterior than at the posterior extremity. The greatest breadth, 0·68 mm., occurs just behind the middle of the body, at the level of the yolk-glands. There is a well-defined "abdomen" (Pl. III. fig. 17. *d*), which is wholly retracted in the preserved state. The skin is sharply striated transversely, and these striae, although best seen on the ventral aspect, extend to the dorsum. The ventral sucker (*b*) is near the oral sucker (*a*), and is about twice its size, measuring 0·34 mm. in external and 0·18 mm. in internal diameter. Owing to contraction the mouth and the oral sucker are somewhat bent ventrally. The pharynx is globular, measuring 0·12 mm. longitudinally and 0·1 mm. transversely. The two main gut-branches (*g*, *g*) terminate blindly some way in front of the base of the abdomen, whereas in other species they usually extend for a varying distance into this structure. The genital pore (*gp*) opens immediately behind the lip of the oral sucker. A very noticeable feature is the enormous seminal vesicle (*sv*), which has a thick muscular coat. The yolk-glands (*y*, *y'*) are compact and lobulated, and lie in the middle region of the body between the "abdomen" and the ventral sucker. Immediately in front of these is a large ovary (*ov*) 0·34 mm. transversely and 0·16 mm. longitudinally, and anterior to this two testes (*t*, *t'*), 0·2 mm. × 0·2 mm., situated slightly diagonally to one another. The uterus (*ut*) is filled with eggs, 0·05 mm. × 0·03 mm., and occupies most of the interstices between the posterior lobule of the yolk-glands and the ventral sucker. The eggs are very small as compared with those in the succeeding Hemiuridae.

Aponurus, Looss.

14. *Aponurus bowersi*, Leip. and Atk. (Pl. III. fig. 18.)

Aponurus bowersi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Length 1 mm. The oral sucker has a characteristic fleshy lip along its dorsal rim only. Gut-branches greatly dilated, and extending to the posterior end of the body. The yolk-glands are peculiar: two half-moon shaped solid masses lying in apposition, immediately in front of the ovary.

Host.—*Trematomus bernacchii.*

Parasite.—Most of the specimens appear comma-shaped, owing to the ventral bending of the anterior portion of the body. The worms taper considerably in front, having their greatest width at the level of the yolk-glands, where the body becomes thick and almost cylindrical. The posterior end is very bluntly rounded. The excretory pore lies at the base of a small dimple. There is no abdomen, nor does the skin appear to be striated, although on the ventral aspect irregular rugae are seen, apparently attributable to the bending of the specimen. The oral sucker (Pl. III, fig. 18, *a*) is about half the size of the ventral sucker (*b*). The suckers vary considerably in shape and in the thickness of the muscular wall in different specimens. This is due to varying amounts of contraction. A characteristic feature of the oral aperture is a fleshy lip extending around the dorsal but absent from the ventral rim.

The pharynx is small and globular. The main gut-branches (*g*) are greatly dilated. They extend to the posterior end of the body, where they are almost contiguous.

The yolk-glands (*y*, *y'*) consist of two half-moon-shaped solid masses lying in apposition, one anterior to the other. The ovary (*ov.*) is smooth and oval, with the posterior aspect somewhat indented by the yolk-gland. The testes (*t*, *t'*) are compact rounded bodies lying slightly diagonally to one another, immediately in front of the ovary. The eggs as seen within the uterus (*ut*) measure 0·04 mm. by 0·02 mm., and are brownish in colour.

LEPOCREADIINAE.

Lepodora, Odhner, 1905.

15. *Lepodora garrardi*, Leip. and Atk. (Pl. III, fig. 20.)

Lepodora garrardi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Flat fleshy forms 3 mm. by 0·9 mm. Colour brownish, due to numerous yolk-glands. Skin covered with delicate spines. Ventral sucker 0·27 mm., oral sucker 0·37 mm. Stout pyriform pharynx, 0·2 mm. Eggs few but large. Testes tandem. Gut-branches wide and extending to the posterior end of the body.

Host.—Two specimens from the intestine of *Trematomus bernacchii*.

Parasite.—Flat fleshy forms, 3 mm. by 0·9 mm., of a brownish colour, apparently due to the large and numerous yolk-glands, which extend from the level of the bifurcation of the gut to the posterior end of the body, and inwards also to unite across the body. Delicate spines occur on the skin. The ventral sucker (Pl. III, fig. 20, *b*), 0·27 mm. in diameter, is slightly smaller than the oral sucker (*a*), and lies at the junction of the anterior and middle third of the body. The oral sucker, 0·37 mm. in diameter, opens subterminally. There is a prepharynx and a stoutly developed pyriform muscular pharynx, 0·2 mm., succeeded by a slender oesophagus. The two gut-branches (*g*) are of wide lumen and reach to within 0·1 mm. of the excretory opening. The genital orifice (*gp*) lies immediately in front of the ventral sucker and is unusually obvious. The cirrus is short and fleshy. The globular testes (*t*, *t'*) lie tandem, and immediately in front of them, and slightly to one side of the middle line, is a large smooth ovary (*ov*) 0·22 mm. The eggs are few in number but of very considerable size, and have a brown shell measuring 0·1 mm. by 0·03 mm. while still within the body.

ALLOCREADIINAE.

Podocotyle, Dujardin, 1845.

16. *Podocotyle pennelli*, Leip. and Atk. (Pl. III, fig. 19).

Podocotyle pennelli, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Small forms tapering from the large pouting ventral sucker. The armed eirrus extends to the posterior level of the ventral sueker. Yolk-glands large and discrete. Testes smooth, tandem. Eggs large, with a flat knob-like protrusion at one pole.

Host.—About six members of this species were obtained from *Trematomus bernacchii.*

Parasite.—The specimens vary in length from 2·4 mm. to 2·8 mm. The greatest transverse diameter of the body is in the region of the large fleshy ventral sucker, from which the body tapers markedly in both directions. The skin is smooth. The position of the ventral sucker (Pl. III, fig. 19, *b*) varies; the posterior portion of the body may elongate so that the sucker appears to be situated in the anterior third, in other cases the sucker is almost in the centre. The oral sucker (*a*) is a spherical muscular organ, 0·18 mm. by 0·15 mm., succeeded immediately by a round pharynx of half its diameter. The gut-branches (*g*) do not extend quite to the hind end of the body, but end on a level with the posterior limit of the testes. The genital pore (*gp*) opens midway between the oral and ventral suckers, always considerably to the left of the middle line. The armed cirrus is slightly extended, and can be traced backwards as a sausage-shaped mass to a level just short of the posterior rim of the ventral sucker. The yolk-glands (*y*, *y'*) are discrete and extensive, ranging from the level of the genital pore to the posterior extremity. The testes (*t*, *t'*) are smooth oval bodies which vary markedly in size in different specimens. They lie one in front of the other in the intercaecal region behind the ventral sucker; in front of them and slightly to the right is a large ovary (*ov*), which may be pear-shaped or very slightly lobate. The eggs are large, 0·06 mm. by 0·04 mm. Each has a distinct knob-like protrusion of the shell-substance at one pole.

Allocreadium, Looss, 1900.

17. *Allocreadium fowleri*, Leip. and Atk. (Pl. III, fig. 21.)

Allocreadium fowleri, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

Immature forms 0·74 mm. in length, 0·4 mm. broad. Skin smooth. Cylindrical excretory vesicle with fine black pigment-granules. Large ventral sucker 0·36 mm. Three small round bodies, 0·1 mm. in diameter, represent the genital glands.

Host.—*Trematomus bernacchii.*

Parasite.—A few microscopic Trematodes of a deep red colour occurred with the other Trematodes from this fish. None were sexually mature. The largest specimen measures only 0·74 mm. in length. The greatest breadth is 0·4 mm., in the region of the ventral sucker (Fig. 21, *b*), whence the worm becomes bluntly pointed both anteriorly and posteriorly. The skin is smooth. The ventral sucker occupies almost the entire width of the worm, measuring 0·36 mm. transversely by 0·26 mm. antero-posteriorly. Its muscular wall, as seen in optical section, is 0·1 mm. thick. The oral sucker (*a*) is about one-quarter the size of the ventral sucker. A muscular pharynx succeeds the oral sucker, and the alimentary canal then immediately divides into two dilated main gut-branches, which terminate blindly a short way behind the ventral sucker (*g*). The testes lie one in front of the other, somewhat diagonally, and the ovary is found on one side of the testes. These three bodies are smooth and round, measuring about 0·1 mm. in diameter. The extent of the yolk-glands cannot be determined. No eggs were present in any of the specimens. Details of the cirrus and other structures could not be made out from the material available. The excretory vesicle (*ex*) is cylindrical and in some specimens is rendered conspicuous by the presence of fine black pigment-granules.

MONOSTOMOIDEA.

Ogmogaster, Jägerskiöld, 1891.

18. *Ogmogaster plicatus* (Creplin). (Pl. III, fig. 16. Text-figs. 5 and 6.)

Monostomum plicatum, Creplin, 1829.

Hosts.—The specimens of this Monostome were obtained from both Weddell's Seal (*Leptonychotes weddelli*) and the Crab-eating Seal (*Lobodon carcinophagus*). Some occurred loosely attached to the coats of the small intestine, others upon the contents of the intestine.

Parasite.—In colour the worms were nearly always a light pink, like that of some corals and shells. The colour always disappeared on fixation, when they became isabelline to brown. The parasite is in shape exactly like the half of a hemp-seed split longitudinally.

The size of the specimens varies considerably—those obtained from the Crab-eating Seal being generally the largest. The average length is 5–6 mm., none being above 8 mm.; they are, therefore, slightly smaller on the whole than those from *Balaenoptera acutorostrata* and *B. musculus*,* described by Jägerskiöld. The greatest transverse diameter varies from 4·5 mm. to 5·5 mm. The ventral aspect is hollowed and cupped, the dorsal convex from end to end and from side to side. The worm is narrower at the cephalic end than at the caudal end; its greatest diameter being at the equatorial line. The ventral surface is raised into a succession of longitudinal rugae (Pl. III, fig. 16, *r*), averaging in number fourteen to fifteen, as ascertained from cross-

* The Common Rorqual.—S.F.H.

section. The number varies at different levels. Pl. III, fig. 16, shows the manner of ending in the front region. In no specimen was the cirrus protruded as in the original description given by Creplin. The dorsal surface is smooth and without spines or hooks. The anterior extremity of the worm is surmounted by the oral sucker (text-fig. 5, *e*). The wavy margin of the worm separates the oral sucker as by a short intervening lip (text-fig. 5, *a'*) from the corrugated ventral surface on which, at a deeper level, is the common genital pore (Pl. III, fig. 16, *gp*). Just within this can be seen two important structures, a large ringed vaginal aperture (text-fig. 5, *d*) and a smaller ringed cirrus (text-fig. 5, *c*).

This parasite was previously obtained by Dr. Creplin from *Balaenoptera acuto-rostrata*, in 1829, in Arctic waters, and again by L. A. Jägerskiöld from *B. acuto-rostrata* and *B. musculus*, in 1891, on the northern shores of Norway. The seals are,

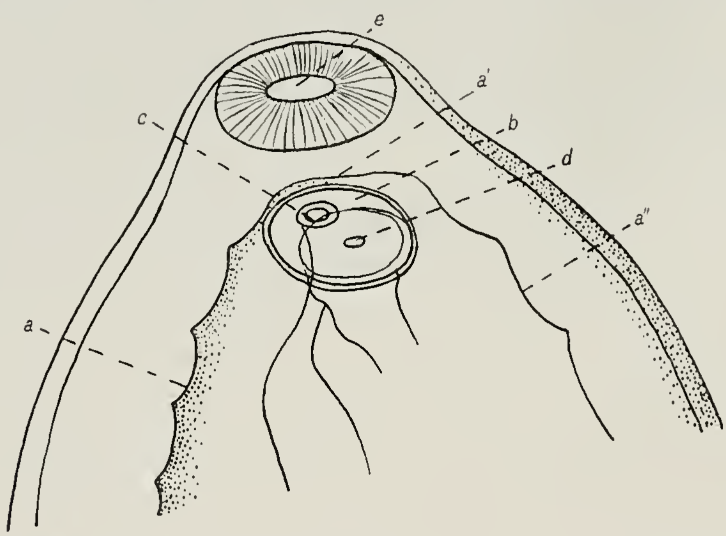

Fig. 5.—*Ogmogaster plicatus* (Creplin.): Ventral view of the anterior end, showing: *a*, *a'*, *a''*, the ventral folds of the margin of the body; *b*, the genital sinus; *c*, the aperture of the male, and *d*, that of the female genital duct; *e*, the oral sucker.

therefore, new hosts, and are both confined to the Antarctic region. Whales, believed to be of the same species, occur, however, in both Arctic and Antarctic seas, and are known to have similar parasites in each region.

Internal Anatomy.

Digestive Tract.—At the cephalic end is the oral sucker, measuring 0·5 mm., with an internal aperture measuring 0·25 mm. The sucker opens immediately into the oesophagus, and this soon divides into the two gut-branches, which run a tortuous course down either side of the worm to end at a short distance from the caudal extremity.

Only a very few points can be added to the excellent and exhaustive description given by L. A. Jägerskiöld.

Genital Organs.—The genital opening is in the middle line on the ventral surface, behind the oral sucker, from which it is separated by a lip. It is at a deeper level than the sucker. It consists of a thick ring surrounding the cirrus-opening and the wider vaginal opening (text-fig. 5, *b*). The yolk-glands (Pl. III, fig. 16, *y*) vary greatly in number, from ten to eighteen occurring on either side. The variation in the size and shape of the ovary (Fig. 16, *ov*) is also marked, as will be seen from text-figure 6 (a, b, c, d, e, f, g). The shell-gland is a thin structure immediately in front of the ovary, and is composed of large cells with a small nucleus.

The posterior ending of the rugae seems to be in a small punctate opening.

The occurrence of this parasite may serve to throw some light on the much discussed question of the specific identity of whales found in widely separated localities.

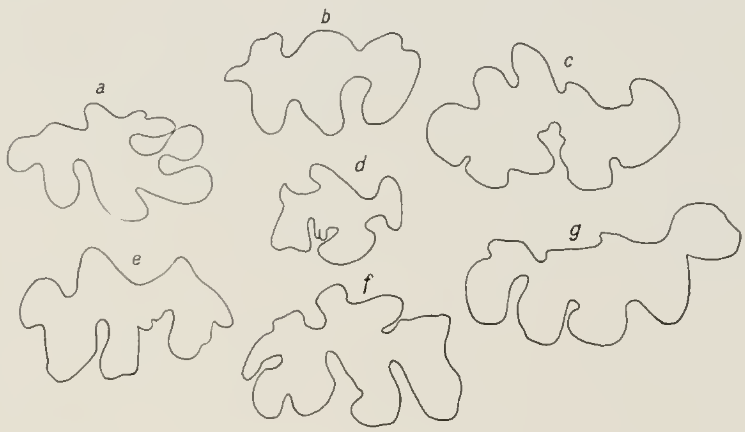

Fig. 6.—*Ogmogaster plicatus:* The ovary, outlined from seven specimens, to show variation in contour.

The occurrence of *Crassicauda crassicauda* in a Northern Rorqual, as described by Creplin, and in a specimen of a Humpback (*Megaptera*) caught off New Zealand, also has some bearing upon this matter.

CESTODA.

Order PSEUDOPHYLLIDEA.

Fam. BOTHRIOCEPHALIDAE.

Dibothriocephalus, Lühe, 1899.

19. *Dibothriocephalus mobilis*, Rennie and Reid, 1912.

This minute Cestode occurred in large quantities in the stomach and in the upper part of the small intestine of all the specimens of Weddell's Seal examined.

The average length, including the head, is 1·6 mm. There is no neck, and segmentation begins immediately behind the head. The segments increase in breadth about the middle, and diminish, tending to become more elongate, towards the tail-end.

The segments number from five to six; the broadest measuring 0·58 mm. transversely, and 0·22 mm. from before backwards. None show genital glands.

The genital pores are placed in the middle line, nearer the head-end of each segment.

The head is peculiar. It is relatively large, measuring 0·58 mm. in length, and in its broadest part 0·34 mm. in width. On either side there is a large sucker, guarded by peculiar lips, and having a small opening. The sucker is 0·39 mm. long, and 0·18 mm. across in its broadest part.

The worms are so immature that we are unable to give a specific diagnosis. We place these forms, with some hesitation, under *D. mobilis*, Rennie and Reid.

20. *Dibothriocephalus coatsi*, Rennie and Reid, 1912. (Pl. V, figs. 37, 38.)

Host.—These small Cestodes were collected from the small intestine of Weddell's Seal. They come from a slightly lower level than the preceding form. The infection was in most cases an exceedingly heavy one, the whole of the inner surface of the intestine being a felted mass of these minute worms. The intestine itself did not show any macroscopic changes resulting from their presence.

External Characters.—The worms are from 1 cm. to 1·5 cm. long, varying in colour from dirty grey to brown. The head is narrow and is bluntly pointed at its apex. There is only a very short neck, and the segments then become clearly defined at once. These, with the exception of the first two, become elongated on passing backwards.

Head.—The dorsal and ventral surfaces of the blunt, elongated head are grooved by shallow, gaping slits or suckers, 0·75 mm. long; these suckers do not extend on to the top of the head. The head measures 1·1 mm. in length and 0·36 mm. across in its broadest part, which is, roughly, just below the upper third.

Segments.—The fourteenth segment (Pl. V, fig. 38) is narrow above, widens in front of the middle, and tapers again to the hind end. The segments do not overlap each other in any way. In a stained specimen there is an outer, clear and unstained portion at the periphery of the whole segment. The genital pores (*c*) are in the middle line, much nearer the cephalic than the caudal end of the segment. The cloacal opening measures 0·1 mm. in its greatest length, and 0·06 mm. in its greatest breadth. The cirrus was not extruded in any segment, and therefore was not measured. The uterine opening (*d*) is nearly circular, its diameter measuring 0·05 mm. in any direction. It is placed immediately behind the cirrus-opening. The ovary, uterus (*e*) and female organs are grouped for a short space behind this. The limits of the uterus are circumscribed and do not extend far down the segment. This organ is simple and not branched, and usually contains from eight to ten eggs, which first appear in the sixth to the eighth segments, and measure 0·06 mm. in length. The testes number about ninety. They are very distinct and are of a regularly rounded shape. They are not arranged in any characteristic manner, but are scattered generally throughout the segments, being fewest at the anterior border.

The segment described measures 1·04 mm. from before backwards, 0·44 mm. in its broadest side to side measurement, and 0·34 mm. in width at the caudal end. The surfaces of the segments are not folded. Two excretory canals run down either side of the segment; the inner pair run down practically alongside the female organs, while the outer pair are separated from the others by a considerable interval. The testes are distributed between and outside these canals.

21. *Dibothriocephalus lashleyi*, Leip. and Atk. (Pl. V, figs. 40, 41.)

Dibothriocephalus lashleyi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

3 to 4 cm. in length. Young segments quadrate. Mature segments 3 to 4 times as long as broad. Head 1·2 mm. long and 0·77 mm. broad. Suckers situated laterally, almost circular, and not extending far down the head. Eggs first appear at the 14th segment, and measure 0·06 mm. in diameter. The testes extend inwards in each segment in single series of three.

Host.—Weddell's Seal (*Leptonychotes weddelli*). This Cestode, like the previous one, occurs in the upper part of the small intestine in large numbers.

External Characters.—The colour varies; the head and some part of the anterior end are white, but where the segments begin to elongate the colour becomes pearly grey. This Cestode is larger than the preceding and measures 3 cm. to 4 cm. in length. The surface is folded, but this is probably due to contraction. The anterior segments are quadrate and shortened antero-posteriorly, broader from side to side than from before backwards. The hinder segments are enormously elongated and their length is three to four times as great as their breadth. The head is somewhat conical, ending in a point, and is less markedly clubbed than in the preceding species.

Head (Pl. V, fig. 40).—The head is relatively small, measuring 1·2 mm. in its greatest length, while its greatest breadth is 0·77 mm. The central portion, between the two suckers, terminates as a nipple-shaped projection. No rostellum and no hooks are present. The suckers are placed on either side, not on the dorsal and ventral surfaces. They are almost circular and do not run down the head for any considerable distance. They measure 0·24 mm. antero-posteriorly and 0·17 mm. from side to side. They are depressions, and have not the fold found in the following species (text-fig. 11). The head is continuous with the neck, which is short, the worm rapidly becoming segmented.

Segments (Fig. 41).—In the strobila examined the eggs first appear at the fourteenth segment. The anterior of the segments which are mature are broader from side to side than from before backwards. The posterior are greatly elongated. The former measure 1·4 mm. from side to side and 0·6 mm. from before backwards. The latter measure 1·8 mm. from before backwards, 0·92 mm. from side to side at the cephalic end, and 0·58 mm. at the caudal end.

The genital pore is in the middle line and is a simple opening; it is placed nearer the cephalic than the caudal border of the segment. It consists of the cloacal opening

(Fig. 41, *c*), which is 0·13 mm. in its longest diameter, and 0·07 mm. in its broadest. The cirrus was not extruded in any segment, and therefore could not be measured.

The small uterine opening (*d*) is behind and slightly to one side of the cloacal opening. Its longest diameter is 0·05 mm. and its greatest breadth 0·03 mm. Behind the genital opening the ovarian and other female organs are always grouped very regularly and in a very characteristic manner. The uterus is small and simple, and only contains a few eggs, which measure 0·06 mm.

The testes are very numerous and are grouped in a definite manner, which is characteristic. They tend to be roughly in paired columns, and there is always, running toward the caudal end of the female organs, a definite row of three or more testes marked off by their direction from the remainder.

The excretory canals are continuous throughout the segments, and a single one runs down on either side, just outside the junction of the middle and outer thirds. The testes are distributed on their outer side as plentifully as on their inner side. The musculature is not well marked.

22. *Dibothriocephalus archeri*, Leip. and Atk. (Text-fig. 7.)

Dibothriocephalus archeri, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

6 to 12 cm. in length. Large square head, 2·04 mm. broad. Lips of the suckers folded inwards. The eggs first appear in the 57th segment and measure 0·07 mm. Testes scattered diffusely.

Host.—Weddell's Seal (*Leptonychotes weddelli*); collected in fair quantities from the upper part of the small intestine.

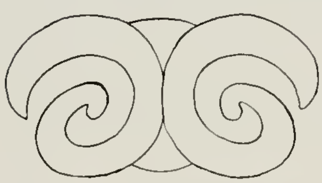

FIG. 7. — *Dibothriocephalus archeri*: Optical transverse section of the head, showing the inward folding of the walls of the suckers.

External Characters.—The colour of the worms is a dirty white, and in length they measure from 6 cm. to 12 cm. They are flattened dorso-ventrally, and attain their greatest breadth as the caudal end of the worm is reached. The anterior segments are more quadrilateral than the posterior, which tend to become broadened from side to side and shortened from before backwards. The genital pores are in the median line, and at about the middle of the segment.

Head.—The head is relatively large, and is somewhat square, its greatest breadth (2·04 mm.) being in the anterior part. Its length is 2 mm.

The central portion, between the two suckers, terminates in a slight cone suggesting a rostellum. There is no true rostellum, and no hooks are present. The suckers run down the head for 1·25 mm. of its length. The central, interior, portion of the head seems to be a rod of more solid structure between the two suckers. On looking at the head from the front, the two suckers are seen to be cup-shaped and folded (text-fig. 7); the outer lapel of the suckers running out from the head for some distance. The suckers, at their anterior end, measure 1·02 mm. from side to side.

and 0·86 mm. dorso-ventrally. They are placed on either side of the worm, and not on its dorsal and ventral surfaces. The apex of the head measures 1·56 mm. from side to side and 0·92 mm. from above downwards.

Segments.—That described is the ninety-seventh segment. The segments are quadrate, their hinder and lateral portions slightly overhanging the following segment by a short nipple-shaped projection on either side. They are broader from side to side than from before backwards, with the exception of the first few segments. There is a long neck. In a stained specimen the outer portion of each segment stains diffusely with haematoxylin. Measurements: from side to side, 1·5 mm.; from before backwards, 1 mm.

The genital pore is surrounded by a slight mound, which includes the aperture for the cirrus and the vaginal opening. The mound usually has an elongation towards the vaginal pore. The opening is placed about mid-way in the segment. The cirrus is extended in nearly all the segments that are mature. It ends in a clubbed, roughened portion having five lobes, but no hooks, and measures 0·12 mm. in length. The opening is almost circular and measures 0·02 mm. The vaginal opening is very small, relatively, measuring 0·04 mm. in its greatest breadth and 0·06 mm. in its greatest length. From it a well-marked vagina leads slantingly backwards to the uterus. The female organs are collected just behind the opening, forming a dark staining mass. The uterus is small and is confined to this space. The eggs begin to appear at the fifty-seventh segment, and measure 0·07 mm. The testes are numerous and are scattered throughout the tissue of the segment; there are few on the outer side of the excretory canals. There is no definite arrangement as in the preceding Cestode. The single pair of excretory canals are wide. They lie just outside the junction of the outer and middle thirds of the segment. The ventral surface of the segment seems to bear definite transverse rugae. These may have been caused by contraction, but are more probably a permanent feature. The longitudinal muscular fibres are well marked, but the circular are less distinct. The shape of the genital opening is very distinctive; as is the shape of the extremity of the cirrus.

Diphyllobothrium, Cobbold, 1859.

23. *Diphyllobothrium perfoliatum*, Railliet and Henry, 1912. (Text-fig. 8.)

Host.—Weddell's Seal (*Leptonychotes weddelli*); small intestine. The parasite occurs in a well-marked tuft at the beginning of the small intestine. The majority of the individuals have their heads beneath the first two or three valvulae conniventes. The Report of the French Antarctic Expedition under Dr. Charcot, 1909, describes the same arrangement of the worms at the ileocaecal valve.

External Appearance.—The worms measure, on the average, 14 cm. in length, but there is a certain amount of variation in size. The head and some portion of the segments are of a pearly white colour, varying to yellowish white at the hinder end. The segments, except those near the neck, show marked imbrication, and on the ventral surface, at the hinder border of each, there is a marked V-shaped indentation.

Head.—The head (text-fig. 8) is club-shaped, broadening near its apex and then narrowing. It measures 1·35 mm. transversely, and 1 mm. in a dorso-ventral direction. The suckers are simple slit-like depressions which extend on to the summit of the head, where they are separated by a fairly broad ridge. One lies on the dorsal, the other on the ventral surface of the head. The lips of the suckers are narrow, with the result that there is no folding.

The lips approximate as they proceed down the head. The suckers have an extreme breadth of 0·58 mm. in front, and are 0·05 mm. broad at the thin end. The length from the front of the head to the end of the sucker is 1 mm. There is no rostellum, and there are no hooks. The head tapers to join the neck, which extends to about 0·7 cm., after which the first segments appear.

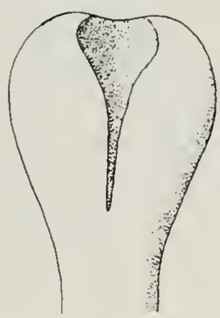

FIG. 8. — *Diphyllobothrium perfoliatum*, Railliet and Henry: The head, showing the shallow lips of the sucker.

Segments.—The segments are relatively wide, and vary in breadth from 3 mm. near the head-end to 5 mm. near the tail. They are exceedingly short, and markedly imbricated.

The genital pores are in the middle line and are placed on a slight projection. The surface of the segment is folded around them to make a depression. The cirrus-sac is large, the cirrus itself simple and unarmed, and measuring 0·3 mm. in length and 0·1 mm. in breadth; it is anterior to the vagina, which is a narrow straight tube, 0·35 mm. long and 0·04 mm. broad.

The uterus is convoluted and occupies the central and lateral portions of the segment. The testes are numerous and occupy the imbricated portion of the segment as well as the central portion; some of them tend to be aggregated into small groups. Later the segments become full of eggs at the expense of the other contents.

Well-marked bands of longitudinal muscular fibres are continued down the ventral and dorsal aspects of the central portions of the segments. The circular fibres are not so well marked. A single wide excretory canal runs down either side of the segment, near its outer part.

24. *Diphyllobothrium rufum*, Leip. and Atk.

Diphyllobothrium rufum, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 224.

3 to 6 cm. in length. The head, which is characteristically pigmented brick-red around the base of the suckers, measures 1·64 × 1·44 mm. The suckers are dorsal and ventral. The segments overlap markedly, as in *D. perfoliatum*. The eggs measure 0·025 mm.

Host.—Weddell's Seal (*Leptonychotes weddelli*); small intestine.

The worms are confined as a definite tuft to the first few valvulae conniventes as in *D. perfoliatum*. They were found by Mr. D. G. Lillie, in a seal killed near Coulman Island, Lat. 74° S. approximately, and a similar set was seen at Hut Point in Lat. 77° 45′ S.

External Appearance.—The worms are from 3 cm. to 6 cm. long, the average length being about 5 cm. The strobila is shaped like an Indian club, being narrow in front, broadest behind the middle, and tapering slightly to the hinder end. The colour is a yellowish white. The head, around the suckers, contains a very characteristic scarlet pigment.

Head.—The head measures 1·64 mm. from before backwards, and 1·44 mm. from side to side in its broadest part. Anteriorly there are two deep suckers lying ventrally and dorsally. The sucker measures 0·52 mm. internally, 1 mm. externally, and 1·45 mm. from before backwards. Its hinder part is surrounded by a free edge. A bright scarlet pigment-band on the outer side of the fold surrounding the sucker is very characteristic. It only encroaches partially on the inner side and measures 0·11 mm. at its broadest part.

Segments.—The segments immediately succeed the head without the interposition of a neck. They vary in size, measuring 2 mm. transversely at the head-end, 5 mm. at the broadest portion, and 3 mm. at the tail-end. The segment described is from near the head-end of the worm. The dorso-ventral measurement is 2·14 mm. The segment consists of a central portion, measuring 0·32 mm. from before backwards, and two lateral portions. There is marked imbrication of the segments, as in *D. perfoliatum*. The genital openings are central and are placed partly on the anterior surface of the overlapping edge. The cirrus is fairly large, measuring 0·41 mm. in length and 0·11 mm. in breadth; it is anterior to the vagina, which is a slender tube measuring 0·24 mm. in length and 0·02 mm. in width. The testes are numerous and extend out into the lateral portions of the segment. The uterus is also extensive, the eggs, which measure 0·025 mm., being present in the later segments to near the periphery. Two winding excretory canals run down either side of the segment close to the junction of the central and lateral portions. The musculature is not so well marked as in *D. perfoliatum*. The longitudinal bands are small and are not continuous over a large number of segments. The fibres are small and insignificant. The circular fibres are better marked.

25. *Plerocercoid larva*, sp. inc. (Pl. V, figs. 39, 42.)

A few larvae, apparently of Bothriocephalid Tapeworms, were found encysted under the mucous coat of the pyloric processes of the gut of *Trematomus bernacchii*. It is impossible to associate them with any particular species, but there is every probability that they are the young stages of one or other of the species of *Dibothriocephalus* or *Diphyllobothrium* found in the Seals.

Order TETRAPHYLLIDEA.

Fam. PHYLLOBOTHRIIDAE.

Anthobothrium, Van Beneden, 1850.

26. *Anthobothrium wyatti*, Leip. and Atk.

Anthobothrium wyatti, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Scolices small, unsegmented. Four large auricular appendages, each occupied by two tandem suckers A brightly pigmented band crosses the neck in the living state.

Attached to the wall of the rectum of the fish *Trematomus bernacchii* were a large number of small Cestode scolices characterised in the living state by the presence of a bright red ring of pigmentation in the neck. There are four auricular discs, each carrying a pair of round suckers. The rostellum also is occupied by a muscular sucker.

These parasites bear some resemblance to the forms figured by Van Beneden in 1861 as typical of his genus *Anthobothrium*, and they are accordingly referred to that genus. The scolex measures 1·18 mm. in length by 0·53 mm. in breadth. There is no indication of segmentation. The auricles measure 0·3 mm. by 0·18 mm. The suckers on each side lie one in front of the other; the anterior measuring 0·1 mm. in diameter, the posterior being slightly larger, viz., 0·12 mm.

Oriana, Leip. and Atk.

Oriana, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226.

A Tetraphyllid with large quadrate discoidal head carrying four round suckers. Rostellum absent.

27. *Oriana wilsoni*, Leip. and Atk. (Pl. V, figs. 32, 33, 34.)

Oriana wilsoni, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Segments all immature. Strobila 13 cm. long. Head discoidal, 3 mm. in diameter, quadrate in outline, 4 round suckers present terminally. Neck very slender. Testes arranged in two definite groups of 7–8 and 17–18. Near to *Diplobothrium*.

Host.—These Cestodes were obtained by Mr. D. G. Lillie from the intestine of a Rorqual (*Balaenoptera borealis*, Lesson), caught off the Bay of Islands, New Zealand (Stat. 149).

External Appearance.—The worms vary very greatly in size and length and in the number and shape of their segments. None contain eggs. The length of the unsegmented part, or neck, varies also very greatly, sometimes being as much as 3 cm. The description is of an average specimen and will hold for the majority obtained.

Head.—The length of the strobila is 13 cm. to 14 cm. The head is discoidal, anteriorly flattened and square-sided, varying from 2·8 mm. to 3·2 mm. in diameter. The neck is exceedingly narrow and is attached to the head much as is the stem to the bowl of a champagne-glass. The four suckers, which almost completely occupy the anterior surface of the head, are nearly circular. They have a diameter, outside, of 1·35 mm. and, inside, of 0·76 mm. They are fairly deep and are embedded for some distance in the substance of the head. There is no rostellum and there are no hooks.

The margins both of the head and of the orifices of the suckers are rounded (Pl. V, figs. 32, 33).

Segments.—The segments figured (Fig. 34) are about the 221st and 222nd. The shape of the hinder segments usually varies considerably, but in general conformation the remaining segments are the same. A typical segment measures 1·35 mm. transversely, but is only 0·47 mm. long. The genital pore opens marginally near the anterior border of the segment. There is a slender, elongate, unarmed and sometimes pyriform cirrus, measuring 0·14 mm. The vas deferens makes its way as a straight uncoiled tube to the centre of the segment, where it ends in a slight dilatation. Caudad, but in close proximity to this, is a narrower tube, the vagina, which runs to the middle of the segment, ending in a small punctate mass which possibly represents the shell-gland. The testes are rounded and are arranged very definitely in two sets, divided by the vas deferens and vagina. The set on the side of the pore usually numbers seven to eight, and that on the opposite side 17 or 18. The total number of testes is 24 to 25, of which the majority (from 17 to 18) occupy that side of the segment distant from the cirrus. They are situated internally to the excretory canals. The segments do not overlap in any way, and their lateral borders are rounded. A fair number of chalk-bodies are present. Even in the most caudal segments there are no eggs, and the uterus is not fully developed.

The infection of the Rorqual was evidently a recent and a very heavy one.

This species has been made the type of a new genus *Oriana* near to *Diplobothrium*, a preoccupied genus, in the family Phyllobothriidae.

Order CYCLOPHYLLIDEA.

Fam. TETRABOTHRIIDAE.

Tetrabothrius, Rud., 1819.

28. *Tetrabothrius heteroclitus*, Dies.

Host.—Great Grey Shearwater (*Puffinus cinereus*); small intestine.

External Characters.—These Cestodes are exceedingly long and slender and are from 10 cm. to 13 cm. long. The segments are fairly uniform in shape, but towards the caudal end they become broader from side to side and decrease comparatively in depth. They are broader in front than behind and each overlaps the succeeding segment for a short portion. Their hinder ends are carried out as sharp points beyond the margins of the succeeding segments. The worms were in a tangled mass in the intestine, and were thus exceedingly difficult to separate.

Head.—The head is shaped like a truncated cone bluntly rounded off. From the sides hang the four suckers with well-developed auricular appendages. The lips of the suckers are broad and folded inwards. The cavities widen posteriorly. The suckers do not appear on the anterior surface of the head.

The head, which is succeeded by a fairly long and simple neck, measures 0·37 mm.

in length. The apex is 0·24 mm. across, while the lower and broadest part is 0·45 mm. There is no rostellum and there are no hooks. The neck is broadest at its junction with the head and gradually narrows to the first segment.

Segments.—The following information regarding the segments is derived from stained specimens, from near the head-end and near the tail-end of the worms.

Maturity is late. The general size and shape of the segments, which are broader than long, does not vary much. Antero-posteriorly they measure 0·32 mm., the cephalad border being 0·5 mm. in width and the caudad border 0·62 mm. The staining of the segments is diffuse. The genital openings are on the side and are unilateral; they vary considerably in formation in various parts of the worm. Thus in immature portions there is no projecting ring, while in those which are more mature there is a well-marked ring outside the border of the segment, while at a deeper level there is a second ring containing the openings of the cirrus and vagina. The cirrus is simple, rounded and unarmed. The straight vas deferens which runs from it ends in a slight dilatation. The vagina is below the cirrus-opening. The small and rounded testes are arranged in a circular manner around the dilated end of the vas deferens, and this is a characteristic feature of the species; they number from twenty-two to twenty-four. In the more mature segments they are displaced to one side by the uterus. In front of them, and some distance from the anterior border, are the ovary and yolk-gland. These are of no great size, but can easily be differentiated by their staining. A single excretory canal runs down each side, externally to the testes. The canal is narrow and is internal to the genital atrium.

29. *Tetrabothrius cylindraceus* (Rud.), 1819. (Pl. IV, fig. 31.)

Host.—McCormick's Skua (*Megalestris maccormicki*); intestine. These birds feed largely on blubber, and on the excrement of seals. They also feed on fish. Although a large number of birds were examined only a very few Cestodes were obtained.

External Appearance.—This is a fairly slender worm. The longest specimen is 8 cm. long, and the segments are at first uniform in size, but gradually lengthen towards the caudal end. The colour is a dirty brown. Unfortunately, all the specimens had lost the scolex.

Description of Segment.—The segments drawn (Pl. IV, fig. 31) are from fairly near the anterior end of the fragment. They are quadrate, and measure 0·64 mm. from side to side, and 0·47 mm. longitudinally. Each segment is slightly narrower at the cephalic end than at the caudal border. In a stained specimen the outer portions remain unstained.

In the middle, occupying the more cephalic portion of the segment, is a deeply-staining mass composed of the testes (Fig. 31, *t*). These are numerous—fifteen to thirty—and are generally arranged in a horse-shoe shape, with the concavity caudad. The ovary and yolk-gland (*yg*) are in front of these, fairly large, and immediately behind the cephalic border.

The genital atrium is very large and has a fleshy wall. The pores are single and on the same side throughout the strobila. The massive atrium occupies nearly the whole border of the segment. The outer measurement of the atrium is 0·23 mm., while its cavity is 0·15 mm. across. The cirrus (*sp*) is usually extruded and hooked backwards in nearly every segment. It measures 0·05 mm., and its surface is roughened by ridges. The broad vagina crosses the segment, and, after turning once upon itself, runs towards the centre. Two excretory canals run down either side, immediately internally to the genital atrium, throughout the segments. The outer canal is small, the inner nearly twice as wide.

30. *Tetrabothrius priestleyi*, Leip. and Atk. (Pl. IV, fig. 28.)

Tetrabothrius priestleyi, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 10 cm. long, excessively slender, with large tulip-like head. Testes 17–20. Near to *T. pelecani*, Fuhrmann.

Host.—A Frigate bird (*Fregata aquila* or *F. ariel*), shot at South Trinidad (Stat. 36); intestine.

External Appearance.—The worms measure from 10 to 11 cm. in length, and for the greater part are exceedingly slender. The segments become enlarged only towards the caudal end. They are pearly white in the anterior thin part, changing to yellowish-white posteriorly. The worms were removed from the intestine in a tangled mass, and owing to their long slender necks were difficult to separate from one another.

Head.—The head is comparatively large, and is armed with four suckers placed on the sides and not showing on the top of the head. The suckers are narrow in front and expand to their greatest width behind. The head is 0·55 mm. long, and attains 0·44 mm. in breadth at its broadest part. Each sucker is 0·42 mm. long and 0·22 mm. wide at its broadest part. The head-region is well-defined. There is a slight constriction behind the suckers, and this is succeeded by a fairly long neck, before the segments make their appearance.

Segments.—The segments figured (Pl. IV, fig. 28) are from about the middle of the worm. Maturity is late. The segments stain diffusely with haematoxylin. They are broader than long, measuring 0·6 mm. by 0·3 mm. Their shape does not vary much, but they become thicker and broader toward the posterior end. The genital atria are unilateral, large and rounded, measuring 0·14 mm. They open laterally. The cirrus is rounded and unarmed, measuring 0·1 mm. in length and 0·06 mm. in its greatest breadth. A short vagina lies behind it. The testes are relatively large and form about seventeen to twenty groups. They are confined to the central part of the segment. In some of them the bulk is increased markedly, and stained nuclei are found only round the periphery. The yolk-gland is placed in front of them, in the middle of the cephalic border. It is large, circular, and stains deeply, measuring 0·04 mm. across. A single excretory canal runs down either side, externally to the testes. The canal is broad and runs internally to the genital atrium. A most characteristic feature in a stained specimen of this worm is a series of about fifteen strong bands of muscular fibres which run down the ventral aspect of the worm. They are continuous from segment to segment.

Apart from the number of the testes, this form appears to be similar to that recorded by Fuhrmann in 1908 under the name *Tetrabothrius pelecani* (Rud., 1819), a binomial abbreviation for *Taenia pelecani aquilae* Rud. The names *Taenia heterosoma* and *T. sulae fuscae* had previously been given by Baird (as *nomina nuda*) to specimens in the British Museum, which both Monticelli and Fuhrmann, on re-examination, have pronounced to be identical with *T. pelecani* (Rud.)*

31. *Tetrabothrius nelsoni*, Leip. and Atk. (Pl. IV, fig. 25.)

Tetrabothrius nelsoni, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 226.

Fragments only. Head absent. Testes 6 to 8, aggregated at the side of the segment remote from the cirrus.

Host.—Sooty Albatros or Hutton's Albatros (*Phoebetria palpebrata*); intestine.

External Appearance.—Only fragments of the strobila were obtained. The anterior portions are white, the more mature segments grey and almost transparent.

Segments.—The figure represents the posterior end of a fragment, where the segments measure 2 mm. transversely and 0·4 mm. in length. The hinder lateral borders of each segment overlap the succeeding segment considerably. The staining is diffuse. The genital cloaca (Pl. IV, fig. 25, *a*) is large and thick-walled; it is always on the same side of the strobila and opens directly on the side. The cirrus (*c*) measures 0·32 mm. × 0·20 mm. From it there proceeds across the segment a very slightly coiled vas deferens (*b*). The vagina (*v*) runs an erratic course just behind the vas deferens to almost the middle of the segment, where it turns backwards to end in a large dilatation which varies considerably in the different segments. The contents give a chromatin staining and appear to be spermatozoa. Immediately in front of this is a large ovarian mass measuring 0·15 mm. in its greatest diameter. The testes (*t*), which number from six to eight, are large, measuring 0·09 mm., and they are aggregated together in a small area on the side of the segment remote from the genital opening. Two narrow excretory canals run down either side: they are external to the testes and internal to the genital openings. The musculature is poorly marked.

32. *Tetrabothrius creani*, Leip. and Atk. (Pl. IV, figs. 26, 27.)

Tetrabothrius creani, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 4·5 cm. Head 0·84 mm. broad, carrying four suckers but no rostellum. Testes numerous. Yolk-gland large. Cirrus 0·06 mm.

Host.—This Cestode was obtained from the small intestine of *Œstrelata trinitatis* and *Œ. arminjoniana*. These two Petrels in all probability are only one species, the

* See Fuhrmann, "Die Cestoden der Vögel," *Zool. Jahrb.* Suppl. x, 1909, p. 34, note 5.

variation in colours being due to age. The birds were taken at South Trinidad (Stat. 36).

External Characters.—The worm is of a dirty white colour. The head is followed by a short neck. The strobila measures from 4·5 cm. to 5 cm. Each segment slightly overlaps its successor. About the middle of the body the segments are almost as long as they are broad, but towards the posterior end the breadth considerably exceeds the length.

Head.—The head (Pl. IV, fig. 26) carries four suckers, which occupy ear-shaped projections on its sides. They are not visible from the top, as in the two other species obtained from this bird. The head measures 0·84 mm. from side to side, and 0·92 mm. antero-posteriorly. Each sucker is longer than it is broad and measures 0·94 mm. longitudinally and 0·62 mm. transversely. There is no rostellum and there are no hooks.

Segments.—The segments described (Pl. IV, fig. 27) are from about the middle of the worm. Each is slightly wedge-shaped, being narrower in front than behind, the hinder margin overlapping considerably. They measure 0·62 mm. antero-posteriorly, 0·6 mm. from side to side in front, and 0·82 mm. from side to side behind.

The genital pores are marginal and unilateral. They measure 0·14 mm. in length and are somewhat rounded. The cirrus is well developed, unarmed, and measures 0·06 mm. in length. The outer portion of each segment in a stained specimen remains clear and unstained. The testes and the female organs are confined to the space internal to this. The testes are numerous, numbering 35–50 or more, and are of medium size. The yolk-gland is relatively large and is placed in front of the testes, at the anterior border of each segment. The uterus is a simple sac containing the eggs. Eggs are found only in the latter segments. Two well-marked excretory canals run down either side, externally to the testes and just internally to the cirrus-opening.

33. *Tetrabothrius catherinae*, Leip. and Atk. (Pl. IV, figs. 29, 30. Text-fig. 9.)

Tetrabothrius catherinae, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Stouter than the preceding species. Head comparatively small. Suckers mostly on the top of the head. The segments overlap their successors by one-third. Testes 30 to 45, bunched in the middle of the segment. Genital organs very characteristic. Cloaca divided into outer and inner portions. There is a large pyriform seminal vesicle internally to the cirrus.

Host.—Trinidad Petrel (*Œstrelata trinitatis*); small intestine.

External Characters.—The colour is white. The worm is stouter and thicker than the preceding Cestode. The segments are broad from side to side, and short from before backwards; and this shape is uniform throughout. There is a comparatively small head, no neck being present, and the segments immediately follow it. These gradually increase in breadth until the worm ends caudally. The genital pores are unilateral and open nearer the ventral than the dorsal aspect.

Head.—The head (Pl. IV, fig. 29) is comparatively small, and is without hooks or rostellum. There are four suckers, which are placed mostly on the top of the head, and do not extend for any great distance down the sides. They are not deep and have no overhanging border.

The head measures 0·9 mm. in breadth and 0·9 mm. in an antero-posterior direction. The outside measurement of a sucker in its broadest part is 0·42 mm., and in its longest axis 0·62 mm. The greatest inside measurements are 0·2 mm. by 0·34 mm. There is no neck, the head being immediately followed by the segments.

Segments.—The segments described (Fig. 30) are those from the head-end of the worm, and later, segments cut in serial sections from nearer the caudal end. Each segment measures 1·14 mm. from side to side and 0·42 mm. antero-posteriorly. The hinder border of the preceding segment overlaps it for over a third of its ventral surface, and it in turn overlaps the following segment. The musculature is exceedingly well developed. There is a clear outer space in a stained specimen and a more deeply staining interior containing the generative organs. The testes are numerous, 30 to 45, and are found internally to the excretory canals. They are bunched more closely together in the middle of the segment and are there difficult to count. A small ovary and yolk-gland are placed in front of them near the anterior border of the segment. The genital openings are peculiar. They are unilateral and open on the side of the segment, but more on the ventral than on the dorsal aspect. There is a small punctate opening or depression showing signs of striation (text-fig. 9, *ec*). Internally to this there is a well-marked ring (*ic*) containing the male and female openings, and behind that a very large cirrus (*s*) and cirrus-sac (*sb*). The outer opening has an internal measurement of 0·02 mm. and an external diameter of 0·04 mm. The inner ring has an internal aperture of 0·04 mm. and an external opening of 0·06 mm. The cirrus measures 0·16 mm., and is unarmed.

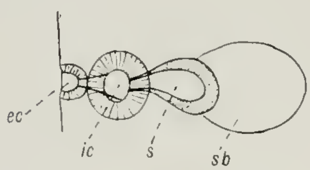

FIG. 9.—*Tetrabothrius catherinae*: the terminal organs of the genital apparatus. *ec*, muscular external portion of cloaca; *ic*, internal portion; *s*, cirrus; *sb*, cirrus-sac.

In sections of more mature segments the whole of the interior is taken up by a mass of eggs in a sac-like uterus, which is simple and undivided. Well-marked broad bands of muscular fibres are present. Two excretory canals run down either side of the segments. The outer and smaller lies very near the edge. The inner, a far wider canal, runs down at a short distance from it internally.

34. *Tetrabothrius aichesoni*, Leip. and Atk. (Text-fig. 10).

Tetrabothrius aichesoni, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 3 cm., more slender than in the preceding species. Segments more uniform, only overlapping slightly. Testes arranged in three distinct sets, very numerous, far in excess of those of the previous forms.

Host.—Trinidad Petrel (*Œstrelata trinitatis*); intestine.

External Characters.—This Cestode is of a dirty white colour, and measures 3 cm. to 3·5 cm. in length. It is a more slender worm than the preceding, and the segments are more uniform in size and shape. The head is succeeded by a very short neck, and segmentation begins almost at once. The segments are uniform nearly the whole way down the body. The genital pores are single and unilateral.

Head.—The head is large. It expands from its narrow junction with the neck to its bulbous end. It has four large suckers, which are deeply hollowed. They open above on its upper surface, and run for some distance along its sides (text-fig. 10). There is a free border formed by the flap making the edge of the sucker. The head measures 0·92 mm. from side to side and 1 mm. from before backwards. It is roughly square when looked at from in front. Each sucker has an outside measurement of 0·44 mm. and an inside measurement of 0·24 mm.

Segments.—Unlike the last Cestode, the uniformity of the shape and size of the segments is marked. They measure 0·49 mm. from before backwards, and 0·76 mm. from side to side. The borders are rounded, and they slightly overlap one another. In a stained specimen the outer portion of the segments remains unstained. The genital openings are unilateral and occur at the sides, rather upon the ventral surface. The opening measures 0·04 mm. and is rounded. The cirrus-sac measures 0·14 mm. and is also rounded. The vagina is fairly wide. The testes, which number 30 to 40, are small and rounded; they are confined definitely to the space between the excretory canals on either side. They are also generally arranged in three distinct sets—the number in the middle set being far in excess of that in either of the other two. In front of these and near the cephalic end of the segment are the deeply-staining yolk-gland and ovary. The ovary is 0·06 mm. across and is rounded. The uterus is a simple sac, and the eggs occur late in the hinder segments. Two excretory canals run down either side, internally to the cirrus but externally to the testes, and are continuous throughout the segments.

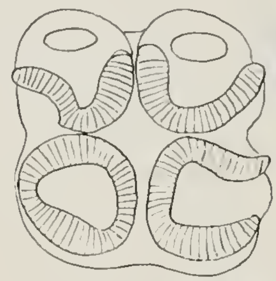

FIG. 10. — *Tetrabothrius aichesoni*: view of the anterior extremity of the scolex.

The main differences from the previous Cestode are in the genital openings, the number, distribution and arrangement of the testes, the shape of the head and suckers, and the uniformity of the segments in shape and size.

35. *Tetrabothrius wrighti*, Leip. and Atk. (Pl. IV, fig. 22.)

Tetrabothrius wrighti, Leiper and Atkinson, *Proc. Zool. Soc.*, 1914, p. 225.

Strobila 2·2 mm. long, none of the segments containing eggs. Head 0·4 mm. in length. Testes constantly twelve. Auricular appendages of suckers well developed.

Host.—A few of these minute Cestodes were obtained from the gut of the Adélie Penguin (*Pygoscelis adeliae*), a species which is usually peculiarly free from parasites of any kind.

Head.—The short neck is surmounted by a large head with four suckers and a peculiar rounded armature. There is no rostellum, nor do hooks occur. The head measures 0·4 mm. in length. The suckers attain their greatest breadth, 0·2 mm., posteriorly. They have overhanging edges and ear-like prolongations.

Segments.—The neck is followed by twenty segments. The segments gradually increase in length from behind the head without diminishing in transverse measurement. The last segment has a breadth of 0·3 mm., and a length of 0·15 mm. The internal organs begin to develop at the eleventh segment. The genital pores are marginal and on the same side. There is a large thick-walled cloaca. The cirrus is large and muscular. The vagina leads into a wide straight tube. The testes are few in number (twelve in each segment); their staining qualities markedly diminish in the last segments. The ovary is situated in the middle line, and near the anterior border of the segment. In front of this is a small, deeply-staining yolk-gland. The cirrus-pouches are external to the excretory canals and are situated marginally, in the middle third of each segment.

In all the material obtained from Adélie Penguins the strobila had the extraordinarily small size above noted. The number of testes is constantly twelve, and the auricular appendages are well developed.

Three species of *Tetrabothrius* have been found hitherto in Penguins, viz., *T. joubini*, Raill., *T. eudyptidis*, Lönnberg, and *T. lutzi*, Parona. *T. wrighti* seems to correspond in many points to the description given by Fuhrmann for *T. monticellii*. The limited number of testes is especially remarked upon by Fuhrmann as peculiar to this species. *T. joubini* is reported, however, to have only five to eight testes. The type-material of that species is said to be immature and poorly preserved.

Fam. DILEPINIDAE.

Anomotaenia, Cohn, 1900.

36. *Anomotaenia zederi* (Baird). (Pl. IV, figs. 23, 24. Text-fig. 11.)

Taenia zederi, Baird, 1853.
Tetrabothrius zederi, Monticelli.
Prosthecocotyle zederi, Fuhrmann.

Host.—Emperor Penguin (*Aptenodytes forsteri*); intestine.

External Appearance.—The worms measure 4 to 5 cm. in length. The head bears a rostellum and four suckers, and is pointed, while caudad from the suckers there is a well-marked pyriform swelling which subsides after a course of 0·7 cm. to join the segments (Pl. IV, fig. 23).

Head.—The head (text-fig. 11) is pointed, and there is a well-marked rostellum (*r*) measuring 0·24 mm. by 0·15 mm. transversely. The rostellum is retractile within a well-marked groove on the surface of the head. Its centre, distally, is marked by a small opening, and communicates with a hollow interior which forms a blind sucker situated within the rostellum. There are two series of well-marked hooks (*h*), nine in each series. The hooks measure 0·09 mm. from end to end; 0·04 mm. from the tip there is a well-marked guard. They are 0·01 mm. thick. The four other suckers (*s*) on the head are circular, and have an external measurement of 0·24 mm. and an internal diameter of 0·1 mm. Their surface is fleshy, and they are unarmed. The head is succeeded by a large globular neck measuring 0·7 cm. in length and 0·5 cm. transversely. In the interior two wide wavy excretory canals run toward the segments.

Segments.—The segments are very peculiar. There is a central portion, rounded dorsally and cupped ventrally. From the outer borders of each segment there is a well-marked lapel or apron which crosses from either side toward the centre. It is divided by a deep cleft in the middle line from its neighbour of the opposite side. The edge is crenated and suggests the machicolations on ramparts. Only in the latter segments were there any genitalia developed. The testes number 30 to 40, and are confined definitely to the dorsal portion of the segment. They are large and show a crenated outline. Two wide excretory canals run down either side, at the junction of the lapels with the segments. No eggs were present in any of the segments. The longitudinal muscular bands are very marked. The genital pore is peculiar and opens on the border of the lapel ventrally; the pores probably alternate. The anatomy of the segments is exceedingly difficult to make out.

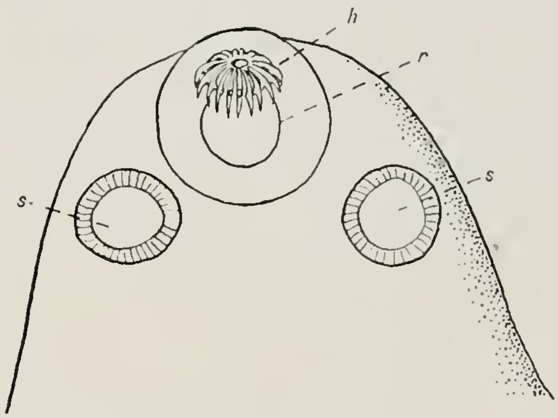

FIG. 11.—*Anomotaenia zederi* (Baird): anterior portion of scolex. *h*, hooks; *r*, rostellum; *s*, suckers.

Encysted in the Emperor Penguin, and completely closed off, occur forms consisting of only the head and neck (Pl. IV, fig. 23). Other cysts occur (Fig. 24) in which several individuals are present and the cyst is connected with the gut of the host. These worms consist of a head and a varying number of flat immature segments, the beginning of the genital apertures being visible on the sides. There also occur more mature forms in the cysts showing the peculiar conformation of the segments. In detail the heads and necks of the three forms are identical. An almost analogous case is mentioned by Railliet and Henry. These parasites were obtained by the French Antarctic Expedition from *Pygoscelis papua*, and the authors ascribe the mature form to *Anomotaenia zederi*.

ORDER TRYPANORHYNCHA.

FAM. TETRARHYNCHIDAE.

Tetrarhynchus, Rud., 1809.

37. *Tetrarhynchus* sp. (larva). (Pl. V, fig. 35.)

This interesting little *Tetrarhynchus* was collected together with some larval Nematodes, encysted in the wall of the caecum of a Barracouta (*Lepidopus caudatus*) at the Bay of Islands, New Zealand. The specimens are minute, pearly white and almost spherical bodies, measuring, on the average, 1·02 mm. long. The greatest breadth is 0·96 mm.

On the outer aspect of the anterior half of the body are four large fleshy suckers surrounding a depression from which four rostella emerge. The borders of the suckers project beyond the body at their posterior limits. The muscular fibres of the suckers give the walls an appearance of coarse striation.

The rostella are long and slender, slightly bulbous at their distal ends, and well armed with series of backwardly curved hooks. They measure 0·45 mm. in length, 0·06 mm. in breadth at their distal ends, and 0·04 mm. at their proximal ends. In vertical series the hooks number eleven rows, and in horizontal series eight rows.

From the posterior end of each hook-bearing rostellum, a cylindrical portion, possibly muscular, proceeds backwards and is surrounded by a short kidney-shaped sac. These sacs are 0·37 mm. long and 0·14 mm. broad.

Into the posterior half of the body a broad but short "abdomen" or tail is countersunk, and the tail shows a slight median depression. There are always a large number of chalk-bodies contained in the interior. The surface of the body is smooth and the whole cyst appears to be enclosed in a delicate transparent capsule probably secreted by the host.

Abothros, Welch, 1876.

38. *Abothros carcharias*, Welch, 1876. (Pl. V, fig. 36.)

This worm, a larval form, was obtained from the stomach of a small shark (*Carcharias* sp.) caught in 1910 at the Island of S. Trinidad (Stat. 37). It consists of a clubbed anterior portion, and a longer and more slender tail "telescoped" into the fore-body somewhat after the manner of the "abdomen" of *Hemiurus*. The total length is 21 mm., the anterior portion measures 7·3 mm., and the tail-end is 13·7 mm. long. The tail-end is in part protrusible.

The body is surmounted anteriorly by four slender rostella armed with hooks. The length of the rostellum is 0·7 mm.; the breadth, which is uniform, being 0·12 mm. The vertical number of hooks is twenty-seven, and the horizontal number is eight in each row. The hooks are sharply down-curved, sharp-pointed, and with a broad base; they measure 0·03 mm. from tip to base. There is a striking diminution in the size of the hooks of the proximal rows. There is a well-marked sac for each rostellum. To each are attached long bundles of muscular fibres which run back, to become inserted into the line of attachment of the abdominal portion of the body. The excretory canals run down into the tail-portion. The skin is smooth and unarmed. In the interior of the bulbous anterior end there are a large number of granules of brown pigment.

Somewhat similar forms have been described by Welch from the stomach of a shark (*Carcharias* sp.) and by Rennie and Reid from the muscles of the Bonito.

Owing to the absence of suckers, Welch created a separate genus *Abothros* for his specimen. Our material does not appear to differ from his species *A. carcharias*. Welch merely states that the number of hooks on each rostellum is about 200.

SUMMARY AND CONCLUSIONS.

We now summarise the species that have been collected by the various Antarctic Expeditions up to the present time. The species described as new in the corresponding Reports are indicated by an asterisk.

Ross's Antarctic Expedition, 1841–4. 2 species (both new).

CESTODA:—

**Dibothriocephalus antarcticus* (Baird), 1853.
**Taenia zederi*, Baird, 1853.

National Antarctic Expedition, 1901–4 ("Discovery"). 4 species (3 new, 1 previously known).

CESTODA:—

Dibothriocephalus antarcticus (Baird), 1853.
* ,, *scotti*, Shipley, 1907.
* ,, *wilsoni*, Shipley, 1907.

NEMATODA:—

**Leptosomatum australe.*

Scottish National Antarctic Expedition ("Scotia"). 17 species (8 new, 5 previously known, 4 doubtful).

CESTODA:—

**Dibothriocephalus scoticus*, Rennie and Reid, 1912.
* ,, *coatsi*, Rennie and Reid, 1912.
,, *antarcticus* (Baird), 1853.
* ,, *mobilis*, Rennie and Reid, 1912.
* ,, *pygoscelis*, Rennie and Reid, 1912.
Anchistrocephalus microcephalus (Rud.), 1819.
Hymenolepis sp. ?
Phyllobothrium sp. ?
Tetrarhynchus sp. ?

NEMATODA:—

(parasitic):—

**Ascaris radiata*, v. Linst., 1906.
* ,, *rectangula*, v. Linst., 1906.
,, *osculata*, Rud. 1802.
,, *diomedeae*, v. Linst., 1888.
,, sp. ?
**Monorygma dentatum*, v. Linst., 1906.

(free living):—

Thoracostoma setosum, v. Linst., 1896.

ACANTHOCEPHALA:—

**Echinorhynchus antarcticus*, Rennie, 1906.

Expédition Antarctique Française ("Pourquoi Pas?"). 18 species (4 doubtful, 8 new, 6 previously known).

CESTODA :—

**Diphyllobothrium resimum*, Railliet and Henry, 1912.
,, *wilsoni* (Shipley), 1907.
* ,, *perfoliatum*, Railliet and Henry, 1912.
* ,, *clavatum*, Railliet and Henry, 1912.
,, *antarcticum* (Baird), 1853.
,, sp.?
Anomotaenia zederi, Baird, 1853.
**Tetrabothrius joubini*, Railliet and Henry, 1912.
**Choanotaenia dominicana*, Railliet and Henry, 1912.
Tetrabothrius heteroclitus, Dies., 1850.
,, sp. (?)
? ,, sp.
? ,, sp.

NEMATODA :—

Ascaris decipiens, Krabbe, 1878.
,, *osculata*, Rud., 1802.
* ,, *falcigera*, Railliet and Henry, 1907 (=*A. radiata*, v. Linst., 1906).
* ,, *stenocephala*, Railliet and Henry, 1907 (=*A. rectangula*, v. Linst., 1906).

ACANTHOCEPHALA :—

**Corynosoma sipho*, Railliet and Henry, 1907 (=*C. antarcticus*, Rennie, 1906).

British Antarctic Expedition ("Terra Nova") 1910–13.

A. 9 Forms previously recorded from the Antarctic Zone, represented in the collection.

NEMATODA :—

Leptosomatum setosum, v. Linst., 1906.
Ascaris osculata, Rud. [*Kathleena*] . . . (Hosts, *Hydrurga leptonyx*, *Lobodon carcinophagus* and (larvae) *Trematomus bernacchii*).
,, *radiata*, v. Linst. [*Kathleena*] . . (Host, *Leptonychotes weddelli*).
,, *rectangula*, v. Linst. [*Kathleena*] . (,, ,, ,,).

ACANTHOCEPHALA :

Echinorhynchus hamanni, v. Linst. [*Corynosoma*]. (Hosts, *Leptonychotes weddelli*, *Lobodon carcinophagus*, *Hydrurga leptonyx*).

CESTODA :—

Taenia zederi, Baird [*Anomotaenia*] . . . (Host, *Aptenodytes forsteri*).
Dibothriocephalus mobilis, Rennie and Reid, 1912. (,, *Leytonychotes weddelli*).
Dibothriocephalus coatsi, Rennie and Reid, 1912. (,, ,, ,,).
Diphyllobothrium perfoliatum, Railliet and Henry, 1912. (,, ,, ,,).

B. 3 Forms previously recorded from the Arctic Regions, now found in the Antarctic Zone.

NEMATODA :—

Filaria crassicauda, Creplin [*Crassicauda*] . (Host, *Megaptera*).

ACANTHOCEPHALA :—

Echinorhynchus turbinella (Dies.) Porta. [*Pomporhynchus*]. (,, ,,).

TREMATODA :—

Monostomum plicatum, Creplin [*Ogmogaster*] . (Hosts, *Leptonychotes weddelli*, *Lobodon carcinophagus*).

C. 1 Form previously recorded elsewhere and now found within the Antarctic Circle.

CESTODA :—

Tetrabothrius cylindraceus (Rud.), 1819 . (Host, *Megalestris maccormicki*).

D. New species,† collected in the Antarctic Zone.

NEMATODA :

**Kathleena scotti* . . . . (Host, *Diomedea melanophrys*).

ACANTHOCEPHALA :—

**Echinorhynchus campbelli* . . . . . . (Host, *Trematomus bernacchii*).
* „ *rennicki* . . . . („ „ „).
* „ *debenhami* . . . . . . („ „ „).

TREMATODA :

**Hemiurus oatesi* . . . . (Host, *Trematomus bernacchii*).
**Aponurus bowersi* . . . . („ „ „).
**Lepodora garrardi* . . . . („ „ „).
**Podocotyle pennelli* . . . . („ „ „).
**Allocreadium fowleri* . . . . („ „ „).

CESTODA :—

**Dibothriocephalus lashleyi* . . . . . . (Host, *Leptonychotes weddelli*).
* „ *archeri* . . . . . . („ „ „).
**Diphyllobothrium rufum* . . . . . . („ „ „).
**Oriana wilsoni* . . . . („ *Balaenoptera borealis*).
**Tetrabothrius wrighti* . . . . („ *Pygoscelis adeliae*).
**Anthobothrium wyatti* . . . . („ *Trematomus bernacchii*).

E. Forms collected in Tropical and Temperate Zones during the voyage of the "Terra Nova."

(1) Previously recorded :—

CESTODA :—

Abothros carcharias, Welch., 1876 . . . (Host, *Carcharias* sp.).
Tetrabothrius heteroclitus, Dies., 1850 . . („ *Puffinus cinereus*).

(2) New species.

CESTODA :—

**Tetrabothrius erevani* . . . . (Hosts, Trinidad Petrels, *Œstrelata trinitatis* and *Œ. arminjoniana*).
* „ *aichesoni* . . . . (Host, *Œ. trinitatis*).
* „ *catherinae* . . . . . . („ „).
* „ *priestleyi* . . . . („ Frigate Bird, *Fregata aquila* or *F. ariel*).
* „ *nelsoni* . . . . („ Sooty Albatros, *Phoebetria palpebrata*).

(3) Undetermined.

CESTODA :—

Tetrarhynchus (larva). . . . . (Host, *Lepidopus caudatus*).

F. New Genera.

NEMATODA :—

(1) *Crassicauda* . . . . Genotype, *Filaria crassicauda*, Creplin, 1829.
(2) *Terranova* . . . . „ *Terranova antarctica*, Leip. and Atk., 1914.
(3) *Kathleena* . . . . Genotype, *Ascaris osculata*, Rud., 1802.

CESTODA :—

(4) *Oriana* . . . . Genotype, *Oriana wilsoni*, Leip. and Atk., 1914.

G. In *Trematomus bernacchii* caught in icehole-traps were found the developmental stages of *Corynosoma hamanni*, *Dibothriocephalus* spp. and Ascarids, which attain maturity in the Antarctic Seals.

† Diagnoses of these new species have already been published in the Proceedings of the Zoological Society, 1914, pp. 222–226.

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PLATE I.

Figs. 1, 4, 7.—*Terranova antarctica.*
,, 2, 5, 8.—*Kathleena scotti.*
,, 3, 6, 9.—*Leptosomatum setosum.*

Fig. 1.—*Terranova antarctica*, Leiper and Atkinson ; ex *Mustelus antarcticus*. Anterior portion showing *a*, simple œsophagus, and *b*, caecal prolongation of the intestine.

Fig. 2.—*Kathleena scotti*, Leiper and Atkinson ; ex *Diomedea melanophrys*. Anterior portion showing *a*, œsophagus, with *b*, posterior appendage, and *c*, the caecal prolongation of the intestine.

Fig. 3.—*Leptosomatum setosum*, v. Linst. Anterior end, showing *a*, cephalic armature ; *b*, œsophagus ; *c*, ocelli ; *d*, nerve-ring.

Fig. 4.—*Terranova antarctica*. Posterior end of female. *a*, anus.

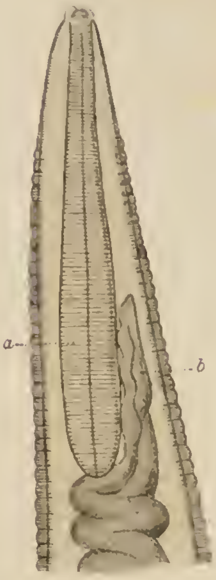
Fig. 5.—*Kathleena scotti*. Posterior extremity of male, showing *sp.*, spicules. The papillae are illustrated in text-fig. 1.

Fig. 6.—*Leptosomatum setosum*. Posterior end of male showing four papillae, *p.*, and the peculiar spicules, *sp.*, accessory piece, *ap.*, and sucker, *s*.

Fig. 7.—*Terranova antarctica*. Anterior end, showing outline of the lips. Interlabia are absent.

Fig. 8.—*Kathleena scotti*. Anterior end, showing the lips, *a*, *a'*, *a''*, from the ventral aspect. There is a large interlabium, *b*, separating the two ventral lips, *a*, *a''*. The other two are not visible in this position.

Fig. 9.—*Leptosomatum setosum*. Head, showing *a*, cephalic armature in optical section, and *b*, cuticular spines.



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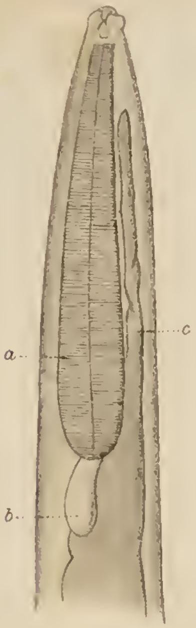

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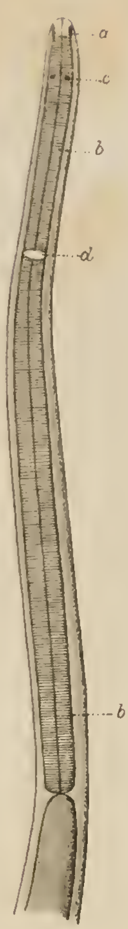

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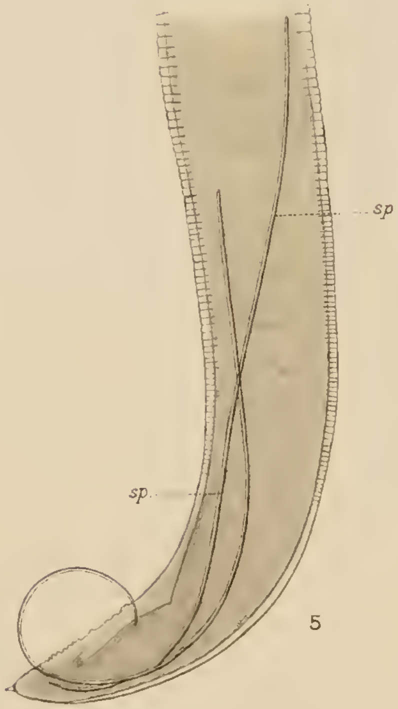

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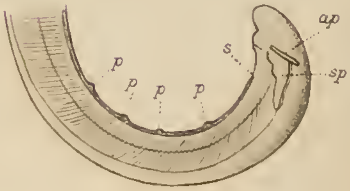

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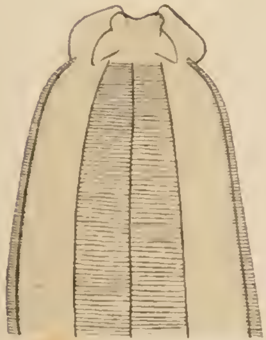
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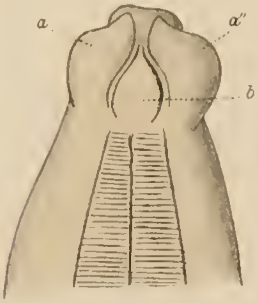

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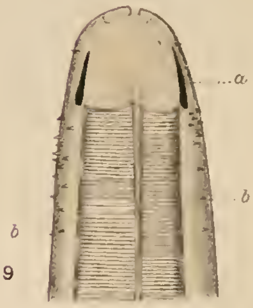

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Nematoda

PLATE II.

Fig. 10.—*Pomporhynchus turbinella*, Dies., complete male; ex *Balaenoptera borealis*: *a*, rostellum; *b*, head, bearing large hooks; *c*, neck; *d*, *d′*, testes; *e*, prostatic glands; *f*, cirrus; *g*, bursal sac; *g′*, sac partially protruded.

Fig. 11.—*Corynosoma hamanni*, v. Linst., male; ex *Leptonychotes weddelli*: *a–g*, as in Fig. 10; *h*, *h′*, spines on skin of body.

Fig. 12.—*Corynosoma hamanni*, v. Linst.; larval stage; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10. Enlarged 43 diameters.

Fig. 13.—*Echinorhynchus campbelli*, Leiper and Atkinson, male; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10.; *l*, *l′*, lemnisci.

Fig. 14.—*Echinorhynchus debenhami*, Leiper and Atkinson, male; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10; *l*, *l′*, lemnisci.

Fig. 15.—*Echinorhynchus rennicki*, Leiper and Atkinson, male; ex *Trematomus bernacchii*: *a–g*, as in Fig. 10; *l*, *l′*, lemnisci.

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Acanthocephala

PLATE III.

Fig. 16.—*Ogmogaster plicatus* (Creplin); ex *Leptonychotes weddelli.* Ventral view; *a*, oral sucker; *b*, wavy margin of body; *gp*, genital pore; *ov*, ovary; *r*, rugae; *t*, *t'*, testes; *ut*, uterus; *y*, yolk-glands.

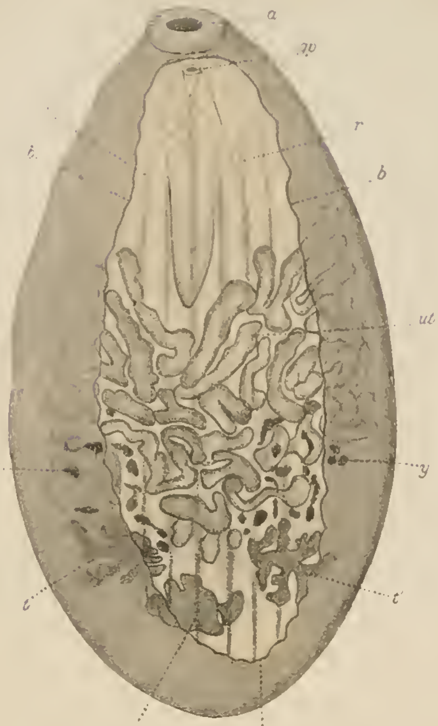
Fig. 17.—*Hemiurus oatesi*, Leiper and Atkinson; ex *Trematomus bernacchii.* *a*, oral sucker; *b*, ventral sucker; *c*, cirrus; *d*, abdomen; *ex*, excretory vesicle; *g*, branch of gut; *gp*, genital pore; *ov*, ovary; *ph*, pharynx; *sv*, seminal vesicle; *t*, *t'*, testes; *ut*, uterus; *y*, *y'*, yolk-glands.

Fig. 18.—*Aponurus bowersi*, Leiper and Atkinson; ex *Trematomus bernacchii.* Lettering as in Fig. 17.

Fig. 19.—*Podocotyle pennelli*, Leiper and Atkinson; ex *Trematomus bernacchii.* Lettering as in Fig. 17.

Fig. 20.—*Lepodora garrardi*, Leiper and Atkinson; ex *Trematomus bernacchii.* Lettering as in Fig. 17.

Fig. 21.—*Allocreadium fowleri*, Leiper and Atkinson; ex *Trematomus bernacchii.* Immature form. Lettering as in Fig. 17.



