1915

Commonwealth of Australia

Department of Trade and
Customs

FISHERIES

Zoological Results of the Fishing Experiments
carried on by the F.I.S. "Endeavour," 1909-14.

H. C. Dannevig,
Commonwealth Director of Fisheries

VOL. III.

Published by Direction of the Minister for Trade
and Customs, Hon. Frank Gwynne Tudor

Sydney, 1915

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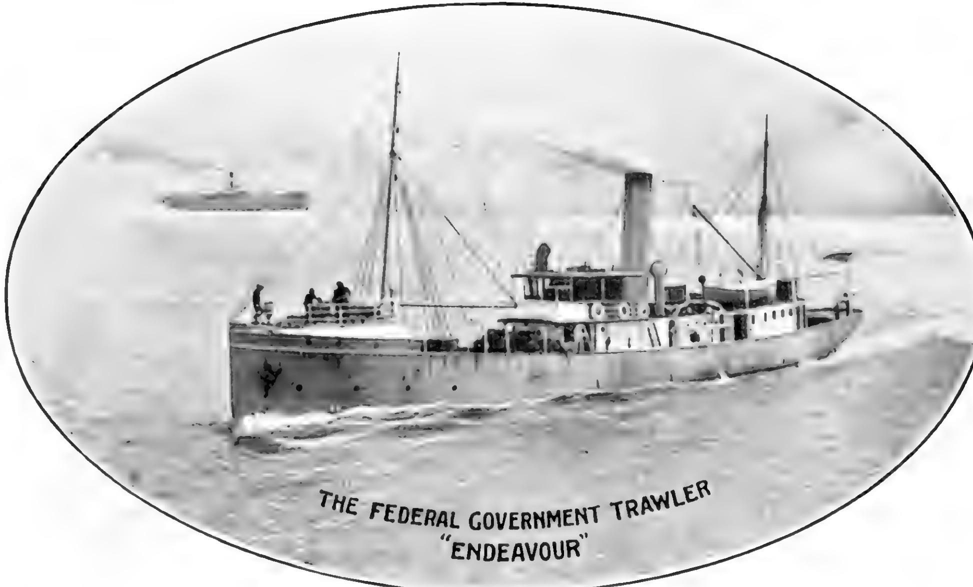

THE FEDERAL GOVERNMENT TRAWLER
"ENDEAVOUR"

"There is on the lone, lone sea
  A spot unmarked, but holy,
For there the gallant and the free
  In their ocean bed lie lowly."—*Anonymous.*

In Memoriam

"Had I been any god of power, I would
Have sunk the sea within the earth or ere
It should the good ship so have swallow'd and
The fraughting souls within her."—*The Tempest.*

H. C. DANNEVIG, DIRECTOR ;

G. W. C. PIM, MASTER ;

C. T. HARRISSON, BIOLOGIST ;

And eighteen others, comprising the crew of the F.I.S. "Endeavour," who were lost at sea in December, 1914.

The pages of this Part are numbered in Roman numerals to enable the reader to insert the letterpress in any position in Vol. III. he may think fit.

HARALD CHRISTIAN DANNEVIG,

DIRECTOR,

and the Work and Loss of the F.I.S. "Endeavour."

"There dwells a wife by the Northern Gate,
And a wealthy wife is she;
She breeds a breed o' rovin' men
And casts them oversea."—*Kipling.*

On 20th November, 1914, the Fisheries Investigation ship left Hobart for Macquarie Island. She arrived there on 1st December, and, after a delay of two days occasioned by bad weather, fulfilled her mission of relieving an operator at the Wireless Station. She started on her return journey on 3rd December.

A brief view by the solitary officers stationed at the island of the staunch little ship as she disappeared into the sea mists, a terrific gale two days later, and that, perhaps, is all we shall ever know of the end of our friend, Harald Dannevig, who, in his knowledge of the mysteries of the sea knew no superior; of Captain Pim, a capable navigator, whose previous career in tropical seas knew every resource of defence from storm or danger; and of a good and true ship's company. The sea has taken toll, and the "Endeavour's" work is finished.

In years to come that work will be appreciated at its proper value. No more capable man could have been chosen to direct it than Harald Christian Dannevig, who combined a knowledge of the habits and of the life of fish, acquired from childhood, with the enthusiasm of one who loved his profession and lived almost solely for it. Out in all weather, in storm and sunshine, when he could have readily directed the work from a comfortable office on shore, his one thought and ambition was to succeed in bringing home to the many doubting minds in Australia that there is a rich reserve of food supply in the fisheries of our coast, simply waiting to be harvested.

From the coast of Queensland to those of Western Australia a great portion of the sea-bed has been explored, and extensive areas suitable for trawling and rich in food fishes have been surveyed and charted. There is no monopoly of the sea-bed; there are no fences. It waits for enterprise and industry; and with care and reasonably good management must yield profit to the harvester and, what is of greater concern to our people, a certain and abundant cheap supply of fish food. That was the objective of the "Endeavour's" work during the brief period of her existence—less than six years—and the foundations have been laid for what in time will prove to be a flourishing and permanent industry.

Harald Christian Dannevig was born at "Flodevig Hiso," an island owned by his father, on one of the fiords of Norway, near Arendal. His father, Gunnar Mathias Dannevig, was the first to introduce fish culture into Norway, and the Norwegian Government established the first fish hatchery on his island. Harald Dannevig was thirteen years old at the time, and he thus became familiar with the work from childhood. He studied at the Christiania University under the eminent Professor G. O. Sars, and chose those subjects most likely to be of practical value in the work of fish culture and acclimatisation. In 1894 he was selected by the Fisheries Board of Scotland to supervise the completion of the Marine Hatcheries at Dunbar, and later on he selected the new site at Aberdeen, designed the new plant, and constructed the tidal spawning pond. In 1895 he was consulted by the Lancashire Fisheries Board, and again designed the necessary plant, and in the same year visited Italy for a similar purpose at the invitation of the authorities.

Still engaged in the service of the Fisheries Board of Scotland, he spent a considerable portion of his time at sea on fishing vessels and trawlers, investigating the various methods of capture and the habits of fish life. In 1902 the Agent-General for New South Wales was requested to consult the best authorities and obtain, as far as possible, the most competent fisheries expert available. Harald Dannevig was recommended and appointed.

On his journey to Australia Mr. Dannevig conducted, with unqualified success, an experiment which until then was unexampled. He fitted in the between decks of an Orient mail steamer two tanks in which he succeeded in bringing to Sydney from England several hundred live adult plaice, turbot, and other fish. He secured sufficient fish food before leaving, which he kept in the freezing room of the ship. Sleeping alongside the tanks he regulated, as far as practicable, the temperature, and kept his charges under continual observation. On arrival in Sydney the fish ponds provided were found to be ill-constructed and unsuitable; a heat wave occurred soon afterwards, and it became necessary to release the fish in the deeper and freer waters of the sea. That incident was characteristic of the man—patient and thorough, with only one thought, his work.

He designed and constructed the Fish Hatchery at Gunnamatta Bay, Port Hacking, New South Wales. In 1906 he succeeded in transferring from Hobart to the Hatchery 2,000 adult flounders, from which he hatched and liberated 20,000,000 fry. He conducted a later similar experiment with greater results.

Amongst the more important original works which, in addition to his work on the "Endeavour," will prove an enduring record of his valuable services, may be mentioned investigation in regard to the reproduction of food fishes; where fish eggs are deposited; the natural dangers and troubles of fish life; periodicity in the abundance of fish and its causes (a paper on which he read before the Royal Society); fresh water fish culture in New South Wales; the habits and migrations of the Mullet; the life history of the Cray Fish, together with many other interesting and useful features associated with the history of fish life.

Harald Dannevig was an interesting man personally, as well as in regard to his particular work. Kind hearted, of splendid physique, he will be sadly missed by those who knew him. To the Government he has rendered good service. There was no necessity for him to visit Macquarie Island. The vessel was engaged in work apart from her ordinary responsibilities. He was, however, above all, a courageous man. Scenting danger, he thought his proper place was with his crew on board the ship. He went and died in what he conceived to be the performance of his duty. He leaves, mourning, a widow, a daughter of sixteen, and a son of five years of age.

Captain George Pim was in command of the "Endeavour" from 9th October, 1911, and she never had a more capable master. He had held a command since he was 22 years of age without an accident of any kind. He had considerable experience of the Pearl Shell and Beche-de-mer Fisheries in Torres Straits and Northern Australia, and for some time had sole charge of a number of vessels engaged in the pearling industry. He was a member of the Scientific Expedition to New Guinea in 1905 of Major Cooke Daniels, who wrote:—"I count myself lucky to have found so good a skipper. Your loyalty to my interests, which were those of the whole expedition, and your enthusiasm of helpfulness, earned the reward of a very great deal of work. Topography, Hydrography, Technology and general Ethnography, you did them all more than well. So on the side of actual work you did not only all you ought to have done as the master of the "Kori," but all you could do as a man of many capabilities in many directions." High but deserved praise for a quiet, modest, capable man ; and it is comforting to know, whatever happened to the "Endeavour" two good men were in charge, and no accident which could possibly have been avoided by those on board contributed to the disaster. Some unforeseen disaster overwhelmed the ship and her crew.

Captain Pim has left a widow to mourn her sad loss.

There are sorrowing hearts for others who were on board the "Endeavour," and these equally claim our sympathy for their loss, and a kindly memory for those for whom they grieve.

The names of those on board were :—

Director of Fisheries	Harald Christian Dannevig
Master	George William Charles Pim
Mate	Joseph Reynoldson Burkitt
Biologist	Charles Turnbull Harrisson
Second Mate & Chief Fisherman	Alfred Ackers
Fisherman	Herbert A. Farrant
,, ...	L. Olsen
,, ...	George Cooper
,, ...	Harold E. Samson
Chief Engineer	Angus Ross Mackay
Second ,, ...	Stanley Ditcham
Third ,, ...	Richard Charles Hoe
Fireman	Alfred Holmes
,, ...	Nils Rasmussen
,, ...	J. Byrne
Ordinary Seaman	Thomas Rice
,, ,, ...	J. W. Jackson
Chief Cook and Steward ..	A. Wythe
Assistant Cook	Harry Kitching
Messroom Boy	Thomas Scott
Clerk, Meteorological Bureau	Harold Power.

They now rest in the depths of the sea, the mysteries of which they had been seeking to understand.

May they rest in peace !

N. LOCKYER.

GEORGE WILLIAM CHARLES PIM,

MASTER MARINER.

"And now the storm-blast came, and he
Was tyrannous and strong:
He struck with his o'ertaking wings,
And chased us south along."—*Coleridge.*

CAPTAIN G. W. C. PIM was born at Gloucester, England, on 9th March, 1866, the son of Mr. John Robert Pim, a gentleman of means. He came of a well-known nautical family, the eldest son in every instance having been in the Royal Navy, a practice extending backwards for upwards of two hundred years. The subject of this notice was the first who, although he had been entered as a Naval cadet, was in consequence of unforeseen causes unable to continue a naval career.

The family of Pim, or Pym, as originally written, has left its mark in British history. There is reason to believe that Captain Pim is a lineally descended kinsman of the celebrated English parliamentarian, John Pym, who, with John Hampden, equally eminent in the same direction, was one of the "five members" impeached by Charles I. in 1642. The name appears to have originally been Pym, but in the reign of James I. some of the younger and gayer members, it is said, became courtiers, but this step not meeting with the approbation of the older Quakers, the latter expressed their resentment by changing the family name to Pim.

The name is well known in naval history. From 1798 to 1810 one Lieutenant Samuel Pym (subsequently Captain and finally Admiral Sir Samuel Pym) did great service in the Anglo-French naval fights in the West Indies. His most important commands appear to have been the 74-gun ship "Atlas," and the frigate "Sirius." In recent years the best known naval member of the family was Admiral Bedford Clapperton Pim (grand-uncle to Captain Pim), who was born at Bideford in Devonshire in 1826. He took part, amongst other achievements, in the Franklin Search Expedition to the Arctic regions under Sir E. Belcher, in 1852.

After severing his connection with the naval training ship, George Pim, to use a colloquial phrase, "went to sea" about 1881, serving in various capacities in at least three sea-going vessels until 1886, when, being then in Queensland, he entered the Lighthouse service and was attached to the Proudfoot Lightship on the Proudfoot Shoal, Torres Strait. After some months of this monotonous life Pim transferred to the Moreton Bay Pilot service. Henceforth tired of subordinate positions, he struck out for himself, and either alone or in partnership occupied himself for some years in "sandalwood getting" on the Queensland coast; then migrating to Thursday Island he entered the "beche-de-mer" trade, and to some slight extent that of "pearl shelling" also. He successively owned, or part owned (it is uncertain which), and commanded, when not more than twenty-three years of age, in 1888 the "Violet," a cutter of nine tons; in 1889, the "Alice" and the "P.C.E." respectively, a lugger of ten and a cutter of nineteen tons; and finally the "Whaup," a ketch of thirty-four tons. In this last venture Captain Pim was in partnership with a Mr. Luff, of Thursday Island.

In these several voyages the subject of our notice made money, which was spent in scientific research in New Guinea and North Queensland. Towards the end of 1903 Mr. Pim was in Sydney with the view of obtaining a certificate; he passed as "only mate" for fore-and-aft vessels on 11th February, 1904.

Towards the end of 1903 there arrived in Sydney Major W. Cooke Daniels, of the United States Army, who had been Adjutant-General of Division in the Cuban campaign, accompanied by certain scientific friends. It was his purpose to carry out anthropological and ethnological researches in South-east New Guinea. For this purpose a schooner-yacht of 67 tons, called the "Kori," with auxiliary steam power and a sea-going steam launch was brought from England. Mr. Pim was appointed master, and the expedition left Sydney in April, 1904. During the cruise he did excellent work by surveying and charting Tokunu, or Alcester Island, in the Trobriand Group, and Gawa Island, in the Marshall Bennett Group. He also furnished a description of Kwaiawata Island, in the same group, and this, with the above charts, appeared in the "Geographical Journal" for April, 1906, as portion of a paper by Drs. C. G. Saligmann and W. M. Strong, members of the expedition, the former of whom expressed his thanks to Captain Pim for the latter's excellent services.

After navigating the "Kori" to Singapore on the break up of the expedition Mr. Pim, in 1906, became connected for a time with the Celebes Trading Company at the Aru Islands.

Mr. Pim was appointed master of the "Endeavour" on the 9th October, 1911, and so remained until disaster brought about the untimely death of himself and companions, somewhere between Macquarie Island and either New Zealand or Tasmania.

He is described as an indefatigable worker, a careful navigator, and ever on the watch for trouble when the "Endeavour" was at work. The nature of her investigations called for much marine surveying and hydrographic work for the charting of rocks and other irregularities ; these duties had often to be carried out by Captain Pim under the most trying circumstances. The investigation of new areas called for unremitting care and attention, and he was to be seen in all parts of the ship watching the trawl-warps and controlling the soundings, etc., whilst at the same time keeping a sharp eye on the navigation. When Mr. Dannevig was not on board the whole responsibility of the trawling operations and scientific work fell upon Captain Pim's shoulders. The difficulties of working with comparatively so small a vessel in exposed areas made his task a very difficult one. He was a keen collector, with a sharp eye for anything unusual, and many interesting and new organisms in the "Endeavour's" collections were personally secured and preserved by him. Whilst master of the "Endeavour" Captain Pim, in 1913, conveyed Captain Brewis, R.N., who was engaged in reporting upon the lighthouses around Australia, from Fremantle to Busselton in Western Australia.

Captain Pim was a man of indomitable resolution, keen and persevering in his professional duties, quiet and rather reserved in demeanour, but, beneath all, of a kind and sympathetic nature. His end, and those of his companions, was, alas, only another exemplification of the fate of many "that go down to the sea in ships—that do business in great waters."

R. ETHERIDGE.

CHARLES TURNBULL HARRISSON,

BIOLOGIST.

"We bring no store of ingots,
Of spice or precious stones,
But that we have we gathered
With sweat and aching bones."—*Kipling*.

THE zoological knowledge of Charles T. Harrisson was gathered not in a laboratory nor from lectures, but under the open sky, from beach, mountain and forest. This type of pioneer, to whom Biology owes so much, seems more and more rarely bred under modern conditions. Yet there is work to be done on the frontiers of science that none do so well as that self-taught, self-reliant, keen free-lance—the field naturalist.

He belonged to a family long settled in Tasmania, which, like the Atkinsons and the Hulls, were mostly naturalists, and to whom such scientific leaders of the last generation as Tate and Tenison Woods expressed their indebtedness.

Charles was the eldest son of Frank Harrisson, who had an extensive orchard on the Brown River Road, south of Hobart, and for some years was a near neighbour of Lieut. C. E. Beddome, the well-known Conchologist. The second son, Ernest Harrisson, was also a keen and successful collector. The brothers were smart yachtsmen, and explored with the dredge a wide area of the Derwent Estuary and D'Entrecasteaux Channel. As far back as 1882, Beddome dedicated *Cemori harrissoni* and *Alexia harrissoni* to Mr. Charles Harrisson "one of my fellow workers."

Ornithology was one of the first subjects to interest him, and he formed a large collection of Tasmanian birds and their eggs.

On the death of the parents, the home broke up, and Harrisson tried various occupations without much success. For a time he had a dairy farm at Long Bay. Then he set up a studio in Melbourne, but though a clever artist, with especial ability in landscapes, he failed to obtain sufficient recognition.

A small post in the Government service at Hobart was then offered him, in which position he lived pleasantly for several years, and during the tenure of which he married and had a son. The local Scientific Society found in him a zealous and active member. With success he entered on the study of Tasmanian Crustacea. So that when Sir Douglas

Mawson required a good all-round collector for his Antarctic expedition, the services of Mr. Harrisson were recommended, and he was enrolled.

The position of Naturalist to the Western Party, under Mr. F. Wild, was allotted to him. Opportunities for zoological collecting were scarce, but what could be done was done. Ever cheerful, ever helpful, he was a comrade whose energy and good temper were proof against starvation and such miseries as Antarctic explorers endure. In the "Home of the Blizzard," Wild writes, "many of the gusts must have exceeded one hundred miles per hour, since one of them lifted Harrisson, who was standing beside me, clean over my head and threw him nearly twenty feet." A number of Harrisson's coloured drawings of Antarctic scenery embellish Mawson's book.

A shipmate on the "Aurora" (Mr. J. H. Collinson Close) has supplied the following information:—"Mr. C. T. Harrisson was deeply respected and liked by us all. He impressed one, on my first acquaintance, as being one whom the Expedition Leader and we, his comrades, would ill have afforded to dispense with. Usually preoccupied in thought, and of earnest, serious manner, his slow, deliberate conversation was listened to attentively by the most thoughtful among us. Whether it was heaving on the 'Noah's Ark' windlass to weigh anchor, turning out in the 'wee sma' hours of a dirty morning to haul—in bitter icy gale—on frozen topsail-halliards and weather braces, or taking a trick at the wheel, manning a boat in a 'jobbly' sea or shovelling coal in the stoke-hole, Harrisson was ever to the fore. Harrisson's sledging exploits around the 'Second Base' of the Expedition need no comment here, beyond remarking that he did as much—if not more—sledging than anybody else in the party, or indeed in the Expedition, with the exception of our courageous leader, Sir D. Mawson, and his own Base-leader, Mr. Frank Wild.

"His artistic work with brush, crayon and pastel excited universal admiration. The first icebergs we encountered, steaming south, he transferred to canvas, sketching with remarkable fidelity and rapidity the various shaded azure tints of the crevassed ice, and snow mantles of virgin white enshrouding the bergs. Harrisson was always ready to impart useful information from knowledge born of his years of practical training and experience, to any caring to avail themselves of the opportunity. In view of his many admirable talents, and the circumstances that he was, in all things, a shining example to younger men, his presence on such an expedition was invaluable. The news of his loss with the ill-fated 'Endeavour' throws an indescribable sadness over his comrades of other days, and it is safe to say the hearts of all beat with the deepest sympathy for his dear ones left to mourn his loss."

On his return from the Antarctic he was appointed by the Federal Government Biologist to the Fisheries Bureau. In this capacity his work was admirable, large collections were sorted out, and despatched with a skill and neatness much appreciated by those whose duty it was to deal with them at a later stage. As an expression of this appreciation a new shark has been called by Mr. McCulloch *Centrophorus harrissoni*. In the interests of Australian Marine Biology it was hoped that he would long continue such excellent work. When he embarked on the last cruise of the "Endeavour" he had reached the age of forty-seven.

Mr. W. L. May, a life-long neighbour, writes :—"He was a man of most courteous and pleasant manner, and his loss will be deplored by a large circle of friends, of whom I am one."

C. HEDLEY.

1915

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Department of Trade and
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FISHERIES

Biological Results of the Fishing Experiments carried on by the F.I.S. "Endeavour," 1909-14.

H. C. Dannevig,
Commonwealth Director of Fisheries.

VOL. III., PART 1.

Published by Direction of the Minister for Trade and Customs, Hon. Frank Gwynne Tudor

Sydney, 9th January, 1915

W. E. Smith Ltd., Bridge Street, Sydney.

I. Report on the Foraminifera and Ostracoda obtained by the F.I.S. "Endeavour" from the east coast of Tasmania, and off Cape Wiles, South Australia.

BY

FREDERICK CHAPMAN, A.L.S., F.R.M.S.

Palæontologist to the National Museum, Melbourne.

Plates I.-III.

REPORT ON THE FORAMINIFERA AND OSTRACODA.

I.—Introduction.

In 1912, I dealt[1] with a sample of Globigerina ooze taken from 1122 fathoms off the eastern coast of Tasmania. In some respects this was a preliminary report, and the results, together with notes on the new and rare species, are included here, in conjunction with descriptions of further samples from the same trawling expeditions.

Three additional samples of soundings have been examined and their tabulated results are as follows :—

Date.—13th July, 1909 ; station 35.

Position.—East of Tasmania Lat. 42° 17′ S., Long. 148° 35′ E.

Depth.—377 fathoms (bottom sample).

Details.—Globigerina ooze. Colour a pale cream. Consisting almost entirely of the tests of *Globigerina* and *Pulvinulina.* In the finer washings numerous stellate, calcareous spicules of Ascidians were noticed. The quantity of material being small, the percentage of carbonate of lime was not estimated, but would be very high. No Ostracoda were seen in this sample.

Date.—13th July, 1909. Station, 36.

Position.—East of Tasmania. Lat. 42° 17′ S., Long. 148° 41′ E.

Depth.—777 fathoms.

Details.—Globigerina ooze. Colour a pale cream.

CARBONATE OF LIME.

Percentage.	Foraminifera.	Other Organisms.
76.7	Chiefly *Globigerina* and *Pulvinulina.* Amongst the more interesting genera are *Ophthalmidium, Sigmoïlina, Hyperammina, Brachysiphon, Rhabdogonium, Spirillina* and *Patellina.*	Echinoid spines and test-fragments abundant ; Ostracoda abundant, many new and interesting species being present ; fish otoliths frequent ; also a few Mollusca including Pteropods (*Styliola*).

1. Chapman, Zool. Res. "Endeavour," I., pt. 3, 1912, p. 309.

RESIDUE.

Percentage.	Siliceous Organisms.	Fine Washings.
23.3	Sponge spicules; also arenaceous foraminifera.	Fine terrigenous particles; fragments of sponge spicules; echinoid spines; shell fragments, and minute foraminifera.

Date.—9th August, 1909.

Position.—Forty miles south of Cape Wiles, South Australia. Lat. 35° 35′ S., Long. 135° 15′ E.

Depth.—100 fathoms.

Details.—Polyzoal and Foraminiferal sand. Colour a pale yellow, with a brownish tinge.

CARBONATE OF LIME.

Percentage.	Foraminifera.	Other Organisms.
99.6	Chiefly Miliolines, Uvigerines and Textularids.	Polyzoa abundant, chiefly small and slender forms. Ostracoda fairly common. Alcyonarian joints and spicules present.

RESIDUE.

Percentage.	Siliceous Organisms.	Fine Washings.
.4	Tetractinellid sponge spicules; arenaceous foraminifera.	Fine white and sharp quartz sand.

General Note on the above samples.—The present soundings are taken from new ground so far as the microzoa are concerned. That from off Cape Wiles is the only locality which was approached by the "Challenger," but even that (Station 160, 2600 fathoms) was situated much farther south and in deeper water. It is not surprising, therefore, that so many points of interest arise from an examination of the present material dredged by the "Endeavour."

II.—List of Foraminifera with Descriptions and Notes of New and Rare Species.

References to authors of species are here given only when especially needed. Those omitted may be found in such works as H. B. Brady's "Report on the Foraminifera of the 'Challenger,'" 1884; in Dr. J. Flint, "Report United States National Museum" for 1897; and in the report by the present writer on the "Foraminifera of the Subantarctic Islands of New Zealand," 1909.

Family MILIOLIDÆ.

Sub-Family MILIOLININÆ.

Genus Biloculina, *d'Orbigny.*

Biloculina bradii, *Schlumberger.*

Biloculina bradii, Schlumberger, Mém. Soc. Zool. France, iv., 1891, p. 557, pl. x., figs. 63-71, woodcuts, 15-19. *B. bradii* (Schlumberger) Chapman, Sub-antarctic Islands of N.Z., Rep. on the Foram., ii., 1909, Art. xv., p. 314, pl. xiii., fig. 1.

This species has a wide distribution, occurring in the Atlantic as well as in New Zealand waters. It is also an Oligocene fossil at Balcombe Bay, in which series (Balcombian) a strong component of our living foraminiferal fauna had already been established.

Forty miles south of Cape Wiles; 100 fathoms. One specimen.

Biloculina depressa, *d'Orbigny.*

A cosmopolitan species. Recorded by the writer from shallow water at Shoreham, Victoria. Also occurring as a fossil in Victoria, as old as the Balcombian Series (Altona Bay bores and Grice's Creek).

Station 36, east of Tasmania, 777 fathoms. Small, but common.

Biloculina depressa, *d'Orb.*, var. murrhyna, *Schwager.*

This is an essentially deep-water form. It has been recorded by the writer from Funafuti in depths varying from 1050 to 2715 fathoms.