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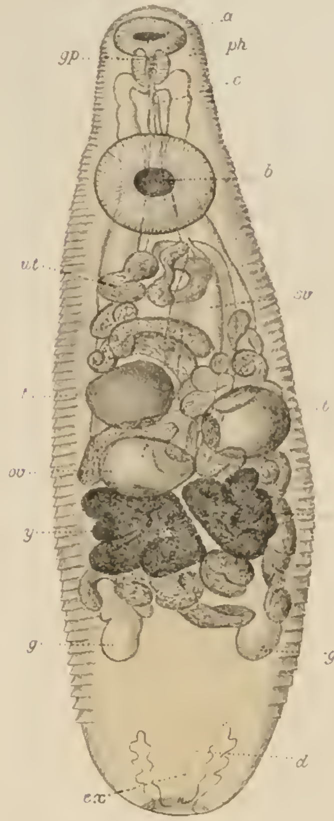

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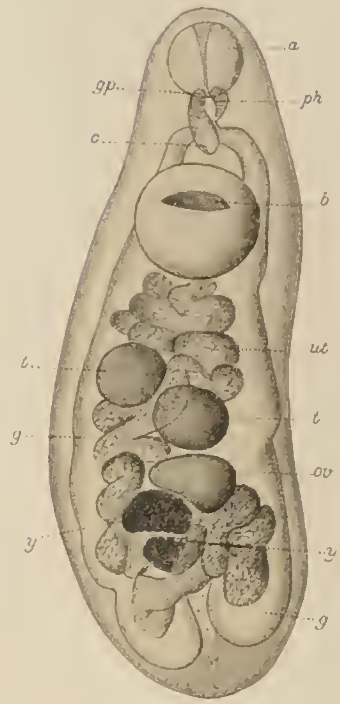

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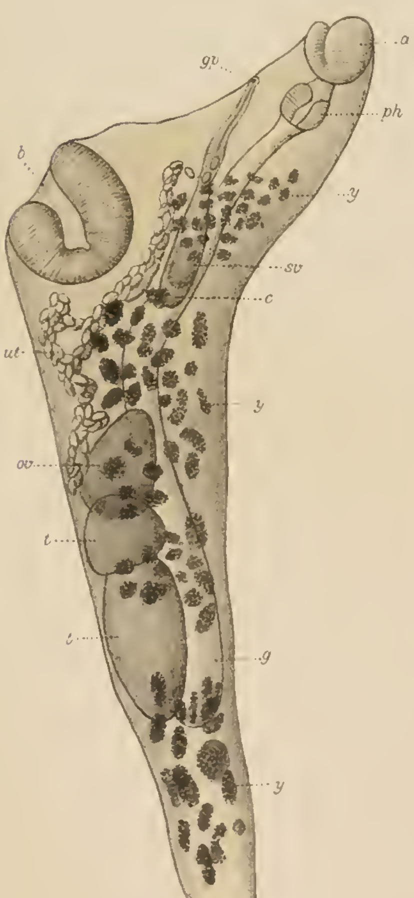

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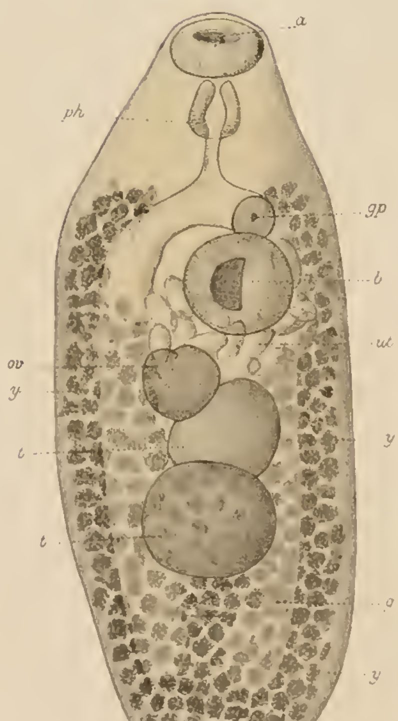

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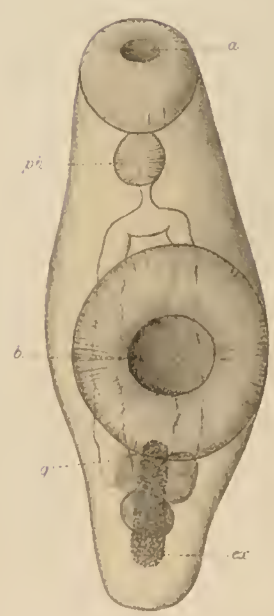

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Trematoda

PLATE IV.

Fig. 22.—*Tetrabothrius wrighti*, Leiper and Atkinson; ex *Pygoscelis adeliae*. Complete but immature strobila, showing characteristic suckers, and the arrangement of the testes in the segments.

Fig. 23.—*Anomotaenia zederi*, ex *Aptenodytes forsteri*. Immature form from cyst.

Fig. 24.—*A. zederi*. Cyst dissected out from intestinal wall and showing long neck and opening into lumen of the gut of the host.

Fig. 25.—*Tetrabothrius nelsoni*, Leiper and Atkinson; ex *Phoebetria palpebrata*. Segment, showing *a*, genital atrium; *b*, vas deferens; *c*, cirrus; *t*, testes; *v*, vagina; *vs*, vesicula seminalis.

Fig. 26.—*Tetrabothrius creani*, Leiper and Atkinson; ex *Œstrelata trinitatis*; head, showing suckers.

Fig. 27.—*T. creani*. Segments.

Fig. 28.—*Tetrabothrius priestleyi*, Leiper and Atkinson; ex Frigate Bird (*Fregata aquila* or *F. ariel*). Immature segments; *c*, cloaca; *sp*, cirrus; *t*, testes.

Fig. 29.—*Tetrabothrius catherinae*, Leiper and Atkinson; ex *Œstrelata trinitatis*; scolex.

Fig. 30.—*T. catherinae*. Segments; *c*, cloaca; *sp*, cirrus; *t*, testes.

Fig. 31.—*Tetrabothrius cylindraceus*, ex *Megalestris maccormicki*. Segments, showing horse-shoe arrangement of testes; *c*, cloaca; *sp*, cirrus; *t*, testes; *yg*, yolk-gland.


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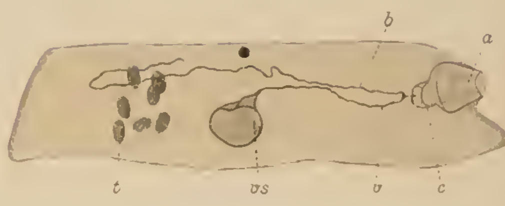

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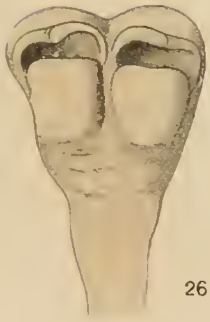
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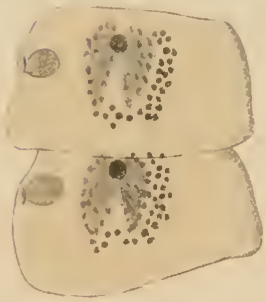
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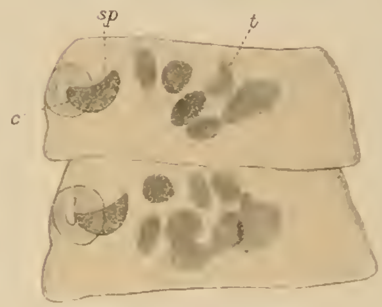

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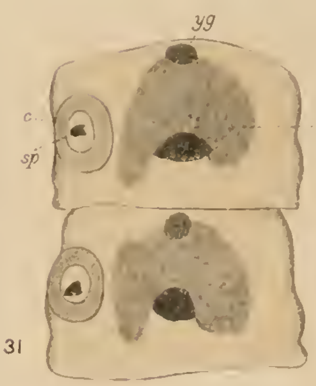

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Cestoda

PLATE V.

FIG. 32.—*Oriana wilsoni*, Leiper and Atkinson ; ex *Balaenoptera borealis*. Head, anterior surface, showing four round suckers ; no rostellum.

FIG. 33.—*O. wilsoni*. Head seen laterally, showing mode of attachment of slender neck.

FIG. 34.—*O. wilsoni*. Segments.

FIG. 35.—*Tetrarhynchus* sp., ex *Lepidopus caudatus*. Larva removed from cyst.

FIG. 36.—*Abothros carcharias*, Welch, ex *Carcharias*, sp. Complete specimen ; only three of the four rostella are shown.

FIG. 37.—*Dibothriocephalus coatsi*, ex *Leptonychotes weddelli*. Complete strobila.

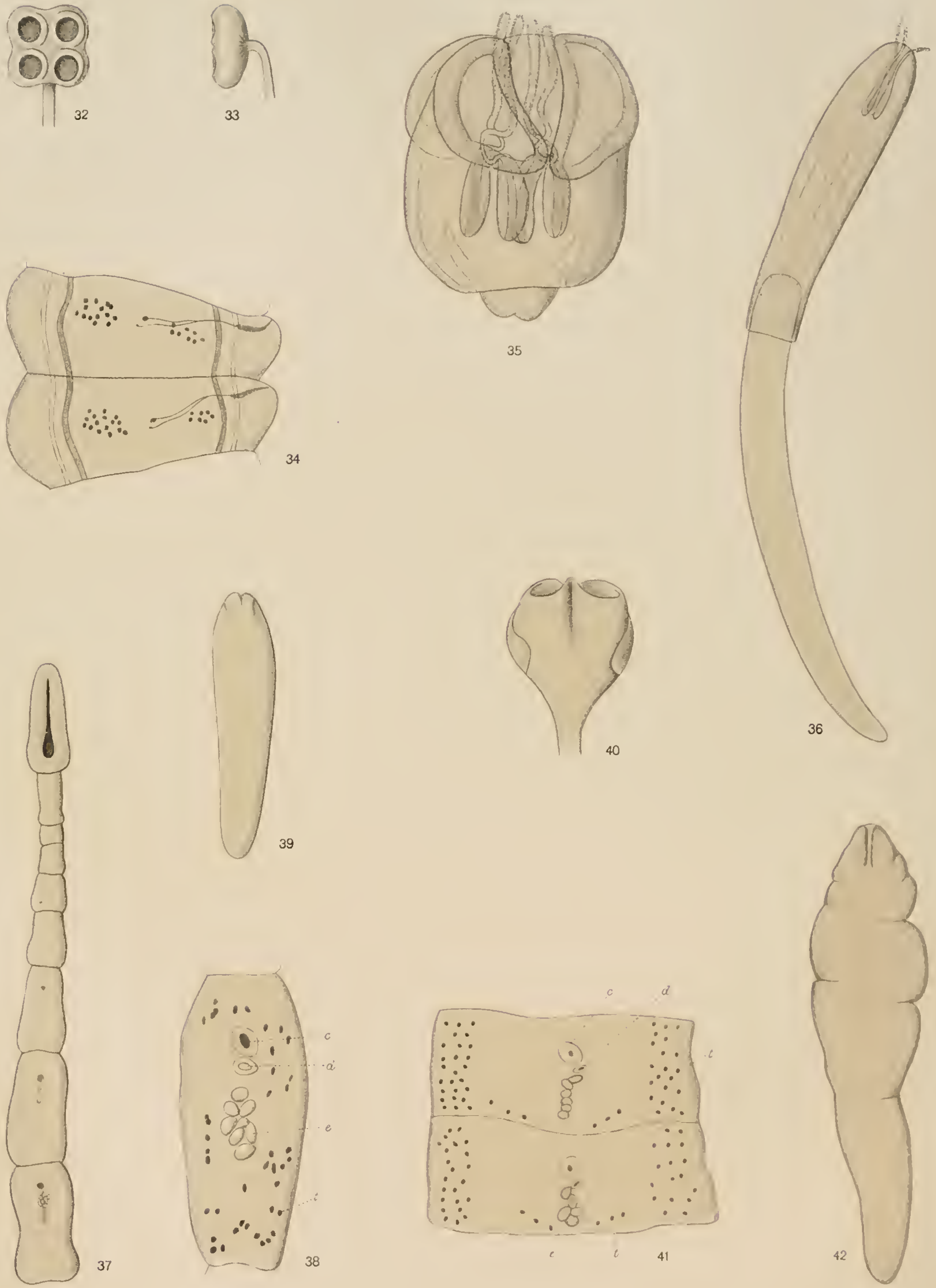
FIG. 38.—*D. coatsi*. Mature segment ; *c*, cloaca ; *d*, uterine pore ; *e*, uterus, containing eggs ; *t*, testes.

FIG. 39.—Plerocercoid larva, ex *Trematomus bernacchii*.

FIG. 40.—*Dibothriocephalus lashleyi*, Leiper and Atkinson ; ex *Leptonychotes weddelli*. Head.

FIG. 41.—*D. lashleyi*. Segments ; lettering as in Fig. 38.

FIG. 42.—Plerocercoid larva, ex *Trematomus bernacchii*.



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Cestoda

MOLLUSCA.

PART I.—GASTROPODA PROSOBRANCHIA, SCAPHOPODA, AND PELECYPODA.

BY EDGAR A. SMITH, I.S.O.,

Lately Assistant Keeper of Zoology, British Museum (Natural History).

I.—INTRODUCTION.

The following descriptive account deals only with a part of the Mollusca obtained by the "Terra Nova" Expedition, namely, the Prosobranchs, Scaphopods, and Pelecypods.

Although the amount of material is not large, the number of undescribed species is considerable, but it is rather disappointing that no new generic forms were discovered.

1. Among the Antarctic series (fifty-eight species) twelve are new to the region explored by the "Terra Nova." The paucity of new species in such a remote region is, of course, in a great measure due to the fact that almost the same part of the Antarctic had previously been investigated by the "Southern Cross" and the "Discovery."

2. From off the north of New Zealand only thirty-four species were obtained, including four undescribed forms, and at Port Lyttelton, in the South Island, a specimen of *Xylotrya saulii* was extracted from the hull of the "Terra Nova."

3. Seven species from Station 38 (west of the Falkland Islands, in 125 fathoms) include three new species of Gastropods, an undescribed *Cardium*, and the *Cuspidaria* (*Cardiomya*) *simillima*, described as new, from Station 42, off Rio de Janeiro.

4. At Station 42, off Rio de Janeiro, in 40 fathoms, twelve interesting new forms were obtained. This seems a large proportion of the thirty-two species dredged at this station, but this is accounted for from the fact that comparatively little dredging has hitherto been done off the Brazilian coast, and it certainly would offer a fauna well worth investigation.

As is well known, a West Indian facies obtains along this coast, and in the present collection nine of the thirty-two species recorded occur in the Antillean region.

5. From Station 36, South Trinidad Island, in the South Atlantic, 700 miles east of Brazil, only two species were obtained, one of which, *Modiolaria lateralis*, is of special interest as showing the extended geographical range of this well-known European species.

II.—DESCRIPTIONS OF SPECIES.

1. ANTARCTIC.

LIST OF STATIONS.

Station 194. Off Oates Land, 69° 43′ S., 163° 24′ E., 180–200 faths.
,, 220. Off Cape Adare, mouth of Robertson's Bay, 45–50 faths.
,, 294. Ross Sea, 74° 25′ S., 179° 3′ E., 158 faths.
,, 314. 5 miles N. of Inaccessible Island, McMurdo Sound, 222–241 faths.
,, 316. Off Glacier Tongue, about 8 miles N. of Hut Point, McMurdo Sound, 190–250 faths.
,, 331. Off Cape Bird Peninsula, entrance to McMurdo Sound, 250 faths.
,, 338. McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 faths.
,, 339. McMurdo Sound, 77° 5′ S., 164° 17′ E., 140 faths.
,, 340. Ross Sea, 76° 56′ S., 164° 12′ E., 160 faths.
,, 348. Off Barne Glacier, McMurdo Sound, 200 faths.
,, 349. Off Butter Point, Western shore of McMurdo Sound, 80 faths.
,, 355. McMurdo Sound, 77° 46′ S., 166° 8′ E., 300 faths.
,, 356. Off Granite Harbour, entrance to McMurdo Sound, 50 faths.

1. *Lepeta coppingeri* (Smith).

Tectura (Pilidium) coppingeri, Smith, Proc. Zool. Soc., 1881, p. 35, pl. IV, figs. 12, 12A.
Lepeta (Pilidium) antarctica, Smith, "Discovery" Lamellibranchiata, p. 12, pl. II, figs. 11, 11A (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 3.
Lepeta (Pilidium) coppingeri: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 185.

Stations 220, 340, 348. Depth 45–200 fathoms.

In describing the single specimen obtained by the "Discovery" I noted that it was "narrower than *L. coppingeri* from the Straits of Magellan," and had "fewer radiating liræ." I now find that the characters referred to are somewhat variable.

2. *Margarites gemma*, n. sp. Pl. I, fig. 1.

Shell turbinate, moderately umbilicated, thin, greenish-iridescent, finely spirally lirate throughout, the threads upon the base below the periphery finer than those above, sculptured also with fine arcuate lines of growth, which are coarser towards the suture, giving a somewhat cancellated appearance to the shell at this part; they cross the four or five spirals below the narrowly channeled suture, producing minute sharp points or nodules upon them; whorls $5\frac{1}{2}$, the nucleus globose, white, smooth, porcellanous; the next whorl with four spirals; the third with seven, not all equal in thickness; the penultimate with eleven; and the last having about fourteen above the periphery and about twenty-five below; the umbilical area is smooth, dirty white: peristome thin, subcircular, interrupted on its junction with the whorl, the columellar margin slightly thickened, expanded upon the whorl and very narrowly reflexed; aperture iridescent and finely sulcate, the grooves corresponding to the external liræ. Greater diameter 22, smaller diameter 19, height 18 mm.

Station 194, off Oates Land, 180–200 fathoms.

Only a single specimen of this beautiful shell was obtained. *M. charopus*, Watson,* from Kerguelen Island, is an allied form, but differs in colour and details of sculpture.

3. *Margarites dulcis* (Smith).

Valvatella dulcis, Smith, "Discovery" Gastropoda, p. 10, pl. II, fig. 8 (1907).
Margarites dulcis: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 190, pl. XI, fig. 21.

Stations 316, 331: 190–250 fathoms.

The figure of this species in Thiele's work is much better than that in the "Discovery" Report. The characters distinguishing this form seem to be fairly constant, but one specimen from Station 331 has the uppermost lira rather nearer the suture than usual.

4. *Margarites crebrilirulata* (Smith).

Valvatella crebrilirulata, Smith, "Discovery" Gastropoda, p. 11, pl. II, fig. 9 (1907).
Submargarita? crebrilirulata: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 258.

Station 331: 250 fathoms.

The angle upon the body-whorl above the periphery is more apparent in the two specimens in the present collection than is indicated in the figure in the "Discovery" Report.

5. *Margarites*, sp.

Station 194: 180–200 fathoms.

A single dead shell with a broken spire from the above station differs from all the known Antarctic forms. It would probably consist of about five convex whorls, increasing rather rapidly. The last is suborbicular, rounded at the periphery, and ornamented with numerous spiral threads of unequal thickness. Altogether there are twenty-seven, of which about nine are finer than the rest, and in places they are

* "Challenger" Gasteropoda, p. 78, pl. V, figs. 6–6B.

alternately coarse and fine. Lines of growth very fine. Aperture obliquely subcircular; peristome thin, margins joined by a thin callus. Columellar margin somewhat expanded.

6. *Margarella refulgens* (Smith).

Valvatella refulgens, Smith, "Discovery" Gastropoda, p. 11, pl. II, fig. 7 (1907); Hedley, Brit. Antarct. Exped. 1907–1909, Biol., vol. II, p. 4.
Margarella refulgens: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 188.

Stations 194, 316, 331, 340, 355: 160–300 fathoms.

A specimen from Station 13 is rather larger than the type, being 6 mm. both in height and greatest width.

7. *Epitonium antarcticum* (Smith).

Scala antarctica, Smith, "Discovery" Gastropoda, p. 8, pl. I, figs. 10–10B (1907).

Station 294: 158 fathoms.

Only a single specimen, agreeing in all respects with the type from much shallower water.

8. *Eulima exulata*, n. sp. Pl. I, fig. 2.

Shell subulate, generally a little curved or excentric towards the apex, white, glossy; whorls 9, slowly increasing, slightly convex; suture a little oblique, narrowly hyaline-marginate; aperture inversely auriform; labrum (viewed laterally) prominently curved, obscurely sinuate near the suture; columella a little thickened, united to the end of the labrum by a very thin callus.

Length, 9 mm.; diameter, 2·75.

Station 316: 190–250 fathoms.

Nine specimens containing the reddish animals. This is the largest of the Antarctic species. The former lips are not observable unless very carefully looked for. Although the spire is tapering, the apex is not acuminate.

9. *Eulima solitaria*, n. sp. Pl. I, fig. 3.

Shell small, white, shining, somewhat curved, consisting of seven slightly convex whorls which increase gradually and are separated by an almost horizontal suture, very narrowly hyaline-margined beneath. Spire slightly arcuate with an oblique obtuse apex; aperture inversely auriform, about one-third the length of the shell; columella straightish, united above to the outer lip by a thin callus.

Length, 4 mm.; diameter, 1·5.

Station 331: 250 fathoms.

A single specimen. Differing from the known Antarctic forms by its curved growth, form of the aperture, etc.

10. *Rissoia adarensis*, Smith.

Rissoa adarensis, Smith, "Southern Cross" Mollusca, p. 205, pl. XXIV, fig. 17 (1902); "Discovery" Gastropoda, p. 8, pl. II, fig. 2; Melvill and Standen, Voy. "Scotia," Zool., vol. V, p. 102; Lamy, Deuxième Expéd. Antarct. Franç., Gastropodes, p. 10; Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 5.

Stations 220, 316, 331, 340: 45–250 fathoms.

A synonym of *Rissoa* is *Apanthausa*, Gistel (Naturgesch. Thierreichs. 1848, p. x.).

11. *Rissoia glacialis*, Smith.

Rissoia glacialis, Smith, "Discovery" Gastropoda, p. 9, pl. II, fig. 4 (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 5.

Stations 220, 316, 331, 340: 45–250 fathoms.

Twenty-three specimens, obtained at the above stations, show that the characters pointed out in the original description, drawn up from only two examples, are quite constant. Their surface is not so glossy however, due probably to their having been in spirit for some time.

12. *Rissoia gelida*, Smith.

Rissoia gelida, Smith, "Discovery" Gastropoda, p. 9, pl. II, fig. 5 (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 5; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 195, pl. XI, figs. 37, 38.

Stations 220, 316, 331: 45–250 fathoms.

This species is closely related to *R. transenna*, Watson,* from 140 fathoms, between Marion Island and Prince Edward Island. It is, however, larger and more coarsely spirally lirate.

13. *Rissoia demissa*, n. sp. Pl. I, fig. 4.

Shell imperforate, white, smooth, slightly glossy; whorls $4\frac{1}{2}$, convex; the apex large, obtuse, flatly arched at the top; last whorl rounded at the periphery; aperture subcircular, obscurely pointed above; peristome continuous, the ends being joined by a callus on the whorl, columellar margin thickened and reflexed.

Length, 2 mm.; diameter, 1·33.

Stations 220, 316: 45–250 fathoms.

This species may be the *R. columna*, Pelseneer,† but the spire appears to be shorter, and the aperture rounder.

14. *Rissoia regularis*, n. sp. Pl. I, fig. 5.

Shell ovately conical, narrowly rimate, of a greyish colour; whorls 6, regularly increasing, a little convex, smooth, exhibiting only delicate growth-striæ; spire

* "Challenger" Gasteropoda, p. 603, pl. XLV, fig. 9.

† Voy. "Belgica," Mollusca (1903), p. 21, pl. V, fig. 55.

conical; aperture rather round; peristome thin at the edge, columellar margin slightly thickened and reflexed, united above to the outer margin by a thin callus.

Length, 3·5 mm; diameter, 2.

Stations 220, 316: 45–250 fathoms.

This species differs from *R. adarensis*, *R. glacialis*, *R. deserta*, and some others, by the conical spire and less convex whorls.

15. *Sublacuna indecora*, Thiele.

Sublacuna indecora, Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 195, pl. XII, fig. 4, shell; pl. XV, fig. 19, radula (1912).

Station 340: 160 fathoms.

Two specimens, the largest 4·5 mm. in height, and 4 broad. These shells agree exactly with Thiele's description, but their penultimate whorl is not quite so high as represented in the figure. Allowing for some variation, this is not of much importance. The operculum is concave above, and consists of about four whorls, separated by a thread-like suture.

16. *Capulus subcompressus*, Pelseneer.

Capulus subcompressus, Pelseneer, Voy. "Belgica," Mollusca (1903), p. 20, pl. V, figs. 52–54; Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 5; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 199, pl. XII, figs. 13, 14.

Stations 316, 331, 355: 190–300 fathoms.

The figure given by Pelseneer is that of a young shell, as pointed out by Thiele, whose illustration exactly represents the specimens in the present collection.

17. *Marseniopsis mollis* (Smith).

Lamellaria mollis, Smith, "Southern Cross" Mollusca, p. 205, pl. XXIV, figs. 19–21 (1902).

Stations 194, 338: 180–207 fathoms.

Seven small specimens of *Marseniopsis* or allied genera from Stations 314, 340, 348, and 355 have still to be determined, but these had better be left to the anatomist for investigation.

18. *Marseniopsis conica* (Smith).

Lamellaria conica, Smith, "Southern Cross" Mollusca, p. 206, pl. XXIV, fig. 4.

Station 356, off Granite Harbour, entrance to McMurdo Sound: 50 fathoms.

The genus *Marsenia* of Leach has been used by Bergh instead of *Lamellaria* of Montagu, on the grounds that Leach limited the first section of Montagu's genus to *Oscanius*, Leach, and the second to *Marsenia*, Leach. The latter author's generic names, however, were not published in 1820, but first appeared in the Ann. Mag. Nat.

Hist., 1847, vol. XX, p. 268. The circulation of "more than one copy of the Proofs" (Gray*) of 116 pages of his posthumous work, "Moll. Brit. Synopsis," about the year 1820, does not constitute publication. These names, therefore, cannot date earlier than 1847. In the meantime, in 1830, Menke† had limited the name *Lamellaria* to the second section of that genus, and therefore undoubtedly it should be employed instead of *Marsenia*.

19. *Trichotropis antarctica*, Thiele. Pl. I, fig. 6.

Trichotropis antarctica, Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 197, pl. XII, fig. 6; pl. XV, fig. 21, radula (1912).

Station 355 : 300 fathoms.

A single specimen, much larger than the shell described by Thiele, which was probably young. It is 8·5 mm. in its greater diameter, and 7·75 in height. The soft, thick periostracum is very remarkable, forming a close, spine-like coronation upon the spiral ridges. The form of the aperture in this more adult specimen is rounded and not quite so much produced as shown in Thiele's figure. In a younger shell the form would, I think, be as depicted by him.

20. *Trichotropis planispira*, n. sp. Pl. I, fig. 7.

Shell depressed, orbicular, flat above, rather widely umbilicated, with three thick keels upon the body-whorl, clothed with a thick, soft, dirty white periostracum, except upon the two white apical whorls; volutions three, very rapidly enlarging, the first a little rounded, the rest flat above, separated by a channeled suture; last whorl with a strong keel at the shoulder, and a similar one at the periphery, bordering the base, upon which is the third carina; the periostracum consists of closely packed threads of growth; aperture subcircular, white within; peristome waved by the ends of the three carinæ, expanded, subcontinuous, the columellar margin united above to the outer lip by a thin callus. Greater diameter 9 mm., height 5·5. The operculum is triangular, and is composed of fine curved lines of growth, the nucleus being terminal, as represented by the fig. 6A on plate XXIX of Adams' "Genera of Mollusca."

Station 314 : 222–241 fathoms.

This remarkable species, of which only one specimen was obtained, differs in its depressed orbicular shape from all other known forms of *Trichotropis*, and rather calls to mind the general aspect of *Lippistes*.

Trichotropis usually exhibits a very slight notch or rudimentary canal at the base of the columella, but this feature is scarcely indicated in the present species. The rather large umbilicus is not peculiar, since *T. kröyeri* is also openly umbilicated, whilst, on the contrary, some other species are imperforate.

* Synopsis Moll. Gt. Brit. by Leach, 1852, preface.

† Synopsis method. Moll. ed. altera 1830, p. 87.

21. *Torellia* (*Trichoconcha*) *mirabilis* (Smith).

Trichoconcha mirabilis, Smith, "Discovery" Gastropoda, p. 6, pl. I, figs. 7–7c (1907).
Torellia (*Trichoconcha*) *mirabilis*: Thiele, Deutsche Südpolar-Exped., p. 197.

Station 316: 190–250 fathoms.

One adult and two half-grown specimens. The latter have the peristome formed like the full-grown shell, but the spire is more sunken at the apex. Dr. Thiele has suggested that this form approaches *Torellia* too closely for generic separation, and that beyond the greater elevation or sunken character of the spire there is little to distinguish the northern and Antarctic genera.

22. *Neoconcha restita*, Smith. Pl. I, fig. 8.

Neoconcha vestita, Smith, "Discovery" Gastropoda, p. 6, pl. I, figs. 11–11c (1907).

Stations 194, 340, 356: 50–200 fathoms.

"It has the appearance of being the young state of a shell that might grow to a considerable size, judging from the large apical whorls." This supposition is now confirmed by the series of adult shells in the present collection. The largest example is 28 mm. in its greater diameter, and 23 in height. Even at this stage the shell is thin and flexible, and consists of four to four and a half volutions, the last being very large and inflated.

The remarkable, very thick, spongy periostracum is not produced into a sort of coronation, a little below the suture, in any of the specimens, as described in the type, but its growth in oblique, closely packed lines of increment is maintained. It is so thick that the outer margin of the peristome appears to be incrassated, but in fact the shell itself is quite thin. The columella is rather broadly expanded, and is united above to the outer lip by a thin callus. The aperture is of a very pale olivaceous tint inside, but the peristome is bordered within by a reddish brown colour, the extreme edge being paler. The umbilicus is more open in the adult stage than in young specimens.

This remarkable form is one of the gems of the collection, and does not appear to be circumpolar, since it has not been discovered by any other Antarctic expedition.

It seems to be fairly constant in its general features, but one specimen exhibits a spiral constriction or sulcus at the upper part of the body-whorl. Another example, somewhat smaller, has four such sulci, marking off five spiral rounded bands on the body-whorl.

23. *Neoconcha insignis*, n. sp. Pl. I, fig. 9.

Shell globose, thin, narrowly umbilicated, covered with a thick, light, dirty olivaceous, horny periostracum, which is produced into five prominent, equidistant, acute, and delicately fringed keels upon the body-whorl, of which the uppermost revolves up the short spire; whorls four, very rapidly increasing, the last very large;

apical whorls whitish beneath the periostracum, the embryonic one being glossy and very finely spirally striated; the periostracum exhibits closely packed, oblique lines of growth; aperture large, with a very thin, whitish, calcareous lining, somewhat roundish; peristome olive brownish, not thickened on the outer margin, but having the little curved columellar edge expanded and reflexed, a thin callosity upon the whorl uniting it with the outer lip.

Greater diameter, 22; height, 20 mm. Aperture, 14 mm. long, 12 in width.

Station 355: 300 fathoms.

The animal has a small oblong foot, squarish in front, and the tentacles are long, slender, tapering to a sharp point, having the eyes at their outer bases. As the soft parts are to be investigated by an anatomist, the radula has not been extracted. Having the general features of *Neoconcha* and a similar kind of operculum, it may for the present be left in that genus.

It is a most remarkable shell, and is quite distinct from any other Antarctic form excepting *Neoconcha vestita*, from which it differs in the remarkable manner in which the periostracum is produced into the conspicuous carinæ. Can this be only variation? Three similar specimens were obtained.

24. *Natica grisea*, Martens.

Natica grisea, Martens, Sitz.-Ber. Gesell. Natur. Freunde, Berlin, 1878, p. 24; Watson, "Challenger" Gasteropoda, p. 432, pl. XXVIII, fig. 5; Strebel, Schwedisch. Südpolar-Exped., Gastropoden, p. 61, pl. V, fig. 66; Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 7; Thiele, Deutsche Tiefsee Exped., vol. VII, pl. IV, figs. 2, 3; pl. VIII, fig. 44, radula.

Natica delicatula, Smith, "Southern Cross" Mollusca (1902), p. 206, pl. XXIV, fig. 6; "Discovery" Gastropoda, p. 5; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 199, pl. XII, figs. 16, 17.

Station 316: 190–250 fathoms.

In the "Discovery" Report I expressed an opinion that *N. delicatula* would eventually prove to be merely the young state of *N. grisea*, Martens, from Kerguelen Island. An adult shell from Station 316 of the present collection confirms that suggestion, and there appear to be several other described forms from these cold regions which are scarcely separable.

25. *Amauropsis rossiana*, Smith.

Amauropsis rossiana, Smith, "Discovery" Gastropoda, p. 5, pl. I, figs. 6, 6A (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 7.

Stations 314, 316, 331, 338, 339, 348, 355: 140–300 fathoms.

Young specimens were obtained at each of these stations. At this stage of growth, with one exception, they do not exhibit the peculiar oblique ridges upon the last and penultimate whorls noted in the adult form. The operculum is horny and paucispiral, as might have been expected. In every instance, as in the type, the tip of the spire is invariably eroded.

26. *Cerithiopsilla antarctica* (Smith).

> *Lovenella antarctica*, Smith, "Discovery" Gastropoda, p. 10, pl. II, figs. 6, 6A (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 5.
> *Cerithiopsilla antarctica*: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 205, pl. XII, fig. 28.

Stations 316, 331: 190–250 fathoms.

The generic name *Lovenella*, Sars (1878), being preoccupied for a genus of Hydroids described by Hincks in 1869, was changed to *Cerithiella* by Verrill in 1882. According to Thiele the radula of this and two allied species differs from that of *Cerithiella*.

27. *Prosipho elongatus*, Thiele.

> *Prosipho elongatus*, Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 210, pl. XIII, fig. 5 (1912).

Station 338: 207 fathoms.

A single specimen, rather larger than the type, measuring 14·5 mm. in length and 6 in diameter. The periostracum is yellowish, thickish, and in the dried condition more or less deciduous. The shell is white externally, also within the aperture.

28. *Prosipho similis*, Thiele, var.

> *Prosipho similis*, Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 207, pl. XII, fig. 32; pl. XVI, fig. 7, radula (1912).

Station 194: 180–200 fathoms.

A single specimen agreeing in form with the figure, but differing in having three spiral threads instead of four on the upper whorls. In this respect it agrees with *P. gracilis*, Thiele, figured on the same plate (fig. 33), but that species is much more slender, and its aperture much shorter in proportion to the whole length of the shell.

29. *Prosipho mundus*, n. sp. Pl. I, fig. 10.

Shell shortly fusiform, dirty whitish; whorls $5\frac{1}{2}$, first one and a half smooth, convex, forming a mammillated apex; three following whorls with four spiral liræ, the last with thirteen, of which the two or three uppermost, like those on the spire, are finely nodulous through being crossed by longitudinal threads, about twenty in number, on the penultimate whorl; fine lines of growth cover the entire surface; aperture pyriform, smooth, and white within, less than half the length of the shell; columella arcuate above, oblique below; anterior canal moderately broad, oblique, and slightly recurved.

Length, 7·5 mm.; diameter, 3·5. Aperture, 3·5 mm. in length.

Station 331: 250 fathoms.

Only a single specimen, but quite distinct from the other known forms of the genus.

30. *Prosipho tuberculatus*, n. sp. Pl. I, fig. 11.

Shell ovately fusiform, whitish; whorls $4\frac{1}{2}$, the first one and a half large, convex, smooth, forming a mammillated apex, the two following convex, with three strong spiral liræ, the last with five similar liræ, with well-marked (about eighteen) acute tubercles upon them, and also upon those of the spire; about eight finer smooth liræ encircle the lower part of the last whorl; longitudinal plicæ, corresponding to the tubercles, not strongly developed in the interstices; lines of increment very fine, closely packed; aperture pyriform, half the length of the shell; columella gently arcuate above, a little oblique below: canal rather broad, recurved.

Length, 5 mm.; diameter, 2·75.

Station 316: 190–250 fathoms.

Allied to *P. cancellatus*, but separable on account of having three instead of two liræ on the spire, and, like those on the body-whorl, they are coarser also and closer together.

31. *Prosipho cancellatus*, n. sp. Pl. I, fig. 13; Pl. II, fig. 15.

Shell ovately fusiform, dirty white, consisting of $4\frac{1}{2}$ whorls; the one and a half apical smooth, forming a rounded nucleus, the two following convex, with two spiral liræ around the middle, and the last with about twelve liræ, eight of which on the anterior part of the shell are finer than the four above, which, like those on the spire, are acutely nodulous through being crossed by fine longitudinal threads, about eighteen on the penultimate whorl; extremely fine striæ of growth are observable between these threads; aperture almost half the length of the shell; anterior canal moderately broad, a little recurved; columella rather straight, not quite perpendicular, smooth, covered with a thin white callus.

Length, 5 mm.; diameter, 3.

Station, 340: 160 fathoms. Also Station 42, off Rio de Janeiro, 40 fathoms.

This species, of which only a single specimen is at hand from Station 340, must be closely related to *P. nodosus* of Thiele, but the spiral liræ appear to be finer, the tubercles more acute, and more numerous. The longitudinal threads are more delicate, and are continued farther over the body-whorl, thus producing a cancellated appearance. The specimen from Station 42 is figured on Plate II., fig. 15. It agrees in every respect with that from Station 340, and consequently it seems probable that some mistake in connection with the localities has occurred. It is not likely that this species lives in such remotely distant regions.

32. *Prosipho congenitus*, n. sp. Pl. I, fig. 12.

Shell shortly fusiform, whitish; whorls 5, first two smooth, convex, forming a dome-like apex, two following convex, with four spiral liræ, of which the uppermost is finer than the rest; last whorl with five principal liræ, and about thirteen much finer ones below them; the stronger liræ, like those on the spire, are more or less nodose by being crossed by rather faintly developed longitudinal plicæ, about fifteen on the penultimate volution; aperture pyriform; columella arcuate above, oblique anteriorly; canal oblique, recurved.

Length, 7·5 mm.; diameter, 3·5. Aperture, 3·5 long.

Station 194: 180–200 fathoms.

In general features rather like *P. mundus*, but having less pronounced cancellation, a different apex, and finer spirals on the lower part of the body-whorl.

33. *Pareuthria innocens* (Smith).

Thesbia innocens?, Smith, "Discovery" Gastropoda, p. 4, pl. I, figs. 1–1B (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 6.

Pareuthria innocens: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 212, pl. XIII, fig. 23; pl. XVI, fig. 22, radula.

Stations 316, 331: 190–250 fathoms.

This species was originally doubtfully assigned to the genus *Thesbia*, but the study of the radula by Thiele shows that it is practically the same as that of *Pareuthria*.

34. *Neobuccinum eatoni*, Smith.

Neobuccinum eatoni, Smith, 1875. For full synonymy see Lamy, Deuxième Expéd. Antarct. Franç., Gastropodes, p. 5 (1911); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 6, pl. I, figs. 11–12.

Station 340: 160 fathoms.

Although only one dead shell was brought home by the expedition, it is said to be "abundant in five to sixty fathoms" (Hedley).

35. *Neobuccinum tenerum*, Smith.

Neobuccinum tenerum, Smith, "Discovery" Gastropoda, p. 2, pl. 1, figs. 2, 2A (1907).

Probuccinum tenerum: Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 211, pl. XIII, fig. 21, shell, 21A, operculum; pl. XVI, fig. 21, radula.

Stations 331, 340, 356: 50–250 fathoms.

Three specimens rather older and more thickened than the type, and consequently hardly pellucid. The very slight modification in the radula, form of the shell and operculum does not seem sufficient to warrant generic distinction.

36. *Volutharpa charcoti* (Lamy).

Buccinum charcoti, Lamy, Deuxième Expéd. Antarct. Franç., Gastropodes, p. 4, pl. I, figs. 1–2 (1911).

Station 194: 180–200 fathoms.

Two specimens, the larger much broken, 22 mm. in length; the small one, evidently young, only 13. Both have the spire more or less eroded, and even more obtuse than as represented by Lamy's fig. 1.

The soft parts accompany the shell, and since they present no operculum, and taking into consideration also the general form of the shell, I am inclined, until the animal has been investigated, to place this species in the genus *Volutharpa.*

37. *Trophon longstaffi*, Smith.

Trophon longstaffi, Smith, "Discovery" Gastropoda, p. 3, pl. I, figs. 3–3D (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 8, pl. I, fig. 14.

Station 331 : 250 fathoms.

A single specimen was found by Mr. R. E. Priestley, at "Evans Cove, Terra Nova Bay, Victoria Land, in glacier 30 feet above sea level." Possibly carried to this place by a bird, or, being very light when devoid of the animal, blown there by the high winds which prevail in that inclement region.

38. *Trophon coulmanensis*, Smith. Pl. I, fig. 14.

Trophon coulmanensis, Smith, "Discovery" Gastropoda, p. 3, pl. I, figs. 4–4B (1907); Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 212.

Station 194 : 180–200 fathoms.

A single specimen from this station containing the animal is rather larger than the type, and some of the lamellæ on the back of the body-whorl are produced into hook-like hollow spines.

It is 19·5 mm. in length, 10 in diameter, and consists of six volutions.

39. *Trophon shackletoni*, Hedley. Pl. I, fig. 15.

Trophon shackletoni, Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 7, pl. I, fig. 13 (1911).

Stations 316, 340, 355 : 160–300 fathoms.

This species is quite distinct from *T. coulmanensis*, differing in having the whorls at the shoulder just below the suture rounded, and not tabulated or angulated. In character the erect lamellæ are very similar to those of *Trophon laciniatus* (Martyn).

40. *Trophon drygalskii*, Thiele.

Trophon drygalskii, Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 213, pl. XIII, fig. 25 (1912).

Stations 316, 340 : 160–250 fathoms.

One specimen from Station 340, 8 mm. long, and 3·5 in width, and a smaller one from Station 316. Remarkable on account of the very numerous, delicate, and somewhat wavy lamellæ, about twenty-six on a whorl. Above the shoulder the volutions in these specimens are less sloping than as represented by Thiele's figure, and the columella is not so straight, inclining to the left anteriorly.

41. *Marginella hyalina*, Thiele.

Marginella hyalina, Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 213, pl. XIII, fig. 26 (1912).

Stations 316, 331, 339, 340 : 140–250 fathoms.

This species was described by Dr. Thiele from very young specimens, only 3·5 mm. in length. The largest "Terra Nova" shell is 14 mm. long and 7 in width, and the aperture is 11·5 mm. in length, and 3 wide. Although this specimen may be adult, it does not exhibit any thickening of the labrum.

42. *Volutomitra fragillima*, Watson.

Volutomitra fragillima, Watson, "Challenger" Gasteropoda, p. 263, pl. XIV, fig. 7 (1885).
Paradmete typica, Strebel, Schwedisch. Südpolar-Exped., Gastropoda, p. 22, pl. III, figs. 35A–35F ; Melvill and Standen, Voy. "Scotia," Zool., vol. V, p. 131.

Station 194 : 180–200 fathoms.

The Kerguelen shell figured by Watson has a much shorter spire than other specimens from the same locality which agree perfectly with Strebel's figure of *Paradmete typica*. The specimen in the present collection is of the same form, having the produced spire.

With regard to the generic position of this shell it appears to me to agree in all respects with *Volutomitra grönlandica*, and consequently the genus *Paradmete* was not required. The animals of these Antarctic forms are as yet unknown, but it is possible that, when they have been investigated, they may be found to offer characters sufficient to separate them from their northern allies, in which case the genus *Paradmete* will become available for their reception.

43. *Admete delicatula*, Smith.

Admete delicatula, Smith, "Discovery" Gastropoda, p. 4, pl. I, figs. 5, 5A (1907).

Station 316 : 190–250 fathoms.

A single dead shell only, but agreeing in all respects with the type.

A. antarctica, Strebel (Schwedisch. Südpolar-Exped., Gastropoden, p. 21, pl. IV, figs. 44A–C, 1908), is closely allied to the present species, but the spire is rather shorter and the spiral sculpture finer.

44. *Dentalium majorinum*, Mabille and Rochebrune.

Dentalium majorinum, M. and R., Mission Scientifique du Cap Horn, Zool., vol. VI, Mollusques, p. 100, pl. IV, fig. 10 (1889) ; Pilsbry, Man. Conch., vol. XVII, p. 27, pl. XII, figs. 98, 99 (copy of Mab. and Roche.).

Station 194 : 180–200 fathoms.

The specimens from the above station agree exactly with the figure, but the largest of them is only 24 mm. long, whereas the type appears to be about 50 mm. The longitudinal costæ are about 18–20 in number anteriorly, fine, yet not acute, rather uniform in thickness, and a trifle narrower than the intervening grooves. The fine striæ of growth are a little oblique.

45. *Lissarca notorcadensis*, Melvill and Standen, var. Pl. I, figs. 16, 17.

Lissarca notorcadensis, M. and S., Voy. "Scotia," Zool., vol. V, p. 114, pl. figs. 14, 14A (1909).

Stations 194, 314, 316, 331, 339, 340. Depth ranging from 140–457 fathoms.

The specimens from the above stations differ slightly from typical examples from the South Orkney Islands. They are thinner and not quite of the same form, the hinge-line being a little shorter, so that the valves have a less broad-shouldered appearance.

The number of the hinge-teeth is variable. Melvill and Standen state that there are "five on each side of the hinge-plate." I have carefully examined two examples from the South Orkneys, and find in both valves six in front of the central ligament and four behind.

In the "Terra Nova" specimens also similar variation as regards the hinge-teeth is observable, as indicated below.

	Anterior.	Posterior.	
Right valve	5	3	Three specimens from Station 331.
,, ,,	5	3	
,, ,,	5	5	
Left ,,	5	3	
,, ,,	5	3	
,, ,,	5	3	
Right ,,	6	5	A specimen from Station 194.
Left ,,	6	5	

The inner margin of the valves is described as "crenulate," but it should have been stated that on the ventral side, where the byssus would pass between the valves, the edges are smooth. The denticulation in the "Scotia" specimens is a little stronger than that of the "Terra Nova" shells.

Lissarca gourdoni (Lamy*), if not a variety of the present species, is very closely related, and *L. kerguelensis* (Thiele†) is hardly separable. The species is probably circumpolar, and exhibits slight modifications in different localities, as indicated by the variation in the "Terra Nova" specimens, from those described from the South Orkneys.

46. *Limopsis marionensis*, Smith (?).

Limopsis marionensis, Smith, "Challenger" Lamellibranchiata, p. 254, pl. XVIII, figs. 2–2B (1885).

Stations 316, 349: 80–250 fathoms.

Only two worn dead valves were obtained, and it is consequently difficult to determine with certainty to which species they belong.

* Deuxième Expéd. Antarct. Française (1908–1910), p. 21 (1911), as *Arca (Bathyarca) gourdoni*.

† Deutsche Südpolar-Exped., vol. XIII, p. 253, pl. XVIII, fig. 7 (1913).

47. *Limopsis lilliei*, n. sp. Pl. I, fig. 18.

Shell quadrately rounded, rather convex, a little inequilateral, very slightly broader behind than in front, covered with a yellowish pilose periostracum ; hairs very short, glossy, golden, crowded, arranged in concentric and radiating series, some of the latter, $\frac{1}{2}$–$\frac{3}{4}$ millim. apart, having coarser setæ than the very delicate intervening series ; valves rather thin, a little shorter in front than behind, broadly curved anteriorly, a little higher and less curved posteriorly, ventrally very broadly arcuate, white within, very delicately radiately striated, except a narrow smooth band along the lower margin, and a smooth space on each side defined by a faint ridge enclosing the large subpyriform adductor-scars ; margins smooth, not crenate ; hinge-plate narrow, with three or four denticles on each side of the elongate triangular ligament ; umbones obtuse, eroded at the tip.

Length, 14 mm. ; height, 13 ; diameter, 7.

Stations 331, 339. McMurdo Sound, 250 and 140 fathoms.

This species is apparently quite distinct from any of the known Antarctic forms of *Limopsis*, and is chiefly distinguished by its beautifully and delicately setose periostracum, and also by the unusually broad form. A single valve from Station 339 is rather narrower posteriorly than the type from Station 331.

48. *Limopsis grandis*, Smith.

Limopsis grandis, Smith, "Discovery" Lamellibranchiata, p. 5, pl. III, figs. 7–7B (1907) ; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 228.

Station 355. McMurdo Sound, 300 fathoms ; also off new land, south of Ballene Island, in 200 fathoms.

A number of specimens in fresh condition, showing that the periostracum is light brownish rather than "yellowish," as originally described.

It has been suggested by E. Lamy* that this species is the same as *L. jousseaumei*, Mab. and Rochebr., but on the other hand Dr. Thiele has shown that they are distinct, on account of certain hinge-characters.

49. *Adacnarca nitens*, Pelseneer.

Adacnarca nitens, Pelseneer, Voy. "Belgica," Mollusca (1903), pp. 24, 41, pl. VII, figs. 83–88 ; Smith, "Discovery" Lamellibranchiata, p. 5, pl. III, figs. 6–6C ; Lamy, Expéd. Antarct. Franç., Pélécyp., p. 19 ; *id.*, Deuxième Expéd., Pélécyp., p. 27 ; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 228 ; Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 3.

Stations 194, 316, 338, 339, 340, 356. Depths, 50–250 fathoms.

Apparently a circumpolar form.

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* Deuxième Expéd. Antarct. Franç., Pélécypodes, p. 26.

50. *Philobrya limoides*, Smith.

Philobrya limoides, Smith, "Discovery" Lamellibranchiata, p. 4, pl. III, figs. 2–2B (1907); Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 3.

Stations 194, 294, 314, 316, 331, 339, 340.

Mr. James Murray, in his preface to Mr. Hedley's report, states that this species and *Lima hodgsoni* were abundant. The largest specimen from Station 339 exceeds the dimensions given in the "Discovery" report. It is 9·75 mm. in length, 10·25 high, 5 in diameter.

51. *Chlamys colbecki* (Smith).

Pecten colbecki, Smith, Report "Southern Cross" Mollusca (1902), p. 212, pl. XXV, fig. 11; "Discovery" Lamellibranchiata, p. 6, pl. III, figs. 9, 9A: Lamy, Deuxième Expéd. Antarct. Française (1908–1910), p. 23; Melvill and Standen, Voy. "Scotia," Zool., vol. V, p. 116; Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 3; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 225.

Pecten racovitzai, Pelseneer, Voy. "Belgica," Mollusca (1903), p. 27, pl. VIII, figs. 101–102; Lamy, Expéd. Antarct. Franç., Pélécyp., p. 16, pl. I, figs. 19–21.

Station 356 and on shore Evans Cove, Terra Nova Bay.

52. *Lima* (*Limatula*) *hodgsoni*, Smith.

Lima (*Limatula*) *hodgsoni*, Smith, "Discovery" Lamellibranchiata, p. 6, pl. III, figs. 9–9A (1907); Hedley, British Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 3; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 226.

Stations 194, 316, 331, 339, 348, 355, 356: 50–300 fathoms, and "Evans Cove, Terra Nova Bay, in glacier, 30 feet above sea level" (R. E. Priestley).

Apparently very abundant. "The *Lima* is constantly present at depths of twenty-five to eighty fathoms. Very commonly the animal is embedded in a sponge, usually in one of the softer horny kinds" (J. Murray in the preface to Mr. Hedley's report).

53. *Cardita astartoides*, Martens.

Cardita astartoides, Martens, Sitzungsberichte Gesell. Nat. Freunde, Berlin, 1878, p. 25: Smith, "Challenger" Lamellibranchiata, p. 212, pl. XV, figs. 2–2C; Lamy, Expéd. Antarct. Franç., Pélécyp., p. 14; Smith, "Discovery" Lamellibranchiata, p. 2; Lamy, Deuxième Expéd. Antarct. Française (1908–1910), p. 21; Thiele, Deutsche Südpolar-Exped., vol. XIII, p. 230, pl. XVIII, fig. 10.

Stations 194, 294, 316, 331, 339, 340, 355: 140–300 fathoms.

54. *Kellia simulans*, Smith.

Kellia simulans, Smith, "Discovery" Lamellibranchiata, p. 2, pl. III, fig. 1 (1907): Lamy, Deuxième Expéd. Antarct. Française (1908–1910), p. 20.

Stations 194, 331: 180–250 fathoms.

Only five specimens were obtained. The largest of them is a trifle larger than the type, being 8 mm. long, 5·75 high, and 3·75 in diameter. In describing this species it was stated that there were two small cardinal teeth in the left valve. One of these, immediately beneath the umbo, should perhaps be regarded rather as a thickening of the hinge-line than a tooth. The second distinct denticle is just in advance of the umbo.

55. *Tellimya antarctica*, Smith.

Tellimya antarctica, Smith, "Discovery" Lamellibranchiata, p. 3, pl. II, figs. 16–16B (1907).

Station 331. Off Cape Bird Peninsula, entrance to McMurdo Sound, 250 fathoms.

Only two specimens obtained. *Cyamium subquadratum*, Pelseneer,* is the same size and very similar in form, but is described as flattened and reddish brown. *Montaguia charcoti*, Lamy,† and *Tellimya minima*, Thiele,‡ are also closely allied to the present species.

56. *Anatina elliptica*, King and Broderip (1831).

For references and synonymy, see Lamy, Deuxième Expéd. Antarct. Française (1908–1910), Moll. p. 21.

Cape Evans, McMurdo Sound, February 8th, 1911, in 5 fathoms (D. G. Lillie).

A single specimen containing the animal. The species has a circumpolar range, and also occurs at Kerguelen Island. Mr. Hedley (Brit. Antarct. Exped. 1907–9, Moll. p. 3) states that it was found "abundant from 7–30 fathoms."

57. *Thracia meridionalis*, Smith.

Thracia meridionalis, Smith, "Challenger" Lamellibranchiata, p. 68, pl. VI, figs. 4–4B (1885); "Discovery" Lamellibranchiata, p. 1; Lamy, Expéd. Antarct. Franç., Pélécyp., p. 15; *id.*, Deuxième Expéd., p. 22; Hedley, Brit. Antarct. Exped. 1907–9, Biol., vol. II, Mollusca, p. 3.

Stations 316, 331, 348, 349, 356, and Evans Cove, Terra Nova Bay, Victoria Land, 30 feet above sea level in glacier (R. E. Priestley).

A single dead valve only from the last locality, probably blown there.

2. NEW ZEALAND.

1. *Helcioniscus radians* (Gmelin).

Patella radians, Gmelin, Syst. nat., p. 3720 (1790).

Helcioniscus radians: Pilsbry, Man. Conch., vol. XIII, p. 139, pl. LXIX, figs. 25–39, pl. XXIII, figs. 4, 6–8; Suter, Man. N.Z. Moll., p. 81, pl. VII, fig. 13.

Station: Bay of Islands.

One specimen The species is very variable, very common, and widely distributed throughout New Zealand. *H. antipodum* (Smith), regarded by Suter (Manual, p. 79) as a separate species, I now regard as a variety of *H. radians*. The figures illustrating

* Voy. "Belgica," Mollusca (1903), p. 15, pl. IX, fig. 124.

† Expéd. Antarct. Franç., Pélécyp., p. 13, pl. I, figs. 13, 14.

‡ Deutsche Südpolar-Exped., vol. XIII, p. 284, pl. XVIII, fig. 13.

Suter's work, although here quoted in the text, have not yet been issued, but were "expected to be available by the end of 1914."

2. *Cantharidus rufozona*, A. Adams. Pl. I, fig. 19.

Canthiridus rufozona, A. Adams, Proc. Zool. Soc., 1851, p. 170.

Cantharidus rufozona: Suter, Proc. Malac. Soc., vol. II, p. 273, fig. of immature shell, p. 274; *id.*, Man. N.Z. Moll., p. 127, pl. XXXV, fig. 16.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

This shell is described by Suter as "rather thin," but this is not the fact, since, for a shell of such small size, it certainly is rather solid. It varies in form, some specimens being narrower than others, and the spiral liræ are sometimes fewer and coarser.

3. *Solariella egena*, Gould.

Solarium egenum, Gould, Proc. Bost. Soc. Nat. Hist., 1849, vol. III, p. 84; *id.*, U.S. Explor. Exped. 1838–1842, vol. XII, Moll. p. 196, Atlas, pl. XIII, figs. 226–226c.

Monilea egena: Pilsbry, Man. Conch., vol. XI, p. 253, pl. XXXVII, fig. 13; Suter, Man. N.Z. Moll., p. 141, pl. XXXVIII, fig. 25.

Margarita dilecta, A. Adams, Proc. Zool. Soc., 1854, p. 40: Pilsbry, op. cit., p. 471.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

This species, originally described as a *Solarium*, has since been placed in the genus *Torinia* by W. B. Marshall,* in *Monilea* by Pilsbry and Suter, and now is referred to *Solariella*. Hutton† has described this shell as *Monilea zelandica*, and Sowerby‡ has figured it with the same specific name, but placed it in the genus *Margarita*.

The locality "Straits of Magellan," given by A. Adams for his *Margarita dilecta*, is undoubtedly incorrect, and is merely one more instance of the many errors of this kind met with in the Cuming collection. The genus *Minolia*, A. Adams, 1860, with *M. punctura*, A. Ad., as the type, is apparently equivalent to *Solariella* of Searles Wood, 1842. The latter has been retained by Pilsbry for certain northern forms. *Monilea*, Swainson, should be regarded as beyond recognition, being founded upon some unknown species, and not upon the *Trochus calliferus*, Lamarck, as stated by Pilsbry.

4. *Solariella plicatula* (Murdoch and Suter), var.

Minolia plicatula, Murdoch and Suter, Trans. N.Z. Inst., vol. XXXVIII, p. 299, pl. XXVI, figs. 47–49 (1906).

Monilea plicatula: Suter, Man. N.Z. Moll., p. 142, pl. XXXIII, fig. 12.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

Two specimens differing from the typical form in having the longitudinal

* Tryon's Man. Conch., vol. IX, p. 22, pl. VI, figs. 22, 23.

† Cat. Marine Moll. N.Z., p. 40 (1873).

‡ Conch. Icon., vol. XX, pl. II, fig. 17.

plications upon the upper part of the body-whorl almost obsolete, and the two circumumbilical carinæ are almost smooth, whereas in the type they are described as "beaded."

5. *Astræa heliotropium* (Martyn).

Trochus heliotropium, Martyn, Univ. Conchol., vol. I, pl. XXX (1784).
Astralium heliotropium: Pilsbry, Man. Conch., vol. X, p. 228, pl. LVI, fig. 87.
Astræa heliotropium: Suter, Man. N.Z. Moll., p. 166, pl. XLI, fig. 1.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

This species should be regarded as the type of Bolten's genus *Astræa*,* since (as *A. imperialis*, Gmelin) it heads the species he quoted.

6. *Litorina mauritiana* (Lamarck), var.

Phasianella mauritiana, Lamarck, Anim. s. Vert., vol. VII, p. 54 (1822).
Litorina mauritiana: Suter, Man. N.Z. Moll., p. 188, pl. XXXVIII, fig. 28.

Hab.—Bay of Islands, New Zealand.

The type of *L. mauritiana*, figured by Delessert, was an inch long, but the New Zealand form of the species, according to Suter, does not exceed half that length. However, beyond this difference in size, there do not appear to exist any features by which they can be separated. *L. unifasciata*, Gray; *L. diemenensis*, Quoy and Gaimard; *L. acuta*, Menke; and *L. antipodum*, Philippi, are synonyms.

7. *Turritella vittata*, Hutton.

Turritella (Haustator) vittata, Hutton, Cat. Marine Moll. N.Z., p. 29 (1873); *id.*, Man. N.Z. Moll., p. 84 (1880).
Turritella carlottæ, Watson, J. Linn. Soc., vol. XV, p. 222 (1881); *id.*, "Challenger" Gasteropoda, p. 478, pl. XXX, fig. 5; Suter, Man. N.Z. Moll., p. 266, pl. XXXIX, fig. 19.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

The name *vittata*, Hutton, has been discarded by Murdoch and Suter† on the ground that Lamarck had already used that term for another species. Since, however, I have failed to find any reference to such a species, either in Lamarck's or any other author's writings, I here adopt Hutton's name, which has eight years' priority over Watson's *carlottæ*.

Mr. Hedley's observations‡ upon the "Challenger" specimens are altogether incorrect with regard to two out of the four specimens probably being from Bass Straits. The two shells referred to are examples of *T. symmetrica*, Hutton, and doubtless were dredged with the two other specimens on the same tablet in Queen Charlotte Sound. The shell from East Moncœur Island, Bass Strait, quoted by

* Mus. Bolten, p. 79 (1798). The name ASTREA was used in 1789 by P. Browne, a "non-binomial" author.

† Trans. N.Z. Inst., vol. XXXVIII, p. 292 (1906).

‡ Proc. Linn. Soc. N.S.W. 1913, vol. XXXVIII, p. 292.

Watson, is preserved in a box by itself, and is distinct. It evidently was not seen by Mr. Hedley.

T. vittata attains much larger dimensions than those given by Hutton or Suter. The latter quotes a specimen from Channel Island, 52 mm. long; but a shell presented to the British Museum in 1850 by the Rev. R. Taylor has a length of 85 mm., and the last whorl is 19 mm. in diameter at the periphery.

8. *Crepidula monoxyla* (Lesson).

Calyptræa (*Crepidula*) *monoxyla*, Lesson, Voy. "Coquille," p. 391 (1830).

Crepidula monoxyla: Tryon, Man. Conch., vol. VIII, p. 128, pl. XXXVII, figs. 35, 36, after Quoy and Gaimard; Harris, Cat. Tertiary Moll. Australasia, p. 246 (1897).

Crepidula contorta, Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. III, p. 418, pl. LXXII, figs. 15, 16 (1835).

Crypta profunda, Hutton, Cat. Tertiary Moll. N.Z., p. 14 (1873).

Crepidula crepidula, Hutton (non Linn.), Index Fauna N.Z., p. 79; Suter, Man. N.Z. Moll., p. 286, pl. XLIV, fig. 5, 5A (1904).

Crepidula (*Ianacus*) *unguiformis*, Harris (non Lamarck), op. cit. p. 248.

Station 134, near North Cape, New Zealand: 11–20 fathoms. From mouths of shells inhabited by Hermit Crabs.

Although this species has a very close resemblance to the Mediterranean *C. crepidula*, there is one feature, at least, by which these two forms may be distinguished. Deshayes* has pointed out that in *C. crepidula* the shells present a notch at the right extremity of the internal septum where it joins the wall of the shell. This is not met with in *C. monoxyla*. The septum is described by Lesson "rectiligne à son bord libre," and Quoy and Gaimard characterise it as "lisse et droite."

I have examined a large series of the New Zealand shell, and have not found a trace of a notch.

The shells are very variable in form, according to the object to which they are attached. When the surface is flat or convex the *Crepidula* assumes an arched form, but when resting on a concave surface, such as the interior of Gastropod shells, then it becomes almost flat. It may be noticed that in convex specimens the septum is almost flat or even concave, whereas in flat examples it becomes arched or convex.

9. *Crepidula costata*, Sowerby.

Crepidula costata, Sowerby, Genera Rec. and foss. shells, part 23, pl. 152, fig. 3 (1824); Suter, Man. N.Z. Moll., p. 287, pl. XLIV, figs. 6, 6A; Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. III, p. 414, pl. LXXII, figs. 10–12.

Crepidula costata, Deshayes, Encyclop. Méthod., Vers, vol. II, part 2, p. 26 (1830); *id.*, Anim. sans Vert., ed. 2, vol. VII, p. 644.

On beach, Spirits Bay, near North Cape, New Zealand.

* Anim. sans Vert., ed. 2, vol. VII, p. 644, footnote.

A very common shell, which has been referred to the *C. aculeata* of Gmelin by Hutton, Harris, and Tryon, and Suter also appears to be of the same opinion, although he adopts Sowerby's name because, he says, it "was first figured." This, however, is not true, since Gmelin's *C. aculeata* was figured by Chemnitz in 1788. The latter, however, is a very different shell from *C. costata*, and does not occur in New Zealand. It differs from the New Zealand species not only in its form and prickly sculpture, but also in the character of the internal septum, which has a waved free margin, and not an almost straight margin, as in *costata*.

10. *Sigapatella novæ-zelandiæ* (Lesson).

Calyptræa (*Sigapatella*) *novæ-zelandiæ*, Lesson, Voy. "Coquille," Zool., vol. II, p. 395 (1830).

Calyptræa novæ-zeelandiæ: Suter, Trans. N.Z. Inst., vol. XXXVIII, p. 326 (1905).

Crepidula maculata, Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. III, p. 422, pl. LXXII, figs. 6–9 (1835).

*Calyptræa maculata**: Deshayes, Anim. sans Vert., ed. 2, vol. VII, p. 628; Suter, Man. N.Z. Moll., p. 285, pl. XIV, figs. 3, 3A (subgen. *Sigapatella*).

Station, on the beach, Spirits Bay, near North Cape, New Zealand.

Although Mr. Suter admits that Lesson's name has priority over that of Quoy and Gaimard, he adopts the latter because the species was first figured by these authors. But this conclusion is not admissible, since a species, if recognisable from an unillustrated description, must always be accepted.

With regard to the generic position of this shell it seems to me to differ from *Calyptræa* sufficiently to warrant its separation. The character of the septum in *C. chinensis*, Linn., the type of *Calyptræa*, is different.

The genus *Sigapatella* has the septum with a simple curved free margin, whereas in *Calyptræa*, starting from the centre or umbilical region, it juts out to a point and then recedes.

In the Cuming collection there are three very fine specimens (the largest 36 mm. in diameter) labelled "*comma-notata*, Sowb." These specimens passed through Gray's hands when preparing his revision of the *Calyptræidæ*,† and without referring to Sowerby's description,‡ and concluding that these shells were correctly named, he naturally placed the species in the synonomy of *maculata*, Q. and G. They certainly are quite distinct from *C. comma-notata*, said to have a central apex and to come from the coast of Guinea.

* Also quoted under this name by Martens and Hutton. It is the *Calyptræa calyptræiformis* of Tryon, Man. Moll., vol. VIII, p. 122, and of Harris, Cat. Tertiary Moll. Australasia, p. 252. Lamarck's *calyptræformis* is a different species.

† Proc. Zool. Soc. 1867, p. 736.

‡ Tankerville Cat. Appendix, p. vii (1825).

11. *Sigapatella calyptræformis* (Lamarck).

Trochus calyptræformis, Lamarck, Anim. sans Vert., vol VII, p. 12, no. 7 (1822).
Calyptræa lamarcki, Deshayes, Encycl. Méthod., Vers, vol. II, p. 170 (1830).
Crepidula tomentosa, Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. III, p. 419, pl. LXXII, figs. 1–5 (1835).
Trochita calyptræformis: Reeve, Conch. Icon., vol. XI, fig. 11 (septum too deeply arcuate).
Calyptræa calyptræformis: Pritchard and Gatliff, Proc. R. Soc. Victoria, vol. XII, p. 199 (1900); Hedley, Proc. Linn. Soc. N.S.W., vol. XXXVIII, p. 288 (1913).

Station 134, near North Cape, New Zealand: 11–20 fathoms.

This species, which also occurs on the coast of New South Wales and South Australia, although greatly resembling *S. novæ-zelandiæ*, is, as described by Reeve, "rather more spirally convoluted." Other differences are the larger penultimate whorl, the spire nearer the centre, and the umbilicus less marked and not so near the side. The periostraca are not quite the same, and although the interior of the shell is usually tinted with a purplish flesh-colour, it is not marked with dark purplish brown or purple, like *novæ-zelandiæ*. The septum is usually of a more or less lilac tint, whereas in Lesson's species it is white. The largest specimen is 30 mm. in diameter.

12. *Sigapatella tenuis* (Gray). Pl. I, figs. 20–22.

Clypeola tenuis, Gray, Proc. Zool. Soc., 1867, p. 735.
Trochita tenuis: Hutton, Cat. Marine Moll. N.Z., p. 32 (1873).
Trochita scutum: Hutton, Journ. de Conch., vol. XXVI, p. 30 (1878).
Calyptræa scutum: Hutton, Index Faunæ N.Z., p. 79 (1904); Suter, Man. N.Z. Moll., p. 284, pl. XLIV, fig. 4 (1913).
Calyptræa tenuis: Hedley, Proc. Linn. Soc. N.S.W., vol. XXXVIII, p. 289 (1913).

Station 134, near North Cape, New Zealand: 11–20 fathoms.

This species has been considered the same as *Calyptræa* (*Sigapatella*) *scutum* of Lesson,* but it seems very doubtful whether that supposition is correct. There are several features mentioned in Lesson's description which are not observable in the shell before us. In the first place the size given by Lesson (11 lines = 27 mm.) is never reached by *S. tenuis*. It is described as "à tours de la spire plus marqués et plus grands" than in *Sigapatella novæ-zelandiæ*. As a matter of fact the whorls are traceable with much more difficulty in *tenuis*. The epidermis is said to be "blond doré," the columella "courte, un peu dilatée à sa base," the septum "échancrée en devant," and the umbilicus "presque nul."

Now in *S. tenuis* the periostracum is so thin that it is generally worn off, the columella is hardly dilated at the base, the septum is curved, not notched, in front, and there certainly is no trace of an umbilical chink. Lesson twice refers to the *pearly* interior, but this is a character which does not occur in the *Calyptræidæ*, and

* Voy. "Coquille," Zool., vol. II, pt. 1, p. 395 (1830).

his words "nacrée, très-lisse" and "nacré brillant" probably are merely descriptive of a highly glossy and perhaps slightly iridescent surface.

It is of course possible that a mistake has occurred, and that the specimens he described came, not from New Zealand, but were obtained elsewhere during the same voyage.

The South Australian shells which have been called *Calyptræa scutum* by Gatliff and Gabriel are separable from the New Zealand species, since they have not the hollow axis of that form. They appear more depressed and spread out, and they do not exhibit the finely tuberculous or pustulose external sculpture of the true *S. tenuis*.

The septum also in the Australian shell is curved outward, whereas in the New Zealand form it is incurved.

Gray's inadequately described types were from New Zealand, and are in the British Museum collection.

Since Mr. Hedley was the first to call attention to the difference in the axis of these two forms I have associated his name with the Australian shell.

13. *Sigapatella hedleyi*, n. sp. Pl. 1, figs. 23–25.

> *Galerus pellucidus:* Angas, Proc. Zool. Soc., 1867, p. 211.
> *Calyptræa pellucida:* Tate, Trans. R. Soc. S. Aust., vol. XVII, p. 199 (1893); Tate and May, Proc. Linn. Soc. N.S.W., vol. XXVI, p. 376 (1901).
> *Calyptræa scutum:* Gatliff and Gabriel, Proc. R. Soc. Victoria, vol. XXII, p. 38 (1909).
> *Calyptræa tenuis:* Hedley, Proc. Linn. Soc. N.S.W., vol. XXXVIII, p. 289 (1913).
> *Calyptræa calyptræformis*, partim: Watson, "Challenger" Gasteropoda, p. 460.

The *Trochita pellucida* of Reeve confused with this species is a true *Calyptræa*, having the same kind of septum as *C. chinensis*, the type of the genus.

A single specimen from off East Moncœur Island, Bass Strait, named by Watson *C. calyptræformis*, belongs to the present species.

14. *Charonia*,* sp. juv.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

A single young specimen of a "Triton" in perfect condition, allied to the early stage of the well-known *C. tritonis* (Linn.). It consists of six and a half whorls, of which the first four and a half form the protoconch. These are brownish, corneous, smooth, convex. The last two volutions are rosaceous, less convex, with spiral series of small pustules and spiral striæ between them. There are five rows of nodules on the penultimate whorl and eight or nine on the last, which has an oblique curved rounded varix on the left side and a similar one outside the labrum, which is thickened within with a fine whitish riblet bearing twelve very small nodules. The columella is

* See Iredale, Nautilus, vol. XXVII, p. 55 (1913).

straightish above, then oblique at the canal, above which there is a slight callus and two or three oblique wrinkles. The aperture is of the same rosy tint as the exterior, irregularly oval, and about half the length of the whole shell.

Length, 11·5 mm.; diameter, 6.

This specimen is not the young of *C. rubicunda* (Perry), another large "Triton" occurring in New Zealand. The protoconch in that species is purplish, and the following normal whorls are finely spirally striated, and without rows of pustules.

15. *Vexillum* (*Pusia*) *biconicum* (Murdoch and Suter).

Vulpecula (*Pusia*) *biconica*, Murdoch and Suter, Trans. N.Z. Inst., vol. XXXVIII, p. 289, pl. XXIII, fig. 22 (1906).

Station 134, near North Cape, New Zealand: 11–20 fathoms.

This species has been considered by Suter,* the same as *Turricula marginata*, Hutton,† a tertiary fossil from Wanganui, but judging from his description and figure there seems sufficient difference to separate these two forms. Moreover, an allied fossil species of *Mitridæ* had already been described by Lamarck‡ under the name *Mitra marginata*.

16. *Verconella dilatata* (Quoy and Gaimard).

Fusus dilatatus, Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. II, p. 498, pl. XXXIV, figs. 15, 16 (1833).

Verconella dilatata: Iredale, Proc. Malac. Soc., vol. XI, p. 175 (1914).

Station.—New Zealand.

17. *Verconella nodosa* (Martyn).

Buccinum nodosum, Martyn, Univ. Conch., vol. I, fig. 5 (1784).

Station.—Mouth of Bay of Islands, New Zealand: 20 fathoms.

18. *Cominella adspersa* (Bruguière).

Buccinum adspersum, Bruguière, Encycl. Méthod., Vers, vol. I, p. 265 (1789).

Buccinum maculatum, Martyn (nec Linné), Univ. Conch., vol. II, fig. 49 (1784).

Cominella maculata: Suter, Man. N.Z. Moll., p. 385 (for synonymy), pl. XLV, fig. 7.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

19. *Arcularia coronata*, var. Pl. I, fig. 28.

Buccinum coronatum, Bruguière, Encycl. Méthod., Vers, vol. I, p. 277, no. 46 (1789).

Nassa coronata: Reeve, Conch. Icon., vol. VIII, pl. III, fig. 20.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

The single dead shell is rather narrower than typical examples, has flattish whorls

* Man. N.Z. Moll., p. 363.

† Trans. and Proc. N.Z. Inst., vol. XVII, p. 315 (1885).

‡ Anim. sans Vert., vol. VII, p. 324 (1822).

and rather a feeble columellar callus. This species has not been recorded from New Zealand. It has a wide distribution from South Africa to the Pacific.

20. *Voluta* (*Alcithoe*) *arabica*, var. *depressa*. Pl. I, figs. 26, 27.

Buccinum arabicum, Martyn, Univ. Conch., vol. II, fig. 52 (1784).
Fulguraria (*Alcithoe*) *arabica*: Suter, Man. N.Z. Moll., p. 445 (for synonymy), pl. XLVIII, fig. 5.
Var. *Fulguraria* (*Alcithoe*) *depressa*, Suter, op. cit., p. 447, pl. XLVIII, fig. 7.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

Beyond the fact that the spire is less produced, I do not observe any distinguishing feature in Mr. Suter's *V. depressa*. The character of the markings, nodulation of the whorls, and the columellar folds are precisely the same as in the typical form.

21. *Voluta* (*Alcithoe*) *gracilis*, Swainson.

Voluta gracilis, Swainson, Quart. Journ. Sci. Lit. Arts, vol. XVII, p. 32 (1824).
Cymbiola gracilis, Swainson, Exotic Conch., ed. 2, p. 20, pl. XLII.
Fulguraria (*Alcithoe*) *gracilis*: Suter, Man. N.Z. Moll., p. 448, pl. XLVIII, fig. 8.

Station.—Mouth of Bay of Islands, 20 fathoms; Station 90, Three Kings Islands, 100 fathoms; Station 134, near North Cape, New Zealand, 11–20 fathoms.

The generic name used by Mr. Suter is given *Fulgoraria* by Schumacher, not *Fulguraria*; and the species described in 1824 apparently was not figured in the first edition of the "Exotic Conchology."

22. *Ancilla mucronata* (Sowerby).

Ancillaria mucronata, Sowerby, Species Conchyl., p. 8, figs. 47, 48 (1830); Kiener, Coq. Viv., p. 7, pl. III, fig. 3 (1843).
Ancillaria pyramidalis, Reeve, Conch. Icon., vol. XV, pl. IV, figs. 11A–11B (1864).
Var. *Ancillaria mucronata*: Sowerby, jun., Thesaurus Conch., vol. III, p. 63, pl. 211, fig. 11; Reeve, op. cit. pl. IV, figs. 10A–10B.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

The figure 47 in Sowerby's "Species Conchyliorum" is a good representation of *A. pyramidalis*, Reeve. It shows the acuminate spire of that so-called species, and not the more obtuse and callose spire of *A. mucronata*, as depicted in the "Thesaurus Conchyliorum" (fig. 11), and by Reeve (figs. 10A–10B).

However, I consider that these two forms are not specifically separable. The type (= *pyramidalis*) is rather broader than the variety (= *mucronata*, auctt.), besides having the more acute spire; but in the British Museum collection intermediate examples occur.

Weinkauff* and Suter † have placed Reeve's *pyramidalis* in the synonymy, or as a

* Conch. Cab. *Ancillaria*, p. 16.
† Man. N.Z. Moll, p. 452.

variety of *A. australis*, Sowerby, and I admit that, beyond a difference in coloration, there does not appear to be any important distinction.

23. *Ancilla novæ-zelandiæ* (Sowerby).

Ancillaria novæ-zelandiæ, Sowerby, Thesaurus Conch., vol. III, p. 65, pl. 213, figs. 48, 49 (1859).
Ancilla bicolor: Suter, Man. N.Z. Moll., p. 453, pl. XLVI, fig. 20.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

A. tricolor, Sowerby,* nec Gray, and *A. nana*, Watson,† are synonyms of this species. By a slip of the pen or misprint Mr. Suter has given the name *bicolor* instead of *tricolor*.

24. *Marginella muscaria*, Lamarck.

Marginella muscaria, Lamarck, Anim. sans Vert., vol. VII, p. 359 (1822); Suter, Man. N.Z. Moll., p. 463 (for synonymy), pl. XLVI, fig. 21.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

Only a single immature specimen.

25. *Columbarium suteri*, n. sp. Pl. I, fig. 30.

Shell slenderly fusiform, with angular coronate whorls, dirty whitish, with pale brown spots between the short spines which adorn the middle of the whorls; periostracum pale straw colour, deciduous; the two apical whorls large, smooth, obtuse at the top, the rest sloping above the middle, which is prominently carinate, the keel being produced into short spines or acute tubercles, ten on the last whorl. Below the keel the volutions are contracted to the suture, which is oblique; above the carina, on the last and penultimate whorls, there are three fine spiral threads, and below it, on the last whorl, there are three rather coarser threads, below which the rest of the slender rostrum is covered with oblique, very much finer threads. The keel has one or two spiral striæ upon it, and the whole surface exhibits fine but distinct striæ or lines of growth; aperture somewhat triangular above, produced below into a very slender straight canal; outer lip thin, angled at the keel, faintly or shallowly sinuated above it; columella covered with a thin glossy callus, which extends from the tip of the canal to the outer lip above.

Length, 17 mm.; diameter, 6. Aperture, with canal, 11 in length.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

The unique specimen, judging from the protoconch, is merely the young stage of a shell which attains larger dimensions. It consists only of six whorls, but its characters are so striking that I have not hesitated to found a new species upon it.

In general form it considerably resembles *C. spinicincta*, Martens, from East Australia, but it differs considerably in the details of its ornamentation.

* Thesaurus Conch., vol. III, p. 63, pl. 211, figs. 9, 10.

† "Challenger" Gasteropoda, p. 230, pl. XVII, fig. 10.

The genus *Columbarium*, which, as far as at present known, consists of a very few species, has not hitherto been recorded from New Zealand. I have associated with this species the name of Mr. Henry Suter, as a mark of appreciation of the immense industry displayed in the production of his "Manual of the New Zealand Mollusca," published in 1913. Although it may be necessary to revise the nomenclature in a considerable number of instances, and occasionally to correct the synonymy, there can be no doubt that this will always remain *a* standard work, or even *the* standard work, on New Zealand Mollusca. To have produced such a volume of 1120 pages, without the advantage of consulting such complete libraries and collections as we have in this country, reflects the greatest credit upon the author.

26. *Mangilia huttoni*, n. sp. Pl. I, fig. 29.

Shell ovately fusiform, whitish, with a pale brown zone round the middle of the body-whorl between the costæ, a pure white thread above it, another pale brown band below the suture, and the anterior extremity stained reddish; whorls 6–7 probably (tip broken off), convex; the first normal volution with four spiral threads, the rest obliquely costate, costæ about twelve in number, narrowed above at the suture, extending below the middle of the last whorl, but not to the extremity; ribs crossed by a number of spiral liræ (5–6 on the penultimate whorl), and excessively fine striæ between them; aperture narrow, half the length of the shell; labrum thickened outside with the last rib, smooth within, faintly sinuated towards the suture; columella arcuate above the middle, oblique below; anterior canal oblique, rather narrow, scarcely recurved.

Length, 9 mm.; diameter, 3·75.

Station 134, near North Cape, New Zealand: 11–20 fathoms.

Allied to *M. sinclairii*, Smith, but more fusiform, with less convex whorls, the last being longer in proportion to the length of the spire. The sculpture also is different, that of *M. sinclairii* being coarser. Named *M. huttoni* in remembrance of the late Captain F. W. Hutton, F.R.S.

27. *Arca* (*Barbatia*) *novæ-zealandiæ*, n. sp. Pl. II, figs. 1, 2.

Arca decussata of New Zealand authors (non Sowerby).
Arca (*Barbatia*) *decussata*: Suter, Man. N.Z. Moll., p. 848, pl. LVI, figs. 2, 2A (1913).

This species, hitherto confused with *A. decussata*, may be recognised by the minute crenulation on the anterior and posterior inner margins of the valves, and also by both the exterior and interior being more or less stained with a reddish tint. Neither of these features is met with in the true *decussata*, which is always pure white within and without, and its lateral margins are broader, flattened, and invariably smooth. Although very similar externally, it may be observed that the radiating sculpture upon the posterior dorsal area is finer than in *A. decussata*, and more distinctly defined by an obtuse, rounded umbonal ridge. The posterior adductor impression in *A. decussata* is large and round, whereas in *A. novæ-zealandiæ* it is obliquely truncate behind.

Length, 67 mm.; height, 36; diameter, 24.

Station 96, north of New Zealand: 70 fathoms.

The three characters above referred to—(1) the crenulation of the lateral margins; (2) colour; (3) fine posterior dorsal sculpture—should, I think, be sufficient to separate this species from *A. decussata* of Sowerby.

Similar marginal crenulation occurs in *Arca fusca*, Brugnière, of which *A. rodatzi*, Dunker, is a synonym.

28. *Glycimeris laticostata* (Quoy and Gaimard).

> *Pectunculus laticostatus*, Q. and G., Voy. "Astrolabe," Zool., vol. III, p. 466, pl. 77, figs. 4–6 (1835).
>
> *Glycimeris laticostata*: Suter, Man. N.Z. Moll., p. 851, pl. LVI, figs. 3, 3A.

Station 134, Spirits Bay, near North Cape, north of New Zealand: 11–20 fathoms.

Two dead valves with some egg-capsules of a Gastropod attached, also incrusting Polyzoa, etc.

29. *Chlamys consociata*, n. sp. Pl. II, figs. 3 and 8.

Shell allied to *P. zelandiæ*, Gray, but flatter, with smaller ears, especially the anterior auricles; valves thinner, with about twenty-four delicate principal costæ, with one or two still finer ones in the intervening grooves; all minutely squamose, the scales more closely packed in some specimens than in others; anterior auricle of left valve having about eight thread-like squamate radiating liræ, the one forming the dorsal line stronger than the rest; the posterior auricle similarly sculptured, but liræ fewer; anterior ear of right valve with a moderately deep byssal sinus, with five radiating liræ above, the upper marginal one twice as strong as the rest; colour pale pinkish or reddish, sometimes showing a few irregular opaque white markings; interior of the valves glossy, whiter than the outside, radiately grooved and ridged.

Length, 29 mm.; height, 26·5; diameter, 6·5.

Stations 90 and 96, north of New Zealand: 70–100 fathoms.

There is a marked difference in the size of the anterior auricles in this species and *P. zelandiæ*, and besides being flatter, and more delicate in texture, the present form has a tendency towards obliquity in growth.

30. *Chlamys* (*Pallium*) *convexus* (Quoy and Gaimard).

> *Pecten convexus*, Q. and G., Voy. "Astrolabe," Zool., vol. III, p. 443, pl. 76, figs. 1–3 (1835); Suter, Man. N.Z. Moll., p. 879, pl. LVI, figs. 8, 8A.

Station 90, north of New Zealand: 100 fathoms.

Only a few dead valves covered with Polyzoa, etc.

31. *Venericardia purpurata* (Deshayes).

Venericardia australis, Lamarck ?, Anim. sans Vert., vol. V, p. 610 (1818).
Venericardia australis (Lamk. ?), Quoy and Gaimard, Voy. "Astrolabe," Zool., vol. III, p. 480, pl. 78, figs. 11–14.
Cardita purpurata, Deshayes, Proc. Zool. Soc. 1852, p. 100, pl. XVII, figs. 12, 13.
Cardita quoyi, Deshayes, l.c., p. 103.
Cardita tridentata, Reeve (non Say), Conch. Icon., vol. I, pl. V, figs. 22A–22B.

Station 134, near North Cape, New Zealand : 11–20 fathoms.

I have not adopted Lamarck's name for this common New Zealand shell, although it has been employed in all works on that fauna. We have no proof that the specimen (4–5 mm. in diameter) described by Lamarck is, in fact, the young of this species. It appears to have been considered as such by Quoy and Gaimard, but these authors do not state that they had seen Lamarck's type said to be from "Nouvelle Hollande." Moreover, Deshayes distinctly says that the Quoyian species is different, and has given to it the name *Cardita quoyi.* The shells he had before him (now in the British Museum), said to be Australian, belong undoubtedly to the same species as the New Zealand shells in question.

Mr. Hedley * has made some observations upon this subject, and in pointing out Deshayes' misquotation of Quoy and Gaimard's plate and figures has fallen into a similar error himself. The correct reference is given above, and is not pl. 70, figs. 12–14, but pl. 78, figs. 11–14.

32. *Mactra (Mactrotoma) elongata,* Quoy and Gaimard.

Mactra elongata, Q. and G., Voy. "Astrolabe," Zool., vol. III, p. 518, pl. 83, figs. 1, 2 (1835) ; Suter, Man. N.Z. Moll., p. 965, pl. LX, fig. 2.

Station 134, Spirits Bay, near North Cape, north of New Zealand : 11–20 fathoms. Two dead valves, encrusted with Gastropod egg-capsules, Polyzoa, worm-tubes, etc.

33. *Chione (Chamelea) spissa* (Deshayes).

Station 134, near North Cape, New Zealand : 11–20 fathoms.

For synonymy and references see Suter, Proc. Malac. Soc., vol. VI, pp. 202–5 ; Smith, loc. cit., p. 206 ; Suter, Manual New Zealand Moll., pp. 991–2, pl. LXII, fig. 4.

A common and variable New Zealand shell. Mr. Suter still maintains his opinion that *C. spissa* (= *crassa*)† and *C. mesodesma,* Q. and G., are distinct. On the other hand, a further study has failed to convince me of the correctness of that conclusion.

34. *Cardium (Nemocardium) pulchellum* (Gray).

Cardium pulchellum, Gray, Dieffenbach's New Zealand, vol. II, p. 252 (1843) ; Reeve, Conch. Icon., vol. II, pl. VIII, fig. 42.

Station 134, near North Cape, New Zealand : 11–20 fathoms.

* Australian Fisheries Report, 1911. Part I, pp. 97–98.
† Preoccupied by Gmelin : Syst. nat. p. 3288.

For other references and localities see Suter, Manual New Zealand Mollusca, p. 1000 (1913). This is the only species of cockle found in New Zealand.

35. *Panope zelandica*, Quoy and Gaimard.

Panopæa zelandica, Q. and G., Voy. "Astrolabe," Zool., vol. III, p. 547, pl. 83, figs. 7–9 (1835); Suter, Man. N.Z. Moll., p. 1013, pl. LXI, figs. 10, 10A.

Station 134, Spirits Bay, near North Cape, north of New Zealand: 11–20 fathoms. A single valve with egg-capsules of a Gastropod attached.

36. *Xylotrya saulii* (Wright).

Nausitora saulii, Wright, Trans. Linn. Soc., vol. XXV, p. 567, pl. 65, figs. 9–15 (1865).
Teredo (*Xylotrya*) *saulii*: Suter, Man. N.Z. Moll., p. 1021, pl. LV, figs. 8A–8B (1914).

The single specimen in the collection was taken from the hull of the "Terra Nova" in Lyttelton Harbour. The general structure of the shell agrees with specimens of *X. saulii*, presented to the British Museum by Mr. Suter, but the character of the pallets is somewhat different, the joints being drawn-out and arranged closely together.

3. WEST OF FALKLAND ISLANDS.

1. *Margarites iris*, n. sp. Pl. II, fig. 4.

Shell depressed turbinate, narrowly umbilicate, thin, whitish, opalescent; whorls 5, the apical one smooth, glossy, rounded, opaque white, the rest rather convex, ornamented with spiral thread-like cords, four on the second whorl, about six or seven on the next, eight or nine on the penultimate, and about forty on the body-whorl; the threads vary in thickness, some being very much more slender than others; the body-whorl is obtusely subangled at the periphery and in the umbilical region is opaque white, smooth except for some growth-lines; the whole surface of the shell exhibits curved lines of growth, but they are not strong enough to make the spiral liræ distinctly granose; the aperture is pearly within, large, subcircular; outer lip thin; columella obliquely arcuate, thickened, white, reflexed, appressed to the umbilical region.

Greater diameter, 14 mm.; lesser diameter, 12; height, 12. Aperture, 7 mm. across.

Station 38, West of Falkland Islands: 125 fathoms.

Three specimens of this beautiful shell were obtained. The manner in which the columella is reflexed and appressed to the shell is a peculiar feature.

2. *Glypteuthria acuminata*, n. sp. Pl. II, fig. 5.

Shell slender, with a long acuminate spire, dirty whitish, spotted irregularly with a light reddish colour: whorls $8\frac{1}{2}$, first one and a half smooth, rounded, pale brown, forming a mammillated apex, the following whorls almost flat at the sides, slowly increasing, sculptured with slightly curved longitudinal fine costæ and spiral liræ, the points of intersection forming small rounded nodules; costæ about twenty-six on the penultimate whorl, liræ six or seven; body-whorl contracted below the middle, beneath which the shell is scarcely affected by the longitudinal costæ, so that the transverse liræ are smooth, and not nodulous; aperture narrow, suboval; labrum thin at the edge, a little thickened exteriorly, with about seven slender, short liræ within, a short distance from the margin; columella arcuate above, oblique below, covered with a thin callus.

Length, 15 mm.; diameter, 5·5. Aperture, with canal, 6 mm. long, 2 broad.

Station 38, West of Falkland Islands: 125 fathoms.

Remarkable for the slender acuminate form. Although the obscure colour markings are somewhat irregular, the light reddish spots are mostly at the upper part of the whorls, and the body-whorl has an obscure band just below the periphery.

3. *Trophon pelseneeri*, n. sp. Pl. II, figs. 6, 7.

Shell fusiform, dirty white; whorls $7\frac{1}{2}$. The apical two and a half, forming the embryonic shell, convex, smooth, the rest sloping above, then angled and contracted below, having longitudinal lamellæ, produced above into hollow backwardly curved spines, spirally lirate rather strongly, and also sculptured with very finely lamelliform lines of growth. The longitudinal lamellæ are about eleven in number, smooth on the front side, but sculptured behind with the lines of growth and the spiral liræ; aperture pyriform, produced into a rather narrow, oblique, anterior canal; outer lip thickened by the last lamella; columella arcuate above, covered with a thin, white callus, joining the outer lip above, and extending along the canal in front.

Length, 20·5 mm.; diameter, 9·5. Aperture, with canal, 11 long, 4 in width.

Station 38, west of Falkland Islands: 125 fathoms.

Two specimens. Remarkable for the strong spiral liræ and the longitudinal lamellæ, produced upward into hollow curved spines. The general form of the shell is rather like that of *T. carduelis*, Watson,* found in 410 fathoms off Sydney. Named after Professor Pelseneer of Ghent.

4. *Typhis belcheri*, Broderip.

Typhis belcheri, Broderip, Proc. Zool. Soc., 1832, p. 178; Sowerby, Thes. Conch., vol. III, pl. 284, figs. 8, 9; *id.*, Conch. Icon., vol. XIX, pl. II, fig. 9; Tryon, Man. Conch., vol. II, p. 137, pl. XXX, figs. 300, 301.

Murex (Typhis) cleryi, Petit, Rev. Zool., 1840, p. 327; *id.*, Mag. de Zool., 1842, pl. 54.

Station 38, west of Falkland Islands: 125 fathoms.

A splendid series of sixty-seven specimens of this very remarkable shell was

* "Challenger" Gasteropoda, p. 167, pl. X, fig. 7.

obtained. Although originally described as from Cape Blanco, West Africa, it seems very likely that this locality was incorrect, and the Cape Blanco may have been the prominence with that name on the east coast of Patagonia. This seems to be probable, since I have not noticed any other record of its occurrence on the West African coast. Moreover, Petit gave the locality "Cape Saint Thomas, Brazil," and now it has been collected still further south, west of the Falkland Islands.

Most of these specimens are marked with somewhat interrupted, spiral, reddish, broad lines, about six on the back of the body-whorl. The upper ends of the varices are so much hooked that they curve over and touch the whorls above.

5. *Cuspidaria* (*Cardiomya*) *simillima*, n. sp. *See* p. 104.

6. *Arca* (*Anadara*) *chemnitzi*, Philippi.

For synonymy and references see Lamy, Journ. de Conch., 1907, vol. LV., p. 272.

Station 38, West of Falkland Islands: 125 fathoms.

Only a single dead valve obtained. It agrees very closely with *A. d'orbignyi*, Kobelt, from the West Indies. This species, according to Lamy, is the same as *chemnitzi*, Phil. Its known range is from the West Indies to South Brazil, and consequently I am doubtful whether this valve really came from Station 38 (=H.V. 1), but think it more likely it occurred at Station 42 (= H.V. 2) off Rio de Janeiro.

7. *Cardium delicatulum*, n. sp. Pl. II, fig. 9.

Shell roundish, a little inequilateral, longer than high, thin, greyish white, with obscure reddish markings; radiating costæ fine, about 38 in number, not prominent, those down the middle portion of the valves slightly rounded, with a series of minute tubercles down the middle of each of them, almost three times as broad as the intervening grooves. Eight to ten of the costæ on the posterior side are ornamented with distant prominent prickles, and an equal number of ribs in front exhibit prickles, but not quite so strong as those behind; lunular area lanceolate, smooth, the hinge-margin in both valves being reflexed in front of the umbones, which are smooth at the tip and contiguous; interior of the valves whitish, but faintly tinted with pale red or yellow towards the umbones, finely sulcate radiately; hinge normal, delicate.

Length, 22 mm.; height, 20; diameter, 14.

Station 38, west of Falkland Islands: 125 fathoms.

This species probably attains much larger dimensions than those given above. Young shells of *C. muricatum*, Linn., which occur at the West Indies and along the Brazilian coast as far south as Rio de Janeiro, must be rather like the present species. Their costæ, however, would be more elevated, and the tubercles upon them are attached to the sides and not down the middle.

4. OFF RIO DE JANEIRO.

1. *Turris formosissima* n. sp. Pl. II, fig. 10.

Shell elongate, fusiform, white, excepting a reddish keel below the suture, and a faint reddish zone below the convex part of the body-whorl; whorls 13?; apex broken off: remaining volutions slightly convex, with three spiral keels, of which the central one round the middle is thicker than the other two; between the keels the shell is sculptured with oblique divergent lines of growth, and a spiral thread in each intercarinal space; the suture is also bordered above by a spiral thread; last whorl with five principal keels, and numerous other less pronounced liræ below them. The strong raised lines of growth become much finer on the rostrate part of the whorl; aperture oval above, produced anteriorly into a long, narrow, straightish canal; labrum thin, shortly sinuated above at the principal carina; columella straightish, smooth.

Length, if complete, about 26 mm.; diameter, 7·5. Aperture, with canal, 11·5 mm.

Station 42, off Rio de Janeiro: 40 fathoms.

Only two specimens. Allied to *T. antillarum* (Crosse),* but differing apparently in the intercarinal sculpture. The uppermost keel also is not so strong as the central one, whereas in the West Indian species they are described as equal.

2. *Drillia braziliensis*, n. sp. Pl. II, fig. 11.

Shell slender, fusiform, light brown, with whitish nodules; whorls 11, slowly increasing, the two apical smooth, forming a large rounded protoconch, the rest longitudinally obliquely costate, the costæ most prominent at the middle of the whorls, where they are crossed by two spiral liræ, which form transversely elongate nodules upon them; a wavy carina passes along the upper margin of the whorls, and a finer thread borders the lower suture. On the body-whorl the costæ are produced downwards below the middle, but do not extend quite to the end of the rostrum; the spirals are about eighteen, and about seven of the upper ones are more or less nodulous on crossing the costæ, the rest below are finer and smooth; between the nodulous liræ, both on the spire and on the last whorl, there are fine thread-like lines, and the whole surface exhibits delicate wavy growth-striæ; aperture brown within, not quite one-third the length of the shell; labrum thin at the edge, distinctly sinuate below the sutural keel, and having a costa or varix, larger than the other costæ, on the outside; columella straightish, covered with a pale callus, formed into a tubercle at the sinus.

Length, 21 mm.; diameter, 6.

Station 42, off Rio de Janeiro: 40 fathoms.

* Journ. de Conch. 1865, vol. XIII, p. 34, pl. 1, fig. 8.

This species, of which two specimens were dredged, is closely allied to *D. bilirata*, Smith,* but has about twelve finer costæ, and the protoconch is larger. The spiral thread-like lines also are much more distinct.

3. *Drillia rioensis*, n. sp. Pl. II, fig. 12.

Shell fusiform, pale brown, with whitish costæ; whorls 9, two apical smooth, convex, forming a mammillar apex, the rest concave above the convex, oblique costæ (ten on the penultimate whorl) with transverse tubercles on the middle caused by spiral liræ passing over them; the tubercles are more pronounced upon some of the upper volutions than upon the last two or three; in the upper concavity the threads are finer than those below; last whorl attenuated in front, finely lirate throughout; aperture white within; labrum with a strong external varix a little way from the thin brown finely denticulate edge; posterior sinus moderately deep, rounded; columella smooth, with a thin callus united above to the end of the outer lip; anterior canal slightly recurved.

Length, 22·5 mm.; diameter, 7. Aperture 10 mm. long, width in the middle 2·5.

Station 42, off Rio de Janeiro: 40 fathoms.

Two of the spiral liræ around the middle of the whorls are more conspicuous than the rest, and much more distinctly nodulous. The fine growth-lines are sinuose, and most evident at the upper part of the whorls.

4. *Marginella fraterculus*, n. sp. Pl. II, fig. 13.

Shell subcylindrical, pale straw-colour, smooth, shining; spire very short, pale reddish at the rounded tip; whorls 4–5, the last with gently curved outlines; suture marked with a thin white line; aperture almost as long as the shell; labrum thickened externally, white, a little incurved; columella with four white plaits; in one specimen there are five, the fifth being less pronounced than the rest, and situated above them.

Length, 30 mm.; diameter, 15.

Station 42, off Rio de Janeiro: 40 fathoms.

I am somewhat in doubt whether this may not be a dwarf variety of *M. cuvieri*, Jousseaume,† from which it differs in its rather narrower form and more distinct and elevated spire. One of the four specimens from Station 42 is of an opalescent brown colour, rather similar to that of *M. bullata*, Born.

5. *Marginella janeiroensis*, n. sp. Pl. II, fig. 14.

Shell small, fusiformly ovate, white, smooth, shining; whorls four, apex obtuse; last and penultimate whorls sloping above, then faintly angled; aperture narrow,

* Ann. Mag. Nat. Hist., 1888, vol. II, p. 305.

† Revue et Mag. de Zool. 1875, vol. XXVI, p. 251.

more than half the length of the shell; labrum thickened, with seven small denticles on the inner margin, the most posterior one being the largest; columella with four equidistant plaits.

Length, 4·25 mm.; diameter, 2·25. Labrum, 3 mm. long.

Station 42, off Rio de Janeiro: 40 fathoms.

This species appears to be very like *M. scalaris*, of Jousseaume,* in some respects, but differs in the absence of very fine longitudinal striæ. Considering the larger size and absence of colour, it does not seem probable that *M. scalaris* is the same as *M. striata*, Sowerby, as suggested by Tryon.†

6. *Ancilla dimidiata* (Sowerby).

> *Ancillaria dimidiata*, Sowerby, Thesaurus Conch., vol. III, p. 62, pl. 213, figs. 55, 56 (1859); Reeve, Conch. Icon., vol. XV, pl. X, figs. 39A–39B; Tryon, Man. Conch., vol. V, p. 96, pl. XXXIX, fig. 50, after Reeve.

Station 42, off Rio de Janeiro: 40 fathoms.

This species was said to be from the Red Sea, which evidently was an error, since specimens of it from Rio de Janeiro are in the Museum from three different sources. One example was dredged in three fathoms by J. Macgillivray during the voyage of the "Rattlesnake" in 1845. A second example was obtained by Captain D. W. Barker between Pai Island and Maricas Islands, off Rio de Janeiro, in 36–41 fathoms. The third specimen is that from Station 42.

It is quoted by Sowerby ‡ as a South African species, but he does not say upon what evidence. Until some confirmation of this statement can be adduced I am inclined to regard it as incorrect.

7. *Prosipho cancellatus*, n. sp. *See* p. 71.

8. *Turritella hookeri*, Reeve.

> *Turritella hookeri*, Reeve, Conch. Icon., vol. V, pl. XI, fig. 61 (1849); Tryon, Man. Conch., vol. VIII, p. 206, pl. LXIV, fig. 9, after Reeve; Kobelt, Conch. Cab., p. 29, pl. VI, fig. 11.

Station 42, off Rio de Janeiro: 40 fathoms.

The locality of this species has not hitherto been recorded, although the types described by Reeve were labelled "Cape Frio," which is east of Rio de Janeiro, where Captain Ross touched in June, 1843, on the voyage home from the Antarctic. The species attains a considerably larger size than the specimen figured by Reeve, which was only 20 mm. in length. The largest shell from Station 42 has the upper part of the spire broken off, but when perfect it must have been fully 36 mm. long, and consisted of about nineteen whorls.

* Revue et Mag. de Zool. 1875, vol. XXVI, p. 189, pl. VII, fig. 9.

† Man. Conch., vol. V, p. 26.

‡ Marine Shells of South Africa, p. 17 (1892).

The apical whorl is smooth, rounded at the top, and the rest have two prominent keels round the middle, and a third adjacent to the lower suture. They are concave between the carinæ, and exhibit some rather obscure spiral lines in the interstices, more visible on the lower than on the upper whorls.

9. *Crepidula aculeata* (Gmelin).

Patella aculeata, Gmelin, Syst. nat., p. 3693 (1790).

Patella fornicata aculeata, Chemnitz, Conch. Cab., vol. X, p. 334, pl. 168, figs. 1624, 1625.

Crepidula aculeata: Carpenter, Mazatlan Cat., pp. 268–271. A full discussion of the species.

Station 42, off Rio de Janeiro: 40 fathoms.

The specimens from this station are small, thin, white externally, delicately spinose, with a red stain within in the depth of the shell. Chemnitz gave West Indies as the locality for his specimens.

If *C. hystrix*, Broderip, and *C. echinus*, Broderip, as suggested by Carpenter, Reeve, and Tryon, belong to this species, it has a very remarkable distribution. D'Orbigny * has quoted it from Patagonia, Rio de Janeiro, and the West Indies. It is also known from Cape Colony.

10. *Trochilina candeana* (d'Orbigny).

Infundibulum candeanum, d'Orbigny, in Ramon de la Sagra's Hist. Cuba, Mollusques, vol. II, p. 190, pl. XXIV, figs. 28, 29 (1846).

Calyptræa candeana: Tryon, Man. Conch., vol. VIII, pl. XXXIV, figs. 76, 77 (copy of d'Orbigny).

Station 42, off Rio de Janeiro: 40 fathoms. West Indies (d'Orbigny).

This little species in general aspect resembles the young of the European *Calyptræa chinensis* (Linn.), but is separable on account of the perforate axis and a smaller protoconch. D'Orbigny mentions very fine radiating striæ, but after a careful examination of his types and the numerous specimens from Station 42, I have failed to observe any such marks.

11. *Calliostoma nubilum* (Philippi).

Trochus nubilus, Philippi, Zeitsch. Malak., 1848, p. 110; Conch. Cab., p. 255, pl. XXXVIII, fig. 2.

Calliostoma nubilis (sic): Pilsbry, Man. Conch., vol. XI, p. 344, pl. XVIII, fig. 22, copy of Philippi.

Station 42, off Rio de Janeiro: 40 fathoms.

A single specimen, with a rather taller spire than the type, but agreeing in other respects. *Calliostoma rioense*, Dall, is a closely allied species.

12. *Nucula uruguayensis*, Smith.

Nucula uruguayensis, Smith, Ann. Mag. Nat. Hist., 1880, vol. VI, p. 320; *id.*, "Challenger" Lamellibranchiata, p. 229, pl. XVIII, figs. 12–12B.

Station 42, off Rio de Janeiro: 40 fathoms.

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* Voy. Amér. Mérid., vol. V, p. 464 Sagra's Hist. Cuba, Moll., vol. II, p. 191.

Only a dead valve obtained, but showing that the species occurs much farther north than the original locality.

13. *Nuculana* (*Adrana*) *electa* (A. Adams).

Leda electa, A. Adams, Proc. Zool. Soc., 1856, p. 48; Hanley, Thesaurus Conch., vol. III., p. 109, pl. 227, figs. 40, 41; Sowerby, Conch. Icon., vol. XVIII, pl. I, figs. 2A, 2B.
Nucula lanceolata (Lamk.?), Sowerby, Genera, pl. 82, fig. 1.
Leda (*Adrana*) *electa*: H. and A. Adams, Genera Moll., vol. II, p. 547.

Station 42, off Rio de Janeiro: 40 fathoms. One broken valve only. Santos, Brazil (A. Ad.).

Larger, smoother, and whiter than *N. janeiroensis*, also differently sculptured.

14. *Nuculana* (*Adrana*) *janeiroensis*, n. sp. Pl. II, fig. 16.

Shell elongate lanceolate, acuminately rounded anteriorly, rostrate behind, a little inequilateral, dirty white, concentrically finely striated or very delicately sculptured with threadlike liræ, which are rather stronger near but not upon the anterior dorsal slope, which is more finely striated; they are also coarser at the rostrate end. There is a smooth linear lunule defined by a delicate keel extending from the umbo a considerable way towards the end of the dorsal margin; posteriorly there is a rather broader smooth escutcheon bounded by a rounded carina, which is strongly sculptured with close lamellæ; a second keel radiates from the umbo at a little distance from the other, both terminating at the end of the rostrum; the valves are moderately strong, convex, and glossy white within; teeth numerous, erect, extending about the same distance on both sides of the small, broadly triangular resilium-pit.

Length, 28 mm.; alt., 8; diameter, 5.

Hab.—Off Rio de Janeiro in 40 fathoms. Lat. 22° 56′ S., Long. 41° 34′ W.

At first sight this species exhibits a close resemblance to *N. crenifera*, Sowerby,* from Xipixapi, on the west coast of South America. It is, however, less acuminate anteriorly, the hinder dorsal margin is more concavely curved, the concentric sculpture at both ends is a little coarser, the valves are a trifle more convex, and the distinct ridge or keel which borders the front dorsal margin of *N. crenifera* is absent in this species. The hinge-teeth in the former are both finer and more numerous—quite fifty on each side the resilium-pit—whereas in *N. janeiroensis* there are only about thirty-eight.

N. decora† (A. Ad.) is similarly sculptured, but is shorter, a little more convex, with a shorter hinge-line and fewer teeth than the present species. I feel in some doubt whether they ought not to be considered forms of the same species. However, judging by the amount of material at hand, there is no difficulty in distinguishing them.

* Thesaurus Conch., vol. III, p. 110, pl. 227, figs. 37, 38.
† Thesaurus Conch., vol. III, p. 111, pl. 227, figs. 47, 48.

15. *Malletia cumingii* (Hanley).

Solenella cumingii, Hanley, Proc. Zool. Soc., 1860, p. 441; *id.*, Thesaurus Conch., vol. III, p. 164, pl. 226, fig. 3: Sowerby in Reeve's Conch. Icon., vol. XVIII, fig. 3 (much overcoloured).

Station 42, off Rio de Janeiro: 40 fathoms.

Described by Hanley from the Falkland Islands, it has not since been recorded further north. One dead valve only in the present collection.

16. *Limopsis janeiroensis*, n. sp. Pl. II, fig. 17.

Shell oblique, produced posteriorly, rather solid, white, moderately convex, concentrically striated with lines of growth crossed by very fine close-set radiating striæ; anterior outline prominently convex, posterior side oblique, almost straight, in some young shells a little excurved; dorsal edge straight: area narrow; central ligament-pit triangular and subequilateral in each valve; hinge-teeth about eighteen, a few in the middle under the ligament-pit small or obsolete, seven or eight on the posterior side arranged in a downward curve, those in front not so obliquely disposed; interior of the valves very faintly and minutely radiately striated near the pallial line, beyond which the margin is smooth and glossy; anterior adductor small, oval, close to the end of the hinge-plate, posterior very much larger, and considerably remote from the end of the row of teeth.

Length, 19 mm.; height, 17; diameter, 9.

Station 42, off Rio de Janeiro: 40 fathoms.

Allied to *L. pelagica*, Smith,* from mid-Atlantic, but more solid, more finely radiately striated, and having rather different hinge-teeth.

L. læviuscula, Pelseneer,† has a curved posterior outline, and the hinder margin of the valves is peculiarly thickened behind the adductor scar.

17. *Plicatula ramosa*, Lamarck.

Plicatula ramosa, Lamarck, Anim. sans Vert., vol. VI (1), p. 184 (1819); Hanley, Recent Biv. Shells, p. 288; Smith, "Challenger" Lamellibranchiata, p. 286.

Station 42, off Rio de Janeiro: 40 fathoms.

This West Indian shell occurs along all the coast of Brazil as far as Rio de Janeiro, according to d'Orbigny,‡ who recorded it as *Plicatula barbadensis*, Petiver, a non-binomial author, whose conchological names are not admissible.

18. *Pecten ziczac* (Linnæus).

Ostrea ziczac, Linnæus, Syst. nat., ed. 12, p. 1144?

Pecten ziczac: Reeve, Conch. Icon., vol. VIII, pl. VI, fig. 29.

Station 42, off Rio de Janeiro: 40 fathoms.

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* "Challenger" Lamellibranchiata, p. 254, pl. XVIII, figs. 3–3A.

† Voy. "Belgica," Mollusca (1903), p. 24, pl. VII, figs. 91, 92.

‡ In Ramon de la Sagra's Hist. Cuba, Mollusques, vol. II, p. 360.

Two small broken valves only.

This species occurs throughout the West Indies, but has not been recorded so far south as Rio de Janeiro. The localities "Red Sea and Philippine Islands," given by the monographers Sowerby, Reeve, Hanley, and Kobelt, evidently do not apply to this species.

19. *Chlamys tehuelchus* (d'Orbigny).

Pecten tehuelchus, d'Orbigny, Voy. Amérique Mérid., Moll., p. 662, pl. LXXXV, figs. 21–24 (1847); Bavay, Journ. de Conch., 1906, pp. 1–10.

Pecten darwinii, Reeve, Conch. Icon., vol. VIII, fig. 62 (1853).

Station 42, off Rio de Janeiro: 40 fathoms.

This species has been recorded by d'Orbigny and Reeve from the east coast of Patagonia, and by M. Bavay from the shores of Argentina. M. Bavay also mentions its occurrence in a fossil state in several places on the coast of the Province of Buenos Aires. Only young specimens were obtained at Station 42, and these exhibit the variation in the number of costæ and sculpture indicated by M. Bavay.

20. *Chlamys nodosus* (Linnæus).

Pecten nodosus (Linn.): Reeve, Conch. Icon., vol. VIII, fig. 15; Sowerby, Thesaurus Conch., vol. I, p. 66, pl. XV, fig. 115, pl. XVII, fig. 147; Küster, Conch. Cab., pp. 41, 112, pl. XI, figs. 3–5, pl. XXXII, fig. 2.

Station 42, off Rio de Janeiro: 40 fathoms.

One right valve, an inch long.

This common West Indian shell has not been known previously from so southern a locality. The specimens I recorded from St. Helena* as *P. corallinoides*, d'Orbigny, I now consider small examples of the present species.

21. *Lucina costata*, d'Orbigny.

Lucina costata, d'Orbigny, Voy. Amér. Mérid., Moll., p. 586; *id.* in Ramon de la Sagra's Hist. Cuba, Moll., vol. II, p. 296, pl. XXVII, figs. 40–42 (1846).

Lucina antillarum, Reeve, Conch. Icon., vol. VI, pl. X, fig. 37.

Station 42, off Rio de Janeiro: 40 fathoms.

A few odd valves differing from the typical form in exhibiting only concentric sculpture on the posterior dorsal area, and in having the anterior adductor impression a little shorter than usual in this species, which also occurs in the West Indies.

22. *Lucina* (*Divaricella*) *quadrisulcata*, d'Orbigny.

Lucina quadrisulcata, d'Orbigny, Voy. Amér. Mérid., Moll., p. 584 (1847); *id.*, Sagra's Hist. Cuba, Moll., vol. II, p. 294, pl. XXVII, figs. 34, 36; Smith, "Challenger" Lamellibranchiata, p. 177.

Lucina eburnea, Reeve, Conch. Icon., vol. VI, pl. VIII, fig. 49.

Lucina americana, C. B. Adams, Contrib. Conch., p. 243.

Station 42, off Rio de Janeiro: 40 fathoms.

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* Proc. Zool. Soc. 1890, p. 306.

Originally described by d'Orbigny from Rio de Janeiro. He also quoted it from various islands in the West Indies. The habitats "St. Elena, West Columbia and Panama," given by Reeve for *L. eburnea*, require confirmation.

23. *Diplodonta patagonica* (d'Orbigny).

Lucina patagonica, d'Orbigny, Voy. Amér. Mérid., Moll., p. 587, pl. LXXXIV, figs. 16, 17 (1847).
Loripes patagonica: Tryon, Proc. Acad. Nat. Sci. Philad., 1872, p. 90.

Station 42, off Rio de Janeiro: 40 fathoms.

D'Orbigny describes this shell as "albida," and as inhabiting the "sable vaseux, au niveau des marées basses" at San Blas, north of Patagonia. This may account for the pale brownish tint of his types in the British Museum, which have the appearance of being mud-stained. Beyond being much whiter the shells in the present collection agree in all other respects. *Diplodonta brasiliensis*, Mittre (1850), *Lucina janeiroensis*, Reeve (1850), *L. subglobosa*, C. B. Ad. (1847), and *L. guaraniana*, d'Orbigny (1847), appear to belong to the same species, but differ in form from *D. patagonica*. They are all recorded from Brazil, excepting *subglobosa*, said to be West Indian.

24. *Tellina petitiana*, d'Orbigny.

Tellina petitiana, d'Orbigny, Voy. Amér. Mérid., vol. V, Moll., p. 537, pl. LXXXI, figs. 26, 27 (1847); Bertin, Nouv. Arch. Mus. Paris, série 2, vol. I, pp. 211, 299, name only.

Station 42, off Rio de Janeiro: 40 fathoms. Off Cape Saint-Thomé, Brazil, at a depth of 80 metres (d'Orbigny).

This species appears to have been overlooked in the monographs by Sowerby * and Römer,† and was merely noticed by Bertin as non-existent in the Paris Museum. It is of a very elongate form, rounded at the anterior end, and pointed at the other extremity. The right valve has two divergent cardinal teeth, of which the hinder one is bifid. The laterals are slender, that on the anterior side, slightly divergent from the dorsal margin, is connected above with the oblique anterior cardinal. The posterior tooth is more remote and passes into the nymph which supports the ligament. The anterior of the two cardinals in the left valve is thick, triangular, and bifid; the posterior slender and inclined backwards. The anterior adductor-scar is pyriform, the posterior rounder. The pallial sinus is very deep and extends almost across three-fourths of the shell, which is pure white within and without.

Several odd valves were obtained by the "Terra Nova," the largest being 36 mm. in length and 16 in height.

* Conch. Icon., vol. XVII.
† In Martini and Chemnitz Conchyl. Cab., 1870–3.

25. *Macoma angusta*, n. sp. Pl. II, figs. 18, 19.

Shell oblong, inequilateral, longer in front than behind, white, rounded anteriorly, narrowed, shortly rostrate, and obliquely truncate posteriorly; valves thin, finely concentrically striated, the right a little less convex than the left; the front dorsal margin longer than the posterior, a little curved, but not much descending; hinder margin obliquely sloping, somewhat concave; in both valves there is a faint keel extending from the umbo to the extreme point at the hinder end; two cardinal teeth in each valve; in the right the anterior tooth is thicker than the posterior, which is bifid; in the left the anterior is bifid, and much stronger than the hinder one, which is quite slender, and directed backwards; interior of the valves glossy, faintly radiately striated at the ventral margin; anterior adductor-scar elongate, posterior roundly pyriform; pallial sinus extending three-fourths across the valves, rounded in front.

Length, 16·5 mm.; alt., 9; diameter, 4.

Station 42, off Rio de Janeiro: 40 fathoms.

Macoma assimilis, Hanley,* from the Philippine Islands, closely resembles the present species as regards form; it is, however, rather more obtuse in front, and the valves are more tumid and more glossy.

26. *Semele cordiformis*, Chemnitz.

Tellina cordiformis, Chemn., Conch. Cab., vol. XI, figs. 1941–2 (1795).
Amphidesma cordiformis: Reeve, Conch. Icon., vol. VIII, pl. V, fig. 30.
Semele cordiformis: Smith, Proc. Zool. Soc., 1890, pp. 301, 321.

Station 42, off Rio de Janeiro: 40 fathoms.

One small valve only.

Some remarks on the synonymy and distribution of this species are given by the present writer in the place cited above.

27. *Mactra* (*Mactrinula*) *janeiroensis*, n. sp. Pl. II, fig. 20.

Shell broadly subtrigonal, a little inequilateral, longer behind the umbones than in front, white, subpellucid, thin, concentrically plicate upon the umbones, and finely striated with the lines of growth upon the lower half of the valves; a rather sharp keel running from the tip of the umbones to the posterior end of the valves marks off the hinder dorsal area; there is also a smooth lunular area; the concentric ridges or plicæ do not extend into either the lunular or the posterior area; in the latter, one or more faint radiating keels or ridges are also usually observable; dorsal margins oblique, at first nearly rectilinear, then curving downwards at the ends; anterior end sharply rounded, posterior rather more acuminate, ventral margin very widely arcuate; umbones smooth at the extreme tip, inclined towards the front, a little

* Thesaurus Conch., vol. I., p. 302, pl. LVIII, fig. 95, as *Tellina*.

antemedian, approximated, but not quite touching; interior of the valves showing traces of the external sculpture, white, rather glossy; hinge normal, somewhat delicate; anterior adductor impression narrowly pyriform, posterior larger, round; pallial sinus long, rounded at the end, extending about half-way across the valves.

Length, 31 mm.; height, 20; diameter, 12.

Station 42, off Rio de Janeiro: 40 fathoms.

M. angusta, Deshayes,* from Panama, is rather like this species, but is flatter, not so trigonal in shape, being broader at the anterior end. The plicæ on the umbones are less developed, and the hinge is rather more delicate.

28. *Macrocallista maculata* (Linnaeus).

Venus maculata, Linn., Syst. nat., ed. X, p. 686.
Venus (Cytherea, Callista) maculata: Römer, Monog. *Venus, Callista*, p. 46, pl. XVI, figs. 1–1c.

Station 42, off Rio de Janeiro: 40 fathoms.

Only one small valve obtained.

For references and synonymy see Römer and Dall.† A very common West Indian shell, and already recorded by d'Orbigny from Rio de Janeiro.

The late Mr. Jukes-Browne (Proc. Malac. Soc., vol. X., p. 344) upheld the use of the genus *Callista* of Poli as restricted by H. and A. Adams in 1857, but as pointed out by Dall this name of Poli's had already in 1852 been applied to quite a different group of Veneridæ.

Mr. Jukes-Browne's argument (l.c. p. 336) upon this subject appears to me unconvincing, and I fail to see that in this instance "the rule of priority is breaking down from the shear weight of absurdities," etc.

29. *Pitaria rostrata* (Koch).

Cytherea rostrata, Koch, in Philippi's Abbild., vol. I, p. 150, pl. I, fig. 3 (1844).

Station 42, off Rio de Janeiro: 40 fathoms.

For synonymy, references, and some remarks, see Smith. "Challenger" Lamellibranchiata, p. 137. Only a number of odd valves were obtained at the above station. They are rather longer in proportion to the height than the typical form figured by Philippi, and the pallial sinus is wider and not so pointed.

Length of largest specimen, 33 mm.; of Koch's type, 39 mm. Height of largest specimen, 26 mm.; of Koch's type, 36 mm.

* Reeve's Conch. Icon., vol. VIII, fig. 93.

† Trans. Wagner Inst. Sci. Philad., vol. III, p. 1256 (1903).

30. *Corbula tryoni*, Smith. Pl. II, figs. 21, 22.

Corbula tryoni, Smith, Ann. Mag. Nat. Hist., 1880, vol. VI, p. 321.

Station 42, off Rio de Janeiro : 40 fathoms.

Only a single lower valve was dredged at the above station. The species was originally described from 48 fathoms in 32° 45′ S. lat., 50° 39′ W. long., east of Uruguay. The figures now given are taken from the type specimen.

31. *Cuspidaria braziliensis*, n. sp. Pl. II, fig. 23.

Shell not very thin, elongate, rounded in front, prolonged and rostrate behind, moderately globose, exhibiting fine growth-lines and minute crowded granules upon the entire surface, those upon the upper slope of the rostrum being arranged in closely packed transverse series; dirty white, surface dull, not glossy; dorsal margins oblique, anterior straight at first, then curving into the rounded end, posterior longer, a little concave; lower margin sinuated below the beak, then widely curved. Umbones antemedian. An oblique faint depression from the umbones to the sinus in the ventral outline marks off the rostrum, the upper part of which is feebly defined by an oblique obscure ridge. Character of the hinge normal. Interior of the valves white, somewhat glossy, exhibiting some rather faint irregular radiating striæ, which are more or less interrupted by a subpunctate impression from the anterior adductor-scar to the broad, rounded, pallial sinus; anterior impression ovate, posterior semicircular, truncate above.

Length, 27 mm.; height, 15; diameter, 11.

Station 42, off Rio de Janeiro : 40 fathoms.

This species is at once distinguishable from others, more or less similar in form, by the minutely granose surface, a most uncommon feature in the genus.

32. *Cuspidaria* (*Cardiomya*) *simillima*, n. sp. Pl. II, fig. 24.

Shell ovate, posteriorly rather shortly rostrate, inequilateral, longer in front of the umbones than behind, white, very convex; valves thin, with about twenty-five curved radiating costellæ upon the greater part of the surface, but not upon the rostrum; a few of the posterior costæ are stronger than the rest, the hindmost one marking off the comparatively smooth beak; this, however, exhibits a few (nine or ten) very fine curved liræ, some of which near the dorsal margin are rather indistinct, being crossed by crowded growth-striæ; the rest of the surface of the valves is also covered with very fine lines of growth; anterior dorsal margin obliquely arched, posterior more obliquely inclined, and a little concave; anterior end sharply rounded, ventral edge widely arcuate, but slightly incurved at the rostrum; umbones smooth at the tip, almost contiguous, inclining backwards; lunular area without radiating liræ, and there is also a lanceolate, smooth, sunken escutcheon posteriorly; interior of the valves faintly radiately sulcate, except towards the lower margin, where the grooves are deeper, producing a pectinate edge; hinge normal, and posterior adductor-scar bounded by a rounded ridge passing from under the hinge-line.

Length, 15 mm.; height, 10·25; diameter, 8·5.

Station 42, off Rio de Janeiro, 40 fathoms; and Station 38, west of Falkland Islands, 125 fathoms.

Closely allied to *C. curta*, Jeffreys, but rather longer in proportion to the height, and more distinctly costate upon the anterior half of the valves. The anterior dorsal outline is not so hunched up as in *curta*.

5. SOUTH TRINIDAD ISLAND.

1. *Arca* (*Barbatia*), sp.

Station 36, South Trinidad Island: on the shore.

Two specimens, in somewhat decomposed condition, appear to be very closely related to the Mediterranean *Arca barbata*, but owing to the bad state of preservation it would be hazardous to pronounce a definite opinion.

2. *Modiolaria lateralis* (Say).

> *Mytilus lateralis*, Say, Journ. Acad. Nat. Sci. Philad., vol. II, p. 264 (1822).
> *Modiola marmorata*, Forbes (1838); Forbes and Hanley, Brit. Moll., vol. II, p. 198, pl. XLV, fig. 4.

Station 36, South Trinidad Island: on the shore.

Originally described by Say from Florida, this species occurs further north along the coast of the United States. It is also known from Bermuda. On comparing British with American specimens I fail to find any real distinguishing features. *M. cuneata*, Gould, and *M. cænobita*, Vaillant, may be regarded as forms of this species.

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PLATE I.

Fig. 1. *Margarites gemma*, n. sp.
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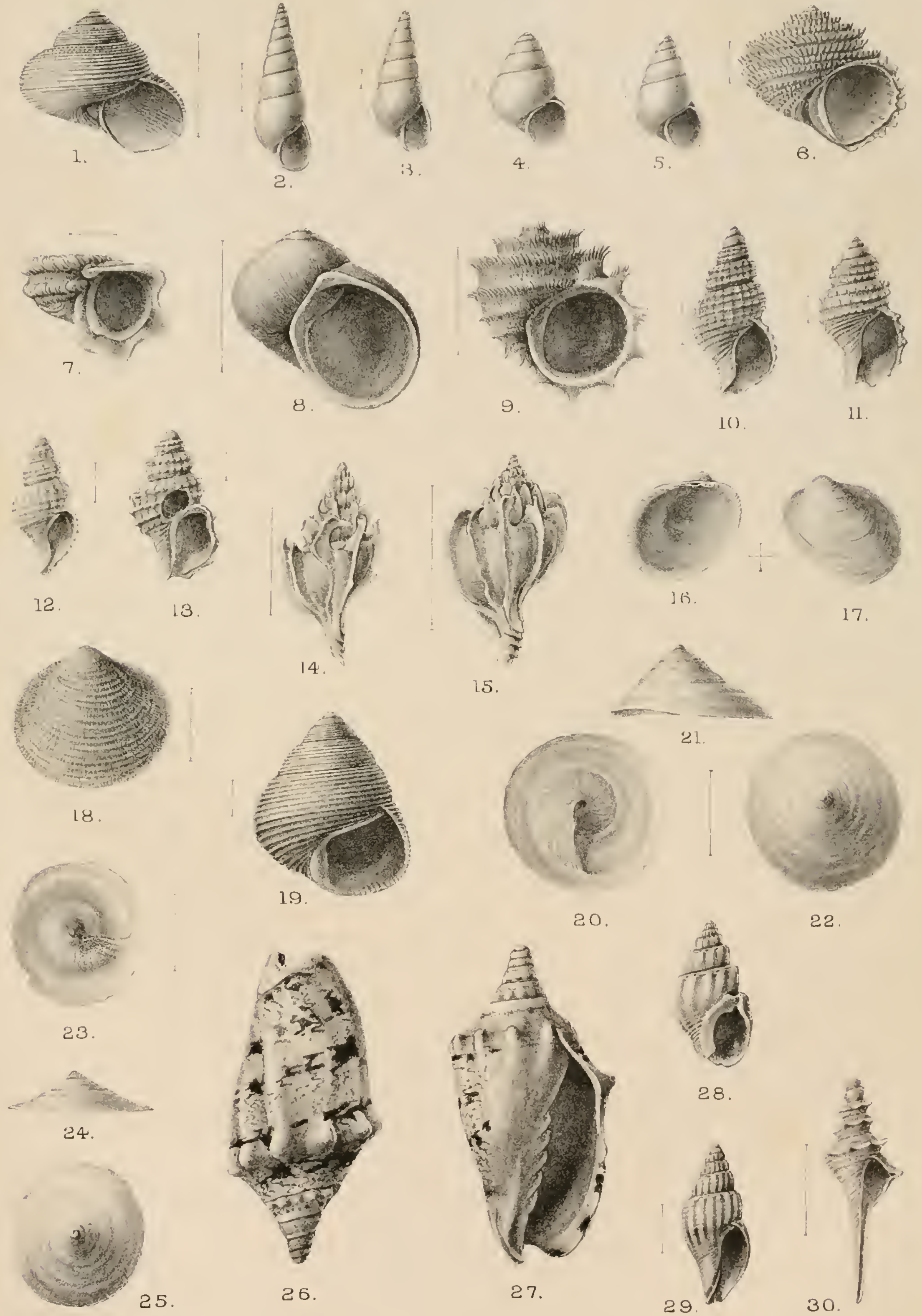
Brit. Antarctic (Terra Nova) Exped. 1910.



J Green del. et lith. Huth imp.

PLATE II.

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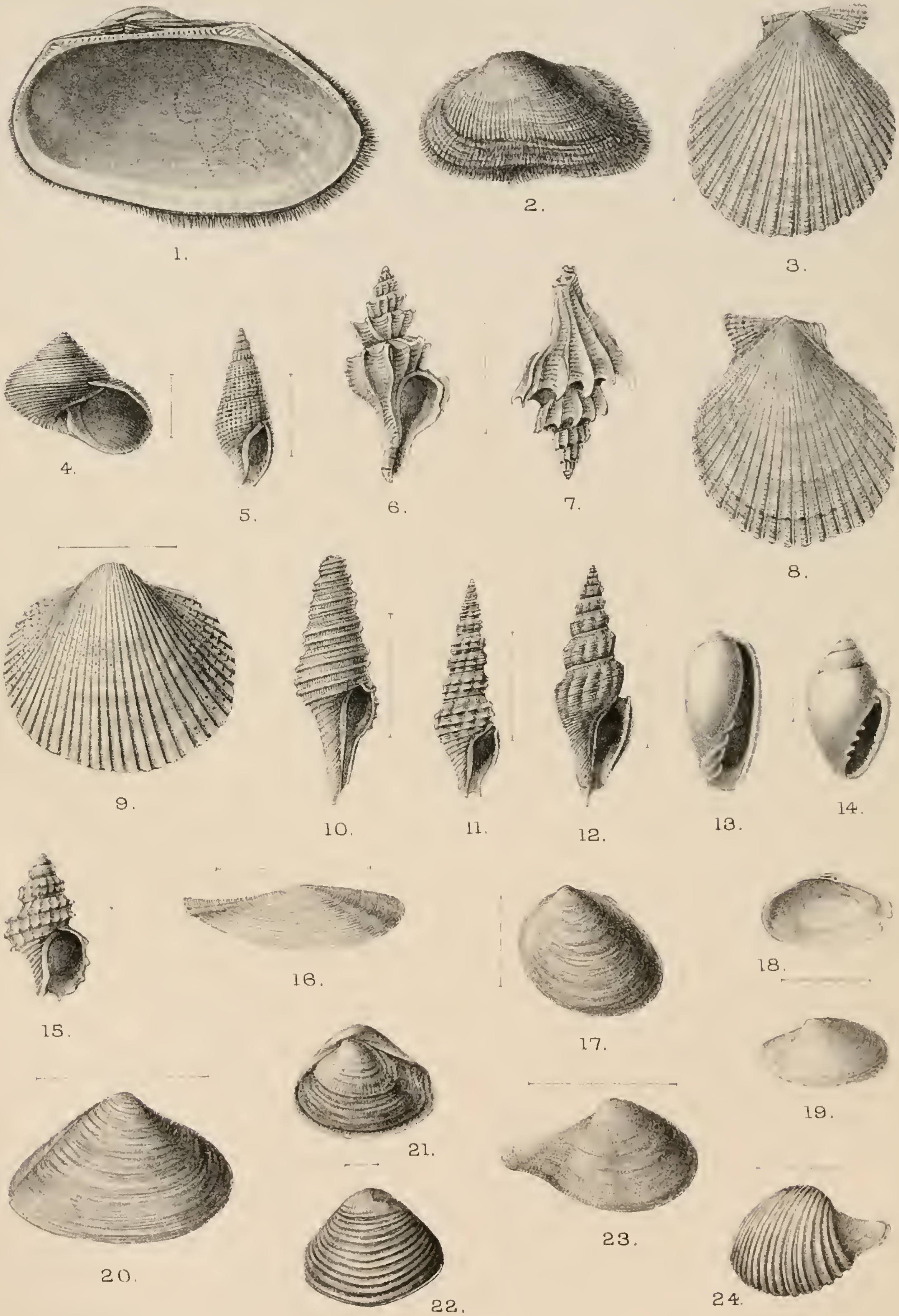

J Green del. et lith. Huth imp.

NEMERTINEA.

BY H. A. BAYLIS, B.A.

WITH FOUR FIGURES IN THE TEXT AND PLATES I-II.

I.—GENERAL.

The Nemertinea collected by the "Terra Nova" came, for the most part, from the Antarctic and Subantarctic regions, chiefly from dredging-stations in the Ross Sea and McMurdo Sound.

Three species, each represented by a single specimen, were captured off New Zealand.

The total number of species in the collection is small, and of this number very few are certainly new to science. A survey of the whole collection gives the following results:—

Total number of species, 10.
Previously described species, 5.
New species, 2.
Doubtful species, 3.

The previously described species are the following:—

(*a*) From the Antarctic regions:—

Amphiporus moseleyi, Hubr.
Amphiporus multihastatus, Joubin.

Prostoma unilineatum (Joubin).
Lineus corrugatus, M'Int.

(*b*) From New Zealand :—
Baseodiscus giardii (Hubr.).

The two forms described as new are :—
Baseodiscus antarcticus, sp. n., and
Lineus scotti, sp. n.,
both from the Antarctic regions.

The three doubtful forms are :—
(*a*) From the Antarctic regions :—
A very small specimen, apparently belonging to the genus *Cerebratulus*, and probably very young.

(*b*) From New Zealand :—
Two species probably belonging to the genus *Lineus*, each represented by one specimen only. They are referred to in the sequel as *Lineus*, spp. "A" and "B."

The material on the whole is very well preserved, and no difficulty, on the ground of preservation, has been experienced in making out microscopic details by means of sections or otherwise. On the other hand, the number of specimens in some cases is so small that it was thought undesirable to dissect them to any great extent, and the accounts given of their structure must be regarded as subject to modification at some future time, when more abundant material may be available.

It is a matter for regret that almost no record appears to have been kept of the colours and markings of the various species during life. The specimens, by the time that they were handed over to me for study, were all, with a very few exceptions which will be mentioned in their appropriate places, deprived of all traces of their natural colours by the spirit in which they had been stored.

Transverse sections taken by hand were employed as a means of assigning many of the specimens to their position. This method was found extremely valuable for rapidly sorting individuals which were so contracted, or of such nondescript external appearance, as to be inseparable by mere inspection. The sections were lightly stained with Paracarmine or Picrocarmine, and rapidly differentiated, dehydrated, cleared (preferably in Xylol) and mounted in Balsam. In the cases where serial sections were made, the best results were obtained by staining on the slide with Hæmalum, or with Delafield's Hæmatoxylin followed by Eosin.

Creosote was found useful in clearing some preparations, such as the proboscis of the Amphiporidæ, in order to see details of structure without making permanent mounts.

The following Table gives a conspectus of the various collecting stations, and the species of Nemertinea collected at each station. The numbers in the left-hand column correspond with the numbers in thick type in the general "List of Collecting Stations" of the Expedition (Vol. II., pp. 1–12):—

Station No.	Position.	Nature of Bottom.	Depth (in fathoms and mètres).	Species.
91	From Summit, Great King, Three Kings Islands, S. 10° W., 25 miles (New Zealand)	Rock.	300 fms. (548 m.)	*Bascodiscus giardii.* *Lineus*, sp. "B."
134	Spirits Bay, near North Cape, New Zealand.	Shelly.	11–20 fms. (20–37 m.)	*Lineus*, sp. "A."
220	Off Cape Adare, mouth of Robertson's Bay (Antarctic).	Shingle.	45–50 fms. (82–92 m.)	*Amphiporus moseleyi.* *A. multihastatus.* *Prostoma unilineatum.* *Lineus corrugatus.* *L. scotti.*
294	Ross Sea, Lat. 74° 25′ S., Long. 179° 3′ E.	(?)	158 fms. (289 m.)	*Amphiporus moseleyi.* *Lineus corrugatus.* *L. scotti.*
314	5 miles N. of Inaccessible Island, McMurdo Sound (Antarctic).	Mud.	222–241 fms. (406–441 m.)	*Bascodiscus antarcticus.* *Lineus scotti.*
316	Off Glacier Tongue, about 8 miles N. of Hut Point, McMurdo Sound.	Undecomposed animal remains and mud.	190–250 fms. (348–457 m.)	*Amphiporus multihastatus.* *Lineus corrugatus.* *L. scotti.*
331	Off Cape Bird Peninsula, entrance to McMurdo Sound.	Mud.	250 fms. (457 m.)	*Amphiporus multihastatus.* *Lineus corrugatus.* *L. scotti.*
338	McMurdo Sound, Lat. 77° 13′ S., Long. 164° 18′ E.	,,	207 fms. (379 m.)	*Lineus corrugatus.* *L. scotti.*
339	Entrance to McMurdo Sound, Lat. 77° 5′ S., Long. 164° 17′ E.	,,	140 fms. (256 m.)	*Amphiporus moseleyi.* *Lineus corrugatus.* *L. scotti.* ? *Cerebratulus*, sp., juv.
340	Ross Sea, Lat. 76° 56′ S., Long. 164° 12′ E.	,,	160 fms. (293 m.)	*Lineus corrugatus.* *L. scotti.*
355	McMurdo Sound, Lat. 77° 46′ S., Long. 166° 8′ E.	(?)	300 fms. (548 m.)	*Bascodiscus antarcticus.* *Lineus scotti.*
356	Off Granite Harbour, entrance to McMurdo Sound.	Mud.	50 fms. (92 m.)	*Amphiporus multihastatus.* *Lineus corrugatus.*

II.—SYSTEMATIC AND MORPHOLOGICAL.

Order METANEMERTINI.

Fam. AMPHIPORIDÆ.

Amphiporus, Ehrenberg, 1831.

1. *Amphiporus moseleyi*, Hubrecht.

Amphiporus moseleyi, Hubrecht, 1887, pp. 20–22; Pl. I, figs. 20, 21; Pl. IX, figs. 4, 7–9; Pl. X, fig. 3; Pl. XV, figs. 11, 12, 20.

Stations 220, 294, 339: 45–158 fathoms.

The collection contains three small specimens and various fragments, including pieces of the proboscis, which I assign to this species, not, however, without some hesitation. The material being so scanty, and the specimens not attaining to the large size of the types in the "Challenger" collection, though some of them are sexually mature, it may be questioned whether we are not here dealing with a new form. But on comparing the details of the proboscis-armature, and hand-sections taken through the whole animal, with the "Challenger" preparations and figures of this species, the resemblances are so great, and the differences so slight, that I do not feel justified in making a specific distinction.

With so small a number of specimens at my disposal, I was unable to cut a series of sections, and have therefore no important contribution to make to the anatomy of the species. It may be remarked, however, that in the various transverse sections taken by hand, chiefly in the middle or posterior region of the body, the lateral nerve-stems do not appear to be situated quite so far dorsally as in the type material. Hubrecht, indeed, lays particular emphasis on the point that the nerve-stems lie *above* the lateral gut-cæca in *A. moseleyi*, and notes this as one of the characteristic features of the species. In the examples now under consideration the nerves do, apparently, lie at some distance from the lateral margin of the body, and nearer to the dorsal than the ventral side, but they are not entirely dorsal to the gut-cæca, parts of which extend outwards both above and below them, and may be said to envelope them, as it were, on three sides. This slight discrepancy may, of course, be due merely to different states of contraction, or to a difference in the level at which the sections were cut.

The nerve-layer of the proboscis, as I find is the case in the "Challenger" material, contains fourteen longitudinal nerves.

The genital organs are also arranged as stated in Hubrecht's account.

The only other point specially observed was the great development, in some specimens, of muscle-bundles running through the gelatinous parenchyme in a dorso-ventral direction. These muscles pass through the longitudinal muscle-layer, and are connected with the circular muscle-layer dorsally and ventrally.

2. *Amphiporus multihastatus*, Joubin. (Pl. I, figs. 1, 2, 5, 7, 9.)

Amphiporus multihastatus [Punnett (*in litt.*)], Joubin, 1910, pp. 11–12; Text-figs. 15, 16; Pl. I, figs. 7, 8.

Stations 220, 316, 331, 356: 45–250 fathoms.

This species appears to be tolerably abundant in and near McMurdo Sound. It was first recorded from Cape Adare, in the "Southern Cross" collection, and some of the "Terra Nova" material comes from the same locality. The collection contains thirteen specimens and some fragments belonging to this species. As it has been possible to cut some serial sections, and to examine the proboscis carefully, a few points in the structure of the species, which have not previously been described, may now be noticed, and a few measurements given.

External Features.

The largest specimens measure about 5 cm. in length. Their thickness, according to the state of contraction, is very variable.

The alimentary canal and proboscis-sheath have a common opening on the head, in the form of a median vertical slit (Pl. I, fig. 2, M.). The external openings of the cerebral organs are in the form of crescentic slits, mainly transverse in direction (Pl. I, fig. 2, C.S.) Numerous eyes were found to be present: they are situated rather deep in the substance of the head, and are arranged in two lateral patches (Pl. I, fig. 1, E.).

Internal Anatomy.

Alimentary Canal.—The œsophagus is at first (in the region of the brain) very narrow. Soon, however, it expands into a voluminous stomach, with much folded walls. This is succeeded again by a narrower pyloric canal (Pl. I, fig. 5, Pyl.) which opens into the mid-gut at about 4 mm. (in a spirit specimen, as calculated from serial sections) from the tip of the head. There is a large cæcum (Pl. I, fig. 5, Cæc.) extending forwards from this point, ventrally to the pyloric canal, as far as the posterior end of the folded stomach, with which it appears to be in close contact. This caecum sends out numerous lateral pockets (Pl. I, fig. 5, L.P.), which curve upwards within the muscles of the body-wall.

Proboscis.—The most striking feature of the proboscis in this species, as M. Joubin notices, is its very great thickness in proportion to the animal's body. Its anterior portion is exceedingly muscular, and its diameter is about equal to half that of the body (Pl. I, fig. 5, Pr.). The nerve-layer of this portion of the organ contains sixteen longitudinal nerves.

The armature of the proboscis (Pl. I, fig. 7) is quite distinctive. The stylets are of a blunter and stouter shape than is usual in the genus, and are particularly broad at the base. The functional stylet measures 0·28 mm.–0·40 mm. in length, and in width, at the point of attachment, 0·12 mm.–0·22 mm. The basis of the functional stylet is also very broad and stout, and is of a somewhat triangular outline. It measures 0·70 mm.–1·3 mm. in length, and 0·4 mm.–0·8 mm. in width at its thickest part, which is posterior.

The reserve stylets are contained in twenty-eight or thirty pockets, arranged in a circle round the bulbous expansion of the proboscis (Pl. I, fig. 7). Each pocket contains one, or at most two, stylets.

Body-wall.—The external epithelium stands on a comparatively thick basement-membrane (Pl. I, figs. 5 and 9, B.M.). The circular muscle-layer is not very thick, but the longitudinal layer (Pl. I, figs. 5 and 9, L.M.) is well-developed, and about equal in thickness to the external epithelium and basement-membrane together.

Cephalic Organs.—Each of the crescentic apertures leads into a cavity which is wide at first, but soon becomes a narrower tube, circular in section, running backwards and inwards to come into connection with the anterior part of the brain. The inner end of each organ is surrounded by the usual ganglionic and glandular structures.

Genital Organs.—In both sexes the gonads are arranged in a manner very similar to that of *A. moseleyi*; *i.e.*, they are distributed round the inside of the body-wall, so that several may be seen in the same transverse section (Pl. I, fig. 9, G.), and without any definite alternation with the gut-cæca. Their ducts open, for the most part, at the sides of the body, but towards the hinder end, where the genital sacs are more numerous, some of the openings are dorsal and ventral.

Fam. PROSTOMATIDÆ.

Prostoma, Ant. Dugès, 1828. [= *Tetrastemma*, Ehrenberg, 1831.]

3. *Prostoma unilineatum* (Joubin). (Pl. I, figs. 3, 8. Text-figs. 1–2.)

Tetrastemma unilineatum [Punnett (*in litt.*)], Joubin, 1910, p. 12; Pl. I, fig. 9.

Stations 220, 339: 45–140 fathoms.

Of this pretty little species there are nine examples in the present collection.* The type specimens in the "Southern Cross" collection are in poor condition, but there can be little doubt of the determination of these individuals. One of them (Pl. I, fig. 3)

* At the time of studying the material, only two specimens were available. Seven more very small individuals were subsequently sorted out from among dredged material from Station 220.

is somewhat larger than the type specimens, the body measuring 8 mm. in length, and 3 mm. from side to side at the widest part, which is about the middle. The animal tapers towards the head and tail. The dorsal surface is convex, the ventral surface concave. The proboscis was extruded to a distance of 3 mm., but is now broken off, and a microscopic preparation has been made of it to show the armature.

Several of the specimens are very minute, measuring only about 2 mm. in length.

The coloration (in spirit) is as follows: the dorsal side is of a yellowish flesh-colour, with a distinct reddish-brown pigmented median stripe; the ventral side is of a pale ochreous yellow.

The four large eyes have been made out by clearing in creosote. The two on either side lie close together, one behind the other. (Text-fig. 1.)

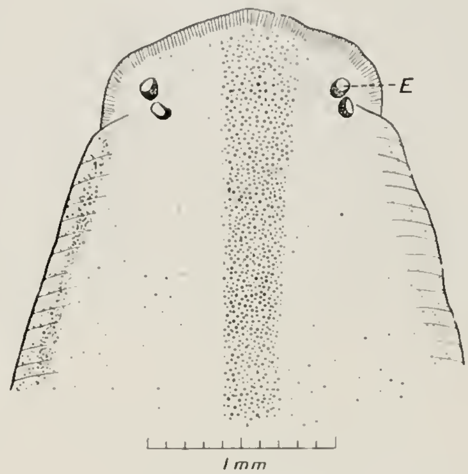

Fig. 1.—*Prostoma unilineatum*: dorsal view of the anterior end, magnified, showing the eyes (E.)

Internal Anatomy.

The anatomy has not been fully worked out, as serial sections have not been cut. A few transverse sections taken by hand reveal the following characters:

Body-wall.—The external epithelium (Pl. I, fig. 8, Ep.) consists of very tall cells, interspersed with many unicellular glands and their secretions, which are seen escaping to the exterior. It rests on a thin basement-membrane, which separates it from the circular muscle-layer. Both this latter layer and the succeeding longitudinal layer are thin and but feebly developed.

Ova.—The largest specimen is a female, and the entire space within the longitudinal body-muscles, where not occupied by the gut and its lateral diverticula, or by the proboscis-sheath, is filled with eggs of relatively enormous size (Pl. I, fig. 8, Ov.), measuring about 0·4 mm. in diameter. Their nuclei are also large (0·08 mm.–0·1 mm. in diameter) and contain many refringent globules.

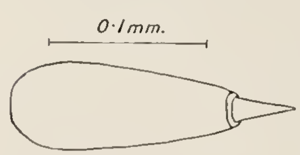

Fig. 2.—*Prostoma unilineatum*: the functional stylet of the proboscis, and its basis, highly magnified.

Proboscis-sheath and Proboscis.—The proboscis-sheath is proportionally large, and is supplied with strong circular muscles.

The proboscis is relatively very stout, but its armature is minute, in accordance with the small size of the whole animal. The form of the central stylet and its basis is represented in text-fig. 2. The basis measures 0·15 mm. in length. There are two pockets containing reserve stylets to the number of about four in each.

ORDER HETERONEMERTINI.

FAM. BASEODISCIDÆ.

Baseodiscus, Diesing, 1850. [= *Eupolia*, Hubrecht, 1887.]

4. *Baseodiscus antarcticus*, sp. n. (Pl. I, figs. 4, 6.)

Stations 314 and 355: McMurdo Sound, 222–300 fathoms.

A fairly distinct constriction immediately behind the mouth, when the head is not retracted. Cephalic grooves lateral and vertical. Mouth small and circular. Primary basement-membrane of cutis deep, but loose, and with many radial muscle-fibres. A well-developed layer of gland-cells in connection with the cutis. Bundles of fibres in outer longitudinal muscle-layer of body separated by much gelatinous tissue. Circular muscle-layer thin. Walls of gut not folded. Proboscis slender, and proboscis-sheath thin-walled.

Two specimens which I refer to this form occur in the collection.

The larger of the two measures 5·5 cm. in length, and has a maximum thickness of 9 mm. The smaller, which is apparently a young female, measures only 2 cm. in length and 5 mm. in thickness.

There is no trace of colour or markings upon either individual.

EXTERNAL FEATURES.

In the small specimen the characters of the head (Pl. I, fig. 4) can be fairly well made out; it is marked off from the body by a moderately distinct constriction, immediately behind the mouth. The proboscis-pore (P.P.) is a well-marked vertical slit just below the apex of the head. The shallow cephalic grooves (G.) are lateral and vertical, and apparently do not form a complete ring. The mouth (M.) is small and circular, with regularly wrinkled margin.

In the larger example the head is much retracted, and little of these features can be made out with certainty.

INTERNAL ANATOMY.

A small piece was taken from about the middle of the body of the small specimen, and cut into transverse sections (Pl. I, fig. 6). These reveal the following features:—

The external epithelium of the body (Ep.) consists of tall cells, resting on a secondary basement-membrane ($B.M^2.$), succeeded by two thin layers of muscle-fibres, an outer circular and an inner longitudinal. Beneath the latter is a well-developed layer (Gl.) of large glandular cells. Next comes the thick primary basement-membrane ($B.M^1.$), consisting of a rather loose connective tissue, through which many bundles of muscle-fibres pass outward radially.

The outer layer of longitudinal body-muscles ($L.M^2.$) comes next in order. The bundles of fibres belonging to this layer are somewhat scattered, and are embedded in a considerable amount of gelatinous and solid-looking connective tissue.

The circular muscle-layer (C.M.) is thin. Between it and the outer longitudinal muscles lie the large lateral nerve-stems (L.N.).

The inner layer of longitudinal muscles ($L.M^1.$) is comparatively thick and dense. Beneath it lie the proboscis-sheath (P.S.), the gut, and a certain amount of loose connective tissue. In this connective tissue, between the muscles and the gut, there are numerous large spaces, some of which are probably blood-sinuses, but others appear to be the gonadial sacs. The former are situated dorsally and ventrally, the latter at the sides. In the anterior part of the series of sections these gonadial spaces are empty, but more posteriorly ova are beginning to be developed from their walls. The ova always appear on that side of the sac which is towards the exterior. The sex of the larger specimen was not determined, and I am unable to give any particulars as to the arrangement of the gonads in the male.

The gut (Pl. I, fig. 6, Int.) is simple and spacious, and its wall is not folded.

The proboscis is feebly developed, and its sheath is thin-walled, and not abundantly provided with muscles.

With such scanty material available, nothing further can be said at present of the anatomy of this species. Its chief interest lies in the fact that it is the only member of the genus as yet recorded from truly Antarctic waters, unless we accept *Eupolia punnetti* as a "good" species. I shall further state my views with regard to this question under the heading of *Lineus corrugatus*; but I may be permitted to remark here that I can see no reason for referring that form to the genus *Eupolia* (or *Baseodiscus*). If this view be correct, the present species will be the only one, I believe, hitherto recorded from a latitude further south than 42°.

5. *Baseodiscus giardii* (Hubr.)

Eupolia giardii [M'Intosh (*in litt.*)], Hubrecht, 1887, pp. 11–13: Pl. I, figs. 7–9; Pl. V; Pl. VI, figs. 4–11; Pl. VII, figs. 4, 5, 8; Pl. X, fig. 6; Pl. XI, fig. 12.

Station 91: 300 fathoms.

A single specimen taken near Three Kings Islands, New Zealand, appears to belong, in all probability, to this species. It measures about 6 cm. in length, and has a thickness of 6 mm. The head-end tapers somewhat, and shows a faint surrounding groove, as described and figured by Hubrecht. The tail is conically pointed, and thicker than the head.

The specimen is a female.

No traces of colour can now be made out.

Fam. LINEIDÆ.

Sub-Fam. LINEINÆ.

Lineus, Sowerby, 1806.

6. *Lineus corrugatus*, M'Int. (Text-figs. 3–4.)

Lineus corrugatus, M'Intosh, 1876, pp. 322–323. M'Intosh, 1879, p. 262; Pl. XV, figs. 17, 18. Studer, 1879, p. 123. Bürger, 1904 (1), pp. 96–97. Joubin, 1910, pp. 2–8; Text-figs. 1–10; Pl. I, figs. 1–5.

Cerebratulus corrugatus, Hubrecht, 1887, pp. 41–43; Pl. I, fig. 17; Pl. XI, fig. 9; Pl. XII, figs. 3, 4; Pl. XIII, figs. 1–6; Pl. XIV, figs. 2–4. Joubin, 1908, p. 6.