East of Tasmania, 1122 fathoms. Rather minute, frequent.

Biloculina elongata, *d'Orbigny.*

This species in temperate seas frequents shallow water, and deepens its habitat in more tropical areas. It has been recorded fossil from the Victorian Balcombian Series, and where found may indicate that deposit to be of moderately deep-water origin, since the climatic condition was warmer than at present.

Station 36, east of Tasmania, 777 fathoms. One specimen.

Biloculina irregularis, *d'Orbigny.*

B. irregularis is a fairly deep-water species, and is generally distributed in the Southern Hemisphere. It has, however, been recorded from the North Atlantic, off Palma, Canary Islands.

Station 36, east of Tasmania, 777 fathoms. Frequent. Of variable size.

Forty miles south of Cape Wiles, 100 fathoms. Common.

Biloculina lucernula, *Schwager.*

Station 36, east of Tasmania, 777 fathoms. Common. Specimens small, but otherwise typical.

Biloculina sarsi, *Schlumberger.*

Biloculina sarsi, Schlumberger, Mém. Soc. Zool. France, iv., 1891, p. 553, pl. ix., figs. 55-59; woodcuts, 10-12. Chapman, Jour. Linn. Soc., Zool., 1907, xxx., p. 14, pl. i., figs. 1, 2.

This species has been dredged from the North Sea and from around the Subantarctic Islands of New Zealand. As a fossil it occurs in the Balcombian Series of Port Phillip.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

Genus Spiroloculina, *d'Orbigny.*

Spiroloculina acutimargo, *Brady.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

Spiroloculina canaliculata, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. Abundant, of medium size.

Spiroloculina dorsata, *Reuss*, var. circularis, *var. nov.*

(Plate I., fig. 1.)

Typical specimens of *S. dorsata*, Reuss[1], are usually restricted to shallow water. In the present variety, from deep water, the distinguishing characters, due no doubt to the difference in habitat, are the thin test, the prolonged apertural neck, and the nearly circular outline. The largest specimen has a diameter of .615mm., the smallest, .41mm.

Station 36, east of Tasmania, 777 fathoms. Three specimens.

Spiroloculina grata, *Terquem*, var. reticosa, *var. nov.*

(Plate I., fig. 2.)

This variety agrees with Terquem's specific form[2] in general contour, having the same depressed type of shell; but the longitudinal and oblique ridges are perforated at intervals in the interspaces.

Length of figured test, 1.44mm.

The species itself is common in coral seas of the Pacific, both in shallow and deep water.

Forty miles south of Cape Wiles, 100 fathoms. Two examples.

Genus Miliolina, *Williamson.*

Miliolina agglutinans, *d'Orbigny, sp.*

This species is commonly found in shallow water, but occasionally occurs at greater depths. *M. agglutinans* has been recorded by the writer from shore-sand at Beaumaris, Port Phillip. It is also known as a fossil in the Older Tertiary (Balcombian) of Victoria.

Forth miles south of Cape Wiles, 100 fathoms. One moderate-sized specimen.

Miliolina angulata, *Williamson.*

Miliolina bicornis, W. and J., sp., var. *angulata*, Williamson, Rec. Foram. Gt. Brit., 1858, p. 88, pl. vii., fig. 196. *M. angulata* (Will.), Chapman, Rep. Foram. Subant. Ids. N.Z., 1909, Art. xv., p. 321, pl. xiii., fig. 5.

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1. *Spiroloculina dorsata*, Reuss, Denkschr. k. Akad. Wiss. Wien, XXV., 1866, p. 123. *S. limbata*, Brady (*non* d'Orb.), Chall. Rep., Zool., IX., 1884, p. 150, pl. ix., figs. 15-17. *Spiroloculina dorsata* (Reuss), Jones, Foram. Crag, pt. II. (Pal. Soc. Mon.), 1895, p. 110, woodcuts, figs. 4, 8*a*, *b*.

2. Terquem, Mém. Soc. Geol. France, ser. 3, I., 1878, p. 55, pl. x., figs. 14-15. Brady, Chall. Rep., Zool., IX., 1884, p. 155, pl. x., figs. 16, 17, 22, 23.

This species has been recorded by the writer from dredgings off the Subantarctic Islands of New Zealand.

Station 36, east of Tasmania, 777 fathoms. A few small specimens.

MILIOLINA CIRCULARIS, *Bornemann, sp.*

This species has been recorded by the writer from shore-sand at Altona Bay, Western Port, and Torquay, Victoria.

Forty miles south of Cape Wiles, 100 fathoms. Small, very abundant.

MILIOLINA CONTORTA, *d'Orbigny, sp.*

Quinqueloculina contorta, d'Orbigny, Foram. Tert. Vienne, 1846, p. 298, pl. xx., figs. 4-6. *Miliolina contorta* (d'Orb. sp.), Chapman, Journ. Linn. Soc., Zool., xxx., 1907, p. 19, pl. ii., fig. 35.

This species is related to *M. undosa*, Karrer, sp., but is not so strongly undulose in the ridges of the segments.

M. contorta has been recorded by the writer from shore-sand at Altona Bay, Beaumaris, Western Port and Torquay, Victoria. It occurs as a fossil in the Port Phillip Tertiaries.

Station 36, east of Tasmania, 777 fathoms. Two examples.

MILIOLINA CUVIERIANA, *d'Orbigny, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Small, very abundant.

MILIOLINA INSIGNIS, *Brady.*

Miliolina insignis, Brady, Chall. Rep., Zool., ix, 1884, p. 165, pl. iv, figs. 8-10.

This handsome species has a wide distribution. The nearest recorded locality to the present is off East Moncoeur Island, Bass Strait, 38 fathoms. It has also been recorded by the writer from off Great Barrier Island, New Zealand, 110 fathoms, and from the Subantarctic Islands of New Zealand, 85 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Two examples. Rather small.

MILIOLINA LINNEANA, *d'Orbigny, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Specimens somewhat erratic in habit of growth. Not common.

Miliolina polygona, *d'Orbigny, sp.*

Quinqueloculina polygona, d'Orbigny, Foram. Cuba, 1839, p. 198, pl. xii., figs. 21-23. *Miliolina polygona* (d'Orbigny, sp.), Chapman, Subant. Ids. New Zeal., Art. XV., 1909, p. 321, pl. xiii., fig. 6.

This species has been recorded from several stations off the Subantarctic Islands of New Zealand, at depths varying from 60-85 fathoms.

Station 36, east of Tasmania, 777 fathoms. One typical specimen.

Miliolina subrotunda, *Montagu, sp.*

This species has been recorded by Mr. Howchin from the Port Adelaide River, South Australia.

Forty miles south of Cape Wiles, 100 fathoms. Abundant; small, probably due to exceptional depth.

Miliolina tricarinata, *d'Orbigny, sp.*

This species has been recorded by the writer from shore sand at Beaumaris, Port Phillip, Victoria.

Forty miles south of Cape Wiles, 100 fathoms. East of Tasmania, 1122 fathoms. Rare and small from both samples.

Miliolina trigonula, *Lamarck, sp.*

This species has been recorded by the writer from Western Port and Torquay, Victoria.

Forty miles south of Cape Wiles, 100 fathoms. One rather large example.

Miliolina undosa, *Karrer, sp.*

Quinqueloculina undosa, Karrer, Sitzungsb. d. k. Ak. Wiss. Wien, lv., 1867, p. 361, pl. iii., fig. 3. *Miliolina undosa* (Karrer, sp.), Brady, Rep. Chall., Zool., ix., 1884, p. 176, pl. vi., figs. 6-8.

None of the present specimens show the elongated neck of the variety figured by Dr. Brady (*loc. supra cit.*, figs. 8*a*,*b*). It is interesting to note Brady's remark that the finest examples he has seen are from off East Moncoeur Island, Bass Strait, 38 fathoms, a locality not far removed from that now recorded.

M. undosa has been noted by the writer from shore-sand at Torquay, Victoria.

Forty miles south of Cape Wiles, 100 fathoms. Common and typical.

MILIOLINA VENUSTA, *Karrer, sp.*

This species has been recorded by the writer from shore-sand at Altona Bay, Beaumaris and Western Port, Victoria; and by Mr. Howchin from the Port Adelaide River, South Australia.

Station 36, east of Tasmania, 777 fathoms. Very rare, small.

Forty miles south of Cape Wiles, 100 fathoms. Rare, small.

MILIOLINA VULGARIS, *d'Orbigny, sp.*

This species has been recorded by the writer from shore-sand at Altona Bay, Beaumaris and Western Port, Victoria.

Forty miles south of Cape Wiles, 100 fathoms. Abundant, rather small.

Genus SIGMOÏLINA, *Schlumberger.*

SIGMOÏLINA CELATA, *Costa, sp.*

Spiroloculina celata, Costa, Atti Acc. Pontaniana, vii., 1856, pt. I*a*, pl. xxvi., fig. 5. *Sigmoïlina celata* (Costa, sp.), Chapman, Journ. Linn. Soc., Zool., xxx., 1907, p. 21, pl. ii., fig. 41.

This species was first described from the Italian Tertiary, and has since been recorded from the Balcombian of Victoria. As a recent species it has been noted from the Subantarctic Islands of New Zealand at 60 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

SIGMOÏLINA SCHLUMBERGERI, *Silvestri.*

Planispirina celata (*non* Costa, sp.), Brady, Rep. Chall., Zool., ix., 1884, p. 197, pl. viii., figs. 1-4. *Sigmoïlina, schlumbergeri,* A. Silvestri, Mem. dell. Pontif. Acc. Romana d. Nuovi Lincei, xxii., 1904, p. 267.

Station 36, east of Tasmania, 777 fathoms. Frequent. East of Tasmania, 1122 fathoms. Two dwarfed specimens.

SIGMOÏLINA SIGMOIDEA, *Brady, sp.*

The occurrence of this species in the Southern Ocean is of decided interest, since it had only been previously recorded in the living condition in the Southern Hemisphere from South America. It is found fossil, however, in the Tertiary beds (Oligocene) of Port Phillip and Muddy Creek, in Victoria, which area may have been the original point of dispersion for this species. Dr. Egger recorded its occurrence off the West Australian coast at 82 metres.

Station 36, east of Tasmania, 777 fathoms. One typical specimen.

SUB-FAMILY HAUERININÆ.

Genus OPHTHALMIDIUM, *Kübler.*

OPHTHALMIDIUM INCONSTANS, *Brady.*

A fairly deep-water form, ranging "mostly between 350 and 1000 fathoms"—Brady. The writer has previously recorded the species from Funafuti at 1050 fathoms. Dr. Egger obtained his "Gazelle" specimens from a sounding off the coast of Western Australia at 1187 metres.

Station 36, east of Tasmania, 777 fathoms. Abundant; examples in good condition and well developed.

Genus PLANISPIRINA, *Seguenza.*

PLANISPIRINA EXIGUA, *Brady.*

The occurrence of this species at 777 fathoms constitutes a record for deep water, 620 fathoms being apparently the deepest habitat hitherto known. Egger obtained specimens from off the coast of Western Australia at 359 metres.

Station 36, east of Tasmania, 777 fathoms.

SUB-FAMILY PENEROPLIDINÆ.

Genus CORNUSPIRA, *Schultze.*

CORNUSPIRA CARINATA, *Costa, sp.*, VAR. EXPANSA, *var. nov.*

(Plate I., fig. 3.)

In this variety the tests partake of the characters of both *C. carinata*, Costa, sp.[1] and *C. foliacea*, Philippi, sp.[2]. The test, although increasing rapidly in width, as in *C. foliacea*[3], is, however, depressed on the sides and even tends to become concave, as in typical examples of *C. carinata.* The larger specimen of the varietal form has a diameter of 1.23 mm.

Forty miles south of Cape Wiles, 100 fathoms. Two examples, identical in varietal form.

CORNUSPIRA CRASSISEPTA, *Brady.*

Cornuspira crassisepta, Brady, Chall. Rep., Zool., ix., 1884, p. 202, pl. cxiii., fig. 20. Egger, Abhandl. d. k. Bayer. Akad. Wiss., Cl. ii., xviii., 1893, Abth. ii., p. 54, pl. iii., fig. 22.

This species was first described by Dr. Brady from specimens dredged in the Faroe Channel by the "Knight Errant." Since then it has been recorded living off the coast of Australia by Dr. Egger. Latterly the species has occurred fossil in the older Tertiary deposits of Victoria, where large examples are found, usually twice the diameter of the living shells.

Forty miles south of Cape Wiles, 100 fathoms. One small example, 46 mm. in diameter.

CORNUSPIRA INVOLVENS, *Reuss, sp.*

This widely distributed species was also an inhabitant of the early Tertiary seas around the Australian Continent, being found in some abundance in the Victorian Oligocene

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1. *Operculina carinata*, Costa, Atti dell' Accad. Pontan., vii., 1856, p. 209, pl. xvii., figs. 15A, B.

2. *Orbis foliaceus*, Philippi, Enum. Moll. Sicil., ii., 1844, p. 147, pl. xxiv., fig. 26.

3. An abnormal form of *Cornuspira foliacea*, with a concave and a convex face, has been noted and figured by Heron-Allen and Garland, from shore-sand at Selsey Bill, Sussex, England (See Journ. Roy. Micro. Soc., 1911, p. 305, pl. ix., figs. 5, 6.).

at Port Phillip (Balcombe's Bay), and Muddy Creek, near Hamilton.

Egger records *C. involvens* from off the coast of Western Australia at 359 and 1187 metres. The writer has also recorded it from off the Snares, Subantarctic Islands of New Zealand, at 60 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Both small and large shells, frequent.

Family ASTRORHIZIDÆ.

Sub-Family PILULININÆ.

Genus Technitella, *Norman.*

Technitella legumen, *Norman.*

The nearest previously recorded locality to the present is off Sydney, 410 fathoms.

East of Tasmania, 1122 fathoms. Two specimens.

Technitella raphanus, *Brady.*

This species has not been hitherto noticed from Australian waters, in fact being confined to one other locality, Kandavu, Fiji Islands, 210 fathoms.

East of Tasmania, 1122 fathoms.

Sub-Family RHABDAMMININÆ.

Genus Hyperammina, *Brady.*

Hyperammina elongata, *Brady.*

Station 36, east of Tasmania, 777 fathoms. A fragmentary specimen, evidently belonging to this species.

Hyperammina ramosa, *Brady.*

H. ramosa has not hitherto been recorded from this locality, although Egger obtained it from off Western Australia, and it has since occurred in the New Zealand area.

Station 36, east of Tasmania, 777 fathoms. One specimen.

Genus Marsipella, *Norman.*

Marsipella cylindrica, *Brady.*

(Plate I., fig. 4.)

Marsipella cylindrica, Brady, Chall. Rep., Zool., ix., 1884, p. 265, pl. xxiv., figs. 20-22. Goddard and Jensen, Proc. Linn. Soc. N.S. Wales, xxxii., 1908, p. 301.

The present specimens are more robust in build than Brady's figured examples, the largest of which has a diameter of only .266 mm. as compared with the Australian specimens, which measure .35 mm. The previously recorded localities in the North and South Atlantic and the South Pacific occur in deep water. Messrs. Goddard and Jensen have noted the species in Australian waters at twenty-seven and a-half miles east of Port Jackson Heads, 300 fathoms.

East of Tasmania, 1122 fathoms. Two specimens.

Genus Rhizammina, *Norman.*

Rhizammina indivisa, *Brady.*

This species occurs in the Faröe Channel, off the Cape of Good Hope, off Kandavu Island, off Cape Verde, and around the Subantarctic Islands of New Zealand.

The present record is the deepest sounding from which this species has yet been taken.

East of Tasmania, 1122 fathoms. Several typical specimens.

Genus Brachysiphon, *Chapman.*

Brachysiphon corbuliformis, *Chapman.*

Brachysiphon corbuliformis, Chapman, Trans. N.Z. Inst., xxxviii., 1906, p. 84, pl. iii., figs. 2*a*,*b*, 3. Goddard and Jensen, Proc. Linn. Soc. N.S. Wales, xxxii., 1908, pp. 306, 307.

This species was formerly recorded from off Gt. Barrier Island, New Zealand, at 110 fathoms. Goddard and Jensen have found it in beach sand at Lyell Bay, New Zealand.

Station 36, east of Tasmania, 777 fathoms. One example.

Family LITUOLIDÆ.

Sub-Family LITUOLINÆ.

Genus Reophax, *Montfort.*

Reophax dentaliniformis, *Brady.*

This species is generally confined to deep-sea dredgings.

Station 36, east of Tasmania, 777 fathoms. One small specimen.

East of Tasmania, 1122 fathoms. One well-grown example.

REOPHAX FUSIFORMIS, *Williamson, sp.*

East of Tasmania, 1122 fathoms. One specimen.

REOPHAX SCORPIURUS, *Montfort.*

Forty miles south of Cape Wiles, 100 fathoms. Two erratically grown examples.

Genus HAPLOPHRAGMIUM, *Reuss.*

HAPLOPHRAGMIUM CANARIENSE, *d'Orbigny, sp.*

East of Tasmania, 1122 fathoms. One small specimen.

FAMILY TEXTULARIIDÆ.

SUB-FAMILY TEXTULARIINÆ.

Genus TEXTULARIA, *Defrance.*

TEXTULARIA AGGLUTINANS, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. One small specimen.

TEXTULARIA CONCAVA, *Karrer, sp.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

TEXTULARIA FOLIUM, *Parker* and *Jones.*

Textularia folium, Parker and Jones, Phil. Trans., clv., 1865, pp. 370, 420, pl. xviii., fig. 19. Chapman, Journ. Quekett Micr. Club, (2), x., 1907, p. 127, pl. ix., fig. 4.

The present occurrence extends the bathymetrical range for this beautiful little species. It is mainly found in the neighbourhood of coral reefs in the Pacific and Indian Oceans, but has also been taken from Bass Strait at 38 fathoms, and from shore sand at Port Phillip and Western Port.

Forty miles south of Cape Wiles, 100 fathoms. One typical example.

TEXTULARIA TROCHUS, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. One small example.

Genus VERNEUILINA, *d'Orbigny.*

VERNEUILINA SPINULOSA, *Reuss.*

Dr. Egger records this species from 359 and 1187 metres off the West Australian coast.

Forty miles south of Cape Wiles, 100 fathoms. Specimens frequent.

Genus SPIROPLECTA, *Ehrenberg.*

SPIROPLECTA CARINATA, *d'Orbigny, sp.*

Textularia carinata, d'Orbigny, Ann. Sci. Nat., 1826, p. 263, No. 13 ; *Id.*, Foram. Foss. Vienne, 1846, p. 247, pl. xiv., figs. 32-34. *Spiroplecta carinata* (d'Orb. sp.), Chapman, Journ. Linn. Soc., Zool., xxx., 1907, p. 27, pl. iii., fig. 61.

This species is a common Tertiary fossil in Southern Australia and New Zealand.

Forty miles south of Cape Wiles, 100 fathoms. Abundant and typical.

SPIROPLECTA GRAMEN, *d'Orbigny, sp.*

Station 36, east of Tasmania, 777 fathoms. One specimen.
Forty miles south of Cape Wiles, 100 fathoms. Frequent.

SPIROPLECTA NUSSDORFENSIS, *d'Orbigny, sp.*

This species is usually confined to fossil deposits. It has occurred both in the Vienna Miocene and the Victorian Oligocene.

40 miles south of Cape Wiles, 100 fathoms. One specimen.

SPIROPLECTA SAGITTULA, *Defrance, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Not common.

SPIROPLECTA SAGITTULA, *Defr., sp.*, var. FISTULOSA, *Brady.*

Forty miles south of Cape Wiles, 100 fathoms. Very rare.

Genus GAUDRYINA, *d'Orbigny.*

GAUDRYINA PUPOIDES, *d'Orbigny.*

East of Tasmania, 1122 fathoms. One specimen.

GAUDRYINA RUGOSA, *d'Orbigny.*

Dr. Brady records the finest examples from the "Challenger" dredgings from Raine Islet at 155 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Typical examples fairly common.

Genus Clavulina, *d'Orbigny.*

Clavulina angularis, *d'Orbigny.*

Clavulina angularis, d'Orbigny, Ann. Sci. Nat., vii., 1826, p. 268, No. 2, pl. xii., fig. 7. Chapman, Journ. Linn. Soc., Zool., xxx., 1907, p. 29, pl. iv., figs. 68-73.

The specimens here recorded are of the slender, blunt-edged variety, which appears to belong to form A of the dimorphic couples (see above reference to the Victorian fossil examples).

Forty miles south of Cape Wiles, 100 fathoms. Two examples.

Clavulina cylindrica, *Hantken.*

The present would have been the least depth amongst recent soundings recorded for this species, but for the shallow water sample of 2 fathoms from Van Diemen's Inlet, Gulf of Carpentaria, recorded by Goddard and Jensen.

Clavulina parisiensis, *d'Orbigny.*

This is a well-known fossil species in the Tertiary of the Paris Basin and in the London Clay. It is curious to note that the depth of the ancient sea-bed with *C. parisiensis*, where Piccadilly now stands, was computed by Professors Jones and Parker[1] to indicate a similar depth to the present sample, viz., 100 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. A common species in the present sounding.

Clavulina textularioidea, *Goës.*

Clavulina parisiensis, d'Orbigny, forma *textularioidea*, Goës, Arctic and Scandinavian Rhizop. Svenska Vet.-Akad. Handl., xxv., 1892, No. 9, p. 42, pl. viii., figs. 387-399.

This also is a fossil species, occurring in the Victorian Cainozoics at Port Phillip.

Forty miles south of Cape Wiles, 100 fathoms. Examples frequent.

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1. Jones and Parker—"On the Foraminifera of the London Clay." The Geologist, vii., 1864, p. 89.

Sub-Family BULIMININÆ.

Genus Bulimina, *d'Orbigny.*

Bulimina aculeata, *d'Orbigny.*

This species was recorded by Goddard and Jensen from twenty-seven and a-half miles east of Port Jackson Heads, 300 fathoms.

Egger obtained it in "Gazelle" dredgings off the coast of Western Australia at 359 and 1187 metres.

Station 36, east of Tasmania, 777 fathoms. One specimen.

East of Tasmania, 1122 fathoms. Two very fine examples.

Bulimina buchiana, *d'Orbigny.*

Bulimina buchiana, d'Orbigny, Foram. Foss. Vienne, 1846, p. 186, pl. xi., figs. 15-18. Chapman, Journ. Quekett Micr. Club, (2), x., 1907, p. 127, pl. ix., fig. 6.

Egger records this species from a "Gazelle" sounding off the Queensland coast at 951 metres. It occurs in shore-sand on the Victorian coast at Western Port.

Forty miles south of Cape Wiles, 100 fathoms. Common.

Bulimina elegantissima, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. Very common.

Bulimina elegantissima, *d'Orb.*, var. apiculata, *Chapman.*

Bulimina elegantissima, d'Orb., var. *apiculata*, Chapman, Journ. Linn. Soc., Zool., xxx., 1907, p. 31, pl. iv., fig. 77.

This variety was first described from the Oligocene beds at Port Phillip (Balcombe Bay, etc.).

Forty miles south of Cape Wiles, 100 fathoms: Common.

Bulimina elegantissima, *d'Orb.*, var. seminuda, *Terquem.*

Among other localities, Dr. Brady recalls this little variety from East Moncoeur Island, Bass Strait, at 38 fathoms. Terquem's specimens came from the Eocene of the Paris Basin.

Forty miles south of Cape Wiles, 100 fathoms. Rare.

Bulimina inflata, *Seguenza.*

Brady remarks that this species is usually met with in deeper water than the allied form, *B. buchiana*.

East of Tasmania, 1122 fathoms. Frequent.

Genus Virgulina, *d'Orbigny.*

Virgulina schreibersiana, *Czjzek.*

Pleurostomella alternans, Chapman, Zool. Res. "Endeavour," I., pt. 3, 1912, p. 310 (not of Schwager).

The tests of this cosmopolitan species are, as a rule, thin and of slender build when found in deep water. After a careful examination I now refer the specimen formerly recorded as *?Pleurostomella alternans*, Schwager, to this species.

Station 36, east of Tasmania, 777 fathoms. One specimen.

East of Tasmania, 1122 fathoms. One specimen.

Genus Bifarina, *Parker* and *Jones.*

Bifarina limbata, *Brady, sp.*

East of Tasmania, 1122 fathoms. One specimen.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

Bifarina porrecta, *Brady, sp.*

Bolivina porrecta, Brady, Chall. Rep., Zool., ix., 1884, p. 418, pl. lii., fig. 22. *Bifarina porrecta* (Brady, sp.), Chapman, "The Foraminifera," 1902, p. 173, pl. ix., fig. P.

A moderately deep water form.

Station 36, east of Tasmania, 777 fathoms. One specimen.

Genus Bolivina, *d'Orbigny.*

Bolivina beyrichi, *Reuss.*

This species was recorded by Dr. Brady, amongst other localities, from off Sydney, 410 fathoms. Dr. Egger had specimens from a Western Australian station at 359 metres. As a fossil it dates from the Oligocene, but so far has not been found in strata in the Southern Hemisphere.

Station. 36, east of Tasmania, 777 fathoms. Very abundant.

East of Tasmania, 1182 fathoms. Rare.

Bolivina nobilis, *Hantken.*

A previous Australian record for this species, by Dr. Brady, is Port Jackson, 6 fathoms. Egger found it off the west coast of Africa, and Millett in the Malay Archipelago. Its geological history dates from the Upper Chalk (Taplow), and it is a common form in the Oligocene of Grice's Creek, Port Phillip.

Station 36, east of Tasmania, 777 fathoms. Frequent.

Forty miles south of Cape Wiles, 100 fathoms. Common.

BOLIVINA OBSOLETA, *Eley.*

The *Textularia quadrilatera* of Schwager and the "Challenger" Report is a synonym of the above species.

B. obsoleta frequents moderately deep water.

Station 36, east of Tasmania, 777 fathoms. Two fine examples.

East of Tasmania, 1122 fathoms. One specimen.

BOLIVINA PUNCTATA, *d'Orbigny.*

Station 36, east of Tasmania, 777 fathoms. One specimen.