? *Cerebratulus charcoti*, Joubin, 1905 (1), pp. 315–318, and text-figure. Joubin, 1905 (2), p. 432. Joubin, 1908, pp. 2–6; Fig. 1.

Lineus hanseni, Joubin, 1910, pp. 8–9; Fig. 11.

Eupolia pannetti, Joubin, 1910, pp. 9–10; Figs. 13, 14.

Stations 220, 294, 316, 331, 338, 339, 340, 356: 45–250 fathoms; Station 324, McMurdo Sound, on shore.

This fine species forms the bulk of the present collection, having been captured at nearly all the dredging stations in the Ross Sea and McMurdo Sound, where it is evidently very abundant.

The best account of this form is still that of Hubrecht (1887) in the report on the "Challenger" collection. His description and figures of the histological details of the body-wall in particular are most accurate and complete.

The original description of the species by M'Intosh (1876) is very brief, and may be quoted here in full:—

"Body (in spirit) flattened, rather abruptly pointed anteriorly, and more gradually posteriorly. The œsophageal region is marked externally by a series of prominent and somewhat regular rugæ, which sweep from the mouth dorsally and ventrally; so that the dorsal view recalls that observed in *Arion ater*.

"Colour dark olive throughout, with the exception of a white band, which crosses the anterior border of the snout, and passes backward to the posterior third of the lateral fissure, where it bends dorsally and terminates.

"The special characters are the very large mouth, with the prominent rugæ, which show that the animal probably possesses unusual powers of œsophageal protrusion—a supposition borne out by the great development of the external circular muscular fibres and the succeeding longitudinal coat of the organ. The internal glandular lining is also very firm. The outer layers of the proboscis correspond with the type in the Lineidæ; but the internal longitudinal layer is largely developed."

In size the specimens in the present collection vary very greatly; the smallest of the young individuals measure about 6 cm. in length, and are generally coiled ventrally in a spiral when in spirit. The largest specimen is 65 cm. in length; this example was found "washed up on Hut beach, Feb. 28th, 1911," and is in a very expanded condition. Another measures 52 cm., and there are several of nearly this size.

The colours of the large examples are no longer distinguishable—some are perfectly white, while others have apparently been discoloured by the spirit in which they were kept.* The young, however, still show the characteristic markings mentioned in M'Intosh's description. The ground colour is now (in spirit) a dirty reddish brown above, somewhat paler below, and with slight indications of a paler longitudinal stripe on either side in some cases. The cephalic slits are edged with white, and a white streak passes dorsally from near the hinder end of each slit, forming a nearly complete band across the head.

In some of the large examples the head is exceedingly elongate, the mouth measuring 23 mm. (in the "Hut beach" specimen 30 mm.) in length, and the cephalic slits about 6 mm.

One specimen, measuring about 50 cm. in length, exhibits a very marked flattening of the posterior end, which led me to question whether this was not of a different species from the rest. It is, indeed, remarkably similar to the form described by Joubin (1908) as *Cerebratulus charcoti*. By means of sections, however, I have satisfied myself that there is no ground for believing that it is not an example of *L. corrugatus*. It is a male, and in the flattened posterior portion the testes may be seen in section, disposed peripherally within the muscles of the body-wall. The various layers of the body-wall are much reduced in thickness in this region, and the muscle-layers in particular appear at this point to be very weak. Hence the probable explanation of the flattening (which is seen in varying degrees in other specimens also†) is that at the time of sexual maturity the body-wall becomes reduced in thickness, and less strongly muscular, in order to provide more room for the sexual products which are ripening within. The natural result of this process would be that the weakened portion would participate less fully in the muscular contraction which takes place under the action of a fixing reagent, and, if already flattened, would remain so.

I have been led, during my investigation of this species, to entertain doubts as to the validity of certain other species from Antarctic waters, and it is appropriate here to make some reference to them. While working on the "Terra Nova" collection I have had at my disposal the types of the "Challenger," "Discovery," and "Southern

* The following note on their colours during life has been submitted to me by Mr. D. G. Lillie:—"The long *Lineus*-like specimens obtained in the Antarctic were of a purplish light red or terra-cotta colour on the dorsal side, and a yellowish-creamy white on the under surface. The colouring was very much alike in all the larger specimens obtained." He adds, with regard to this species, that "they had great power of elongating and contracting their bodies."

† The "Hut beach" specimen is flattened throughout its entire length, but it is probable that this individual was in a moribund condition when collected, and I do not attach any importance to its exceptional appearance.

Cross" collections. Among them there are good series of sections of *Lineus corrugatus*, *Lineus hanseni*, and *Eupolia pannetti*. I have worked through all the series, paying particular attention to those (twelve in all) which were taken through the heads of the worms, and which show the arrangement of the brain, cephalic organs, and blood-spaces in that region. On carefully comparing all these series together, and also with the "Terra Nova" specimens of *L. corrugatus*, I can find no reason, either in the grosser anatomy, or even in the finer details of histology, for regarding any of them as distinct species, and I therefore consider them all synonymous with that originally described by M'Intosh (1876).

One of the most characteristic features of *Lineus corrugatus*, as has been noticed by M. Joubin (1910), is the arrangement of the large blood-sinuses in the head. I have paid special attention to this system in all the species mentioned, and find it in every instance identical. Such slight apparent differences as there are, are evidently the result of different states of contraction, and are in no way due to any variation in structure. At the point where the blood-sinus traverses the nerve-collar it becomes so compressed in some specimens as to be almost obliterated, but it can nevertheless be traced, and shown to go through essentially the same changes at different levels, in all the specimens examined, and in all the "species" above named.

As my conception of this blood-sinus and its transformations differs somewhat in details from that of M. Joubin (1910), and as it is an important feature of the species, I have prepared a series of diagrams illustrating its appearance as it is traced back through any series of transverse sections, commencing with the snout of the animal. These diagrams were all outlined with the camera lucida, though they were not all taken from the same series of sections, as the vessels in a given region were better displayed sometimes in one specimen, sometimes in another, according to its state of contraction. In all, however, they could be traced with more or less ease, and reduced to the same plan.

Starting, then, with the tip of the animal's head, we find a single blood-sinus occupying a median position dorsal to the rhynchodæum (Fig. 3, A.). This sinus soon widens out (Fig. 3, B.), and becomes divided into two lateral spaces by the development of a partition from the dorsal side of the rhynchodæum to the opposite wall of the sinus (Fig. 3, C.). The blood-spaces, a little behind this point, come to embrace the rhynchodæum between them, each being of a crescentic shape in transverse section (Fig. 3, D.). This condition remains constant until the region of the brain begins to be reached. The connective and muscular tissues in the centre now begin to increase at the expense of the blood-spaces, which become very attenuated (Fig. 3, E.–H.). This development of muscular tissue is the first indication of the proboscis-sheath proper, whose muscles are at this point continuous with those of the proboscis itself.

A space, or spaces, now begin to appear in the central tissue. These represent the beginning of the lumen of the proboscis-sheath, which soon completely surrounds

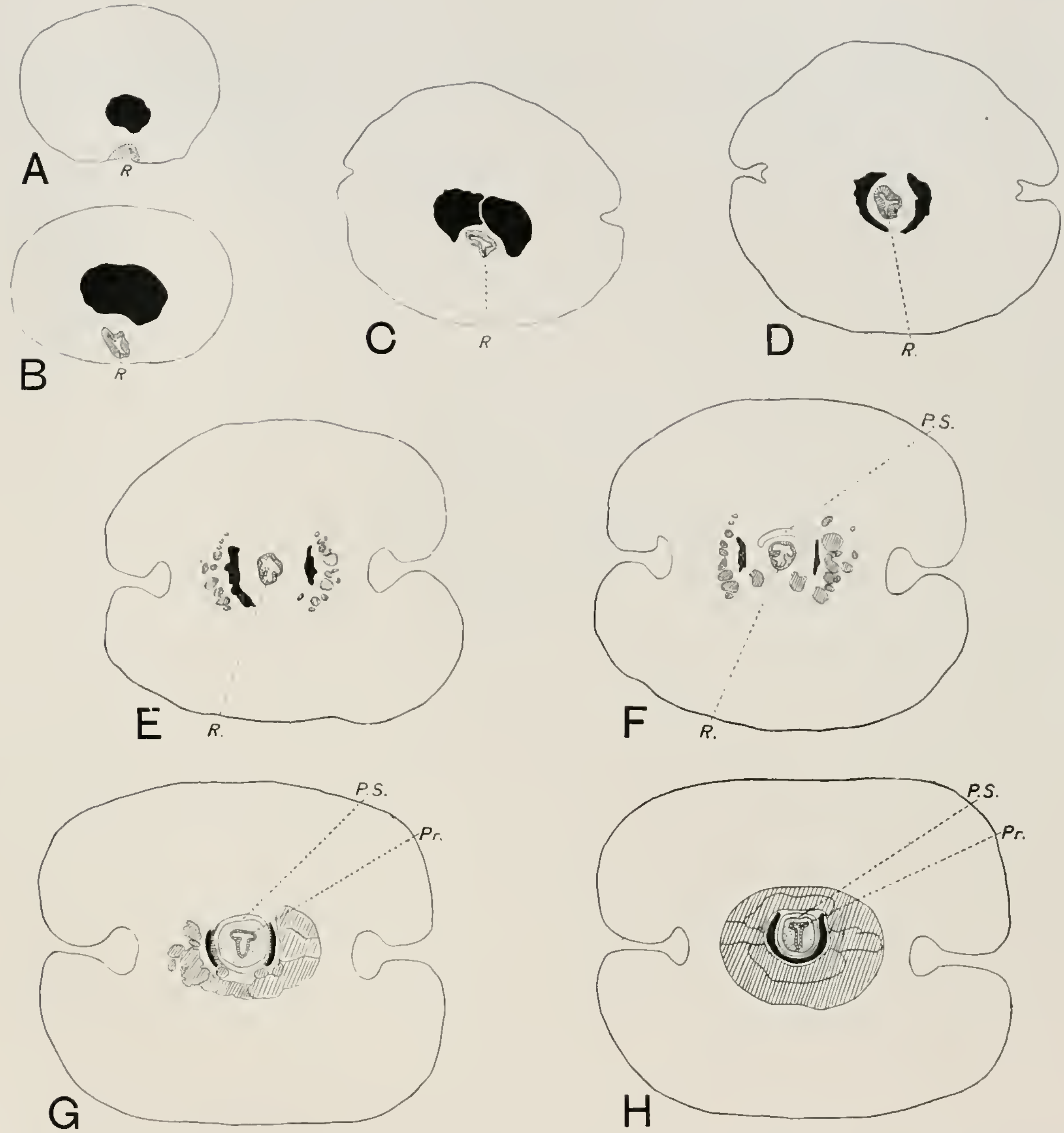

FIG. 3.—*Lineus corrugatus.*—Diagrams of a series of transverse sections, illustrating the vascular system, which has been represented in solid black. The brain and nervous structures are hatched. *Pr.*, proboscis; *P.S.*, cavity of proboscis-sheath; *R.*, rhynchodæum, seen opening to the exterior in the first diagram (**A**).

A—Shows the median blood-sinus in the snout, lying dorsally to the proboscis-pore (*R.*). Blood-sinus represented in solid black.

B—The proboscis-pore has passed into the rhynchodæum (*R.*), and the blood-sinus is of wider calibre.

C—The blood-sinus becomes divided into two by a partition of connective tissue developing on the dorsal side.

D—There is now a complete wall of connective and muscular tissue dividing the two blood-spaces, and enclosing the rhynchodæum.

E—Nerves from the anterior part of the brain are appearing laterally, and the central tissue is encroaching more and more upon the blood-spaces, so as to reduce them in size.

F—The central muscular tissue begins to show spaces—the beginning of the cavity of the proboscis-sheath (*P.S.*). Blood-spaces still further reduced.

G—The cavity of the proboscis-sheath is now seen completely surrounding the proboscis (*Pr.*), and separated by a thin wall from the blood-space on either side. The blood-spaces are pressed between the brain and the proboscis-sheath, so as to be very narrow at this point.

H—The blood-spaces have coalesced ventrally, so as to form a U-shaped vessel enclosing the proboscis-sheath.

the proboscis. It has only a thin wall ventrally and laterally, separating it from the blood-sinus, which is now a single U-shaped cavity, the two lateral sinuses having coalesced below. (Fig. 3, II.)

The blood-sinus may be regarded as a single cavity throughout, broken up by the encroachment of bridges of connective and muscular tissue, which appear quite irregularly, and are not always symmetrical on the two sides. Immediately after passing behind the brain, a median ventral blood-space is formed for a short distance, as shown by M. Joubin (Fig. 4, A.). This, however, is soon divided again into two lateral spaces (Fig. 4, B.), which become more and more widely separated by the intervening mass of connective tissue (Fig. 4, C.). This median space is quite distinct from the vessel of the proboscis-sheath, and instead of passing gradually into it, as described by M. Joubin, never has any connection with it whatever. This vessel, usually called the dorsal vessel, though clearly belonging to the proboscis-sheath, is a small cavity in the wall of the sheath itself, on the ventral side, appearing first at the level of the hinder part of the brain, and extending, probably, throughout the length of the sheath. Its dorsal wall anteriorly is a very thin and collapsible membrane. Posteriorly the vessel sinks more deeply into the tissues below the proboscis-sheath, so that its dorsal wall becomes much thicker. Not having cut a whole worm into sections (which would be a somewhat extensive undertaking), I am unable to state what actually becomes of this vessel at the hinder end; but so far as my evidence goes it is not, at any rate at the anterior end, in direct communication with the other system of sinuses. To continue the history of the main system, as we pass backwards through the series of sections to the region where the mouth and œsophagus appear, the lateral sinuses, at first few and large (Fig. 4, C.), are seen to spread round the outside of the œsophagus, so as to embrace it laterally and dorsally, except for the interruption of the proboscis-sheath. They subsequently become more and more subdivided by the bridges of connective tissue and muscles, and at the same time smaller and less conspicuous.

Finally, behind the mouth, their condition is that of a network of quite small vessels almost completely surrounding the gut (Fig. 4, D.). They lie between the inner longitudinal body-muscles and the circular muscle-layer which surrounds the gut, and have now acquired a much more definite lining epithelium of their own. They now present, in fact, exactly the appearance described and figured by Hubrecht (1887, Pl. XIII, fig. 6).

One other point may be mentioned in connection with the vascular system, in which I cannot entirely agree with M. Joubin's description (1910). He states that both in *L. corrugatus* and in *L. hanseni* there are certain "orifices" by which the cavity of the rhynchodæum is in communication with that of the blood-sinus in the head. This communication is said not to be direct, but certain "ampullæ" in the thickness of the wall of the rhynchodæum are said to communicate through a kind of spongy tissue with the blood-sinus, being at their inner ends in direct

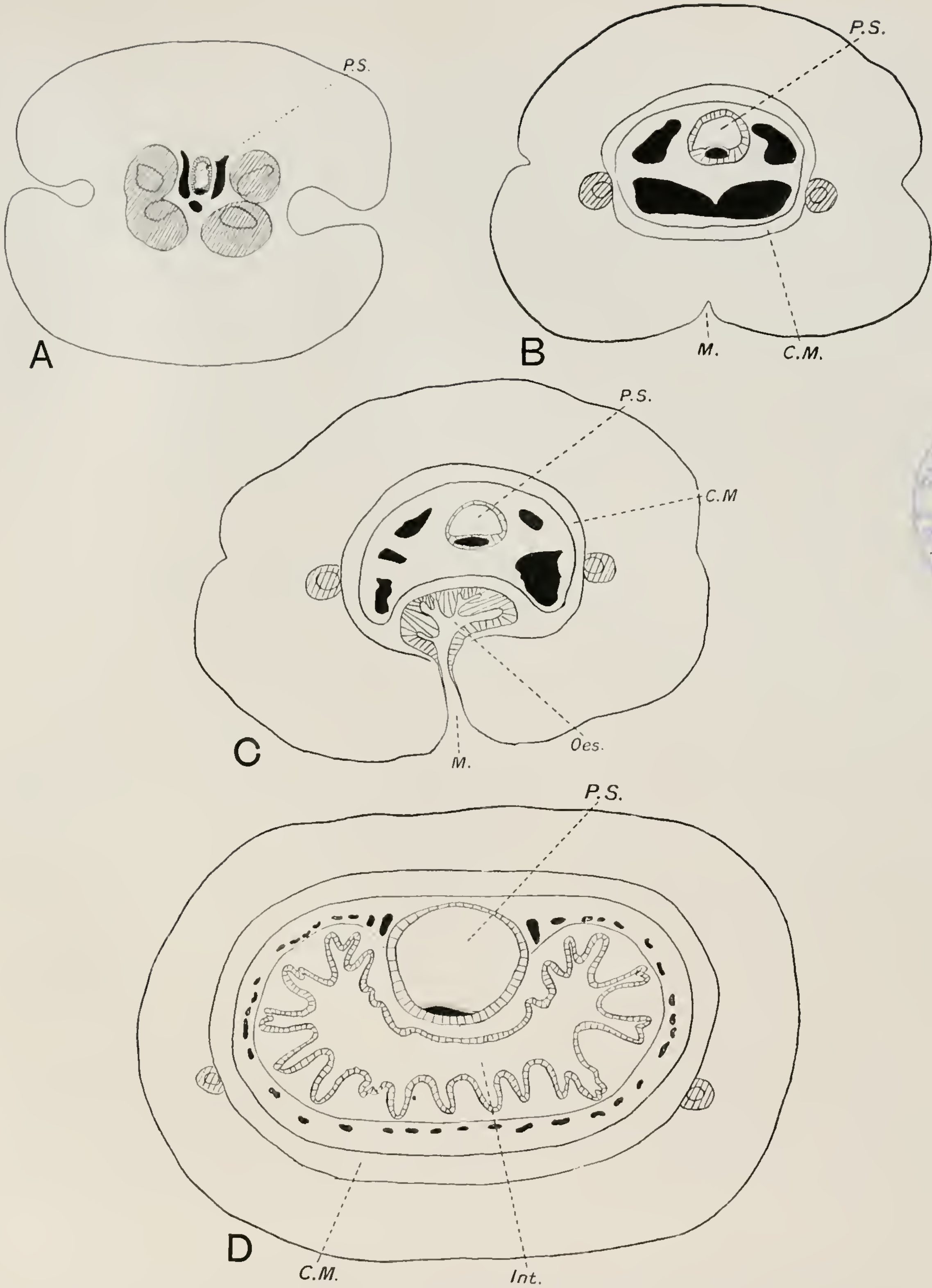

Fig. 4.—*Lineus corrugatus.* Continuation of the series of diagrams illustrating the vascular system (solid black). *C.M.*, circular muscles; *Int.*, intestine; *M.*, mouth; *Oes.*, œsophagus; *P.S.*, cavity of proboscis-sheath.

A—Bridges of connective tissue and muscles begin to cross the blood-space irregularly, breaking it up into a network of intercommunicating vessels. A small blood-vessel, with very thin dorsal wall, is now appearing in the wall of the proboscis-sheath, on the ventral side. (The proboscis is no longer seen, having been torn out in this specimen.)

B—A median ventral blood-space has appeared temporarily, but is already being encroached upon by the connective tissue, and separated into two lateral spaces.

C—The branches of the blood-space are becoming widely separated, and spreading round to embrace the walls of the œsophagus and mouth, which have now appeared.

D—The final condition of the blood-space with its network of vessels. These now lie below the inner layer of longitudinal muscles, and completely surround the intestine. The blood-vessel of the proboscis-sheath is still seen, its dorsal wall being an exceedingly thin membrane (exaggerated in thickness in the drawing).

communication with the lumen of the rhynchodæum. The figures given, however, are not altogether convincing; and on re-examining the material (which is not conspicuously well preserved), I have formed the conclusion that the "ampullæ" are to a certain extent artificial results of the contraction of the wall of the rhynchodæum. They are, in fact, a kind of "hernia" of the lining epithelium, which is here and there pushed outwards between the muscles, thus forming minute diverticula still in communication with the main cavity of the rhynchodæum. They do not occur in all the series of sections examined, and are not, therefore, an essential feature of the species. Moreover, their outer communications with the blood-sinus are, I believe, imaginary. In no case have I detected any actual opening, and though they sometimes come very near to the surface, I believe that this appearance is entirely due to artificial causes.

Having already stated my conviction that *Lineus hanseni* and *Eupolia punnetti* are synonymous with *L. corrugatus*, I may perhaps be permitted further to add that I feel some doubt as to whether *Cerebratulus charcoti*, Joubin, should not come under the same category. The author's description (1908) does not appear to me to show any very satisfactory grounds for its separation; no description or figures of its internal anatomy are given, and the main points upon which the distinction of the species is based are (1) the marked flattening of the posterior end of the body: (2) certain very vague features of colour: and (3) the great length and attenuation of the head. Now (1) the flattening of the body, as I have attempted to show above, occurs in specimens which I cannot regard as other than *L. corrugatus*; (2) colour, in spirit-preserved material, can hardly be said to have any importance at all, being often affected by the pigments of other specimens, &c., which may have been immersed in the same spirit; while (3) the comparative length of the head, mouth, &c., in these worms is a matter obviously dependent upon the growth of the individual and the mode of fixation or preservation employed, and may be extremely variable in preserved specimens of the same species.

Taking all these facts into consideration, I think the evidence points to the conclusion that in all four cases (*Lineus corrugatus*, *Lineus hanseni*, *Cerebratulus charcoti*, and *Eupolia punnetti*) we are dealing with one and the same species, and that this is the form originally described by M'Intosh (1876) under the name of *Lineus corrugatus*.

Distribution.

By the inclusion of the several species above-mentioned in the synonymy of *L. corrugatus*, the range of the latter is seen to extend to the western as well as the eastern side of the subantarctic regions. The specimens determined by M. Joubin as *Cerebratulus corrugatus* and *C. charcoti* came from Booth-Wandel Island. I have also to add that some immature specimens brought from Cumberland Bay, South Georgia, by the late Major G. E. H. Barrett-Hamilton's Expedition, 1913–1914, belong, in my opinion, to the same species. Combining, therefore, all these records, we have the following:—

Locality.	Collection.	Approximate Latitude.	Approximate Longitude.
Cape Adare	"Southern Cross," "Terra Nova."	72° S.	170° E.
McMurdo Sound	"Discovery," "Terra Nova."	77° S.	165° E.
Heard Island	"Challenger."	53° S.	74° E.
Kerguelen	British Transit-of-Venus Exp., "Challenger."	50° S.	70° E.
Booth-Wandel Island	Charcot's 1st Exp.	65° S.	66° W.
South Georgia	Major Barrett-Hamilton's Exp., 1913–1914.	54° S.	37° W.

These localities lie in a fairly complete circle, between the approximate latitudes of 50° S. and 77° S., and it appears that we are dealing with a single common species which extends completely round the subantarctic region. It is, perhaps, somewhat remarkable that the species, occurring as near as South Georgia, should not have been recorded from the Strait of Magellan, which lies well within its range of latitude; and possibly sooner or later it will be found there. Its northern range, however, with the exception of Kerguelen and Heard Island, appears to lie within the extreme limits of the pack-ice.

7. *Lineus scotti*, sp. n. (Pl. II, figs 1–6.)

Skin smooth. Head blunt and rounded. Mouth rather short. A transverse groove encircling the head behind the cephalic slits. The latter are deep, and communicate with the brain only at their hinder ends. Primary basement-membrane of cutis lacking. Glandular cells in epithelium with a brownish secretion. Outer longitudinal muscle-layer very dense and thick. Proboscis with four longitudinal nerves. Its circular muscle-fibres form dorsal and ventral crosses. Cerebral organs large, projecting into lateral head-sinuses.

Length up to 10·7 cm. (probably often greater).

Stations 220, 294, 314, 316, 331, 338, 339, 340, 355: 45–300 fathoms.

The species seems to occur together with *L. corrugatus* in nearly every case.

A number of specimens of this *Lineus*, which is clearly distinct from *L. corrugatus*, occur in the collection. I have named this species in honour of the lamented Commander of the Expedition. The two forms, when in spirit, are generally readily separated by mere external inspection, though by this means some specimens of *L. scotti* might easily be taken for immature individuals of *L. corrugatus* which had become decolorised.

External Features.

The chief points in the external appearance of *L. scotti* which serve to distinguish it from *L. corrugatus* are as follows:—

The skin is comparatively smooth, and not thrown into marked wrinkles and furrows.

The head is usually blunt and rounded in front. The snout is, however, evidently capable of some extension, as in a small number of individuals it has been fixed in a more tapering form.

The young specimens do not appear to coil up ventrally in a spiral when killed, as do those of *L. corrugatus*.

The mouth (Pl. II, fig. 1) is a longitudinal slit, but not nearly so elongate as in the other species. In the largest individual it measures 5 mm. in length. The lips are thrown into regular folds transversely to the long axis of the mouth.

There is in many cases a more or less well-marked transverse groove behind the cephalic slits. This is especially noticeable on the ventral side (Pl. II, fig. 1), where it runs back in the middle line to meet the anterior end of the mouth, thus forming a V-shaped furrow.

The cephalic slits are very deep and clean-cut, measuring about 4 mm. in length in the largest individuals.

The proboscis-pore (Pl. II, fig. 1) is, as usual, a vertical slit at the tip of the snout, crossing at right angles a slight groove which joins the anterior ends of the cephalic slits.

In length, complete specimens (of which there are few) measure from 2·4 cm. to 10·7 cm. The larger specimens are all fragmentary, and it is impossible to guess at the maximum length probably attained; but this would seem to be certainly very much smaller than that reached by *L. corrugatus*. In thickness, the largest fragment measures about 8 mm. laterally and 6 mm. dorso-ventrally; the other specimens vary greatly in thickness according to their state of contraction.

No traces of the original colours of the species can be made out.

Nearly all the specimens appear to be sexually immature.

Internal Anatomy.

Body-wall.—The outer epithelium (Pl. II, fig. 3, Ep.) consists of very tall ciliated cells, with numerous smaller interstitial cells at their bases. Between the tall epithelial cells are scattered many large club-shaped cells (Pl. II, fig. 3, $Gl.^2$) full of a refractive yellowish-brown secretion.

Below the epithelium there is a thin but solid-looking basement-membrane (B.M.), scarcely as deep as the epithelium itself. Beneath this again there is a thin layer of circular muscle-fibres ($C.M^2.$). A well-developed and conspicuous, deeply-staining layer of large glandular cells (Gl.) succeeds this, resting immediately upon, and being partly embedded among the fibres of the outer longitudinal muscle-layer ($L.M^2.$). The deep "primary basement membrane," so conspicuous in *L. corrugatus*, separating the glandular layer from the musculature, is entirely absent.

The outer layer of longitudinal muscles (Pl. II, figs. 2, 3, 4, 5, $L.M^2.$) is exceedingly thick and well-developed. Its fibres are separated into groups only by slight partitions of connective tissue, so that under a low power of the microscope they appear closely and evenly placed together, and the whole layer has a very solid aspect. Between this layer and the circular muscles there is present the usual nerve-plexus (Pl. II, fig. 2, N.P.), with the two large and well-developed lateral nerve-stems and a small dorsal nerve.

The circular muscle-layer (Pl. II, figs. 2, 4, 5, C.M.), like the outer longitudinal layer, is very stout and solid in appearance. It is succeeded by a comparatively thin inner longitudinal layer ($L.M^1.$). The last two layers together make up a thickness nearly equal to that of the outer longitudinal coat.

Alimentary Canal.—The intestine is U-shaped in transverse section (Pl. II, fig. 2, Int.), and without marked lateral diverticula. It seems to be characteristic of this species that the "crypts," or pockets, in the lining epithelium—at least, in the œsophageal portion of the gut—form very regular and acute angles.

Proboscis-sheath and Proboscis.—The proboscis-sheath is larger in diameter, relatively to the size of the whole animal, than that of *L. corrugatus*. Its lining epithelium rests on (1) a thin basement-membrane, followed by (2) a thin longitudinal coat of muscle-fibres; (3) a thin circular coat of muscles, connected dorsally with the circular musculature of the body-wall; and (4) another coat of longitudinal muscles, which is in reality part of the inner longitudinal coat of the body-wall.

The dorsal blood-vessel (Pl. II, figs. 2, 4, 5, D.V.), or vessel of the rhynchocœle, as it might more descriptively be called, lies, anteriorly, on the inside of the circular muscles of the proboscis-sheath; more posteriorly, it sinks through the circular muscle-layer, and eventually comes to lie below it, among the outer longitudinal muscles. It has very thick walls, as compared with the corresponding vessel in *L. corrugatus*.

The proboscis is thin, and its musculature is not strongly developed. In transverse section (Pl. II, fig. 6) some of the circular muscle-fibres are seen to cross each other dorsally and ventrally (C., C.), and pass outwards to the periphery, as in the common *Cerebratulus marginatus*. Within the circular layer of muscles there is a nervous layer, containing four large longitudinal nerves (N.). There is no inner longitudinal layer of muscles separating this nervous layer from the lining epithelium. The latter is mainly composed of tall glandular cells.

Vascular System.—The blood-sinuses in the head are arranged on a plan similar in essential points to that of *L. corrugatus*, already described; but after the U-shaped sinus has passed behind the dorsal commissure of the brain, its two arms extend dorsally and outwards (Pl. II, fig. 4, B.S.), so as to embrace the dorsal ganglia and cerebral organs. They then become separated by muscular tissue from the ventral portion of the "U" (Pl. II, fig. 4, V.B.S.), just as in *L. corrugatus*, so that there are for a short distance three apparently distinct spaces. Further back, the system of intercommunicating vessels is not nearly so elaborately developed as in the former species; the blood-spaces round the gut are by no means so distinct or so numerous, the most conspicuous being a pair of longitudinal vessels situated to right and left of the prosboscis-sheath, dorsal to the gut (Pl. II, figs. 2 and 5, B.S.). A few smaller and more irregular vessels can be seen laterally and ventrally.

Sense-organs and Nervous System.—There is a minute "frontal organ" at the tip of the snout, and the head is very abundantly supplied with gland-cells, some of which are probably connected with it.

The cephalic slits are very deep and straight-sided. There is very little expansion at the bottom of the furrows, which communicate with the brain only at their hinder ends. On the posterior wall of each slit there is a prominent transverse ridge, containing a groove which leads into the canal of the cerebral organ.

The upper extremity of the dorsal ganglion of the brain on either side ends immediately in front of the cerebral organ. In the anterior and upper part of the dorsal ganglia, the largest or "giant" type (Bürger) of ganglion-cells are extraordinarily well seen, and are of very large size in proportion to the whole brain.

The cerebral organs (Pl. II, fig. 4, C.O.) are well-developed, large, and abundantly supplied with glands. On their inner and dorsal sides they are closely surrounded by the lateral portions of the cephalic blood-sinus.

The lateral nerves, with their investment of ganglionic cells, run out almost at right angles to the long axis of the animal for a considerable distance on leaving the brain (Pl. II, fig. 4, L.N.), and then turn back to run in the usual manner along the sides. They are very stout, and lie somewhat towards the ventral side of the animal (Pl. II, fig. 2, L.N.).

There is a complete plexus of nervous tissue (Pl. II, fig. 2, N.P.) immediately outside the circular muscles of the body-wall, and a small dorsal nerve in this layer, in the middle line, as in *L. corrugatus*.

Genital Organs.—In a female specimen examined, the gonads appear to form a continuous series along either side of the worm (Pl. II, fig. 5, G.). They compress the gut between them, and are not separated from their neighbours by any lateral gut-cæca. The eggs contained in this individual measure about 0·2 mm. in diameter.

I am unable to give any account of the arrangement of the genital organs in the male.

Note:—It may be remarked that there is nothing in my description of this form contradictory to the supposition that it is identical with *Cerebratulus validus*, Bürger, from South Georgia. On the other hand, the description (1893) of the latter species is based upon one specimen only, and is so brief that it would be scarcely possible to determine the species from it, and moreover no figures are given. Hence I have not hesitated to regard the "Terra Nova" material in the light of a new species.

8, 9. *Lineus*, spp. "A" and "B."

"A," Station 134. "B," Station 91.

There remain two specimens, apparently of this genus, from the New Zealand waters, belonging evidently to two distinct species; but as to the determination of these I prefer to reserve judgment. I hesitate to found a new species upon a single specimen, as the description must necessarily be incomplete, and may only lead to confusion. One of these two individuals, which I will call *Lineus* sp. "A," is interesting mainly on account of the following features: The body is slightly flattened, and the head is shaped like an arrow-head, the posterior ends of the cephalic slits projecting considerably at the sides, and the snout tapering to a point. The cephalic slits are 3·5 mm. long. The mouth is small, and measures only slightly over 2 mm. in length. The skin is deeply pigmented, of a rather dark olive-green colour. The pigment-granules are closely crowded together in the thick primary basement-membrane, and in another layer immediately outside the circular muscle-layer of the body-wall. Between these two main layers scattered granules are also seen in the radiating strands of connective tissue among the outer longitudinal muscles. The snout, and the edges of the cephalic slits and mouth, are ochreous, and may perhaps have been red during life. [Length of specimen (tailless), 5 cm.]

Sub-Fam. MICRURINÆ.

Cerebratulus, Renier, 1804.

10. ? *Cerebratulus*, sp. (juv.)

Station 339.

There is a single very small specimen in the collection, with a minute tail-like appendage at the posterior end. The total length of the animal is about 7 mm. The skin is transversely wrinkled, and the general colour yellowish, thickly dotted with minute reddish-brown spots of pigment.

The snout is thick and square, and the whole head large in proportion to the body. The cephalic slits measure a little over 1 mm. in length. The mouth is elongate, but not large, and lies behind the cephalic slits.

It is only provisionally that I assign this specimen to the genus *Cerebratulus*, and I regard it as probably a very young individual.

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PLATE I.

FIGS. 1, 2, 5, 7, 9.—*Amphiporus multihastatus.*
" 3, 8.—*Prostoma unilineatum.*
" 4, 6.—*Baseodiscus antarcticus.*

FIG. 1.—*Amphiporus multihastatus,* Joubin. Dorsal view of anterior end, showing E., the two groups of eyes.

FIG. 2.—*Amphiporus multihastatus.* Ventral view of anterior end. M., single opening of the mouth and proboscis-pore ; C.S., cephalic slits.

FIG. 3.—*Prostoma unilineatum* (Joubin). Dorsal view of the entire animal, × 8. Pr., the partially everted proboscis.

FIG. 4.—*Baseodiscus antarcticus,* sp. n. Ventral view of anterior end, showing G., lateral grooves in which the openings of the cerebral organs are situated ; M., mouth ; P.P., proboscis-pore.

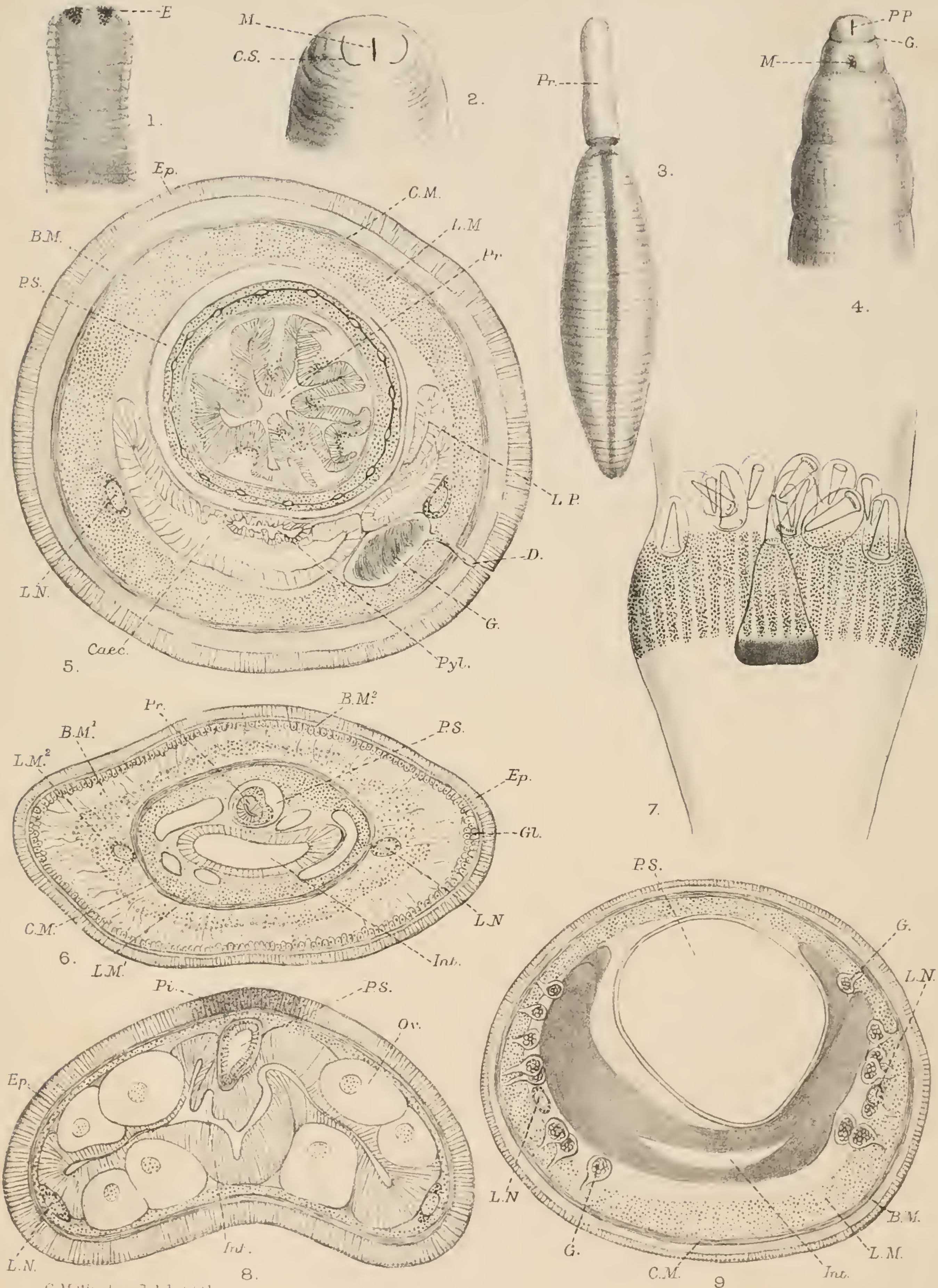
FIG. 5.—*Amphiporus multihastatus.* Transverse section near the anterior end. B.M., basement-membrane ; Cæc., anterior cæcum of the intestine ; C.M., circular muscle-layer ; D., a genital duct ; Ep., external epithelium ; G., gonadial sac (testis) ; L.M., longitudinal muscle-layer ; L.N., lateral nerve-stem ; L.P., lateral pouch of intestinal caecum ; Pr., proboscis ; P.S., cavity of proboscis-sheath ; Pyl., pyloric canal.

FIG. 6.—*Baseodiscus antarcticus.* Transverse section at about the middle of the body. $B.M^1.$, primary basement-membrane ; $B.M^2.$, secondary basement-membrane ; C.M., circular muscle-layer ; Ep., external epithelium ; Gl., glandular layer of the integument ; Int., intestine ; $L.M^1.$, inner longitudinal muscle-layer ; $L.M^2.$, outer longitudinal muscle-layer ; L.N., lateral nerve-stem ; Pr., proboscis ; P.S., cavity of proboscis-sheath.

FIG. 7.—*Amphiporus multihastatus.* Middle portion of the proboscis, seen by transparency, showing the armature and reserve-stylets.

FIG. 8.—*Prostoma unilineatum.* Transverse section in the middle region of the body. Ep., external epithelium ; Int., intestine ; L.N., lateral nerve-stem ; Ov., ova ; Pi., dorsal band of pigment ; P.S., cavity of proboscis-sheath.

FIG. 9.—*Amphiporus multihastatus,* ♀. Transverse section in the middle region. B.M., basement-membrane ; C.M., circular muscle-layer ; G., gonadial sacs, containing ova ; Int., intestine ; L.M., longitudinal muscle-layer ; L.N., lateral nerve-stems ; P.S., cavity of proboscis-sheath.



G. M. Woodward del. et lith. Huth imp.

PLATE 11.

Lineus scotti, sp. n.

FIG. 1.—Ventral view of the anterior end of one of the smaller specimens, magnified, and showing the mouth, cephalic slits, proboscis-pore, and the groove forming a " V " immediately in front of the mouth.

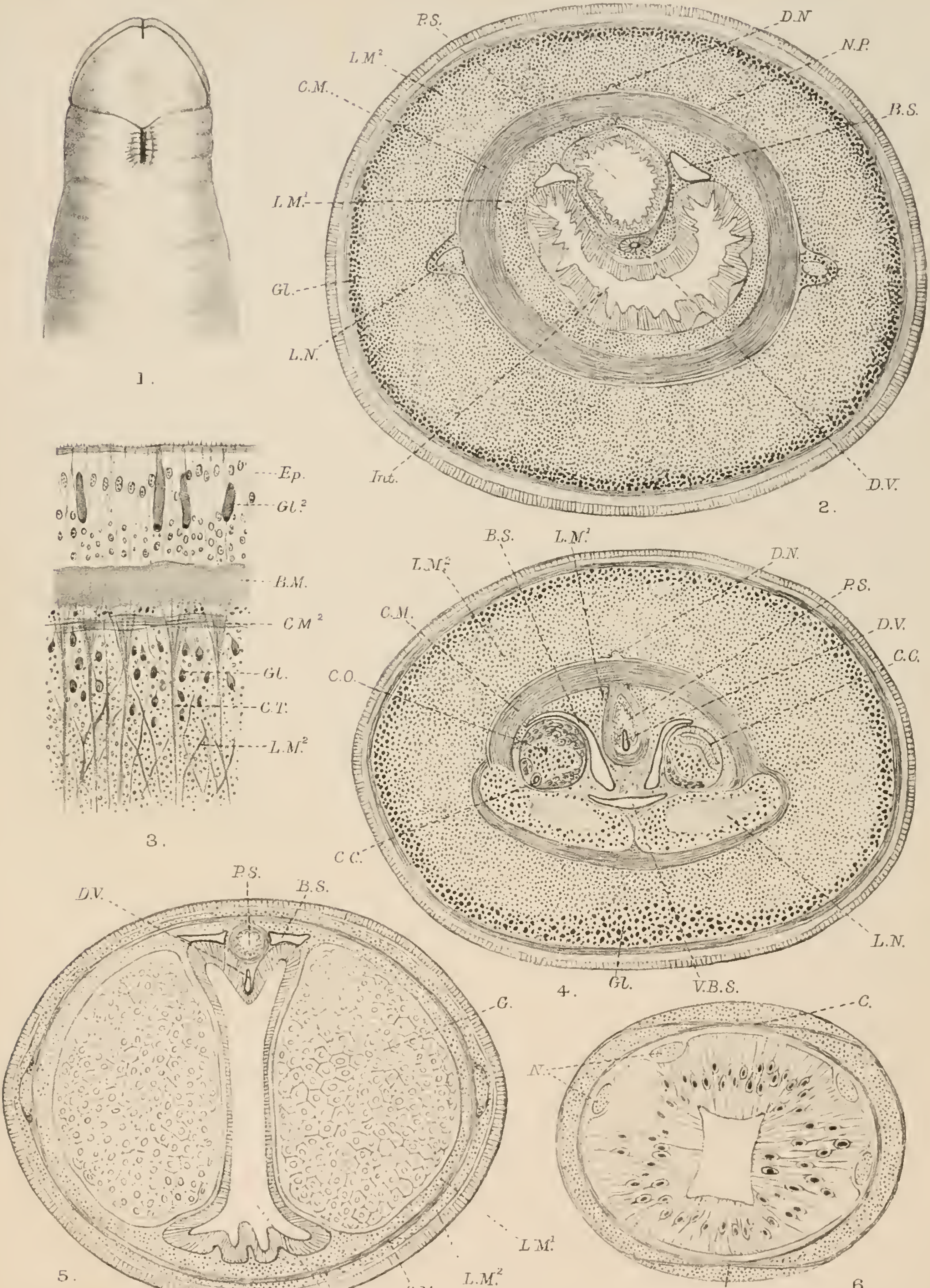
FIG. 2.—Transverse section towards the middle of the body. B.S., blood-sinus; C.M., circular muscle-layer; D.N., dorsal nerve; D.V., dorsal blood-vessel; Gl., glandular layer of the integument; Int., intestine; L.M^1., inner longitudinal muscle-layer; L.M^2., outer longitudinal muscle-layer; L.N., lateral nerve-stem; N.P., nerve-plexus; P.S., cavity of proboscis-sheath.

FIG. 3.—Portion of the outer part of the body-wall in transverse section, highly magnified. B.M., (secondary) basement-membrane; C.M^2., layer of circular muscle-fibres; C.T., connective tissue strands; Ep., external epithelium; Gl., glandular layer; Gl^2., gland-cells of the epithelium; L.M^2., outer longitudinal muscles.

FIG. 4.—Transverse section immediately behind the brain. B.S., blood-sinus; C.C., cerebral canals; C.M., circular muscle-layer; C.O., cerebral organ; D.N., dorsal nerve; D.V., dorsal blood-vessel; Gl., glandular layer; L.M^1., inner longitudinal muscle-layer; L.M^2., outer longitudinal muscle-layer; L.N., lateral nerve-stem passing outwards from the brain; P.S., cavity of proboscis-sheath; V.B.S., ventral portion of blood-sinus.

FIG. 5.—Transverse section through the middle region of the body of a female specimen. B.S., blood-sinus; C.M., circular muscle-layer; D.V., dorsal blood-vessel; G., gonadial sac, filled with ova; Int., intestine; L.M^1., inner longitudinal muscle-layer; L.M^2., outer longitudinal muscle-layer; P.S., cavity of proboscis-sheath.

FIG. 6.—Transverse section through the proboscis, highly magnified. C., C., points where the circular muscle fibres cross each other dorsally and ventrally; N., longitudinal nerves.



G. M. Woodward del et lith.

Huth, imp.

MYZOSTOMIDA.

BY CHARLES L. BOULENGER, M.A., D.Sc.
(Zoological Department, University of Birmingham).

WITH ONE PLATE.

I.—INTRODUCTORY.

The collection of Myzostomes brought back by the "Terra Nova" Expedition is a small one, consisting of one free-living specimen and five cysts obtained within the Antarctic Circle at Stations 294 and 355.

The only Myzostomida previously recorded from Antarctic regions are those collected by the National Antarctic Expedition ("Discovery"), 1901–4, and described by v. Stummer-Traunfels in 1908. The "Terra Nova" collection contains representatives of the two species dealt with in this author's report, and includes no forms new to science; it is, however, not devoid of interest since the cyst-forming specimens belong to the remarkable species *Myzostoma cysticola*, v. Graff, and four of the five cysts were obtained from the peculiar Crinoid *Promachocrinus kerguelenensis*, a form not previously recorded as the host of Myzostomida.

In the structure of their cysts and in their position on the body-disc of the host these parasites differ from all previously known examples; their size, moreover, considerably exceeds that of the specimens described by v. Stummer-Traunfels and other observers of the species.

II.—SYSTEMATIC.

MYZOSTOMA, F. S. Leuckart.

Myzostoma antarcticum, v. Stumm.-Tr.

Myzostoma antarcticum, v. Stummer-Traunfels, Nat. Ant. Exp. ("Discovery"), 1901–4, vol. iv, 1908, Myzostomidæ, p. 2.

This species was formed by v. Stummer-Traunfels for a number of free-living specimens from *Antedon adriani*, Bell, collected by the "Discovery" Expedition. It is represented in the "Terra Nova" collection by a single individual taken at a depth of

547 metres at Station 355. 77° 46′ S., 166° 8′ E. (McMurdo Sound). The host is unfortunately unknown, the worm having been found loose.

The "Terra Nova" specimen is larger than any described by v. Stummer-Traunfels, having a length of 8 mm. The lateral margins are bent downwards so as to make the dorsal surface very convex, but when flattened out the body is seen to have a breadth of nearly 9 mm.

A narrow, translucent marginal area is rather sharply marked off from the very thick body-disc, its border is slightly crenulated and presents distinct concavities at the anterior and posterior extremities.

As in the type specimens the dorsal integument, except in the marginal area, is covered with small, closely set tubercles, too small to be distinguished by the naked eye, but giving the skin a very characteristic "warty" appearance when viewed under a low power of the microscope. v. Stummer-Traunfels describes the ventral surface as smooth; in the specimen before me, however, the ventral integument is sculptured in a similar but less pronounced manner than that of the dorsal surface.

The ten pairs of cirri arise from little notches in the margin, they are bilaterally symmetrical in their arrangement and approximately equidistant from one another, except in the case of the first and last pairs, the members of which are much further apart than the others.

The structure of the parapodia, suckers, and other organs is exactly as in the type specimens.

Myzostoma cysticola, v. Graff.

Myzostoma cysticolum, v. Graff, "Challenger" Rep., vol. x, 1884, p. 66.
,, ,, v. Stummer-Traunfels, *op. cit.*, p. 7.
,, ,, var. *orientale*, McClendon, Bull. Amer. Mus. Nat. Hist., vol. xxii, 1906, p. 120.
,, ,, sub-sp. *cystihymenodes*, McClendon, Proc. U.S. Nat. Mus., vol. xxxii, 1907, p. 65.

I have referred all the cysticolous specimens collected by the "Terra Nova" Expedition to this very interesting species. *M. cysticola* was first described by v. Graff in 1884 from a number of specimens forming small cysts (1–3 mm. in length) on the arms of *Actinometra meridionalis*, var. *carinata*, from Brazil and Grenada.

The species was redescribed in 1906 by McClendon from a single specimen on *Antedon discoidea* obtained by the "Albatross" Expedition off the eastern coast of Japan; on account of the large size of this cyst (5 mm. in length) and of certain slight differences in structure it was referred by the author to a new variety *orientale*.

v. Stummer-Traunfels, in his report on the "Discovery" collection, points out that the differences between McClendon's and v. Graff's specimens are undoubtedly due to individual variation, and includes two large cysts (5 mm. and 6·2 mm. in length) from *Antedon adriani* in this widely distributed species. The cysts and the worms enclosed in them agree in most particulars with the type specimens, apart from size the chief difference being in the thickness of the cyst-wall, which is considerably less in the Antarctic specimens than in those described by v. Graff. v. Stummer-Traunfels puts forward the view that in the cysticolous Myzostomids the character of the cyst-wall is likely to vary with different hosts, and also that large cysts may be expected to possess thinner walls than small ones; in this connection he calls attention to v. Graff's statement that the smallest of the type cysts was of more solid consistency than the rest.

Whilst v. Stummer-Traunfels' memoir was in preparation McClendon published a second paper containing a short account of a still larger cyst of this species from the Trinity Islands; owing to its large size (7·5 mm. in length) and the uncalcified nature of the cyst-wall he considers it to represent a new sub-species which he names *M. cysticolum cystihymenodes*.

The five cysts obtained by the "Terra Nova" Expedition are, with one exception, larger than any previously recorded; they measure 6, 8, 10, 11 and 12 mm. in length, respectively. Four of these cysts were found attached to the body-discs of *Promachocrinus kerguelenensis*, dredged at a depth of 547 metres at Station 355 in the McMurdo Sound, the fifth being fixed to a fragment of a Crinoid arm* from Station 294 in the Ross Sea at a depth of 289 metres.

Except in size the latter specimen very closely resembles those described by v. Stummer-Traunfels. The cyst (Fig. 5) is ovoid in shape, 10 mm. long, with a maximum width of about 5 mm.; it is attached by its whole length to the arm of the Crinoid, along the ambulacral groove. The cyst-wall is thin and flexible, and is not calcified.

The two openings at the extremities of the cyst are both quite conspicuous. They are, however, very unequal in size; the one directed towards the disc of the host measures a little less than a millimetre in diameter, whilst that at the opposite extremity has a diameter of nearly 3 mm. The latter opening is not quite terminal, being set slightly obliquely to the long axis of the cyst; through it the cloacal extremity of a large Myzostome projects for about 1·5 mm.

As mentioned above, the four cysts from *Promachocrinus kerguelenensis* are peculiar in being attached to the body-discs of their hosts instead of to the arms; three specimens of the Crinoid were found with the parasites, one bearing two cysts.

The cysts have a characteristic and apparently constant position on the actinal surfaces of the discs (Fig. 6), each has its anterior extremity in close proximity to the point of bifurcation of one of the posterior ambulacral grooves, and is attached by its whole length along the branch of the groove which lies closest to the anal tube of the Crinoid. In the case where two cysts occurred on the same host these occupied similar positions on either side of the anal tube.

The cysts from *Promachocrinus kerguelenensis* are approximately oval in shape,

* The fragment can hardly be determined with certainty, but Prof. F. J. Bell believes it to have belonged to *Antedon adriani*.—S. F. H.

but slightly depressed, the breadth, which measures about one-half of the length, being always a little greater than the height. The cyst-walls are thin and uncalcified. The usual openings are present near the extremities, but, unlike the specimen described from the Crinoid arm, these are approximately equal in size, having a diameter of about 1 millimetre.

The above description shows that both in structure and position on the host the four cysts from Station 355 differ markedly from all previously recorded examples; the worms enclosed in them correspond, however, so closely both with those from the fifth cyst and with those described by v. Graff, v. Stummer-Traunfels, and McClendon, that I have no hesitation in referring them all to the same species.

One of the cysts on the body-disc of *Promachocrinus kerguelenensis* was left intact, all the others were opened, and each was found to contain the usual pair of Myzostomes, consisting of a large individual (so-called "female") occupying the greater part of the cyst-cavity, and a small individual (so-called "male") lying in the narrow space between the former and the cyst-wall.

The large individuals all had the characteristic "tubular" shape, the sides of the body being bent upwards so that the lateral margins come almost to meet in the mid-dorsal line; the margins were never found overlapping as in some of the specimens described by v. Stummer-Traunfels. In their rolled up condition the measurements of these individuals are as follows:—

	Length.	Breadth.	Depth.
a . .	5·5 mm.	2·5 mm.	2·25 mm.
b . .	10 mm.	5 mm.	4·5 mm.
c . .	11·25 mm.	5·5 mm.	5 mm.
d . .	9 mm.	3·5 mm.	4·25 mm.

Specimens *a*, *b* and *c* are from the cysts on the body-disc of *Promachocrinus kerguelenensis*. It will be noticed that these are slightly depressed in shape, in conformity with the shape of the cysts. The orientation of these large individuals within the cysts was characteristic and evidently constant; each worm, as usual, lay with its ventral surface downwards, but its vertical plane was not at right angles to the surface of the disc, being inclined slightly to one side, so that the mid-dorsal line, represented by the groove between the body margins, came to be directed towards the anal tube of the Crinoid host.

I have not much to add to previous accounts of the structure of the large individuals (*cf.* Figs. 1–3). The parapodia are quite small, almost vestigial; suckers and cirri are absent. The ventral surface of the body is smooth and not sculptured; in some specimens it is divided up into a number of areas by faint grooves (Fig. 1). The mouth is situated at the bottom of a deep anterior concavity, the pharynx is protruded through the cyst-opening in the majority of cases, and appears as a stout cylindrical organ, without papillæ on the oral margin.

The size of the small individuals seems to vary with that of the large individuals, those found in the larger cysts from the "Terra Nova" collection being considerably larger than the specimens described by previous observers. They are approximately circular in shape, but always a little longer than broad, as shown by the following measurements :—

	Length.	Breadth.
a . . .	1·35 mm.	1·1 mm.
b . . .	1·95 mm.	1·8 mm.
c . .	2·2 mm.	2 mm.
d . . .	2·1 mm.	1·8 mm.

In structure these specimens agree perfectly with those described by v. Stummer-Traunfels, and the largest show no marked advance over the smallest investigated by previous observers (the "male" individual described by v. Graff had a length of ·8 mm. only).

The different individuals show considerable variation in the mode of branching of the intestinal cæca; the latter may even differ on the two sides of the body, as shown in Fig. 4.

The exact positions of the parapodia also vary somewhat; in all the specimens, however, the third parapodium of each side is situated nearer the centre of the body than the rest. The other organs are exactly as described by v. Stummer-Traunfels.

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4. —— "New Marine Worms of the Genus Myzostoma." Smithson. Inst. U. S. Nat. Mus. Proc., vol. xxxii, 1907.
5. Stummer-Traunfels, R. v.—"Myzostomidæ." Nat. Antarct. Exped. ("Discovery"), 1901–4. Nat. Hist., vol. iv., 1908.

PLATE I.

Myzostoma cysticola, v. Graff.

FIG. 1. Large individual ("female") from cyst on body-disc of *Promachocrinus kerguelenensis*, ventral view, × 7.

FIG. 2. Same individual, dorsal view, × 7.

FIG. 3. Same individual, lateral view, × 7.

FIG. 4. Small individual ("male") from the same cyst as the specimen shown in Figs. 1–3; ventral view, as seen when cleared in cedar-wood oil, × 38.

FIG. 5. Cyst on the arm of a Crinoid, × 7.

FIG. 6. Part of the body-disc of *Promachocrinus kerguelenensis* with attached cyst, × 4½.

LETTERING.

an. t., Anal tube of Crinoid.
cl., Cloaca.
int., Branch of intestine.
M., Myzostome protruding through cyst-opening.
m., Mouth of Crinoid.
M.c., Cyst of Myzostome.
p., Parapodium.
ph., Pharynx.
st., Stomach.
te, Testis.
♂, Male genital opening.

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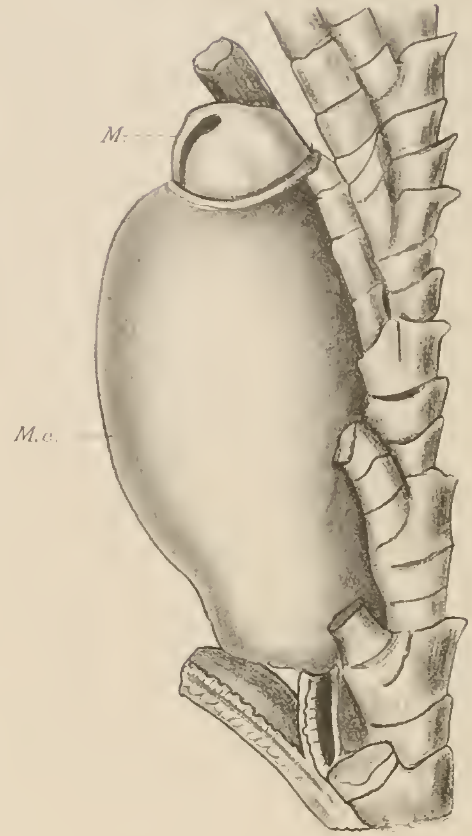

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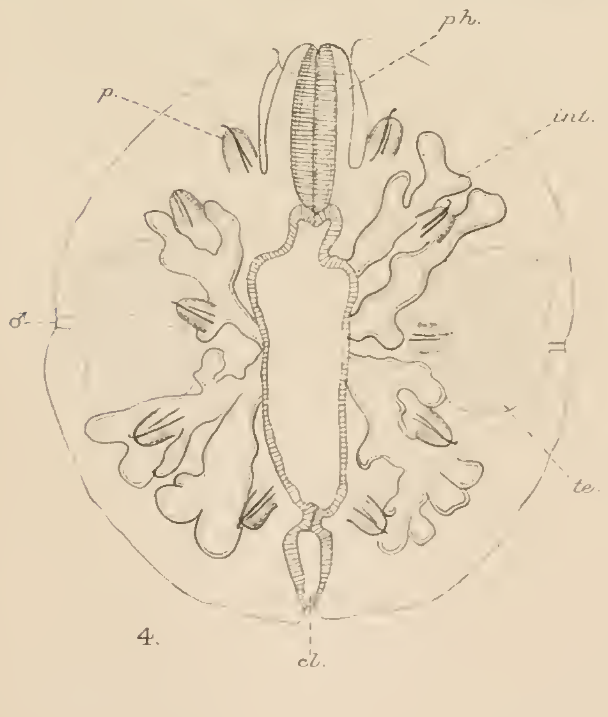

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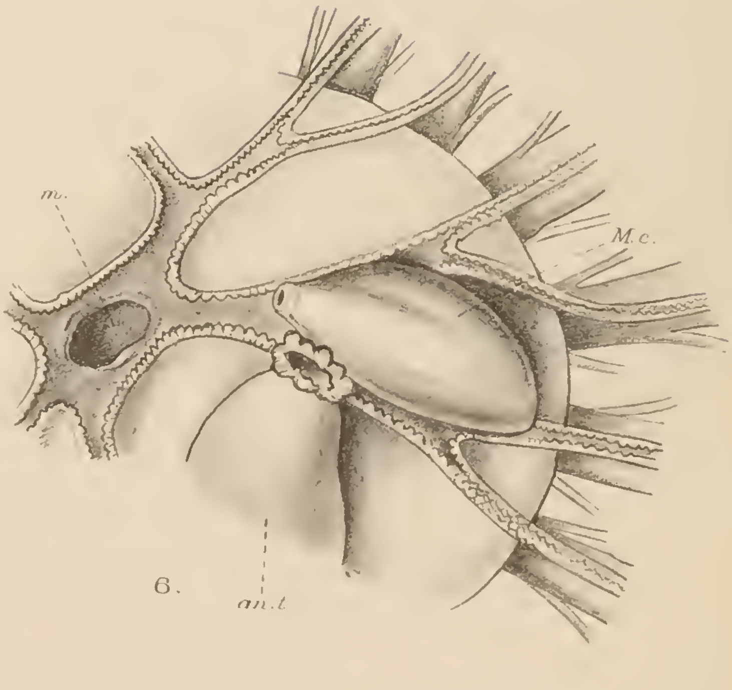

6.

C. L. Boulenger del. Huth, Lith.r London

MOLLUSCA.

PART II.—CEPHALOPODA.

BY ANNE L. MASSY.

WITH FORTY-THREE FIGURES IN THE TEXT.

I.—INTRODUCTION.

THE Cephalopoda taken by the "Terra Nova" consist of about sixty-eight specimens belonging to seventeen species and twelve genera. More than half of the collection, consisting of nine species and some forty specimens, belong to the Octopoda, the abundance of the genus *Moschites* being very striking. The Myopsida are represented by one species only, and, while it is not surprising to find that the *Sepia* family is entirely absent, it seems rather remarkable that so few small Oegopsids were taken. Geographically, the waters explored by the "Terra Nova" in which Cephalopods occurred may be separated into three divisions—namely, the Atlantic from south of Madeira to off Monte Video; the Pacific, to the north of North Island, New Zealand; and, thirdly, various points within the Antarctic Circle. Joubin (1912) has remarked on our scanty knowledge of the Cephalopod fauna of this latter region, and, unfortunately, the present collection does not add any more species to the list, only two species discovered by the French Antarctic Expeditions being met with here—namely, *Moschites charcoti* (Joubin), [taken at 80–207 fathoms on a varying bottom of mud, glassy sponges, or undecomposed animal *débris*], and *Moschites turqueti* (Joubin), [taken at 222–300 fathoms on mud]. A large damaged *Moschites* also occurred, and possibly the eyes of a large Oegopsid, particulars of which will be found in the text, are referable to this region.

In the Pacific, off North Island, New Zealand, *Moschites* seemed to be entirely absent, but only six hauls of the bottom fauna were made in this region, and

Cephalopods were only once present, in shallow water on a shelly bottom, when four specimens of the very local *Polypus australis* (Hoyle) occurred. Other species taken in plankton-nets in this region included *Argonauta böttgeri*, Maltzan, which, as far as our knowledge goes, is absent from the Atlantic and Arctic regions, and ranges in Polynesian and Indian seas from China and Hawaii to Australia and New Zealand; *Tremoctopus violaceus*, Delle Chiaje, a cosmopolitan pelagic species recorded from all seas except the neighbourhood of the poles, the most northerly locality known being apparently Japan, and the most southerly the new records of the "Terra Nova"; larvae of *Pyroteuthis* (*Pterygioteuthis*) *giardi*, Fischer, a species with a wide range in the Atlantic, Pacific and Indian oceans; *Rhynchoteuthion*, of a type recorded by Chun from the Indian and Atlantic oceans; *Pyrgopsis pacificus* (Issel), a species widely distributed in the Pacific, having been recorded from Japan to Tahiti; and *Teuthowenia antarctica*, Chun, the type of which was taken at 55° 57′ S., 16° 14′ E. This species is very nearly allied to *Teuthowenia megalops* (Prosch), a species of the North Atlantic which has been found at various points from Greenland to the south of the Canaries. A specimen of *Moroteuthis ingens*, E. A. Smith, was taken at the surface off Three Kings Islands. Pfeffer ('12, p. 112) enumerates thirteen Patagonian examples of this species preserved in various museums. Hoyle ('12, p. 281–282, fig. 9) records an example from the South Orkneys, and fragments of another, which were taken in the stomach of a Ross' Seal from off the same island group. The only other specimen known seems to be that brought to Cambridge by Darwin from the voyage of the "Beagle." As regards the Atlantic specimens, quite a striking group was trawled in forty fathoms on sandy ground at Station 41, off Rio de Janeiro, close to the Tropic of Capricorn. This group included the only Myopsid, *Semirossia tenera* (Verrill), a species limited to the Atlantic, where it has been recorded from Spitsbergen to the south and west coasts of Patagonia; *Polypus rugosus* (Bosc) d'Orb., a species of the South Atlantic, Indo-Malayan, Japanese and Australian regions; *Polypus brucei*, Hoyle, the type male of which was taken off Tierra del Fuego; and *Moschites brevis* (Hoyle), the type of which occurred a little south of this, off Monte Video.

Moschites turqueti (Joubin) and *Moschites charcoti* (Joubin) both extend their range from within the Antarctic Circle, and from the South Shetlands and South Orkneys to this point. Although the Rio de Janeiro specimen of *M. charcoti* appears to be exactly like the Antarctic examples, its locality suggests the possibility that the present species, in spite of the various differences pointed out by Joubin ('05, p. 7), may after all be only a form of *Moschites verrucosa* (Verrill), a species of the north-east coast of America. Joubin (*op. cit.*, p. 17) remarks of *M. verrucosa* and *M. charcoti*, "Ce sont deux espèces évidemment voisines l'une de l'autre." *Polypus occidentalis* (Steenstrup MS.) was taken between tide-marks on the shore of South Trinidad Island, and has been recorded previously from Ascension and the Galapagos Islands, as well as from the type-locality of Cuba. A specimen of the cosmopolitan *Onychoteuthis banksi* (Leach) was washed on board the "Terra Nova" south of Madeira, and the broad-bodied form of *Rhynchoteuthion* was taken at the surface in a plankton-haul made not far from this. A larval specimen of *Pyroteuthis* (*Pterygioteuthis*) *giardi*, Fischer, was captured in a young fish-trawl off Monte Video; a young damaged Histioteuthid, which I have doubtfully referred to *Stigmatoteuthis chuni*, Pfeffer [= *Calliteuthis hoylei*, Chun], being also present. The type of this species was recorded from 4° 34′ S., 53° 42′ E.

It will be seen from this summary that many species known to occur in one portion or another of the waters explored are conspicuous by their absence: e.g., three *Cirroteuthis* species have been described by Hoyle from the Pacific and Southern oceans; *Polypus fontanianus* (d'Orb.), originally recorded from Peru and Patagonia, has recently (Joubin, '05, p. 1) been found in Antarctic regions; *Polypus patagonicus* (Lönnberg), *Loligo patagonica*, E. A. Smith, *Loligo* (?) *ellipsura*, Hoyle, *Gonatus antarcticus*, Lönnberg, and *Crystalloteuthis glacialis*, Chun, are but a few of many interesting forms occurring in Southern seas. This list can be expanded enormously by a careful perusal of Dr. Hoyle's "Catalogue of Recent Cephalopoda" with its two Supplements.*

All the large specimens have been preserved in alcohol, and the smaller examples taken in plankton-hauls were preserved in formalin.

In conclusion, I wish to express my thanks to my colleague, Mr. R. Southern, for three of the drawings, and for help on various occasions. Many of the other drawings have been done by Miss E. E. Barnes, of Dublin, in a room kindly lent for the purpose by Miss Stephens, National Museum, Dublin.

II.—DESCRIPTIONS OF SPECIES.

Family ARGONAUTIDAE.

1. *Argonauta böttgeri*, Maltzan. Figs. 1, 2.

> *Argonauta Böttgeri*, Maltzan, Journ. de Conch., XXIX, p. 163, pl. 9, fig. 7, 1881.
> *Argonauta böttgeri*, E. A. Smith, Ann. Mag. Nat. Hist., ser. 5, XXI, p. 409, pl. 17, figs. 1–6, 1887.
> *Argonauta Böttgeri*, Hidalgo, Rev. R. Acad. Cien. Madrid, p. 9, 1905.
> *Argonauta böttgeri*, Dall, Bull. Mus. Comp. Zool., XLIII, no. 6, pp. 226, 229, 1908; Berry, Bull. Bur. Fish., XXXII, pp. 277–280, pl. 48, fig. 5, text-figs. 3–7, 1914.

Station 130, off Three Kings Islands, surface, square 18-mesh net, plankton, Aug. 27th, 1911.—One ♀.

This has a somewhat rounder body than Berry's specimen, which is possibly due to some difference caused by preservation. There is a deep ventral furrow, and the mantle-opening is very wide. The funnel reaches above the eyes, its apex being about on a level with the mouth. The funnel-organ consists of a median Λ-shaped

* Proc. Royal Phys. Soc. Edinburgh, '86, '97, '09.

pad. and two lateral pads, just as in Berry's (*op. cit.*) text-figure 5. The web extends to about the third sucker laterally, and to about the fourth dorsally and ventrally. The highly-elevated suckers are very large on the proximal two-thirds of the arms, and very small distally. Round, expanded, brown chromatophores are present on the posterior dorsal surface, and elongated transverse chromatophores on the head. Small, contracted, round, dark chromatophores are dotted about at the base of the suckers, and are placed in two rows on the dorsal surface of the arms. Some of the arms have had the surface abraded, so that it cannot be ascertained if the chromatophores were in two rows on all of them. The radula (Fig. 1) of the present specimen differs considerably from that of *A. argo*, Linn., as figured by Jatta ('96, pl. 18, fig. 19)—e.g., the median tooth has three denticles, and the first laterals are much smaller instead of being of the same size; the second laterals have a longer base, which is produced both in front and behind the denticle, and the marginal plates are not so long in proportion to their width.

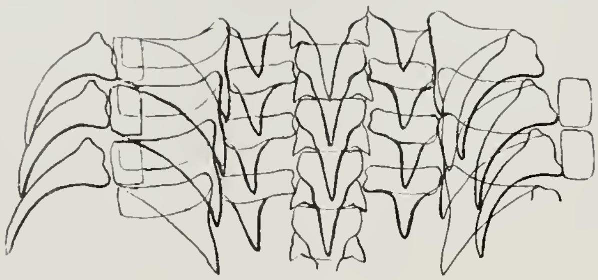

FIG. 1.—*Argonauta böttgeri*, radula, × 60.

FIG. 2.—*Argonauta böttgeri*, mandible, × 2.

Dimensions in Millimetres.

End of body to ventral mantle-margin	8
Breadth of mantle	8
Breadth of head	9
Length of funnel	5·50
1st right arm (to expanded portion)	8
2nd right arm	11
3rd right arm	*ca.* 10
4th right arm	*ca.* 11
1st left arm (to expanded portion)	8
2nd left arm	12
3rd left arm	mutilated
4th left arm	9
Diameter of largest sucker	1

Distribution.—Mauritius and Chagos Islands (E. A. Smith); Masbate and Philippines (E. A. Smith, Hidalgo); China Sea and Australia (E. A. Smith); Hawaiian Islands (Dall).

2. *Tremoctopus violaceus*, Delle Chiaje. Figs. 3, 4.

(?) *Tremoctopus violaceus*, Delle Chiaje, Memorie sulla struttura e Notomia degli animali senza vertebre del Regno di Napoli, I, pls. 70 and 71, 1829; Descrizione e Notomia degli animali invertebrati della Sicilia citeriore I, Molluschi Cefalopodi e Pteropodi, I, p. 6, V, p. 66, 1841.

Octopus gracilis, Souleyet, in Eydoux and Souleyet, Voy. Bonite, Zool., p. 13, pl. I, figs. 8–9, 1852.

(?) *Octopus dubius*, Souleyet, in Eydoux and Souleyet, *op. cit.*, p. 15, pl. I, figs. 10–14, 1852.

Tremoctopus quoyanus, Hoyle, Bull. Mus. Comp. Zool., XLIII, no. 1, p. 12, fig. A, 1904.

Tremoctopus violaceus, Jatta, Cefalopodi, Fauna u. Flora G. v. Neapel, Monogr. 23, pp. 201–9, pl. 6, fig. 2; pl. 20, figs. 1–18, 1896; Berry, Bull. Bur. Fish., XXXII, pp. 281–286, pl. 49, figs. 3, 4, text-figs. 8–10, 1911.

Station 89, off Three Kings Islands, surface, 24-mesh net, plankton, July 25th, 1911.—Two ♂, two ♀.

Station 129, off Three Kings Islands, surface, square 18-mesh net, plankton, Aug. 26th, 1911.—Two ♀.

These are all young specimens, the two males having a ventral mantle measuring 4 mm. and 4·25 mm. The smallest shows the third right (hectocotylized) arm coiled round beneath the skin. The females have a mantle measuring 4 to 5 mm. The largest shows the two aquiferous pores at the base of the dorsal arms, but those on the ventral surface cannot be seen; unless, however, the delicate integument is quite uninjured the pores cannot be discovered. The colour of all the specimens is pale buff, with a few rust-coloured or dark chromatophores on the mantle, and more numerous and very dark chromatophores on the dorsal surface of the head. Usually, though not in one of the specimens, a very large dark chromatophore is present at each side of the base of the siphon. The chromatophores on the dorsal surface of the arms in the six examples follow a very definite plan—namely, a single row is arranged proximally, changing into two rows distally. There is also a well-defined row on the outer surface of suckers at each side of the arm, and a few are dotted about on the inner surface of the suckers. In the largest specimen fourteen to fifteen suckers are present on each of the third arms, and about forty-two were counted on each of the first arms. The web extends dorsally to the fifth sucker, and to the fourth ventrally. On the mantle of this female being slit open the visceral envelope was found to be much more deeply pigmented with dark chromatophores, both dorsally and ventrally, than the outer surface. The anal aperture has very long appendages (Fig. 4, *a.app.*). The ink-sac is of an elongated flask-shape, and is somewhat deeply imbedded in the liver, which latter has a strong median indentation posteriorly. The nidamental glands, which are dotted with chromatophores, are circular rather than oval, and are coiled round, and raised up in the centre. The ridged grinding pads of the stomach appear like transverse bands glimmering through to the outer surface. The posterior salivary glands are somewhat triangular in outline, the anterior margin being the shortest. The radula (Fig. 3) of this specimen is very like that figured by Jatta (*op. cit.*, pl. 20, fig. 14).

FIG. 3.—*Tremoctopus violaceus*, radula, × 140.

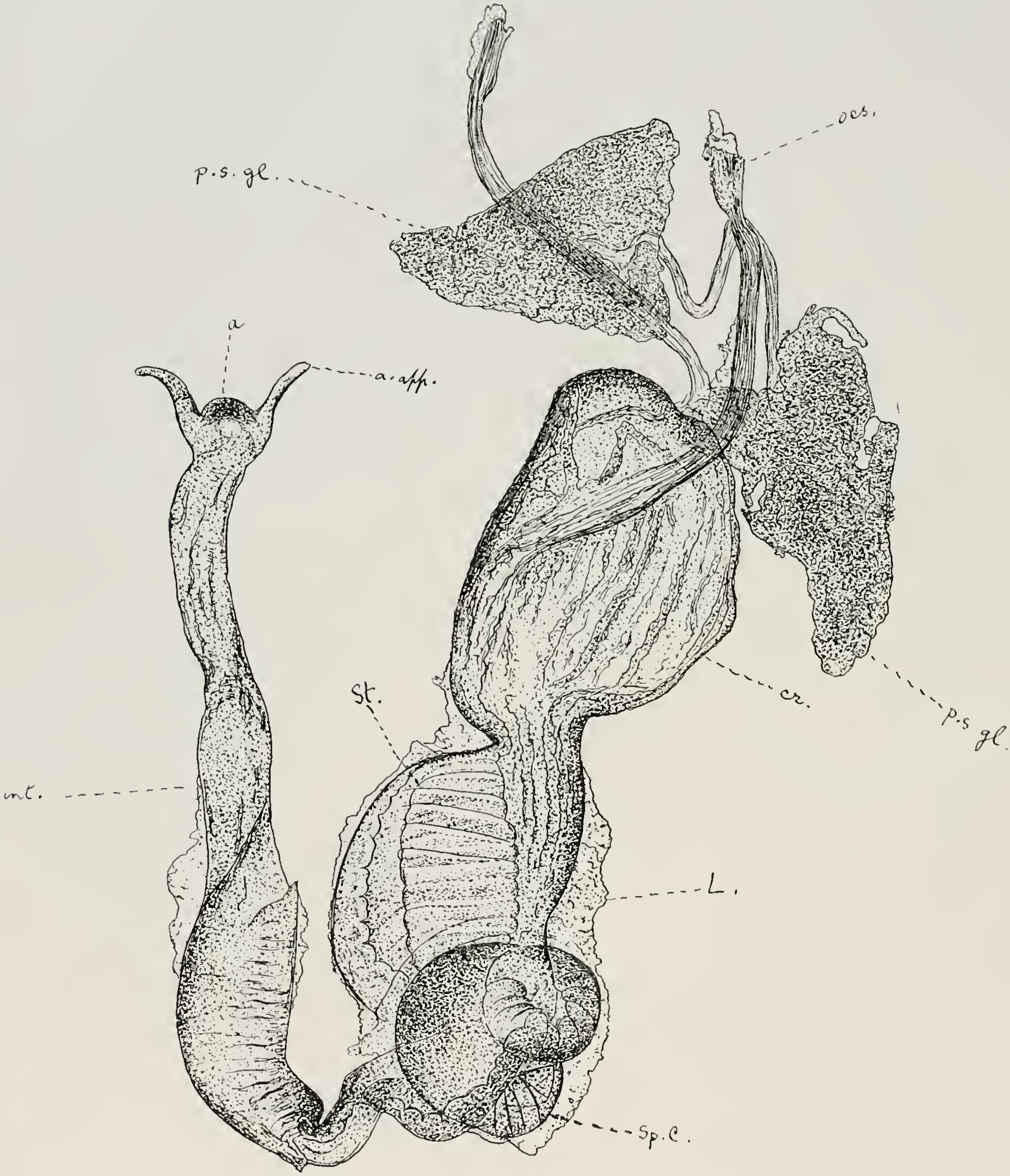

Fig. 4.—*Tremoctopus violaceus*, alimentary canal, × 27. *a.*, Anus; *a. app.*, anal appendages; *cr.*, crop; *int.*, intestine; *L.*, liver; *oes.*, oesophagus; *p.s.gl.*, posterior salivary glands; *Sp.C.*, spiral caecum; *St.*, stomach.