BOLIVINA PYGMÆA, *Brady.*

Bolivina pygmæa, Brady, Chall. Rep., Zool., ix., 1884, p. 421, pl. liii., figs. 5, 6.

This minute and presumably rare form has a very wide geographical distribution, extending from the North Sea to the Southern Ocean.

East of Tasmania, 1122 fathoms. One specimen.

BOLIVINA ROBUSTA, *Brady.*

Station 36, east of Tasmania, 777 fathoms. One specimen.

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

BOLIVINA TEXTILARIOIDES, *Reuss.*

A widely distributed form, and occurring in the Older Tertiary of southern Australia.

Station 36, east of Tasmania, 777 fathoms. Occasional.

East of Tasmania, 1122 fathoms. In fine washings.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

SUB-FAMILY CASSIDULININÆ.

Genus CASSIDULINA, *d'Orbigny.*

CASSIDULINA NURRHYNA, *Schwager, sp.*

East of Tasmania, 1122 fathoms. One specimen.

CASSIDULINA SUBGLOBOSA, *Brady.*

Forty miles south of Cape Wiles, 100 fathoms. Very abundant.

Genus EHRENBERGINA, *Reuss.*

EHRENBERGINA SERRATA, *Reuss.*

This species is generally found in moderately deep water, although Goddard and Jensen[1] have recorded it from the extremely shallow depth of 15 fathoms off Palm Island, near Townsville, Queensland.

It has recently been found in a raised beach above the Drygalski Glacier in the Antarctic (Shackleton Expedition).

Other fossil occurrences are in the Oligocene beds of Grice's Creek, Port Phillip, and of Muddy Creek, Hamilton, Victoria.

Station 36, east of Tasmania, 777 fathoms. Common.

FAMILY LAGENIDÆ.

SUB-FAMILY LAGENINÆ.

Genus LAGENA, *Walker* and *Boys.*

LAGENA GRACILIS, *Williamson, sp.*

East of Tasmania, 1122 fathoms. Occurs in the fine washings.

LAGENA LACUNATA, *Burrows* and *Holland.*

Lagena lacunata, Burrows and Holland, in Jones, Foram. Crag. (Pal. Soc. Mon., xlix.), 1895, p. 205, pl. vii., figs. 12*a*, *b*.

This species was described by Dr. Brady under Schwager's name, *L. castrensis*, from which it differs in having surface pits instead of exogenous beads. *L. lacunata* has occurred, amongst other places, off East Moncoeur Island, Bass Strait, at 38 fathoms.

Station 36, east of Tasmania, 777 fathoms. One specimen.

LAGENA LÆVIGATA, *Reuss, sp.*

East of Tasmania, 1122 fathoms. One specimen.

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1. Goddard and Jensen—Proc. Linn. Soc. N.S. Wales, xxxii., 1908, p. 298

LAGENA LAGENOIDES, *Williamson, sp.*

Egger records this species from off the west coast of Australia at 1187 metres.

East of Tasmania, 1122 fathoms. One specimen.

LAGENA ORBIGNYANA, *Seguenza, sp.*

Dr. Egger records this species from off the coast of West Australia at depths from 359-1188 meters.

The writer obtained it from soundings taken round the Subantarctic Islands of New Zealand at 60-85 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

LAGENA QUADRICOSTULATA, *Reuss.*

East of Tasmania, 1122 fathoms. One example.

LAGENA SCHLICHTI, *A. Silvestri, sp.*

Fissurina schlichti, A. Silvestri, Mem. Pont. Acc. Rom. Nuovi Lincei, xix., 1902, p. 14, woodcuts, figs. 9-11. *Lagena schlichti* (Silv. sp.), Chapman, Rep. on Foram. Subantarctic Ids. of N. Zealand, Art. xv., 1900, p. 337, pl. xv., figs. 7*a*, *b*.

Station 36, east of Tasmania, 777 fathoms. One specimen.

LAGENA SQUAMOSA, *Montagu, sp.*

Station 36, east of Tasmania, 777 fathoms. One specimen.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

LAGENA STRIATA, *d'Orbigny, sp.*

Station 36, east of Tasmania, 777 fathoms. One specimen.

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

LAGENA SULCATA, *Walker* and *Jacob, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Two fine examples.

SUB-FAMILY NODOSARIINÆ.

Genus NODOSARIA, *Lamarck.*

Sub-genus GLANDULINA, *d'Orbigny.*

NODOSARIA (GLANDULINA) LÆVIGATA, *d'Orbigny.*

Station 36, east of Tasmania, 777 fathoms. One fine example.

NODOSARIA (GLANDULINA) ROTUNDATA, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. Two moderate-sized specimens.

Sub-genus DENTALINA, *d'Orbigny.*

NODOSARIA (DENTALINA) PYRULA, *d'Orbigny.*

It is unusual to find this species at so great a depth. The "Challenger" records were from shallow water to 600 fathoms. It occurs in the New Zealand area off Great Barrier Island (110 fathoms) and off the Subantarctic Islands of New Zealand at 60 and 85 fathoms.

Station 36, east of Tasmania, 777 fathoms. One typical example.

NODOSARIA MUCRONATA, *Neugeboren, sp.*

East of Tasmania, 1122 fathoms. One specimen.

NODOSARIA PERVERSA, *Schwager.*

Nodosaria perversa, Schwager, Egger, Abhandl. d. k. Bayer. Ak. Wiss., Cl. ii., xviii., Abth. ii., 1893, p. 152, pl. xi., fig. 42.

Brady records this species from one locality only, namely off the Ki Islands, south-west of Papua, at 129 fathoms.

Egger obtained it from a station off the west coast of Australia at 359 metres.

This species was recorded in my previous report as "*Nodosaria aff. proxima*, Silvestri."

East of Tasmania, 1122 fathoms. One specimen.

NODOSARIA PROXIMA, *Silvestri.*

Station 36, east of Tasmania, 777 fathoms. One small specimen.

NODOSARIA SCALARIS, *Batsch, sp.*, VAR. SEPARANS, *Brady.*

Forty miles south of Cape Wiles, 100 fathoms. Very common.

Genus MARGINULINA, *d'Orbigny.*

MARGINULINA COSTATA, *Batsch, sp.*

(Plate I., fig. 5).

The present specimen is not so strongly costated as the "Challenger" examples figured by Dr. Brady. There is a marked difference in outline between the earlier portion of the shell and the last chamber, which is suggestive of some forms referred to the dimorphous genus *Amphicoryne*, Schlumberger.

In the southern hemisphere this species has been previously found in the New Zealand area at 85 and 150 fathoms, and in shore-sand at Torquay, Victoria.

Forty miles south of Cape Wiles, 100 fathoms. One example.

Genus Cristellaria, *Lamarck*.

Cristellaria articulata, *Reuss*.

Forty miles south of Cape Wiles, 100 fathoms. Frequent.

Cristellaria cultrata, *Montfort, sp.*

Station 36, east of Tasmania, 777 fathoms. One specimen.

Cristellaria orbicularis, *d'Orbigny, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Frequent.

Cristellaria rotulata, *Lamarck, sp.*

Forty miles south of Cape Wiles, 100 fathoms. One example.

Cristellaria schloenbachi, *Reuss*.

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

Cristellaria tricarinella, *Reuss*.

(Plate I., fig. 6).

(Vaginuline variety).

Cristellaria tricarinella, Reuss, Sitzungsb. k. Ak. Wiss., xlvi., 1862, p. 68, pl. vii., fig. 9, pl. xii., figs. 2-4.
C. protosphaera, Reuss, *ibid.*, 1862, p. 68, pl. vii., fig. 8, pl. xii. fig. 10.

The present shell is nearest Reuss' figure of *C. protosphaera*, and in fact approaches more closely to the type of *Vaginulina*, which has no coiled commencement as in *Cristellaria*. Since there are gradations between the two species mentioned, Dr. Brady has rightly included them under one name.

C. tricarinella is a well-known Cretaceous and Eocene fossil. Its occurrence in recent dredgings is rather sparing, being noted from only the following localities :—Off the Philippine

Islands at 95 fathoms; off Raine Island, 155 fathoms; off the west coast of New Zealand, 150 fathoms; off Great Barrier Island, New Zealand, 110 fathoms; north of Enderby Island, N.Z., 85 fathoms; from the Mauritius and off the west coast of Australia.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

Sub-genus POLYMORPHININÆ.

Genus POLYMORPHINA, *d'Orbigny.*

POLYMORPHINA ANGUSTA, *Egger.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

POLYMORPHINA COMMUNIS, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

POLYMORPHINA ELEGANTISSIMA, *Parker* and *Jones.*

This truly Australian species is found both in recent dredgings and in shore-sands off the Australian coast, as well as in strata of Cainozoic age in various horizons in southern Australia.

Forty miles south of Cape Wiles, 100 fathoms. Frequent. Forms rather slender.

POLYMORPHINA OBLONGA, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

Genus UVIGERINA, *d'Orbigny.*

UVIGERINA ACULEATA, *d'Orbigny.*

East of Tasmania, 1122 fathoms. Two specimens.

UVIGERINA ANGULOSA, *Williamson.*

Station 36, east of Tasmania, 777 fathoms. Abundant, well-grown.

East of Tasmania, 1122 fathoms. One minute specimen.

UVIGERINA ASPERULA, *Czjzek,* VAR. AMPULLACEA, *Brady.*

Dr. Brady remarks that the range of depth of nine recorded localities for this species lies between 350 and 725 fathoms.

The present sounding, therefore, extends its known bathymetrical limits.

Station 36, east of Tasmania, 777 fathoms. Common.

Uvigerina interrupta, *Brady*.

Station 36, east of Tasmania, 777 fathoms. Two specimens.

Uvigerina pygmæa, *d'Orbigny*.

Station 36, east of Tasmania, 777 fathoms. One specimen.

East of Tasmania, 1122 fathoms. One specimen.

Forty miles south of Cape Wiles, 100 fathoms. Normal examples very common; elongate variety, frequent.

Family GLOBIGERINIDÆ.

Genus Globigerina, *d'Orbigny*.

Globigerina æquilateralis, *Brady*.

Station 36, east of Tasmania, 777 fathoms. One specimen.

East of Tasmania, 1122 fathoms. One specimen.

Globigerina bulloides, *d'Orbigny*.

Station 35, east of Tasmania. Bottom sample, 377 fathoms. Very abundant, and variable in size.

Station 36, east of Tasmania, 777 fathoms. Abundant.

East of Tasmania, 1122 fathoms. Occasional; very small.

Forty miles south of Cape Wiles, 100 fathoms. Rare.

Globigerina dubia, *Egger*.

Dr. Brady records this species as far south as Lat. 46° in the Southern Ocean.

Amongst other localities, Dr. Egger has noted the species from the west coast of Australia at 1187 and 4298 metres.

Station 36, east of Tasmania, 777 fathoms. One large example.

East of Tasmania, 1122 fathoms. Rare.

Globigerina dutertrei, *d'Orbigny*.

Station 35, east of Tasmania. Bottom sample, 377 fathoms. Frequent.

Forty miles south of Cape Wiles, 100 fathoms. Common.

Globigerina inflata, *d'Orbigny.*

Station 35, east of Tasmania. Bottom sample, 377 fathoms. Very common.

Station 36, east of Tasmania, 777 fathoms. Very common.

East of Tasmania, 1122 fathoms. Very common.

Forty miles south of Cape Wiles, 100 fathoms. Very abundant.

Globigerina rubra, *d'Orbigny.*

East of Tasmania, 1122 fathoms. One specimen.

Forty miles south of Cape Wiles, 100 fathoms. Rare.

Globigerina triloba, *Reuss.*

East of Tasmania, 1122 fathoms. Rare.

Forty miles south of Cape Wiles, 100 fathoms. Rare.

Genus Orbulina, *d'Orbigny.*

Orbulina universa, *d'Orbigny.*

Station 36, east of Tasmania, 777 fathoms. Common.

East of Tasmania, 1122 fathoms. Common.

Forty miles south of Cape Wiles, 100 fathoms. Common. Small specimens.

Genus Pullenia, *Parker* and *Jones.*

Pullenia sphæroides, *d'Orbigny, sp.*

East of Tasmania, 1122 fathoms. One small specimen.

Genus Sphæroidina, *d'Orbigny.*

Sphæroidina bulloides, *d'Orbigny.*

Station 36, east of Tasmania, 777 fathoms. A large, well-developed example.

East of Tasmania, 1122 fathoms. One specimen.

Family ROTALIIDÆ.

Sub-Family SPIRILLININÆ.

Genus Spirillina, *Ehrenberg.*

Spirillina denticulo-granulata, *Chapman.*

Spirillina denticulo-granulata, Chapman, Journ. Quekett Micr. Club, (2), x., 1907, p. 133, pl. x., figs. 6*a-c*. *Id.*, Subantarctic Ids. of N. Zealand, Art. xv., 1909, p. 355, pl. xvii., figs. 3*a*, *b*.

The present occurrence considerably extends the bathymetrical range of this species, the previous records being shore-sand, Torquay, near Geelong, and from off the Snares, Subantarctic Islands of New Zealand, 60 fathoms.

Station 36, east of Tasmania, 777 fathoms. One example.

SPIRILLINA INÆQUALIS, *Brady.*

Previously recorded, amongst other localities, off the coast of Western Australia, and from the Subantarctic Islands of New Zealand.

Station 36, east of Tasmania, 777 fathoms. A typical example.

SPIRILLINA LIMBATA, *Brady.*

Station 36, east of Tasmania, 777 fathoms. One specimen.

SPIRILLINA VIVIPARA, *Ehrenberg.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

SUB-FAMILY ROTALIINÆ.

Genus PATELLINA, *Williamson.*

PATELLINA CORRUGATA, *Williamson.*

One of the deeper soundings in which the above species occurs is here recorded, viz., 1122 fathoms. The deepest record for the species, which usually inhabits shallow or moderately shallow water, is that by the writer, from Funafuti, at the exceptional depth of 2298 fathoms.

Station 36, east of Tasmania, 777 fathoms. Frequent.

East of Tasmania, 1122 fathoms. In fine washings.

Genus DISCORBINA, *Parker* and *Jones.*

DISCORBINA ARAUCANA, *d'Orbigny, sp.*

Station 35, east of Tasmania, bottom sample, 377 fathoms. Very rare and small.

DISCORBINA BERTHELOTI, *var.* BACONICA, *Hantken.*

Station 35, east of Tasmania, bottom sample, 377 fathoms. One specimen.

DISCORBINA BICONCAVA, *Parker* and *Jones.*

This species, although found elsewhere, is particularly Australian in its distribution, being known from Bass

Strait, Port Jackson, Torres Strait and the Gulf of Carpentaria.

Forty miles south of Cape Wiles, 100 fathoms. Two small examples.

DISCORBINA ORBICULARIS, *Terquem, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

DISCORBINA ROSACEA, *d'Orbigny, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

DISCORBINA RUGOSA, *d'Orbigny, sp.*

Station 36, east of Tasmania, 777 fathoms. One small example.

DISCORBINA TURBO, *d'Orbigny, sp.*

Amongst other localities, Brady records this species from off Port Jackson, New South Wales, 2 to 10 fathoms. The present examples are from an exceptionally deep sounding for the species.

Station 36, east of Tasmania, 777 fathoms. Common.

DISCORBINA VILARDEBOANA, *d'Orbigny, sp.*

This form is closely allied to the previously noted *D. araucana*, but the earlier chambers on the inferior surface are largely concealed.

Forty miles south of Cape Wiles, 100 fathoms. One small specimen.

Genus TRUNCATULINA, *d'Orbigny.*

TRUNCATULINA CULTER, *Parker* and *Jones, sp.*

This species inhabits fairly deep water.

Station 36, east of Tasmania, 777 fathoms. Two specimens.

East of Tasmania, 1122 fathoms. One small specimen.

TRUNCATULINA HUMILIS, *Brady.*

East of Tasmania, 1122 fathoms. Two examples.

TRUNCATULINA LOBATULA, *Walker* and *Jacob, sp.*

East of Tasmania, 1122 fathoms. Two small and rather irregularly-grown specimens.

Forty miles south of Cape Wiles, 100 fathoms. Two small but typical specimens.

TRUNCATULINA PYGMÆA, *Hantken.*

Forty miles south of Cape Wiles, 100 fathoms. Common.

TRUNCATULINA RETICULATA, *Czjzek, sp.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

TRUNCATULINA TENERA, *Brady.*

This form is of more usual occurrence in the Southern Ocean, and appears to be sparingly found at any time.

Station 36, east of Tasmania, 777 fathoms. Two specimens.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

TRUNCATULINA TENUIMARGO, *Brady.*

This species appears to be more typically Australian, although occasionally found in other areas.

Station 36, east of Tasmania, 777 fathoms. Common; unusually fine examples.

TRUNCATULINA UNGERIANA, *d'Orbigny, sp.*

A very common form in the Southern Ocean, and typical of all Australian Cainozoic foraminiferal faunas.

Station 36, east of Tasmania, 777 fathoms. One specimen.

East of Tasmania, 1122 fathoms. One specimen; a minute example.

Forty miles south of Cape Wiles, 100 fathoms. Very common; tests both small and large.

TRUNCATULINA VARIABILIS, *d'Orbigny.*

Forty miles south of Cape Wiles, 100 fathoms. Common; some extremely erratically grown forms present.

TRUNCATULINA WUELLERSTORFI, *Schwager, sp.*

Station 36, east of Tasmania, 777 fathoms. Frequent. Small specimens.

Forty miles south of Cape Wiles, 100 fathoms. Frequent; typical.

Genus Anomalina, *Parker* and *Jones*.

Anomalina ammonoides, *Reuss, sp.*

This species is exceedingly common in shallow and moderately deep water dredgings around the Australian coast, and is a well-known form in Australian Cænozoic strata.

Station 35, east of Tasmania. Bottom sample, 377 fathoms. One small example.

Station 36, east of Tasmania, 777 fathoms. Common and typical.

Forty miles south of Cape Wiles, 100 fathoms. Common and typical.

Anomalina coronata, *Parker* and *Jones*.

Anomalina coronata, Parker and Jones, Ann. Mag. Nat. Hist. (2), xix., 1857, p. 294, pl. x., figs. 15, 16. Chapman, Subantarctic Ids. of N. Zealand, Art. xv., 1909, p. 360, pl. xvii., fig. 10.

Found in the Southern Ocean, off Prince Edward Island, 50-150 fathoms (Brady); off the Subantarctic Ids. of N. Zealand (Chapman); Kerguelen Id., 366 metres (Egger).

Forty miles south of Cape Wiles, 100 fathoms. Three typical specimens.

Anomalina grosserugosa, *Gümbel, sp.*

Station 36, east of Tasmania, 777 fathoms. Two examples; one typical, the other minute.

Anomalina polymorpha, *Costa*.

Anomalina polymorpha, Costa, Atti dell. Accad. Pontan., vii., 1856, p. 252, pl. xxi., figs. 7-9. Chapman, Journ. Quekett Micr. Club, (2), x., 1907, p. 138.

This species has occurred off Sydney at 410 fathoms; and in shore-sand at Beaumaris, Port Phillip.

Forty miles south of Cape Wiles, 100 fathoms. Common.

Genus Pulvinulina, *Parker* and *Jones*.

Pulvinulina auricula, *Fichtel* and *Moll, sp.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

PULVINULINA CANARIENSIS, *d'Orbigny, sp.*

Station 36, east of Tasmania, 777 fathoms. Two specimens.
East of Tasmania, 1122 fathoms. Frequent.

PULVINULINA CONCENTRICA, *Parker* and *Jones.*

Forty miles south of Cape Wiles, 100 fathoms. Common. Variable in size.

PULVINULINA CRASSA, *d'Orbigny, sp.*

East of Tasmania, 1122 fathoms. One specimen.

PULVINULINA ELEGANS, *d'Orbigny, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Frequent.

PULVINULINA EXIGUA, *Brady.*

East of Tasmania, 1122 fathoms. One minute example.

PULVINULINA PATAGONICA, *d'Orbigny, sp.*

Station 36, east of Tasmania, 777 fathoms. Two specimens.
East of Tasmania, 1122 fathoms. Frequent; small.

PULVINULINA PROCERA, *Brady.*

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

PULVINULINA REPANDA, *Fichtel* and *Moll, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Two specimens.

PULVINULINA TRUNCATULINOIDES, *d'Orbigny, sp.*

Station 35, east of Tasmania; bottom sample, 377 fathoms. Two examples.

Station 36, east of Tasmania, 777 fathoms. Very abundant.

East of Tasmania, 1122 fathoms. Very common.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

Genus ROTALIA, *Lamarck.*

ROTALIA CLATHRATA, *Brady.*

This is a common form in Bass Strait, and has occurred in the shore-sand of Torquay, Victoria. It occurs fossil in the various Cainozoic beds of Victora.

Station 36, east of Tasmania, 777 fathoms. Two typical specimens.

Forty miles south of Cape Wiles, 100 fathoms. Two well-grown shells.

ROTALIA PAPILLOSA, *d'Orbigny*, var. COMPRESSIUSCULA, *Brady*.

Occasionally found round the Australian coast. Also from the Japanese Sea and round Papua.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

ROTALIA SOLDANII, *d'Orbigny, sp.*

East of Tasmania, 1122 fathoms. One specimen.

SUB-FAMILY POLYSTOMELLINÆ.

Genus NONIONINA, *d'Orbigny*.

NONIONINA POMPILIOIDES, *Fichtel* and *Moll, sp.*

This distinct little form is almost confined to deep water soundings.

East of Tasmania, 1122 fathoms. One small example.

NONIONINA UMBILICATULA, *Montigue, sp.*

East of Tasmania, 1122 fathoms. One minute example.

Genus POLYSTOMELLA, *Lamarck*.

POLYSTOMELLA CRISPA, *Linné, sp.*

Forty miles south of Cape Wiles, 100 fathoms. Frequent.

POLYSTOMELLA MACELLA, *Fichtel* and *Moll, sp.*

Station 36, east of Tasmania, 777 fathoms. One minute example.

Forty miles south of Cape Wiles, 100 fathoms. One specimen.

SUB-FAMILY NUMMULITINÆ.

Genus HETEROSTEGINA, *d'Orbigny*.

HETEROSTEGINA DEPRESSA, *d'Orbigny*.

Forty miles south of Cape Wiles, 100 fathoms. One small specimen.

III.—List of Ostracoda: with Descriptions and Notes of New and Rare Species.

Section PODOCOPA.

Family CYPRIDÆ.

Genus Aglaia, *G. S. Brady.*

? Aglaia meridionalis, *G. S. Brady.*

? *Aglaia meridionalis*, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 34, pl. xxx., figs. 7*a-d*. *Aglaia meridionalis* (Brady), Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 418, pl. i., figs. 37-39.

Brady described this species from anchor-mud collected in 6 fathoms at Stanley Harbour, Falkland Island.

Egger's "Gazelle" specimens came from Western Australia at 357 metres; West Africa at 677 metres; and from near Mauritius at 411 metres. The writer obtained this species from dredgings round Funafuti at 1215 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Four separate valves.

? Aglaia obtusata, *G. S. Brady.*

? *Aglaia obtusata*, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 35, pl. xxx., figs. 8*a-d*. Chapman, Journ. Linn. Soc., Zool., xxx., 1910, p. 426.

The previous records for this distinct little species are Kerguelen Island, 20-50 fathoms, and round Funafuti at 1050 fathoms. It is interesting to find this rare form so well represented in this Australian dredging.

Forty miles south of Cape Wiles, 100 fathoms. Common and typical.

Genus Pontocypris, *G. O. Sars.*

Pontocypris attenuata, *G. S. Brady.*

(Plate ii, fig. 1.)

Pontocypris attenuata, G. S. Brady, Ann. Mag. Nat. Hist. (4), ii., 1868, p. 179, pl. iv., figs. 11-14. *Id.*, Chall. Rep., Zool., i., pt. iii., 1880, p. 38, pl. xv., figs. 2*a-d*. *Id.*, Trans. R. Soc. Edin., xxxv., 1890, p. ii., p. 491, pl. i., figs. 3, 4. Chapman, Journ. Linn. Soc., Zool., xxviii., 1902, p. 419.

The present specimens more nearly resemble those from the South Seas described by Dr. Brady in the later reference, in being more pointed posteriorly and in some cases armed with a short spine. The extreme form of this series now figured closely approaches *P. sicula*, G. S. Brady[1], which was described by that author also from the South Seas.

The occurrence of this species at the exceptional depth of 777 fathoms is interesting. It has been previously recorded from Hong Kong Harbour, 7 fathoms; Humboldt Bay, Papua, 37 fathoms; Mauritius; Noumea, New Caledonia; and shore gatherings, Upolu. I had it from Funafuti, South Pacific, in varying depths, the deepest dredging being 200 fathoms.

Station 36, east of Tasmania, 777 fathoms. Fairly numerous.

Pontocypris subreniformis, *G. S. Brady.*

? *Pontycypris subreniformis*, G. S. Brady, Chall. Rep., Zool., i, pt. iii., 1880, p. 38, pl. vii., fig. 5; pl. xv., figs. 8*a-d*. *Pontocypris subreniformis* (Brady), Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 421, pl. vii., figs. 50-52.

This ostracod was doubtfully placed in the genus *Pontocypris* by Dr. G. S. Brady on account of its carapace being anteriorly depressed. He considered this character argued against its being a typical pontocyprid, and thought it might equally well be *Bythocypris*. Some examples of *Pontocypris attenuata*, however, often show quite as much depression in front as the present species.

P. subreniformis was dredged by the "Challenger" in Simon's Bay, South Africa, 15-20 fathoms; and from Port Jackson, New South Wales, 2-10 fathoms. Dr. Egger's "Gazelle" specimens came from the neighbourhood of Mauritius at a depth of 411 metres.

Station 36, east of Tasmania, 777 fathoms. One valve.

Pontocypris trigonella, *G. O. Sars.*

Pontocypris trigonella, G. O. Sars, Oversigt af Norges marine Ostracoder, 1865, p. 16. G. S. Brady, Trans. Linn. Soc. Lond., xxvi., 1868, p. 387, pl. xxv., figs. 31-34;

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1. Brady, G. S.—Trans. Roy. Soc. Edin., xxxv., pt. ii., No. 14, 1890, p. 492, pl. 1, figs. 7, 8.

pl. xxviii., fig. 3. Brady, Crosskey and Robertson, Mon. Post.-tert. Entom. Scotland, etc. (Pal. Soc. Mon.), 1874, p. 137, pl. xvi., figs. 26-28. G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 36, pl. xv., figs. 4*a-d*. Brady and Norman, Sci. Trans. Roy. Dubl. Soc., ser. ii., iv., No. ii., 1889, p. 109, pl. xxii., figs. 18-25; pl. xxiii., fig. 6. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 422, pl. i., figs. 16, 17. Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 426.

This species occurs sparingly in the warmer waters of the ocean, but is very abundant in the North Atlantic, and especially round the British Islands. It generally affects shallow water in cold and temperate seas, occurring in deeper water in lower latitudes. At Funafuti it was found at the great depth of 1485 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. One complete carapace of typical dimensions.

Genus ARGILLŒCIA, *G. O. Sars.*

ARGILLŒCIA AFFINIS, *Chapman.*

Argillœcia affinis, Chapman, Journ. Linn. Soc. Lond., Zool., xxviii., 1902, p. 419, pl. xxxvii., figs. 1*a-c*. *Id.*, *ibid.*, xxx., 1910, p. 428.

This species was originally described from soundings made by H.M.S. "Penguin," near Funafuti, at 1489 fathoms, and has been since recorded by the writer from three soundings from the same place, at 1050, 1417 and 2715 fathoms.

Station 36, east of Tasmania, 777 fathoms. Common.

ARGILLŒCIA GRACILIOR, *Chapman.*

Argillœcia gracilior, Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 428, pl. lvi., figs. 18*a-b*.

A. gracilior was first described from the soundings by the "Penguin" from Funafuti, at 1050 and 1215 fathoms. The present specimens are rather smaller than the type, measuring .44mm. in length against that of .7mm. from the Funafuti example.

Station 36, east of Tasmania, 777 fathoms. Two specimens.

Genus Macrocypris, *G. S. Brady.*

Macrocypris decora, *G. S. Brady, sp.*

Cytherideis decora, G. S. Brady, Trans. Zool. Soc. Lond., v., 1865, p. 366, pl. lvii., figs. 13*a-c*. *Macrocypris decora*, Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 44, pl. i., figs. 3*a-d*; pl. vi., figs. 8*a-b*. *Id.*, Trans. Roy. Soc. Edin., xxxv., pt. ii., No. 14, 1890, p. 492.

The carapaces found in the present dredgings are of typical dimensions. The depth is rather exceptional, 390 fathoms being the deepest hitherto recorded for this species.

Station 36, east of Tasmania, 777 fathoms. Frequent.

Macrocypris gracilis, *sp. nov.*

(Plate ii., figs. 2*a-c*.)

Description.—Carapace very slender; siliquose; highest in the middle. Height less than one-fourth the length. Dorsal margin evenly arcuate, ventral margin concave just above the middle and curving out to meet the depressed anterior margin. Posterior end tapering to a blunt point. Edge view, elongate-ovate, compressed at the extremities. Length, 1mm.; greatest height, .23mm.

Relationships.—This species bears a general resemblance to *M. tenuicauda*, Brady[1] but is much more elongate, and the dorsal border more evenly rounded. The specimen figured by Dr. Egger from Station 90, off Western Australia, at 357 metres[2] and referred to *M. tenuicauda*, Brady, is probably referable to this new species.

Station 36, east of Tasmania, 777 fathoms. A left valve.

Genus Bythocypris, *G. S. Brady.*

Bythocypris elongata, *G. S. Brady.*

Bythocypris elongata, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 47, pl. vi., figs. 1*a-c*.

Separate valves of the above species occur in the undermentioned dredging. They agree in outline with Brady's

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1. Brady—Chall. Rep., Zool., i., pt. iii., 1880, p. 41, pl. ii., figs. 1a-f; pl. iii., figs. 2a-b.
2. Egger—Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth ii., 1901, p. 424, pl. i., figs. 23, 24.

figured examples, which came from Tristan d'Acunha at 1425 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Two valves.

Genus BAIRDIA, *McCoy.*

BAIRDIA AMYGDALOIDES, G. S. *Brady.*

Bairdia amygdaloides, G. S. Brady, Trans. Zool. Soc. Lond., v., 1865, p. 364, pl. lvii., figs. 6*a-c*. *Id.*, Chall. Rep., Zool., i., pt. iii., 1880, p. 54, pl. ix., figs. 5*a-f* ; pl. x., figs. 2*a-e*.

B. amygdaloides appears to be almost peculiarly an Australian form, but it also occurs in the South Pacific. It is also a common fossil in Australian Tertiary beds, from at least Miocene times upwards.

Station 36, east of Tasmania, 777 fathoms. Frequent; specimens small.

Forty miles south of Cape Wiles, 100 fathoms. Frequent; specimens of normal size.

BAIRDIA ANGULATA, *G. S. Brady.*

(Plate ii., fig. 3).

Bairdia angulata, G. S. Brady, Les Fonds de la Mer, i., 1867, p. 199, pl. xxvii., figs. 11, 12. *Id.*, Chall. Rep., Zool., i., pt. iii., 1880, p. 59, pl. xi., figs. 5*a-d*.

It is of great interest to meet with this widely distributed but rare species in the Southern Ocean. Dr. Brady records it from off the Azores, 450 fathoms; Torres Strait, 155 fathoms; and off the West Coast of South America, 160 fathoms.

Station 36, east of Tasmania, 777 fathoms. Two left and one right valve.

BAIRDIA FUSCA, *G. S. Brady.*

Bairdia fusca, G. S. Brady, Trans. Zool. Soc. Lond., v., 1865, p. 364, pl. lvii., figs. 7*a-d*. *Id.*, Chall. Rep., Zool., i., pt. iii., 1880, p. 49, pl. vii., figs. 2*a-d*. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 427, pl. vii., figs. 47-49.

This species is characteristically Australian, having been originally described by Brady from Australian specimens and afterwards obtained by the "Challenger" at Port Jackson, New South Wales, 2-10 fathoms. It has been recorded and figured by Dr. Egger from "Gazelle" dredgings off the West African coast at 677 metres. The figure given by Egger shows the anterior extremity more than usually broad, so that there may be some doubt as to whether his specimen is correctly referred to *B. fusca*, Brady.

Station 36, east of Tasmania, 777 fathoms. Two single valves.

Bairdia villosa, *G. S. Brady.*

Bairdia villosa, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 50, pl. iii., figs. 3*a-b*; pl. v., figs. 2*a-g*; pl. viii., figs. 4*a-f*.

This species appears to be restricted to the Southern Ocean, having occurred in "Challenger" dredgings off Nightingale Island, Tristan d'Acunha, 100 to 150 fathoms; Balfour Bay, Kerguelen Island, 20 to 50 fathoms; off Christmas Harbour, Kerguelen Island, 120 fathoms; off Prince Edward Island, 50 to 150 fathoms; and off East Moncoeur Island, Bass Strait, 38 to 40 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Separate valves, abundant.

Bairdia woodwardiana, *G. S. Brady.*

Bairdia woodwardiana, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 57, pl. xi., figs. 1*a-e*. *Id.*, Trans. Roy. Soc. Edin., xxxv., pt. ii., No. 14, 1890, p. 494.

This species was previously described by Dr. Brady from off Nukualofa, Tongatabu, at 18 fathoms, and Vuna Point, Taviuni, between tide-marks.

The present examples resemble *B. crosskeiana* in side view, but, as Brady has pointed out, they are more equally ovate in edge view. Our specimens have minute puncta scattered over the valve surface.

Station 36, east of Tasmania, 777 fathoms. Two isolated valves.

Family CYTHERIDÆ.

Genus Cythere, *Müller.*

Cythere canaliculata, *Reuss, sp.*

Cypridina canaliculata, Reuss, in Haidinger's Abhandl., iii., 1850, p. 76, pl. ix., fig. 12.

Cythere canaliculata (Reuss sp.), G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 73, pl. xiv., figs. 7*a-d*. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth., ii., 1901, p. 432, pl. iv., figs. 15, 16.

This species dates back to Miocene times, in which formation it occurs both in Europe (Bohemia, Austria, Galicia, Italy, etc.), and in Australia (Victoria). Amongst the fossils from the Miocene of the Mallee there occurs a papillate variety of the species identical with the present living example.

The "Challenger" specimens came from Bass Strait, 38-40 fathoms; and from Port Jackson, New South Wales, 2-10 fathoms. Dr. Egger records his "Gazelle" specimens from the West Coast of Australia.

Station 36, east of Tasmania, 777 fathoms. One valve.

Cythere cancellata, *G. S. Brady*.

Cythere cancellata, G. S. Brady, Les fonds de la Mer, i., 1868, p. 62, pl. vii., figs. 9-11. *Id.*, Chall. Rep., Zool., i., pt. iii., 1880, p. 73, pl. xiv., figs. 9 *a-e*. Chapman, Trans. N.Z. Inst., xxxvii., 1906, p. 108.

This species has been recorded by Brady from Tongatabu, at 18 fathoms, and off Booby Island at 6-8 fathoms. The writer obtained it from Great Barrier Island, New Zealand at 110 fathoms; and from shore-sand on the seaward face of Cocos Island.

Station 36, east of Tasmania, 777 fathoms. Two separate valves.

Cythere crispata, *G. S. Brady*.

Cythere crispata, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 72, pl. xiv., figs. 8*a-d*.

This species was previously known from Port Jackson, New South Wales, 2-10 fathoms; from Booby Island, 6-8 fathoms, and from anchor mud in Hong-kong Harbour, 7 fathoms.

Forty miles south of Cape Wiles, 100 fathoms. Two valves.

Cythere cytheropteroides, *G. S. Brady*.

(Plate ii., figs. 4*a-b*).

Cythere cytheropteroides, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 78, pl. xv., figs. 5*a-d*.

A single valve of this rare species occurs in the present soundings. It was originally described from "Challenger" examples, from a dredging in 150 fathoms off the Cape of Good Hope.

Station 36, east of Tasmania, 777 fathoms. A left valve.

CYTHERE DICTYON, *G. S. Brady.*

Cythere dictyon, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 99, pl. xxiv., figs. 1*a-y*.

C. dictyon is a generally deep water species, but it occasionally occurs at moderate depths. The specimens here found in the sounding at 100 fathoms are most like those which I have described as Miocene fossils in the polyzoal rock in the Mallee Borings of Victoria.

Station 36, east of Tasmania, 777 fathoms. Specimens typical, common.

Forty miles south of Cape Wiles, 100 fathoms. Specimens well grown and abundant; ornament comparatively stronger than in deep water forms.

CYTHERE FOVEOLATA, *G. S. Brady.*

Cythere foveolata, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 75, pl. xiii., figs. 5*a-h*.

The "Challenger" examples were obtained off Christmas Harbour, Kerguelen Island, at 120 fathoms; and off Heard Island at 75 fathoms.

C. foveolata has been recently identified by the writer from Raised Beaches in the Antarctic.

This species forms a central type with several varieties or allied forms as *C. moseleyi*, G.S.B., and *C. falklandi*, G.S.B.

The present example has the surface reticulations less strongly developed than usual, otherwise it is typical.

Station, 36, east of Tasmania, 777 fathoms. One valve.

CYTHERE IMPLUTA, *G. S. Brady.*

Cythere impluta, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 76, pl. xvi., figs. 3*a-d*; pl. xxvi., figs. 6 *a-d*.

The present specimens most nearly resemble the figures on plate xxvi. of Dr. Brady's Report, which represent examples from both Tristan d'Acunha and the Falkland Islands. The type of shell figured on plate xvi. of the same

Report, from the Falkland Islands only, is less distinctly areolate on the surface.

Forty miles south of Cape Wiles, S.A., 100 fathoms. Two separate valves.

CYTHERE LEPRALIOIDES, *G. S. Brady.*

Cythere lepralioides, G. S. Brady, Chall. Rep., Zoöl., i., pt. iii., 1880, p. 94, pl. xix., figs. 5*a-d*.

The "Challenger" specimens were obtained in Simon's Bay, South Africa, 15-20 fathoms, and off the Cape of Good Hope, 150 fathoms.

The present example is very typical and well preserved.

East of Tasmania, 1122 fathoms. One right valve.

CYTHERE PARALLELOGRAMMA, *G. S. Brady.*

Cythere parallelogramma, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 82, pl. xv., figs. 1*a-e*. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 442, pl. vi., figs. 15-16.

The "Challenger" example came from Prince Edward Island, 50-150 fathoms. Dr. Egger obtained it off the West Coast of Africa. It has recently been identified in Raised Beach deposits in the Antarctic by the writer.

Forty miles south of Cape Wiles, 100 fathoms. A right valve.

CYTHERE PECTUNCULATA, *Chapman.*

Cythere pectunculata, Chapman, Journ. Linn. Soc. Lond., Zool., xxviii., 1902, p. 425, pl. xxxvii., figs. 2*a-b*.

C. pectunculata is allied to *C. lactea*, G. S. Brady[1] in the tritubercular ornament, but is distinguished by the former being triangular in lateral aspect instead of quadrangular as in *C. lactea*.

The above species was first discovered in beach-sand at Avalau Islet, Funafuti, where it is not uncommon.

Station 36, east of Tasmania, 777 fathoms. One valve.

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1. Brady—Trans. Zool. Soc. Lond., v., 1865, p. 377, pl. lx., figs. 3A-C. Rep. Chall., Zool., i., pt. iii., 1880, p. 91, pl. xxii., figs. 1A-D.

CYTHERE QUADRIACULEATA, *G. S. Brady.*

Cythere quadriaculeata, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 86, pl. xxii., figs. *2a-d*; pl. xxv., figs. *4a-d*.

Originally described from specimens dredged by the "Challenger" in the Inland Sea, Japan, 15 fathoms, and off the reefs at Honolulu at 40 fathoms. At Funafuti it occurred in deep soundings at 1050 and 1215 fathoms respectively.

Station 36, east of Tasmania, 777 fathoms. Two separate valves.

CYTHERE SCABROCUNEATA, *G. S. Brady.*

Cythere scabrocuneata G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 103, pl. xvii., figs. *5a-f*; pl. xxiii., figs. *2a-c*. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 441, pl. viii., figs. 1-3.

This species is very typical of the Bass Strait fauna, and was also recorded from the Inland Sea, Japan, and from Wellington Harbour, New Zealand, by Dr. Brady. The "Gazelle" specimens of Dr. Egger came from the west coast of Australia.

Station 36, east of Tasmania, 777 fathoms. Frequent.

East of Tasmania, 1122 fathoms. Occasional.

CYTHERE SWEETI, *Chapman.*

Cythere sweeti, Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 432, pl. lvii., figs. *23a-b*.

This species was originally recorded from Funafuti, where it occurred at depths of 1050 to 1485 fathoms.

Station 36, east of Tasmania, 777 fathoms. One typical valve.

Genus EUCYTHERE, *G. S. Brady.*

EUCYTHERE DECLIVIS, *Norman*, SP.

(Plate ii., fig. 5.)

Cythere declivis, Norman, Nat. Hist. Trans. Northumb. and Durham, i., 1865, p. 16, pl. v., figs. 9-12.

Eucythere declivis (Norm. sp.), G. S. Brady, Trans. Linn. Soc. Lond., xxvi., 1868, p. 430, pl. xxvii., figs. 22-26, 52-55. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 449, pl. iv., figs. 65-67.

This generally-distributed Atlantic species was found in "Gazelle" dredgings by Dr. Egger off the coast of West Australia at a depth of 357 metres.

Forty miles south of Cape Wiles, 100 fathoms. One valve.

Genus KRITHE, *Brady, Crosskey & Robertson.*

KRITHE PRODUCTA, *G. S. Brady.*

Krithe producta, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 114, pl. xxvii., figs. 1*a-j*. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 451, pl. iv., figs. 17-18.

This species is widely distributed and almost confined to deep-water conditions. Amongst other localities it has been found off Sydney at 410 fathoms. Egger records it from near Kerguelen Island and off the west coast of Australia.

Station 36, east of Tasmania, 777 fathoms. Common.

East of Tasmania, 1122 fathoms. A left valve.

Genus LOXOCONCHA, *G. O. Sars.*

LOXOCONCHA AUSTRALIS, *G. S. Brady*[1], *var.* TASMANICA, *var. nov.*

(Plate ii., fig. 6.)

The specimens of the present series are thin-shelled and ovoid, and the valves are less distinctly pitted than in the typical form. The species, which usually occurs in shallow water, has been recorded by Dr. Brady from Port Jackson, N. S. Wales, 2-10 fathoms; off Booby Island, Cape York, 6-8 fathoms; and from the Port of Nouméa, New Caledonia, 2-6 fathoms. The writer has also obtained *L. australis* from the beach-sands and lagoon dredgings round Funafuti.

Station 36, east of Tasmania, 777 fathoms. Two separate valves.

LOXOCONCHA VARIOLATA, *G. S. Brady.*

Loxoconcha variolata, G. S. Brady, Trans. Zool. Soc. Lond., x., 1878, p. 400, pl. lxviii., figs. 4*a-d*. *Id.*, Chall. Rep., Zool., i., pt. iii., 1880, p. 121, pl. xxix., figs. 6*a-d*.

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1. *Loxoconcha australis*, G. S. Brady, Rep. Chall., Zool., i., pt. iii., 1880, p. 119, pl. xxviii., figs. 5A-F; pl. xxix. figs. 3A-D. *Id.*, Trans. Roy. Soc. Edin., xxxv., pt. ii., No. 14, 1890, p. 507. Chapman, Journ. Linn. Soc. Lond., Zool., vol. xxviii., 1902, p. 427.

This species has been recorded from recent dredgings off Booby Island, 6-8 fathoms ; and as a fossil from the Lower Pliocene of Belgium (Antwerp Crag). Curiously, the recent example off Cape Wiles, South Australia, is nearest in general characters to the fossil form, the specimens from Booby Island being shorter and less compressed around the margins of the valves.

Forty miles off Cape Wiles, 100 fathoms. A left valve.

Genus Xestoleberis, *G. O. Sars.*

Xestoleberis davidiana, *sp. nov.*

Xestoleberis, sp. nov. aff. *setigera*, Brady, Chapman, Zool. Results, " Endeavour," i., pt. iii., 1912, p. 311.

The following description is based on a specimen from a raised beach on the slopes of Mt. Erebus in the Antarctic region. The publication of the paper in which it should have appeared being unavoidably delayed, I am indebted to Professor David for permission to include it here.

Carapace in side view, semiovate, bluntly pointed in front and behind ; back rounded, slightly angulated at the summit ; ventral border gently concave, edge rounded, ventral surface excavate. Edge view, compressed ovate. End view, conical, with rounded sides. Surface of shell more or less numerously pitted, each pit or group of pits surrounded by a white spot ; probably armed with fine bristles (as in *X. setigera*) in the living state. A few valves of narrower build are present, one of which is figured ; they are probably referable to male specimens.

Measurements: Length of type specimen, .48mm. ; greatest thickness of carapace, .3mm. ; height, .3mm.

It is extremely interesting to find this neat little species still living in the Southern Ocean.

South of Tasmania, 1122 fathoms. One valve.

Xestoleberis ?intermedia, *G. S. Brady.*

Xestoleberis ? intermedia, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 128, pl. xxxiii., figs. *2a-d.*

The example found in the present series agrees in all particulars with Dr. Brady's figured specimen from Torres Strait, 155 fathoms. It differs from *X. setigera*, G. S. Brady, in the rounded anterior extremity of the carapace.

Forty miles south of Cape Wiles, 100 fathoms. A left valve.

Xestoleberis nana, *G. S. Brady.*

Xestoleberis nana, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 126, pl. xxxi., figs. 5*a-c*.

Our specimens from Cape Wiles are rather higher than those figured by Dr. Brady, but there is little doubt that they are referable to the above species.

X. nana was recorded from 18 fathoms off Tongatabu.

East of Tasmania, 1122 fathoms. One small valve.

Forty miles south of Cape Wiles, 100 fathoms. Two valves.

Xestoleberis variegata, *G. S. Brady.*

Xestoleberis variegata, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 129, pl. xxxi., figs. 8*a-g*.

The previously recorded localities for this species are off St. Vincent, Cape Verde, 1070 fathoms ; off Tongatabu, 18 fathoms ; Nouméa, 2-6 fathoms ; and in the Fiji and Samoan Islands, in shallow water. In dredgings taken at 1489 fathoms at Funafuti the writer found a single valve of this species.

Forty miles south of Cape Wiles, 100 fathoms. Two valves.

Genus Cytherura, *G. O. Sars.*

Cytherura cryptifera, *G. S. Brady.*

Cytherura cryptifera, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 134, pl. xxxii., figs. 4*a-c*.

The "Challenger" specimens were from a dredging in Bass Strait, 38-40 fathoms. Only one carapace of this species has been previously found.

Station 36, east of Tasmania, 777 fathoms. Two separate valves, of a normal and a narrow carapace.

Cytherura tenuicosta, *Chapman.*

Cytherura tenuicosta, Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 436, pl. lvii., figs. 25*a-b*.

This is an interesting form of the genus, in which the ornament consists of fine parallel costulæ. It was originally described from deep dredgings around Funafuti, at 1215 and 1417 fathoms. This second occurrence of the species in deep water seems to indicate its persistent bathymetrical habitat, even in areas of different latitudes.

Station 36, east of Tasmania, 777 fathoms. Two valves.

Genus Cytheropteron, *G. O. Sars.*

Cytheropteron abyssorum, *G. S. Brady.*

Cytheropteron abyssorum, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 138, pl. xxxiv., figs. 3*a-d.* Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 437.

Brady's original specimens were dredged by the "Challenger" in the Southern Ocean, south-west of Tasmania, in 2600 fathoms. Since then the writer has met with it in dredgings from round Funafuti at 1050 and 1417 fathoms.

Station 36, east of Tasmania, 777 fathoms. One valve.

East of Tasmania, 1122 fathoms. One valve.

Cytheropteron abyssorum, *G. S. Brady*; var. wilesensis, *var. nov.*

(Plate iii., figs. 1*a-b.*)

Description.—This variety differs from *C. abyssorum* in having a longer carapace with more produced extremities, a sharper and more prominent beak, and a more depressed shell. Moreover, the areolated surface is finer, and relieved by radial lines emanating from the beak. A typical valve measures: length .54 mm., height .365 mm.

Forty miles south of Cape Wiles. Two valves.

Cytheropteron coccoides, *G. S. Brady.*

Cytheropteron coccoides, G. S. Brady, Trans. Roy. Soc. Edin., xxxv., pt. ii., No. 14, 1890, p. 510, pl. iii., figs. 20-21.

This rare form is recorded for the first time in Australian waters. It was originally described by Dr. Brady from a fringing reef at Mango Island, Fiji.

It is somewhat anomalous to find this species in two such totally distinct conditions as shallow reef waters in low latitude and in deep water of considerably higher latitude.

Station 36, east of Tasmania, 777 fathoms. One valve.

Cytheropteron dannevigi, *sp. nov.*

(Plate iii., figs. 2*a-c.*)

Description.—Valve in lateral aspect elongate and subrectangular. Height less than half the length. Anterior extremity broad, rounded below and truncately rounded to the back. Dorsal line slightly sinuous, concave in the middle. Ventral border straight. Posterior extremity obliquely truncated below, bearing off to a blunt point at the dorsal angle. Beak well developed over the median area, with a broad, blunt termination. Surface of valve round the anterior border depressed and flange-like, the posterior extremity being similarly depressed. Surface smooth, except for some faint pittings in the rostral area, and faint lineations on the terminal part of the beak and on the dorsal area parallel with the hinge margin.

Dimensions.—Length .8 mm., height .365mm.

Affinities.—So far as I am aware there appears to be no species of the genus which closely approaches the above form. The nearest that might be cited is *C. wellingtoniense*, G. S. Brady[1], but this differs in the suboval form of the valve in side view, and in the absence of a marked depression at the extremities. *C. wellingtoniense*, moreover, has a narrow anterior extremity as compared with the broadly expanded form of *C. dannevigi*.

Named in honour of Mr. H. C. Dannevig, Director of Fisheries, under whose auspices these soundings were collected.

Station 36, east of Tasmania, 777 fathoms. One left valve.

CYTHEROPTERON FIMBRIATUM, *sp. nov.*

(Plate iii., figs. 3*a*-*b*.)

Description.—Seen from the side, shell elongate ovate, narrow at the anterior extremity, acuminate posteriorly. The dorsal margin is evenly and strongly convex ; ventral margin sinuous and concave. Beak prominent, somewhat arched and produced into a sharp point, the margin beneath bearing a short fringe of sharp spines. Surface of shell finely punctate.

Dimensions.—Length .54 mm., height .327 mm.

Affinities.—This species is related both to *C. antarcticum*, Chapman[2], and to *C. abyssorum*, var. *wilesensis*. From *C. antarcticum* it differs in the inflation of the median area of the shell, in its punctate surface, and in the fimbriate

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1. Brady—Rep. Chall. Zool., vol. i., pt. iii., 1880, p. 136, pl. xxxiv., figs. 4A-D.
2. Chapman—Rep. on Ostracoda from a Raised Beach above the Drygalski Glacier, South-east of Mount Larsen. (Now in the press.)

margin of the beak. From the variety *wilesensis* it is distinguished by the latter character, and by the constantly finer ornamentation of the surface. Another species closely related to the above is *C. alatum*, G. O. Sars[1]; this differs principally in the greater expansion of the alæ.

Station 36, east of Tasmania, 777 fathoms. Frequent.

Genus Bythocythere, *G. O. Sars.*

Bythocythere retiolata, *Chapman.*

Bythocythere retiolata, Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 437, pl. lvii., figs. 26*a-b*.

The occurrence of this species in the Southern Ocean is interesting, since it was recently recorded from Funafuti at a depth of 1050 fathoms.

The Australian specimens differ from that from Funafuti in having a less prolonged extremity, but otherwise the essential features agree.