Dimensions in Millimetres.

End of body to ventral mantle-margin	5
End of body to eye	8
Breadth of body	6·50
Breadth of head	7
Umbrella between dorsal arms	3
1st left arm	20
2nd left arm	mutilated
3rd left arm	5
4th left arm	6

Type locality.—Of *violaceus*, the Bay of Naples, Italy; of *gracilis*, long. 106° W., lat. 8° N., Pacific Ocean (*fide* Tryon).

Distribution.—Of *violaceus*, Mediterranean (Delle Chiaje, Jatta, etc.); middle Atlantic; Japan (Wülker). Of *gracilis*, eastern mid-Pacific (Souleyet); neighbourhood of the Hawaiian and Midway Islands (*Albatross*); eastern tropical Pacific (Hoyle, as *quoyanus*); between Papua and Japan (Hoyle); near Mauritius (Souleyet, as *dubius*) (Berry).

Family POLYPODIDAE.

3. *Polypus rugosus* (Bosc), d'Orbigny. Figs. 5, 6.

Sepia rugosa, Bosc, Actes Soc. d'histoire nat. Paris, p. 24, pl. 5, figs. 1, 2, 1792.

Octopus rugosus, d'Orbigny, Céphalopodes acétabulifères, p. 45, pls. 6, 23, fig. 2, 1838; Brock, Zool. Jahrb., II, pp. 591–614, pl. 16, figs. 1–4, Jena, 1887; Joubin, Bull. Soc. Zool. France, XXII, p. 99, 1897.

Octopus granulatus, Lamarck, Mém. Soc. d'histoire nat. Paris, p. 20, 1799; Hoyle, "Challenger" Rep. (Cephalopoda), XVI, pp. 80–81, 1886; Goodrich, Trans. Linn. Soc., VII, p. 19, 1896; Wülker, Abh. Wiss., III. Suppl. Bd. I. Abh., pp. 5, 6, München, 1910.

Octopus boscii, var. *pallida*, Hoyle, Diagnoses I, p. 223, 1885; Prelim. Rep. I, p. 97, 1885; "Challenger" Rep., pp. 81–83, pl. 1, pl. 3, fig. 2, 1886.

Octopus polyzenia, Gray, Brit. Mus. Cat., p. 13, 1849; E. A. Smith, Rep. Zool. Coll. Indo-Pacific Ocean during voyage of H.M.S. "Alert," p. 34, pl. 4, fig. A, 1884.

(?) *Octopus kagoshimensis*, Ortmann, Zool. Jahrb., V, p. 644, pl. 21, fig. 2, 1888.

Station 42, off Rio de Janeiro, 22° 55′ S., 41° 34′ W., 40 fathoms (73 m.). Agassiz trawl, bottom fauna (sand), May 2nd, 1913.—One ♂.

This has the arms two and a half to three and a half times the length of the hard, stiff, rugged body. The arms are so much curled up that the measurements given below must be regarded as approximate. The web is much less than the ventral mantle-length, and about equal all round, slightly lowest between the ventral arms, and highest between the left lateral arms; it is not much continued up the arms, but forms expansions at the distal portion of each, especially on the fourth pair. The suckers are very large, and are enlarged on the four lateral arms.

Hectocotylus very minute. A furrow is present on the ventral mantle. Funnel-organ W-shaped. Colour reddish-brown above with oblong dark markings, pinkish buff below. Surface very rugose, even ventrally, and inside web. Large ocular cirri.

This seems to have somewhat longer arms, with the dark and light coloration, between their dorsal and ventral surface, less marked than usual, and a longer umbrella, especially between the dorsal arms, than is customary in typical examples. On the whole, however, the assemblage of characters, particularly the very minute hectocotylus, point to its being this widely distributed species. The radula and mandibles are figured (Figs. 5, 6).

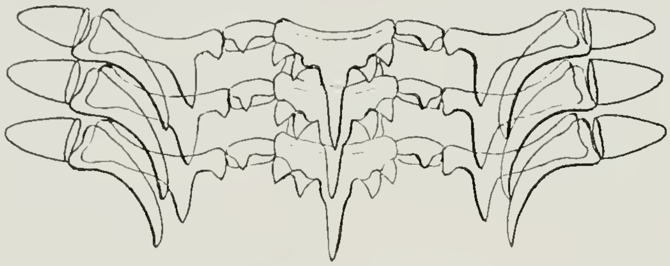

FIG. 5.—*Polypus rugosus*, radula, × 60.

FIG. 6.—*Polypus rugosus*, mandibles, × 2.

Dimensions in Millimetres.

End of body to mantle-margin	30
End of body to eye	37
Breadth of body	27
Breadth of head	25
Web between ventral arms	18
Web between dorsal arms	20
Web between left lateral arms	26
Web between right lateral arms	20
1st right arm	90
2nd right arm	122
3rd right arm	96
4th right arm	96
1st left arm	93
2nd left arm	110
3rd left arm	119
4th left arm	89
Hectocotylus	1
Diameter of largest sucker	3·50

Distribution.—Africa, west and south; Peru; Indo-Malayan region; Japan; Australia.

4. *Polypus occidentalis* (Steenstrup, MS., Hoyle). Figs. 7, 8.

Octopus occidentalis, Steenstrup, MS. in Mus. Havn.
Octopus vulgaris, var. *americanus*, d'Orbigny, Moll. Cuba, p. 14, pl. 1, Paris, 1853.
Octopus occidentalis, Hoyle, "Challenger" Cephalopoda, XVI, pp. 77–78, 1886.
Polypus occidentalis, Hoyle, Bull. Mus. Comp. Zool., XLIII, p. 14, 1904.

Station 36, South Trinidad Island, shore between tide-marks, July 26th, 1910. —One ♀.

The dorsal surface of this is much paler (a smoky grey on a light ground) than that of the female in the British Museum, taken by the "Challenger" Expedition at

Ascension. The peculiar sculpture is the same in both—e.g., numerous small papillae, which form rosette-like clusters inside umbrella and on dorsal arms, are present all over the dorsal surface. The two specimens are also alike in the broad head, constriction between it and body, very narrow mantle-opening, and short web between dorsal arms. The funnel-organ of the present specimen is not in very good condition, but appears to be **W**-shaped, with the median pads much narrower than the lateral ones. This may be due to contraction, however. The siphon is narrow and pointed, and extends about one-third of the distance to the margin of the umbrella. The radula and mandibles are shown in Figs. 7, 8. All the arms are mutilated, except the fourth pair, which are about four times the length of the mantle. The umbrella is very soft, loose, and semi-transparent, and measures about a quarter the length of the arms, and is much extended up them.

FIG. 7.—*Polypus occidentalis*, radula, × 60.

FIG. 8.—*Polypus occidentalis*, mandibles, × 2.

Dimensions in Millimetres.

End of body to ventral mantle-margin	23
End of body to eye	31
Breadth of body	20
Breadth of head	22
Breadth of constriction between head and body	16
Diameter of largest sucker	*ca.* 2·25
Web between dorsal arms	18
Web between ventral arms	23
Fourth left arm	102

Distribution.—Cuba (d'Orbigny); Ascension and Galapagos Islands (Hoyle).

5. *Polypus australis* (Hoyle). Figs. 9, 10.

Octopus australis, Hoyle, Diagnoses I, p. 224, 1885; Prelim. Rep. I, p. 98, 1885; "Challenger" Rep. (Cephalopoda) XVI, pp. 88–89, pl. 3, figs. 4 and 5, 1886; Brazier, Cephalopoda, Sydney, Austr. Mus. Cat., p. 5, 1892.

(?) *Octopus duplex*, Hoyle, Diagnoses I, p. 226, 1885; Prelim. Rep. I, p. 101, 1885; "Challenger" Rep. (Cephalopoda) XVI, pp. 90–91, pl. 7, fig. 5, 1886.

Station 134. Spirits Bay, near North Cape, New Zealand, 11–20 fathoms (20–37 m.), dredge, bottom fauna (shelly), Aug. 31st, 1911.—One ♂, one ♀, two immature.

The single row of large brownish spots up each ventral arm, extending into bars on the dorsal arms, make this a very pretty and distinctive species. In the young specimens the spots are quite round and very dark. These specimens are all without the raised ridge on the ventro-lateral margin of body present in the "Challenger" specimens, possessing instead a very slight ventral furrow; but in all other external characters they are in close agreement with the type—e.g., arms about three times the length of mantle, and umbrella about one-third of length of arms, and usually a little longer laterally than ventrally, mantle-opening rather narrow, siphon extending half way to mantle-margin, funnel-organ **W**-shaped. Branched ocular cirri are present, and there are many tubercles on body. There is a strong constriction between head and body. Hectocotylus broad and clumsy, with the lateral margins folded over. *P. australis* seems to be very near *P. globosus*, Appellöf, but, compared with Bombay examples belonging to the Indian Museum, which I have referred to *P. globosus*, the present specimens have a more closely tubercled body, thicker and shorter arms, no enlarged suckers in male, a longer umbrella, and the already-mentioned row of large spots on arms. An Indian example of *P. globosus*, with mantle of only 6 mm., shows two rows of large spots on all the arms, which are not distinguishable in the larger specimens. The colour of the chromatophores is redder in *P. australis*, and browner in *P. globosus*. The hectocotylus of the latter is much narrower, but this may be due to the Indian specimen being younger (mantle 12 mm.).

Some specimens which I have seen of *P. macropus*, Risso, belonging to the British and Indian Museums, quite support M. Joubin's remark ('97, p. 99) as to the close relationship of *P. globosus* and *P. macropus*. The types of *P. duplex* (Hoyle) bear a strong likeness to the various sized specimens which are referred here to *P. australis*, and I think it is probable they will eventually prove to be the young of that species.

FIG. 9.—*Polypus australis*, radula, × 60.

FIG. 10.—*Polypus australis*, mandibles, × 2.

Dimensions in Millimetres of Male.

End of body to mantle-margin	17
End of body to eye	23
Breadth of body	20
Breadth of head	17
1st right arm	52
2nd right arm	56
3rd right arm	46
4th right arm	60
1st left arm	53
2nd left arm	57
3rd left arm	58
4th left arm	55
Hectocotylus	5
Diameter of largest sucker	3

Distribution.—Type in British Museum, from Port Jackson, Australia, 6–15 fathoms, one female, one immature (Hoyle); George's Beach, Port Jackson, N.S.W. (Brazier).

6. *Polypus brucei*, Hoyle. Fig. 11.

Polypus brucei, Hoyle, Trans. Roy. Soc. Edinburgh, XLVIII, pt. II. (no. 14), pp. 276–278, text-figs. 2 (hect.), 3 (radula), 1912.

Station 42, off Rio de Janeiro, 22° 56′ S., 41° 34′ W., surface, 40 fathoms (73 m.). Agassiz trawl, bottom fauna (sand), May 2nd, 1913.—One ♀.

This is a pretty little specimen with a quite smooth surface, short equal web, attached as in the type, and long spidery arms, with close-set bead-like suckers. The arms are about four times, and the web about one quarter, of the mantle-length. The mantle opens just below the eye. The siphon does not extend half-way to the margin of the umbrella. Colour as in the type, "dull purplish above, changing gradually into a pinkish stone colour below." The chromatophores are very small, and of a purplish brown tint. The radula has the median teeth without any cusps, and closely resembles that figured by Hoyle (*op. cit.*, p. 280, text-fig. 7 [H 924]) for *Moschites charcoti* (Joubin), but the teeth next the outer lateral teeth have the broad bases just as in Hoyle's (*op. cit.*) fig. 3 [H 924] of *P. brucei*.

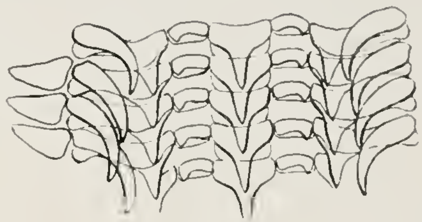

Fig. 11.—*Polypus brucei*, radula, × 60.

Dimensions in Millimetres.

End of body to mantle-margin	9
End of body to eye	12
Breadth of body	10
Breadth of head	9
Diameter of largest sucker on arm	*ca.* ·75
Length of first right arm	37
Length of second right arm	38
Length of third right arm	mutilated
Length of fourth right arm	33

Distribution.—Off Tierra del Fuego, a male specimen (Hoyle).

7. *Moschites charcoti* (Joubin). Figs. 12–21.

Eledone Charcoti, Joubin, Exp. Antarctique Française, pp. 2–9, text-fig. 1, pl. 1, figs. 1–2, 1905; Joubin, Deuxième Exp. Antarctique Française, pp. 34–37, text-figs, 1, 2, 1914.

Moschites charcoti, Hoyle, Trans. Royal Soc. Edinburgh, XLVIII, pt. II (no. 14), pp. 279–280, text-figs. 6 (hect.) and 7 (radula), 1912.

Station 42, off Rio de Janeiro, 22° 56′ S., 41° 34′ W., 40 fathoms (73 m.). Agassiz trawl, bottom fauna (sand), May 2nd, 1913.—One ♀.

Station 194, off Oates Land, 69° 43′ S., 163° 24′ E., 180–200 fathoms (329–366 m.). Agassiz trawl, bottom fauna (undecomposed animal *débris*), Feb. 2nd, 1911.—One young.

Station 294, Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms (289 m.). Agassiz trawl, bottom fauna, Jan. 15th, 1913.—Three ♀.

Station 338, McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 fathoms (379 m.). Agassiz trawl, bottom fauna (mud), Jan. 23rd, 1912.—Four ♂, six ♀, and four young.

Station 349, off Butter Point, Western Shore of McMurdo Sound, 80 fathoms (146 m.), Agassiz trawl, bottom fauna (large catch of glassy sponges), Feb. 15th, 1912.—One ♂.

Joubin ('14) has pointed out that the only important difference between this species and *M. turqueti* (Joubin) is that in *M. charcoti* the back and upper surface of the dorsal arms are covered with fine cutaneous tubercles, while in *M. turqueti* these parts of the body are smooth. The above collection of five males, ten females, and

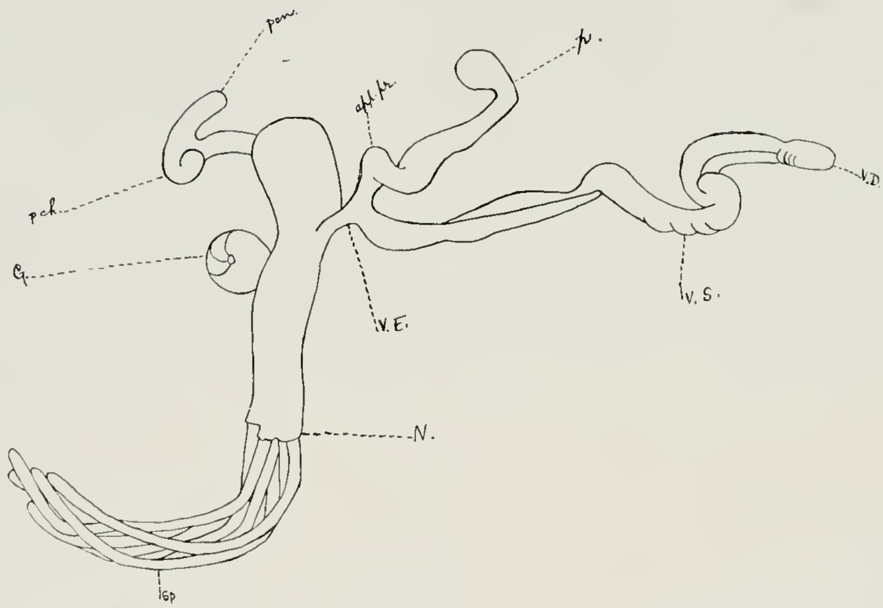

FIG. 12.—*Moschites charcoti*, male reproductive organs, skin of Needham's pouch stripped off to show sperms, natural size. *app. pr.*, Appendix to prostate; *G.*, genital gland; N., Needham's pouch; *p.*, prostate; *pch.*, pouch-like dilatation; *pen.*, penis; *sp.*, spermatophores; *V.D.*, vas deferens; *V.E.*, vas efferens; *V.S.*, vesicula seminalis.

five young specimens have a mantle-length varying from 40 to 7 mm. The funnel-organ consists of two **V**-shaped pads, which, although placed closely together, are distinctly separate, so as not to form the **W**-shaped organ seen in *M. cirrosa* (Lmk.), and in *M. moschata* (Lmk.).

Three males from Station 338 (Jan. 23rd) were partially dissected, and are distinguished by the letters A, B, and C. The mantle-lengths of each are—A, 40 mm., B, 32 mm., and C, 25 mm. The male reproductive organs (Fig. 12) all show a very large pouch to the penis, and possess a large prostate and small accessory gland, and the vas efferens is very short and thick. Specimens A and B possess a genital gland measuring about 25 by 17 mm., and show no trace of sperms in any part of the genital ducts, the internal walls of which are longitudinally ridged throughout. Specimen C (Fig. 12) has a very small genital gland, and enormous sperms ready for exclusion are packed in the spermatophore-sac; one of these (Fig. 13), which was found loose in the mantle-cavity, measures 80 mm. in length. The hectocotylus is broad and thick. Specimens A and B have each about nine transverse grooves in the hollow part, and specimen C has only four. B has also a distinct longitudinal ridge, absent in the other specimens. The sperm-canal is well developed. The digestive system (Fig. 14) seems to resemble in all its main features that of *M. cirrosa* figured by Isgood ('09, pl. 4, fig. 17). The intestine usually appears thicker, and the ink-sac smaller, in *M. charcoti*, but the shape of these must depend largely on whether they have been recently emptied. The anterior vena cava, the lateral venae cavae, with their venous appendages and branchial hearts, are placed as in Isgood's illustration ('09, pl. VII, fig. 52) of the same in *M. cirrosa*. The size of the liver in specimen A is about 26 by 24 mm., and 20 mm. in diameter: the stomach is about 13 by 9 mm.; the spiral caecum about 10 by 5 mm.; and the branchial hearts measure about 9 mm. in length and breadth. The mandibles (Fig. 16) call for no special remark. The radula (Fig. 15) of specimen A contains about 120 rows of teeth, and measures about

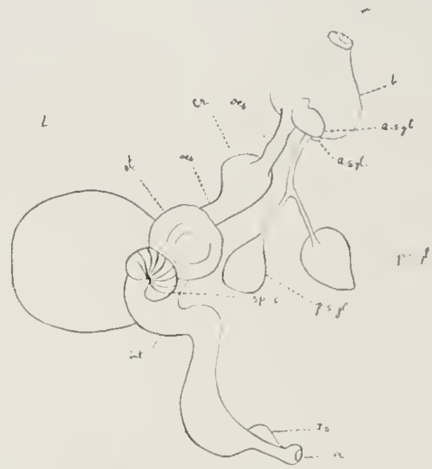

Fig. 14.—*Moschites charcoti*, alimentary canal, $\frac{2}{3}$ natural size. *a.*, Anus; *a.s.gl.*, anterior salivary glands; *b.*, buccal mass; *cr.*, crop; *int.*, intestine; *I.s.*, ink-sac; *L.*, liver; *m.*, mouth; *oes.*, oesophagus; *p.s.gl.*, posterior salivary glands; *sp.c.*, spiral caecum; *st.*, stomach.

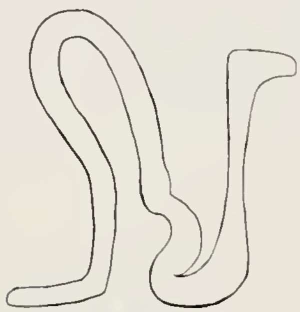

Fig. 13.—*Moschites charcoti*, a spermatophore, × 2.

Fig. 15.—*Moschites charcoti*, radula, × 38.

17 mm. in length. The median tooth has a central denticle, and usually two lateral cusps at each side. The radulae of specimens B and C show much the same variation in the shape of the median tooth, and the different lateral teeth are in agreement with

FIG. 16.—*Moschites charcoti,* mandibles, × 2.

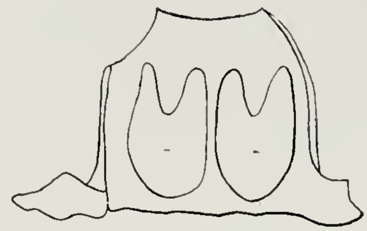

FIG. 17.—*Moschites charcoti,* funnel-organ, × $1\frac{1}{2}$.

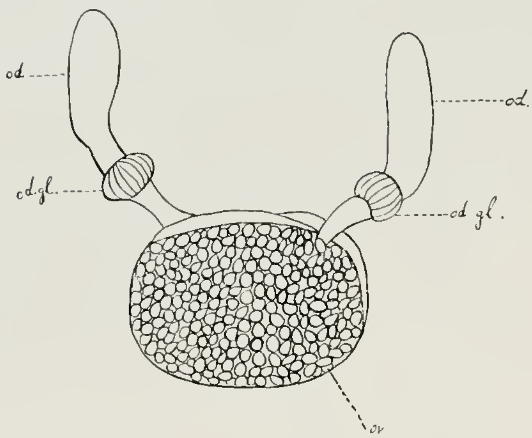

FIG. 18.—*Moschites charcoti,* ovary, × 3. *od.,* Oviduct ; *od gl.,* oviducal gland ; *ov.,* ova.

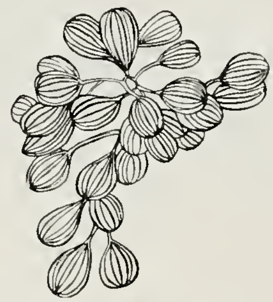

FIG. 19.—*Moschites charcoti,* ova much enlarged.

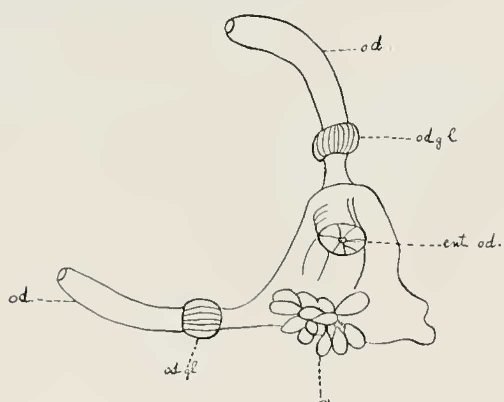

FIG. 20.—*Moschites charcoti,* oviducts and interior of ovary, × 3. *ent.od.,* Entrance to oviduct ; *od.,* oviduct ; *od.gl.,* oviducal gland ; *ov.,* ova.

FIG. 21.—*Moschites charcoti,* statolith, × 35.

those of specimen A. The ovary (Fig. 18) of a female from this haul, with mantle-length of 35 mm., is packed with eggs (Fig. 19), the largest measuring 1·50 mm. in length. They have longitudinal ridges on their outer surface, and somewhat similar ridges are apparent on the external surface of the oviducal glands. Part of the interior of the ovary, with eggs *in situ*, is shown in Fig. 20. The contents of the stomach and crop of specimens A, B, and C, and those of two females from the same haul, were examined, and consisted of fragments of sponge and many sponge-spiculae, pieces of glandular skin, setae of Polychaeta, opercula of *Spirorbis*, a foraminifer, and a quantity of much digested animal *débris*, some of it apparently crustacean. These specimens were taken on muddy ground, and in no case was there a great quantity of food present; either crop or stomach, in some instances, being quite empty. In a young specimen from Oates Land, from a bottom of undecomposed animal *débris*, the stomach and crop were distended to their utmost capacity with animal substances.

Dimensions in Millimetres.

	Station 349.	Station 338.				
	♂	A♂	B♂	C♂	♀	♀
End of body to mantle-margin .	35	40	32	25	35	33
Breadth of body . . .	39	50	53	42	42	38
Breadth of head . . .	30	41	28	33	30	23
1st right arm . . .	72*	124	93	77	mutilated	64
2nd right arm . . .	71*	112	99	78	29	62
3rd right arm . .	74	101	89	65	98	65
4th right arm . . .	85*	131	99	82	102	65
Hectocotylus . . .	6	6	5	5	—	—
Diameter of largest sucker .	3	4	4·75	2·50	3	2

Distribution.—Type, a female taken at Booth-Wandel Island, South Shetlands, 65° 05′ S. lat., among algae and shingle on the beach, Sept. 3rd, 1904 (Joubin, '05). South Orkneys, August, 1903, 10 fathoms, a male; same locality, May, 1903, 9–10 fathoms, a female (Hoyle, '12). Antarctic, two specimens (Joubin, '14).

8. *Moschites turqueti* (Joubin). Figs. 22–28.

Eledone Turqueti, Joubin, Exp. Antarctique Française, pp. 9–11, pl. 1, figs. 3–6, 1905; Joubin, Deuxième Exp. Antarctique Française, pp. 37–38, text-figs. 3, 4, 1914.

Station 42, off Rio de Janeiro, 22° 56′ S., 41° 34′ W., 40 fathoms (73 m.), Agassiz trawl, bottom fauna (sand), May 2nd, 1913.—One ♀.

Station 314, 5 miles N. of Inaccessible Island, McMurdo Sound, 222–241 fathoms (406–441 m.), Agassiz trawl, bottom fauna (mud), Jan. 23rd, 1911.—One ♀.

Station 355, off Cape Evans, McMurdo Sound, 77° 46′ S., 166° 8′ E., 300 fathoms (547 m.), Agassiz trawl, bottom fauna, Jan. 20th, 1913.—One ♂, one ♀.

The male from Station 355 and the female from Station 314 have both got a squat body, with a very few dorsal tubercles, closely resembling that figured by Joubin ('05, pl. 1, figs. 3, 4). The females from Stations 355 and 42 have a longer, narrower body, but both are wrinkled and distorted; neither has any tubercles. The colour of the specimens varies from pinkish to purple-grey. The chromatophores are always

* Less tip.

uniformly distributed in fine dots. Arms two and a half to three times of body, and web one-third to one-fifth of arms. The funnel-organ is very like that of *M. charcoti*, and consists of two V-shaped pads of very broad outline, especially posteriorly. The hectocotylus (Fig. 26) is broad and clumsy, and the outer edges of the spoon-shaped process have a number of ridges, but the hollow inner surface is almost quite smooth. The sperm-canal is very broad, and its outer surface is closely striated. The specimen

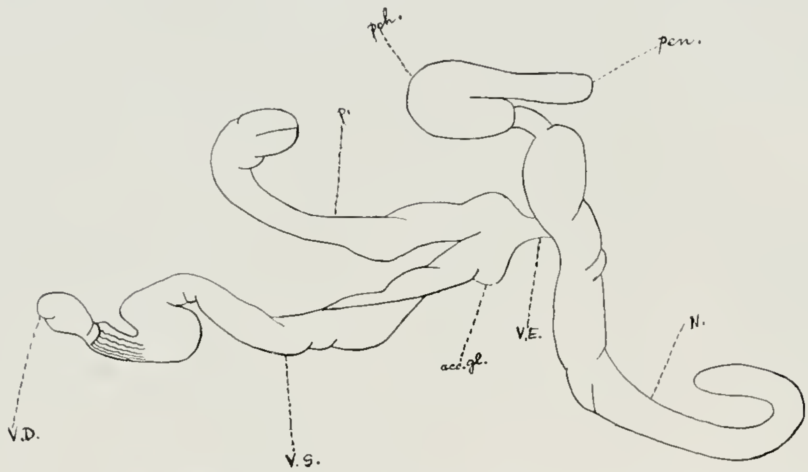

FIG. 22.—*Moschites turqueti*, male reproductive organs, natural size. *acc.gl.*, Accessory gland; *N.*, Needham's pouch; *p.*, prostate; *pch.*, pouch-like dilatation; *pen.*, penis; *V.D.*, vas deferens; *V.E.*, vas efferens; *V.S.*, vesicula seminalis.

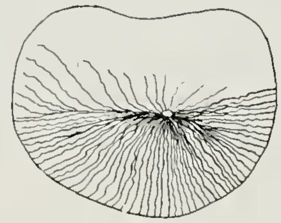

FIG. 23.—*Moschites turqueti*, genital gland, × 2.

FIG. 25.—*Moschites turqueti*, ova, much enlarged.

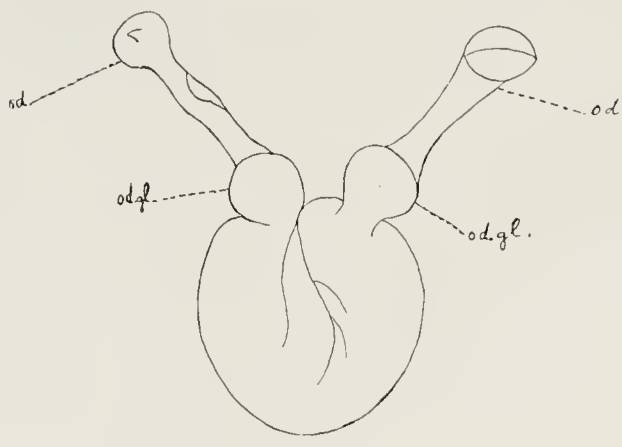

FIG. 24.—*Moschites turqueti*, ovary, × 3. *od.*, Oviduct; *od.gl.*, oviducal gland.

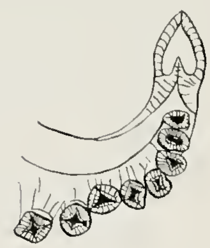

FIG. 26.—*Moschites turqueti*, extremity of hectocotylized arm, slightly enlarged.

taken off Rio de Janeiro, which has the arms three times the length of body, and a web extending one-fifth of their length, and almost obsolete ventrally, is referred here with some slight hesitation, as it is paler in colouring, and the arms seem a little longer and slenderer, with more prominent suckers, than those of the other specimens. In the shape of the body, however, it resembles the female from Station 355, and the funnel-organ, narrow web, quite smooth surface, and uniform small chromatophores, are all in harmony with the other specimens; the arms, moreover, are longer and slenderer, and the umbrella narrower than in Hoyle's description of *Moschites rotunda* ('86, pp. 104, 5, pl. 8, figs. 4–6), a species of the Pacific and Southern oceans. A remarkable feature of *M. rotunda* is that the colour of the umbrella is deepest on the inner surface, which is the reverse of what prevails in this specimen. The male reproductive organs of *M.*

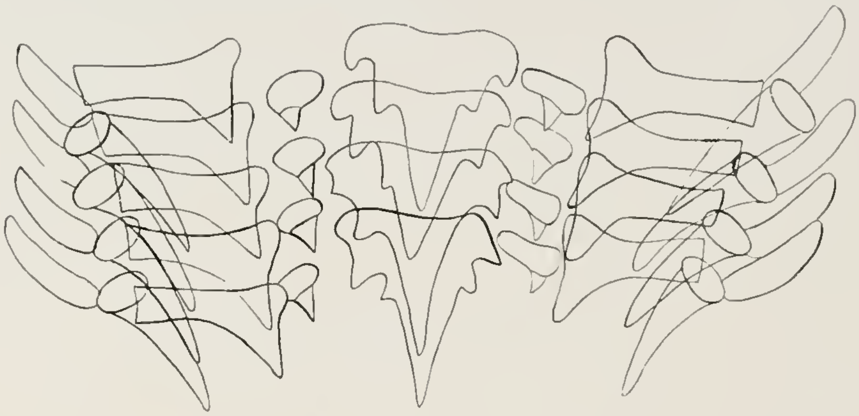

FIG. 27. *Moschites turqueti*, radula, × 40.

turqueti (Figs. 22, 23) closely resemble those of *M. charcoti* (Joubin), having the same huge pouch to the penis, enormous prostate, and very small accessory glands. The ovary of the female from Station 355 (Fig. 24) was examined, and the oviducts seem to be placed closer together than in that of *M. charcoti* (Fig. 18). Probably, however, this is a variable feature dependent upon the number of eggs with which the ovary is

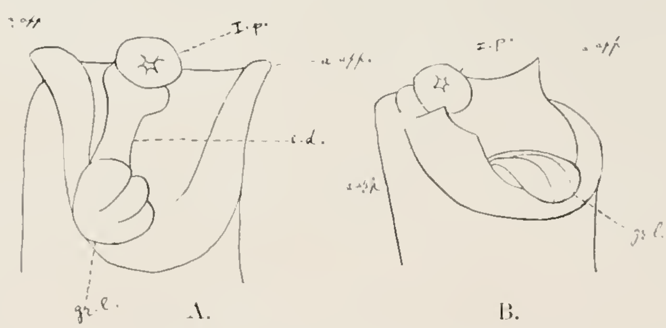

FIG. 28.—*Moschites turqueti*, anal apex, A., front view; B., side view, × 10. *a.app.*, Anal appendages; *gr.l.*, grooved lining of inner wall of anus; *i.d.*, ink duct; *I.p.*, ink duct papilla.

distended. The oviducal glands show no external ridges. A small yellow swelling is present on the left oviduct, above the oviducal gland, and seems to have no opening, either externally or into the oviduct; the internal wall of the latter is ridged, and its apex is a simple median aperture. The right oviduct has the apex folded, perhaps accidentally, so that it presents the appearance of two minute nidamental glands. The pear-shaped eggs are very faintly grooved externally, and have an aperture at the free broad end. No anatomical difference seems to exist between this species and *M. charcoti* (Joubin) as regards the alimentary system, gills, venae cavae, and mandibles. The anal apex of the female from Station 355 (Fig. 28) is in very good condition, and shows that the long appendages commonly seen in the Oegopsida and Myopsida are here limited to a short upright projection at each side, between which the ridged internal wall is seen hanging over the edge of the integument in front like a tongue, and the papilla of the ink-gland opening into the dorsal wall is observed to have its aperture slightly above the level of the anal apex. The stomach and crop of this specimen were perfectly empty, as was also the crop of the male of this haul: the stomach of the latter contained some much digested animal remains, and (?) crustacean ova. The radula (Fig. 27) is very like that of *M. charcoti* (Joubin); the chief difference seems to be that the base of the first lateral teeth has a wider projection at the side next the median teeth than in that species.

Dimensions in Millimetres.

	Station 42.	Station 314.	Station 355.	
	♀	♀	♂	♀
End of body to mantle margin .	30	12	48	44
Breadth of body	27	17	61	37
Breadth of head	26	17	47	32
1st right arm	95	42	115	80
2nd right arm	97	mutilated	123	88
3rd right arm	100	43	119	87
4th right arm	103	43	136	95
Hectocotylus	—	—	8	—
Diameter of largest sucker . .	3	—	5	4

Distribution.—Antarctic (Joubin, '05, '14). Type female, and four small examples.

9. *Moschites brevis* (Hoyle). Figs. 29–32.

Eledone brevis, Hoyle, Diagnoses I, p. 230, 1885; Prelim. Rep., p. 106, 1885; "Challenger" Rep. (Cephalopoda), XVI, pp. 105–106, pl. 8, fig. 7, 1886.

Station 42, off Rio de Janeiro, 22° 56′ S., 41° 34′ W., 40 fathoms (73 m.), Agassiz trawl, bottom fauna (sand), May 2nd, 1913.—One ♂.

This has a raised ridge on the ventro-lateral margin of body, but no ventral furrow. The arms are nearly twice the length of the body, and the web extends nearly half the length of the arms. There are about forty-three suckers on the first right arm, and about twenty-five on the third right arm. The hectocotylus is very minute, and as if imperfectly developed. The sperm-canal is well defined. The siphon is somewhat pointed, and reaches less than half-way to umbrella-margin, and the funnel-organ (Fig. 30) consists of two V-shaped pads. Colour buff, with dark purple chromatophores above, and many of a reddish tint on the ventral surface. Large ocular cirri and numerous irregular tubercles are present on the dorsal surface. As regards anatomy, there seems to be nothing particular to note, except that the posterior salivary glands seem to be somewhat rounder than in *M. turqueti* (Joubin) and *M. charcoti* (Joubin). The anal aperture has the usual two narrow lateral appendages. The genital organ is shown as *in situ* in Fig. 29. The pouch of the penis is very distinct. On breaking the visceral envelope surrounding the genitalia, the penis was found to lead into an oval sac attached to the genital gland; but no trace of sperms, or of the various regions present in the adult reproductive organs of male specimens of this genus, could be discovered, so that the specimen is apparently immature. The radula and mandibles are figured (Figs. 31, 32).

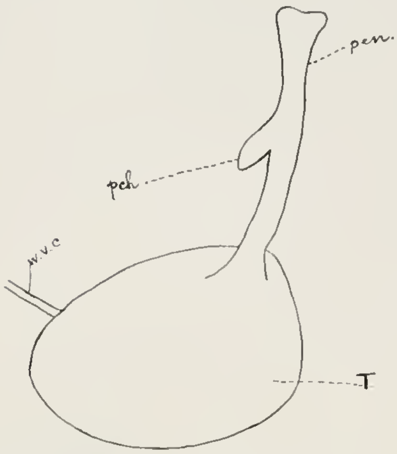

Fig. 29.—*Moschites brevis*, male reproductive organs, × 5. *pch.*, Pouch-like dilatation; *pen.*, penis; *T.*, testes; *W.V.C.*, water vascular canal.

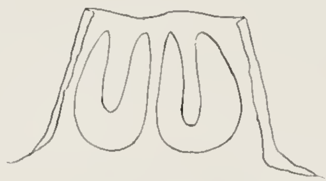

Fig. 30.—*Moschites brevis*, funnel-organ, × $3\frac{1}{2}$.

Fig. 31.—*Moschites brevis*, radula, × 60.

Fig. 32.—*Moschites brevis*, mandibles, × 2.

Dimensions in Millimetres.

End of body to ventral mantle-margin	25
End of body to eye	27
Breadth of body	26
Breadth of head	17
1st right arm	46
2nd right arm	47
3rd right arm	39
4th right arm	46
Hectocotylus	1·50
Diameter of largest sucker	2·50

Distribution.—Type specimens. Off Monte Video, February 14th, 1876; 37° 17′ S., 53° 52′ W., 600 fathoms, green sand.—Three females (Hoyle).

10. *Moschites*, sp. Fig. 33.

Rock Pool, Cape Evans, McMurdo Sound.—One.

This very large specimen was in deplorable condition when I had the good fortune to examine it; as a consequence of which, in the dimensions given below, the arms are numbered one to eight, as they had all become detached from the body, and every vestige of web had disappeared. The funnel was in very bad condition and did not show funnel-organ. The anterior salivary glands were present on the buccal bulb; one was oval, and the other somewhat heart-shaped; neither had the marginal indentation figured by Isgood ('09, pl. 4, fig. 22) for *M. cirrosa*. The sub-lingual salivary gland is heart-shaped above, the narrow end just meeting the Λ-shaped indentation of the gular lamina of the lower mandible. This upper part measures 25 × 30 mm., and the lower surface of the gland is considerably longer, extending to a length of about 35 mm. The upper mandible measures 50 mm. in length by 37 mm. in breadth and 40 mm. in height; the frontal lamina projects about 10 mm. beyond the palatine lamina; there is no notch below the rostrum, but only a moderate scoop out between it and the inner end of the ala; the base of the palatine lamina is very straight. The lower mandible measures 42 × 45 mm., and is also without a notch below the rostrum, the cutting edge forming a gentle curve along the ala. The radula (Fig. 33) measures about 40 mm. in length by 5 mm. in breadth, and the teeth are very dark horn-colour. The median teeth are very broad, and without lateral denticles, and almost triangular in shape; the anterior margin of the base of each is usually marked by about nine indentations, the median three or four showing through the half of the tooth immediately above it. As will be seen by a reference to the illustration, the first laterals are somewhat like miniature editions of the median teeth, and, while the second laterals call for no special remark, the outer laterals (instead of presenting the appearance usually depicted in representations of cephalopod radulae of these teeth—e.g., that of claw-shaped teeth placed laterally, and projecting over the bases of the second laterals) are arranged like the median teeth, the base projecting equally on either side of the central denticle, and they come between the median and first lateral teeth in size, and are not unlike them in shape.

FIG. 33. *Moschites* sp., radula, × about 5.

A small species of *Sepia*, which I recently described under the name of *S. arabica* ('16, p. 228, pl. 24, fig. 10), shows much the same variation in the appearance of the outer laterals. The only other Cephalopod known to me presenting a somewhat similar arrangement of these teeth is the large Oegopsid *Symplectoteuthis luminosa* (dorsal mantle-length, 120–166 mm.) recently described by Sasaki ('15, p. 148, text-fig. 4). Possibly the contraction of the delicate membrane to which the teeth are attached causes the outer lateral teeth to appear as usually drawn, and, under certain conditions of preservation, or of individual toughness of this substance, or with age thickening, the membrane becomes sufficiently stout to enable the radula to lie flat. The absence of cusps in the median teeth, and the comparative shortness of the median denticle, suggest that the teeth may be worn down from age. Although the margin of the membrane of this radula is uninjured, there seems to be no trace of marginal plates.

The chitinous lining of the crop is present, and measures 50 mm. by 35 mm., and contains half an Amphipod, and a considerable quantity of chopped-up green seaweed, many of the fragments of which have Polyzoa and *Spirorbis* attached to them. All writers who have touched upon the food of the Cephalopoda appear to be unanimous in considering them to be wholly carnivorous. Various reasons have been suggested to me to account for the presence of this quantity of seaweed in the present specimen.

For instance, owing to advanced age, and the apparently worn state of the teeth, had the animal taken to eating seaweed instead of harder things? Secondly, do the carnivorous animals in the Antarctic have to supplement their carnivorous diet by seaweed? This is not likely, as animal food is apparently not deficient in quantity in these latitudes. Thirdly, is it possible that, in taking in other animals as food, the Cephalopod accidentally engulfs sundry unconsidered trifles, like seaweed, which it would periodically get rid of when there was an inconvenient accumulation in the crop?

With regard to the first and third questions, the facts that only half the Amphipod was present, and that the bits of seaweed were neatly divided as if by the scissors-like action of the mandibles, point to the food having been methodically gathered rather than accidentally engulfed, and, as it shows no trace of the rasping of a radula working forwards, backwards, and laterally, it would seem that the teeth had not acted materially (possibly, however, because the animal may have hastily swallowed the food from sudden fright at the time of capture). It should also be taken into consideration that its sojourn in the rock-pool may have been an enforced one, owing to injury, in which case the diet would be restricted to what could be got in a limited area. The contents of the stomach and crop of all the large Cephalopods dissected for the present paper were examined, and the limited amount of evidence available goes to show that animal and not vegetable matter forms the normal food of Antarctic Cephalopods.

Approximate dimensions in Millimetres.

Length of body	170
Breadth of body	205
Siphon	50
Anterior salivary glands	19 × 14
Arms*—	
1	210
2	200
3	185
4	220
5	200
6	210
7	205
8	180
Diameter of largest sucker	17

* All detached from body and numbered 1–8 for convenience.

Family SEPIOLIDAE.

11. *Semirossia tenera* (Verrill). Fig. 34–39.

Heteroteuthis tenera, Verrill, Am. Journ. Sc., XX, p. 392, 1880; Proc. U.S. Nat. Mus. III., p. 360, 1880; Bull. Mus. Comp. Zool., III., p. 103, pl. 3, figs. 5–5*b*; pl. 7, figs. 2–2*d*, 3–3*b*, 1881; Trans. Connect. Acad., V, p. 357, pl. 46, figs. 2–2*d*, 3–3*b*; pl. 47, figs. 5–5*b*, 1881: Rep. U.S. Fish. Comm. for 1879, pp. 385–387 (175–177), pl. 33, pl. 34, fig. 1, 1882.

Rossia patagonica, E. A. Smith, "Alert" Exp., p. 22, pl. 3, fig. 3. 1881; Hoyle, Rep. "Challenger" Exp. (Cephalopoda), XVI, pp. 119–120, pl. 15, figs. 10–18, 1886.

Semirossia tenera, Steenstrup, Overs. Danske Vid. Selsk. Forh. 7, p. 89, 1887; Lönnberg, Svensk. Akad. Handl. XVII, Afd. IV, p. 18, 1891; Pfeffer, Nordisches Plankton, IV, pp. 44–46, text-figs. 44–47, 1908.

Station 42, off Rio de Janeiro, 22° 56′ S., 41° 34′ W., 40 fathoms (73 m.), Agassiz trawl, bottom fauna (sand), May 2nd, 1913.—Six ♂, five ♀.

The above have a dorsal mantle-length of 18–27 mm. The funnel-organ consists of a short Λ-shaped median pad and two long, narrow lateral pads. The long, narrow valve of the siphon, consisting of two flaps folded towards one another (Fig. 38),

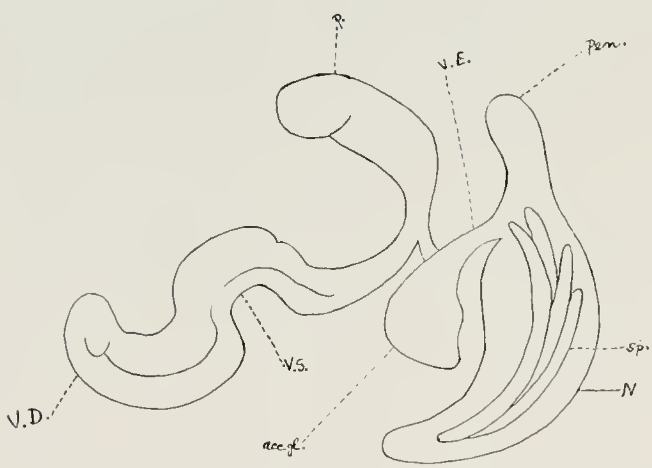

Fig. 34.—*Semirossia tenera*, male reproductive organs, × 3. *acc.gl.*, Accessory gland; *N.*, Needham's pouch; *p.*, prostate; *pen.*, penis; *sp.*, spermatophores; *V.D.*, vas deferens; *V.E.*, vas efferens; *V.S.*, vesicula seminalis.

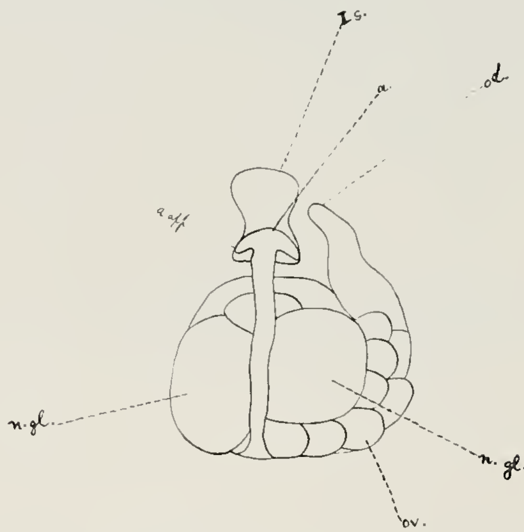

Fig. 35.—*Semirossia tenera*, ovary, partly diagrammatic, to show ink-sac, × 2. *a.*, Anus; *a.app.*, anal appendages; *I.s.*, ink-sac; *n.gl.*, nidamental glands; *od.*, oviduct; *ov.*, ova.

becomes wider posteriorly, where it measures about the breadth and one-third of the length of one of the lateral pads of the funnel-organ. On opening the ventral mantle of a male, the anal aperture, with very long appendages, is observed situated at a short distance below the median pad of the funnel. About half-way between the anal aperture and the end of the body the renal papillae are conspicuous at a little distance on either side of the anus. The penis, which is short and broad and without a pouch, projects to a short way below the anal aperture. The spermatophore-sac is much distended with sperms in the specimen figured (Fig. 34), and the accessory and prostate glands are very large. A spermatophore from another specimen is figured (Fig. 36). The ink-sac is spherical, with a short neck and square mouth; a narrow winding canal, opening at the centre of the mouth, conveys the ink to the dorsal

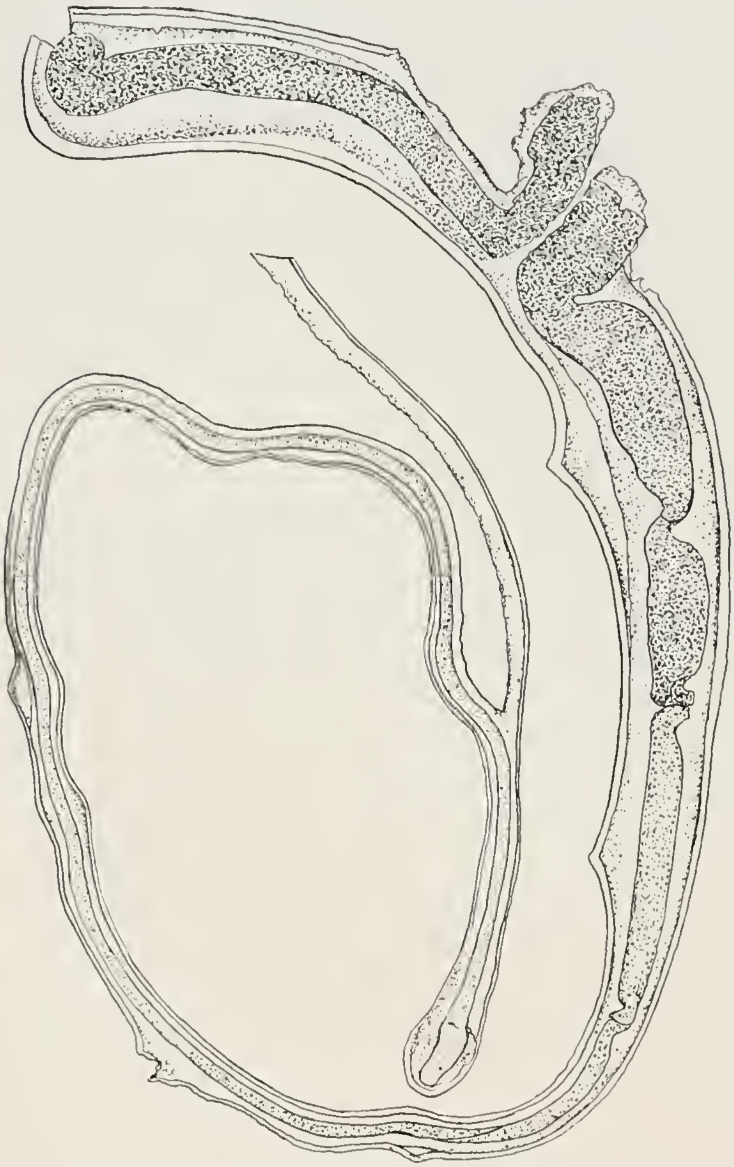

FIG. 36.—*Semirossia tenera*, spermatophore, × 21.

FIG. 37.—*Semirossia tenera*, ova, × 2.

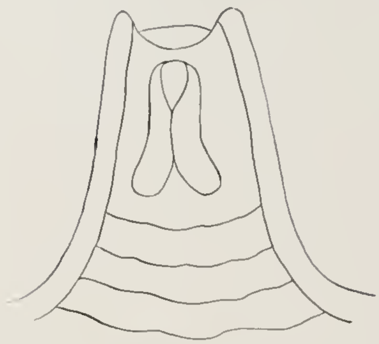

FIG. 38. *Semirossia tenera*, valve in siphon, × 9.

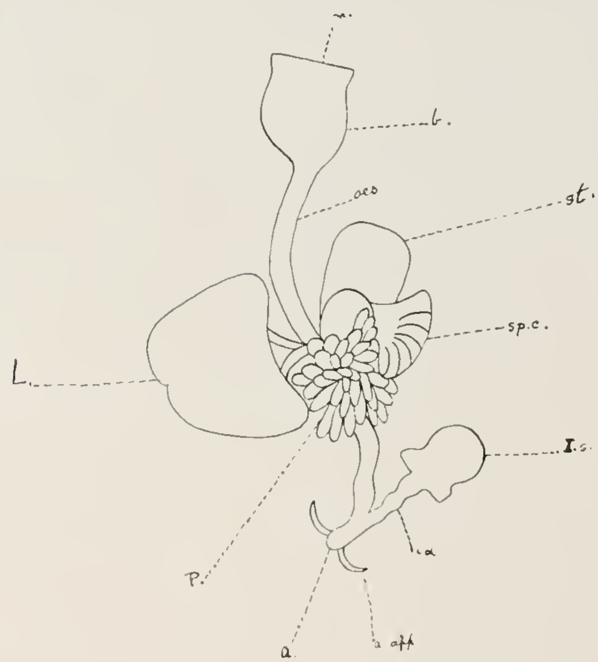

FIG. 39. *Semirossia tenera* ♂, alimentary canal, × 2. *a.*, Anus; *a.app.*, anal appendages; *b.*, buccal mass; *i.d.*, ink duct; *I.s.*, ink-sac; *L.*, liver; *m.*, mouth; *oes.*, oesophagus; *P.*, pancreas; *sp.c.*, spiral caecum; *st.*, stomach.

side of the anal tube near its aperture. The digestive system, showing the great development of the pancreas, is represented in Fig. 39. A considerable cartilaginous development is present on the buccal bulb between the outer and inner lips. On dissecting the former away, broad cartilaginous plates become apparent along the outer surface of the inner lip, and form a coating over most of the ventral surface of the bulb. The rim of the outer lip is also strengthened by a narrow cartilaginous belt, which expands conspicuously on the ventral surface of the bulb. A female, with mantle-length of 25 mm., possesses nidamental glands measuring about 9 mm. by 6 mm. A very large number of eggs, all with their surface adorned with a graceful honeycomb-pattern, are present, the largest measuring 4 mm. by 3·50 mm.

Distribution. N.E. America (Verrill, '82); Spitsbergen and north coast of Siberia (Lönnberg, '91); East, South, and West Patagonia (E. A. Smith, '81, and Hoyle, '86).

Family ENOPLOTEUTHIDAE.

12. *Pyroteuthis* (*Pterygioteuthis*) *giardi*, Fischer.

Pterygioteuthis giardi, Fischer, Journ. Conchyl., XLIII, p. 205, pl. 9, 1896; Hoyle, Bull. Mus. Comp. Zool., XLIII, pp. 39–42, 51, pls. 7, 9, 1904; Fischer and Joubin, Bull. Mus. Paris, XII, p. 334, figs. 6–8; pl. 23, figs. 6, 7; pl. 24, figs. 9–15, 1906.

Pterygioteuthis Giardi, Chun, Zool. Anz., XXXIII, p. 87, 1908; "Valdivia" Exp., part I, Oegopsida, pp. 108–136, pls. 12–16, 1910: "Michael Sars" N. Atlantic Exp., III, p. 3, 1913.

Pyroteuthis (*Pterygioteuthis*) *Giardi*, Pfeffer, Plankton Exp., pp. 204–206, 1912.

Pyroteuthis (*Pterygioteuthis*) *Giardi*, var. *Hoylei*, Pfeffer, *op. cit.* pp. 206–208, 1912.

Station 80, from summit Great King, N. 87° W., 11 miles, 0–100 m., 24-mesh net, plankton, July 22nd, 1911.—One.

Station 86, off Three Kings Islands, 3 m., 50-mesh net, plankton, July 25th, 1911.—One.

Station 311, off Monte Video, 35° 29′ S., 50° 26′ W., 2 m., young fish trawl, plankton, April 22nd, 1913.—Two.

These little creatures seem to be obviously the same larva as that figured in so many stages by Chun ('10, pl. 12, figs. 3–15, pl. 13, figs. 9–12), and which he was able to trace, by numerous gradations in size from newly-hatched specimens to full-grown examples, to *P. giardi*. All have the large eyes and the characteristic bend near the base of the tentacles, which latter terminate in little round clubs. The outline of the gladius is very distinct in all. The arm-suckers are placed two in a row, except that the most proximal is usually placed singly. None has any chromatophores on the mantle, but this may be due to abrasion of the epidermis. A few large golden-brown or reddish chromatophores are present on the head, and a single large one is invariably placed on each tentacle near the club, and a few smaller ones are scattered on the arms.

The largest specimen (Station 80) has a mantle-length of 4·50 mm. Beautiful blue, violet, and pink luminous organs shimmer on the ventral surface of each eye, the organ 10 (Chun, '10, pl. XIV, fig. 6, numeration of eye-organs) is present on both, the right eye has also 9, 1, and 3; the left eye seems to have 3, 5, 7, and 8 as well as 10. The third and fourth arms have wide membranes. The tentacles have each a bunch of about twenty suckers with apparently smooth ring; no hooks present. The specimen from Station 86 has a mantle-length of 3 mm., and a much rounder, plumper body, and much smaller fins than the preceding specimen: over thirty suckers, with apparently smooth ring and papillary area, are present on each club: the arm-suckers seem also to have smooth rings. The eyes are almost withdrawn inside the mantle: a white swelling is present below each on either side of siphon, and some small white protuberances are visible round the top of each eye: these all seem to be indicative of luminous organs in the making. On the mantle being opened, two brown-coloured luminous organs are seen on either side of the anus, and two larger, similarly coloured, are situated near the root of the gills. The specimens from Station 311 have a mantle-length of about 2·25 mm. The club is almost circular, and possesses about twenty-six suckers. As is the case with the other specimens, the first arms are the shortest. Luminous organs do not seem to be as yet developed.

Type.—A female, "Talisman" Expedition (Fischer, '96).

Distribution.—Off San Francisco, Gulf of California, Galapagos Islands (Hoyle, '04): Indian Ocean and South Atlantic (Chun, '10): North Atlantic (Chun, '13).

Family ONYCHOTEUTHIDAE.

13. *Moroteuthis (Moroteuthopsis) ingens* (E. A. Smith).

Onychoteuthis ingens, E. A. Smith, Proc. Zool. Soc., "Alert" Exp., p. 25, pl. 3, figs. 1–1*b*, 1881; Lönnberg, Öfv. Vet. Ak. Förh. no. 10, p. 55, pls. 4, 5, 1897; Pfeffer, Mitteil. Nat. Mus., XVII (Jahrb. Hamburg. Wiss. Anst., XVII), p. 160, 1900: Hoyle, Trans. Roy. Soc. Edinburgh, XLVIII, pt. 2 (no. 14), pp. 281–282, text-fig. 9 (radula), 1912.

Moroteuthis ingens, Pfeffer, Nordisches Plankton, IX, p. 68, 1908.

Moroteuthis (Moroteuthopsis) ingens, Pfeffer, Mitteil. Nat. Mus., XXV (Jahrb. Hamburg. Wiss. Anst., XXV), p. 294, 1908: Pfeffer, Ceph. Plankton Exp., pp. 108–113, pls. 11, 12, 1912.

Station 129, off Three Kings Islands, surface, square 18-mesh net, Aug. 26th, 1911.—One.

This has a dorsal mantle-length of 20 mm., and the posterior end of the pen extends 0·50 mm. from the extremity of body. Only one club is present, and it is not in very good condition, but shows many small suckers on the distal end, with one hook in centre; what appear to be the sockets of many more hooks being also present on the median part of club.

Distribution.—Patagonian and sub-Antarctic regions.

14. *Onychoteuthis banksi* (Leach).

Loligo Banksii, Leach,* Zool. Miscellany, Class Ceph., III, p. 141, 1817.

Onychoteuthis Banksii, Férussac et d'Orbigny, Ceph. acétabulifères, p. 330, 1839.

Ancistroteuthis lichtensteinii, Jatta, Cefalopodi, Fauna und Flora G. von Neapel, Monogr. 23, p. 103, pl. 13, 1896.

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* For full synonomy see Pfeffer, Plankton Exp., pp. 70–71, 1912.

Teleonychoteuthis Krohnii, Pfeffer, Mitteil. Nat. Mus. XVII (Jahrb. Hamburg. Wiss. Anst.), p. 158, 1900.
Teleoteuthis Carolii, Joubin, Rés. Camp. Sc. Albert I. de Monaco, XVII, p. 64, pl. 11, figs. 2–10, 1900.

Washed on board the "Terra Nova" south of Madeira, July, 1910.—One ♀.

The above has a dorsal mantle-length of 140 mm. The nidamental glands measure 23 × 7 mm., and have their anterior extremity on a line with the lowest of the two luminous organs in the mantle-cavity.

Distribution.—Atlantic, all seas from Hammerfest to Straits of Magellan; Indian and Pacific oceans; New Zealand.

Family OMMATOSTREPHIDAE.

15. *Rhynchoteuthion*, Pfeffer.

Poulpe (jeune âge)? Eydoux et Souleyet, Voy. "Bonite," Zool., T. II, p. 17, pl. I, figs. 15–21, 1852.
Decapodo incertae sedis, Jatta, Boll. Soc. Natural. Napoli, anno 3, p. 67, 1889.
Rhynchoteuthis, Wülker, Abh. Wiss. III. Suppl.-Bd. I. Abh., p. 54, pl. 5, fig. 54, München, 1910.
Rhynchoteuthis chuni, Hoyle, Bull. Mus. Comp. Zool., XLIII, pp. 32–33, text-fig. G, 1904.
Rhynchoteuthis, Issel, Cef. "Liguria," pp. 215, 217, pl. 9, figs. 12–14, 1908.
Rhynchoteuthion, Pfeffer, Nord. Plankton, IV, Ceph., p. 88, 1908; Plankton Exp., pp. 383, 466, 1912.
Rhynchoteuthis, Chun, Zool. Anz. XXVI, p. 716, 1903; "Valdivia" Exp., Oegopsida, pp. 201–205, pls. XXVIII, XXIX, 1910.
Larvae of Ommatostrephidae, Chun, "Michael Sars" Exp., p. 6, 1913.

Station 69, west of Canary Islands, 29° 10′ N., 33° 36′ W., surface, 50-mesh net, plankton, May 29th, 1913.—One.

Station 93, from summit Great King, S.E. by S., 13 miles, surface, 24-mesh net, plankton, July 28th, 1911.—One.

The specimen from Station 69 has a mantle of 3·50 mm. in length by 2·25 mm. in breadth, and a head measuring 2 mm. in breadth. The total length is about 5·75 mm. All the arms are developed, but the ventral pair are very small. About four pairs of suckers are present on the third arms, and a few, which appear to have a smooth ring, are placed on the proboscis. The latter has a median line showing where it would eventually have split up to form the tentacles. Three large, round chromatophores are placed in a transverse line on the dorsal surface of the head, and another occurs near the fork of the dorsal arms.

The specimen from Station 93 has a total length of about 7 mm., of which the mantle occupies 4 mm. The fins are very small. The ventral arms are extremely minute, the others being well developed and of about equal length, and possessing ten to fourteen suckers each. Seven or eight suckers are present on the proboscis, which is fused throughout its length, the line of future severance being, however, very distinct. Two large chromatophores are present on the dorsal surface of the head below each eye. Both specimens were preserved in formalin.

Chun ('10, p. 202) considers that the thirty-five larvae from the Atlantic and Indian oceans which he has met with belong to more than one species of Ommatostrephidae, one being a type with slender body and moderate-sized eyes, and the other having a plump body and great eyes. Pfeffer ('12, p. 383), with regard to this, points out that Verrill's name of *Stenoteuthis* is older than the name *Ommatostrephes*, and that two species of this genus are found in the tropical part of the Atlantic—e.g., *S. bartrami* (Lesueur), common, and *S. pteropus*, Steenstrup, rare (l.c. p. 380). *S. bartrami* is certainly present in the Indian Ocean also, but Pfeffer seems to doubt Steenstrup's record of *S. pteropus* from Mauritius, as no museum possesses any specimen of this species from the Indian Ocean. He, therefore, arrives at the conclusion that both Chun's types are probably referable to *S. bartrami*, and that probably fluctuating conditions of environment may account for their individual variation. The New Zealand specimen in the present collection appears to belong to Chun's type, with long narrow mantle, and seems to be obviously a different species from the specimen from the North Atlantic, which, although possessing a much shorter mantle-length, has a wider head, and more developed eyes and arms. The mantle of this specimen is turned back so that the form of attachment, resembling exactly the figures of Chun (l.c. pl. 29, figs. 3 and 4), can be seen. I think that it is possible that future material may go to prove that Chun was right in dividing his finds into two species. The broad-bodied form would appear to have a wide range in the Atlantic, as a very young specimen with a total length of 3 mm., taken off the south-west of Ireland by the "Helga," belongs to this type.

Distribution.—Both types of Chun in Indian and Atlantic oceans. Tropical Pacific, the wide-bodied type (Issel, '08); Marquesas (Hoyle, '04); Pacific (De Blainville, *fide* Chun); North Atlantic (Chun, '13).

Family HISTIOTEUTHIDAE.

16. *Stigmatoteuthis chuni*, Pfeffer.

> *Calliteuthis Hoylei*, Chun, "Valdivia" Exp., part I, Oegopsida, pp. 170–173, pl. 18, fig. 1; pl. 19, fig. 6; pl. 20, figs. 1, 2, 5, 10, 12, 1910.
> *Stigmatoteuthis Chuni*, Pfeffer, Plankton Exp., pp. 286–288, 1912.

Station 311, off Monte Video, 35° 29′ S., 50° 26′ W., 2 m., young fish trawl, plankton, April 22nd, 1913. (?) One.

This is obviously a young Histioteuthid, but, unfortunately, it is a damaged specimen; the ventral surface of the head has been torn away, and the end of the mantle, including the fin, is much crushed. The mantle measures a little more than 3 mm. in length. Order of arms: 3, 2, 1, 4. The fourth pair are much the shortest, and measure about 1·50 mm. in length. The suckers of the arms are usually placed two in a row, but occasionally they appear as if placed almost singly. It was impossible, without injuring the specimen, to obtain a view of the rings of any suckers on the first and fourth pairs of arms. On one of the second arms a sucker in a good position for observation showed a crenulated rim, and on one of the third arms similar crenulations were distinctly split up to form a few broad irregular teeth on distal margin of ring. The tentacles, which measure about 5 mm., have no suckers on the stem, and the club is not expanded, or grooved in the centre. The suckers are arranged about two in a row proximally, and about four in a row distally; all are about equal in size; some rings appear to be smooth, but are not in good condition. A sucker-ring near the tip shows clearly at least four teeth on its distal part: about twenty-seven suckers are present on one club. The ventral surface of the head is so injured that only some slight prominences indicate what may have been the site of luminous organs. On the dorsal surface of the head seven luminous organs can be traced. Three are indistinct and form a transverse row across the middle of the head. Above them are four larger and beautifully iridescent organs, two of which are placed at the base of each second arm just below the fork dividing it from the first arm, the remaining two being placed just below the others, so as to form a line passing between the inner and outer organs of the lower row. No other luminous organs could be traced on arms or tentacles, all of which have a few reddish chromatophores present on their dorsal surface, but none is visible on the mantle. The whole surface is of a greenish discoloured tint.

Pfeffer ('12, p. 288) separates this from *Stigmatoteuthis hoylei* (Goodrich), on the ground that the former has only three luminous organs in the ventral middle line of the head, and that the rings of both arm- and tentacle-suckers have teeth surrounding the entire ring, while *S. chuni* has four luminous organs in the ventral median line of the head, and teeth only on the distal half of the sucker-rings of the arms and tentacles.

Distribution.—4° 34′ S., 53° 42′ E., vertical net to 2,000 m., female (Chun, '10).

Family CRANCHIIDAE.

17. *Pyrgopsis pacificus* (Issel). Fig. 40.

Zygaenopsis pacifica, Issel, Cef. "Liguria," p. 223, pl. 10, figs. 33–44, 1908.
Enzygaena pacifica, Chun, "Valdivia" Exp., Oegopsida, pp. 354–356, pl. 52, figs. 1–3, 1910.
Pyrgopsis pacificus, Pfeffer, Plankton Exp., Oegopsida, pp. 661–664, 1912.

Station 126, off Three Kings Islands, 34° 13′ S., 172° 15′ E., surface, square 18-mesh net, plankton, Aug. 24th, 1911.—One.

Station 139, off North Island, New Zealand, 34° 30′ S., 171° 53′ E., surface, square 18-mesh net, plankton, Sept. 6th, 1911.—One.

Neither of the above is in very good condition. The arms are extremely minute, except those of the third pair, which, in both specimens, measure about three times the length of the fourth pair. Some suckers belonging to the third arms in the example from Station 126 were examined, and appeared to have smooth rings with papillary area. In the same specimen, the fourth left arm, measuring about 1 mm., has seven suckers, and the fourth right, five: probably some have dropped off, as each arm has space for about two more pairs proximally, and possibly one or two more distally. The crystalline tubercles of the ventral mantle, which commence at its margin on either side of the base of the funnel, extend to a distance of about 8 mm., or about one-third of the length of the mantle. The latter is very much crumpled, but the epidermis shows indications of a few dark chromatophores on the dorsal surface, and a few are present on the back of each club. The radula (Fig. 40) is so delicate that it was very difficult to mount without injury, and some of the teeth cannot be seen clearly. The median teeth have a central denticle not so long as in *Teuthowenia antarctica*, Chun, and are without lateral cusps. The outer lateral teeth are of the curved claw-like shape usually seen in this tooth among Cephalopods. The specimen from Station 139 also has the third arms much longer than the rest, its suckers being arranged in two rows. The latter were examined after a heavy thunder-shower, when the light was unusually clear, and seemed to have quite smooth rings. The large suckers of the club appear to be larger in proportion to the rest in this specimen, which slightly exceeds the other in size, and their rings have part of the circumference smooth, and about nine teeth on the distal margin. The small suckers of the club, which are placed in four rows distally, have a papillary area, but the actual ring appears to be smooth. What seems to be a minute sucker is present on a tentacle-stem. The tubercles extend to about 14 mm., and consequently occupy about the anterior half of the ventral mantle, thirteen being at one side and sixteen at the other. A few large oblong chromatophores are present on the mantle; those on the back of the club are arranged as in Issel's (*op. cit.*, pl. 10, fig. 43) very similarly sized specimen—e.g., a large median and two lateral rows of smaller chromatophores. The chief difference in these two examples from the type, and from the Japanese specimen described by Chun, is that the large tentacular rings have teeth only on the distal border, while Issel describes them as extending all round the ring, and Chun's illustration (*op. cit.*, pl. 52, fig. 2) represents them as being quite smooth.

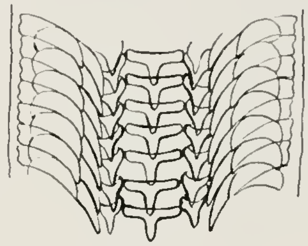

FIG. 40.—*Pyrgopsis pacificus*, radula, × 330.

Dimensions in Millimetres.

	Station 126.	Station 139.
End of body to mantle-margin	23	*ca.* 27
Eye and peduncle	4	*ca.* 4
Fin-length	3·50	5
Breadth across fins	6·50	8
3rd arms	*ca.* 3	*ca.* 4
4th arms	*ca.* 1	*ca.* 1·50
Tentacle	*ca.* 11	*ca.* 15
Club	*ca.* 2	*ca.* 2·25
Pen	25	28

Distribution. Between Tahiti and Pango-Pango, 14° 32′ 15″ S., 167° 43′ W. (Issel); Japan (Chun); (?) Atlantic, a damaged specimen (Chun).

18. *Teuthowenia antarctica*, Chun. Figs. 41–43.

Teuthowenia antarctica, Chun, "Valdivia" Exp., part I, Oegopsida, pp. 376–9, pl. 56, figs. 1–5, pl. 57, figs. 3–7, 1910; Pfeffer, Plankton Exp., pp. 745–6, 1912.

Station 113, off North Island, New Zealand, 33° 12′ S., 171° 05′ E., 3 m., 50-mesh net, plankton, Aug. 9th, 1911.—One and also (?) a damaged specimen.

Station 129, off Three Kings Islands, surface, square 18-mesh net, plankton, Aug. 26th, 1911.—Two.

The damaged specimen from Station 113 has a mantle-length of 5 mm., and only the peduncles of the eyes are present. A few stalked suckers were observed on each of the minute arms, and also on the battered tentacles; they appear to have been arranged on the stem as well as club of the latter. The neck seems to be a little longer in proportion than in the other specimen from this haul, which has a mantle-length of 7 mm. This latter has the tentacular suckers with four teeth on distal margin of ring, and the suckers of the stems are arranged in four rows, nearly, if not quite, to the mouth. Two large dark chromatophores are present on the dorsal surface of the head and eyes; those of the mantle are more oblong than in Chun's illustration, but the ventral luminous eye-organs are exactly as in his specimens (*op. cit.*, pl. 57, figs. 3, 4, 5).

The examples from Station 129 have a dorsal mantle-length of 11 and 12 mm. The funnel does not quite reach the base of the arms in the largest specimen, but extends a little above this level in the smaller example. The fins are mutilated in the larger specimen, but measure about one-eleventh of the mantle in the other, and their attachment is very similar to that figured by Pfeffer ('12, pl. 48, fig. 9) for *Teuthowenia megalops* (Prosch). Order of arms in both: 3, 2, 4, 1.

The smaller specimen has about six pairs of stalked suckers on the dorsal arms, eight pairs on the second, eleven pairs on the third, and about five pairs on the ventral arms. The horny rings are missing from many suckers; one or two present showed a papillary area and an apparently smooth ring. Eight to twelve pairs of suckers occur on the arms of the other specimen. The tentacles in both examples have the suckers in four rows, except for about the proximal two rows of the stem, where they are usually placed two in a row. Several suckers of the club showed two sharp teeth on the distal part of the ring, and others were obviously missing. The lower mandible of the larger specimen is figured (Fig. 41).

FIG. 41.—*Teuthowenia antarctica*, lower mandible, × 4.

In the radula (Figs. 42–43) the median teeth of each row possess a long central denticle, and small, blunt lateral cusps. The first and second laterals are nearly the same size as the median tooth. The outer lateral teeth, and the oval plates beyond them, are like those of *Desmoteuthis hyperborea* (Steenstrup), as figured by Verrill ('82, pl. 45, fig. 2) under *D. tenera*, Verrill. Except that the first laterals have a cusp at the left side, the only indication of which, in *T. antarctica*, is an extension of the base at that side, these two radulae are much alike. The largest specimen, on being opened ventrally, showed the twisted vena cava, and other organs arranged as in Chun's illustration ('10, pl. 57, fig. 7). Numerous dark oblong chromatophores are present on both sides of the mantle; those on the dorsal surface of the club and distal part of stem form broad stripes of orange-brown. Both specimens have the mantle much wrinkled along the median dorsal line, so that probably a considerable amount of contraction should be allowed for in the dimensions given below of the largest specimen.

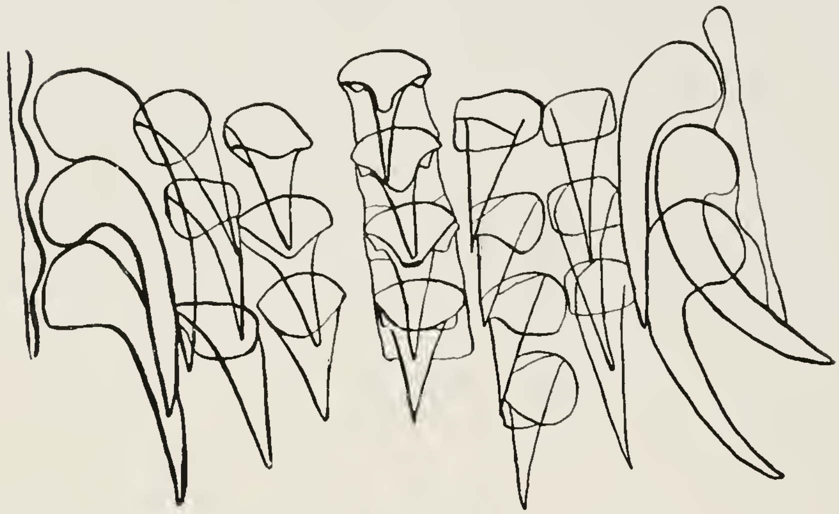

FIG. 42.—*Teuthowenia antarctica*, radula, × 220.

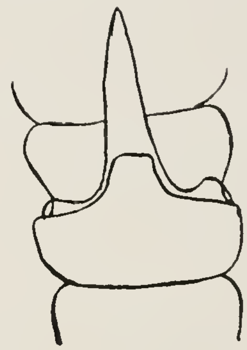

FIG. 43.—*Teuthowenia antarctica*, middle tooth of radula, × 500.

Dimensions in Millimetres.

	Station 129.
End of body to dorsal mantle-margin	12
Breadth of body	6
Breadth of head	5
Eye and peduncle	2·50
1st right arm	*ca.* 2
3rd right arm	*ca.* 3

Distribution.—One example, 55° 57′ S., 16° 14′ E., vertical net to 2.000 m. (?) Four damaged specimens, southern Indian Ocean (Chun).

OEGOPSIDA.

19. *Sp. incert.*

From stomach of Snowy Petrel (probably taken off Antarctic Circle, south of New Zealand, near 65° 14′ S., 161° 24′ E., 2 m.), March 5th, 1911.—Four eyes.

These appear to belong to some large Oegopsid species, and are about 28 by 32 mm., or about the size of a penny. The eyeballs measure about 12 mm. in diameter. No Station-number accompanies this find, but the bird would appear to have been taken in Antarctic regions, as on March 6th, 1911, the "Terra Nova" was in the latitude recorded above, and on the other date nearest to this in the list of stations—e.g., February 22nd, 1911—she was cruising off Oates Land in 69° 43′ S. latitude.

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BRACHIOPODA.

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Assistant Keeper of the Manchester Museum; Hon. Secretary of the Conchological Society of Great Britain and Ireland.

WITH ONE PLATE.

I.—INTRODUCTION.

The Brachiopoda obtained by the "Terra Nova" Expedition in 1910 form a most interesting and valuable series. They far surpass, both in number of species and of specimens, the collection brought back by the previous "Discovery" Expedition, and add very considerably to our knowledge of already recorded species. This applies more especially to certain forms from Antarctic waters, the descriptions of which have hitherto been very incomplete. In one case the excellent material so provided has enabled a fairly complete study to be made of an Antarctic Rhynchonellid previously ascribed to *Rhynchonella*. For this form it has been found necessary to create a new genus, viz., *Compsothyris*. Our knowledge of the geographical range of this and of several other forms has been increased very materially by the "Terra Nova" dredgings.

The "Terra Nova" Brachiopods come from two distinct areas, viz.—A. New Zealand, and B. Antarctic (Ross Sea region), and are described under these two headings in the following pages.

The material from New Zealand was obtained from four stations, and comprises the four well-known New Zealand species, viz.—*Hemithyris nigricans* (Sow.); *Terebratella sanguinea* (Leach) [=*cruenta*, Dillwyn]; *Terebratella rubicunda* (Sow.); and *Neothyris* *lenticularis* (Deshayes). In addition to these there are two fragmentary valves of a Terebratuloid, dredged off Three Kings Islands, the determination of which is not possible owing to the bad state of preservation of the remains. This doubtful form is referred to in the present Report as *Liothyrella sp.* It may be an entirely new form. There is also from the same station a series of three very immature Brachiopods, which may be young forms of *Terebratella sanguinea*, and if such be the case the range of that species is considerably increased. These young forms are described under *Magellania* or *Terebratella sp.* in subsequent pages.

The range in depth of the New Zealand species is from the shore-line to 100 fathoms, and two new northern localities—Three Kings Islands and Off North Cape—are added for one of the forms, viz., *Neothyris lenticularis*. Hitherto New Zealand Brachiopods have been mainly recorded from the southern portions of the Islands. It is interesting, therefore, to find that at least one species has a much more extended distribution.

The species from the Antarctic region—Ross Sea area—are distinct in every way from the New Zealand forms, and comprise the following:—*Compsothyris* (*olim Rhynchonella*) *racovitzæ* (Joubin); *Liothyrella antarctica* (Blochmann); *Magellania fragilis*, Smith; and *Magellania joubini*, Blochmann [=*sulcata*, Smith]. These were dredged at twelve stations, ranging in depth from 45 to 300 fathoms. Two of the species, *Compsothyris racovitzæ* and *Liothyrella antarctica*, are new to the Ross Sea area, though known in other parts of the Antarctic, viz., *C. racovitzæ* in the Western Antarctic ("Belgica" Expedition) and *L. antarctica* in the Eastern Antarctic—Kaiser Wilhelm II. Land ("Gauss" Expedition). *Magellania fragilis* is as yet only known from the Ross Sea area ("Discovery" and "Terra Nova" Expeditions). *Magellania joubini* has been previously recorded for the same neighbourhood ("Discovery") and from the Eastern Antarctic ("Gauss"). It probably also ranges to the Western Antarctic, as some fragmentary Brachiopods having some resemblance to this species were dredged by the "Belgica" Expedition.

The collection of Brachiopods obtained by the previous British Antarctic ("Discovery") Expedition, 1901–04, was an extremely small one, and consisted solely of Antarctic forms. These comprised two species of *Magellania*, a few specimens of each being secured from the three stations where examples of this class were dredged. They were described by the late E. A. Smith [1907]* as new species, but one of them—*M. sulcata*—proved to be synonymous with an Antarctic form previously described by F. Blochmann [1906] under the name *M. joubini*: the other of Smith's species is *M. fragilis*.

The Antarctic species are all thin-shelled forms, differing in this respect from the well-known Magellanic species—*Liothyrella uva* (Brod.), *Terebratella dorsata* (Gmel.), and *Magellania venosa* (Sol.); and from the New Zealand species already mentioned,

* See Bibliography at end.

which, in addition to being stronger shelled, are also more brilliantly coloured. They belong to the Antarctic Zone (Glacial district) as defined by Regan in his Report on the Fishes of the "Terra Nova" Expedition. Possibly all will ultimately be found to have a circumpolar distribution.

From the above summary it will be seen that no new forms are added to the list of species known to occur in Antarctic waters; but on the other hand certain species are absent. These are: *Pelagodiscus atlanticus* (King), *Liothyrina blochmanni*, Jackson, and *Macandrevia diamantina*, Dall, all three dredged in 1,410 fathoms, off Coats Land ("Scotia" Expedition); *Macandrevia vanhöffeni*, Blochmann, Eastern Antarctic ("Gauss" Expedition); *Crania lecointei*, Joubin, Western Antarctic ("Belgica" Expedition); *Liothyrella uva* (Brod.) var. *notorcadensis*, Jackson, South Orkneys ("Scotia" Expedition), South Georgia (Swedish Expedition), and Western Antarctic (French Expedition). The above localities, like those of the Ross Sea area, all lie inside the extreme limit of pack-ice. Of Antarctic species living outside the limit, four have been recorded from Kerguelen Island, viz., *Hemithyris psittacea* (Watson, MS., Davidson) ("Challenger" Expedition); *Liothyrina moseleyi* (Davidson) ("Challenger" Expedition); *Terebratella enzenspergeri*, Blochmann ("Gauss" Expedition, and erroneously as *T. dorsata* (Gmel.), "Challenger" Expedition); and *Magellania kerguelenensis* (Davidson) ("Challenger" and "Gauss" Expeditions).

Excepting *Pelagodiscus atlanticus*, a typical abyssal form and a species of almost cosmopolitan distribution,* *Macandrevia diamantina* is the only species which ranges any considerable distance outside Antarctic waters. This species was originally described from specimens taken in deep water in the Gulf of Panama, and was again met with in deep water off Northern Peru. The highly interesting discovery in the Antarctic of adult and very young specimens of this member of the Dallininæ, a sub-family previously thought to have been restricted to boreal seas, is discussed in detail in my "Scotia" Report [Jackson, 1912, pp. 379–383].

Before proceeding with the descriptions of the "Terra Nova" species, I must here express my thanks to Mr. D. G. Lillie for his kindness in supplying the surface temperatures of the sea in the case of most of the species. He remarks that in the Antarctic region the bottom temperature is approximately either just below or just above 0° C. (=32 F.).

I have also to thank Dr. S. F. Harmer, Keeper of Zoology in the British Museum (Natural History), for entrusting me with this Report, and Mr. G. C. Robson, Assistant in charge of the Brachiopoda in the same institution, for supplying me with necessary information.

A bibliography of the principal works consulted in the preparation of this Report is given at the end.

* Two larvæ dredged by the "Gauss" Expedition in the Eastern Antarctic are probably referable to this species. (*See* Eichler, 1911, p. 87.)

II.—DESCRIPTION OF SPECIES.

The literature is restricted to the more important works.

A.—NEW ZEALAND.

LIST OF STATIONS.

Station 90. From Summit, Great King, Three Kings Islands, S., 14° W., 8 miles, 100 fathoms. Surface temperature, 59·21° F.
" 96. 7 miles E. of North Cape, New Zealand, 70 fathoms. Surface temperature, 61° F.
" 243. Neighbourhood of Admiralty Bay, Nelson, New Zealand, 15 fathoms, sand.
" ? On the sandy beach at Waikawa, Southland, New Zealand, 1912.

1. *Hemithyris nigricans* (G. B. Sowerby, 1846).

Terebratula nigricans, Sow., *Proc. Zool. Soc.*, 1846, p. 91.
" " Sow., "Thes. Conch.," i., 1846, p. 342, pl. 71, figs. 81–82.
Rhynchonella nigricans (Sow.), Davidson, "Recent Brachiopoda," *Trans. Linn. Soc.*, iv, pt. ii, 1887, p. 169, pl. 24, figs. 16–19.
Hemithyris nigricans (Sow.), Dall, *Proc. Acad. Nat. Sci. Philad.*, 1873, p. 196.
" " " Suter, "Manual N.Z. Mollusca," 1913, p. 1076.

Hab.—"On the sandy beach at Waikawa, Southland, N.Z., 1912" [= Otago].

Obs.—Three live specimens of this well-known New Zealand form were picked up at the above locality. The largest example measures: length, 22 mm.; breadth, 25 mm.; depth, 12·5 mm.

This species seems to be restricted in its distribution to the southern part of New Zealand. It has been recorded from 5 miles E. of Ruapuke Island, 19 fathoms; Foveaux Strait (abundant); off Waipapa Point, 24–26 fathoms; 15½ miles E. of Shag Point, 30–40 fathoms, and the Chatham Islands [Hutton, 1873 (1), p. 87; 1880, p. 178. Davidson, 1887, p. 169. Suter, 1911, p. 284, and 1913, p. 1076].

In a fossil state the species is said to occur in the Tertiary Rocks of New Zealand [Hutton, 1873 (2), p. 37; 1904, p. 480; Suter, 1913, p. 1076]; but it is open to question whether the specimens so named are correctly referred to *H. nigricans*. They probably represent a coarsely ribbed, imbricate, ancestral form of which the recent *H. nigricans* may be a catagenetic development, and the recent *H. döderleini*, from Japan, a spinose (anagenetic) development [Thomson, 1915 (3), p. 388]. A closely related form has been obtained from the Table Cape Beds at Wynyard, Tasmania, reputed to be of Miocene Age [Jackson, 1916, pp. 25–26].

Compared with the genotype of *Hemithyris* (*H. psittacea*), *H. nigricans* presents some interesting internal differences. The dental plates, instead of being vertical as in *H. psittacea** (also *H. lucida*), curve backwards into the umbonal cavity. The teeth,

* Thomson [1915 (3), p. 391] has recently called attention to the erroneous statements made by Hall and Clarke [1895, p. 835] and Schuchert [1913, p. 399] that dental plates are absent in this genus. In gerontic examples of *H. psittacea* the dental plates tend to become obsolete (J. W. J.).

too, are relatively larger, and there is a stronger development of the pedicle-collar.* In the dorsal valve the cardinalia† differ somewhat, especially in the possession of a definite bilobed cardinal process, which extends outwards from the apex of the valve as a small shelf embayed medially. This feature, which I have never observed in any example of *H. psittacea*, is present both in the "Terra Nova" specimens and in two examples in my own collection from the Chatham Islands [Jackson, 1916, p. 25]. There is a short, low, mesial septum, which is very much stronger than that in *H. psittacea.* In the latter species the septum is quite rudimentary, and there is no true cardinal process, the diductor muscles being attached directly to the posterior ends of the crural bases. *H. lucida* agrees with *H. psittacea* in this respect, except that the muscular area is margined anteriorly by slight ridges.

Much work still remains to be done with regard to dental plates, etc., and doubtless a close study of the fossil forms of the *nigricans* group would reveal some interesting features. Of named forms pertaining to this series the most noteworthy are: *Rhynchonella squamosa*, Hutton‡ (Tertiaries of Australasia and Antarctica); *R. cœlata* (M'Coy MS.), Woods§ (Tertiary of Tasmania); *R.* (?) *tubulifera*, Tate¶ (Oligocene of Muddy Creek, Victoria); and *Hemithyris imbricata*, Buckman‖ (Tertiary of Antarctica). A further study is also desirable of *Rhynchonella nigricans* var. *pyxidata* (Watson, MS.), Davidson** (Recent off the Kerguelen Isles).

2. *Liothyrella sp.* Pl. I, figs. 1 A, B.

Hab.—Station 90; 100 fathoms.

Obs.—Two imperfect ventral valves of a Terebratulid were dredged at the above station. Both examples are overgrown with Polyzoa and a pink sessile Foraminifer (*Polytrema miniaceum*),†† and are so imperfect and badly preserved that it is difficult for comparisons to be made with other forms.

One specimen, A (Pl. I, fig. 1 A), is larger than the other, and seems to indicate a somewhat pyriform shell, with a maximum diameter a little anterior to the middle of the valve. The test is fairly thick. The posterior part of the valve is very convex, while the anterior part is broadly flattened along the middle. The size of the specimen represented by this fragment is: length, 40+ mm. (probably 45 mm.); width, 38 mm. Portions of the exterior surface are covered by very fine, almost obsolete, radial lines, and the surface generally has very prominent growth halts. The colour of the shell is dirty-white. The beak, of which one side only is preserved, is truncated by a large.

* See Jackson [1916, pp. 24–25] and Thomson [1915 (3), pp. 390–391, fig. 2] for descriptions and figure of this feature.

† Cardinalia embrace collectively the socket walls or ridges, crural bases, hinge-plates, and cardinal process of the dorsal valve [Thomson, 1915 (3), p. 391].

‡ [1873 (2)]. § [1877]. ¶ [1899]. ‖ [1910]. ** [1880 and 1887].

†† I am indebted to Professor S. J. Hickson, F.R.S., of the Victoria University, for verifying this determination.

oblique foramen. Part of a deltidial plate remains, and is separated from the rounded flanks of the beak by a sharp edge. There is also a slight pedicle-collar. The inner surface of the valve shows traces of two parallel furrows down the middle, such as are seen in shells of *Liothyrella uva* [see Jackson, 1912, pl. i, fig. 9; and Fischer and Oehlert, 1892, pl. viii, fig. 23].

The other specimen, B. (Pl. I, fig. 1 B), measures: length, 35 mm.; width, about 30 mm. It is pyriform, with its maximum width anterior to the middle. Valve convex, and deepest in the umbonal area. The beak has rounded flanks and is truncated by an oblique, oval foramen, which possesses a labiate prolongation over the conjoined deltidial plates. Outer surface with somewhat coarse growth-lines, but no radial striæ are apparent; interior surface quite smooth; slight pedicle-collar.

It is possible that both specimens, A and B, belong to the same species.

The absence of the dorsal valve renders a description of the cardinalia and brachidium impossible. That the species belongs to the short-looped forms, however, is clearly evident from the presence in the ventral valve of a feature known only to exist in short-looped species, viz., a pedicle-collar. In a recent paper [Jackson, 1916] I called attention to the fact that in some twenty-four recent and a number of fossil species of short-looped forms which I had examined, a true pedicle-collar* was universally present. This feature does not appear to be developed in any of the higher long-looped forms such as: *Magellania*, *Terebratella*, *Dallina*, *Macandrevia*, *Terebratalia*, etc., etc. This fact seems to provide a useful criterion for separating, into their right group, odd ventral valves, when other evidence is not available.

The shell-substance of the New Zealand specimens, A and B, when viewed under the microscope, is seen to be tunnelled in every direction by very fine burrows, presumably made by organisms similar to those found in *Compsothyris racovitzæ* (see p. 190), and it is difficult to get even $\frac{1}{16}$th of a square mm. without these. Consequently it is almost impossible to study the punctæ and shell-mosaic in a satisfactory manner. This is all the more unfortunate as there is much yet to learn regarding punctation. The shells are undoubtedly very finely and densely punctated, the number of pores per square millimetre, as far as can be ascertained, ranging from 272 to 304 (six counts on the same specimen yielded 288).

The species has a striking resemblance to some of the forms of *Liothyrella uva*,† figured and described from the Magellanic region, viz.—Falkland Islands (Burdwood Bank), South Georgia, and South Orkneys, as well as from the West Antarctic. Perhaps the most striking resemblance, however, of this New Zealand species is to the geographic variant of *L. uva*, viz., var. *notorcadensis*, described by me in 1912 from Scotia Bay, South Orkneys [compare Pl. I, fig. 1, with Jackson, 1912, pl. i, figs. 1–3]. The general form is similar and there is the same curious labiate prolongation of the

* The "doublure sous-apicale" and "doublure sous-cardinale" of Fischer and Oehlert [1891, pp. 44, 103, etc.].

† This species also has fine radial striæ on the surface of the valves.

foramen. It would be unwise, however, with the present material, to conclude that the New Zealand form is to be referred to the Magellanic species, and its identification must await further researches in the neighbourhood of Three Kings Islands.

Regarding the records of *L. uva* in Australian waters, Davidson [1880, p. 31, pl. ii. figs. 3–3b] referred to this species a dead specimen obtained at Twofold Bay, Auckland, N.S. Wales, in 120 fathoms, but this has since proved to be an error in identification. Blochmann [1906 and 1908] has clearly demonstrated that it is not *L. uva*, but a new species, to which he has given the specific name *fulva*. The same form has since been obtained alive off the East Coast of Tasmania, in 40 fathoms [Blochmann, 1914, pp. 112–113, pl. x.]. In the construction of the brachidium, and from the fact that certain important spicules are absent from the bases of the cirri, this species resembles the *L. vitrea* series, *i.e.*, it belongs to the true Liothyrinæ and not to the genus *Liothyrella* recently created by Thomson [1916, p. 44] for the reception of *L. uva* and some others. Some remarks on the validity of this new genus have been published by me in the *Geological Magazine* for February, 1918 (pp. 73–79).

Hedley [1902, p. 289] gives Coogee Bay and Botany Bay (both near Sydney) as localities for *L. uva*, but here again an error of determination was made, the specimens being *Terebratulina cancellata*, Koch [*fide* Blochmann, 1912].

Hedley's later record [1905, p. 43] of *L. uva* from 111 fathoms, East Cape Byron, Australia, may be founded on a similar error.

Blochmann [1908, p. 616] gives a most interesting record of *L. uva* at "Tahiti." The specimen is in the Berlin Museum under that locality. That it is *L. uva* there does not appear to be the slightest doubt; but the locality is open to question. Further researches in that part of the world would be very welcome.

No *Liothyrina* or *Liothyrella* has been recorded for New Zealand until quite recently, when a single juvenile example was met with in Foveaux Strait [Thomson, 1915 (2), p. 408]. Unfortunately the specimen is too small for specific determination. Thomson also writes me (February, 1917) that he is shortly describing a new species, under *Liothyrella*, from Cook Strait.

3. *Terebratella sanguinea* (Leach, 1814).

Terebratula sanguinea, Leach, *Zool. Misc.*, 1814, p. 76, pl. 33 (not Chemnitz).
Terebratula cruenta, Dillwyn, *Descr. Cat. Rec. Shells*, ii, 1817, p. 295.
Terebratula (*Terebratella*) *cruenta*, Dillw., Reeve, "Conch. Icon.," xiii, 1860, pl. v, fig. 20.
Terebratella cruenta (Dillwyn), Davidson, "Rec. Brach.," *Trans. Linn. Soc.*, iv, pt. ii, 1887, p. 87, pl. 14, figs. 1–8.
Terebratella sanguinea (Leach), Suter, "Manual N.Z. Moll.," 1913, p. 1074.

Hab.—Station 243; 15 fathoms, sand.

Obs.—One live immature specimen was met with at this station.

According to Davidson [1887, p. 88] this species is very abundant in Cook's and Foveaux Straits, New Zealand. Suter [1911, p. 284] records it "Off Oamaru, 35 and 43 fathoms, and 23 miles S.W. of Akaroa, 24–30 fathoms"; and in his later

Manual [1913, p. 1075] gives its distribution as Cook Strait to Stewart Island. Thomson [1915 (2), p. 405] cites it from Chetwode Islands (Cook Strait), Wellington Harbour, and Foveaux Strait, and later [1916, p. 46, pl. i, fig. 3] he describes and figures an interesting variety dredged off Cape Colville, Auckland, in 20 fathoms.

As a fossil it is recorded from the New Zealand Tertiaries at Wanganui, etc. [Hutton, 1873 (2), p. 36; 1904, p. 477; Suter, 1913, p. 1075].

4. *Terebratella rubicunda* (G. B. Sowerby, 1846).

Terebratula rubicunda, Sow., *Proc. Zool. Soc.*, 1846, p. 92.
" " Sow., "Thes. Conch.," vol. i, 1846, p. 351, pl. 70, figs. 45–47.
Terebratula (*Terebratella*) *rubicunda*, Sow., Reeve, "Conch. Icon.," xiii, 1861, pl. vii, fig. 27.
Terebratella rubicunda (Sow.), Davidson, "Recent Brach.," *Trans. Linn. Soc.*, iv, pt. ii, 1887, p. 84, pl. 15, figs. 15–29.
Terebratella rubicunda (Sow.), Suter, "Manual of N.Z. Moll.," 1913, p. 1075.

Hab.—"On the sandy beach at Waikawa, Southland, N.Z. 1912" [=Otago].

Obs.—Five live specimens in various stages of growth were obtained at the above locality.

This species has been recorded from Dusky Bay, Otago [Hutton, 1873 (1), p. 86]; Cook and Foveaux Straits [Davidson, 1887, p. 85]; off Waipapa Point, 24–26 fathoms, and off Nugget Point, 15–50 fathoms [Suter, 1911, p. 284]; Chatham and Auckland Islands [Hutton, 1880, p. 177; Suter, 1913, p. 1076]; and Chetwode Islands (Cook Strait), Wellington Harbour, and Foveaux Strait [Thomson, 1915 (2), p. 405].

As a fossil it is given by Hutton [1873 (2), p. 36; 1904, p. 478], and by Suter [1913, p. 1076], as occurring in the New Zealand Tertiaries at Wanganui.

5. *Neothyris lenticularis* (Deshayes, 1839). Pl. I, figs. 2 A, B.

Terebratula lenticularis, Desh., *Revue Zool. Soc. Cuv.*, 1839, p. 359.
" " Desh., Sowerby, "Thes. Conch.," vol. i, 1846, p. 360, pl. 72, figs. 108–110.
Terebratula (*Waldheimia*) *lenticularis*, Desh., Reeve, "Conch. Icon.," xiii, 1860, pl. 2, fig. 4.
Neothyris lenticularis (Desh.), Douvillé, *Bull. Soc. Géol. de France*, 3rd Sér., vii, 1879.
Waldheimia lenticularis (Desh.), Davidson, "Recent Brach.," *Trans. Linn. Soc.*, iv, pt. i, 1886, p. 52, pl. 9, figs. 2–13.
Magellania lenticularis (Desh.), Suter, "Manual of N.Z. Mollusca," 1913, p. 1074.

Hab.—Stations 90 and 96; 70–100 fathoms.

Obs.—At Station 90, an imperfect dead specimen of this species was obtained, consisting of the dorsal and ventral valves firmly articulated together. Both the valves are overgrown, inside and outside, with Polyzoa, Serpulæ, and sessile Foraminifera (*Polytrema miniaceum*). The specimen closely agrees in size and build with the example figured by Davidson from Foveaux Strait, New Zealand [1886, pl. 9, fig. 2]. In the interior of the dorsal valve the cardinalia are very massive, and the cardinal process is very much larger than in the specimens figured by Thomson [1915 (1),

p. 395, fig. 2f], and Davidson [1886, pl. 9, fig. 10]. The process, in fact, fills the whole of the hinge-trough, very much as in the Tertiary fossil specimen of *Neothyris ovalis* (Hutton) figured by Thomson from Castlecliff, Wanganui [1915 (1), p. 395, fig. 2e].

At Station 96, two apical fragments (dorsal, ventral, Pl. I, fig. 2 A, B.) of old shells, presumably belonging to the above species, were also brought up from a depth of 70 fathoms. Both the fragments are of a dirty-grey colour, and may belong to the same specimen. In the fragment of the ventral valve the shell structure appears to be much altered and no punctæ are visible, but in the dorsal valve the punctæ are visible in many places. The muscular impressions in the interior are well-defined and very deep, but the cardinalia are not quite as massive as in the example from Station 90. The foramen, too, of the ventral valve is much smaller. The fragments are, unfortunately, too small and imperfect to give a correct idea of the size and contour of the specimen. From their general appearance, and from the fact that the muscular impressions contained a quantity of hard grey mud, one might be justified in regarding them as possibly fossil rather than recent.

The discoveries made at the above two stations are of considerable interest, as the northern range of *N. lenticularis* is thereby very materially increased. Hitherto specimens of this species have been recorded from more southern localities. Davidson [1886, p. 52] states that the species lives abundantly, attached to rocks in Foveaux Strait, in 15 fathoms. Hutton [1880, p. 176] and Suter [1913, p. 1074] give Cook Strait to Stewart Island, while Suter in an earlier paper [1911, p. 284] records it "Off Oamaru, 35–43 fathoms."

In a fossil state the species is said to occur abundantly in the younger Tertiary rocks (Wanganuian) of the North Island of New Zealand [Hutton, 1873 (2), p. 35; Davidson, 1886, p. 52; and Suter, 1913, p. 1074].

6. *Magellania* or *Terebratella sp.* Pl. I, fig. 7.

Hab.—Station 90; 100 fathoms.

Obs.—Three very young live examples of a Brachiopod belonging to the family Terebratellidæ were dredged at this station.

The generic and specific determination of these presents no little difficulty owing to their small size. They are certainly to be referred to the sub-family Magellaniinæ, and not to that of Dallininæ, on account of the peculiar development of the loop.

In form the shells are longer than wide, being broadest about the middle. The beak is short; foramen large, incomplete; and deltidial plates very small.

The three specimens are milk-white in colour, and their dimensions, in mm., are as follows:—

	1	2	3
Length	4·4	4·7	3·9
Breadth . . .	3·6	4·0	3·4

All three examples show incipient ventral uniplication.

The valves have a smooth surface, but at the anterior margins of specimens No. 1 and No. 2 incipient alternate multicostation is visible as a slight crinkling of the edges of the valves. On specimen No. 2 the dorsal valve clearly shows two costæ occupying the sinus.

The shell-structure is conspicuously and evenly punctated. On the inner surface the pores are circular; on the outer, they are slightly oval and larger than the inner. The number of pores per square millimetre, at the middle of the ventral valve (specimen No. 1), ranges from 180 to 200 (average of ten counts = 188).

In the interior of the dorsal valve (No. 1, 3·5 mm. long) the loop consists of two very thin descending branches and an ascending portion in the form of a ring, which is broad below and narrower above [Pl. I, fig. 7]. Both the descending and ascending portions are united along the side of the septum, and the stage of loop-development is not unlike that designated by Thomson [1915 (2), p. 405, fig. 6] "Magelliform" for *Terebratella rubicunda*. The anterior part of the high septum, however, is produced somewhat beyond the broad base of the ring, as in the Magadiform stages of *Terebratella dorsata* and *Neothyris lenticularis*, figured by Beecher* [1893, pl. i, figs. Ea and Eb].

The septum, which is extremely thin anteriorly, broadening rapidly posteriorly, reaches right back to the hinge-plates, which consist of two oblique lamellæ extending from the dental socket-ridges towards the centre-line of the valve. These plates are hollowed out underneath in the direction of the apex. Between the hinge-plates is a somewhat narrow depression or trough which extends forward along the upper surface of the septum as a shallow groove. In the centre of this trough, between the hinge-plates, is a small elongated tubercle. The cardinal process consists of a transverse bilobed plate superimposed on the inner posterior ends of the hinge-plates. The socket-ridges overlap the margin of the valve posteriorly as two tiny ears.

The presence of a groove along the top of the septum and of a tubercle in the hinge-trough are interesting points. I have met with the same features in juvenile stages of other species of the *Magellania-Terebratella* group (*e.g.*, *T. dorsata*). The two edges bounding the groove are distinctly connected and continuous with the hinge-plates; the tubercle is apparently a disconnected part of the septum, or the beginning of a buttress to the cardinal process. In an early stage of *Magellania flavescens* the tubercle looks as if it were the posterior part of the mesial septum protruding through the line of joining of the hinge-plates. In later stages of the same species it usually disappears, but occasionally in fully adult specimens a distinctly bulbous cardinal process with a triangular buttress is seen extending forward into the hinge-trough. Similar features are also present in *T. dorsata* and *M. venosa*. One or two of my

* In this stage, apparently, the descending and ascending branches have not yet united on the side of the septum.

specimens of the last-named species have a type of cardinalia almost as massive as that in species ascribed to *Pachymagas* and *Neothyris*.

Though the immature shells now under discussion were dredged along with a dead specimen of *Neothyris lenticularis*, they can scarcely be regarded as young forms of that species, owing to the fact that the latter is not known to have a multicostate stage. Neither can they be referred to *Terebratella rubicunda*, as multicostation here comes on very late in life, or not at all in some cases. There remains, therefore, only one other New Zealand form with which comparison can be made, viz., *Terebratella sanguinea*. In this species costation appears early* and gradually increases in intensity.

Unfortunately the smallest example of *T. sanguinea* in my collection is one measuring 10·7 mm. long, ventral valve (dorsal = 9 mm.). In this specimen the loop is apparently no further advanced than the Magelliform stage of *T. rubicunda*, figured by Thomson [1915 (2), fig. 6 on p. 407], or the Magaselliform stage of *N. lenticularis*, as figured by Beecher [1893, pl. i, fig. Fb]. The cardinalia are pretty much the same as in the example from Station 90, and there is also a tubercle lying in the hinge-trough, but it is much more elongate.

The punctæ in my specimen are very evenly distributed, but are less in number than in the example from Station 90, being from 112 to 140 per square mm., about the middle of the ventral valve. It might be stated, however, that there is considerable variation in the punctation of *T. sanguinea* in different stages of growth. On the early (apical) parts of adult shells which I have examined, the punctæ are very even, but later, as the costæ become more pronounced, the punctæ are densely segregated in the costæ, leaving the furrows with considerably fewer. In one adult example examined I found from 232 to 288 punctæ per square mm. in the costæ, while the furrows only contained 132 to 160 per square mm.

If the examples from Station 90 should ultimately prove to be young stages of *T. sanguinea*, then the range of this species, like *N. lenticularis*, is considerably increased northwards. The most northernly locality recorded for *T. sanguinea* appears to be Cape Colville, Auckland (some 250 miles S.E. of Station 90), where an interesting variety was dredged in 20 fathoms [Thomson, 1916, p. 46, pl. i, fig. 3].

It might be stated, however, in conclusion that the advanced stage of the loop in such small specimens is suggestive of a higher form than *Terebratella*. One is tempted to ascribe the shells to the well-known Australian species, *Magellania flavescens*, as they resemble the young stages of that species very closely; but beyond the somewhat doubtful record of "Chatham Islands," given by Thomson [1915 (2), p. 409], *M. flavescens* has never been described from New Zealand waters.

* Thomson [1915 (2), p. 405] gives 3 mm. as the length of the ventral valve on which multicostation is apparent.

B.—ANTARCTIC.

LIST OF STATIONS.

Station 194. Off Oates Land, 69° 43′ S., 163° 24′ E., 180–200 fathoms. Surface temperature, 29·4° F.
,, 220. Off Cape Adare, mouth of Robertson's Bay, 45–50 fathoms. Surface temperature, 31° F.
,, 294. Ross Sea, 74° 25′ S., 179° 3′ E., 158 fathoms. Surface temperature, 30·8° F.
,, 295. Ross Sea, 73° 51′ S., 172° 57′ E., 190 fathoms.
,, 314. 5 miles N. of Inaccessible Island, McMurdo Sound, 222–241 fathoms. Surface temperature, 32·9° F.
,, 316. Off Glacier Tongue, about 8 miles N. of Hut Point, McMurdo Sound, 190–250 fathoms. Temperature at 165 fathoms, 30·5° F.
,, 338. 77° 13′ S., 164° 18′ E., 207 fathoms.
,, 339. 77° 5′ S., 164° 17′ E., 140 fathoms.
,, 340. 76° 56′ S., 164° 12′ E., 160 fathoms. Temperature near Stations 338–340 at 110 fathoms, 28·4° F.
,, 348. Off Barne Glacier, McMurdo Sound, 200 fathoms.
,, 355. 77° 46′ S., 166° 8′ E., 300 fathoms. Surface temperature, 32·6° F.
,, 356. Off Granite Harbour, entrance to McMurdo Sound, 50 fathoms. Surface temperature, 31° F.

Compsothyris,* *gen. nov.*

Shell resembling *Frieleia*, Dall, from which it differs in type of cardinalia and folding. The cardinalia consist of two divergent socket-ridges united to the crural bases by transversely striated curved lamellæ. From the inner sides of the crural bases two curved lamellæ extend to the floor of the valve, where they become fused to a posterior bifurcation of a short but well-defined mesial septum. Crura short, abruptly truncate or slightly denticulate. No obvious cardinal process. Dental plates and a pedicle-collar present in ventral valve. Surface of valves with hair-like radii. Folding dorsally uniplicate. Genotype: *Rhynchonella racovitzæ*, Joubin.

7. *Compsothyris racovitzæ* (Joubin, 1901). Pl. I, figs. 3 A–F, 4, 5, 6 A, C, E, 9, 10.

Rhynchonella racovitzæ, Joubin, "Résultats du Voyage du S.Y. Belgica en 1897–1898–1899"; Zoologie: "Brachiopodes," Anvers, 1901, p. 5, pl. i, figs. 1–4.
Rhynchonella gerlachei, Joubin. *Ibid.*, p. 7, pl. i, figs. 5–9; pl. ii, fig. 10.
? *Hemithyris sp.*, Jackson, "The Brachiopoda of the Scottish National Antarctic Expedition." *Trans. Roy. Soc. Edinb.*, vol. 48, pt. ii, 1912, p. 370.

Hab.—Stations 194 and 316; 180–250 fathoms.

Obs.—Several examples of a finely-ribbed, thin-shelled Rhynchonellid were trawled at each of the above stations. Nearly all are empty shells in the adult stage of growth, and only three or four half-grown examples contain the imperfect remains of the animal. These latter are attached to fragments of Polyzoa.

The specific determination of this form has been considerably hampered by the inaccessibility (owing to the European conflict) of certain type specimens preserved in the museums at Paris and Brussels.

* κομψός, elegant; θύρα, a door.

In general form the "Terra Nova" species is ovately triangular, broadest anteriorly; lateral margins merging into anterior margin without angulation. The type of folding is dorsally uniplicate (Pl. I, figs. 3, 6).

Both valves are about equally inflated and perfectly rounded in early stages, but become broadly flattened anteriorly, later in growth. The surface of both is densely covered with fine regular hair-like radii. Delicate growth-lines occur at irregular intervals. These are more numerous and closer together towards the anterior border. The radii increase in number by intercalation, and apparently extend from the nepionic portion, which is semi-elliptical in outline with fine incremental lines. They are variable in number in different specimens, and in different situations on the same individual. They are plainly visible through the shell. One specimen from Station 194, on microscopic examination revealed nine radii per mm., about the middle of the ventral valve; ten (possibly eleven) nearer the beak; and an average of eight near the anterior margin. Other specimens from the same Station and from Station 316 yielded somewhat similar results—*i.e.*, an average of nine radii per mm. in the middle, and higher numbers posteriorly. The spaces between the radii are unequal, and this accounts for some difference in their number per mm. The mosaic formed by the calcareous prisms of the inner layer of the test is shown in Pl. I, fig. 10. This figure also shows two of the radii seen through the shell from the inside.

The ventral valve is pointed posteriorly, and has a short recurved beak; the pedicle-opening consists of two parts—a small rounded notch, permesothyrid* in position, opening into a wide ovate delthyrium, bounded anteriorly by discrete deltidial plates; dental plates vertical, extending from below the slightly recurved teeth backwards into the beak-cavity; pedicle-collar very distinct, occupying quite half the length of the pedicle-opening (Pl. I, fig. 4). The lateral margins of the valve are slightly curved, passing over extremely rounded angles into a rounded anterior margin. The interior of the valve is smooth, with fairly clear traces of the muscular impressions; these are clustered together in the umbonal region a little in advance of the teeth. The confluent adductor scars are in the middle in the form of a heart-shaped mark (a little posterior to the centre of the group), which is almost surrounded by the flabelliform diductor impressions; behind the latter and overlapping them slightly are the scars of the ventral peduncular muscles.

The dorsal valve is roundly pointed posteriorly; the cardinalia consist of two divergent socket-ridges, bounding deep and transversely grooved dental sockets; crural bases well marked, extending as ridges obliquely from the apex, and attached to the inner sides of the socket-ridges by means of transversely striated curved lamellæ, which are grooved alongside the crural base ridges; crura short, abruptly truncated, or very slightly denticulated, at the extremities. On their posterior inner sides the crural bases send down strongly curved lamellæ, which are fused to a posterior

* For definition of this term, see Buckman [1916, p. 131].

bifurcation of a mesial septum (Pl. I, fig. 5). Anterior to this bifurcation the septum is sharp-edged and well-defined, and extends forward to about a third the length of the valve, separating the four distinct scars of the adductor muscles, of which the two anterior are the largest. In some cases these muscle-scars extend slightly in front of the end of the septum. There is no obvious cardinal process, the diductor muscles being attached to the posterior parts of the crural bases and socket-ridges. In neither valve is there any trace of the furrows for the pallial sinuses.

The foregoing general description is applicable to the majority of the "Terra Nova" specimens. A few others show certain deviations. In young shells the form is more regularly ovate (much as in *Macandrevia cranium*), and the folding is incipient (Pl. I, fig. 6). An old thick-shelled example from Station 194 shows considerable calcification in the umbonal cavity of the ventral valve, with nearly complete obsolescence of the dental plates and pedicle-collar.* In the dorsal valve of this specimen the cardinalia are similarly thickened, and the posterior inner sides of the crural bases almost meet in the median line over the septum, leaving, however, a tiny cavity below the apex.

The valves of several of the shells are pierced with small circular holes, doubtless owing to attacks by carnivorous gastropods; others are partly overgrown by Polyzoa. Many present a curious feature when viewed under the microscope, owing to the fact that the external surface of the shell is undermined by a network of fine strings connected with enlargements which are not uniform in shape (Pl. I, fig. 9). The nature of the organisms which form these burrows is not certain.

In 1901, Joubin described, as two new species, some thin-shelled, radially-striated Rhynchonellids which were dredged by the "Belgica" Expedition in 192 to 275 fathoms in the Western Antarctic. The first species, to which he gave the name of *Rhynchonella racovitzæ*, was founded upon a single specimen containing the animal, and a fragment of a ventral valve showing interior details. The second species (*R. gerlachei*) was based upon two small examples showing obvious juvenile features. In my opinion it possesses no definite characters which separate it from *R. racovitzæ*, and I feel convinced that it cannot be regarded as more than a young stage of that species.

The types of the above are in the Brussels Museum, and are, therefore, not available for study; but from the excellent descriptions and figures given by Joubin [1901] it is evident that the "Terra Nova" Rhynchonellid is identical with *R. racovitzæ*. The discovery of this species in the Ross Sea area thus extends the range very considerably.

The resemblance of this species to *Rhynchonella cornea* (Fischer MS.), Davidson, is very striking. This fact was noted by Joubin, but as he was only in possession of one

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* In old adult shells of *Hemithyris psittacea* the pedicle-collar is sometimes fused to the floor of the umbonal cavity, and the dental plates tend to become obsolete through excessive calcification.

perfect adult specimen he was unable to appreciate fully the remarkable likeness of the two forms. Joubin's type specimen [1901, pl. i, figs. 1–3] is ovoid in form, with the valves regularly rounded, about equally inflated, and possessing no flattened part such as is present in *R. cornea* and in some of the "Terra Nova" examples. In *R. cornea* the two lateral angles are very much accentuated, which gives the shell a more triangular appearance. One of the "Terra Nova" examples (Pl. I, fig. 3 F) agrees exactly in size and form with Joubin's type, and shows the same features as those described, but there are others which show that this species is subject to considerable variation in outline and in the amount of flattening of the valves (Pl. I, figs. 3. 6).

In emphasizing the difference between *R. cornea* and *R. racovitzæ* Joubin remarks:—"Le contour de la commissure palléale est très différent dans les deux espèces. Antérieurement la valve supérieure [=dorsal] présente une échancrure médiane très nette, à laquelle correspond une saillie du bord de la valve inférieure [=ventral] qui vient s'y engager. Dans *R. cornea* c'est le contraire ; l'angle rentrant est sur la valve inférieure, et l'angle saillant sur la valve supérieure," which means that in his opinion *R. cornea* is ventrally uniplicate and *R. racovitzæ* dorsally uniplicate. The latter is a characteristic feature of Rhynchonellids.

I have been unable to obtain a specimen of *R. cornea* in order to verify the above statement, but the illustrations given by Davidson [1887, pl. 25, figs. 2b and 3b] would seem to indicate that this species is incipiently dorsally uniplicate, though in his description he distinctly states that the shell is "without either fold or sinus." The figures given by Fischer and Oehlert [1891, pl. i.] show a lenticular condition with no folding. In the text they state:—"commissure palléale droite, parfois légèrement incurvée au front."

Another point of difference between the Antarctic species and *R. cornea* is the fact that the longitudinal striæ in the former are finer and somewhat more numerous than in the latter.

According to Fischer and Oehlert [*op. cit.*, p. 14], *R. cornea* shows about sixty radii per cm.; while, according to Joubin [*op. cit.*, pp. 6 and 8] *R. racovitzæ* possesses about eleven radii per mm. (*R. gerlachei*, on an average, nine per mm.) at the edge of the valve. As stated previously, the "Terra Nova" examples show eight to ten (possibly eleven) radii per mm. They are clearly visible even over the umbonal region, while in *R. cornea*, according to Joubin, they are not distinguishable until further away from the beak. Possibly it will be found that *R. cornea* will exhibit similar differences in the number of radii present on the shell.

Regarding interior details it is difficult for a comparison to be made in the absence of a specimen of *R. cornea*. The descriptions of the cardinalia furnished by Davidson [1887] and Fischer and Oehlert [1891] are not sufficiently clear as to whether the mesial septum of the dorsal valve is fused with the cardinalia, though from the illustration given by Davidson [1887, pl. 25, fig. 4] one might assume that it was connected at the apex. It is stated by Fischer and Oehlert [1891, p. 15] that the septum commences at the summit of the valve. Their figures [1891, pl. i, figs. 2p and 2q] show no trace of posterior bifurcation; nor does that of Davidson.

With the above exception the interior details appear, from the figures, to be similar in the two species; the outer surfaee of the shell, too, in *R. cornea* is liable to be undermined in the same peculiar manner as in the Antarctic species (compare Pl. I, fig. 9, with Fischer and Oehlert, 1891, pl. i, fig. 2u).

The geographical range of *R. cornea* is the Lusitanian Sub-region of the Atlantic Ocean, from the English Channel to the Soudanese Coast of Africa (Cape Bojador); the range in depth is from 383 to 1,109 fathoms*; the bottom temperature varies between 41° and 32° F. [F. and O., 1891, p. 118].

The "Terra Nova" Rhynchonellid also presents a remarkable superficial resemblance to *Frieleia halli*, Dall, from the N.W. coast of America. A close comparison, however, of specimens with Dall's description [1895, pp. 713–716] and with two examples of *F. halli* recently received, shows structural differences which prove them to be not only specifically, but generically, distinct. The most important difference lies in the construction of the cardinalia. In *F. halli* the latter are characterised by the presence of a platform † consisting of two hinge-plates, excavate below, extending outward from the inner sides of the crural bases and uniting in the median line over the septum. This platform is solidly attached to the septum by means of a widened surface,‡ which supports part of each lamina as well as their line of junction. An impressed mesial line is present on the upper surface of the platform, which is also indented mesially and overhangs the septum in front. A cardinal process is sometimes developed in old age. (Compare Pl. I, figs. 5 and 8.)

The outer surface of *F. halli* is radially striated, but owing to the high polish the striæ are very indistinct. Owing to their fineness I have been unable to obtain a satisfactory photograph for comparison with the "Terra Nova" species.

F. halli is evidently a non-plicate species subject to accidental distorsion which gives the shell a *Bilobites* appearance. It is also subject to attacks of boring organisms similar to those of the Antarctic species. It ranges from latitude 47°, off Grays Harbour, Washington, to the Pacific Ocean, off San Diego, California; 559 to 984 fathoms; bottom temperature, 38° to 39° F.

Another species bearing some external likeness to the above forms is *Hemithyris craneana*, Dall, from the Gulf of Panama (1,175 fathoms; bottom temperature, 36·8° F.), but, according to the description, the deltidial lamellæ are obsolete. The presence or

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* Davidson [1887, p. 172] gives 57½ fathoms, off Cape St. Vincent. This is obviously a misprint for 577½ fathoms (see F. & O. 1891, p. 15). This error has misled Schuchert, as he remarks on the occurrence of this cold water species in the *warm water* off Cape St. Vincent [1911, p. 265].

† The term "spondylium" is used by Dall, but this is strictly applied to the spoon-shaped plate frequently present in the ventral (or pedicle) valve of some Articulata (*Pentamerus*, etc.).

‡ The septum does not bifurcate, as in the "Terra Nova" species.

absence of dental plates is also not indicated. [See Dall, 1895, pp. 717–8, pl. 31, figs. 5–6].

In all probability the *Hemithyris sp.*, dredged in 1,410 fathoms, off Coats Land, Antarctica, by the "Scotia" Expedition [Jackson, 1912] is referable to *Compsothyris racovitzæ*, but the imperfect nature of the material renders a decision on this point out of the question. The mosaic formed by the prisms of the test is apparently larger.

The presence in *Compsothyris racovitzæ* and *Frieleia halli* of features characteristic of Palæozoic genera of the Rhynchonellidæ is particularly noteworthy. As in *Camarotœchia*, the apex of the ventral valve is encroached upon and cut into by the elliptical foramen, though the deltidial plates in *Compsothyris* and *Frieleia* are never completely united so as to close the lower part of the aperture. Somewhat similar conditions are also present in *Rhynchotreta*. In like manner the intimate connexion in *Compsothyris* and *Frieleia* of the mesial septum of the dorsal valve with the hinge-processes recalls *Camarotœchia*, in which the crural laminæ are united by a deposit of callus to a cup-like expansion of the septum. In *C. racovitzæ* this feature is equivalent to the part marked "d" (rostral chamber) in fig. 591C. of *Camarotœchia congregata* (Conrad) figured by Schuchert in Zittel [1913, p. 397].

8. *Liothyrella antarctica* (Blochmann, 1906).

Liothyrina antarctica, Blochmann, Zool. Anzeiger, Bd. xxx, 1906, p. 692.
,, ,, Blochmann, Zeitschr. f. wiss. Zool., Bd. 90, 1908, p. 614.
,, ,, Blochmann: Eichler, "Die Brach. der Deutsch. S.-P. Exped., 1901–03," xii, Zool. iv, 1911, p. 89, pl. 42, figs. 1–4; pl. 43, figs. 13, 19, 20; pl. 44, figs. 25–34.

Hab.—Stations 220 ?, 294, 314, 316, 338, 339, 340, 355, 356; 50–300 fathoms.

Obs.—In some of the above stations this species occurred in fair numbers (Station 355—the deepest—yielded some eighty or ninety specimens), but in others only one or two examples were dredged.

Many of the shells obtained are in a dead condition. Several have been bored by carnivorous gastropods, and one or two have the outer layer of the shell undermined, as in *Compsothyris racovitzæ*. Some of the examples, from Stations 316, 338, and 355 especially, are studded with the tests of Foraminifera, resembling *Discorbina*, and most of the living examples are attached to fragments of Polyzoa. In one or two cases individuals show irregularities of growth due to accident.

The abundance of individuals, in some cases, seems to be an indication of favourable conditions for existence.

The dimensions of the specimens are, in general, larger than those obtained from the type station in the Eastern Antarctic. Some of the largest, from Station 355, are detailed below:

Length, in mm. .	17·1	17·0	16·3	15·7	15·5	14·6	14·0	12·8
Width ,, .	12·8	13·3	12·5	13·1	12·0	12·3	11·5	10·6
Thickness ,, .	8·5	9·5	9·0	8·0	8·4	7·1	6·7	6·5

The largest specimens in the collection are, one example from Station 316: Length, 21; width, 15; thickness, 11·5 mm., and one from Station 338: Length, 21·8; width, 14·7; thickness, 11·7 mm. Both are elongate-oval in outline, and are like the smaller specimen figured by Eichler [1911, pl. 42, figs. 4 a–b]. The example from Station 316 has much coarser growth-lines.

The general characters of this species have been described in detail by Blochmann and Eichler, who state that it belongs to the group of Liothyrinæ characterised by the presence of certain spicules at the bases of the cirri (Cirrensockeln).

From a study of the "Terra Nova" specimens I am able to add some further particulars.

In general outline the shell is pyriform, longer than broad, reaching its greatest breadth a little in front of the middle. In a few cases the outline is more ovate. Both valves are about equally inflated, and on their outer surface very delicate incremental lines are visible. In addition the surface is ornamented by extremely fine radial lines, visible when the shell is held in a particular position. These lines, or striæ, are not mentioned by Blochmann and Eichler; they are apparently coincident with the radial arrangement of the punctæ.

In the majority of the examples the anterior commissure forms a broadly flattened arch dorsalwards, the shells being incipiently uniplicate. A few specimens—not necessarily the largest—are more dorsally uniplicate.

The beak is short with rounded flanks; the pedicle-collar is distinct but short; and there is a labiate prolongation of the rim of the foramen extending in some specimens over the conjoined deltidial plates.

The interior of the dorsal valve possesses a thin, thread-like, mesial septum, but there are no indications in this valve, nor in the ventral valve, of the radiating grooves which serve for the attachment of the pallial sinuses.

In type of cardinalia and brachidium it is closely allied to *L. uva*, and, like that species, it pertains to the genus *Liothyrella* and not to *Liothyrina*.

The test is thin and finely punctate. In the specimens selected for examination (from Station 339) the number of punctæ per square millimetre ranges from 90 to 128, on the inside of the ventral valve, about the middle. Eichler [1911] gives the range from 120 to 150 per square mm. The shell-structure is exactly like that figured by Eichler [1911, pl. 43, fig. 20].

The occurrence of this species in the Ross Sea area is of great interest, as it was hitherto only known from the type station in the Eastern Antarctic—Kaiser Wilhelm II. Land, 210 fathoms ("Gauss" Expedition). It will probably be found to have a circumpolar distribution. *Liothyrina blochmanni*, described by myself in 1912 [Jackson, 1912, p. 378, pl. i, figs. 4–8] from specimens dredged by the "Scotia" Expedition, in 1,410 fathoms, off Coats Land, Antarctica, presents some slight resemblance to *L. antarctica*. It possesses a slight mesial septum in the dorsal valve; the surface of the valves is microscopically striated; and it has a short pedicle-collar. It differs, however, in its larger size, fewer punctæ per square millimetre, and, to some extent, in its spiculation. In addition to the foregoing, *L. blochmanni* is easily distinguished from *L. antarctica*, as well as from *L. uva* from the Magellanic region, by the peculiar disposition of the brachidium. This is of the *L. sphenoidea* type, with parallel descending branches and short, broad, transverse band, while in *L. antarctica* and *L. uva* the branches diverge and the transverse band is long and narrow—in *L. uva* it is longer perhaps than in any other recent species. A full discussion of these points is given in my paper in the *Geological Magazine* for February, 1918.

9. *Magellania fragilis*, Smith, 1907.

Magellania fragilis, Smith. Nat. Hist. of National Antarct. Exped. ("Discovery"), 1901–04, vol. ii, Zool., London, 1907, p. 1, figs. 1–2.

Magellania fragilis, Smith: Eichler, "Die Brach. der Deutsch. S.-P. Exped., 1901–03," xii, Zool. iv, 1911, p. 93.

Hab.—Stations 316, 338, 339, and 355; 140–300 fathoms.

Obs.—This species was first made known to science in 1907 by the late Edgar A. Smith (*op. cit.*), who founded the species on a small number of more or less damaged specimens obtained by the "Discovery" Expedition at Agassiz Island, 300 fathoms, mud, off the ice-barrier. Smith, however, only gives external views of the species, and his description of the internal features is somewhat incomplete; details of the cardinalia and the number of punctæ per square millimetre being wanting.

The specimens obtained by the "Terra Nova" Expedition at the above four stations are few in number. They are not so large as the "Discovery" examples, but appear to possess the characters of this species. A few of the examples from Station 355 are curiously malformed and notched around the periphery, caused through some injury to the mantle during growth.

Through the kindness of the British Museum authorities I have had the loan of one of the original specimens upon which the species was founded by Smith, and in the following pages I have added certain details concerning this example, as it shows more adult features than any of the "Terra Nova" specimens.

In general outline the "Discovery" specimen ($38 \times 30 \cdot 3$ mm.) is almost pentagonal with a truncated front. The early stages, however, as demonstrated by the growth-lines on the shell, show it to have been rounded during the neanic and early ephebic periods of growth. This is confirmed by the "Terra Nova" examples. It possesses moderate growth-lines, which are well spaced over the major portion of the shell, but are somewhat crowded together at the anterior and lateral margins. The shell appears to be lenticular as regards type of folding, but there is some slight indication of incipient ventral uniplication.

The beak, which possesses very much subdued ridges, is truncated by a rather large circular foramen, bordered anteriorly by conjoined deltidial plates. The foramen is situated almost entirely behind the ridges, and is therefore permesothyrid in position. There is a slight pseudopedicle-collar, *i.e.*, a thickened rim inside the foramen for muscular attachment.

Internally both valves are smooth, and no dental plates are present. In the dorsal valve the cardinalia consist of two divergent and high-standing socket-ridges with hinge-plates extending inwards and meeting in the median line over the septum. The crural bases are slightly discernible on the surface of the plates and are separated from the socket-ridges by slight intervals. The inner hinge-plates descend sharply from the crural bases to the septum, forming a rather deep trough. A bulbous cardinal process is present at the apex of the trough. The mesial septum is sharp-edged and extends to rather more than a third the length of the valve. Compared with the typical Magellaniform type of cardinalia, as displayed by *M. flavescens*, the chief difference lies in the steepness of the inner hinge-plates. In consequence of this the mesial septum is not as high as in *M. flavescens*.

In somewhat younger specimens in the "Terra Nova" collection the cardinal process is not so large and prominent, and the hinge-plates are much thinner. Each hinge-plate, too, is clearly divided into two parts by the well-defined crural bases which run independently from the umbo. The type of cardinalia here recalls that seen in several Dallinoid forms.

In the "Discovery" and "Terra Nova" examples the descending branches of the loop do not curve outwards as much as in *M. flavescens*.

The number of punctæ per square millimetre in the "Discovery" specimen is 60; in examples from Station 355, 50–65. On the external surface the punctæ in the latter specimens are slightly oval; on the inside they are rounder and measure 45–55 × 70–80 μ. They are arranged in transverse rows, more or less parallel to the contour of the shell.

Up to the present this species is only known authentically from the neighbourhood of the type-locality. Eichler [1911, p. 93] refers to a specimen found among the material dredged by the Swedish South Polar Expedition, in the Magellanic region, as in all probability possessing affinities with *M. fragilis*. The size of the punctæ, however, seems to suggest that it may be an entirely new species of *Magellania* [cf. Blochmann, 1912, p. 9, pl. i, fig. 15].

Smith, in describing this species, remarks upon its close alliance with the Patagonian *Magellania venosa* of Solander, and more especially with the *M. kerguelenensis* of Davidson. In fact, it was with some hesitation that he ventured to separate it specifically. It is, however, clearly distinct, in my opinion, from either of these species, both externally and internally. From the latter species it differs entirely in type of cardinalia. Judging from specimens in my collection, dredged off Kerguelen Island in 150 fathoms, *M. kerguelenensis* appears to possess a peculiar type of cardinalia, which is somewhat different from that of typical *Magellania* and *Terebratella*. It has a thickened septum, apparently extending to the apex, slight hinge-plates descending to a callus-deposit in the umbonal area, and thick socket-ridges, on the inner sides of which are large scars formed by the dorsal adjustor muscles. A bilobed cardinal process is present at the apex, and is supported anteriorly by a bulbous prolongation into the hinge-trough. I have not yet fully worked out the relationship of this type of cardinalia, but it is apparently Neothyroid in character, and allied to that of *N. lenticularis*, *N. ovalis*, etc.

10. *Magellania joubini*, Blochmann, 1906.

Magellania joubini, Blochmann, Zool. Anz., Bd. xxx, 1906, p. 697.
Magellania sulcata, Smith, Nat. Hist. of National Antarct. Exped. ("Discovery"), 1901–04, vol. ii, Zoology, London, 1907, figs. 3–4.
Magellania joubini, Blochmann, Zeitschr. f. wiss. Zool., Bd. 90, 1908, p. 609.
,, ,, Blochmann: Eichler, "Die Brach. der Deutsch. S.-P. Exped., 1901–03," xii, Zool. iv, 1911, p. 91, pl. 42, figs. 5–6; pl. 43, figs. 17–18; pl. 44, figs. 23–24.
Campages joubini (Blochmann): Hedley, Zool. Results, "Endeavour," 1909–1910, Sydney, Dec. 1911, p. 114.

Hab.—Stations 194, 294, 295, 314, 316, 338, 339, 340, 348, 355; 140–300 fathoms.

Obs.—At some of the above stations only single examples of this species were dredged; at others they were more numerous. Station 339 yielded the largest number. The majority of the specimens consist of immature shells.

The shells in the young stages are milk-white and almost transparent, exhibiting the muscular attachments and pallial sinuses quite clearly through the test; in the older examples the shells are yellowish, or horn-coloured, and the test is much thicker, especially in the umbonal region.

The largest specimen in the collection comes from Station 338. Its dimensions are as follows:—Length, 38·7; width, 26·3; thickness, 27·1 mm. It is evidently a gerontic individual, and is much larger than any obtained by the "Discovery" Expedition (largest = Length, 28; width, 23; thickness, 17 mm.), or by the "Gauss" Expedition (largest = Length, 15; width, 12·5; thickness, 7·5 mm.).

The above specimen agrees almost exactly with the example figured by Smith (*op. cit.*, figs. 3–4*) under the name *M. sulcata*. Its contour is somewhat pentagonal, the shell being widest about the middle. The outer surface is free from extraneous growths with the exception of a few Foraminifera. On the umbonal portions the strong characteristic growth-lines are moderately spaced and rounded; on the middle of the valves the growth-lines are closer together, and somewhat pointed anteriorly; on the outer parts they are densely crowded together anteriorly and laterally, increasing the dorso-ventral diameter of the shell very materially.

The ventral valve is very deep, strongly arched, and slightly longitudinally carinated; the dorsal valve is much shallower, and is flattened posteriorly. The shell shows no folding.

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* Smith's figures are evidently twice enlarged.

The beak has rounded flanks and is strongly incurved over the umbo of the dorsal valve, almost hiding the conjoined deltidial plates. The foramen is circular and of moderate size.

The above and other specimens from the various Stations exhibit very clearly through the test the vascular sinuses in the pallium.

In the ventral valve there are four of these in the mesial portion; the two inner sinuses are straight and slightly divergent; the two outer curve slightly outwards and possess two or three simple ramifications on their exterior sides.

In the dorsal valve two sinuses only are present. These pass alongside the adductor muscles, and then diverge outwards slightly. Each bears two simple ramifications on the exterior side.

In both valves the sinuses cease abruptly some distance from the shell-margin, no ramifications being present at the extremities.

The vascular sinuses in general are very much simpler than those of *Magellania venosa*, figured by Fischer and Oehlert [1892, pl. 12, figs. 5, 12, 13 and 15].

The foregoing description of the external features of this species applies generally to the majority of the smaller adult specimens in the "Terra Nova" collection, and to others obtained by the "Discovery" Expedition, received on loan from the British Museum for purposes of study and comparison. In some cases the shells show a pointed front; in others, of equal size, a truncated front.

In the younger examples the shells are either quite circular or slightly pointed anteriorly. The growth-lines, too, are not so conspicuous or so numerous.

The interior of both valves is concentrically sulcate, like the exterior. In the ventral valve the teeth are moderately strong and situated at the basal angles of the deltidial plates: there are no dental plates, but a slight pseudopedicle-collar is present.

In the dorsal valve the cardinalia and the adult loop are of the *Magellania* type. The branches of the loop, however, are not as narrow as in *Magellania flavescens*, the ascending branches especially being broad, both in adult and earlier stages. Eichler's figures [1911, pl. 44, figs. 23–24], of a specimen in a Terebratelliform loop-stage, show this feature clearly. This character has led Hedley [1911, p. 114] to consider the species as belonging to his genus *Campages*, but I am unable to agree with this conclusion.* There is a thin acute mesial septum extending from the centre of the valve back to the hinge-plates, under which it runs to the apex. The hinge-plates consist of two lamellæ extending from the socket-ridges to the median line over the septum. Each plate is distinctly separable into two parts by the crural bases, which are clearly visible on the surface running from the umbo. Unlike *M. flavescens*, the brackets (which form the dental sockets) do not reach inwards to the crural bases. In

* Hedley also places in *Campages* the South Australian *Magasella jaffaensis*, Bl., but from his figures it is obvious that this species possesses a different type of cardinalia from the genotype, *C. furcifera*, Hedley.

M. flavescens, even in pre-adult stages, these brackets are always closely applied to the crural bases. There is a slight transverse cardinal process at the apex of the valve.

It is not without interest to note that the type of cardinalia in *M. joubini* shows an approach to the Dalliniform type, in which the division of each hinge-plate by the crural bases, and the failure of the supporting brackets to reach the latter, is seen to perfection. The broad character of the ascending branches of the loop is also another feature met with in *Dallina* and some other species in the Dallininæ.

One of the characteristic features of *M. joubini* is its punctation. On the outer surface of the shell the pores are elongate-oval; on the inner they are round or slightly oval. The pores are close together, and their number per square millimetre ranges from 95 to 130. They are arranged generally in transverse rows following the contour of the growth-lines. Blochmann [1906, p. 697] and Eichler [1911, p. 92] give a range of 116 to 132 for the specimens obtained by the "Gauss" Expedition. The shell-mosaic and punctæ of the "Terra Nova" specimens are essentially as figured by Eichler [1911, pl. 43, fig. 17].

Magellania joubini was founded by Blochmann in 1906 upon specimens obtained at the winter quarters of the "Gauss" Expedition, about 90° E., in 210 fathoms. In the following year the same species was described by Smith under the name *M. sulcata*, from specimens obtained by the "Discovery" Expedition in 100 fathoms. at Coulman Island (73° 30′ S., 170° E.), and in 178 fathoms at the winter quarters (78° S., 164° E.). In 1898 the "Belgica" Expedition dredged one very young specimen and several fragments of a Brachiopod in about 275 fathoms in the Western Antarctic (80° W.), but owing to the imperfect nature of the material the form was left unnamed. [See Joubin, 1901, p. 11, pl. ii, figs. 16–17]. The form in question evidently belongs to *Magellania*, and is regarded by Blochmann [1906, p. 697] as pertaining to his species, *M. joubini*. The ascription, however, is not altogether conclusive, but is not improbable. The fragments were dredged along with specimens of *Compsothyris racovitzæ*.

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PLATE I.

Compsothyris racovitzæ. Figs. 3, 4, 5, 6, 9, 10.
Frieleia halli. Fig. 8.
Liothyrella sp. Fig. 1.
Magellania or *Terebratella sp.* Fig. 7.
Neothyris lenticularis. Fig. 2.

FIG. 1.—*Liothyrella sp.* Station 90. Off Three Kings Islands, New Zealand, 100 fms. A, B, ventral valves. Nat. size.

FIG. 2.—*Neothyris lenticularis* (Desh.). Station 96. 7 miles E. of North Cape, New Zealand, 70 fms. A, dorsal valve; B, ventral valve. Nat. size.

FIG. 3.—*Compsothyris racovitzæ* (Joubin). A, C, E, Station 316. Off Glacier Tongue, McMurdo Sound, Antarctica, 190–250 fms. B, D, F, Station 194. Off Oates Land, Antarctica, 180–200 fms. Dorsal views showing variation in shape. Nat. size.

FIG. 4.—*Compsothyris racovitzæ* (Joubin). Station 194, as above. Interior view of apical portion of ventral valve showing foramen, deltidial plates, pedicle-collar and dental plates. × 6.

FIG. 5.—*Compsothyris racovitzæ* (Joubin). Station 194, as above. Interior view of apical portion of dorsal valve showing type of cardinalia. × 7.

FIG. 6.—*Compsothyris racovitzæ* (Joubin). A, C, E, Station 316, as above. Anterior views of the three specimens A, C and E of Fig. 3, showing folding and variation in inflation of valves. Nat. size.

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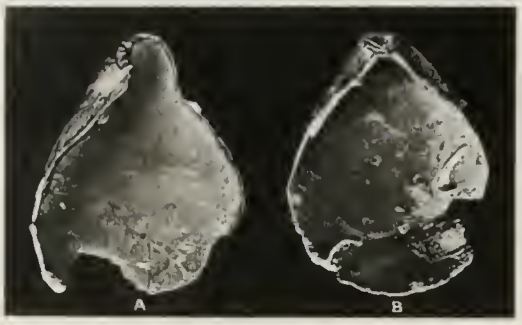
FIG. 8.—*Frieleia halli*, Dall. California, 822 fms. (Brit. Mus. 1918.6.8.1. Presented by J. W. Jackson.) Interior view of apical portion of dorsal valve showing type of cardinalia. For comparison with *Compsothyris racovitzæ*, Fig. 5. × 7.

FIG. 9.—*Compsothyris racovitzæ* (Joubin). Station 194. Off Oates Land, Antarctica, 180–200 fms. View of portion of dorsal valve showing the undermining of external surface by boring organisms (see p. 190). × 100.

FIG. 10.—*Compsothyris racovitzæ* (Joubin). Station 316. Off Glacier Tongue, McMurdo Sound, Antarctica, 190–250 fms. View showing shell-mosaic and two radii (seen through the shell from the inside), about middle of ventral valve. × 175.



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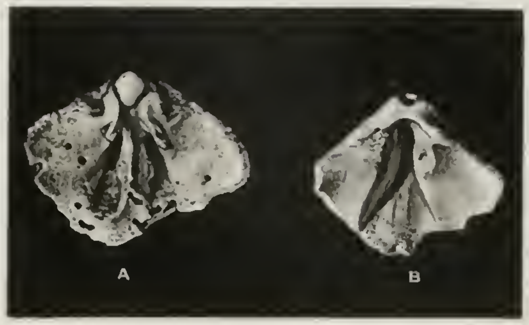

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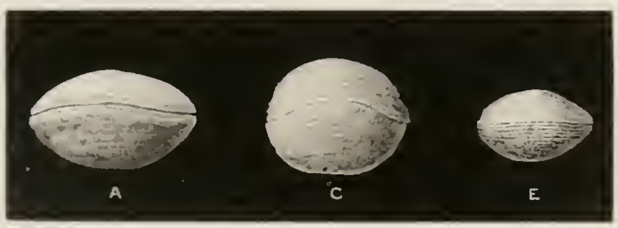

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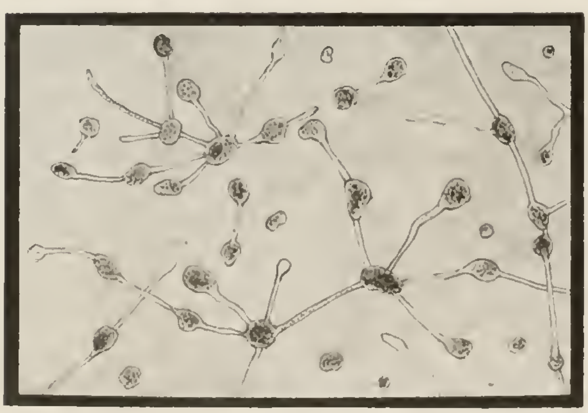

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MOLLUSCA.

PART III.—EUPTEROPODA (PTEROPODA THECOSOMATA) AND PTEROTA (PTEROPODA GYMNOSOMATA.)*

BY ANNE L. MASSY.

WITH NINE FIGURES IN THE TEXT.

I.—INTRODUCTION.

This collection although not containing any species new to science is nevertheless of great interest, especially from a geographical point of view.

Vayssière (1915, pp. 4–5) has shown that the two groups of Pteropoda, those with and without shells, are in reality not closely related to one another, and, consequently, he suggests that the names selected by Boas for the two groups shall be revived, namely that of Eupteropoda for the first group and Pterota for the naked species. These names have the advantage of separating the two groups whilst indicating always the existence of the most apparent external character, the fins.

The seventeen species of Eupteropoda in this report comprise five genera and two subgenera and consist of some thirty thousand individuals. The Pterota number three species belonging to as many genera and included under three thousand four hundred individuals. The area explored by the "Terra Nova" included sixty-six hauls in the Atlantic, at or near the surface in the region from the Bay of Biscay to off Rio de Janeiro, and representatives of both groups were taken in about one third of the hauls.

* MS. received December 15, 1919 (S. F. H.).

Another scene of the activities of the "Terra Nova" occurred in the waters around New Zealand, especially to the north of North Island. About one hundred hauls were made here at soundings of 0–10 m., and specimens were captured in about one fourth of these and they occurred in about the same proportion in hauls to a depth of 50 m. In thirty-three hauls in deep water in these regions specimens occurred in only three hauls. In the Antarctic regions from 65° S. latitude, forty-two hauls occurred in deep water and specimens were present in nearly half of these. Tow-nettings which were made in holes in the ice between Cape Evans and Inaccessible Island, over soundings of deep water, proved to be very fruitful in the number of individuals but poor in species. Specimens were taken in about one-third of nearly fifty hauls made (in Antarctic waters) at the surface or at moderate depths (0–40 m.).

Bonnevie (1913, p. 24) has emphasized the fact that some species frequent the surface and others seem to belong to the deeper layers of the ocean. Many notable absences in this list belong especially to the latter region and their absence in the Atlantic hauls is not therefore so surprising. *Cymbulia peroni* de Blainville, four species of *Thliptodon* and other interesting Pterota, as well as *Cleodora falcata* (Pfeffer) *Peraclis diversa*, Monterosato and *Limacina helicoïdes*, Jeff., have all been found during the cruises of the "Michael Sars" and "Helga" to be confined to the cold bottom water or the layers immediately above it (Bonnevie, 1913; Massy, 1909, 1917). Of the present collection *Cavolinia uncinata*, Rang, *Cavolinia inflexa* (Les.), *Cleodora pyramidata* (L.), *Cuvierina columnella* (Rang), *Styliola subula*, Q. & G., *Creseis virgula*, Rang, *Limacina retroversa* (Flem.) and *Pneumoderma atlanticum*, Bonn. were observed in the Atlantic, and all except the last named two species also occurred in New Zealand waters, where their presence was augmented by *Cavolinia longirostris*, Les., *Cavolinia gibbosa*, Rang, *Diacria trispinosa* (Les.),* *Cleodora sulcata* (Pfeffer), *Cleodora compressa*, Souleyet, *Limacina helicina* (Phipps), *L. inflata* (d'Orb.), *L. bulimoïdes* (d'Orb.), *L. balea*, Möller, *Peraclis* sp. and *Spongiobranchaea australis*, d'Orb. The last-named species and *L. helicina* (Phipps) shared the antarctic waters with *Clione antarctica*, E. A. Smith, and into these regions, *L. inflata*, hitherto considered to be an exclusively warm water species, also penetrated. That this species should have been found within the Antarctic Circle and that *C. uncinata*, Rang, should have been captured so far from the equator as south of South Island, New Zealand, constitute two of the most remarkable features of the present collection. As regards the vertical range of the different species, *C. longirostris*, *C. gibbosa*, *D. trispinosa*, *C. columnella*, *C. virgula*, *S. subula*, *L. bulimoïdes*, *L. retroversa*, and *P. atlanticum* were all found only at or near the surface. *C. inflexa*, *C. pyramidata*, *C. sulcata*, *C. compressa* and *L. inflata* occurred chiefly at the surface and rarely at 80–100 m. *L. balea* was taken on three occasions at soundings of 20–30 m. *L. helicina* and *C. antarctica*, which were the only species except *L. inflata* occurring in large shoals, were taken at various depths from the surface to

* A shell of this species occurred in a haul in the Bay of Biscay.

600 m. Both species were found in abundance near the surface and also in deep water. *S. australis* was only observed at or near the surface except in the case of two larval specimens which are referred with some doubt to this species. The five species taken by the "Discovery" Expedition are all represented here.

I am indebted to my colleague Mr. Farran for one of the drawings, and most of the others have been done by Miss E. Barnes of the National Museum, Dublin.

II.—LIST OF SPECIES TAKEN BY THE "TERRA NOVA" EXPEDITION.

Eupteropoda (Pteropoda Thecosomata).

1. *Carolinia longirostris*, Les.
2. ,, *gibbosa*, Rang.
3. ,, *uncinata*, Rang.
4. ,, *inflexa* (Les.).
5. ,, sp.
6. *Diacria trispinosa* (Les.).
7. *Cleodora pyramidata* (L.).
8. ,, *sulcata* (Pfeffer).
9. ,, *compressa*, Souleyet.
10. *Cuvierina columnella* (Rang).
11. *Styliola subula*, Q. & G.
12. *Creseis virgula*, Rang.
13. *Limacina helicina* (Phipps).
14. ,, *inflata* (d'Orb.).
15. ,, *bulimoïdes* (d'Orb.).
16. ,, *balea*, Möller.
17. ,, *retroversa* (Flem.).
18. *Peraclis* sp.

Pterota (Pteropoda Gymnosomata).

1. *Clione antarctica*, E. A. Smith.
2. *Pneumoderma atlanticum*, Bonnevie.
3. *Spongiobranchaea australis*, d'Orb.

III.—LIST OF STATIONS AT WHICH PTEROPODS WERE OBTAINED.

North Atlantic.

Station 2. June 18, 1910, 46° 21′ N., 11° 45′ W., surface, 5.30–6.30 p.m.

South Atlantic (Equator to neighbourhood of Rio de Janeiro).

Station 39.	April	26/27,	1913,	6 miles off Rio de Janeiro, 2 metres, 11 p.m.–1.30 a.m.
,, 40.	,,	27,	,,	,, ,, ,, 2.30–5 a.m.
,, 45.	May	4,	,,	21° S., 37° 50′ W., surface, 12.50 p.m.–1.30 a.m.
,, 47.	,,	4,	,,	20° 30′ S., 36° 30′ W., surface, 10.30–11 p.m.
,, 49.	,,	6,	,,	18° 51′ S., 33° 40′ W., surface, 4.30–5 a.m.
,, 50.	,,	7,	,,	18° S., 31° 45′ W., surface, 12.35 p.m.–1.15 a.m.
,, 52.	,,	12,	,,	5° S., 27° 15′ W., 2 metres, 4–6 p.m.
,, 58.	,,	16,	,,	0°, 25° 15′ W., surface, 1–1.30 a.m.

North Atlantic.

Station 61.	May	17,	1913,	2° N., 24° 45′ W., surface, 1–1.30 a.m.
,, 62.	,,	18,	,,	4° 50′ N., 24° W., ,, ,,
,, 67.	,,	27,	,,	25° 35′ N., 34° 10′ W., surface, 1.30–2 a.m.

New Zealand (off north end of).