Station 36, east of Tasmania, 777 fathoms. A left valve.

Bythocythere velifera, *G. S. Brady.*

(Plate iii., fig. 4*a-b*.)

Bythocypris velifera, G. S. Brady, Chall. Rep., Zool., i., pt. iii., 1880, p. 143, pl. xxxii., figs. 5*a-c*. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 463, pl. v., figs. 32-34.

Brady records this species from Torres Strait at 155 fathoms, whilst Egger obtained it in dredgings from the west coast of Australia at 357 metres.

The present specimens from Cape Wiles have the alæ regularly and boldly curved anteriorly. The examples from Station 36, east of Tasmania, agree more closely with Dr. Egger's specimens. The arrangement of muscle-spots on the valve is peculiarly interesting, and they are here figured for the first time.

Station 36, east of Tasmania, 777 fathoms. A right valve.

Forty miles south of Cape Wiles, 100 fathoms. Two left valves.

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1. See Brady and Norman, Trans. R. Dubl. Soc., iv., pt. ii., 1889, p. 214, pl. xx, figs. 8-10.

Genus Pseudocythere, *G. O. Sars.*

Pseudocythere caudata, *G. O. Sars.*

Pseudocythere caudata, G. O. Sars, Oversigt Norges marine Ostracoder, 1865, p. 88. G. S. Brady, Trans. Linn. Soc. Lond., xxxi., pt. ii., 1868, p. 453, pl. xxxiv., figs. 49-52, pl. xli., fig. 6. Egger, Abhandl. d. k. Bayer. Akad. Wiss., xxi., Abth. ii., 1901, p. 463, pl. viii., figs. 33, 34. Chapman, Journ. Linn. Soc. Lond., Zool., xxx., 1910, p. 438.

This is a cosmopolitan species, being recorded by Dr. Brady both as a Pleistocene fossil and a recent species from Great Britain, as well as from Kerguelen Island and Prince Edward Island in the Southern Ocean, and off the east coast of South America. The writer obtained it from dredgings round Funafuti at 1050 and 1215 fathoms. The "Gazelle" specimens recorded by Egger were found off the West Australian coast.

Station 36, east of Tasmania, 777 fathoms. Common.

Forty miles south of Cape Wiles, 100 fathoms. One valve.

Genus Sclerochilus, *G. O. Sars.*

Sclerochilus contortus, *Norman, sp.*

Cylhese conoorta, Norman, Ann. Mag. Nat. Hist., (3), ix., 1862, p. 48, pl. ss., fig. 15. *Id.*, Trans. Linn. Soc. Lond., xxvii., 1868, p. 435, pl. xxxiv., figs. 5-10; pl. xli., fig. 7. *Sclerochilus contortus* (Norman, sp.), G. S. Brady, Rep. Chall., Zool., i., pt. iii., 1880, p. 147, pl. xxxv., figs. 8*a*-*b*.

This is a well-distributed genus and species, it being found along the shores of the North Atlantic, while the "Challenger" obtained it from Kerguelen Island, off Heard Island, and from Wellington Harbour.

Station 36, east of Tasmania, 777 fathoms. Two separate valves and a complete carapace.

APPENDIX ON THE OSTRACODA.

This group of minute crustacea has hardly received the attention it deserves in regard to the distribution of its genera and species in the Southern Ocean. Practically all the previous records for that area have been made by Dr. G. Stewardson Brady, F.R.S., in connection with the "Challenger" material, and in his "New and Imperfectly Known Species of Marine Ostracoda,[1]" in which he describes some shallow-water forms from Port Phillip, Victoria.

The genera represented in the present series comprise the following :—? *Aglaia*, *Pontocypris*, *Argilloecia*, *Macrocypris*, *Bythocypris*, *Bairdia*, *Cythere*, *Eucythere*, *Krithe*, *Loxoconcha*, *Xestoleberis*, *Cytherura*, *Cytheropteron*, *Bythocythere*, *Pseudocythere*, and *Sclerochilus*.

The forty-five species and two varieties of the present work are nearly all new to the area of the Southern Ocean east of Tasmania and off South Australia.

Several of the deep-water species, such as *Argillœcia affinis*, *A. gracilior*, *Cythere pectunculata*, *C. sweeti*, *Cytherura tenuicosta*, and *Bythocythere retiolata*, have hitherto been recorded only from Funafuti in the South Pacific. The depths from which these examples from lower latitudes came are generally greater than those of the present soundings. This is only to be expected, for as a rule a widely spread fauna sinks to lower depths and cooler temperatures as it nears the tropics.

Apart from the new species, several very rare forms are likewise noted from these Southern Ocean dredgings. In addition to those just enumerated, they are : ?*Aglaia obtusata* (previous localities, Kerguelen Island and Funafuti), *Pontocypris gracilis* (Levuka and Rambe Island), *Bythocypris elongata* (Tristan d'Acunha), *Bairdia angulata* (Azores, Torres Strait and South America), *Cythere cytheropteroides* (Cape of Good Hope), *Eucythere declivis* (a North Atlantic species and only once recorded from the southern hemisphere, viz., off West Australia), *Loxoconcha variolata* (Booby Island and fossil in the Antwerp Crag), *Xestoleberis davidiana* (Pleistocene in the Antarctic), *Cytherura cryptifera* (a single carapace from off East Moncœur Island, Bass Strait), *Cytheropteron coccoides* (Mango Island, Fiji), and *Bythocythere velifera* (Torres Strait and West Australia).

For valued assistance in the sorting of the material examined, thanks are due to my wife.

1. Brady—Trans. Zool. Soc. Lond., v., 1866, pp. 359-393.

1915

Commonwealth of Australia

Department of Trade and Customs

FISHERIES

Biological Results of the Fishing Experiments carried on by the F.I.S. "Endeavour," 1909-14.

H. C. Dannevig,
Commonwealth Director of Fisheries.

VOL. III., PART 2.

Published by Direction of the Minister for Trade and Customs, Hon. Frank Gwynne Tudor

Sydney, 30th January, 1915

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II. Report on the Algæ dredged by the F.I.S. "Endeavour" in Oyster Bay, Tasmania.

BY

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Sydney Grammar School.

REPORT ON ALGÆ FROM OYSTER BAY, TASMANIA.

PHANEROGAMIA.

Cymodocea antarctica, *Endl.*

The only Phanerogam included is a rooting fragment of this species, which is common on both sides of Bass Strait, and extends to West Australia. The depth of the water recorded was thirty-five fathoms, which is noteworthy; as the specimen was a rooting one, it seems probable that the plant was actually growing at this depth.

ALGÆ.

CHLOROPHYCEÆ.

Codium tomentosum (*Huds.*), *Stackh.*

The only green alga in the collection is a well-grown plant of this species, which is not in fruit.

It is of cosmopolitan range, occurring on both east and west coasts of the Atlantic Ocean; in the Mediterranean Sea; the Red Sea; around Mauritius; and the Philippine Islands. There are other species of very similar appearance, which are common on the south and east coasts of Australia. I have received *C. tomentosum*, however, from Dunk Island, north-eastern Queensland, and I think that it probably occurs in fair abundance in Australian seas. The species of *Codium* afford food and shelter to a large number of molluscs and other invertebrate animals.

FUCOIDEÆ—Brown Sea-weeds.

Sargassum verruculosum (*Mert.*), *Ag.*

Sargassum raoulii, Hook. fil. and Harv.

One fragment, not bearing fruit.

This *Sargassum* is common on both sides of Bass Strait, and extends to New Zealand.

Sargassum undulatum, *J. Ag.* (?)

A small fragment having the wavy folia characteristic of this species, but in the absence of fruit it is impossible to distinguish it from some of its congeners. The floats are mucronate, which is characteristic of the section *Arthrophycus* to which *S. undulatum* belongs.

Port Phillip, Victoria, and Tasmania.

Cystophora uvifera (*Ag.*), *J. Ag.*

Three fronds, not in fruit, bearing characteristic vesicles.

This species occurs all round the southern coast of Australia from Fremantle, West Australia, to Eden, New South Wales, where I have found it in plenty, and about Tasmania.

Cystophora grevillei (*Ag.*), *J. Ag.*

One frond with typical fruit.

From Fremantle, West Australia, to Wilson's Promontory, Victoria, and Tasmania.

Scaberia agardhii, *Grev.*

A fine plant in excellent fruit.

From Fremantle, West Australia, to Port Phillip, Victoria; Tasmania; Lord Howe Island; the Auckland Islands and New Zealand. After very heavy storms from the south, I have found it cast up on Bondi beach, New South Wales.

Lobospira bicuspidata, *Aresch.*

A small, just recognisable fragment, which is much worn.

From Busselton, West Australia, to Barwon Heads, Victoria. Not previously recorded from Tasmania.

Macrocystis pyrifera (*Turn.*), *Ag.*

A broken segment of a mid-frond.

This species occurs in the colder seas; Cape of Good Hope; Cape Horn, and thence northward as far as Peru; Victoria, round to Eden, New South Wales; Tasmania. It also occurs on the west coast of North America, extending south as far as California. It was present with *Scaberia* in some southern drift which I collected at Bondi, New South Wales, after a southerly gale.

FLORIDEÆ—Red Sea-weeds.

Callophyllis coccinea, *Harv.*

A small, but beautifully coloured fragment of this characteristic Tasmanian species, which is without fruit.

Plocamium costatum (*J. Ag.*), *Hook. fil. & Harv.*

Three fragments, not in fruit.

From West Australia to Wilson's Promontory, Victoria. Common in Tasmania.

Ptilonia australasica, *Harv.*

Three fragments bearing scattered cystocarps.
Victoria and Tasmania.

Pollexfenia lobata (*Lamour.*), *Falk.*

Jeannerettia lobata, Hook. fil. & Harv.

Three small fragments.
Fremantle, West Australia, to Port Phillip, Victoria, Tasmania, to Port Arthur.

Metagoniolithon stelligerum (*Lamarck*), *Weber de Bosse.*

Amphiroa stelligera, Lamarck.

Fragments showing fruit here and there, of a beautiful rosy pink colour. In shore debris, the plants are almost always bleached.
Fremantle, West Australia, to Port Phillip, Victoria; Tasmania.

Corallina pilifera, *Lamour.*

Small fronds two inches long, with cystocarps armed with rather long cornua. *C. pilifera* is practically a form of the widely distributed *C. cuvieri*, Lamour., which is found all round the coasts of Australia, except perhaps the north, and is common in Tasmania.

III. Report on the Alcyonarians obtained by the F.I.S. "Endeavour" on the Eastern and Southern Coasts of Australia.

PART I.

BY

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Zoologist, Australian Museum, Sydney.

Plates iv.-xii.

REPORT ON THE ALCYONARIANS.

Part I.

I.—Introduction.

Previous to the publication of Wright and Studer's Report[1] on the Alcyonaria collected by the "Challenger," our knowledge of the Alcyonarian Fauna of Australia was confined mainly to forms from western and north-western localities, and from the shallow waters of Queensland and Torres Strait. This knowledge is based on collections obtained by the "Herald"[2] and "Fly,"[3] the Antarctic Expedition under Ross[4], the German Circumnavigatory Expedition in the "Gazelle,"[5] and to the zoological collections made in the Indo-Pacific Ocean during the voyage of the "Alert."[6] The "Challenger" Expedition extended this field, and also collected and recorded a number of forms from the southern and south-eastern shores of Australia. Since then fresh instalments of new species have been added by Prof. S. J. Hickson[7], who described the collection of Alcyonaria brought together by Mr. J. B. Wilson during the biological survey of Port Phillip, Victoria; and by Prof. W. Kükenthal[8], who has recorded a number of species from Western Australia. Finally, Prof. J. A. Thomson and Miss D. L. Mackinnon[9] published a detailed account of the Alcyonaria, which were gathered together by the "Thetis" Expedition during trawling operations within the one hundred fathom line off the coast of New South Wales.

The Alcyonarians described in the present Report were trawled by the "Endeavour" on the eastern and southern coasts of Australia in depths of from fifteen to three hundred fathoms. The collection includes twenty-seven species, of which twenty-four are referable to known species distributed among fifteen genera; the remainder have required the establishment of three new species.

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1. Wright and Studer—Chall. Rep., Zool., xxxi., 1889.

2, 3, 4. Gray—Proc. Zool. Soc., 1862 and 1872; *Id.*, Ann. Mag. Nat. Hist., (3), v., 1860; (4), ii., 1868; (4), iii., 1869; *Id.*, Cat. Lithophytes in Brit. Mus., 1870.

5. Studer—Monatsber. Akad. Wiss. Berlin, 1878.

6. Ridley—Report Zool. Coll. H.M.S. "Alert," 1884.

7. Hickson—Proc. Roy. Soc. Vict., (n.s.), ii., 1890, pp. 136-140.

8. Kükenthal—Die Fauna Südwest-Australiens, iii., 1, 1910, pp. 3-108.

9. Thomson and Mackinnon—Mem. Austr. Mus., iv., 13, 1911, pp. 661-695.

The following table shows the general nature of the collection :—

	Total number of genera.	Total number of species.	New species.
Order Alcyonacea	1	1	0
Order Pseudaxonia	2	3	0
Order Axifera	8	18	3
Order Stelechotokea	4	5	0
Totals	15	27	3

Of the new species, two belong to the genus *Mopsea* and one to *Plumarella*.

LIST OF SPECIES.

Order ALCYONACEA, *Verrill* (pro parte).

Family ALCYONIDÆ.

Alcyonium (*Erythropodium*) *membranaceum*, Kükenthal.

Order PSEUDAXONIA, *G. von Koch.*

Family MELITODIDÆ.

Mopsella clavigera, Ridley.
Mopsella textiformis (Lamarck).
Acabaria gracillima (Ridley).

Order AXIFERA, *G. von Koch.*

Family ISIDÆ.

Isis hippuris, Linnæus.
Mopsea dichotoma (Linnæus).
Mopsea encrinula (Lamarck).
Mopsea australis, Thomson and Mackinnon.
Mopsea flabellum, Thomson and Mackinnon.
Mopsea elegans, Thomson and Mackinnon.
Mopsea whiteleggei, Thomson and Mackinnon.
Mopsea plumacea, sp. nov.
Mopsea repens, sp. nov.

Family PRIMNOIDÆ.

Stachyodes studeri, Versluys.
Amphilaphis plumacea, Thomson and Mackinnon.
Plumarella thetis, Thomson and Mackinnon.
Plumarella filicoides, Thomson and Mackinnon.
Plumarella australis, sp. nov.
Primnoella australasiæ, Gray.
Primnoella grandisquamis, Wright and Studer.
Caligorgia flabellum (Ehrenberg).

Family GORGONELLIDÆ.

Ctenocella pectinata (Pallas).

Order STELECHOTOKEA, *Bourne*

Section I. ASIPHONACEA.

Family TELESTIDÆ.

Telesto arborea, Wright and Studer.
Telesto trichostemma (Dana).

Section II. PENNATULACEA

Family KOPHOBELEMNONIDÆ.

Kophobelemnon schmeltzii (Kölliker).

Family PTEROEIDIDÆ.

Godeffroyia elegans, Kölliker.
Sarcophyllum grande (Gray).

II.—Description of the Genera and Species.

Order ALCYONACEA, *Verrill* (pro parte).

Family ALCYONIDÆ.

Genus Alcyonium, *Linnæus*.

Alcyonium (Erythropodium) membranaceum, *Kükenthal*.

Alcyonium (*Erythropodium*) *membranaceum*, Kükenthal, Alcyonacea Wiss. Ergeb. deutsch. Tiefsee Exped., xiii., 1, 1906, p. 52, pl. i., fig. 3, pl. ix., figs. 42-44. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 665.

There are in the collection two branched Gorgonid axes, from which all trace of the original cœnenchyma has disappeared. They are completely overgrown by a light brown Sympodium-like Alcyonid, which agrees with Kükenthal's account of *Alcyonium* (*Erythropodium*) *membranaceum.* Owing to the friable nature of the specimens in the dried condition, very little of the internal structure can be distinguished.

There is considerable variety in the spicules of the cœnenchyma. There are (1) approximately spherical bodies—·087 × ·080 mm.; ·120 × ·105 mm.; ·122 × ·105 mm.; (2) short, thick cylinders with about two bands of thorny warts—·087 × ·070 mm.; ·105 × ·070 mm.; ·122 × ·075 mm.; and (3) irregular bodies and a few crosses—·087 × ·077 mm.; ·105 × ·087 mm.; ·122 × ·122 mm.

The polyp-spicules are spindles—·227 × ·070 mm.; ·240 × ·070 mm.; ·245 × ·077 mm.

Localities.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Great Australian Bight, 190-300 fathoms.

Distribution.—Francis Bay, 34°7′3″ S. Lat., 24°59′3″ E. Long., 100 metres (Kükenthal). The "Thetis" specimens were obtained at the following localities off the coast of New South Wales:—Eleven miles east of Broken Bay; Station 34, off Port Jackson, 39-36 fathoms; Station 42, off Wata Mooli, 70-78 fathoms; Station 43, off Botany Bay, 43-66 fathoms; Station 44, off Coogee, 49-50 fathoms; Station 47, off Bulgo, 63-57 fathoms; Station 48, off Wollongong, 55-56 fathoms (Thomson and Mackinnon).

Order PSEUDAXONIA, *G. von Koch.*

Family MELITODIDÆ.

Genus Mopsella, *Gray.*

Mopsella clavigera, *Ridley.*

Mopsella clavigera, Ridley, Report Zool. Coll. H.M.S. "Alert," 1884, p. 360, pl. xxxvii., fig. B, pl. xxxviii., figs. a-aIII. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 670, pl. lxviii., fig. 9. *Id.*, Nutting, Gorgonacea Siboga Exped., viii., Scleraxonia, 1911, p. 49.

Sixteen specimens agree with Ridley's description of *Mopsella clavigera,* though there is no anastomosis. They are all in the dried condition. The height of the largest colony is 61 cm., with a width of 27 cm. across the expanded portion. The branching is strictly in one plane, and is generally dichotomous. The nodes are very swollen, and in the largest specimens they have a diameter of 17 mm. The branches are given off from the nodes.

The polyps are retracted into slightly projecting verrucæ, which are scattered over the surface of the stem and branches, but are usually wanting on a median space on the posterior aspect of the colony.

The spicules of the cœnenchyma agree well with those described by Ridley :—(1) coarsely tuberculate, swollen, orange-coloured, fusiform shapes—·175 × ·035 mm. ; ·140 × ·035 mm. ; (2) lemon-yellow coloured " Blattkeulen "—·070 × ·035 mm. ; ·052 × ·035 mm. ; ·047 × ·026 mm. The measurements agree fairly closely with Thomson and Mackinnon's measurements of the " Thetis " specimens.

The colour is lemon-yellow to brick-red.

Locality.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Distribution.—Port Curtis, 5-11 fathoms, and Port Molle, Queensland, 14 fathoms ; Thursday Island, Torres Straits, 4-6 fathoms (Ridley). Dirk Hartog Island, West Australia, 45 fathoms (Studer). The " Thetis " specimens were obtained at the following localities off the coast of New South Wales :—Eleven miles east of Broken Bay, 30-40 fathoms ; Station 34, off Port Jackson, 39-36 fathoms ; Station 40, off Wata Mooli, 52 fathoms ; Station 42, off Wata Mooli, 70-78 fathoms ; Station 48, off Wollongong, 55-56 fathoms (Thomson and Mackinnon). A fragmentary specimen was taken by the Siboga Expedition in the Bay of Nangamessi, Sumba, 36 metres (Nutting).

MOPSELLA TEXTIFORMIS (*Lamarck*).

Melitæa textiformis, Lamarck, Mém. Mus. Hist. Nat., I., p. 412. *Id.*, Lamouroux, Hist. Polyp. corall. flexibles, 1816, p. 464, pl. xix., fig. 1. *Id.*, Gray, Proc. Zool. Soc., 1857, p. 285.

Melithæa textiformis, Milne-Edwards et Haime, Hist. Nat. Corall., I., 1857, p. 201.

Melitella textiformis, Gray, Cat. Lithophytes in Brit. Mus., 1870, p. 7.

Mopsella textiformis, Verrill, Bull. Mus. Comp. Zool., I., 1864, p. 38. *Id.*, Ridley, Report Zool. Coll. H.M.S. "Alert," 1884, p. 358. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., IV., 13, 1911, p. 671, pl. lxiii., figs. 4, 5.

Several almost complete specimens in the collection agree closely with the description of *Mopsella textiformis* (Lamarck), given by Ridley. The largest specimen has a height of 34cm., with a width of 37cm. across the branched portion. The diameter near the base is 2cm. The basal attachment is lacking. The branching is strictly in one plane with abundant anastomosis. The labyrinthine pattern, to which Thomson and Mackinnon have directed attention, is clearly shown on the weathered axis; and there is a well-marked tendency, as pointed out by Ridley, for the stem and main branches to "*break up almost immediately* into a reticulum of undulating thin branchlets, which almost all anastomose." The internodes vary in length from 4 to 10 mm., and the nodes from 4 to 6 mm.

The polyps are mainly confined to the anterior aspect of the colony. They are disposed irregularly in slightly projecting verrucæ.

The spicules are exactly like those described by Ridley—(1) fusiform shapes sharply pointed at both ends, and covered with irregularly scattered tubercles—·210 × ·035mm.; ·171 × ·035 mm.; ·157 × ·035 mm.; (2) "Blattkeulen" with orange shafts and lemon-yellow heads—·140 × ·052 mm.; ·122 × ·052 mm.; ·087 × ·043 mm. Very few of the "Blattkeulen" have the long shafts mentioned by Ridley. The spicules of the verrucæ are—(3) curved fusiform shapes tapering to sharp points, with few tubercles—·245 × ·035mm.; ·220 × ·035 mm.; ·210 × ·035 mm.; (4) curved fusiform shapes pointed rather bluntly and covered with closely set blunt tubercles—·297 × ·052 mm.; ·236 × ·052 mm.; ·218 × ·070 mm.

Localities.—Off the coast of South Australia.

Fifteen miles south of St. Francis Island, Great Australian Bight, 30 fathoms.

Distribution.—Australia (Lamouroux, Gray, Verrill). South Seas (Gray). Port Curtis, 5-7 fathoms, and Port Molle, Queensland, 12-20 fathoms; Thursday Island and Prince of Wales Channel, Torres Straits, 4-7 fathoms (Ridley). Lord Howe Island (Thomson and Mackinnon).

Genus ACABARIA, *Gray*.

In his "Die Gorgonidenfamilie der Melitodidae," Kükenthal[1] includes the genus *Psilacabaria* Ridley in *Acabaria* Gray—"Zu dieser Gattung rechne ich auch die Gattung *Psilacabaria* Ridley, die keine durchgreifenden Merkmale aufzuweisen hat. Insbesondere tritt das Abgehen der Zweige in rechtem Winkel auch bei andern Arten ein. Hierhin gehört auch *Anicella* Gray, nicht zu *Melitodes*, wie Ridley will."

ACABARIA GRACILLIMA (*Ridley*).

Psilacabaria gracillima, Ridley, Report Zool. Coll. H.M.S. "Alert," 1884, p. 364, pl. xxxvii., figs. D-D[1], pl. xxxviii., figs. f-f[11]. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 671.

A number of broken pieces in a dried condition are referred to this species. The largest fragment is 90 mm. high. Branching is dichotomous and approximately in one plane. The branches are given off approximately at right angles, although in several instances the angle of the dichotomy is somewhat smaller. They have a diameter of about 1 mm. There is no anastomosis. The axis is hard and white.

The polyps occur in spirals on the large branches, but, on the twigs, they have an irregular bilateral arrangement. The individual calyces are low, rounded, tubercular verrucæ.

The spicules include the following types:—(1) large cylinders, fusiform to subclavate, slightly tapering to round-pointed ends and provided with tubercles arranged roughly in whorls—·280 × ·070 mm.; ·262 × ·052 mm.; ·245 × ·070 mm.; (2) smaller spindles, more or less curved, with sharply pointed ends, and tubercles—·262 × ·070 mm.; ·245 × ·052 mm.; ·210 × ·052 mm.; (3) small subclavate spicules, tapering from a broad to a sharp-pointed end, with tubercles —·210 × ·053 mm.; ·201 × ·043 mm.; ·192 × ·035 mm.

The colour is cream to violet.

Locality.—Great Australian Bight, Long. 131°E., 62 fathoms.

Distribution.—Port Molle, Queensland, 12-20 fathoms; Port Darwin, North Australia, 8-12 fathoms; East Australia, 42 fathoms (Ridley). The "Thetis" specimens were obtained at the following localities off the coast of New South Wales:—Station 34, off Port Jackson, 39-36 fathoms; Station 36, off Botany Bay, 23-20 fathoms; Station 48, off Wollongong, 55-56 fathoms; South coast of New South Wales (Thomson and Mackinnon).

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1. Kükenthal—Zool. Anz., xxxiii., 1908, p. 194.

Order AXIFERA, *G. von Koch.*

Family ISIDÆ.

Genus ISIS, *Linnæus.*

ISIS HIPPURIS, *Linnæus.*

(Plate v., figs. 1-2; Plate xi., fig. 1.)

Isis hippuris, Linnæus, Syst. Nat., 10th ed., 1758, p. 799. *Id.*, Pallas, Elenchus Zoophytorum, 1766, p. 233. *Id.*, Ellis and Solander, Nat. Hist. Zoophytes, 1786, p. 105, pl. iii., figs. 1-5. *Id.*, Esper, Die Pflanzenthiere, i., 1791, p. 279, pl. i., figs. 1-4, pl. ii., pl. iii., figs. 1-3, pl. iiiA., figs. 1-4. *Id.*, Lamouroux, Hist. Polyp. corall. flexibles, 1816, p. 476. *Id.*, Lamarck, Hist. Anim. sans vert., ii., 1816, p. 302. *Id.*, Lamouroux, Exposition Méthodique, 1821, p. 59, pl. iii., fig. 1. *Id.*, Blainville, Manuel Actinologie, 1834, p. 503, pl. lxxxvi., fig. 1. *Id.*, Lamarck, Hist. anim. sans vert., 2nd ed., 1836, p. 475. *Id.*, Steenstrup, Om slaegter og der under *Isis hippuris* Linn. sammenblendede Arten, 1848, p. 1. *Id.*, Milne-Edwards et Haime, Hist. Nat. Corall., i., 1857, p. 194. *Id.*, Gray, Proc. Zool. Soc., 1857, p. 283. *Id.*, Kölliker, Icones Histologicæ, ii., 1865, p. 140, pl. xvi., fig. 4, pl. xix., figs. 1-3. *Id.*, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 280. *Id.*, Simpson, Journ. Linn. Soc., Zool., xxix., 1906, p. 421, pl. 43, figs. 1-4. *Id.*, Thomson and Simpson, Alcyonaria Indian Ocean, ii., 1909, p. 180, pl. vi., figs. 1-3. *Id.*, Nutting, Gorgonacea Siboga Exped., v., Isidae, 1910, p. 6, pl. i., figs. 1, 1a, 1b, pl. v., fig. 1.

Although a well-known and striking form, this species was very imperfectly described until Simpson (1906) published his results of an examination of a number of specimens from the Andaman Sea. In the "Endeavour" collection there is a solitary specimen from the coast of Queensland, and the Australian Museum collection contains five others.

The largest specimen is an incomplete colony rising to a height of 13·3 cm., with a breadth of 6·4 cm., and a thickness of 3·5 cm. The main stem, flattened in section, is 9 mm. in thickness. From this arise the main branches, lateral in position, which are compressed in the plane of ramification. The secondary branches are thick and compressed, and give rise to cylindrical branches, which may remain simple, but usually bear terminal twigs with swollen and rounded ends. The twigs have a diameter of 5 mm. near the tips.

A small specimen, evidently the terminal portion of a large colony, agrees with the third of the specimens described by Simpson in its robust and bushy appearance, the marked upward growth, and the palmate terminations of the twigs.

The remaining four colonies, whose measurements in centimetres are included in the following table, correspond most closely with the largest specimen :—

	Height.	Breadth.	Thickness.
I.	7	3	3
II.	10	6·2	1·5
III.	11·2	3·3	2
IV.	12·5	8·2	1·5
V.	12·6	6·4	3
VI.	13·3	6·4	3·5

The axis consists of white calcareous internodes with longitudinal fluting, and short brown horny nodes. The longitudinal ridges of the calcareous joints are dentate. Near the base of the main stem the calcareous joints have lengths of 5-6 mm., and the horny nodes 1·5-2 mm. In the branches the internodes are 7 mm. in length, the nodes being reduced to about 1 mm. The branches arise from the calcareous joints.

The cœnenchyma is very thick and fleshy, in some parts 2 mm. It is very compact and smooth, and does not show any indication of the presence of the jointed axis. The polyps occur all over the surface ; they are numerous, and about 0·5 mm. apart. There are no verrucæ.

There is considerable variety in the spicules of the cœnenchyma :—(1) rods with warty knobs irregularly arranged— ·157 × ·105 mm. ; ·140 × ·070 mm. ; ·105 × ·070 mm. ; (2) spicules of similar form to (1) but with the warts arranged in whorls—·157 × ·080 mm. ; ·150 × ·080 mm. ; ·140 × ·070mm. ; (3) tri- and quadri-radiate forms—·140 × ·105 mm. ; ·122 × ·122 mm. ; ·105 × ·087 mm. ; (4) stellate and irregular forms —·087 × ·087 mm. ; ·087 × ·052 mm. ; ·079 × ·052 mm.

The colour is light brown. Associated with the majority of the colonies are specimens of the bivalve *Pteria chinensis*, Leach.

Localities.—Off the coast of Queensland ("Endeavour"). Murray Island, Torres Strait (Austr. Mus. Coll.).

Distribution.—Indian Ocean (Ellis, Pallas). Mediterranean Sea and America (Pallas). North Sea (Linnæus). Iceland (Olafsen and Polvesen, Lamouroux). Antilles and United States (Lamouroux). Straits of Sunda and southern coast of Sumatra (Ellis and Solander). East Indies (Dana). Amboina (Milne-Edwards et Haime). Pacific Ocean (Wright and Studer). Andaman Sea, surf line and 20 fathoms (Thomson and Simpson). The Siboga Expedition obtained specimens at nine stations in the eastern part of the Indian Archipelago at depths varying from 22-45 metres (Nutting).

Genus Mopsea, *Lamouroux.*

Mopsea dichotoma (*Linnæus*).

Isis dichotoma, Linnæus, Syst. Nat., 10th ed., 1, 1758, p. 799. *Id.*, Lamarck, Hist. anim. sans vert., ii., 1816, p. 302.

Mopsea dichotoma, Lamouroux, Hist. Polyp. corall. flexibles, 1816, p. 467. *Id.*, Milne-Edwards et Haime, Hist. Nat. Corall., 1857, p. 197. *Id.*, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 41, pl. ix., fig. 10. *Id.*, Hickson, Proc. Roy. Soc. Vict., (n.s.), ii., 1890, p. 137. *Id.*, Roule, Expéd. Antarctique Française, 1908, Alcyonaires, p. 5. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 673, pl. lxvii., fig. 1.

A number of broken pieces showing dichotomous branching are referred to this species. In the majority of the specimens the polyps are arranged in close-wound spirals all over the branches. On the most slender specimens, however, the polyps occur in alternating rows on each side, here and there encroaching on the free median spaces. The spicules are as described by Thomson and Mackinnon.

Locality.—South east coast of Australia.

Distribution.—Indian Ocean (Lamarck, Lamouroux). Port Jackson, New South Wales, 35 fathoms (Wright and Studer). Port Phillip, Victoria (Hickson). Booth-Wandel Island, Antarctica (Roule). The "Thetis" specimens were obtained at the following localities off the coast of New South Wales :—Station 47, off Bulgo, 63-57 fathoms ; station 48, off Wollongong, 55-56 fathoms ; station 53, off Crookhaven River, 23 fathoms (Thomson and Mackinnon).

MOPSEA ENCRINULA (*Lamarck*).

Isis encrinula, Lamarck, Hist. anim. sans vert., ii., 1816, p. 302.

Mopsea verticillata, Lamouroux, Hist. Polyp. Corall. flexibles, 1816, p. 467, pl. xviii., fig. 2.

Mopsea encrinula, Ehrenberg, Corallenth. d. rothen Meeres, 1834, p. 131. *Id.*, Milne-Edwards et Haime, Hist. Nat. Corall., 1857, p. 198. *Id.*, Gray, Proc. Zool. Soc., 1857, p. 284 ; *Id.*, Gray, Cat. Lithophytes in Brit. Mus., 1870, p. 15. *Id.*, Studer, Monatsber. Akad. Wiss. Berlin, 1878, p. 665. *Id.*, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 43, pl. vii., figs. 1, 1a, 1b, pl. ix., fig. 11. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 674.

Entangled with a mass of Hydrozoa were found a few broken specimens, which agree with Wright and Studer's description of *Mopsea encrinula* (Lamarck). The salient characters may be summarised thus :—Branching is plume-like and in one plane ; the cœnenchyma is thick ; the polyps club-shaped and arranged in close spirals, bending in towards the stem. The axis is composed of calcareous internodes with distinct longitudinal furrows, and horny nodes. The branches arise from the calcareous joints.

The spicules include the following types :—(1) curved, warty, somewhat flattened spindles, with the convex side produced into a number of strong, prominent teeth—·192 × ·087mm. ; ·157 × ·052mm. ; ·140 × ·061mm. ; ·122 × ·052 mm. ; (2) scales with irregular margins and spiny warts—·105 × ·070mm. ; ·087 × ·052mm. ; ·070 × ·052mm. ; ·052 × ·043mm. ; (3) small irregular bodies and "capstans"—·087 × ·070mm. ; ·052 × ·035mm. ; ·035 × ·035mm.

The colour is yellowish-white.

Locality.—Great Australian Bight, 80-100 fathoms.

Distribution.—"Les mers de la Nouvelle—Hollande" (Lamarck). Australia (Lamouroux, Milne-Edwards et Haime, Gray). North-west coast of Australia, 50 fathoms (Studer). "Challenger" Station 162, off East Moncœur Island, Bass Strait, 38 fathoms (Wright and Studer). The "Thetis" specimens were obtained at the following localities off the coast of New South Wales :—Eleven miles east of Broken Bay ; Station 34, off Port Jackson, 39-36 fathoms ; Station 44, off Coogee, 49-50 fathoms ; Station 47, off Bulgo, 63-57 fathoms (Thomson and Mackinnon).

Mopsea australis, *Thomson and Mackinnon.*

(Plate vi.)

Mopsea australis, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 675, pl. lxiv., figs. 1, 2, pl. lxvii., fig. 5.

A solitary but magnificent lyre-shaped colony represents this species, which was described by Thomson and Mackinnon from very fragmentary specimens.[1] It is 37·5cm. high, and consists of a main stem, 4 mm. in diameter, which arises from an encrusting, disc-like, calcareous base. The colony is expanded in one plane, and has a width of 20cm. in its widest part. At 3·2cm. from the base the main stem divides into two equal branches. These primary branches give off, along the upper side alone, a series of parallel ascending secondary branches, which soon attain to nearly the same thickness as the main branches. In this manner there arises the appearance of a continuous dichotomy. At the same time the main branch tends to bend outwards after each secondary branch is given off, so that its course describes a series of shallow curves. The secondary branches either divide dichotomously or remain simple throughout their length. In general appearance and mode of branching the colony is very similar to *Mopsea dichotoma* (Linnæus).

The cœnenchyma is thin, and where it has been worn off, the axis shows the usual white calcareous internodes with well marked longitudinal fluting, and the short brown-coloured nodes.

The polyps are club-shaped, and occur in close spirals round the branches, to which they are very closely pressed, so that their mouths are hidden.

The spicules include the following forms :—(1) elongate to oval scales, with large teeth round their edges, and a few warts scattered over the surface—·192 × ·087mm. ; ·183 × ·105 mm. ; ·157 × ·087 mm. ; ·122 × ·070 mm. ; (2) warty spindles and clubs—·157 × ·035mm. ; ·122 × ·017mm. ; ·105 × ·035mm. ; (3) Capstans, a few crosses, and small irregular bodies—·070 × ·035mm. ; ·052 × ·035mm.; ·052 × ·052mm. ; ·052 × ·017mm.

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1. I have not been able to find, among the specimens returned to the Australian Museum by Thomson and Mackinnon, any specimen labelled as the type of *Mopsea australis.* I conclude, therefore, that it must have broken up. The co-type, consisting of a number of "branching pieces of various lengths" has been preserved.

The colour of the colony is cream.

Locality.—Fifteen miles N. 35° E. of Saddle Hill, New South Wales, 34-35 fathoms.

Distribution.—Hitherto recorded only from eleven miles east of Broken Bay, New South Wales (Thomson and Mackinnon).

Mopsea flabellum, *Thomson and Mackinnon.*

Mopsea flabellum, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 676, pl. lxiii., figs. 1-3, pl. lxvii., fig. 6, pl. lxxi.

The collection contains two incomplete branching specimens, the characters of which agree in detail with Thomson and Mackinnon's description of *Mopsea flabellum.* The larger of the two colonies is 24 cm. in height. The basal attachment is lacking. The branching is dichotomous and strictly confined to one plane. The branches, though slender, maintain an almost uniform diameter of about 2 mm. throughout their length.

The lower portions of the stem and branches are devoid of cœnenchyma, and the axis, which is about 3 mm. in diameter, is composed of creamy-white calcareous internodes with well marked longitudinal fluting, and brown-coloured horny nodes. In the twigs, however, the colour of the calcareous joints is deep orange.

The club-shaped polyps are arranged in close-wound spirals all over the branches. Their armature consists of about eight longitudinal rows of overlapping spicules. A low operculum is formed of eight plates similar in appearance to the scales with which the polyps are covered.

The superficial spicules are flat, yellow-coloured, circular, 8-shaped, irregular scales—·262 × ·105 mm. ; ·210 × ·157 mm.; ·192 × ·061 mm. ; ·175 × ·175 mm. Each scale is smooth or bears a few simple warts ; the margin is deeply dentate or serrate. The spicules of the cœnenchyma are (1) yellow-coloured spindles with a few large warts—·175 × ·052 mm. ; ·157 × ·052 mm. ; ·122 × ·035 mm. ; and (2) small irregular bodies—·087 × ·052 mm. ; ·070 × ·035 mm.; ·052 × ·052 mm.

The colour of the colonies is orange-brown ; the polyps yellowish.

Locality.—Thirty-six miles S. 58° W. of Cape Wickham, King Island, Bass Strait, 72-80 fathoms.

Distribution.—Hitherto known only from " Thetis " specimens taken off the coast of New South Wales at the following localities:—Station 34, off Port Jackson, 39-36 fathoms ; Station 44, off Coogee, 49-50 fathoms (Thomson and Mackinnon).

MOPSEA ELEGANS, *Thomson and Mackinnon.*

Mopsea elegans, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 677, pl. lxiv., figs. 3, 4, pl. lxviii., fig. 5, pl. lxxii.

A number of broken pieces showing dichotomous, subparallel branching, agree with Thomson and Mackinnon's type. The height of the largest fragment is 18 cm., with a width of 1·3 cm. The branches vary from 1·5 mm. to 2 mm. in diameter.

The polyps are arranged in two alternating rows on each side of the younger branches, leaving a median bare line on each surface. They tend, however, to encroach on these, especially towards the lower portions of the colony, where they are arranged in three or four rows. A comparison with the polyps of the " Thetis " type shows that the " Endeavour" specimens are more slender, a difference due probably to drying.

The spicules of this species are :—(1) superficial ctenoid scales, each with a nucleus from which radiate fine ridges—·077 × ·052 mm. ; ·061 × ·052 mm. ; ·043 × ·043 mm. ; (2) tuberculate capstans with scarcely any waist—·057 × ·043 mm. ; ·049 × ·035 mm. ; ·038 × ·035 mm.

The colour is golden-brown.

Localities.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Six miles S. 30° E. of Brush Island, New South Wales, 65 fathoms.

Distribution.—Hitherto known only from " Thetis " specimens taken off the coast of New South Wales at the following localities :—Station 34, off Port Jackson, 39-36 fathoms ; Station 41, off Wata Mooli, 52-71 fathoms ; Station 42, off Wata Mooli, 70-78 fathoms ; Station 47, off Bulgo, 63-57 fathoms ; Station 48, off Wollongong, 55-56 fathoms (Thomson and Mackinnon).

MOPSEA WHITELEGGEI, *Thomson and Mackinnon.*

Mopsea whiteleggei, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 678, pl. lxvi., figs. 2, 3, pl. lxxiii.

Two well-preserved specimens, referable to this species, were obtained from the same locality. The larger of the two rises from a slightly encrusting base to a height of 26 cm., with a width of 20 cm. across the expanded portion. Branching begins at a height of 2·5 cm. from the base, and is typically plume-like; the branches are confined almost entirely to one plane. The stouter branches have an average diameter of 2 mm., and the twigs of 1 mm. near their tips. The second specimen is 21·5 cm. high, with a spread of 16·5 cm. across the branched part.

The diameter of the axis near the base is 3 mm. The cœnenchyma has worn away from this portion of the stem, and the axis shows the white calcareous internodes with fine longitudinal ridges, and the amber-coloured nodes. The twigs arise from the calcareous internodes.

The polyps are arranged alternately in a single row along the twigs, here and there encroaching on the middle line and becoming irregular in disposition. They are club-shaped, with truncate mouths, and turn upwards towards the extremity of the twig. The average length of a polyp is about ·6 mm.

The spicules are (1) small, colourless, flattened spindles and curved lancet-shaped plates, produced more strongly on one side of the spicule than on the other into a number of tooth-like warts—·262 × ·052 mm.; ·245 × ·052 mm.; ·175 × ·070 mm.; ·131 × ·087 mm.; (2) small spindles and club-like forms—·131 × ·026 mm.; ·122 × ·035 mm.; ·096 × ·035 mm.; ·087 × ·035 mm.; ·052 × ·026 mm.

The colour of the colonies is creamy-white.

Locality.—Six miles S. 30° E. of Brush Island, New South Wales, 65 fathoms.

Distribution.—Hitherto known only from "Thetis" specimens taken off the coast of New South Wales at the following localities:—Eleven miles east of Broken Bay; Station 10, off Broken Head, 28 fathoms; Station 40, off Wata Mooli, 52 fathoms; Station 44, off Coogee, 49-50 fathoms; Station 48, off Wollongong, 55-56 fathoms (Thomson and Mackinnon).

Mopsea plumacea, *sp. nov.*

(Plate iv., fig. 1; Plate vii.)

This new species is well represented by several complete colonies, and a number of incomplete branching pieces.

One complete specimen is 22·5cm. in height, with a maximum breadth across the expanded portion of 11cm. The colonies are typically feather-like, the long frond-like branches bearing on each side a row of alternating twigs. These twigs usually remain simple, but occasionally branch in the same pinnate manner. The colony is attached by a well developed calcareous expansion, about 12mm. in thickness. From this there rises a cylindrical stem, 2·5mm in diameter. At a height of 5·7cm., the stem divides into two main branches, which bear numerous twigs. The branches have a diameter of 2mm. Branching is confined to one plane.

The axis is composed of white calcareous internodes with fine longitudinal fluting, and short amber-coloured nodes. The longitudinal ridges of the calcareous joints are dentate. Near the base of the stem, the horny nodes have lengths of 2-3mm., and the calcareous internodes of 0·5mm. In some cases the internodes are entirely overlapped by the horny joints. Higher up the calcareous joints are 1·5mm. in length, the horny joints being reduced to 0·25mm. The calcareous internodes give rise to one twig each in alternate succession.

The cœnenchyma is thin, and on the twigs is almost entirely hidden by the numerous polyps. These occur in close-wound spirals over the whole surface of the twigs. In the youngest twigs the spiral is wider, but nowhere is there any trace of a bilateral arrangement. On the branches, however, a few scattered polyps occupy a lateral position, here and there encroaching on the middle line.

The polyps are small, 0·5-0·75mm. in height, and club-shaped, with truncate mouths, which turn upward toward the extremity of the twig. In several instances inverted polyps were observed with their mouths directed towards the proximal end of the twig. The calyces are armoured with longitudinal rows of transversely arranged, slightly overlapping scales; there are from ten to twelve of these in the abaxial rows. These spicules are arranged in an imbricate manner; the imbrication being clearly seen in a profile view of the polyp.

The calyx spicules are colourless, flat scales, transversely elongate, 8-shaped, and irregular. The following measurements of the length and breadth in millimetres were taken :— ·192 × ·113 ; ·175 × ·122 ; ·157 × ·105 ; ·140 × ·087 ; ·105 × ·087. Their free edge is deeply dentate ; simple warts are scattered over the surface, and the border round the exposed portion of the scale bears fine radiating ridges. A low eight-rayed operculum is formed by similar scales. There are also somewhat flattened, curved spindles, with the convex side produced into a number of sharp projecting warts— ·192 × ·052mm. ; ·175 × ·043mm. ; ·157 × ·035mm. ; ·149 × ·035mm.

The spicules of the cœnenchyma are (1) stout spindles with prominent warts—·113 × ·070mm.; ·122 × ·070mm. ; ·105 × ·052mm. ; ·096 × ·052mm. ; and (2) capstan-like forms and small irregular bodies—·105 × ·061mm. ; ·087 × ·070mm. ; ·070 × ·052mm. ; ·052 × ·035mm.

The colour of the colonies is creamy-white.

Position.—This species agrees in many respects with *Mopsea whiteleggei*, Thomson and Mackinnon[1], but is distinguished from that species by (1) the invariable arrangement of the polyps in close-wound spirals round the twigs, (2) the smaller number of scales in the abaxial rows of the polyp calyx, and (3) the quite different type of spicules.

Localities.—South Australian Coast.

Fifteen miles south of St. Francis Island, Nuyt Archipelago, Great Australian Bight, 30 fathoms.

Thirty-six miles S. 58° W. of Cape Wickham, King Island, Bass Strait, 72-80 fathoms.

Mopsea repens, *sp. nov.*

(Plate iv., fig. 2 ; Plate viii.)

This species is based on several branching specimens, of which the largest is 13·5cm. in height, with a spread of 14·5cm. across the expanded portion. The branching is strictly confined to one plane. The basal attachment of the stem is missing. Branching begins at a height of 1·4cm., and is very luxuriant. The main stem is bent in a zigzag manner, forming an angle wherever branches arise. The

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1. Thomson and Mackinnon—Mem. Austr. Mus., iv., 13, 1911, p. 678, pl. lxvi., figs. 2 and 3, pl. lxxiii.

branches ascend in the same zigzag manner, and are bent at the point of departure of each twig. The stem has a maximum diameter of 2·5cm.; the average diameter of the larger branches is 2mm., and of the twigs 1mm.

The axis is made up of orange-coloured calcareous internodes with fine longitudinal fluting, and short brown-coloured nodes. Near the base of the colony the major portion of the stem is composed of horny nodes, which are 1·5mm. long. These entirely overlap the calcareous internodes. Higher up the calcareous joints are 2mm. in length; the horny joints being reduced to 0·5mm. The branches arise from the horny nodes.

The polyps are mainly confined to the twigs, along each side of which they are arranged alternately in a single row. A few occur here and there on the branches. The arrangement of the polyps on the twigs shows great regularity and evenness. There are about eleven polyps on one side in a length of 1cm.

The polyps are 0·75-1mm. in height, and club-shaped with truncate mouths, which are incurved toward the cortex of the twig. The calyces are armoured with eight rather indefinite, longitudinal rows of transversely arranged, overlapping scales. The abaxial rows are composed of about sixteen such spicules. The calyx spicules are elongate to oval, ctenoid scales with their free edge crisply waved; the remainder of the margin bears more or less deep indentations. Warts are scattered over the surface of the scale, and the clear border round the exposed portion of the scale bears strongly-marked radiating ridges. The following measurements of the length and breadth in millimetres were taken:— ·166 × ·087; ·140 × ·087; ·122 × ·070; ·105 × ·052. A low eight-rayed operculum is formed by similar scales.

The spicules of the cœnenchyma are yellow spindles— ·140 × ·052mm.; ·122 × ·070mm.; ·105 × ·052mm.; ·087 × ·035mm. They have relatively few, but large warts. There are also a few crosses and small irregular bodies—·087 × ·070 mm.; ·070 × ·052mm.; ·052 × ·052mm. The cœnenchyma is thin and the spicules follow the longitudinal direction of the stalk.

The colour of the colonies is reddish-brown.

Localities.—Thirty-six miles S. 58° W. of Cape Wickham, King Island, Bass Strait, 72-80 fathoms.

Fifteen miles south of St. Francis Island, South Australia, 30 fathoms.

Family PRIMNOIDÆ.

Genus Stachyodes, *Wright and Studer.*

Stachyodes studeri, *Versluys.*

Stachyodes regularis, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 55, pl. xi., figs. 2, 2a, pl. xx., fig. 3.

Stachyodes studeri, Versluys, Gorgoniden Siboga Exped., ii., Primnoidæ, 1906, p. 94, figs. 112-117. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 680.

A single specimen in the collection agrees with the description of *Stachyodes studeri* given by Versluys. The fragment is 55 mm. in length, without a basal attachment. The polyps occur in whorls of eight to ten. Whorls of new young polyp buds are sometimes visible between the whorls of adult polyps.

The colour of the specimen is creamy-white ; the axis is greenish-bronze, with fine longitudinal striations.

Locality.—Off Long Reef, New South Wales, 50 fathoms.

Distribution.—" Challenger " Station 171, off the Kermadec Islands, 600 fathoms (Wright and Studer). Celebes Sea, 1080 and 1165-1264 metres (Versluys). The " Thetis " specimens were obtained off the coast of New South Wales at the following localities :—Station 15, off Norah Head, 32-48 fathoms ; Station 42, off Wata Mooli, 70-78 fathoms ; Station 44, off Coogee, 49-50 fathoms (Thomson and Mackinnon).

Nutting[1] records the occurrence of *Stachyodes regularis*, Wright and Studer, at " Albatross " Station 3879, south of Lanai Island, 923-1081 fathoms. He states, moreover, that " the original specimens were secured by the *Challenger* in the South Atlantic, near Tristan da Cunha, 75-150 fathoms." I can find no authority for this locality, since Wright and Studer and Versluys state definitely that the type locality is the Kermadec Islands.

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1. Nutting—Proc. U.S. Nat. Mus., xxxiv., 1908, p. 577.

Genus Amphilaphis, *Wright and Studer.*

Amphilaphis plumacea, *Thomson and Mackinnon.*

(Plate iv., fig. 4).

Amphilaphis plumacea, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 680, pl. lxv., fig. 3, pl. lxviii., fig. 3, pl. lxxiv.

The occurrence of five colonies in this collection allows of the addition of several details, especially as regards habit, to the description given by Thomson and Mackinnon.

They are slightly smaller than the 18·5 cm. high colony obtained by the "Thetis" Expedition off the coast of New South Wales; the largest is 17·5 cm. in height, with a diameter of 1·5 mm. at the base. One markedly flabellate colony, 7·5 cm. high, has a width of as much as 13·7 cm., and a diameter of 2 mm. at the base of the stem. The corresponding dimensions of another flabellate colony are—height 9 cm.; width 13·5 cm.; diameter of stem 2 mm.

The following significant characters can be made out. The colonies are expanded in one plane. From a slightly swollen base arises a cylindrical stem, which soon branches. Lateral branches, varying much in size, are given off from either side of the plane, and from these spring other branches, which again divide in a dichotomous manner.

In a few cases the cœnenchyma, which is very thin, is intact; generally it is more or less worn away. The axis is dark bronze in colour, and marked by fine longitudinal furrows.

The polyps are densely crowded and arranged in a spiral. They vary from 1-1·5 mm. in length.

The dimensions of the ctenoid scales, with which the polyps are armoured, are—·315 × ·236 mm.; ·297 × ·201 mm.; ·245 × ·192 mm.

The opercular scales (in the form of isosceles triangles) yielded the following measurements:—·420 × ·227 mm.; ·400 × ·210 mm.; ·358 × ·218 mm.