Station 80.	July	22,	1911,	From Summit, Great King, N. 87° W., 11 miles, 0–100 metres, 5 p.m.
,, 85.	,,	24,	,,	From C. Maria van Diemen Light, W.N.W., 24 miles, 2 metres, 1–5 a.m.
,, 86.	,,	24/25,	,,	Off Three Kings Islands, 3 metres, 8 p.m.–5 a.m.
,, 89.	,,	25,	,,	Off Three Kings Islands, surface, 8–10 p.m.
,, 92.	,,	26/27,	,,	From Summit, Great King, S. by W., 24 miles, surface, 9 p.m.–4 a.m.
,, 93.	,,	27/28,	,,	From Summit, Great King, S.E. by S., 13 miles, surface, 9 p.m.–4 a.m.
,, 94.	,,	30,	,,	Off Mongonui, Doubtless Bay, 18 metres, 2–4 p.m.
,, 101.	Aug.	4,	,,	From West Island, Three Kings Islands, S.W., 5 miles, surface, 4–5 p.m.
,, 106.	,,	4,	,,	Same locality, surface, 7–8 p.m.
,, 107.	,,	4/5,	,,	Same locality, surface, 8 p.m.–5.30 a.m.
,, 108.	,,	5,	,,	34° 15′ S., 172° E., surface, noon–4 p.m.
,, 109.	,,	5/6,	,,	34° 15′ S., 172° E., 3 metres, 8 p.m.–8 a.m.
,, 110.	,,	6/7,	,,	34° 4′ S., 171° 55′ E., surface, 9 p.m.–4 a.m.
,, 111.	,,	7,	,,	Off Three Kings Islands, surface, 10 a.m.–1 p.m.
,, 118.	,,	16/17,	,,	34° 32′ S., 172° 20′ E., surface, 9 p.m.–5 a.m.
,, 125.	,,	23,	,,	Between North Cape and Doubtless Bay, surface, 2–4 p.m.
,, 126.	,,	24,	,,	34° 13′ S., 172° 15′ E., surface, 9 a.m.–noon.
,, 128.	,,	25/26,	,,	Off Three Kings Islands, surface, 9 p.m.–6 a.m.
,, 129.	,,	,,	,,	,, ,, ,, ,, 6 p.m.–6 a.m.
,, 130.	,,	26/27,	,,	,, ,, ,, ,, 8 p.m.–6.30 a.m.
,, 131.	,,	27,	,,	,, ,, ,, ,, 9 a.m.–5 p.m.
,, 137.	Sept.	4,	,,	34° 2′ S., 172° 40′ E., surface, 9 a.m.–noon.
,, 138.	,,	5,	,,	Off Three Kings Islands, surface, 2–3.30 p.m.
,, 141.	,,	6/7,	,,	34° 37′ S., 171° 19′ E., surface, 11 a.m.–9 a.m.
,, 143.	,,	8/9,	,,	34° 58′ S., 170° 12′ E., surface, 4 p.m.–9 a.m.

Antarctic (South of New Zealand to Ross Sea).

Station 186. Dec. 31, 1910, 72° 51′ S., 174° 55′ E., surface, midnight.
,, 217. ,, 29, 1911, 66° 46′ S., 177° 48′ W., 10 metres, 10.30 a.m.–noon.
,, 221. Jan. 9, 1912, North of Drygalski Glacier Tongue, Terra Nova Bay, 10 metres, 1–2 p.m.
,, 222. ,, 10, ,, 76° 3′ S., 165° 55′ E., 10 metres, 1–2 p.m.
,, 223. ,, 11, ,, 76° 2′ S., 165° 55′ E., 10 metres, 9–11 a.m.
,, 224. Mar. 9, ,, 60 miles E. of Cape Adare, 1 metre, 7–9 p.m.
,, 227. ,, 15, ,, 68° 03′ S., 169° 45′ E., surface, 1–2 p.m.

New Zealand to Antarctic Circle.

Station 231. Mar. 18, 1912, 64° 3′ S., 160° 12′ E., 80 metres, 1.30–4.30 p.m.
,, 235. ,, 26, ,, 52° 41′ S., 168° 15′ E., 10 metres, 7–10 p.m.
,, 236. ,, 27, ,, 52° 11′ S., 167° 25′ E., 80 metres, 6–8 p.m.
,, 238. ,, 27, ,, 52° 11′ S., 167° 25′ E., 30 metres, 10–10.30 a.m
,, 240. ,, 28, ,, 51° 57′ S., 167° 38′ E., 4 metres, 8.30–9 a.m.
,, 241. ,, 27/28, ,, 51° 57′ S., 167° 38′ E., surface, 9 p.m.–4 a.m.
,, 251. Dec. 20, ,, 54° 2′ S., 177° W., surface, 8–8.30 p.m.
,, 256. ,, 21, ,, 54° 38′ S., 176° 24′ W., 20 metres, 10 p.m.
,, 259. ,, 22, ,, 55° 34′ S., 174° 35′ W., 20 metres, 9 p.m.
,, 264. ,, 26, ,, 64° 33′ S., 166° 30′ W., 20 metres, 9 p.m.
,, 267. ,, 27, ,, 66° 30′ S., 166° 8′ W., surface, 8–8.30 p.m.

Antarctic (Neighbourhood of Ross Sea).

Station 269. Dec. 28, 1912, 68° 37′ S., 166° 14′ W., surface, 6–8 p.m.
,, 270. ,, 29, ,, 69° 51′ S., 166° 17′ W., 0–600 metres, 8 p.m.
,, 272. Jan. 1, 1913, 71° 35′ S., 166° 01′ W., 80 metres, 4 p.m.
,, 274. ,, 3, ,, 71° 29′ S., 166° 0′ W., 80 metres, 9 a.m.–noon.
,, 275. ,, 3, ,, 71° 29′ S., 166° 0′ W., 160 metres, 1–5 p.m.
,, 284. ,, 8, ,, 71° 49′ S., 167° 32′ W., 80 metres, 5.15–7.30 p.m.
,, 285. ,, 8, ,, 71° 49′ S., 167° 32′ W., 0–600 metres, 8–10 p.m.
,, 289. ,, 11/12, ,, 72° S., 168° 17′ W., 24 metres, 8 p.m.–9 a.m.
,, 290. ,, 12, ,, 72° S., 168° 17′ W., 60 metres, 9 a.m.–3 p.m.

New Zealand to Antarctic Circle.

Station 298. Feb. 1, 1913, 63° 11′ S., 158° 52′ E., 12 metres, 8.30 p.m.

Antarctic (McMurdo Sound, Ross Sea).

Station 317. June 7–Oct. 14, 1911, Hole in ice between Cape Evans and Inaccessible Island, 10–20 metres.*
,, 323. Dec. 3, 1911, Hole in ice between Cape Evans and Inaccessible Island, 10 metres* (tow-net down a month).
,, 326. Mar. 15, ,, Cape Evans and immediate neighbourhood, various cracks and holes through the ice, 4–40 metres.
,, 333. Jan. 17, 1912, 77° 22′ S., 165° 22′ E., 80 metres, 1–5 a.m.
,, 336. ,, 20, ,, Near Granite Harbour, 10 metres, 2 p.m.
,, 337. ,, 22, ,, Off Cape Bird Peninsula, 80 metres, 10.30 a.m.–noon.
,, 342. ,, 31, ,, Off Cape Royds, 0–350 metres, 4 p.m.
,, 343. Feb. 1, ,, Off Cape Royds, 0–600 metres, noon.
,, 344. ,, 1, ,, Off Cape Royds, 0–400 metres, 3 p.m.
,, 345. ,, 2, ,, McMurdo Sound, 0–500 metres, 8.30–9.30 a.m.
,, 346. ,, 3, ,, McMurdo Sound, 0–450 metres, 9 a.m.–5 p.m.
,, 350. Mar. 4, ,, Off Glacier Tongue, 250 metres, 2–4 p.m
,, 351 Apr. 26–June 7, 1912, Hole in ice between Cape Evans and Inaccessible Island, 205 metres.
,, 354. Jan. 20, 1913, 77° 46′ S., 166° 8′ E., 12 metres, 11 a.m.–2 p.m.
,, 357. ,, 22, ,, 77° 1′ S., 163° 22′ E., 12 metres, 2–6 p.m.

* Pteropods were obtained at these depths, not at the greater depths recorded in the List of Collecting Stations (Vol. II. No. 1, pp. 1–12).

IV.—DESCRIPTIONS OF SPECIES.

EUPTEROPODA.

Family CAVOLINIIDAE.

Genus CAVOLINIA, Gioeni, 1783—Abildgaard, 1791.

1. *Cavolinia longirostris* (Lesueur). Figs. 1–2.

Hyalaea longirostris, Lesueur (after Blainville), 1821.
,, *limbata*, d'Orb, 1836.
Cavolinia longirostris, Gray, 1850.
Hyalaea longirostris, Lesueur (in Souleyet, 1852).
,, *angulata*, Souleyet, 1852.
,, *fissirostris*, Benson, 1861.
,, *obtusa*, Sow. 1877 (in Reeve, Conchol. Icon. tome xx, fig. 8).
Cavolinia longirostris, P. Pelseneer, 1888; Tesch. 1904; J. Meisenheimer, 1906; A. Vayssière, 1913, 1915.

New Zealand (off North end of).

Station 92, two.	Station 110, ten.	Station 130, two.
,, 101, one.	,, 111, one.	,, 131, nineteen.
,, 106, three.	,, 118, one.	,, 137, three.
,, 107, one.	,, 125, twelve.	,, 138, two.
,, 108, one.	,, 126, forty-eight.	,, 141, two.
,, 109, fourteen.	,, 129, four.	

The above hauls were all made at or near the surface.

This seems to be an almost cosmopolitan species, occurring in all seas between 40° N., and 40° S. It has been observed exceptionally as far as 47° N. M. Vayssière (1915, p. 44) was unable to indicate the position of the caecum, having only had two examples for examination. On dissecting the liver away the caecum was found at the commencement of the intestine (Fig. 1), The gonad (Fig. 2, B), accessory glands (Fig. 2, A) and copulatory organ (Fig. 2, C) are also shown here.

2. *Cavolinia gibbosa*, Rang, 1836 (according to d'Orb.).

Hyalaea flava, d'Orb., 1836.
Cavolinia gibbosa, Gray, 1850.
Hyalaea gibbosa, Souleyet, 1852.
,, *gegenbauri*, Pfeffer, 1880.
,, *gibbosa*, Boas, 1886.
Cav. gibbosa, Tiberi, 1879; Locard, 1886; J. Tesch, 1904; J. Meisenheimer, 1905 and 1906; K. Bonnevie, 1913; A. Vayssière, 1913 and 1915.

Station 126, off North end of New Zealand, one.

This is a warm water species avoiding the immediate neighbourhood of the equator (Boas 1886, Tesch, 1904, Meisenheimer, 1905).

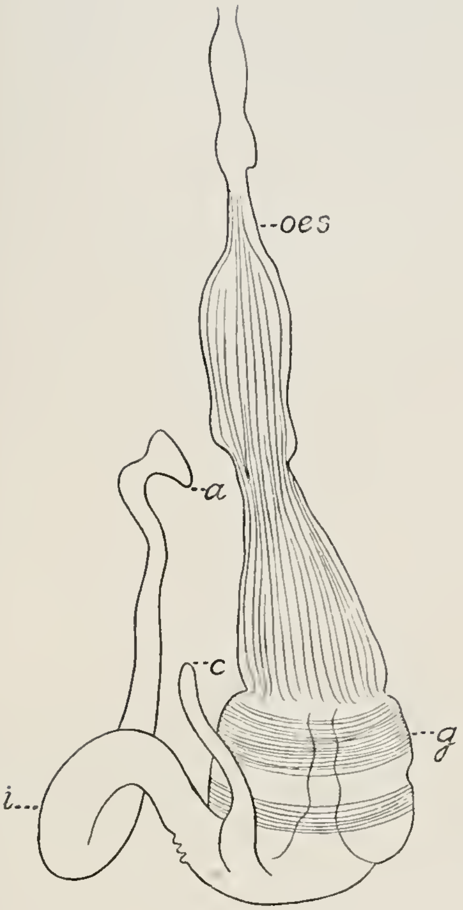


FIG. 1.—*Cavolinia longirostris* (Les.), alimentary canal, × 20; *a.*, anus; *c.*, caecum; *g.*, gizzard; *i.*, intestine; *oes.*, oesophagus.

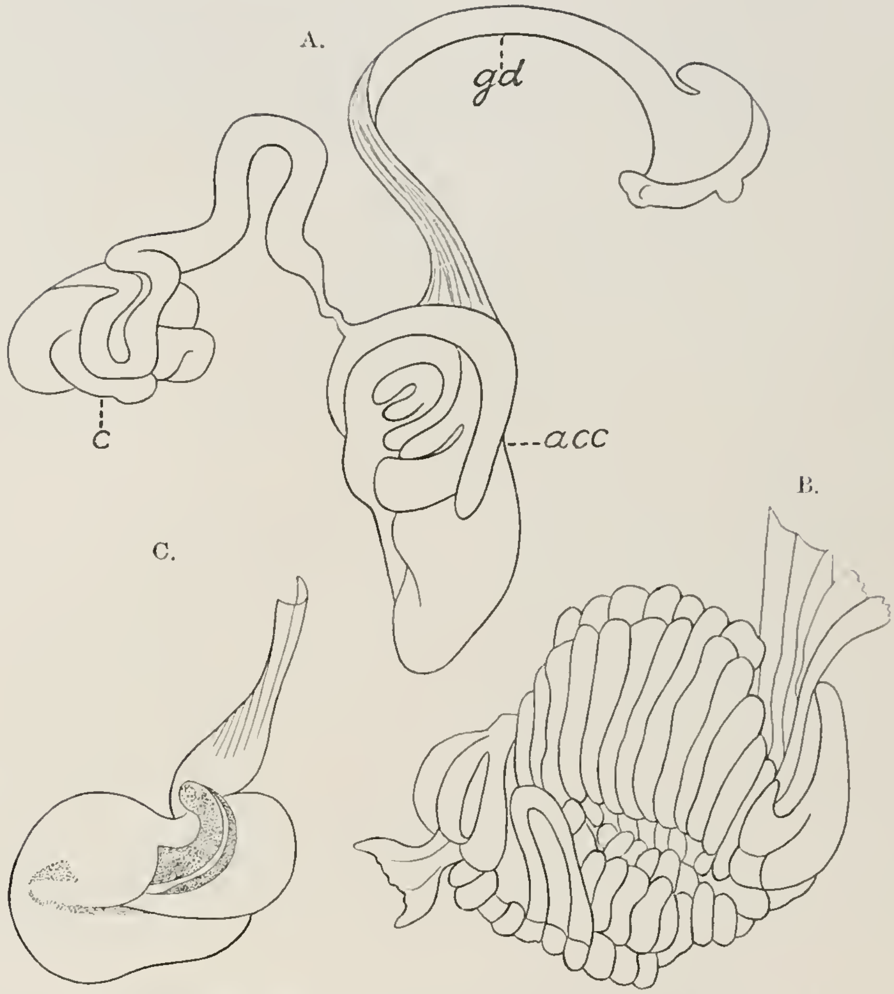


FIG. 2.—*Cavolinia longirostris* (Les.); A, part of genital complex, × 23; *acc.*, accessory glands; *c.*, caecum; *g.d.*, genital duct. B, gonad, × 18. C, copulatory organ, × 18.

Distribution.—Atlantic 27° N. to 41° 40′ N. (Bonnevie, 1913, Vayssière, 1915). Sargasso Sea (Schiemenz, 1906). 33° S., 16° E. to 37° S., 17° E. and 10° S., 97° E. to 27° S. 91° E. (Meisenheimer, 1905). Mediterranean, off Madeira, Yokohama to Sandwich Islands, Melbourne to Sydney, etc. (Pelseneer, 1887).

3. *Cavolinia uncinata* (Rang).

Hyalaea uncinata, Rang, 1836.
Cavolinia uncinata, Gray, 1850.
Hyalaea uncinatiformis, Pfeffer, 1880.
Cavolinia uncinata, Pelseneer, 1888.

Station 50, N.E. of Rio de Janeiro, two.

Station 236, S. of New Zealand, one.

This is an essentially warm water species, and the specimen from the South of New Zealand apparently constitutes a record as regards the distance from the equator.

Distribution.—Atlantic from 41° N., to 43° S. Indian Ocean from Bay of Bengal to 40° S. Red Sea, south-east Arabia to near Australia, 111° 40′ E. Pacific Ocean; Yellow Sea, China Sea, and from 2° 0′ N. to 8° 8′ S. (Pelseneer, 1887, and Meisenheimer, 1905). 1° 15′ N. 123° 37′ E., and near Samau Island (Tesch, 1904).

4. *Cavolinia inflexa* (Lesueur).

Hyalaea inflexa, Lesueur, 1812–1813.
,, *depressa*, d'Orb., 1836.
,, *inflexa* and *labiata*, Souleyet, 1852.
,, *vaginellina*, Cantraine, 1840; Gegeubaur, 1855.
,, *inflexa*, Boas, 1886.
,, (s.g. *Diacria*) *labiata* and *inflexa*, Sowerby (in Reeve, Conchol. Iconica), 1877.
Cavolinia inflexa, Tiberi, 1879; Locard, 1886; Pelseneer, 1889; Tesch, 1904; J. Meisenheimer, 1906; A. Vayssière, 1913.

N.E. of Rio de Janeiro.	New Zealand (off N. end of).	New Zealand (off N. end of).
Station 47, three.	Station 80, one.	Station 109, six.
,, 49, three.	,, 89, one.	,, 110, fourteen.
North Atlantic.	,, 92, seven.	,, 111, one.
Station 61, two.	,, 93, fifty-seven.	,, 118, two.
,, 62, three.	,, 106, one.	,, 130, two.
	,, 107, thirteen.	,, 143, one.

The specimens taken at Station 93 were chiefly young.

Distribution.—A widely distributed species in all seas between about 40° N., and about 40° S. Not observed in large swarms further than 30° N.

5. *Cavolinia*, sp.

Station 61, N. Atlantic, one.

Station 93, off N. end of New Zealand, one.

These are young specimens, minus shells, and an attempt to isolate the radula, in the specimen from Station 61, failed. Both have the blunt end to the body characteristic of *C. longirostris*, Les., and *C. quadridentata*, Les. The specimen from the north of New Zealand measures 3 mm. in total length and the median tooth of the radula agrees very well with that of Vayssière's illustration (1915, table II, fig. 51m) of the median tooth of *C. longirostris*, Les. It has ten denticles at each side. There are twelve rows at least in the radula although the specimen is so young. The radula of *C. quadridentata* seems to bear a close resemblance to that of *C. longirostris* and the lateral teeth of the present specimen agree better with the figures of that tooth given by Vayssière (*op. cit.*, pl. III, fig. 52 l) of *C. quadridentata*, Les. As, however, two examples of *C. longirostris* were taken the previous day at a few miles distance, and *C. quadridentata* is not represented in the "Terra Nova" collection, it is more likely that this little specimen belongs to the former species. The lateral appendages are thicker in proportion to their length than in the adult specimens of *C. longirostris*.

Diacria, Gray, 1842.

6. *Diacria trispinosa* (Lesueur).

Hyalaea trispinosa, Lesueur (in Blainville, Dictionn. d'Hist. Nat. tome 22, p. 82), 1824.
Hyalaea mucronata, Quoy and Gaimard, 1827.
,, *cuspidata*, Delle Chiaje, 1841.
Pleuropus trispinosus and *mucronatus*, A. and H. Adams, 1858.
Diacria trispinosa, Gray, 1850; Tiberi, 1879; Locard, 1886; P. Pelseneer, 1888; Dall, 1889; J. Tesch, 1904; J. Meisenheimer, 1905 and 1906; A. Vayssière, 1913 and 1915.

N. Atlantic (off Bay of Biscay).
Station 2, shell.
New Zealand (off N. end of).
Station 92, four.
,, 93, eight.
,, 101, one.
New Zealand (off N. end of).
Station 108, two.
,, 109, three.
,, 110, one.
,, 111, one.
,, 130, seven.

As in the case of *C. longirostris*, with which it was often associated, this was only observed at or near the surface. With the exception of the shell taken off the Bay of Biscay, the species was only collected to the north of New Zealand.

Distribution.—In all seas, especially the Atlantic, as far north as 55° 13′ N. (Vayssière, 1915, and Bonnevie, 1913).

Cleodora, Péron and Lesueur, 1810.

Clio, Browne, 1756, Linné, 1767.

7. *Cleodora pyramidata* (Linné), 1767.

Clio pyramidata, Linné, 1767; Pelseneer, 1887, J. Tesch, 1904; and Meisenheimer, 1905 and 1906.
Hyalaea lanceolata, Lesueur, 1913.
,, *pyramidata*, d'Orb., 1836.
Cleodora exacuta, Gould, 1852.
,, *lanceolata*, Souleyet, 1852.
,, *labiata*, Sow. (in Reeve, Conch. Iconica), 1877.
,, *lamartinieri*, Rang (in d'Orb. Mollusques de Cuba), 1841.
,, *martensi*, Pfeffer, 1880.
,, *pyramidata*, Péron and Lesueur, 1810; Souleyet, 1852; Tiberi, 1879; Boas, 1886; A. Vayssière, 1913 and 1915.

Off Rio de Janeiro.
Station 45, one.
North Atlantic.
Station 67, one.
New Zealand (off N. end of).
Station 80, one.
,, 86, one.
New Zealand (off N. end of).
Station 89, six.
,, 92, one.
,, 93, eight.
,, 128, one.

The above were all small and mostly without shells. The radula was examined in specimens from stations 80 and 89, and the shells were compared with a large series of *C. pyramidata* from the west of Ireland.

Distribution.—Cosmopolitan.

8. *Cleodora sulcata* (Pfeffer). Figs. 3–5.

Clio sulcata, Pfeffer, 1879; Pelseneer, 1888; and Eliot 1907.

Antarctic (S. of New Zealand to Ross Sea).
Station 224, six.
New Zealand to Antarctic Circle.
Station 236, twenty-two.

New Zealand to Antarctic Circle.
Station 241, twenty.
,, 267, eight.
,, 298, two.

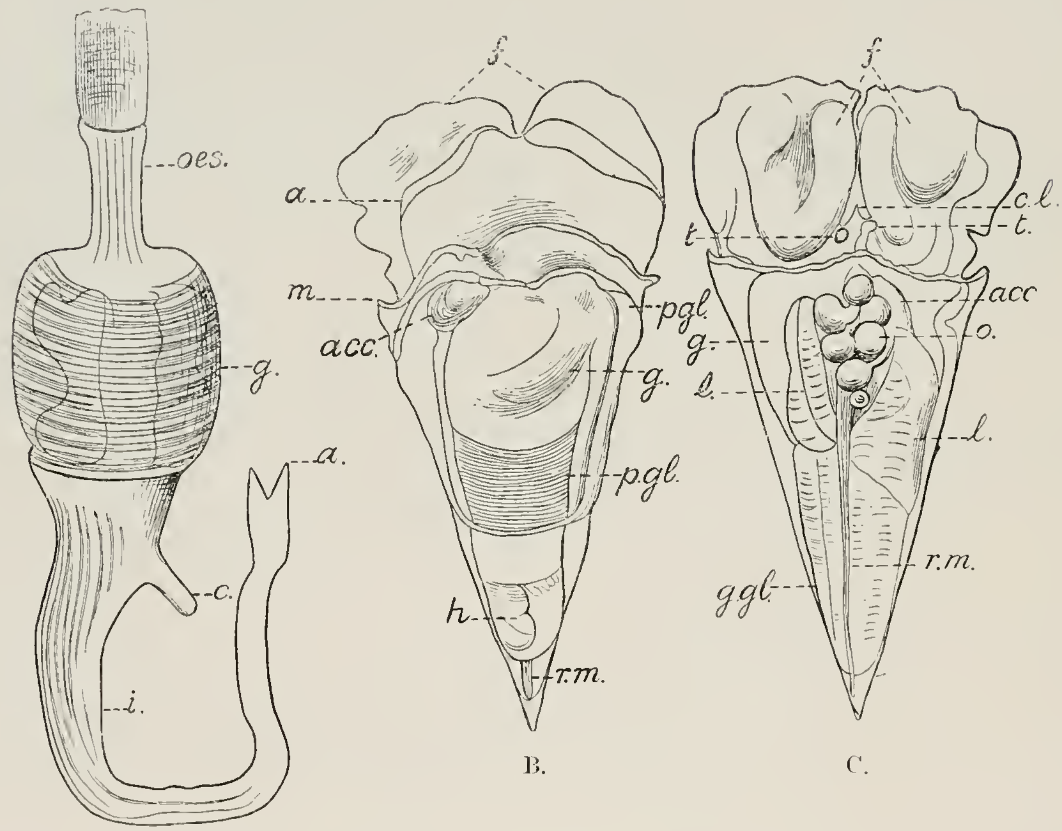
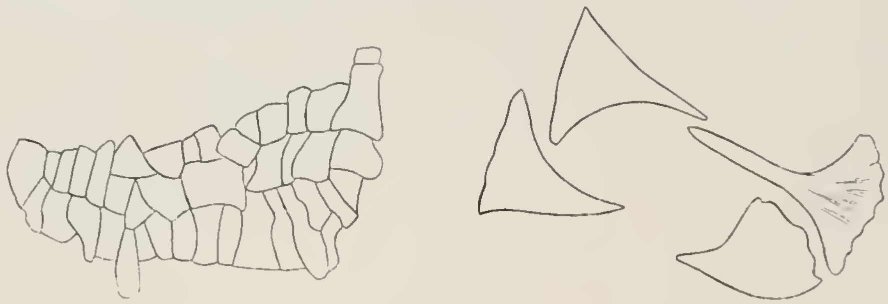


Fig. 3.—*Cleodora sulcata* (Pfeff.). A, Alimentary canal, × 12; *a.*, anus; *c.*, caecum; *g.*, gizzard; *i.*, intestine; *oes.*, oesophagus; B, C, Entire animal without shell. B, ventral aspect, × 4; *a.*, apron; *acc.*, accessory glands; *f.*, fins; *g.*, gizzard; *h.*, heart and organ of Bojanus; *m.*, mantle-margin; *p.gl.*, pallial glands; *r.m.*, retractor muscle. C, dorsal aspect, × 4; *c.l.*, cephalic lobe; *g.gl.*, genital gland; *l.*, liver; *o.*, ova; *t.*, tentacles; *acc.*, *f.*, *g.*, *rm.*, as in B.

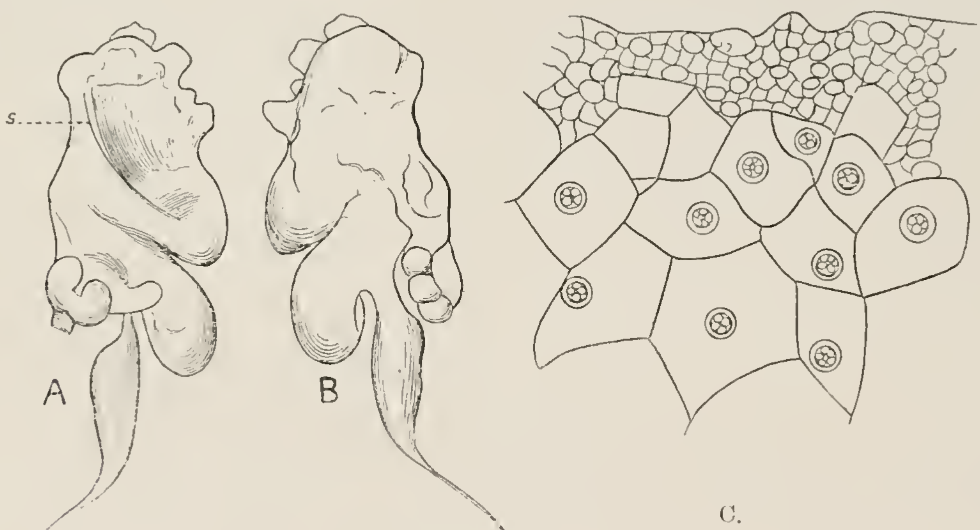
The above occurred from about 5° south of New Zealand to far within the Antarctic Circle. Only the specimens from station 298 possess shells, and these are in fragmentary condition. They are bluish, and distinctly furrowed transversely, as well as having longitudinal folds and lateral keels. The radula has been examined in specimens from all the hauls. The teeth (Fig. 4 B) are without serrulations, and the median tooth is narrower, and the lateral teeth possess broader bases, than the figures of Sars (1878) and Vayssière (1915), of the teeth of *C. pyramidata* (L.). The jaws (Fig. 4, A) are of the



A. B.

Fig. 4.—*Cleodora sulcata* (Pfeff.). A, part of jaw, × 220; B, two median and two lateral teeth of radula, × 220.

usual *Cleodora* type. The fins are shorter, and have more undulating borders than in *C. pyramidata*, and the apron is proportionately higher (Fig. 3, B). The dorsal (A) and ventral (B) aspects of the accessory glands are shown in Fig. 5 A, B. The alimentary canal (Fig. 3 A) has a short caecum. The largest specimen measures 22 mm.



A. B. C.

Fig. 5.—*Cleodora sulcata* (Pfeff.). Accessory glands, × 16; A, dorsal aspect, *s.*, seminal furrow; B, ventral aspect; C, part of the gonad, × 220.

in total length. The examples from stations 236 and 241 consist entirely of young specimens from 4–12 mm. in length. In some of these the retractor muscle, instead of extending 1–2 mm. beyond the end of the gonad, stretches to 4·50 mm. beyond this organ, dragging the visceral envelope with it, so that the animal presents an extraordinarily attenuated appearance compared with the other specimens. The radula, however, in both forms agreed with these of other hauls.

Distribution.—Antarctic waters to 46° S. in the Pacific, and to about 50° S. in the Indian Ocean (Meisenheimer, 1905).

9. *Cleodora compressa*, Souleyet.

Cleodora compressa, Souleyet, 1852; Boas, 1886; A. Vayssière, 1913 and 1915.

N.E. of Rio de Janeiro.
Station 47, two.
Atlantic (Equator).
Station 58, three.
,, 61, (?) one.
New Zealand (off N. end of).
Station 80, two.
,, 85, eight.
New Zealand (off N. end of).
Station 86, seven.
,, 92, one.
,, 93, forty-eight.
,, 110, five.

Only the examples from Station 93 possess shells. The specimen to which a query is affixed is in bad condition and about 1 mm. in length. Pfeffer, Pelseneer, Tesch and Bonnevie have considered this to be a young form of *Cavolinia* (*Diacria*) *trispinosa*. Specimens in the present collection, when compared with examples of *D. trispinosa*, present such a very different appearance to the latter species that I have had no difficulty in taking Vayssière's view. Like him I have found that the younger specimens are proportionately more elongate in form than older examples. Adult shells of *D. trispinosa* measuring 10 mm. in length by 7 mm. in breadth represent very average measurements for this species. If *C. compressa* were only a young form of *D. trispinosa* it would seem very strange that it should still be only at the *C. compressa* stage when the shell measures from 8–12 mm. in length by 4–5 mm. in breadth (Vayssière, 1915, p. 81). About 2 mm. of the breadth given above of an adult shell of *D. trispinosa* is occupied by the lateral "thorns," of which *C. compressa* never exhibits any trace. In *C. compressa* the apron is only about half the height of the fins and has a straight border. In *D. trispinosa* the apron extends above the fins and the free edge takes a semi-circular sweep. The presence of gills in the lateral cavity, two lateral appendages, a well-developed apron and a much reduced cephalic lobe are characters of the genus *Cavolinia*, whilst the genus *Cleodora* possesses a very distinct cephalic lobe, a small apron, and no gills or lateral appendages. The present examples have a distinct cephalic lobe and no trace of gills. The only lateral appendages are the up-turned peaks at the sides of the mantle-border.

Distribution.—Atlantic to about 39° N. (Vayssière, 1915). Pacific (Boas, 1886). It is difficult to give more exact geographical limits on account of so many authors having considered this to be *D. trispinosa*. It did not occur in any of the hauls made by the Fisheries Branch off the west coast of Ireland (Massy, 1909), in which *D. trispinosa* was represented by thirty takes extending to 53° 7′ N.

10. *Cuvierina columnella* (Rang).

Cleodora obtusa, Quoy and Gaimard, 1824.
Cuvieria columnella, Rang, 1827; Souleyet, 1852; Pelseneer, 1887; A. Vayssière, 1913 and 1915.
Cuvieria oryza, Benson, 1835.
,, *urceolaris*, Mörch, 1857.
Triptera columnella and *cancellata*, Pfeffer, 1879.
Cuvierina columnella, Boas, 1886; J. Tesch, 1904 and 1910; Meisenheimer, 1905.

Station 49, N.E. of Rio de Janeiro, one.

Station 86, off N. end of New Zealand, one.

The above measure 5–8 mm. in length and both have lost their shells; but the blunt end of the body, the large salivary glands, the formation of the radula and pallial gland, and the presence of the peculiar organ believed by Pelseneer (1888, p. 17) to be an accessory copulatory organ render it easy to identify the specimens with *C. columnella*.

Distribution.—This species is an abundant dweller of the warm waters of the Atlantic, Pacific and Indian oceans. In the Mediterranean it has only been found living near Gibraltar, but it has been taken as far north as 44° N. in the Atlantic. In the Pacific it has been observed as far south as 42° S., but in the Atlantic and Indian oceans the southern limit seems to be about 35° S.

Subgenus STYLIOLA, Lesueur, 1826.

Cleodora, pars.

Creseis, pars.

11. *Styliola subula* (Q. and G.) 1827.

Cleodora subula, Q. and G., 1827.
Cleodora (Creseis) spinifera, Rang, 1828; Sow., 1877.
Hyalaea subula, d'Orb., 1836.
Cleodora subulata, Souleyet, 1852; (*Styliola*), Dall, 1889; Tiberi, 1879.
Styliola subula, Gray, 1850; Pelseneer, 1881; Tesch. 1904 and 1910; Meisenheimer, 1906; A. Vayssière, 1913 and 1915.
Clio (Styliola) subula, Bonnevie, 1913.

Off Rio de Janeiro.	New Zealand (off N. end of).
Station 45, two.	Station 86, three.
,, 47, three.	,, 93, five.
	,, 110, five.

Distribution.—A warm water form on both sides of the Equator, but apparently avoiding the warmest water (Meisenheimer, 1905, and Bonnevie, 1913). Northern limit about 40° N.; southern limit between 20° S. and 40° S.

Subgenus CRESEIS, Rang, 1828.

Cleodora, pars.
Clio, pars.

12.—*Creseis virgula*, Rang, 1828.

Creseis virgula, J. Tesch, 1904; Meisenheimer, 1906; A. Vayssière, 1913 and 1915.
,, *unguis, cornucopiae* and *caligula*, Eschscholtz, 1829.
Hyalaea corniformis, d'Orb., 1836.
Cleodora virgula, Souleyet, 1852; Boas, 1886.
Styliola virgula and *corniformis*, Gray, 1850.
Cleodora munda, placida, and *falcata*, Gould, 1852.
,, *flexa*, Pfeffer, 1879.
Clio (Creseis) virgula and *conica*, Pelseneer, 1888.

Off coast of Brazil.
Station 39, eighteen.
,, 40, ninety-eight.
,, 52, one hundred and two.

N. Atlantic.
Station 61, nine.

New Zealand (off N. end off).
Station 92, one.
,, 93, five.
,, 110, four.

The specimens from Station 40 measured from 2–9 mm. in length, and those from Station 52 measured from 2–3 mm., with the exception of one example of $5\frac{1}{2}$ mm.

Distribution.—This is a cosmopolitan species with a strong preference for the warmest water. Atlantic, 36° 30′ N.; 39° 50′ S., in Pacific (Munthe, 1887).

Family LIMACINIDAE.

Genus LIMACINA, Cuvier, 1817.

13. *Limacina helicina* (Phipps). Fig. 6.

Clio limacina, Phipps, 1774; Gmelin, 1788–97; Bosc, 1802.
Argonauta arctica, O. Fabricius, 1780.
Limacina helicialis, Lamarck, 1819.
Spiratella limacina, Blainville, 1824 and 1825.
,, *arctica*, G. Deshayes, 1832.
Limacina arctica, J. Ross, 1819; P. J. Van Beneden, 1841; Lovén, 1847; Gray, 1850.
,, *helicina*, Souleyet, 1852; G. O. Sars, 1878; Boas, 1886; Pelseneer, 1888; Vanhöffen, 1897; J. Meisenheimer, 1905 and 1906; A. Vayssière, 1913; K. Bonnevie, 1913.
,, *pacifica*, Dall, 1872 and 1885.
(?) ,, *antarctica*, Woodward, 1856 (*nomen tantum*); Pelseneer, 1887; Eliot, 1907.

New Zealand to Antarctic Circle.
Station 238, eleven.
,, 240, twelve.
,, 264, sixteen.
,, 267, *ca.* eighty, average 2 mm. and many smaller.
,, 298, eleven.

Antarctic (Ross Sea and neighbourhood).
Station 217, twenty-eight.
,, 222, three.
,, 223, five.
,, 269 *ca.* three thousand.
,, 270, two.
,, 272, two.

Antarctic (Ross Sea and neighbourhood).
Station 274, one.
,, 275, two.
,, 284, thirteen.
,, 285, three.
,, 289, *ca.* one hundred and eleven.
,, 290, twenty-three.
Antarctic (McMurdo Sound).
"Discovery" Exp., 1901–4, 3 metres, Feb. 19, 1904, one.
Station 317, June 28, *ca.* four hundred and twenty, average 1 mm.
Station 317, Aug. 8, *ca.* nine hundred and fifty, average 1 mm.
Station 326, *ca.* fifty, about 1 mm.
,, 333, three, 2 mm.
,, 342, thirty-two, 2–3 mm.
,, 350, sixteen, about ·75 mm.
,, 351, Apr. 30, 10 metres, *ca.* three thousand.

Antarctic (McMurdo Sound).
,, ,, May 2, 30 metres, *ca.* two thousand.
,, ,, May 13, *ca.* five thousand six hundred.
,, ,, May 18, 10 metres, *ca.* nine hundred.
,, ,, May 19, 30 metres, *ca.* one thousand four hundred.
,, ,, May 20, 50 metres, *ca.* one thousand nine hundred.
,, ,, May 21, 100 metres, *ca.* three thousand four hundred.
,, ,, May 22, 150 metres, *ca.* four thousand.
,, 354, *ca.* eight hundred and fifty.
,, 357, *ca.* three hundred.

The above thirty-four hauls, comprising a rich material of some twenty-seven thousand individuals would certainly seem to be sufficient for the most exhaustive study. As in the case of the specimens obtained by the "Discovery" Expedition, and referred by Sir C. Eliot to *L. antarctica*, Woodward, the shells are, however, in many cases either absent or partially eroded, or much broken. Boas (1886, p. 42) considered the shells of this species to be more friable than that of any other species of this group known to him. The "Terra Nova" specimens varied in size from ·50 to 6 mm., the vast majority, however, measured from 1–2 mm. The shells (hyaline with faint spiral striae) were only present on specimens up to a size of 2·50 mm. In no case was there a trace of the umbilical border typical of well-preserved shells of moderate sized specimens of *L. helicina*. Sars (1878, p. 329) mentions and figures the umbilical border, and states that none of the specimens which were seen by him exceeded 4 mm. Meisenheimer (1905, p. 410) found with regard to the Arctic specimens which he examined that the umbilical border was very well marked in the shells of adult animals, but in the case of younger (of about 3 mm. in diameter) it was, on the contrary, only very feebly developed. Sir C. Eliot (1907, p. 7) drew up a table containing six points of difference which he observed to be constant between the Antarctic specimens obtained by the "Discovery," which he referred to *L. antarctica*, and a large collection of specimens of *L. helicina* from Davis Straits and the North Pacific. In the first place he found that *L. antarctica* was smaller and possessed fins smaller in proportion to the size of the shell. It seems to me that the fins must be capable of great expansion and retraction, as a vast number of specimens occurred with long, delicate, filmy fins, and very many others were characterized by short, thick, muscular fins. Of course the various preserving fluids* would have a considerable effect as regards this. Gradations between the two forms could, however, be traced in various hauls. The second and third differences (*op. cit.* p. 7) referred to the striation and umbilical border of the shell, characters which have already been noted with reference to the "Terra Nova" specimens. It may, however, be added here that some of the larger examples, without shells, have a furrowed appearance just where the early whorls would have rested, suggesting that the shell might have been impressed with deep spiral striae. The fourth difference (*op. cit.*, p. 7) affected the distribution of colour. The present collection is comprised mainly of more or less lemon-coloured specimens. A small minority, about three hundred, are dark brown. This is the hue of all the larger specimens and also of a few quite small ones. The dark colour seems to peel off easily, especially from the edge of the fins and the last whorl of the body which then become white. No yellow specimens exceeded 2·50 mm. in size. The only haul in which quite dark specimens were associated with the yellow ones occurred at Station 317, August 8, 1911, when four very small dark specimens were observed amongst about a thousand light coloured specimens. One, however, which was dissected seemed to be shrivelled as if it had been allowed to get dry before being put into the tube, and perhaps the dark colour in this instance may be so accounted for. All the other specimens taken from holes in ice, and all occurring in large shoals were light coloured. It seems probable that the dark hue is developed with age, as some of the larger yellow specimens were fawn-coloured, tending towards brownish, particularly at the base of the fins. The species seems to attain its full development, in these regions, during the Antarctic summer from December to February, at which season probably a greater abundance of food is obtainable. All the dark coloured large specimens occurred at this season, and young pale specimens during the months of March, April, May, June and August. An exception to this occurred at Station 269 (end of December) when a large take of small pale specimens occurred. Spawning specimens were observed in a January haul (Station 284). The spawn-masses consisted of a transparent glutinous material connecting many white oblong bodies each of which averaged 132 μ by 88 μ.

The fifth difference noted by Sir C. Eliot (*op. cit.*, p. 7) referred to the posterior lobe of the foot, which he found to be "more deeply and distinctly divided" in *L. antarctica* than in *L. helicina*. In "Terra Nova" specimens this is certainly the case compared with Boas' (1886) figure 70 of Table 5, but the figures of Vayssière (1913, pl. VII, figs. 135 and 136) of the examples of *L. helicina* from Spitsbergen which he has studied, closely resemble many of the specimens in the present collection. The

* Most of the specimens were in formalin, a few were in alcohol, and a still smaller number in some other fluid.

sixth difference (*op. cit.* p. 7) refers to variations in the teeth. Sir C. Eliot found the base of the median tooth in *L. antarctica* to be fairly straight, while in *L. helicina* it was hollowed out almost into a horse-shoe shape. With regard to this I found that even in the same specimen the median teeth vary between these two forms according to the position in which they happen to be placed on the slide. Vayssière (1915, pl. XI, figs. 248 and 248 bis) shows the convex and concave aspect of a median tooth of *L. helicoïdes*, Jeff.; which indicates very well the difference which occurs in regard to the basal part of this tooth in *L. helicina*, according to the position in which it is placed on the slide. A specimen of 4·50 mm. in diameter showed a radula containing fifteen rows with eleven lateral teeth on either side. A median tooth measured 198 μ and a lateral one 164 μ. With regard to the shells of the present species it may be worth noting that some were quite transparent and some quite opaque even when occupied by their owner. In the whole of this vast collection only one case of abnormality was observed. A very young specimen from Station 223 possessed fins joined together at their tips (Fig. 6).

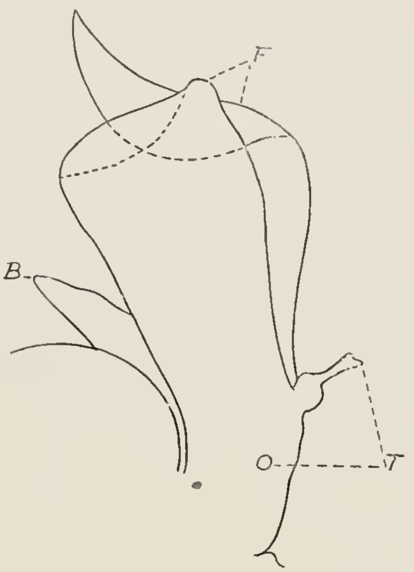


Fig. 6.—*Limacina helicina* (Phipps). Individual with abnormal fins joined at the tips, × 32; B., balancer; F., fins; T., tentacles.

Distribution. — Arctic and Antarctic regions. This species seems only able to exist in very cold water but follows the Labrador current down to 38° N. It has been recorded as *Limacina pacifica*, Dall, from Neah Bay, 48°–49° N., and at 30° N. at Monterey, having evidently followed the cold Vancouver stream which stretches along the coast of California. Munthe (1887) has recorded it from the middle of the Atlantic at 35° 30′ N., and 43° 30′ W. Meisenheimer (1905, p. 7) suggests that this exceptional circumstance is probably due to the melting of ice from southwardly drifting icebergs which, mixing with the water of the warm currents of this region, would cause especially favourable conditions. In the Antarctic regions, where Vayssière (1915, p. 124) thinks it is not indigenous but has been accidentally introduced by marine currents, it has been observed as far north as 35° to 31° S. (Meisenheimer, 1905).

14. *Limacina inflata* (d'Orb.).

Atlanta inflata, d'Orb, 1847.
Spirialis rostralis, Souleyet, 1840.
Limacina scaphoïdea, A. Gould, 1852.
Protomedea elata, Costa, 1861.
,, *rostralis*, P. Fischer, 1882.
Limacina inflata, Boas, 1886; P. Pelseneer, 1888; Tesch, 1904; Meisenheimer, 1905 and 1906; Bonnevie, 1913; Vayssière, 1913 and 1915.

N.E. of Rio de Janeiro.
Station 47, eighty-three.
North Atlantic.
Station 61, *ca.* two hundred.
,, 62, forty-two.
New Zealand (off N. end of).
Station 80, four.
,, 93, *ca.* four hundred and eighty.
New Zealand (off N. end of).
Station 94, eight.
,, 107, *ca.* fifty.
,, 111, ten.
New Zealand to Antarctic Circle.
Station 231, *ca.* seventy.
Antarctic (near Ross Sea).
Station 227, *ca.* eighty.

The above specimens, amounting to about one thousand, measure from about ·50–1·30 mm. Almost all possess shells, which in many cases are in good condition and easily recognizable by the excellent figures of M. Vayssière (1915, pl. VIII, figs. 153–5). Sometimes the shell is in poor condition and gelatinous, but the prolonged lip with reddish or white streak is generally more or less extant. A specimen with a shell of ·75 mm. in diameter had about twelve rows in the radula. The triangular-shaped median teeth seemed to be fewer in number than the lateral ones. When sorting specimens of the present species without shells, they could be discerned at a glance from shell-less *L. helicina* of similar size by their delicate pink and green appearance, more depressed spiral coils, and broader pallial gland. *L. helicina* was, however, not taken in any of the same hauls, but was the only other *Limacina* in the collection observed in shoals. The above hauls add considerably to the previous known range of *L. inflata*. Hitherto Schéeles' captures (Munthe, 1887) from off Cape Horn, 58° 45′ S., 66° 56′ W., constituted the most southerly record. Now we find that it is not only abundant in the waters around New Zealand but ventures far south of that region, and even into the Antarctic circle to the north of Victoria Land. Meisenheimer (1905, p. 6) states that it is a warm water form affecting the warm currents of zones from 40° N. to 40° S. Schiemenz (1906) records it (as an exceptional occurrence) from 60° 2′ N. It will be observed that eight out of the ten hauls were made at or near the surface, and in six of these it was abundant. About seventy were captured in a haul at 80 m., at 64° 3′ S. latitude, while at 68° 03′ S. latitude eighty were captured at the surface. These two hauls would seem to show that the species does not affect any special layer of water in Antarctic latitudes.

15. *Limacina bulimoïdes* (d'Orb.).

Atlanta bulimoïdes, d'Orb, 1835–47.
Spirialis bulimoïdes, Eydoux and Souleyet, 1840; Souleyet, 1852.
Limacina bulimoïdes, Gray, 1850; Boas, 1886; Pelseneer, 1888; Meisenheimer, 1905 and 1906; J. Tesch, 1904 and 1910; A. Vayssière, 1913.

Station 93, off N. end of New Zealand, one.

Distribution.—Chinese Seas and Pacific (Boas, 1886, and Pelseneer, 1887). Off Bermuda, between Cape Verde Islands and West Indies, Guinea Stream, off Montevideo, and off South-west Africa (Munthe, 1887). North Australian seas and Chagos Archipelago (Tesch, 1904). Eastern part of South Atlantic and Indian Oceans (Meisenheimer, 1905). Off Azores (Schiemenz, 1906, and Vayssière, 1915). Between Newfoundland Bank and Azores, and off Canaries (Bonnevie, 1913).

16. *Limacina balea*, Moller.

Limacina balea, Möller, 1841 ; Gray, 1850 ; and Locard, 1897.
Spirialis gouldii, Stimpson, 1851.
Spiriale australe, Eydoux and Souleyet, 1852.
Heterofusus balea, Mörch, 1857 ; Gould, 1870.
Spirialis retroversus, (pars), Jeffreys, 1869.
,, *balea*, Sars, 1878.
Limacina balea, (pars), Boas, 1886 ; Munthe, 1887 ; Posselt, 1898 ; Lenz, 1906.
,, *retroversa*, (pars), Pelseneer, 1888 ; Meisenheimer, 1905 ; Massy, 1909.

New Zealand (S. of).
Station 238, one.
,, 256, six.
,, 259, five.

M. Vayssière (1915, p. 143) thinks that the different types of *Limacina* called *retroversus*, *trochiformis*, *balea* and *australis* all belong to one species, and that the differences of the shell are due in reality only to the differences of age in the individuals studied. As far as the "Terra Nova" specimens are concerned there are too few individuals, and these are not in sufficiently good condition to make a comparative investigation of such minute forms possible. The shells are completely destroyed in all, but as regards the external appearance of the animal the specimens noted above possess characters which agree so closely with the description and figures of Bonnevie (1913) of *L. balea*, and are so very different in appearance to the specimens referred in this report to *L. retroversa* (Flem.), that I think it is better to keep the two forms apart here, particularly as they occurred in widely different localities. It may be remarked, however, in support of M. Vayssière's view, that the specimens referred to *L. retroversa* are all smaller than those placed under *L. balea*. In specimens of the latter, from station 256, the spire varies considerably in the proportion it bears to the last whorl, but the whorls are much more graceful in general contour and blend with one another more imperceptibly than in the abruptly-spired, squat *L. retroversa*.

The specimens taken off the west of Ireland and referred (Massy, 1909) to *L. retroversa* (Flem.) were mainly, if not entirely, referable to the present species.

Distribution.—"In the temperate zones between the Arctic and Antarctic and circumtropical zone" (Bonnevie, 1913).

17. *Limacina retroversa* (Fleming).

Heterofusus retroversus, Fleming, 1828 ; Gould. 1870.
Atlanta trochiformis, d'Orb., 1835–47.
Spirialis fleminyii, Forbes and Hanley, 1850.
,, *retroversus* (pars), Jeffreys, 1869.
Limacina balea (pars), Boas, 1886.
,, *australis*, Pelseneer, 1888.
,, *trochiformis*, Gray, 1850 ; Boas, 1886 ; Pelseneer, 1888 ; Tesch, 1904 ; Vayssière, 1913.
,, *retroversa*, Bonnevie, 1913 ; Vayssière, 1915.

Near Rio de Janeiro.
Station 40, six.
,, 47, five.

These are smaller and darker than the specimens of *L. balea*, Möller, in the present collection, and the spire is much shorter in proportion to the width of the last whorl. Bonnevie (1913, text-fig. 9, A & B, p. 16) has shown clearly the principal difference between this species and *L. balea*.

Distribution.—"Restricted to the warm and temperate waters of the Pacific and Atlantic Oceans" (Bonnevie, 1913). Mediterranean, British Isles, and occasionally off Norway (G. O. Sars).

18. *Peraclis*, sp.

Station 93, off N. end of New Zealand, one.

This is a very small specimen, and the shell is in very bad condition. It consists of $2\frac{1}{2}$ whorls, and has radial furrows on the suture of the last whorl. It is more like *Peraclis brevispira*, Pels., than any other species of the genus as yet described, but as the shell is very soft it is impossible to ascertain if the general surface is smooth. The sub-circular operculum is striated obliquely. Both animal and shell are white, and there are two white symmetrical tentacles. Bonnevie (1913, p. 7) thinks that probably *P. brevispira*, Pels., and *P. bispinosa*, Pels., will prove to be *Peraclis diversa*, Monterosato, with which species she identifies the *P. reticulata* of Meisenheimer (1905, p. 12). *P. diversa*, should this view prove to be correct, will then be found to be a widely scattered species in the Atlantic and Indo-Australian waters from about 40° N. to 30° S.

PTEROTA.

Family CLIONIDAE.

Genus CLIONE, Pallas, 1774.

1. *Clione antarctica*, E. A. Smith.

Clione antarctica, E. A. Smith, 1902; Eliot, 1907.
Clione limacina var. *antarctica*, Meisenheimer, 1906.

Antarctic (near Ross Sea).
Station 186, two.
,, 217, one.
,, 221, one.
,, 222, fourteen.
,, 269 *ca.* two hundred and seventy.

Antarctic (McMurdo Sound).
Station 317,
June 28, *ca.* one hundred and fifty.
Aug. 8, *ca.* one hundred and twenty.
Station 323, *ca.* two thousand
,, 333, twelve.
,, 336, one.
,, 337, *ca.* seventy-four.
,, 342, twenty-one.

Antarctic (McMurdo Sound).
Station 343, five.
,, 344, twenty.
,, 345, twelve.
,, 346, one.
,, 350, thirteen.
,, 351,
April 30, 10 metres, seventeen.
May 2, 30 ,, nine.
,, 18, 10 ,, twelve.
,, 19, 30 ,, *ca.* sixty.
,, 20, 50 ,, *ca.* three hundred.
,, 21, 100 ,, *ca.* one hundred and twenty.
Station 354, *ca.* sixty.
,, 357, fifty-six.

The above specimens, amounting to about three thousand three hundred, were taken at practically all seasons of the year, the only months in which they were not fished being July, September, October and November. Eliot (1907, p. 12), notes that the specimens taken by the "Discovery" were all captured between the months of November and March. The "Terra Nova" specimens varied in size from 0·75 mm. to 9 mm. In each haul they usually consisted of very small examples of an average of 2–3 mm., with a few larger individuals. In the months of December and January the larger specimens seemed to be predominant. There is no evidence to show that the species habitually affects any special layer of the water either at one season or another. As Eliot says (*op. cit.* p. 13) with regard to this species and *C. limacina*, Phipps, there is no doubt that the two are nearly allied. As, however, all the above specimens occurred only in Antarctic waters and, moreover, bear out very fully the differences noted by Eliot (*op. cit.* p. 13) between *C. limacina* and *C. antarctica*, it seems as if the latter should be entitled to specific rather than varietal rank. The presence of larval rings to a late age and the white prominences composing the anterior one are very persistent characters in the present specimens. The thickness of the integuments is also very evident, while there is a distinct neck behind the fins instead of between or above them as in *C. limacina*. In the large haul at Station 323, when the tow-net was down for a month, there were about a dozen specimens which were quite different in appearance to the rest. They were narrower and very transparent, and with a crimson instead of an orange coloured gonad, and were without larval rings, although not large. Their radula and hooks were just like those of the others, however, and a careful search amongst these revealed a few forms partly intermediate between the two types. Probably the transparent form was the result of overcrowding and want of sufficient nourishment owing to the net having been down for a month, so that the earliest caught specimens were likely to have been hemmed in and pressed down by later arrivals.

Distribution.—Antarctic seas.

FAMILY PNEUMODERMATIDAE.

GENUS PNEUMODERMA, Cuvier, 1804.

2. *Pneumoderma atlanticum*, Bonnevie. Fig. 7.

Pneumoderma atlantica, Bonnevie, 1913.

Station 62, N. Atlantic, near Equator, one.

This measures 4 mm. and is nearly colourless, with white opaque spots. The posterior lobe of the foot possesses a tubercle. The radula is 4–0–4 and the suckers number at least fifty on each appendage. The latter are somewhat triangular and the largest suckers (which are about four times the size of the smallest) are placed towards the middle. The specimen is much contracted, and in the effort of dissecting out the buccal parts I failed to find out how the appendages are attached to the proboscis. Bonnevie (1913, p. 69) states that *P. atlanticum* "is distinguished from other species of the genus, *inter alia*, by the acetabuliferous appendages being fixed to the proboscis." This statement is not very clear, as the appendages in question are usually fixed to the proboscis in all the Pterota (Pelseneer, 1887, p. 6, fig. 1. *Pneumonoderma*); and on p. 81 *op. cit.*, under *Pneumonoderma*, we read "*Buccal appendages.*—Two symmetrical appendages latero-ventrally inserted on the proboscis." From Mlle. Bonnevie's illustrations (*op. cit.*, pl. VI, figs. 49 and 50) of *P. atlanticum*, the appendages

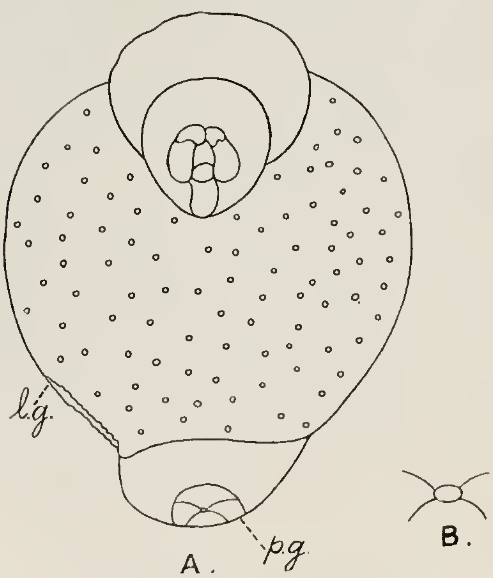


FIG. 7.—*Pneumoderma atlanticum* (Bonn.). A, entire animal, ventral aspect, × 16; *l.g.*, lateral gill; *p.g.*, posterior gill. B, posterior gill, enlarged.

would appear to be more or less coalescent with the proboscis, instead of being free throughout most of their length. The specimen has no external genital organs as in the type, but this seems to be an abnormal state occurring sometimes in various species of Pterota (Tesch, 1904, p. 73: Massy, 1917, p. 231 *). The lateral gill has two crests without fringes and the posterior gill has four small crests. The fact that there are at least fifty suckers on each appendage instead of forty as in *P. violaceum*, d'Orb. seems to render it advisable to refer the specimen to this species. Kwietniewski (1902, p. 15) mentions that in the Mediterranean examples of *P. violaceum* which he has studied, specimens of 3–4 mm. in length (excluding the proboscis) possess ten to fifteen suckers on each arm, and that larger individuals of 5–6 mm. possess about twenty, and that adult, or almost adult examples of the largest specimens (8 mm.) gathered by him possess about thirty-five suckers on each arm. The ventral aspect of the present specimen is shown in figure 7.

Distribution.—36° 52′ N., 39° 55′ W. Surface. Type specimen (Bonnevie, 1913).

3. *Spongiobranchaea australis*, d'Orbigny. Figs. 8, 9.

"*Cliodita caduceus*," Quoy and Gaimard, 1825.
Spongiobranchaea australis, d'Orbigny, 1840.

New Zealand to Antarctic Circle.
Station 235, eleven.
,, 240, one.
,, 251, eight.
,, 256, one.

Antarctic (Ross Sea and neighbourhood).
Station 269, one.
,, 270, (?) two.
,, 323, one.
"Discovery" Collection, 1901–1904, Nov. 12, 1901, one.

These measured from 2·50 mm. to 16 mm. The largest specimens were usually taken in December and the smallest in March hauls. The smallest specimen, 2·50 mm. in length (Station 240), possessed an external genital gland, but the radula proved to be that of the present species. All the specimens examined possessed seven or eight suckers on each arm. They were on very short stalks and became much larger distally. The example from Cape Evans had one arm exserted, but the specimen, although apparently in perfect condition, had a flaccid and more transparent appearance than the other examples. An examination proved that it had lost all its internal organization except the above-mentioned arm. Probably the jaws being widely everted in the effort to capture prey some larger animal came along and snapped up both jaws and prey, and the jaws being caught pulled the stomach, etc., out of the body. This whole mass of organs is usually very firmly connected, and can generally be got out for examination, without injuring the appearance of the specimen, by making a

* See also present paper under *S. australis*, p. 225.

small slit at the back. In this individual there was nothing to indicate a reconstruction-process of any of the organs.

Fig. 8.—*Spongiobranchaea australis* (d'Orb.). Entire animal, ventral aspect, × 14.

Fig. 9.—*Spongiobranchaea australis* (d'Orb.). A, isolated teeth of radula, × 220; B, hook-sacs, × 220.

The specimens to which a query is affixed are very small and measure about 3 mm. in total length, and, as will be seen in fig. 8, larval rings are present, and the entire body is thickly strewn with dark chromatophores. The posterior gill is represented by four folds of skin, but the fringes are not formed, and the only indication of the lateral gill consists of a cluster of cells in the integument. The gonad is brown and is enclosed in a transparent visceral envelope, which latter is dotted over with many dark spots, as is also the lining of the buccal cavity. The chromatophores and the presence of large cone-like tentacles give these specimens a resemblance to *Clione punctata*, Tesch, a species of Indo-Australian waters known as yet solely by its external appearance. *C. punctata* has, however, a more pointed end to the body, and the radula, fig. 9, A, and hook-sacs, fig. 9, B, seem to agree very closely with those of *S. australis*. The arrangement of the jaw-spines is also similar. Many gullet-bladders were observed in both specimens.

Distribution.—Antarctic regions to about 50° S. in the Pacific, in the Indian Ocean to 41° S., and in the Atlantic to 36° S. (Meisenheimer, 1905).

Pages 227-232 follow next article at end of volume.

MOLLUSCA.

PART IV.—ANATOMY OF PELECYPODA.*

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WITH FOUR PLATES.

I.—INTRODUCTION.

The animals whose anatomy forms the subject of this Report fall within ten genera—five belonging to the sub-order Arcacea, and one each to the sub-orders Pectinacea, Ostraeacea, Submytilacea, Veneracea and Anatinacea.

Of these ten genera six, namely, *Lissarca*, *Adacnarca*, *Limopsis* and *Philobrya*, of the sub-order Arcacea, and *Limatula* and *Anatina*, were obtained in the Antarctic in the region of McMurdo Sound, and with the exception of *Anatina* were dredged from considerable depths, varying from 50 to 250 fathoms.

The rest of the specimens were collected off New Zealand (*Chlamys*, *Venericardia*, *Chione*), or from S. Trinidad Island (*Barbatia*).

The condition of the tissues was, in almost every case, remarkably good, especially when one considers the surroundings amidst which the work of preservation had to be done.

* Manuscript received October 6, 1919 [S. F. H.].

II.—LIST OF STATIONS.

Station 36.	South Trinidad Island, on the shore.	
,, 96.	North of New Zealand, seven miles E. of North Cape, 70 fathoms.	
,, 134.	New Zealand, Spirits Bay, near North Cape, 11–20 fathoms.	
,, 194.	Antarctic, off Oates Land, 69° 43′ S., 163° 24′ E., 180–200 fathoms.	
,, 316.	,,	off Glacier Tongue, about 8 miles north of Hut Point, McMurdo Sound, 190–250 fathoms.
,, 331.	,,	off Cape Bird Peninsula, entrance to McMurdo Sound, 250 fathoms.
,, 338.	,,	McMurdo Sound, 77° 13′ S., 164° 18′ E., 207 fathoms.
,, 339.	,,	,, ,, 77° 5′ S., 164° 17′ E., 140 ,,
,, 340.	,,	Ross Sea, 77° 56′ S., 164° 12′ E., 160 fathoms.
,, 356.	,,	off Granite Harbour, entrance to McMurdo Sound, 50 fathoms.

III.—LIST OF SPECIES INVESTIGATED.

FILIBRANCHIATA

ARCACEA, ARCIDÆ.

Lissarca notorcadensis, Melv. and Stand.
Station 331. Smith (18), p. 75.

Adacnarca nitens, Pelseneer.
Stations 194, 316, 338, 339, 340, 356. Smith (18), p. 76.

Arca (*Barbatia*) sp.
Station 36. Smith (18), p. 105.

LIMOPSIDÆ.

Limopsis grandis, Smith.
Station 194. Smith (18), p. 76.

PHILOBRYIDÆ.

Philobrya limoides, Smith.
Stations 331, 340. Smith (18), p. 77.

PECTINACEA.

PECTINIDÆ.

Chlamys consociata, Smith.
Station 96. Smith (18), p. 89.

OSTRÆACEA.

LIMIDÆ.

Lima (Limatula) hodgsoni, Smith.
Station 331. Smith (18), p. 77.

EULAMELLIBRANCHIATA.

SUBMYTILACEA, CARDITIDÆ.

Venericardia purpurata (Deshayes) (*Venericardia australis*, Lamk. ?).
Station 134. Smith (18), p. 90.

VENERACEA, VENERIDÆ.

Chione (Chamelea) spissa (Deshayes).
Station 134. Smith (18), p. 90.

ANATINACEA, ANATINIDÆ.

Anatina elliptica, King and Broderip.
Off Cape Evans, McMurdo Sound, in 5 fathoms. Smith (18), p. 78.

IV.—ANATOMICAL DESCRIPTIONS.

FILIBRANCHIATA.

ARCACEA, ARCIDÆ.

1. *Lissarca notorcadensis*, Melv. and Stand. Pl. I, figs. 1–7.

Station 331. Numerous specimens (in two separate bottles) dredged from the entrance to McMurdo Sound, in 250 fathoms. The specimens in one of the bottles were clustered upon a piece of weed, firmly attached to it by their byssus.

It will be seen from the diagram, Pl. I, fig. 1, that in general the animal approaches in structure to the type characteristic of the Arcas, though the anterior adductor, instead of being as in some species of the family merely reduced in size, is entirely absent.

Mantle.—The mantle is open from end to end. Its border is quite simple, without tentacles or eye-spots. In section it shows three simple folds, as in other members of the family. The middle of these (fig. 2, *m.f.*), which secretes the periostracum, is very slightly expressed, the inner (*i.f.*) is thick and swollen.

Muscles.—There is only one adductor (the posterior), the anterior being entirely absent. There are three pairs of pedal muscles—two anterior and one posterior. Of these the posterior retractors are the largest and most powerful (though much less so than in most Arcas) and are inserted almost entirely into the byssal papilla. The anterior retractors (Fig. 1, *a.r.p.*) occupy the usual position between the œsophagus and the cerebral ganglia; the other pair of muscles (*e.p.*), the elevatores pedis, which are really nothing more than local concentrations of the ordinary muscles of the body-wall, lie further back and pass, from their origin upon the shell on a level with the œsophagus, down the surface of the visceral mass on either side of the pedal ganglia, into the base of the byssal papilla.

Foot.—This is of the type commonly met with in the Arcidæ, laterally compressed, with prominent toe and heel and with the ventral surface cleft by a deep byssal groove into which protrudes a tongue-shaped papilla (Fig. 1, *by.p.*), beset upon its surface by a series of low longitudinal laminæ. The byssus consists of several (three in the specimen examined) short flattened filaments.

Nervous System and Sense-Organs.—The cerebral and visceral ganglia are respectively widely separated, the pedal coalesced. Abdominal sense-organs and otocysts are well developed and occupy the usual positions.

In addition to these sense-organs there is, upon the anterior extremity of each inner gill-lamella, where it merges with the hinder end of the inner labial palp, a well-marked "cephalic" eye similar to those described by Pelseneer (11, 16) and Thiele (19, p. 380) in certain Mytilacea and Arcacea (Figs. 1, 3, *c.e.*).* The eye consists of a deeply pigmented open cup (Fig. 4) occupied by a homogeneous cuticular plug. The nerve-supply to the organ was not traced.

It was observed by Pelseneer (16, p. 776) that among Mytilidæ and Arcidæ, "cephalic" eyes, though common, did not occur in species inhabiting a depth of more than 250–300 metres—a depth to which light does not penetrate. In view of this observation, which is of some importance in estimating the probable functional value of these organs, it is of interest to find that the present specimens of *Lissarca* were obtained from a depth of 250 fathoms, those of *Philobrya* (in which also "cephalic" eyes occur) from 160 and 250 fathoms, and those of *Adacnarca* from depths ranging from 50 to 250 fathoms.

Digestive Organs.—The lips and palps are ribbon-like as in other Arcas. The free part of the outer palp is for most of its extent very narrow (Fig. 5B, *o.plp.*) and represents only the extreme margin of the organ, its basal parts being adherent to the mantle.

Mesial to the inner lip, in the angle between the lip and the body-wall, and at a short distance behind the mouth, there is on either side a pore that leads into a finger-shaped caecal tube (Figs. 1, 5A, and 5B, *l.c.*). The caecum (Fig. 6, *l.c.*) is lined by a deep columnar epithelium, and is occupied by a homogeneous material, probably in the nature of a secretion. I have not come across any description of similar caeca in this position in other Lamellibranchs, but in the present collection I have observed them, as will be mentioned later, in *Adacnarca* and *Philobrya*. There seems little doubt that these tubes are glandular, but what their purpose may be, and with what organs in other groups of Molluscs they may be compared it is difficult to suggest.

* Cephalic eyes have been recorded in *Mytilus, Modiolaria, Lithodomus, Avicula tarentina, Septifer, Malleus, Meleagrina, Anomia, Perna, Arca lactea, Arca* spp.

In connection with these caecal tubes, it is of interest to note that in the three species in which they have been observed (*i.e.*, *Lissarca*, *Adacnarca*, *Philobrya*) there is a modification of the epithelium along the inner margin of the gill-axis. In this position, starting from a point in about the same transverse plane as the pedal ganglia, is an elevated ridge of deep columnar epithelium. At its commencement (Fig. 7, *ep.r.*) the ridge is narrow and sharply defined, resembling closely, when cut transversely, a cross section of an abdominal sense-organ. Further back it gradually becomes broader and flatter, and finally merges in the epithelium covering the branchial nerve. Without further knowledge one hesitates to suggest what the function of this band of elevated epithelium may be, but the fact that it occurs, so far as observed, only in the same species as possess the above-mentioned labial caeca is certainly of interest, and possibly may mean that the two organs are in some way functionally related to one another.

The alimentary canal (Fig. 1) is quite similar to that of other members of the family (see Matthias, 6, p. 363). The stomach is in wide communication on either side with the lobules of the hepato-pancreas. The latter, as seems to be the case in all the more primitive Lamellibranchs, are large, simple, and very loosely packed together. The descending arm of the stomach (gastro-intestine, Fig. 1, *g.int.*) is capacious, and closely resembles in its internal structure that of *Arca barbata*, figured by Matthias (6, Pl. VIII, Figs. 13, 17). The upward bend of the intestine passes below and behind the heart on its way to the upper surface of the adductor.

Heart and Pericardium.—The auricles are not united behind the ventricle, as they are in some species of *Arca*. The ventricle, although slightly expanded in a transverse direction and bifid at either end, is not markedly drawn out to either side and separated, as in so many members of this family in which, owing to the development of the retractor pedis, the width of the back is excessive.

The pericardium also (Fig. 1, *p.c.*), though large, is single; it is produced forward on either side, forming a pair of funnels leading to the reno-pericardial ducts (Fig. 1, *r.pc.d.*). There is no development of pericardial gland-tissue upon the auricles.

Renal Organs.—The nephridium is of the simple type characteristic of the family, and resembles in all particulars that described for *Adacnarca* by Pelseneer (12, p. 42).

The two organs are quite separate from one another. Each (Fig. 1, *r.*) is a simple sac covering the anterior face of the adductor, and wrapped round the retractor pedis. The inner surface is for the most part plain, but towards the anterior end of the organ is to some extent pleated. The kidney opens to the exterior close to its anterior end (Fig. 1, *r.o.*), and slightly behind this point receives ventrally the reno-pericardial duct (Fig. 1, *r.pc.d.*), which passes to this point from the pericardium across its mesial surface.

Generative Organs.—The sexes are separate, and in the specimens examined the gonads were ripe and active.

The gonads of the two sides are not completely separate, but, as recorded also by Pelseneer (12, p. 42) in his account of *Adacnarca*, are in direct and open connection with one another in the ventral parts of the visceral mass. The genital duct passes backwards along the lateral surface of the cerebro-visceral connective, and opens below it slightly in front of and quite separately from the renal aperture (Fig. 1, *g.o.*).

Gills.—The gills are supported on either side by a muscular axis, which extends freely behind the adductor (Fig. 1, *g.a.*). They have the filamentary structure and general freedom characteristic of the Arcacea. The two demibranchs are unequal; the inner, which is the larger of the two, extends forward as far as the inner palp (Fig. 3), a short distance in advance of the anterior extremity of the outer demibranch.

The anterior filament of the inner demibranch is direct, swollen, and slightly elbowed (Fig. 3, $f.^1$), as it is also in *Adacnarca* and *Philobrya* (see below). The rest of the filaments in both demibranchs, except for a few at the extreme hinder end, are reflected, but have no inter-filamentary unions of any sort, except that possibly there may be a ciliary union between them at the angles of reflexion and at the reflected free extremities, but of this I could not be quite certain. The individual filaments are remarkably short and stout, with knobbed rather than hooked free extremities, and in these particulars present a somewhat embryonic appearance. The cavity of each is divided longitudinally by a delicate septum.

2. *Adacnarca nitens*, Pelseneer. Pl. 11, figs. 8–9c.

Stations 194, 316, 338, 339, 340, 356. A dozen or so specimens (in six separate bottles) taken from 50–250 fathoms in and near McMurdo Sound.

The anatomy of this species has been described by Pelseneer (12, p. 41), but although in general the present specimens correspond very well with his description, there are a few points of difference sufficiently remarkable to make it a matter of some difficulty to reconcile them completely with his account.

For instance, the "Belgica" specimens had two adductors, though the anterior one was small; in these the anterior adductor is absent. In the "Belgica" specimens the filaments of the inner demibranch were direct only; in these, except for a few at the hinder end of the demibranch, they are reflected. In these specimens, too, there is a well-developed "cephalic" eye, and though of course it is possible, it is at the same time very unlikely that this organ, if present in the "Belgica" specimens, should have escaped Pelseneer's notice, yet he makes no mention of it.

These differences of structure are difficult to explain, and if no mistake of observation or identification has been made, seem to suggest that two closely allied species may secrete shells of practically identical form.

The examination of two specimens by means of serial sections, and of three others by partial dissection, showed that in general structure *Adacnarca nitens* very closely resembles *Lissarca*, with strong leanings in various particulars to *Philobrya* (see below).

Muscles.—A posterior adductor only is present. The pedal retractors are similar to those of *Lissarca*, except that the body-muscles are not developed as in that genus to form a definite pedal elevator.

Nervous System and Sense-Organs.—The nervous system is similar to that of *Lissarca*, but the otocysts are smaller and lie closer to the sides of the pedal ganglia.

A cephalic eye is present in the usual position at the junction of the inner labial palp and inner demibranch. The eye was little more than a pigment-fleck in one instance (Fig. 8, *c.e.*), but in another specimen was a well-formed pigmented cup occupied by a mass of hyaline material, larger and better formed than the cephalic eye of *Lissarca* shown in Fig. 4.

Digestive Organs and Heart.—The labial caeca and sub-branchial epithelial ridge mentioned in the description of *Lissarca* are present, the latter being peculiarly well developed and deep (Fig. 9A, B, C, *ep.r.*).

The rectum, though not actually perforating the ventricle of the heart, is embedded in the tissues of its ventral walls. The auricles, unlike those of *Lissarca*, unite freely behind the ventricle below the rectum. They show no development of pericardial gland-tissue.

Gills.—As mentioned above, the filaments of each demibranch are reflected and not, as was the case in Pelseneer's specimens, those of the outer one only. This was observed in whole preparations of the gills of three individuals from Stations 316, 338, 339; and in each case the condition was perfectly plain and open to no doubt (Fig. 8A). Towards the hinder end of both demibranchs, but especially of the inner, the reflexion of the filaments becomes gradually less and less, some fifteen filaments of the inner demibranch being simply direct.

In the specimens used for sections reflexion of the inner demibranch seemed to extend only about as far back as the middle of the body, but as sections vertical to the body cut the gills very obliquely, this is the appearance that would naturally be presented, bearing in mind that the posterior fourth or so of the filaments are in fact direct.

The forward extension of the two demibranchs is similar to that of *Lissarca*, and as in that genus and in *Philobrya* the anterior filament of the inner demibranch is swollen and without reflexion. In the details of their structure the gills bear a strong likeness to those of *Philobrya* (see below). The individual filaments are longer and more slender than those of *Lissarca*, and are united in both descending and ascending arms by ciliated discs situated about half-way down the lamina. They are also in ciliary union at their free ends and at the angle of reflexion. The reflected free end of each terminates in a pronounced hook. The cavity of each filament is divided by a longitudinal septum.

In both *Lissarca* and *Adacnarca*, the outer demibranch as it passes forward separates from the inner demibranch and shifts its attachment more or less from the body to the mantle.

In *Lissarca* this divergence is very slight, but in *Adacnarca* is of considerable extent (Fig. 9A, *o.d.*, *i.d.*). The portion of the mantle-cavity included between the forward ends of the demibranchs extends upwards beyond the attachments of the gills

(Fig. 9A, *m.c.*) and from the point at which both demibranchs become attached to the body still continues backwards (Fig. 9B, *m.c.*), burrowing beneath the integument above the kidney nearly to the level of the adductor (Fig. 9C, *m.c.*). A similar supra-branchial extension of the mantle-cavity occurs, as will be mentioned later, in *Philobrya*.