The spicules of the cœnenchyma are circular to oval scales. The following measurements were taken:—·175 × ·105 mm.; ·157 × ·122 mm.; ·122 × ·105 mm.

The colour of the colonies is creamy-white.

Locality.—South-east coast of Australia.

Distribution.—Hitherto known only from "Thetis" specimens taken off the coast of New South Wales at the following localities:—Eleven miles E. by N. of Barrenjoey, 30-40 fathoms; Station 22, off Newcastle Bight, 40-26 fathoms; Station 40, off Wata Mooli, 52 fathoms; Station 44, off Coogee, 49-50 fathoms (Thomson and Mackinnon).

Genus Plumarella, *Gray.*

Plumarella thetis, *Thomson and Mackinnon.*

(Plate ix.).

Plumarella thetis, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 683, pl. lxvi., fig. 5, pl. lxviii., fig. 6, pl. lxxvi.

Two frond-like branches correspond with Thomson and Mackinnon's description of *Plumarella thetis.* They are remarkably robust, the larger being 32·5 cm. long, with a diameter of 4 mm. near the base. The branches give off along each side a row of alternating twigs, which remain simple. The twigs are 11 cm. long, with a diameter of 2 mm. There are seven to eight twigs in each row in a length of 5 cm.

The second frond is 26 cm. long, and has a diameter of 3 mm. near the base. The twigs are 7·5 cm. in length, with a diameter of 2 mm.

The polyps are arranged in close-wound spirals round the twigs, but are scattered irregularly over the whole surface of the branches. They are armed with longitudinal rows of large overlapping scales, of which there are about six in the abaxials; they are broad, shield-like, and fan-like scales, with a nucleus surrounded by numerous finely-tuberculate warts, and with a clear border between the outer margin and the warted portion bearing radiating ridges—·612 × ·367mm.; ·595 × ·280 mm.; ·507 × ·367 mm.; ·455 × ·297 mm. The opercular scales are isosceles triangles with a strong T-square ridge—·472 × ·210 mm.; ·455 × ·192 mm. The scales of the cœnenchyma are triangular, oval, and fan-shaped, with tuberculate warts surrounding an excentric nucleus—·385 × ·350 mm.; ·367 × ·236 mm.; ·280 × ·227 mm.

The colour of the specimens is light-brown. The axis is almost black and bears fine longitudinal striations.

Locality.—Fifteen miles N. 35° E. of Saddle Hill, New South Wales, 34-35 fathoms.

Distribution.—Hitherto known only from specimens obtained by the "Thetis" off the coast of New South Wales at the following localities:—Eleven miles E. by N. of Broken Bay, 30-40 fathoms; Station 34, off Port Jackson, 39-36 fathoms; Station 40, off Wata Mooli, 52 fathoms; Station 42, off Wata Mooli, 70-78 fathoms; Station 47, off Bulgo, 63-57 fathoms; Station 48, off Wollongong, 55-56 fathoms; Station 53, off Crookhaven River, 23 fathoms (Thomson and Mackinnon).

PLUMARELLA FILICOIDES, *Thomson and Mackinnon.*

Plumarella filicoides, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 686, pl. lxv., fig. 5, pl. lxviii., fig. 1, pl. lxxviii.

Two specimens represent this species. One colony has the basal portion intact. The larger of the two has a height of 20·5cm., with a width of 17·5cm. across the expanded portion. Its basal attachment consists of a slightly encrusting expansion from which rises a cylindrical stem, 3mm. in diameter. Branching is typically feather-like, and is confined to one plane. At 5·5cm. from the base, the stem gives off two stout branches which bear on each side a row of alternating twigs. The stem also bears twigs, alternating in a single row along each side. The twigs remain simple, and their average length is 4cm., with a diameter of 2mm. There are ten to eleven twigs on each side of a branch in a length of 5cm.

The polyps are arranged bilaterally on the stem and branches ; a few, however, are scattered over the free median surfaces of the latter. They are arranged in close-wound spirals on the twigs. The polyps are of two sizes :—(1) small polyps partially sunken in the cœnenchyma and closely pressed against the branch. They are armed with a few broad scales ; there are three or four of these in the abaxial longitudinal rows. The operculum forms a sharp, well-defined cone of eight isosceles triangles ; (2) large swollen polyps armed with four scales in the abaxial rows, and two or three in the adaxial-laterals. The operculum is low.

The calyx scales are broad, shield-like and fan-like with a distinct nucleus surrounded by numerous tuberculate warts, and a narrow clear border bearing strongly marked ridges—·490 × ·280mm. ; ·367 × ·350mm. ; ·297 × ·262mm. ; ·262 × ·525mm. The opercular scales are high, sharp-pointed isosceles triangles bearing a strong T-square ridge—·455 × ·210mm. ; ·385 × ·192mm. ; ·350 × ·175mm. The spicules of the cœnenchyma are large, oval and fan-shaped scales, without the clear border. They are covered with tuberculate warts, which surround a well-defined nucleus—·332 × ·210mm. ; ·280 × ·280mm. ; ·192 × ·122mm. ; ·122 × ·122mm.

The colour of the colonies is very light brown. The axis is furrowed, and of a greenish-bronze colour.

Locality.—Six miles S. 30° E. of Brush Island, New South Wales, 65 fathoms.

Distribution.—Hitherto known only from specimens obtained by the "Thetis" off the coast of New South Wales at the following localities:—Station 13, off Cape Three Points, 41-50 fathoms; Station 17, off Broughton Island, 29-48 fathoms; Station 34, off Port Jackson, 39-36 fathoms; Station 48, off Wollongong, 55-56 fathoms (Thomson and Mackinnon).

PLUMARELLA AUSTRALIS, *sp. nov.*

(Plate iv., fig. 3; Plate x.; Plate xi., fig. 2.)

This new species is represented by both dried specimens and others in spirit.

The colonies are typically feather-like. In the largest specimen there is a slightly flattened stem, 5mm. in thickness. The colony has a height of 43cm., with a spread of 32·5cm. across the expanded portion. The basal attachment is lacking. The branching is confined strictly to one plane. The stem gives off strongly flattened branches at rather wide intervals, which bear on each side a row of alternating twigs. These twigs occasionally branch in the same pinnate manner, but usually they remain simple. The longest twigs are 8cm. in length, with a diameter of 2mm. There are eight twigs in each row in a length of 5cm.

Some of the colonies show the basal portion, which consists of a well-developed calcareous expansion about 20mm. in thickness. From this there rises a cylindrical stem, 7mm. in diameter, which soon becomes compressed with its long axis lying in the same plane as that of the colony.

The polyps are arranged bilaterally on the stem and branches; on the twigs their arrangement is also lateral, but there is a tendency, in some instances, to encroach on the middle line. They are arranged in a double row along each side on the twigs, those of one row alternating with those of the other on the same side. The polyps have an average length of ·75 mm.

Scattered among the normal-sized polyps in some of the colonies, there are a few large swollen polyps of about twice the size of the others; these contain reproductive bodies.

The calyx scales are arranged in longitudinal rows, of which the abaxials alone are complete. These consist of three to four relatively large overlapping scales. The adaxials are practically absent. The abaxial-laterals are reduced to about one small scale. The operculum is a well defined sharp cone formed of eight rather high isosceles triangles, which bear on their inner surface a well marked keel or ridge. The abaxial pair is the largest; the adaxial pair is very small and lies bent under the other opercular scales.

The large swollen polyps differ from the normal ones not only in size, but they have a much lower operculum, and the polyp scales are more numerous. The armature consists of overlapping scales of which there are about five in the abaxial longitudinal rows, and two to three in the adaxial-laterals.

The calyx scales are broad, shield-like and fan-like, with finely toothed margins, and a well marked excentric nucleus surrounded by tuberculate warts. The relatively clear border of the scale is narrow, and bears strongly marked radiating ridges. The following measurements of the length and breadth of the calyx scales were taken in millimetres :—·612 × ·315; ·577 × ·315; ·525 × ·385; ·455 × ·332; ·367 × ·350; ·332 × ·437. The eight opercular scales are of very unequal size—·525 × ·210mm.; ·490 × ·192mm.; ·402 × ·192mm.; ·350 × ·210mm.; ·280 × ·140mm. They are sharply pointed isosceles triangles with a strong median ridge. Numerous small warts are grouped along the sides of the ridge. The border is relatively broad and bears a number of jagged projections. The margins of the two long sides of the scale are minutely dentate.

The spicules of the cœnenchyma are rather large scales, oval, fan-shaped and triangular, closely studded with tuberculate warts, and without a clear border. The following measurements were taken :—·490 × ·332mm.; ·437 × ·341 mm.; ·420 × ·350mm.; ·385 × ·332mm.; ·315 × ·297mm. A few oval to spherical bodies covered with warts are also present—·192 × ·175mm.; ·175 × ·175mm.; ·122 × ·122mm.

The colour of the colonies is creamy-white; the axis is greenish-bronze to black, and bears fine longitudinal striations.

Locality.—Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Genus Primnoella, *Gray*.

Primnoella australasiæ, *Gray*.

Primnoa australasiæ, Gray, Proc. Zool. Soc., 1849, p. 146, pl. ii., figs. 8, 9 ; *Id.*, Gray, Ann. Mag. Nat. Hist., (2), v., 1850, p. 510.

Primnoella australasiæ, Gray, Proc. Zool. Soc., 1857, p. 286, and 1859, p. 483 ; *Id.*, Gray, Cat. Lithophytes in Brit. Mus., 1870, p. 50. *Id.*, Verrill, Bull. U.S. Nat. Mus., 1876, p. 76. *Id.*, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 88, pl. xviii., figs. 1, 1a, pl. xxi., fig. 15. *Id.*, Versluys, Gorgoniden Siboga Exped., ii., Primnoidæ, 1906, p. 52, figs. 55-60. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 688, pl. lxi., fig. 1.

This species is represented by a single colony, which is imperfect at the tip, and has a length of 81 cm. The lower portion of the stem is devoid of polyps and cœnenchyma, which is first met with at a height of 55 mm. The thickness of the axis at its base is 5 mm., but rapidly diminishes to 3 mm. in diameter. At the point of attachment of the colony the axis is hard and calcareous, but soon becomes horny and flexible. There are fifteen to nineteen calyces, 2 mm. in length, on each closely packed whorl.

Locality.—Fifteen and a-half miles S. 8° E. of Cape Everard, Victoria, 66 fathoms.

Distribution.—*P. australasiæ* has been recorded frequently from the eastern and southern coasts of Australia, from Tasmania (Gray), and from Bluff Harbour, New Zealand (Verrill). Gray also gives as a locality the "Australian Seas." The "Challenger" Expedition obtained specimens from Port Jackson, New South Wales, 30-35 fathoms, and from off Twofold Bay, New South Wales, 150 fathoms. Records by Thomson and Mackinnon tell of its presence at nine stations on the coast of New South Wales.

Under the name *Primnoella australasiæ* (Gray), Hickson[1] recorded a Primnoid from Port Phillip, Victoria, which he now refers to *Caligorgia flabellum*, Ehrenberg. He writes[2] "I ask therefore to correct my report by substituting the name Caligorgia flabellum (Ehrenberg) for Primnoella australasiæ (Gray), in the list of species obtained at Port Phillip."

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1. Hickson—Proc. Roy. Soc. Vict., (n.s.), ii., 1890, p. 138.
2. Hickson—Proc. Roy. Soc. Vict., (n.s.), xix., 1907, p. 46.

PRIMNOELLA GRANDISQUAMIS, *Wright and Studer.*

Primnoella grandisquamis, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 86, pl. xvii., fig. 4, pl. xxi., fig. 13. *Id.*, Versluys, Gorgoniden Siboga Exped., ii., Primnoidæ, 1906, p. 55.

The collection contains a number of broken pieces of *Primnoella grandisquamis*, Wright and Studer, which does not appear to have been obtained since those authors published their original description of a specimen 39 mm. in length.

They were trawled from the type locality in 40 fathoms. The largest has a height of 210 mm.; the basal attachment is lacking. The axis has an almost uniform diameter of 0·5 mm. The colony is a long, flexible, thread-like, unbranched stem around which the polyps are arranged in whorls. There are four to five polyps in a whorl. The average length of a polyp is 1·5 mm., with a diameter of 0·9 mm. The whorls are about 1·5 mm. apart. Young polyp buds, arranged in whorls, are visible in the internodes.

The calyx scales are large, transversely elongate, and overlapping, and only two longitudinal rows are visible from the dorsal side. Each scale shows a nucleus with fine lines radiating from it. The surface is studded with small warts. The free margin of the scale is entire; the remainder is strongly toothed. Their dimensions are—·385 × ·262 mm.; ·315 × ·227 mm.; ·315 × ·262 mm.; ·297 × ·245 mm. The opercular scales are short, flat structures—·227 × ·070 mm. The spicules of the cœnenchyma are oval, four-cornered, and polygonal plates, with a central nucleus and teeth round the edges, and with warts over the surface—·402 × ·227 mm.; ·385 × ·262 mm.; ·350 × ·297 mm.; ·192 × ·113 mm.

The colour of the specimens is creamy-white.

Locality.—Off Eden, Twofold Bay, New South Wales, 40 fathoms.

Distribution.—Hitherto recorded only from "Challenger" Station 163A, off Twofold Bay, New South Wales, 150 fathoms (Wright and Studer).

Genus CALIGORGIA, *Gray* (emend. *Studer*).

CALIGORGIA FLABELLUM (*Ehrenberg*).

Gorgonia verticillaris, Esper, Fortsetz. der Pflanzenthiere, x., 1797, p. 156, pl. 42.

Primnoa flabellum, Ehrenberg, Corallenthiere rothen Meeres, 1834, p. 134. *Id.*, Kölliker, Icones Histiologicæ, 1865, p. 135, pl. xvii., fig. 11.

Callogorgia flabella, Gray, Proc. Zool. Soc., 1859, p. 484.
Calligorgia verticillata, Gray, Cat. Lithophytes Brit. Mus., 1870, p. 35.
Xiphocella esperi, Gray, Cat. Lithophytes Brit. Mus., 1870, p. 36.
Calligorgia flabellum, Studer, Monatsber. Akad. Wiss. Berlin, 1878, p. 646, pl. ii., fig. 13, a, b.
Caligorgia flabellum, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 79, pl. xiv., fig. 2. *Id.*, Studer, Bull. Mus. Comp. Zool., xxv., 1894, p. 65. *Id.*, Versluys, Gorgoniden Siboga Exped., ii., Primnoidæ, 1906, p. 69, pl. v., fig. 13, pl. vi., fig. 14. *Id.*, Thomson and Henderson, Alcyonaria Indian Ocean, i., 1906, p. 43. *Id.*, Kükenthal, Zool. Anzeig., xxxi., 1907, p. 209. *Id.*, Kinoshita, Journ. Coll. Sci. Tokyo, xxiii., 12, 1908, p. 35, pl. vi., fig. 45. *Id.*, Nutting, Proc. U.S. Nat. Mus., xliii., 1913, p. 60.

The collection contains a single incomplete specimen, which I am unable to separate from the Japanese *Caligorgia flabellum* (Ehrenberg). The polyps and spicules agree with the description and figures given by Versluys, except that the sculpture of the distal scales is not so pronounced as figured. In my specimen the number of polyps in a whorl is usually four, sometimes five, never so many as seven as in those of Versluys. Nutting's specimen has eighteen polyps to a whorl on the bases of the larger branches.

The colour of the colony is cream.

Locality.—Great Australian Bight, Long. 129° 6½′, 200-300 fathoms.

Distribution.—Previously recorded from near Mauritius, Japan, Formosa, and the western part of the Indian Ocean. "Challenger" Station 232, Hyalonema-ground, south of Japan, 345 fathoms (Wright and Studer). Port Phillip, Victoria (Hickson[1]). The "Albatross" Expedition obtained it at the following localities :—Station 3406, Lat. 0° 16′ N., Long. 90° 21′ 30″ W., 551 fathoms ; Station 3424, Lat. 21° 15′ N., Long. 106° 23′ W., 676 fathoms ; Station 3353, Lat. 7° 6′ 15″ N., Long. 80° 34′ W., 695 fathoms (Studer). "Siboga" Station 251, 5° 28′·4 S., 132° 0′·2 E., Kei Island, 204 metres (Versluys). "Investigator" Station 333, 6° 37′ N., 79° 38¾′ E., 401 fathoms (Thomson and Henderson). Indian Ocean, 752 metres (Kükenthal). Sagami Sea, Japan (Kinoshita). "Albatross" Station 4936, Sata Misaki Light, N. 21° E., 103 fathoms (Nutting).

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1. Under the name of *Primnoella australasiæ* (Gray).

Family GORGONELLIDÆ.

Genus Ctenocella, *Valenciennes.*

Simpson[1] and Nutting[2] have both shown that the genus *Scirpearia,* as understood by authors generally, is not identical with that of Cuvier, the latter being based on a Pennatulid. Simpson has retained the genus in its emended form, which, however, cannot be admitted according to the rules of zoological nomenclature. Nutting, on the other hand, has distributed the various species which were included in *Scirpearia* into other genera of the Gorgonellidæ.

Simpson also argued that *Ctenocella* is not distinct from his emended *Scirpearia* from which it only differs in the mode of branching. If his opinion be accepted, the single species of *Ctenocella* (*C. pectinata*) must be placed in one of the several genera into which Nutting has distributed the various species erroniously included in *Scirpearia.* Nutting, however, has not recognised the identity of *Ctenocella* and *Scirpearia* (emended), but maintains it as a good genus; under the circumstances I prefer to follow him.

Ctenocella pectinata (*Pallas*).

(Plate iv., fig. 5; Plate xii.)

Gorgonia pectinata, Pallas, Elenchus Zoophytorum, 1766, p. 179. *Id.,* Ellis and Solander, Nat. Hist. Zoophytes, 1786, p. 85. *Id.,* Lamouroux, Hist. Polyp. corall. flexibles, 1816, p. 416.

Gorgonella pectinata, Kölliker, Icones Histiologicæ, ii., 1865, p. 140, pl. xviii., fig. 41.

Ctenocella pectinata, Valenciennes, Comptes Rendus, xli., 1855, p. 14. *Id.,* Milne-Edwards et Haime, Hist. Nat. Corall., 1857, p. 185. *Id.,* Gray, Cat. Lithophytes Brit. Mus., 1870, p. 26. *Id.,* Studer, Monatsber. Akad. Wiss. Berlin, 1878, p. 657. *Id.,* Ridley, Zool. Coll. H.M.S. "Alert," 1884, p. 348. *Id.,* Studer, Versuch eines Systems der Alcyonarien, 1887, p. 68. *Id.,* Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. lxvi. *Id.,* Studer, Alcyonarien Sammlung

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1. Simpson—Proc. R. Irish Academy, xxviii., 1910, p. 307.
2. Nutting—Gorgonacea Siboga Exped., vi., Gorgonellidæ, 1910, p. 5.

Naturhistorischen Museums Lübeck, 1894, p. 119. *Id.*, Nutting, Gorgonacea Siboga Exped., vi., Gorgonellidae, 1910, p. 15. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 691, pl. lxxxi.

Scirpearia pectinata, Simpson, Proc. R. Irish Academy, xxviii., 1910, p. 319, figs. 36-45.

The first detailed descriptions of this species are those of Nutting (1910) and Simpson (1910), who gave a comprehensive review of its structure. The species is represented in the collection by twenty-nine specimens, all of which are preserved in the dry condition. Although showing a moderate amount of variation in external form, the colonies may be described as typically lyre-shaped. The description and figure of a colony given by Thomson and Mackinnon (1911) portray with exactitude their salient features. The largest specimen is 62cm. in height, with a spread of 31cm. The main stem, which arises from an encrusting base, is 3cm. long and 8mm. in diameter. The main branches into which the stem forks, diverge at an angle of about 45°, and from their upper surface alone give off a series of erect, parallel twigs. The main branches have a basal diameter of 7mm., and the longest is 52cm. in length. Some of the lesser branches are more strongly developed than the rest, and these either give off ascending twigs, or divide in a dichotomous manner. The twigs, up to 23cm. in length, have a uniform diameter of about 2·5mm. They are regularly spaced, and average about 11mm. apart.

The cœnenchyma is thin, compact and smooth. A distinct median furrow can be made out both on the main branches and on the twigs. Where the cœnenchyma is worn away the axis of the colony is seen to be light brown in colour and deeply furrowed.

The polyps are very numerous, 0·5-1mm. apart, and are retracted into low wart-like verrucæ. They are scattered all over the surface of the larger branches, but tend towards a more or less bilateral arrangement on the twigs.

The spicules include (1) colourless warty double clubs—·070 × ·035mm.; ·066 × ·035mm.; (2) elongated forms approaching double spindles—·087 × ·026mm.; ·070 × ·026mm.; and (3) a few crosses—·052 × ·052mm.; ·035 × ·035mm.

The colour of the colonies is creamy-white to yellowish.

Localities.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Eight miles east of Sandon Bluff, Queensland, 35-40 fathoms.

Distribution.—Indian Ocean (Lamouroux). Seas of the Moluccas (Lamarck). India and China (Gray). Cuba (Ridley). Elphinstone Island, Mergui Archipelago (Ridley)[1]. Australia (Studer, Ridley, Thomson and Mackinnon). Rotti and Aru Islands (Nutting). Burma and Andamans (Simpson).

Order STELECHOTOKEA, *Bourne.*

Family TELESTIDÆ.

Genus TELESTO, *Lamouroux.*

TELESTO ARBOREA, *Wright and Studer.*

Telesto arborea, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 262, pl. xxxix., figs. 1, 1a. *Id.*, Thomson and Henderson, Proc. Zool. Soc., i., 1906, p. 434. *Id.*, Thomson and Simpson, Alcyonaria of the Indian Ocean, ii., 1909, p. 276. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 692, pl. lxvii., fig. 2.

This species is represented by two fragments of a dark brown colour. The lateral polyps are cylindrical, 4 to 5 mm. in length and 2 mm. in diameter. The spicules agree with the figure given by Thomson and Mackinnon. They are transparent spindles with long, irregular, sharp spines.

Locality.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Distribution.—" Challenger " Station 190, in the Arafura Sea, lat. 8° 56′ S., long. 136° 5′ E., 49 fathoms (Wright and Studer). Kokotoni Harbour, 5 fathoms, and Wasin Channel, 10 fathoms, Zanzibar (Thomson and Henderson). Andamans, 270-45 fathoms ; southern portion of Malacca Strait ; Gaspar Straits ; east coast of Sumatra ; Karachee (Thomson and Simpson). " Thetis " Station 42, off Wata Mooli, New South Wales, 70-78 fathoms (Thomson and Mackinnon).

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1. Ridley—Journ. Linn. Soc., Zool., xxi., 1889, p. 243.

TELESTO TRICHOSTEMMA (*Dana*).

Gorgonia trichostemma, Dana, Zooph., 1846, p. 665, pl. lix., figs. 3, 3a, 3b.

Telesto trichostemma, Verrill, Amer. Journ. Sci. and Arts, xlv., 1868, p. 415. *Id.*, Wright and Studer, Chall. Rep., Zool., xxxi., 1889, p. 264. *Id.*, Hickson, Fauna Geography Maldive and Laccadive Archipelagoes, ii., 1, 1903, p. 481. *Id.*, Thomson and Henderson, in Herdman, Rep. Ceylon Pearl Oyster Fisheries, Part III., Suppl. Rep., xx., Alcyonaria, 1905, p. 319. *Id.*, Thomson and Simpson, Alcyonaria of the Indian Ocean, ii., 1909, p. 277. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 692.

A solitary specimen is referred to this species. It is 13 cm. in length, and of a yellowish-brown colour. It agrees with the description given by Wright and Studer, and with specimens in the Australian Museum collection. The basal attachment is intact, and consists of a flattened expansion. The spicules are exactly like those described in the "Challenger" Report.

Locality.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Distribution.—Fiji Islands (Dana). Torres Strait, 3-11 fathoms (Wright and Studer). Mulaku Atoll, 25 fathoms, and Miladumadulu Atoll, Maldive Archipelago, 24 fathoms (Hickson). Patani, Siam (Thomson and Henderson). "Thetis" Station 44, off Coogee, New South Wales, 49-50 fathoms (Thomson and Mackinnon).

Family KOPHOBELEMNONIDÆ.

Genus KOPHOBELEMNON, *Kölliker*.

KOPHOBELEMNON SCHMELTZII (*Kölliker*).

Sclerobelemnon schmeltzii, Kölliker, Anatom. Systemat. Beschreib. Alcyonarien, Abth. i., Pennatuliden, 1872, p. 312, pl. xxi., figs. 184a, 184b, 185.

Kophobelemnon schmeltzii, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 693.

A single specimen of a light brown colour represents this species, which was originally described by Kölliker from Formosa.

The dimensions in centimetres are as follows :—

Length of entire colony	15·3
Length of polyp-bearing portion	9·2
Length of the stalk	6·1
Breadth of polyp-bearing portion	1·1
Breadth of the stalk	0·5

Locality.—Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

Distribution.—Formosa (Kölliker). "Thetis" Station 25, off Newcastle, New South Wales, 48-42 fathoms (Thomson and Mackinnon).

Family PTEROEIDIDÆ.

Genus Godeffroyia, *Kölliker.*

Godeffroyia elegans, *Kölliker.*

Godeffroyia elegans, Kölliker, Anatom. Systemat. Beschreib. Alcyonarien, Abth. 1., Pennatuliden, 1872, p. 116, pl. viii., figs. 63-65. *Id.,* Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 693.

This species was founded on a single specimen, 134 mm. in length, from the Gulf of Siam. There are three specimens in the present collection which agree in detail with Kölliker's description.

The dimensions in centimetres are as follows :—

	Sp. I.	Sp. II.	Sp. III.
Length of entire colony	20·5	19·4	18
Length of rachis	11	10·4	10·7
Length of stalk	9·5	9	7·3
Breadth of rachis	5·5	4·8	4·5
Breadth of stalk	1·2	1·2	1·2
Breadth of keel in the middle	1	1·1	1·1
Length of pinnules on the ventral side ..	3	2·2	2·6
Maximum breadth of pinnules	1·1	1	1·1
Number of pinnules on each side	27	32	31

The colour is light brown.