In one of the specimens examined a number of eggs had been extruded, and were lying in the mantle-cavity in front of and between the gills.* The eggs were loaded with yolk-granules of remarkable size, and were surrounded by a very delicate vitelline membrane, in striking contrast to the heavily encapsuled eggs of *Venericardia* and the Anatinacea mentioned below.

3. *Arca* (*Barbatia*) sp.

Station 36. Two specimens from a rock-pool in South Trinidad.

The animal in all essential particulars shows the type of structure characteristic of the genus *Arca*.

The byssal apparatus is strongly developed, and, as in other Arcas in which this is the case, the posterior retractor pedis is enormous, and dominates the arrangement of the other soft parts in its neighbourhood, crowding the heart and the main part of the pericardium forward, and separating the hinder part of the kidneys and pressing them downwards into the upper part of the gill-axis.

Another factor that exerts great influence upon the form of the heart and pericardium in most species of *Arca* is the great breadth of the body between the umbones. In the species under review this region is very broad, and the heart and pericardium are stretched transversely, separating both into distinct and disconnected halves, except for an extremely narrow communication between the anterior extremities of the ventricles. The walls of the two pericardial chambers are united to this transverse ventricular connection, but the chambers themselves show no open communication with one another.

The passage between the auricles and ventricles is guarded by valves, and not merely by a sphincter muscle as described by Matthias (6, p. 422) in *A.* (*Barbatia*) *platei*.

The rectum, in passing from the visceral mass to the upper surface of the adductor, lies below and behind the connection between the two ventricles, a position common to many species of *Arca*, though not universal throughout the genus.

Nervous System and Sense-Organs.—The nervous system shows lateral concentration of both the visceral and the pedal ganglia. The abdominal sense-organs are, as usual in the genus, well developed; the otocysts are relatively small, oval in shape, and situated slightly above and to the outer side of the pedal ganglia.

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* Incubation, though as a rule rare amongst marine Lamellibranchs, is stated by Pelseneer (11, p. 101) to be characteristic of many Antarctic species.

At the anterior extremity of the inner demibranch, at the point where it joins the inner labial palp, is a small cup-shaped vestigial "cephalic" eye, similar to those described above in *Lissarca*. Cup-shaped eye-spots of a like character occur in some numbers, along the outer fold of the mantle-edge, particularly in the inhalent area towards its hinder end.

Renal Organs.—The kidneys are similar both in general structure and in the disposition of the reno-pericardial duct and external opening, and in the union of the latter with the genital duct, to the type of these organs in the genus *Arca* described by Odhner (8, p. 298).

Gills.—The gills are of the usual *Arca* type. The filaments are united by ciliated discs at four points on the descending and three on the reflected arm, and there is also close ciliary connection between their reflected extremities and at the angle of reflexion. A short interlaminar membrane fills in the angle of reflexion of each filament.

LIMOPSIDÆ.

4. *Limopsis grandis*, Smith. Pl. II, figs. 10–12.

Station 194. Numerous specimens of different sizes obtained off Oates Land in 180–200 fathoms.

The animals of three species of this genus (*L. pelagica*, *L. minuta*, and *L. cancellata*) have been figured and briefly described by Pelseneer (9, p. 12, Pl. II, Figs. 1 and 2, and 16A, p. 21). They are chiefly remarkable for the great size and muscularity of the gill-axis.

A diagrammatic view of the arrangement of the chief internal organs of *L. grandis* is shown in Fig. 10, to which may be added the following notes:—

Mantle and Foot.—The mantle is without tentacles, papillæ, or eye-spots; its folds (in cross-section) resemble those of *Barbatia*.

The byssus is small and filiform; it is formed upon the surface and around the base of a long conical and longitudinally pleated papilla, springing from the base of a deep byssal pit (Fig. 10, *by.p.*).

Nervous System and Sense-Organs.—The visceral ganglia are coalesced, as they are in *Pectunculus*, and are of considerable size and importance. The branchial nerves that arise from them are large and richly ganglionated, and underlie a well-marked epithelial thickening (Spengel's organ).

The abdominal sense-organs and otocysts are well developed; the latter retain indications of their original invagination from the exterior in the form of a minute duct. In one specimen this duct was still apparently in open communication with the exterior; in another it terminated in a small dilatation before reaching the surface of the body.

Digestive Organs.—The palps are directly continuous with the lips; they are small, though somewhat swollen and little, if at all, fluted upon their apposed surfaces. The inner lip and palp is a simple fold similar from end to end; the outer lip (Fig. 11, *o.l.*) consists of a swollen base continuous with the palp, and, like it, lined by a deep glandular epithelium, and of a thin membranous extension (Fig. 11, *ext.*) by which its free edge is made to overhang the mouth and lower lip like a curtain. This extension is covered by a thin non-glandular epithelium, and terminates abruptly at the junction of the lip with the palp.

Heart.—The ventricle of the heart is perforated by the intestine; the auricles are voluminous and communicate with one another beneath and behind the ventricle (Fig. 10, *au.c.*), and show in their posterior region a feeble development of pericardial gland-tissue.

Renal Organs.—The kidney is more complicated by labyrinthine folding of its walls than in the Arcidæ. It opens close to its anterior end by a short duct into a small sinus common to it and to the genital duct. On a plane slightly posterior to this lies the reno-pericardial duct, which passes from the anterior region of the pericardium across the *lateral* surface of the kidney to its ventral wall. The two kidneys are quite separate from each other, but towards their hinder end are closely applied and fold in between the posterior pedal retractors, differing apparently in this particular from the kidneys of *Pectunculus* (8, p. 300).

Gills.—The gill-axis, as noted by Pelseneer, is extremely large and muscular. The muscles, as in other Arcacea, consist of two bands situated at the base of each demibranch, and take their origin from the shell just above the anterior extremity of the gills (Fig. 10, *br.m.*). Although these muscles are remarkably well developed they constitute a small part only of the gill-axis (Fig. 12, *m.*), which is composed mainly of a cartilaginoid connective tissue (Fig. 12, *c.*).

The filaments of both demibranchs are reflected, and are united by ciliated discs at about the mid-region of both descending and ascending arms. So far as could be observed, there is also ciliary connection between the filaments at the angle of reflexion and at their free extremities. There are no interlaminar unions.

PHILOBRYIDÆ.

5. *Philobrya limoides*, Smith. Pl. III, figs. 13–15.

Stations 331 and 340. A few specimens dredged in 250 and 160 fathoms off the entrance to McMurdo Sound.

The anatomy of an allied species, *Philobrya sublævis*, has been described by Pelseneer in his Report on the Collections of the S.S. "Belgica" (12, p. 42), and in most particulars of any importance his description of that species applies equally well to *P. limoides*. The following few additional notes seem, however, of sufficient interest to be recorded:—

Mantle and Foot.—The mantle-border has no eye-spots or tentacles; its edge in cross-section closely resembles that of *Lissarca* (Pl. I, fig. 2), except that the outer fold is smaller, the middle slightly more pronounced, and the inner more swollen. The byssus is strong, with a solid root broken up into about thirty filaments.

Digestive Organs.—The lips and palps resemble those of *Lissarca* and *Adacnarca*, and, as in those two genera, the outer palp is for most of its extent confluent with the mantle, its extreme edge only projecting freely (see *Lissarca*, Fig. 5 B, *o.plp.*). It is also worthy of record that in *Philobrya*, as in the two above-mentioned species, there is a well-developed labial cæcum, apparently of a glandular nature, opening to the exterior in the angle between the inner lip and the body-wall (Fig. 13, *l.c.*).

It is to be noticed, too, that in *Philobrya*, as in *Lissarca* and *Adacnarca* (the only three genera in which, so far as observed, labial cæca occur), the epithelium of the inner side of the gill-axis is increased in depth and forms a prominent sub-branchial ridge (Fig. 14, *ep.r.*), similar, both in extent, form, and structure, to that already described above in the account of *Lissarca* (Fig. 7, *ep.r.*).

Sense-Organs.—At the extreme anterior end of the inner demibranch, at the point where it is attached to the inner palp, is a "cephalic" eye, well formed and of some considerable size. As is usually the case with this vestigial organ, it has the form of an open cup of deeply-pigmented cells, filled in by a mass of homogeneous transparent substance (Fig. 15).

Heart.—The ventricle of the heart is perforated by the intestine; and behind the ventricle, as described by Pelseneer for *P. sublævis*, the two auricles communicate with one another by a wide passage (Fig. 13, *au.c.*). The connection between the auricles and ventricle is quite normal, there being no indication of the double communication on the left side found by Pelseneer (probably as a variation) in his specimen of *P. sublævis*.

Renal Organs.—The renal organs and genital duct are closely similar in structure and relations to those of *Lissarca* and *Adacnarca*.

Gills.—The gills in their disposition and in the details of their structure resemble those of *Adacnarca*, except that in *Philobrya* the reflexion of both demibranchs is more extensive, and the reflected angle of each filament is strengthened by a short inter-laminar web. The cavity of each filament is divided longitudinally by a septum.

In view of the several particulars just mentioned (palps, labial cæca, sub-branchial epithelial ridge, gill-structure), in which *Philobrya limoides* shows a marked similarity of structure to *Adacnarca*, it is of some interest to find that there is also a close likeness between these two genera in the disposition of the mantle-cavity in relation to the anterior part of the gills.

It was pointed out above that in *Adacnarca* the mantle-cavity extends upwards for some distance between the separated anterior attachments of the two demibranchs, and that further back this extension is cut off from the general mantle-cavity by the transference of the attachment of the outer demibranch from the mantle to the body-wall, and runs back for some distance as a blind pocket between the kidney and the surface of the body (Figs. 9A, B, C, *m.c.*). In *Philobrya* the relation of the mantle-cavity to the gill-attachment is precisely the same. There is a similar upward extension of the mantle-cavity between the separated anterior attachments of the demibranchs (Fig. 14, *m.c.*), which terminates further back as a blind pocket between the body-surface and the kidney.

Without further and more extensive inquiry it is hardly possible to judge adequately of the importance of such structural details as these; but, so far as can be seen with the material at hand, they are undoubtedly suggestive of an affinity between the animals concerned closer than that indicated by their shells, and thus lend additional support to Pelseneer's view that *Philobrya* is in truth intimately related to the *Arcidæ*, and particularly to *Adacnarca*, although the shell is usually assigned to another family of the Arcacea.

PECTINACEA.

PECTINIDÆ.

6. *Chlamys consociata*, Smith.

Station 96. A few specimens from 50 fathoms off North Cape, New Zealand.

The anatomy of the animal is of the *Pecten* type; although, owing to the presence of a strong byssal apparatus, the musculature differs considerably from that of the genus *Pecten*, and by its one-sided development throws the body more or less out of symmetry.

Mantle.—The mantle is quite similar to that of *Pecten*, with a large inturned inner fold or curtain, and numerous eyes of the *Pecten* type along its free border.

Muscles and Foot.—The single adductor muscle consists of two distinct parts, which are situated, when the hinge-line is placed to the left, one above the other. The fibres of each part are diagonal to those of the other; those of the upper part passing forwards from right to left, and those of the lower forward from left to right. As in *Pecten*, the fibres of the two parts differ in histological structure; those of the lower part being transversely striated, those of the upper smooth. The posterior pedal retractors are represented by that of the left side only. This muscle is of great size, and passes across the body behind the pericardium to the base of the byssal papilla, into which it is inserted.

The byssal papilla occupies a deep cleft in the ventral surface of the finger-shaped foot, and as in *Arca* and *Barbatia* is broken up into a number of parallel longitudinal laminæ.

Nervous System and Sense-Organs.—The central nervous system resembles that of *Pecten*, particularly in the extreme condensation of the cerebral and pedal ganglia, these being so closely applied to one another that they form a continuous horse-shoe shaped mass without any outward indication of cerebro-pedal connectives or pedal commissure. The cerebral ganglia are, as in *Pecten*, widely separated.

The otocysts are large, and lie above the pedal ganglia, within the embrace of the cerebro-pedal mass.

Digestive Organs.—The alimentary canal, and the relation of the rectum to the heart, are the same as in *Pecten.*

Renal and Generative Organs.—The renal organs are of the *Pecten* type, with the external orifice situated at the posterior end, and the reno-pericardial duct in front. Upon the auricles is a very considerable accumulation of pericardial gland-tissue.

The sexes are separate (the specimen examined was a male), but the opening of the gonad to the exterior could not be traced.

Gills.—The gills are of the *Pecten* type, filamentous and deeply pleated, with ten ordinary filaments to the pleat, and enlarged chief filaments at the re-entrant angles. The filaments at the projecting angles are not modified.

The filaments of both demibranchs are reflected, and are united at numerous levels by cilia borne upon prominences that project towards the inter-laminar space. The cavity of each filament is divided by a longitudinal septum, attached on either side to a prominent thickening of its chitinous lining.

OSTRÆACEA.

LIMIDÆ.

7. *Lima* (*Limatula*) *hodgsoni*, Smith. Pl. III, figs. 16, 17.

Station 331. Two bottles, containing numerous specimens dredged off Cape Bird, McMurdo Sound, in 250 fathoms.

Compared with other species of *Lima* (for instance, *L. hians*, *L. elliptica*) the animal is relatively long from the hinge to the adductor. The organs situated in this region (heart, kidney, etc.) are therefore not so much cramped as in these and other species of *Lima*, and show on the whole a less specialised and apparently more primitive condition.

Mantle.—The mantle has the structure commonly found in the genus (7, p. 20), with a voluminous curtain, beset on its inner surface with many tentacles. The tentacles, although well developed, are scarcely so numerous as in certain other species (*e.g.*, *L. hians*). Nowhere do they exceed from three to four rows, and anteriorly, in the region in which the curtains are united, are reduced to a single row.

Muscles and Foot.—Upon the upper edge of the adductor is a small muscle (Figs. 16, 17, *m.*) which, at first sight might easily, from its area of origin, be mistaken either for the retractor pedis, or for a specialised portion of the adductor. It is, however, in reality part of the mantle-musculature, and passes towards the middle line into the base of the curtain a short distance in front of its dorsal closure.

The pedal retractors are remarkably weak; the posterior seem to be absent, but in place of them (functionally) are two small muscles (Figs. 16, 17, *p.r.p.*) that arise from the mantle-border *behind* the adductor, as described by Pelseneer (16A, p. 34), and pass across its posterior surface to the hinder part of the visceral mass and foot. The anterior retractors have no clearly defined origin from the shell, but are formed by the aggregation of scattered muscle-fibres, situated in the body-wall in the neighbourhood of the ventral extremity of the hinge.

The foot shows upon its ventral surface a shallow byssal cleft, which deepens at its posterior extremity to form a pit occupied by from 8–10 longitudinal laminæ, surrounded by a considerable depth of glandular tissue. There is apparently, however, no byssus.

Nervous System and Sense-Organs.—In conformity with the relatively great length of the body, the visceral and cerebral ganglia lie at some distance apart, and do not show the remarkable concentration towards one another that has been described by Pelseneer (**15**, p. 874) in certain species of *Lima*. The cerebral and pedal ganglia are, on the other hand, closely approximated to one another, united by short stout connectives.

The otocysts are large, and lie behind the cerebro-pedal connectives.

Digestive Organs.—The mouth opens freely to the mantle-cavity between the lips, and is not shut in, as in many species of *Lima* (Pelseneer, **13**, p. 722, and **16a**, p. 34), by the fusion of the lips in front of it. The stomach, as in *L. hians*, lies mainly in the left umbo.

The intestine occupies the position shown in Fig. 16, forming a simple S-shaped coil which, in its forward bend, passes to the right of the stomach and thence bends backwards between and below the two lateral chambers of the pericardium and divisions of the heart, and above the hinder connecting passage of the pericardium (Fig. 16, *pc.c.*) to reach the upper surface of the adductor.

Heart.—Owing to the great breadth of the dorsal surface of the body, the heart and pericardium are drawn out to either side, as in many of the Arcidæ. The heart is, in fact, completely separated into two lateral halves, each consisting of a single ventricle and auricle. In front, each ventricle is continued forward as a fine aortic vessel beneath the floor of the anterior extremity of the pericardium, and may possibly form a connection through this vessel with that of the opposite side.

No actual passage from one ventricle to the other was, however, satisfactorily traced, either by sections or dissections, and if present it must be exceedingly minute. In *L. hians* the ventricles, though widely separated laterally, are in communication, close in front of the adductor, by a connecting channel, which, though narrow, can yet easily be traced even by dissection.

The pericardium conforms to the shape of the heart, but posteriorly the two lateral chambers into which it is divided communicate beneath the rectum by a narrow channel (Fig. 16, *pc.c.*). Pericardial gland-cells are freely distributed upon and within the auricles.

Renal and Generative Organs.—The renal organs (Fig. 16, *r.*) are saccular, and occupy a position beneath the pericardium from a short distance behind its anterior extremity to the antero-ventral face of the adductor, having thus a much greater antero-posterior extent than in the species of *Lima* described by Odhner (**8**, p. 307).

The reno-pericardial duct (Fig. 16, *r.pc.d.*) arises from the lateral border of the pericardium some little way behind its forward extremity, and passes across the *outer side* of the saccular distal arm of the kidney to reach its ventral surface. Shortly before its communication with the main cavity of the kidney it receives the genital duct (Fig. 16, *g.d.*). The two capacious distal arms of the kidney are widely united beneath the pericardium, close in front of the adductor (Fig. 16, *r.c.*). Posterior to this communication each is prolonged upon the surface of the adductor nearly as far as the visceral ganglion and close to its termination opens to the exterior (Fig. 16, *r.o.*).

The sexes are separate.

Gills.—The gills are similar in structure to those of other members of the genus. The chief filaments resemble in cross-section most nearly those of *Lima inflata* (Ridewood, 17, p. 215); there are twelve filaments to the pleat. The apical filaments are unmodified. Interlaminar unions occur between the chief filaments and extend for some little distance upwards from the angle of reflexion; interfilamentary unions are numerous and roughly alternate in position from pleat to pleat. The individual filaments have no longitudinal intrafilamentary septum.

The gill-axis contains two stout longitudinal muscle-bands, which, in front, on a level with the upper region of the stomach, become blended with the muscles of the body-wall. Similar muscle-bands run along the continuous selvedge that forms the free margin of the reflected laminæ and along the reflected angle of each demibranch. The hinder end of the gill-axis is not attached simply to the ventral surface of the adductor, as it is in the Arcacea, but extends to the mantle behind the adductor (Fig. 17), leaving, between its inner margin and the edge of the posterior retractor pedis, a small orifice (Fig. 17, *o.*) that leads into a space of considerable extent (*m.d.*), situated upon the posterior and dorsal surface of the adductor, and reaching as far forward as the hinder limit of the pericardium.

This cavity, which occurs also, though to a less degree, in *L. hians*, is a diverticulum of the mantle-cavity, within the substance of the mantle and gill-axis, and has apparently been developed in relation to the excessive breadth of the adductor, filling in the lateral parts of the abnormally wide space between the rectum and the insertion of that muscle.

EULAMELLIBRANCHIATA.

SUBMYTILACEA, CARDITIDÆ.

8. *Venericardia purpurata* (Deshayes) (*Venericardia australis*, Lamarck ?). Pl. III, fig. 18.

Station 134. New Zealand, E. of North Cape, 11–20 fathoms.

So far as can be ascertained from previously published descriptions of the anatomy of genera belonging to this family, there is little of importance to distinguish this genus from *Cardita*. A diagram of the general disposition of the internal organs is shown in Pl. III, Fig. 18, to which the following notes may be added :—

Foot.—The sole of the foot is cleft longitudinally by a shallow gutter surrounded by a small amount of gland-tissue. Posteriorly, the cleft terminates in a pit whose walls are pleated longitudinally and into which projects a small papilla. The gutter and pit contained a little coagulated secretion, and were surrounded by a considerable mass of gland-tissue, but there was no definite byssus in any of the specimens. In some species of *Cardita* the byssus is peculiarly strong.

Nervous System and Sense-Organs.—The pedal ganglia are coherent but superficially separate, the visceral ganglia completely fused together. There is no abdominal sense-organ, but Spengel's organ upon the root of the branchial nerve is fairly pronounced.

Heart and Renal Organs.—The ventricle of the heart is perforated by the rectum. The surface of the auricles, and particularly their internal trabeculæ, are richly beset by cells of (apparently) pericardial gland-tissue. Owing to the somewhat imperfect preservation of the tissues, Keber's organ could not be identified with certainty.

The kidney corresponds in its general structure, in the position of its external orifice, the relations of the reno-pericardial duct, and the position and extent of the intercommunication between the distal arms, with the description and figure of the renal organ of *Cardita* given by Odhner (8, p. 314).

Gills.—The gills resemble in their structure those of *Cardita* (Ridewood, 17, p. 221).

Generative Organs.—The sexes are separate ; the genital duct opens close in front of the orifice of the kidney. The ovarian eggs are surrounded by a thick hyaline capsule, the outer parts of which are dense, the deeper parts vacuolated. In the fresh state no doubt the deeper layers were fluid, and owe their shrunken vacuolated appearance in this prepared material to the action of the reagents used in its preservation. The whole capsule stains deeply with hæmatoxylin.

Although, as a rule, the eggs of marine Lamellibranchs are practically naked, enclosed at the most in an extremely thin vitelline membrane, a thick capsule similar to the above is common in fresh-water genera and among the Anatinacea, and is figured by Deshayes in *Cardita calyculata* and in *Trigonella* (1, Pl. CVI, Fig. 5, Pl. LII, Fig. 7), and described by Lovén (5, p. 317) in *Cardium pygmæum*.

In one of the specimens examined the eggs had been laid, and were found in masses in the interlaminar spaces of all four demibranchs. In this position they were closely packed and adherent to one another by the surfaces of their capsules. There seems no doubt that these eggs were lodged in the gills for purposes of incubation, a habit of somewhat rare occurrence among marine Lamellibranchs (14, p. 243), though common enough among fresh-water forms.

EULAMELLIBRANCHIATA.

VENERACEA. VENERIDÆ.

9. *Chione* (*Chamelea*) *spissa* (Deshayes). Pl. III, fig. 19.

Station 134. Numerous specimens from 11 to 20 fathoms, off the north of New Zealand.

The general anatomy of the animal, as is shown by the diagram (Fig. 19), presents the type common to other members of the family (see *Venus verrucosa*, Deshayes, 1, Pl. XCII, etc.).

Foot.—The byssal apparatus is in very much the condition of that described above for *Venericardia*.

Sense-Organs.—There are no abdominal organs: Spengel's organs are fairly well developed. The otocysts are large, and are situated upon the cerebro-pedal connectives, adherent to their lateral surface close above the pedal ganglia.

Renal Organs.—The kidney resembles that of *Venus* (Odhner, 8, p. 340), and is remarkable for the slight pleating and general want of elaboration of the distal arm. This region of the kidney is a voluminous sac (pleated a little laterally) communicating freely with its fellow by a wide passage below the pericardium (Fig. 19, *r.c.*). Its external opening lies on the same level as the reno-pericardial duct and slightly behind the genital orifice.

The reno-pericardial funnel leads into a long and peculiarly narrow proximal arm, which runs backwards wrapped in a fold of the distal arm parallel to the anterior surface of the retractor pedis, and enters the distal arm far back beneath the renal communication. A well-developed Keber's organ (Fig. 19, *k.o.*) is present in relation to the anterior end of the pericardium.

Gills.—The gills are very unequal in size; the plications in the inner and outer demibranchs are of about the same depth. The reflected edge of the inner demibranch is free of the body, but that of the outer is adherent to the origin of the mantle, nearly as far back as the adductor; beyond this point it is free, and is extended upwards, as in other Veneridæ, to form a thin, free, and unpleated appendage (Fig. 19, *app.*). The intimate structure of the gills also resembles that of other Veneridæ (Ridewood, 17, p. 245). In the outer lamella there are seventeen filaments to the pleat; in the inner, twenty-one.

ANATINACEA, ANATINIDÆ.

10. *Anatina elliptica*, King and Broderip. Pl. IV, figs. 20–23, 25.

One specimen from 5 fathoms off Cape Evans, McMurdo Sound. The specimen (Fig. 20) was somewhat damaged in the region of the adductor, but was otherwise in good condition.

Mantle.—The mantle is similar to that of other species of *Anatina*; it is completely closed except for the siphon-orifices and a small pedal opening (1 cm. in length) situated below and close behind the anterior adductor. The siphons are large and highly muscular, but capable of only partial retraction; externally they are covered by a thick rugose periostracum. No ocular tentacles were observed.

Foot.—Although the foot was considerably shrunken, it is obviously of considerable size in the natural condition. Upon its ventral surface is a narrow byssal groove, though no byssus was attached to it.

The pedal muscles are unequally developed. The anterior retractors, which arise in the usual position close behind the anterior adductor, are of quite average development; the posterior retractors, on the other hand, are very much reduced, and show signs of degeneration not only in the quantity but in the structure of their components. Their origin was destroyed, but they evidently arise as usual in front of the posterior adductor, and pass thence enfolded in the posterior part of the renal organ into the hinder end of the visceral mass. When exposed by the removal of the kidney they present a hard, sharply defined appearance more like that of a rod of cartilage than a muscle of the ordinary type. Examined microscopically, they were found to consist mainly of a peculiarly dense form of fibrous tissue, interspersed with a relatively small proportion of muscle-fibre—a structure more nearly that of a ligament than of an ordinary active muscle.

Digestive Organs.—The lips and palps are voluminous, the latter being triangular and freely pendent, with their apposed surfaces strongly fluted. The general disposition of the stomach and intestine is similar to that described and figured by Lacaze-Duthiers (4, p. 693) for *Aspergillum.* The commencement of the intestine (gastro-intestine) is partially divided into right and left channels by a pair of longitudinal folds. Neither of these cavities contained a crystalline style, but within the stomach was a cuticular secretion (flèche tricuspide) of remarkable development. This secretion is stated by Pelseneer (10, p. 215) to be also highly developed in *Lyonsiella.*

The intestine is of large calibre, but, owing to the fact that it is flattened and considerably coiled, it appears when superficially exposed (as represented in Fig. 20) to be of variable diameter in different parts, according as its narrow edge or flattened surface is presented to view. In its final upward bend it, in fact, narrows considerably. It enters the pericardium and traverses the heart in an almost vertical direction before bending backwards towards the upper surface of the adductor.

Renal and Generative Organs.—The bulk of the kidney (Fig. 20, *r*) is wedged between the pericardium and the adductor, as is common in the Anatinacea. It is compressed antero-posteriorly with its chief axis almost vertical, much as described by Odhner (8, p. 349, fig. 35A) for *Pandora.* This orientation is unusual; as a rule in this group the kidney is much elongated with its long axis horizontal. It is so in the genera described by Odhner, with the above exception, and also to a marked degree in a specimen of *Anatina truncata* which I have had an opportunity of examining. Before, however, concluding that *A. elliptica* is peculiar in this respect, it must be borne in mind that the damage to the adductor in this particular specimen (the muscle appears to have been dragged from the shell while the animal was alive) may have had as one of its results an alteration of the form of the kidney by the forward shrinking of its upper parts. Whether this has been the case or not, the possibility that the form of kidney presented may be unnaturally short in the longitudinal direction and distorted by the forward and upward migration of its posterior end must not be lost sight of.

The pericardium (Fig. 20, *p.c.*) is prolonged backwards along the floor of the kidney on either side of the mid-line ; and, on a level just in front of the mouth of the urinogenital canal, gives place at its extremity to the reno-pericardial funnel (Fig. 20, *r.pc.d.*). This passes upwards towards the remains of the adductor, parallel to the pericardium, and shortly enters the proximal arm of the kidney (Fig. 20, *r.p.*). which, in turn, upon nearing the adductor communicates with the distal arm. Both the reno-pericardial funnel and the proximal arm are complicated by pleating. The walls of the distal arms are closely folded and lobulated, presenting in section an almost solid mass of renal tissue. In the area between the proximal arm and the pericardium they are in open communication with one another. The distal arm opens to the exterior through a long tubular but dorso-ventrally flattened urinogenital canal (Figs. 21, 22, 23A, B, *u.g.c.*). The mouth of this canal lies under cover of the protuberant ventral border of the kidney, at some little distance behind the termination of the attached part of the gill-axis, vertically about half-way between the attachment of the reflected lamina of the inner demibranch and the branchial nerve (Fig. 23A, B, *br.n.*, *r.l.*), and just above the cerebro-visceral connective. The canal runs directly inwards beneath the kidney, and is continued without interruption into the oviduct (Figs. 21, 22, 23B, *o.d.*). In its roof, vertically above the cerebro-visceral connective, is a large circular hole (the nephroproct) (Figs. 21, 22, 23B, *r.o.*) giving access to the cavity of the distal arm of the kidney, and in its floor opposite the anterior and mesial area of the nephroproct is the opening of the male genital duct (Figs. 21, 22, 23A, *m.d.*). The urinogenital canal and both genital ducts are strongly ciliated.

The passage between the kidney and the urinogenital canal is apparently perfectly open and free, and offers little hindrance to the passage of the products of generation into the kidney. In fact, in this particular specimen a bunch of ripe eggs was lodged in the renal orifice, and others were scattered in various parts of the cavity of the kidney.

It is not, however, reasonable to suppose that, under normal conditions, eggs are discharged otherwise than down the urinogenital canal, though they evidently can, without difficulty, find their way into the kidney in the case of any abnormal convulsion of the body, such as probably took place when the animal was killed.

The above arrangement of the renal and genital orifices is not that commonly met with among the Anatinacea. Usually all three ducts open separately upon the surface, though often quite close together (4, p. 721. 10, p. 214, 16A, p. 72). In *Pandora* (8, p. 349) the renal duct is separate, but the two genital ducts open by a common orifice.

In addition to *Anatina elliptica*, I have had the opportunity of examining a specimen of *A. truncata*, and find that in the arrangement of its genital and renal ducts this species differs from *A. subrostrata*, in which these openings are stated by Pelseneer to be separate, and conforms more to the condition shown in *A. elliptica* and *A. boschasina* (20, p. 611), all three ducts opening to the exterior through a common urinogenital sinus (Fig. 24, *u.g.s.*)

The arrangement in *A. truncata* is shown quite diagrammatically in Fig. 24. Upon the dorsal surface of the cerebro-visceral connective, at some little distance below the gill-axis, is a large oval duct (Fig. 24, *m.d.*) which, from the fact that it is occupied by a granular mass (the condition of the material was such that no cell-detail could be made out), I take to be the male genital duct. As this passes backwards it diminishes in size, and upon its mesial aspect is perforated by a small hole communicating directly with one of the lobes of the ovary. This, no doubt, is the oviduct (Fig. 24, *o.d.*). Posterior to this confluence, the combined male and female ducts protrude in a pronounced papilla (Fig. 24, *u.g.s.*) from the side of the body below the attachment of the gill-axis and just above the cerebro-visceral connective. Close to its opening the combined genital duct receives upon its mesial aspect a short duct from the distal arm of the kidney (Fig. 24, *r.d.*). The pericardium, which, as is usual in the Anatinacea, lies in front of the kidney, narrows posteriorly on either side to a fine tube, the reno-pericardial funnel (Fig. 24, *r.pc.d.*) which passes beneath the renal duct, and thence (gradually enlarging) runs posteriorly along the floor of the distal arm of the kidney enveloped in its lobulations.

It will be noticed that the relative position of the genital and urinary ducts, the points at which they open into the urinogenital canal, and the proportionate depth of the latter chamber, differ materially in this species from the condition observed in *A. elliptica*, though the two species agree in the perhaps more important fact that the genital and urinary products are discharged to the exterior through a common opening.

Keber's Organ.—Keber's pericardial gland is highly developed, covering a considerable area of the body-surface in front of and above the pericardium.

Gills.—As in the rest of the Anatinacea, the gills consist on either side of a complete inner demibranch with direct and reflected laminæ, and of an outer demibranch upturned towards the dorsal line of the body, and composed of direct filaments only.

The gill-axis is expanded from its attachment to the body-wall to the commencement of the gill-filaments to form a wide membranous sheet (Figs. 20, 25, *g.a.*), similar to that by which the gills are suspended, according to Hancock (2, p. 289), in *Myochama* and *Cochlodesma*. The sheet is widest half-way along its attachment to the body, and thus has a semilunar form. In *Anatina truncata*, and in an unidentified species of *Anatina* that I had the opportunity of examining, the base of the gill is closely attached to the body-wall without the intervention of a membranous expansion of the axis, such as that just described, and the same is probably also the case in *Anatina rostrata*, briefly described by Woodward (21, p. 26).

At some distance in front of the hinder limit of the visceral mass the gill-axis becomes free of the body, and passes back to the anterior edge of the siphonal septum, to which with the rest of the hinder extremity of the gills it is attached.

The margins, both of the reflected lamina of the inner demibranch and of the upturned outer demibranch, are attached throughout their length to the body (Fig. 20, *a.o.d.*, *a.i.d.*). This is not the condition usually associated with *Anatina*; in this genus the gill-edges are free as a rule, except behind the foot, though in other Anatinacea, as for instance *Myochama* and *Cochlodesma* (2, p. 289), and *Lyonsia* and *Lyonsiella* (10, Pl. XVIII, fig. 69; Pl. XIX, fig. 75), they are attached to the body, as in this particular species of *Anatina*.

Behind the visceral mass the edges of the reflected laminæ of the inner demibranch are united; but the edge of the upturned outer demibranch seemed, so far as the condition of this region of the body allowed of reliable observation, to be for a short distance free, leaving a narrow slit-like passage (Fig. 20, *o.*), between itself and the mantle, through which the supra- and sub-branchial chambers of the mantle-cavity were in communication. Further back, the separation of these two chambers was again completed by the union of the edge of the outer demibranch with a forward lateral prolongation of the siphonal septum (Fig. 20, *s.s.*).

With reference to this passage between the two divisions of the mantle-cavity, it is interesting to notice that a somewhat similar passage is mentioned, though with hesitation, by Hancock (2, p. 290), in his account of the gills of *Myochama*. He says, "In *Myochama*, however, the branchial and anal chambers are not perfectly divided, as they are in *Cochlodesma*, and probably in *Pholadomya*. In the former, the septum, which cuts off the communication, does so only partially, there being a considerable aperture in it (Fig. 1, *f.*), just where it joins the extremity of the gills. It is quite possible that this aperture may be the result of injury," etc.

In their minute structure the gills resemble in all important particulars those of the Anatinacea described by Ridewood (17, p. 261). They are deeply pleated, with a large number of filaments to the pleat (thirty in the inner demibranch, twenty-two in the outer); the chief filaments at the re-entrant angles of the pleats have a strongly concave frontal surface and, where interlaminar junctions are absent, present upon their reverse face, in place of a small acute ridge, such as that figured by Ridewood (17, fig. 51) for *Clavagella*, a large cylindrical prominence enclosing a capacious vessel. A similar prominence occurs also upon all the chief filaments of the outer demibranch.

At the apex of each pleat several of the filaments (usually three) are considerably larger than the normal, but without any particular modification of shape. A similar condition is said by Ridewood (17, p. 265) to be characteristic of the gills of *Pandora* and *Anatina flexuosa*, but not of *Anatina truncata*. In the gill of *Chamostrea* a single enlarged filament in this position is figured by Hancock (3, Pl. IV, fig. 5).

Genital Organs.—The sexes, as in other Anatinacea, are united in the same individual. The limits of the gonad of either sex are not very sharply defined, but the greater part of the ovary is superficial, covering the upper and anterior parts of the visceral mass; the testis lies deeper, and is mainly situated in the ventral region of the visceral mass, packed amongst and around the coils of the intestine. The genital ducts communicate with the exterior, as mentioned in the description of the renal organs, through a urinogenital canal, and in this respect differ from those of *Anatina subrostrata* described by Pelseneer (16A, p. 72).

The eggs, while yet in the ovary, are enclosed, as in other Anatinacea, in a thick capsule. In this particular individual many of them had been laid, and were found in masses in the supra-branchial chambers in the neighbourhood of the mouth of the urinogenital canal. None, so far as observed, had penetrated between the laminæ of the inner demibranch. Among the Anatinacea are some of the comparatively few marine Lamellibranchs in which the eggs are lodged in the gills during a longer or shorter period of incubation. The gills themselves in this group are, however, not really well adapted to contain any great number of eggs, for their tissues are bulky, their pleating is extremely close, and the interlaminar space is much restricted. On the other hand, in the present species of *Anatina* (and in *Myochama* and *Cochlodesma*), owing to the peculiar extension of the gill-axis just described and the fusion of the gill-margins to the body above and below it, an enclosed supra-branchial chamber (Fig. 25, *s.b.c.*) is formed, roomy enough to provide accommodation for a very considerable mass of eggs.

Whether this cavity is used in *Myochama* and *Cochlodesma* for the retention of eggs I do not know, but the presence of masses of eggs within it in *Anatina elliptica* leads one to suppose that it is so used in that species, and suggests further that the modifications observed in the mode of attachment of the gills may be for the purpose of fitting them to serve as an efficient brood-pouch.

In concluding this Report, there are a few points that may be recapitulated, as having an interest beyond that attaching merely to the genera in which they respectively occur.

It will have been noticed that amongst the Arcacea described, three stand apart owing to their close similarity; these are the three monomyarian genera *Lissarca*, *Adacnarca*, and *Philobrya*. The similarity is not only in the broader features of their anatomy, but also in various lesser and apparently trivial peculiarities; such, for instance, as the form and relations to the mantle of the outer palp, the presence of a pair of glandular caeca between the posterior lip and the body, a ridge of modified epithelium between the gill-axis and the body, and in *Adacnarca* and *Philobrya* the details of the relationship of the mantle-cavity to the anterior parts of the gills.

These facts very clearly point to a somewhat close relationship between these three genera, bringing them together to form a group of Monomyarian Arcidæ.

It should be noticed that in *Lissarca* the gonads of the two sides are in complete union with one another, as was seen to be the case in *Adacnarca* by Pelseneer, but this is not so in *Philobrya*. Here each gonad is separate.

Another point of interest is the presence of vestigial cephalic eyes in *Lissarca*, *Adacnarca*, *Philobrya*, and *Barbatia*, members of the Arcacea in which these organs have not hitherto been noticed. The fact that some of these genera live at a depth as great as 250 fathoms, a region well beyond the limits to which light can penetrate, throws some doubt on the functional value of these organs.

Several of the genera described contained eggs either in the mantle-cavity or in the gills (in the anterior part of the mantle-cavity (*Adacnarca*), in the supra-branchial chamber (*Anatina*), in the interlaminar space of the gills (*Venericardia*). Probably in each case the eggs were being incubated; if so, it is a matter worthy of record both because it is an unusual habit among marine Lamellibranchs, and also because it is apparently more common among Antarctic forms than elsewhere. It was found, possibly in adaptation to this habit, that the relations of the gills to the body in *Anatina elliptica* were quite unlike those of any other member of this genus about which information could be obtained, but were identical with those that obtain in *Myochama* and *Cochlodesma*.

I cannot close this Report without expressing my thanks to the authorities of the British Museum, in the first place for entrusting me with it, and then for their patience in awaiting its completion.

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INDEX.

PLATE I.

FIGS. 1–7. *Lissarca notorcadensis.*

FIG. 1.—Diagram of *Lissarca notorcadensis.*

a., Anus; *ab.o.*, abdominal sense organ; *add.*, adductor; *a.r.p.*, anterior retractor pedis; *by.*, byssus; *by.p.*, byssal papilla; *c.e.*, cephalic eye; *e.p.*, elevator pedis; *g.a.*, gill-axis; *g.int.*, gastro-intestine; *g.o.*, genital orifice; *h.*, heart; *i.d.*, inner demibranch; *i.l.*, inner lip; *int.*, intestine; *l.c.*, labial cæcum; *pc.*, pericardium; *p.g.*, pedal ganglia; *p.r.p.*, posterior retractor pedis; *o.*, otocyst; *o.l.*, outer lip; *r.*, renal organ; *r.o.*, renal orifice; *r.pc.d.*, reno-pericardial duct.

FIG. 2.—Mantle-edge in transverse section.

i.f., Inner fold; *m.f.*, middle fold; *o.f.*, outer fold.

FIG. 3.—Posterior end of inner palp and commencement of inner demibranch, showing position of cephalic eye.

c.e., Cephalic eye; f^1., swollen anterior filament of inner demibranch; *i.d.*, inner demibranch; *i.plp.*, inner palp.

FIG. 4.—Transverse section through cephalic eye.

e., Eye; *i.d.*, inner demibranch.

FIGS. 5A, 5B.—Transverse sections at different levels through the lips (Fig. 5A) and palps (Fig. 5B), showing the entry to and position of the labial cæcum.

c.g., Cerebral ganglion; *h.p.*, hepato-pancreas; *i.l.*, inner lip; *i.plp.*, inner palp; *l.c.*, labial cæcum; *m.*, mantle; *o.l.*, outer lip; *o.plp.*, outer palp; *ov.*, ovary.

FIG. 6.—Transverse section through labial cæcum.

i.l., Inner lip; *l.c.*, labial cæcum.

FIG. 7.—Transverse section through the anterior extremity of the sub-branchial epithelial ridge.

ep.r., Epithelial ridge; *i.g.*, attachment of inner demibranch.


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PLATE II.

Figs. 8–9c. *Adacnarca nitens.*

Fig. 8.—Transverse section, showing *c.e.*, cephalic eye ; *i.d.*, inner demibranch ; *ov.* ovum.

Fig. 8a.—Left gill.

d.f.i., Direct filaments of inner demibranch ; *i.d.*, inner demibranch ; *r.f.i.*, reflected filaments of inner demibranch ; *r.f.o.*, ends of reflected filaments of outer demibranch.

Fig. 9a.—Transverse section through renal orifice, showing extension of mantle-cavity between the attachments of the outer and inner demibranchs.

Fig. 9b.—Transverse section through region of transference of attachment of outer demibranch from mantle to body, showing extension of mantle-cavity in body-wall above gill-attachment.

Fig. 9c.—Transverse section through visceral ganglion, showing hinder termination of extension of mantle-cavity.

Figs. 9a–c.—*c.v.c.*, Cerebro-visceral connective ; *ep.r.*, sub-branchial epithelial ridge ; *i.d.*, inner demibranch ; *m.c.*, extension of mantle-cavity ; *o.d.*, outer demibranch ; *r.*, renal organ ; *v.g.*, visceral ganglion.

Figs. 10–12. *Limopsis grandis.*

Fig. 10.—Diagram of the internal anatomy.

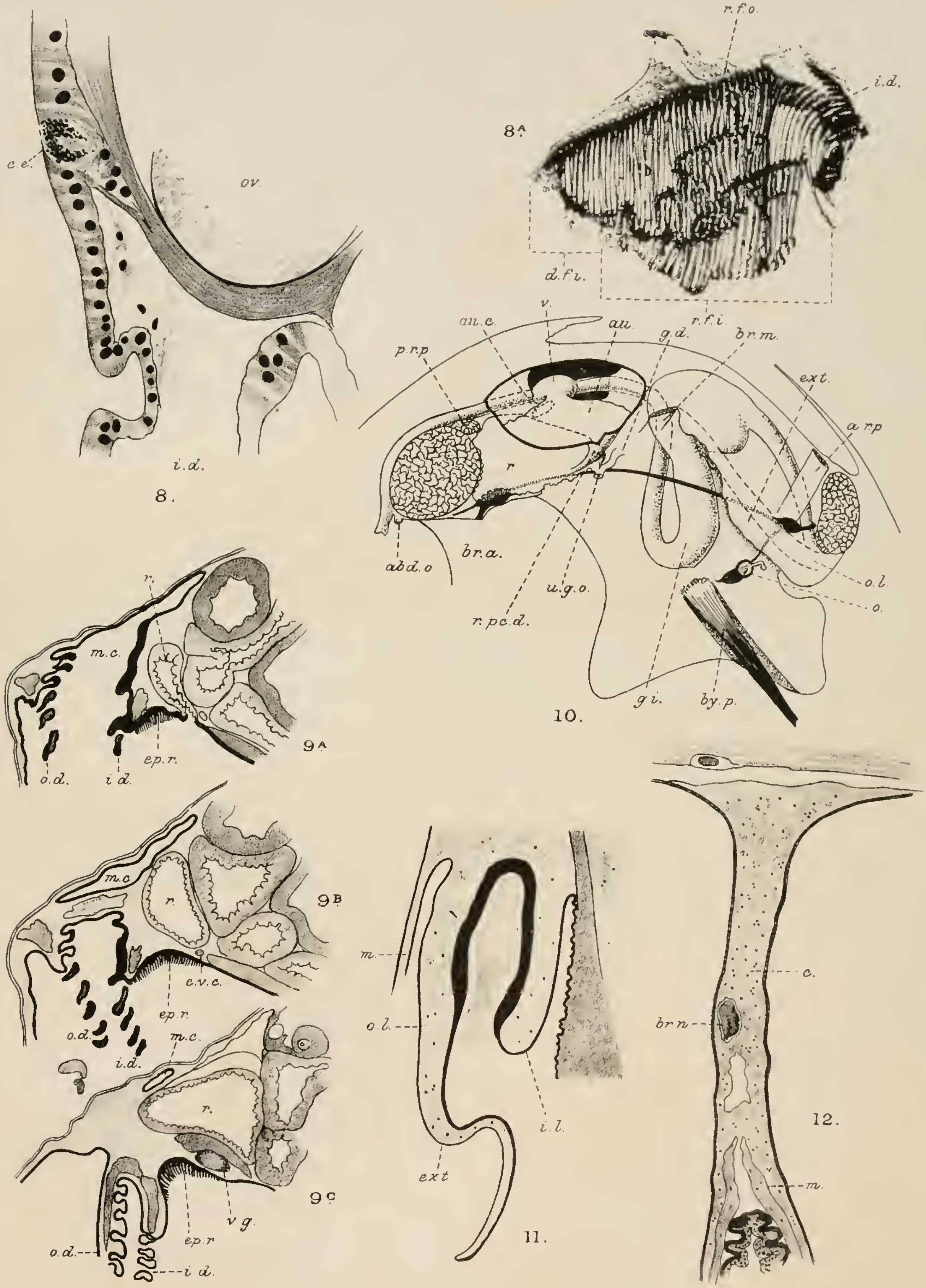
abd.o., Adominal sense-organ ; *a.r.p.*, anterior retractor pedis ; *au.*, auricle ; *au.c.*, auricular communication ; *br.a.*, gill-axis of left side ; *br.m.*, branchial muscle ; *by.p.*, byssal papilla ; *ext.*, curtain-like extension of outer lip ; *g.d.*, genital duct ; *g.i.* gastro-intestine ; *o.*, otocyst ; *o.l.*, outer lip ; *p.r.p.*, posterior retractor pedis ; *r.*, renal organ ; *r.pc.d.*, reno-pericardial duct ; *u.g.o.*, urinogenital orifice ; *v.*, ventricle.

Fig. 11.—Lips in transverse section.

ext., Extension of outer lip ; *i.l.*, inner lip ; *m.*, mantle ; *o.l.* outer lip.

Fig. 12.—Gill-axis in transverse section.

br.n., Branchial nerve ; *c.*, cartilaginoid tissue ; *m.*, branchial muscle.



R.H. Burne del. Huth, London

HIRUDINEA.

BY

W. A. HARDING, M.A., F.L.S.

LITTLE is known of the Hirudinea of the Antarctic and Subantarctic Zones. The leeches collected by the "Terra Nova" Expedition were therefore not likely to be wanting in interest; and in fact, although few in number and representative of but one species, this species proves to be a new one and referable to a new genus of Ichthyobdellidae.

According to information sent with the material this leech is a fish parasite, the seven specimens having been taken at the Winter Quarters, Victoria Land, on two occasions (May 10th and May 16th, 1911), from the gills of fishes of the genus *Trematomus*, probably either *T. hansoni*, or *T. bernacchii*, both of which are widely distributed on the coasts of Antarctica.

I proceed to give a short diagnosis of the new Ichthyobdellid genus together with a description of the new species on which it is founded.

SUB-ORDER RHYNCHOBDELLAE

FAMILY ICHTHYOBDELLIDAE

CRYOBDELLA, gen. nov.

[κρυος, icy cold; βδελλα, leech.]

Small marine leeches parasitic on the gills of fish. Without eyes. Body fusiform, little flattened, smooth. Without pulsating vesicles. "Complete" somite formed of three rings which in the posterior part of the body are sub-divided into six. Last pair of crop caeca partly fused together. Four pairs of testes.

CRYOBDELLA LEVIGATA, sp.n.

Body long, slender and tapering from the slightly swollen middle portion towards either extremity: oval and tending towards the circular in transverse section. The surface is smooth without tubercles or papillae, and the colour, in alcohol, is of a uniform brownish grey, above and below, unrelieved by spots or other special markings.

Anterior sucker small, circular and narrower than half the greatest width of the body. The mouth-opening perforates the upper surface of its interior cup at a point situated about midway between the centre and the somewhat thickened rim.

Posterior sucker large and powerful, slightly oval, centrally attached and broader than the body at its widest part.

There are no eyes and no lateral pulsating vesicles.

A well-marked clitellum is present, its terminal rings being separated from the annuli contiguous to them by exceptionally deep grooves.

There are normally 14 rings between the anterior sucker and the clitellum, but in one individual 15 annuli could be counted, an extra ring apparently having been split off from the anterior sucker.

The clitellum comprises 8 rings and is followed by 39 annuli, each of which is distinctly divided into two by a shallow groove, representing an intermediate stage in ring multiplication not infrequently seen in Hirudinea.

Thus there are, in all, 22 single annuli followed by 39 double ones, behind the anterior sucker.

The anterior half of the 39th (double) ring is the last completely to encircle the body.

In the absence of external metameric features, the ventral ganglia were exposed and the somites plotted out, as seen in Fig. 1, according to the now generally adopted neuromeric standard.

The typical or "complete" somite is composed of three "primary" rings which, as already stated, are sub-divided in the posterior region so that six "secondary" rings can there be counted, a condition similar to that seen in the abdominal "complete" somites of *Calliobdella*. The clitellar somites, as is usual in the Ichthyobdellidae, are modified in response, it would seem, to the comparatively bulky reproductive organs crowded within them, which tend to displace the ventral ganglia involved.

Somite XI contains but two annuli, and the anterior third of Somite XIII (contained within the clitellum) appears to show the final stage in the history of a double ring, the dividing groove, originally shallow, having deepened sufficiently to produce two definitely single rings.

The alimentary tract is shown in Fig. 2. The proboscis is relatively short; the intestine leaves the crop (stomach, thin-walled middle gut) in Somite XIX, tapering gradually to the anus, which opens in the middle of the antepenultimate double ring; and special mention must be made of the last pair of crop diverticula or caeca, which extend posteriorly beneath the intestine throughout nearly the whole of its length.

The extent of fusion, if any, which may exist between these caeca has been regarded by Johansson (1898), in a valuable paper, as of considerable diagnostic importance in the Ichthyobdellidae, and he cites a series of stages ranging from

Abranchus, where the caeca are entirely free, to *Pontobdella*, where the fusion between them is complete and results in a single large caecum. In *C. laevigata* the fusion referred to is not quite complete, the ends of the caeca are free for a short distance and there are indications of another gap between them anteriorly.

The reproductive organs (see Fig. 2) are of fairly simple structure. The large and globular terminal portions of the ejaculatory canals open into a short bursa which ends exteriorly in the male orifice; and a curious feature consists in the reduction of the number of testes to four pairs.

The male genital orifice is situated in the middle of ring 18, that is, in the first ring of Somite XII. The female orifice lies between rings 19 and 20, which form respectively the second and third rings of the same somite. There is no copulatory area of the kind described by Brumpt (1901) in *Piscicola* and *Cystobranchus*, and the female organs bear a general resemblance to the *Glossosiphonid* type.

The coelomic system shows the simplification associated with the absence of lateral pulsating vesicles. As far as could be ascertained, there are no lateral sinuses or segmentally recurring communications between the dorsal and ventral sinuses. A more definite pronouncement would be unwise in view of the limitations of the material.

Of the nephridial system for the same reason, little can be said. No internal openings could be detected and no information could be gathered regarding the type of nephridial network, of which some indications were apparent.

Size. The following measurements were taken from the largest individual in the collection.

Total length 29 mm; greatest width of body 3·5 mm; diameter of anterior sucker 1·5 mm; length of posterior sucker 4·5 mm; width of posterior sucker 4 mm.

Our knowledge of the Ichthyobdellidae is still in an unsatisfactory state.

In this family of Hirudinea perhaps more than in any other, an analysis of the external characters alone has been found to be insufficient for the discrimination of genera, and many of its more delicate members are extraordinarily difficult to preserve with all their diagnostic features intact.

There are a number of Ichthyobdellid genera which have not been fully investigated, and although *Cryobdella laevigata* presents a group of features hitherto undescribed, it is not without hesitation that I have called into being another new genus in which the internal structure has not been completely worked out.

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EXPLANATION OF PLATE.

FIG. 1.—*Cryobdella levigata*, from an example preserved in alcohol, × 3. The body has been twisted so as to show part of the ventral surface anteriorly and part of the dorsal surface posteriorly.

FIG. 2.—Outline drawing of the same, life size.

FIG. 3.—*Cryobdella levigata.* Diagram showing external features and ventral nerve-ganglia. Somites numbered in Roman, and rings in ordinary figures. *an.* Anus. *clit.* Clitellum. *c.oe.g.* Circumoesophageal ganglionic mass. *mth.* Mouth. *p.g.* Posterior ganglionic mass. *v.g.* Ventral ganglion.

FIG. 4.—The same. Diagram showing the reproductive and alimentary systems. *an.* Anus. *cae.* Caeca. *clit.* Clitellum. *cr.* Crop. *ej.c.* Ejaculatory canal. *int.* Intestine. *mth.* Mouth. *ov.* Ovary. *prb.* Proboscis. *te* 1, *te* 4. First and fourth pairs of testes. *tp.* Terminal portion of ejaculatory canal.

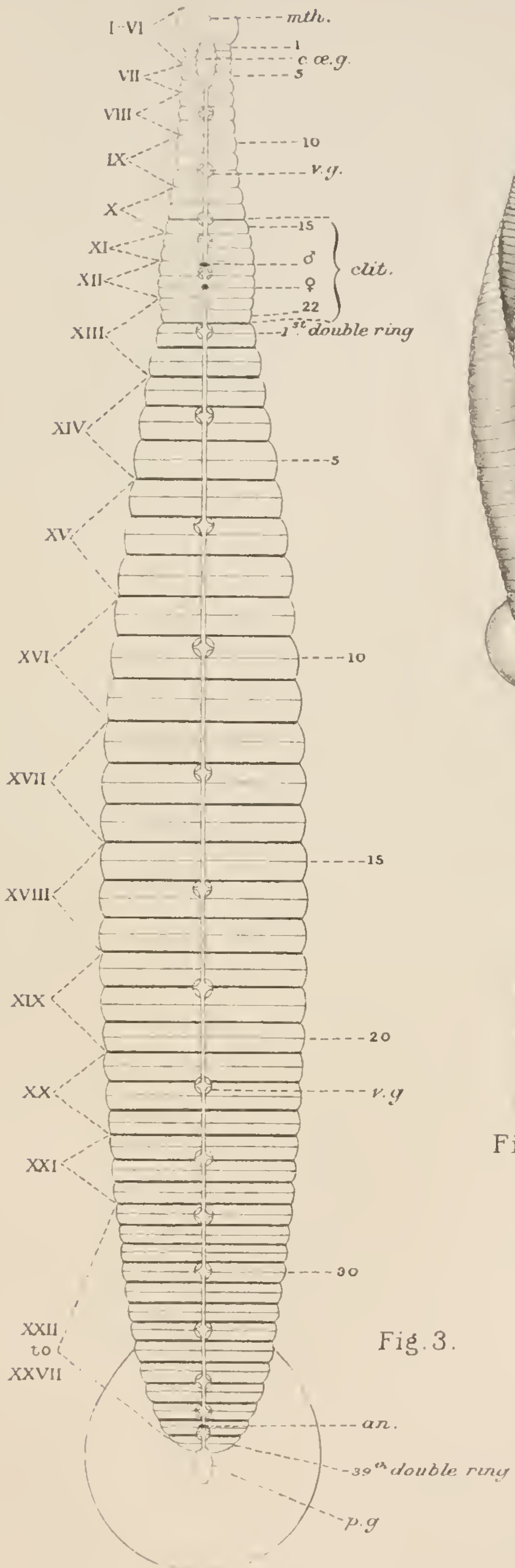


Fig. 3.


Fig. 1.


Fig. 2.

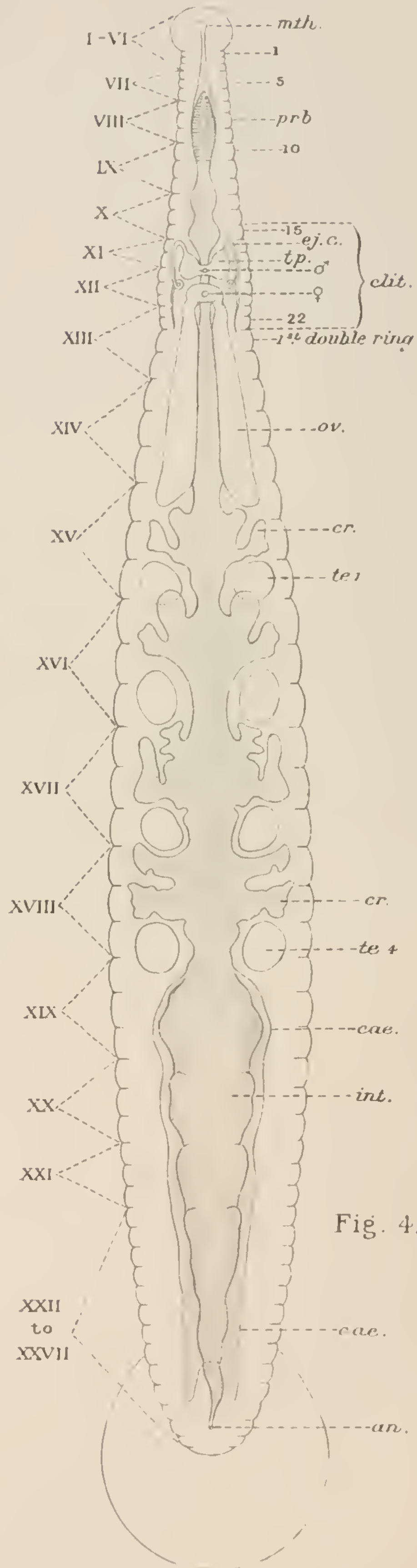


Fig. 4.

CRYOBDELLA LEVIGATA.

PLATE III.

Figs. 13–15. *Philobrya limoides.*

Fig. 13.—Diagram of anatomy.

a.r.p., Anterior retractor pedis ; *au.c.*, auricular communication ; *by.p.*, byssal papilla . *c.e.*, cephalic eye ; *g.o.*, genital orifice ; *l.c.*, labial cæcum ; *p.c.* pericardium ; *p.r.p.*, posterior retractor pedis ; *r.*, renal organ ; *r.o.*, renal orifice ; *r.pc.d.*, reno-pericardial duct.

Fig. 14.—Diagram of mantle-cavity and sub-branchial ridge.

ep.r., Sub-branchial ridge of modified epithelium ; *g.d.*, genital duct ; *m.c.*, extension of mantle-cavity above gill-attachment ; *ov.*, ovum.

Fig. 15.—Cephalic eye.

Figs. 16, 17. *Lima* (*Limatula*) *hodgsoni.*

Fig. 16.—Diagram of general anatomy.

by.g., Byssal groove ; *c.*, curtain of mantle ; *c.g.*, cerebral ganglion ; *g.d.*, genital duct ; *m.*, pallial muscle ; *m.d.*, diverticulum of mantle-cavity above lateral extremity of adductor ; *o.*, otocyst ; *pc.c.*, pericardial communication ; *p.g.*, pedal ganglion ; *p.r.p.*, posterior retractor pedis ; *r.*, renal organ ; *r.c.*, communication between renal organs ; *r.o.*, renal orifice ; *r.pc.d.*, reno-pericardial duct ; *v.*, ventricle ; *v.g.*, visceral ganglion.

Fig. 17.—Diagram of mantle-diverticulum from behind.

a., Anus ; *abd.o.*, abdominal sense-organ ; *add.*, adductor ; *br.a.*, gill-axis ; *c.*, united curtains of mantle ; *m.*, pallial muscle ; *m.d.*, diverticulum of mantle-cavity ; *o.*, opening from general mantle-cavity to diverticulum ; *p.r.p.*, posterior retractor pedis.

Fig. 18. *Venericardia purpurata.*

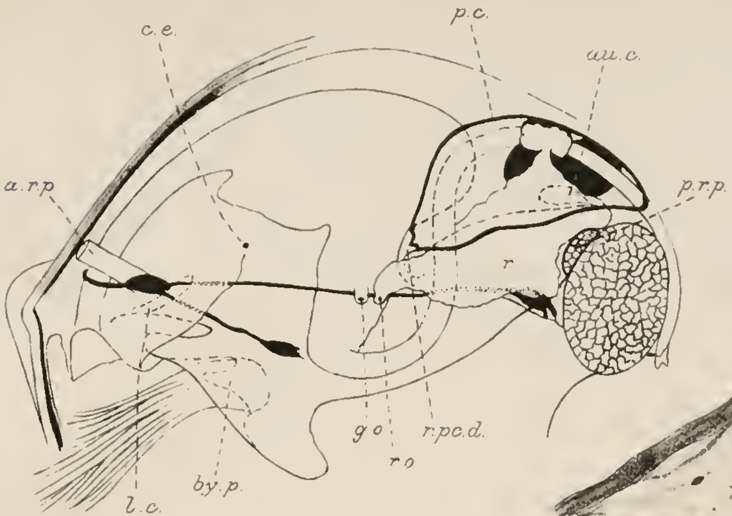
Fig. 18.—Diagram of general anatomy.

by.c., Byssal cleft ; *by.p.*, byssal papilla ; *g.o.*, genital pore ; *ht.*, heart ; *i.p.*, inner palp ; *m.u.*, mantle-union ; *o.*, otocyst ; *p.c.*, pericardium ; *r.*, kidney ; *r.c.*, renal communication ; *r.o.*, renal orifice ; *r.pc.d.*, reno-pericardial duct.

Fig. 19. *Chione* (*Chamelea*) *spissa.*

Fig. 19.—Diagram of general anatomy.

app., Appendage to outer reflected lamina of gill ; *g.o.*, genital orifice ; *h.*, heart ; *k.o.*, Keber's organ ; *o.*, otocyst ; *p.c.*, pericardium ; *r.*, renal organ ; *r.c.*, communication between renal organs ; *r.o.*, renal orifice ; *r.pc.d.*, reno-pericardial duct ; *v.*, siphonal valves.



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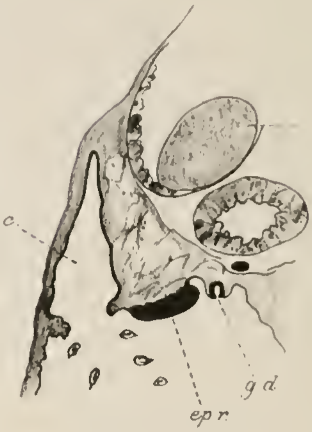

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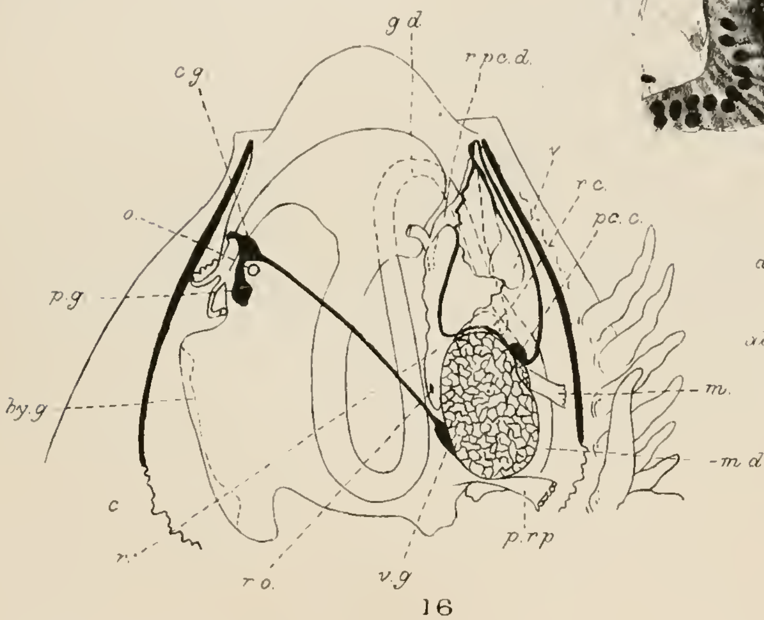

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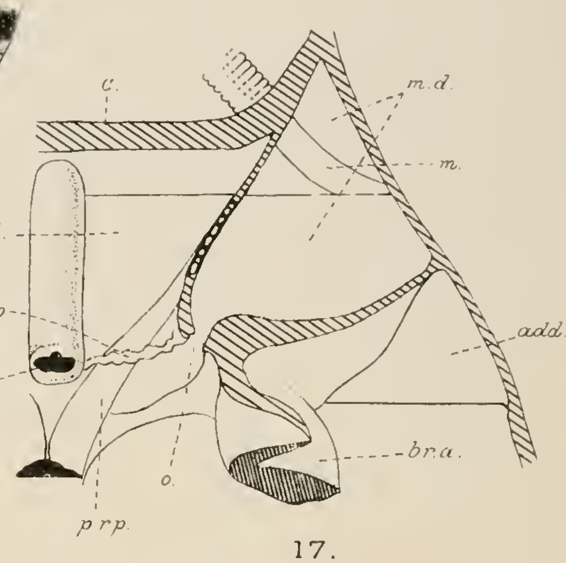

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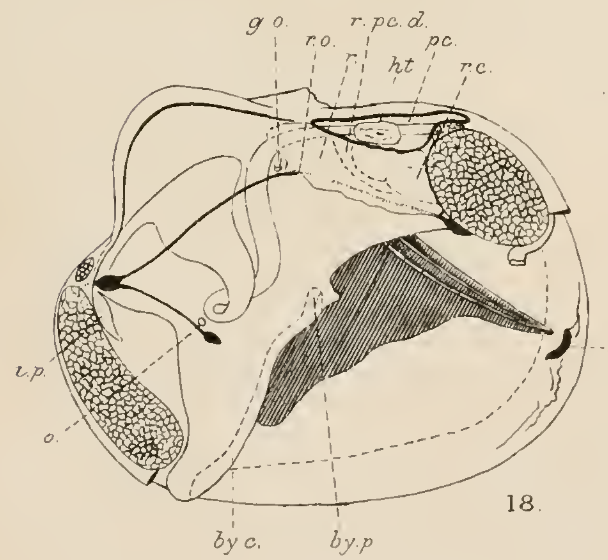

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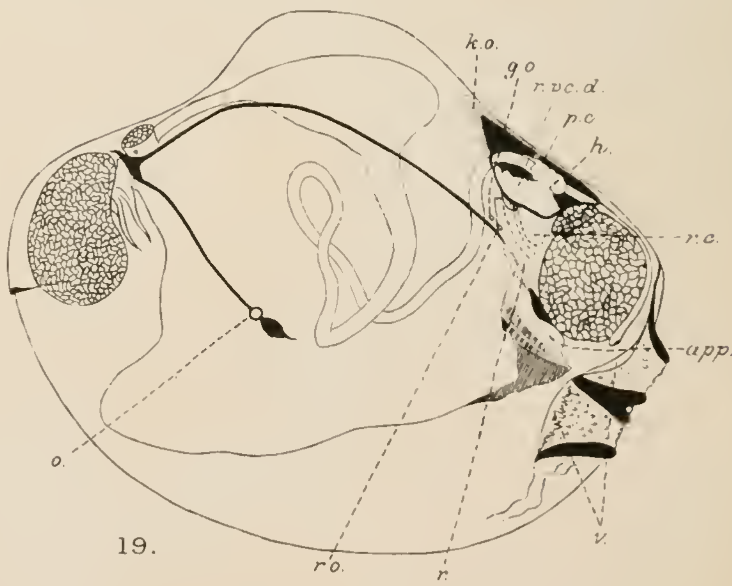

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PLATE IV.

FIGS. 20–23, 25. *Anatina elliptica.*

FIG. 24. *Anatina truncata.*

FIG. 20.—Diagram of the general anatomy of *Anatina elliptica.*

A—B plane of section of Figs. 21, 23. *a.i.d.*, Line of attachment of inner demibranch; *a.o.d.*, line of attachment of outer demibranch; *a.r.p.*, anterior retractor pedis; *b.c.*, byssal cleft; *br.n.*, branchial nerve; *g.a.*, expanded gill-axis; *i.d.*, inner demibranch; *k.o.*, Keber's organ; *o.*, passage between outer demibranch and mantle; *o.d.*, outer demibranch; *p.c.*, pericardium; *p.o.*, pedal orifice; *p.r.p.*, posterior retractor pedis; *r.*, kidney; *r.c.*, renal communication; *r.p.*, proximal arm of kidney; *r.pc.d.*, reno-pericardial duct; *s.s.*, siphonal septum; *u.g.c.*, mouth of urinogenital canal.

FIG. 21.—Diagram of urinogenital canal and genital and urinary ducts, from ventral (posterior) aspect (plane of section shown in Fig. 20, A—B; lettering as in Fig. 23).

FIG. 22.—Diagram of urinogenital canal and genital and urinary ducts, postero-dorsal aspect (lettering as in Fig. 23).

FIGS. 23A, B, C.—Sections in plane A—B, Fig. 20, through the mouth of the male duct (A), through the renal orifice and oviduct (B), and through the urinogenital canal (C).

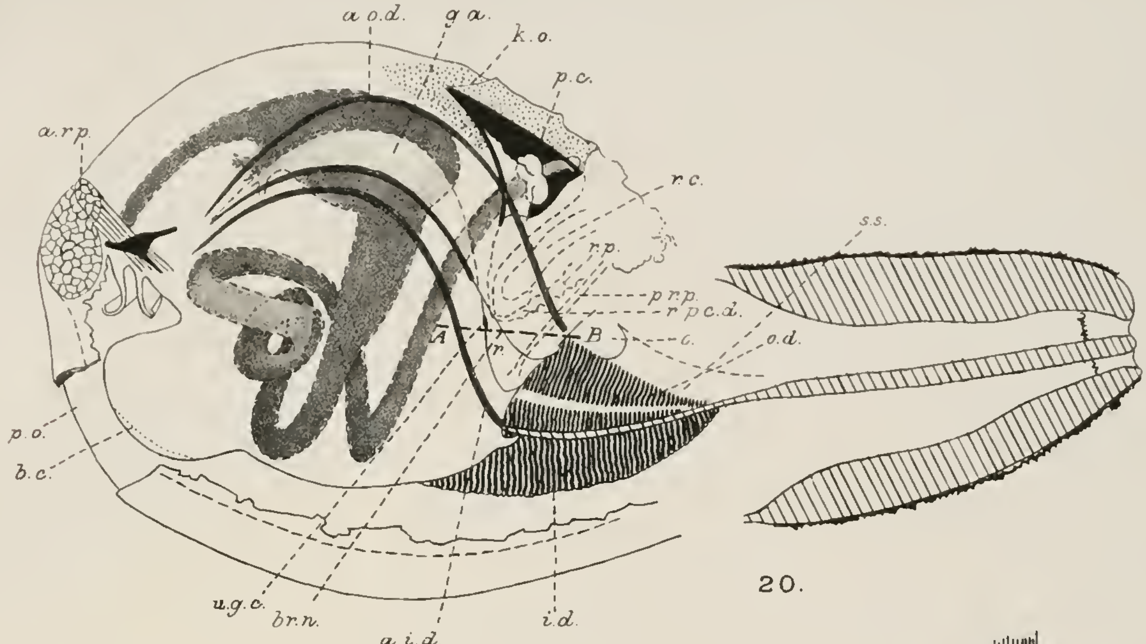
br.n., Branchial nerve; *c.v.c.*, cerebro-visceral connective; *m.d.*, male duct; *o.*, ovum; *o.d.*, oviduct; *r.*, distal arm of kidney; *r.l.*, attachment of reflected lamina; *r.o.*, renal orifice; *u.g.c.*, urinogenital canal.

FIG. 24.—Diagram of genital and urinary ducts of *Anatina truncata* from above (compare Fig. 22).

c.v.c., Cerebro-visceral connective; *m.d.*, male duct; *o.d.*, oviduct; *ov.*, ovary; *p.c.*, posterior horn of pericardium; *r.*, distal arm of kidney; *r.d.*, renal duct; *r.pc.d.*, reno-pericardial duct; *u.g.c.*, urinogenital canal.

FIG. 25.—Diagram of gill and gill-axis, in transverse section, of *Anatina elliptica.*

g.a., Expanded gill-axis; *i.d.*, inner demibranch; *o.d.*, outer demibranch; *sp.c.*, suprabranchial chamber.



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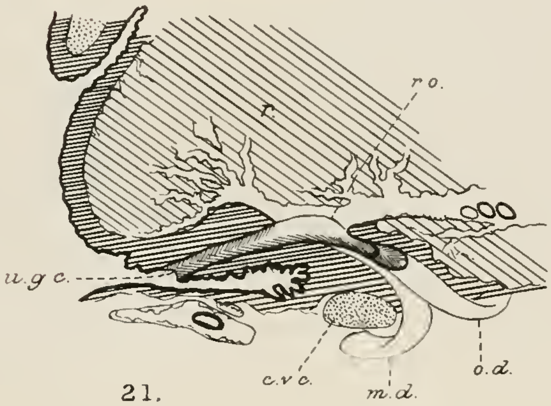

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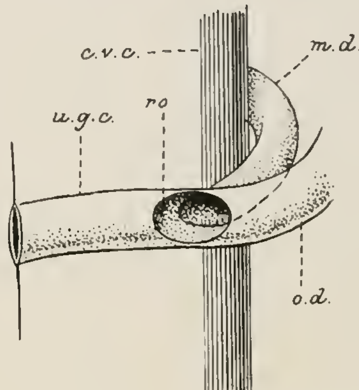

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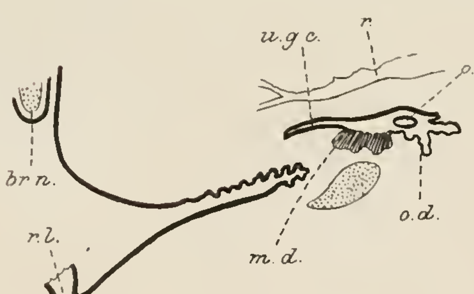

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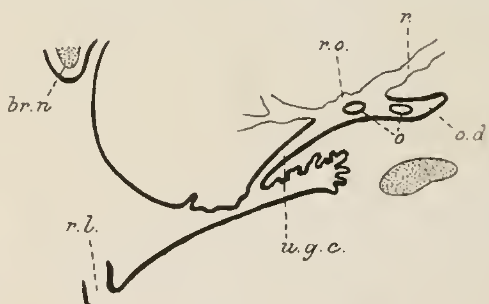

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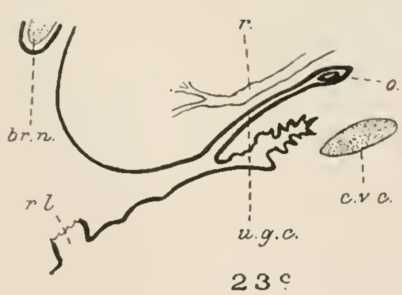

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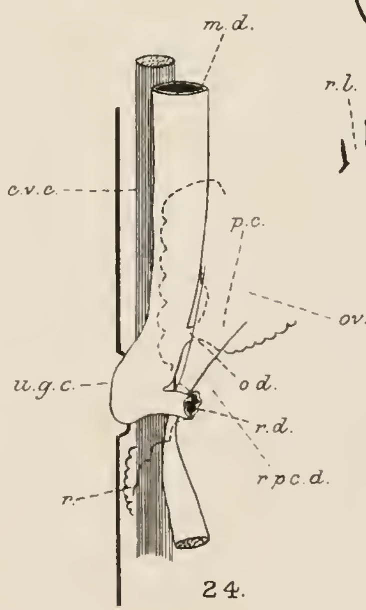

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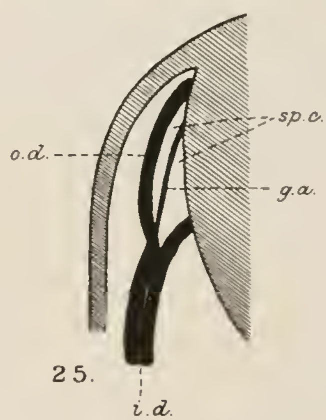

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