Localities.—Shoalhaven Bight, New South Wales, 15-45 fathoms.

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

Distribution.—Gulf of Siam (Kölliker). The "Thetis" obtained it at the following localities off the coast of New South Wales :—Station 22, Newcastle Bight, 40-26 fathoms ; Station 54, Jervis Bay, 10-11 fathoms (Thomson and Mackinnon).

Genus Sarcophyllum, *Kölliker.*

Sarcophyllum grande (*Gray*).

Sarcoptilus grandis, Gray, Proc. Zool. Soc., xvi., 1848, p. 45, pl. i. *Id.*, Gray, Ann. Mag. Nat. Hist., v., 1860, p. 23. *Id.*, Gray, Cat. Sea-Pens Brit. Mus., 1870, p. 25.

Sarcophyllum australe, Kölliker, Anatom. Systemat. Beschreib. Alcyonarien, Abth. 1., Pennatuliden, 1872, pp. 120, 364, pl. viii., figs. 66, 67. *Id.*, Hickson, Proc. Roy. Soc. Vict., (n.s.), ii., 1890, p. 140. *Id.*, Thomson and Mackinnon, Mem. Austr. Mus., iv., 13, 1911, p. 694, pl. lxxxii.

Sarcophyllum grande, Kölliker, Chall. Rep., Zool., i., 1880, p. 2.

A number of specimens of a light brown colour agree on the whole with Kölliker's description of *Sarcophyllum australis* (=*S. grande*, Gray).

Gray's original description, which was based on a single specimen from an unknown habitat, contains the following passage :—" *Pinnæ* placed in two crowded rows, one on each side of one of the faces of the upper part of the shaft, kidney-shaped, crumpled, with the polyps scattered on the edge and upper surfaces, especially near the edge."

After an examination of specimens from Sydney, New South Wales, he writes " When I first described this genus I believed that the polypes were 'scattered over the upper surface of the pinnæ' ; but that is a mistake which I was led into by the imperfect state of the specimen ; the polyps are only placed on the margin of the pinnæ as in other *Pennatulidæ.*"

In the present specimens there are numerous rows of autozooids on the margin of the pinnules. The characteristic spicules of the species are situated in the base of the colony, and consist of large white S-shaped forms measuring up to 4mm. in length.

The dimensions in centimetres of the largest specimen are as follows :—

Length of entire colony	29
Length of the rachis	20·5
Length of the stalk	8·5
Breadth of the rachis	8
Breadth of the stalk	3·5
Maximum breadth of pinnules	4·6
Height of pinnules in the middle	3
Number of pinnules on each side	40

Localities.—Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

East coast of Flinders Island, Bass Strait, 60 fathoms.

Fifteen miles south of St. Francis Island, South Australia, 30 fathoms.

Thirty-six miles S. 58° W. of Cape Wickham, King Island, Bass Strait, 72-80 fathoms.

Off Kangaroo Island, South Australia, 17 fathoms.

Distribution.—Sydney, New South Wales (Gray). Australia (Kölliker). Port Jackson, 6-15 fathoms (Kölliker). Port Phillip, Victoria (Hickson). The "Thetis" obtained specimens from the following localities off the coast of New South Wales:—Station 28, off Manning River, 22 fathoms; Station 31, off Cape Hawke, 28-25 fathoms, and 10-12 fathoms; Station 54, Jervis Bay, 10-11 fathoms; off Port Stephens, 32-48 fathoms (Thomson and Mackinnon).

1915

Commonwealth of Australia

Department of Trade and Customs

FISHERIES

Biological Results of the Fishing Experiments carried on by the F.I.S. "Endeavour," 1909-14.

H. C. Dannevig
Commonwealth Director of Fisheries

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IV. Report on some Fishes obtained by the F.I.S. "Endeavour" on the coasts of Queensland, New South Wales, Victoria, Tasmania, South and South-Western Australia.

PART III.

BY

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Plates XIII.—XXXVII.; Text Figs. 1—3.

REPORT ON THE FISHES.

PART 3.

By the courtesy of the Comptroller General of Customs, Mr. S. Mills, I was enabled to be on board the "Endeavour" during one of her cruises between 12th March and 6th April, 1914. Investigations were carried out on the bank lying to the eastward of Tasmania, and I saw the trawl worked at various depths between sixty and two hundred fathoms, at many localities between Babel Island on the north and Piedra Blanca Island on the extreme south. Large catches of fish and invertebrates of many kinds were made, and valuable collections preserved, but a highly instructive item lies in the fact that only two fishes were secured of which no specimens had been previously sent to Sydney from the "Endeavour." This leads us to the belief that the Babel Island bank has been very thoroughly investigated by the Director of Fisheries, the late Mr. H. C. Dannevig, whose sharp eye rarely overlooked anything unknown to him. Though a great number of specimens still remain to be identified, described and figured, we may perhaps be justified in supposing that on completion of the work, we will have a very fair idea of the fish-fauna of this area between the depths of sixty and one hundred and fifty fathoms.

Family SQUALIDÆ.

Genus CENTROPHORUS, *Müller & Henle.*

CENTROPHORUS SCALPRATUS, *sp. nov.*

(Plate xiii., fig. 2-7.)

Head depressed; snout short and broad, somewhat sharply rounded. Nostrils in the anterior two-fifths of the snout, the space separating them a little less than their distance from its tip. Anterior nasal flap with two lobes near the outer edge, the inner one smaller than the other; posterior margin of each nostril with a narrow skinny border, and a large rounded extero-internal prominence. Mouth below the hinder half of the eye, its width much greater than its distance from the nostrils; it is very slightly arched, with a deep groove and short labial folds at each angle. The oblique lateral groove extends backwards to behind the level of the spiracle, and its length is equal to about two-thirds the width of the mouth.

Teeth compressed, those of the upper jaw much smaller than the lower ones. Upper symphyseal teeth triangular, erect, with the edges entire; the others become more oblique towards the sides, the lateral ones having the cutting edge almost horizontal. Lower teeth with the cutting edge nearly horizontal, and the margins of the cusps serrated.

Eye large, its diameter a little greater than the length of the snout before the nostrils; the orbit is produced anteriorly and posteriorly, its length equal to the preorbital portion of the snout, and 1.09 in its distance from the anterior gill-opening. Spiracle large, sub-triangular, situated a little behind the corner of the orbit, and one diameter above it. Gill-openings increasing in width and becoming closer together backwards; the last is one-third wider than the first, and placed directly in front of the pectoral.

Pectorals angular, the outer angles rather sharp, the inner greatly produced, narrow, acute, and extending backward to below the middle of the first dorsal. Dorsal spines strong, compressed, the anterior exposed for less than half and the posterior more than half its length; the front edge of each is sharp, with a narrow groove on each side of it, the posterior margin broad and excavate. Origin of first dorsal far behind the axils of the pectorals; its base, exclusive of the spine, equal to about two-sevenths of the interdorsal space. Second dorsal rather less than two-thirds the size of the first, its base half as long; it originates behind the posterior angles of the ventrals, and its hinder angle scarcely reaches the level of the commencement of the sub-caudal. Ventral small, the outer angle a little rounded, the posterior acute. Caudal rather deep, about one-fifth of the total length; sub-caudal lobe well developed, separated from the terminal lobe by a notch. Scales small, depressed, pointed posteriorly, the upper surface rough with several keels which converge towards the point.

Colour.—Grey above and on the sides, white beneath. The posterior projections of the pectorals are white.

Described from a female example, 870 mm. long. A second specimen, a male, 907 mm. long, differs in some important details; the mouth is placed below the middle of the eye, which makes the preoral length much shorter than in the female; the posterior gill-opening is much wider than the penultimate one, and is twice as wide as the first; the inner angle of the pectoral is shorter, not reaching to below the middle of the dorsal fin; the ventral and second dorsal are considerably larger than in the female, and the end of the former reaches to below the anterior portion of the latter ; the lower teeth are similar to those of the female, but the upper ones are all erect and triangular, with lateral basal lobes. All these differences suggest that the two specimens belong to different species, but taking into consideration the fact that they were obtained at almost the same locality, I prefer to regard them as sexual forms of the one.

These specimens agree with *C. granulosus*, Schneider, in having the cusps of the lower teeth serrated, and they are possibly identical with that species.

Loc.—Victorian coast, Lat. 38° 50′ S., Long. 148° 15′ E., 70-80 fathoms.

Centrophorus harrissoni, *sp. nov.*

(Plate xiv., fig. 1-4.)

Head depressed, snout rather long and sharply rounded. Nostrils a little nearer the end of the snout than the upper lip ; the space separating them somewhat less than their distance from the end of the snout. Anterior nasal flap with a triangular lobe, which may have a secondary lobule ; posterior margin of nostril with a narrow, skinny lobe. Mouth below the posterior portion of the eye, its width a little greater than its distance from the nostrils ; it is slightly arched with a deep groove and short labial folds at each angle ; the oblique lateral groove extends backward to behind the verticle of the spiracle, its length equal to two-thirds or three-fourths the width of the mouth. Eye large, its diameter less than the length of the snout before the nostrils ; orbit produced anteriorly and posteriorly, its length equal to about three-fourths the snout and but little less than its distance from the first gill-opening.

Spiracle large, sub-triangular, situated a little behind the corner of the orbit and one diameter above it. Gill-openings becoming closer together backwards, the first to fourth sub-equal, the last abruptly wider than the others, and extending around the base of the pectoral.

Upper teeth much smaller than the lower. Those near the symphysis are a little oblique, the others becoming more oblique and somewhat larger towards the sides ; the lateral teeth have the cutting edge almost horizontal. Lower teeth with the cutting edge nearly horizontal, and imperfectly serrated. Scales small, sessile, and pointed posteriorly, the upper surface with several keels which converge towards the point.

Pectorals angular, the outer angle somewhat rounded, the inner much produced and extending back to behind the dorsal spine or almost to below the middle of that fin. Dorsal spines strong, compressed, with sharp anterior edges and a groove on each side, and the hinder surface broad and excavate; one-fourth to one half of the anterior spine is exposed, and half or more than half of the posterior. Dorsal originating far behind the axil of the pectoral, the length of its base more than two-fifths of the inter-dorsal space. Second dorsal about three-fourths the size of the first and similar to it in form. Ventrals small, the outer angle a little rounded, the posterior acute. Caudal rather broad, about one-fifth the total length; sub-caudal lobe well developed, separated from the terminal lobe by a notch.

Colour.—Grey above, lighter beneath, without darker markings.

Described from three females and one male, 760-800 mm. long. The example figured, a female, is selected as the type.

I associate with this species the name of my friend, the late Mr. Charles T. Harrisson, who was Biologist on the "Endeavour," and who was responsible for the collection and preservation of many of the more interesting fishes referred to in this Report.

Loc.—Near Gabo Island, Victoria.

Genus Acanthidium, *Lowe.*

Acanthidium quadrispinosum, *sp. nov.*

(Plate xiv., fig. 5-8.)

Head depressed; snout very long, more than half the length of the head, with sharp edges, and rounded in front. Nostrils much nearer the end of the snout than the upper lip, the space separating them equal to about two-thirds their distance from the end of the snout; their inner portions with free skinny borders. Mouth below the hinder portion of the eye, its width less than its distance from the nostrils. It is slightly arched, and has a long upper and a short lower labial fold at each angle; the upper groove is continued backward almost to below the end of the spiracle. Eye large, nearly three in the length of the snout; orbit equal to its distance from the nostrils, and somewhat less than the space between it and the first gill-opening. Spiracle large, situated behind the end of the orbit, and about half a diameter above it. Gill-openings sub-equal, uniformly spaced, their width less than half the orbital length.

Upper teeth a little smaller than the lower, with pointed cusps arising from broad bases; they are nearly all upright, becoming slightly oblique laterally. The lower teeth differ in the two sexes: in the male they are very similar to those of the upper jaw, though somewhat broader, and a little more oblique laterally; in the female their cutting edges are almost horizontal with the tips turned slightly upwards. Scales with four spines, one of which is broad and leaf-like; they stand on stellate bases and have slender peduncles.

Pectorals rounded, the inner angles not produced, and not reaching the verticle of the origin of the dorsal. Dorsal spines strong, anteriorly compressed, with broad shallow grooves; the position of the first varies from midway between the end of the snout and the base of the tail to a point much nearer the former. Soft portion of the first dorsal low, the hinder angle produced backwards. Second dorsal much higher than the first and but little shorter than it, the hinder angle reaching beyond the commencement of the subcaudal lobe; the spine is long and curved in some specimens, short in others. Outer angle of ventral rounded, the posterior pointed and reaching beyond the verticle of the second dorsal spine in females, and farther in males. Caudal broad, the sub-caudal lobe well developed, and separated from the terminal lobe by a notch.

Colour.—Grey above, somewhat lighter beneath. The anterior portions of the dorsals and pectorals are somewhat darker in the smallest specimen.

Described from two male and three female specimens, 683-1138 mm. long. They vary somewhat in their proportions and the relative lengths and positions of their fins, while the different form of the teeth in the two sexes is very striking. There seems to be no reason, however, to suppose that they represent more than one species. The figures are prepared from the smallest specimen, which is a well preserved, young male, and which is selected as the type.

Locs.—Great Australian Bight, Long. 128°-129° E., 200-300 fathoms.

Edge of bank between Gabo Island and Cape Everard, Victoria, 150-250 fathoms.

Family DASYATIDÆ.

Genus Dasyatis, *Rafinesque.*

Dasyatis brevicaudatus, *Hutton.*

(Plate XV., fig. 1; Plate XVII., fig. 1.)

Trygon brevicaudata, Hutton, Ann. Mag. Nat. Hist. (4), xvi., 1875, p. 317, and Trans. N.Z. Inst., viii., 1876, p. 216.

Dasybatus brevicaudatus, Waite, Rec. Cantb. Mus., i., pt. 2, 1909, p. 151, pl. xxii.

Disc subquadrangular, wider than long, the length from the tip of the snout to the posterior angle of the pectorals 1·19 in the breadth. Upper and lower surfaces perfectly smooth, without traces of spines or tubercles. The snout is a little prominent. Anterior margin indistinctly sinuous, at first a little convex, then very slightly concave; outer angle distinct but rounded. Postero-lateral borders of disc a little convex, nearly straight, and forming an obtuse angle with the inner margins. Margins of ventrals convex, the angles somewhat rounded; the inner border may be cut into one or two angular lobes.

Tail depressed before, cylindrical behind, the spine, its length 1·06 in that of the disc. The basal portion is smooth, but a few small scattered spines are present on the sides at about the level of the insertion of the spine, and they become more numerous as they approach the tip; the terminal part, beyond the lower cutaneous lobe, is uniformly rough with small spiniform tubercles. Spine depressed and grooved, the margins coarsely serrated, 0·65 longer than the preoral length. Lower cutaneous lobe commencing a little behind the insertion of the spine, and ending a little beyond its tip; its greatest height is at the end of the anterior third of its length, but it does not equal the depth of the tail above it.

Eyes very small, placed nearer together than the spiracles, 4·83 in the bony interorbital space, which is 1·53 in the preoral length. Spiracles very large, longer than broad, their length 1·57 in the interorbital width; the upper margin is straight, the outer circular.

The anterior part of the lower surface is closely pitted with minute pores. The space separating the nostrils is a little less than their distance from the tip of the snout. Outer angles of the intra-nasal lobe acute; the hinder margin bears a narrow papillose flap, which forms two small lobes near the median line. Width of the mouth slightly less than two-thirds of the preoral length. Lateral teeth tubercular, the inner ones each developing an angular cusp, which is longest on the median line. A broad fimbriated flap behind the upper jaw, and five papillæ inside the lower one, of which the outer pair is smaller than and remote from the other three. Four anterior gill-openings sub-equal in size, the last a little more than half as wide as the others.

Colour.—Uniform pale greyish-brown above, white below.

The above description and the accompanying figures are based on an adult male specimen, 1080 mm. wide, which was trawled off Babel Island. A second larger example in the Australian Museum, from Port Jackson, differs only in having the spiny tubercles on the tail more numerous, and extending a little farther forward ; it has also two enlarged tubercles with upstanding spines on the median line of the back of the tail between the ventral fins and the spine.

These specimens are evidently identical with *D. brevicaudatus*, Hutton, which has been recently figured by Waite, though they differ from his diagnosis in having the snout a little prominent instead of "scarcely distinct"; in this detail, however, they agree better with Hutton's original description.

The Port Jackson specimen referred to above was labelled *D. pastinaca*, Linnæus, but that species, according to Day[1], has a different shape, and much larger eyes than the Australian ray. It is almost certain, also, that all the records of *D. pastinaca* from New South Wales really refer to *D. brevicaudatus*. A second large species from Eastern Australia, *D. thetidis*, Ogilby[2], appears to differ mainly in having numerous tubercles on the back.

Loc.—Twenty miles east of Babel Island, Bass Strait, 60 fathoms ; March, 1914.

Dasyatis fluviorum, *Ogilby.*

(Plate xvi., fig. 1 ; Plate xvii., fig. 2.)

Dasyatis fluviorum, Ogilby, Proc. Roy. Soc. Qld., xxi., 1908, p. 6.

Mr. Ogilby has very kindly lent me an authentic example of this species for examination, which I have figured here. It is a little smaller than the typical specimen, and differs from it somewhat in the proportions of the disc, and the detailed arrangement of the scapular spines. The tail, also, has no scattered prickles on the sides.

1. Day—Fish. Gt. Brit. Ireland, ii., 1880-1884, p. 350, pl. clxxv.
2. Ogilby in Waite—Mem. Austr. Mus., iv., 1899, p. 46.

A second larger, but very badly stuffed specimen, is in the Australian Museum, from Port Jackson. It is a male, and agrees better with Ogilby's description than the specimen figured. The spines and tubercles on the scapular region are much more numerous, and are arranged in the quinqueradiate formation described in the type; the anterior projection extends forward almost to the level of the hinder margins of the spiracles. The large tubercles on the median line between the scapular region and the caudal spine, are also more numerous than in the female figured. At some distance behind the end of the spine the upper surface of the tail is rough with small spiniform tubercles.

The teeth of the male are triangular and acute, and the outer surface of each is deeply grooved. In the female they are tubercular with the surface broken up into numerous small facets.

Width of the specimen figured 271 mm. Length from tip of snout to hinder margin of ventral fins 271 mm. Tail, from posterior base of ventral fins 520 mm.

Locs.—Brisbane River, Queensland; Port Jackson, New South Wales.

Key to the Australian species of *Dasyatis*.

a. Tail with cutaneous folds........sub-genus DASYATIS.
  b. Tail with a small fold above as well as below.
    c. Scapular region smooth, or with spines on median line only; upper surface with blue spots......*kuhlii.*
    cc. Scapular region with a broad patch of tubercles; upper surface uniformly coloured......*fluviorum.*
  bb. Tail with a fold below, none above.
    d. Back smooth or with isolated tubercles.......... *brevicaudatus.*
    dd. Back with numerous tubercles..........*thetidis.*
aa. Tail without cutaneous folds....sub-genus HIMANTURA.
  e. Back smooth in the young, tubercular in adults.*uarnak.*

Family MYCTOPHIDÆ.

Genus ELECTRONA, *Goode & Bean.*

ELECTRONA RISSOI, Cocco.

Scopelus rissoi, Cocco, Giorn. Sicil., fasc. 77, p. 144, *fide* Günther, Brit. Mus. Cat. Fish., v., 1864, p. 405. *Id.*, Collett, Res. Camp. Sci. Monaco, x., 1896, p. 113.

Myctophum rissoi, Chun, Wiss. Ergebn. "Valdivia," xv., 1906, p. 170, fig. 83.

Electrona rissoi, Goode & Bean, Oceanic Ichth., 1895, p. 91, pl. xxviii., fig. 107.

A large, somewhat battered specimen is 69 mm. long from the snout to the hypural. It only differs from smaller examples from Messina in having the body narrower, the depth ($23\frac{1}{2}$ mm.) being almost three in the length instead of about 2·7 ; a similar variation in a large specimen is noted by Collett. The arrangement of the photophores, relative positions and composition of the fins, and the scales are exactly as in the Messina specimens. The supra-caudal phosphorescent organ may be present or absent ; it is wanting in the Australian specimen.

Loc.—Between Gabo Island and Cape Everard, Victoria, 200-250 fathoms ; October, 1914.

Family CENTRISCIDÆ.

Genus CENTRISCUS, *Linnæus.*

CENTRISCUS CRISTATUS, *de Vis.*

(Plate xxxvi., fig. 1.)

Amphisile cristata, de Vis, Proc. Linn. Soc. N. S. Wales, ix., 1885, p. 872.

Centriscus cristatus, Ogilby, Ann. Qld. Mus., 10, 1911, p. 41.

Amphisile scutata, Kent, "Great Barrier Reef," 1893, p. 307, pl. xvi., fig. 3. *Id.*, Weber, Zool. Forschr. Austr., v., 1895, p. 268 (not *C. scutatus*, Linnæus).

Centriscus scutatus, Waite, Rec. Austr. Mus., vi., 1905, p. 59 (not of Linnæus).

An excellent series of seventy-two specimens, 105-248 mm. long, exhibits great variation with growth. The snout and the posterior spine are very much longer in the young than in adults, and the body becomes much deeper with age ; in consequence of these changes, the shape of the several body-scutes also varies greatly. The following are the proportions of the largest and smallest specimen of the series. Head 2·8-3·4 in the total length. Depth at the ventral spine 2·7-1·6 in the head. Snout 1.3, posterior spine, from the base of the soft dorsal to the tip, 1·9-2 in the head.

A specimen in the Australian Museum, which agrees with Bloch's figure of *C. scutatus*, differs from all the "Endeavour" specimens in the form of its body scutes ; it is also narrower than examples of *C. cristatus* of the same length. The dorso-lateral carapace is also narrower, and its sutures extend obliquely forwards and downwards as illustrated by Bloch. In *C. cristatus* the sutures are more or less vertical.

Locs.—Specimens of *C. cristatus* are in the Australian Museum from Cooktown, Queensland, and Houtman Abrolhos, Western Australia; they include one of the specimens recorded by Waite as *C. scutatus* from the latter locality. The "Endeavour" trawled numerous examples at the following stations:—

Platypus Bay, Queensland, 5-9 fathoms; 20th July, 1910.

Three to seven miles off Hervey Bay, Queensland, 9-11 fathoms; 27th July, 1910.

Fourteen miles S. 52° E. of Cape Capricorn, Queensland, 12-13 fathoms; 29th July, 1910.

Seven miles N. 70° E. of Hummocky Island, Queensland, 14-16 fathoms; 30th July, 1910.

Family PEGASIDÆ.

Genus Acanthopegasus, *gen. nov.*

Near *Parapegasus*, Dumeril, but differing in the structure of the ventral fins. These are composed of one spine and three rays, each of which is clearly divided into two halves in its basal portion; the spine overlies, and is in close contact with the first ray. The body is more rugose and spiny than *Parapegasus*, but similarly constructed.

Type.—*Pegasus lancifer*, Kaup.

Acanthopegasus lancifer, *Kaup.*

(Fig. 1.)

Pegasus natans, Kaup, Cat. Lophobr. Brit. Mus., 1856, p. 4 (part), pl. i., fig. 2 (not *P. natans*, Linnæus).

Pegasus lancifer, Kaup, Arch. für Naturgesch., xxii. i., 1861, pp. 116-117. *Id.*, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 149. *Id.*, Castelnau, Proc. Zool. Soc. Vict., ii., 1873, p. 57. *Id.*, Macleay, Proc. Linn. Soc., N.S.Wales, vi., 1881, p. 286. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 134, and 1890 (1891), p. 37. *Id.*, Lucas, Proc. Roy. Soc. Vict. (2), ii., 1890, p. 38. *Id.*, Zietz, Trans. Roy. Soc. S. Austr., xxxiii., 1909, p. 263.

Parapegasus lancifer, Dumeril, Hist. Nat. Poiss., ii., 1870, p. 494.

Kaup's type of *Pegasus lancifer*[1] was said to have been collected in Java by Leschenault, but this locality is evidently incorrect. The species is not uncommon in Tasmania and Victoria, and is apparently restricted to temperate waters[2]. Bleeker had no knowledge of it when writing on the fishes of Java, and no later writer has recognised it from the East Indies. We may, therefore, conclude that it is confined to southern Australia and Tasmania[3].

Two specimens, 57-67 mm. long, have the following number of fin-rays and osseus rings :—D. 5 ; A. 5 ; P. 18 ; V. i. 3 ; C. 8. The first three rings are united and form the carapace ; the seven following are movable, and the next five anchylosed and forming a flat tail-piece ; the last is minute and movable with the tail. The figure represents the largest specimen, which is from Tasmania.

Loc.—Entrance to Oyster Bay, Tasmania ; 29th July, 1909.

Distrib.—Tasmania (Günther). Derwent Estuary, Tasmania ; common (Johnston). Hobson Bay, Victoria (Castelnau). Port Phillip, Victoria ; common (Lucas). Spencer Gulf (Zietz).

Genus Parapegasus, *Dumeril.*

Parapegasus, Dumeril, Hist. Nat. Poiss., ii., 1870, p. 492 (*Pegasus natans*, Linnæus).

In this genus the ventrals are composed of two separate rays, the first being composite and large, and the second minute ; the first consists of a spine-like process and two rays fused together.

1.—Both Kaup and Dumeril state that the original figure was prepared from a specimen in the Paris Museum ; Günther wrongly believed that it was based on a British Museum specimen.

2.—Dumeril refers to a specimen which Kaup examined from Manila, but this was really an example of *P. natans*, as is clearly stated by Kaup.

3.—This conclusion is supported by a precisely similar error in the locality of the mollusc, *Fissurella javaniciensis*, Lamarck (Hist. Anim. s. vert., vi., 1822, p. 14). This was also said to have been collected in Java by Leschenault, but, as noted by Pilsbry (Man. Conch., xii., 1890, p. 188) " the species does not occur within a thousand miles of Java," while Mr. Hedley recognises it as a common Tasmanian mollusc.

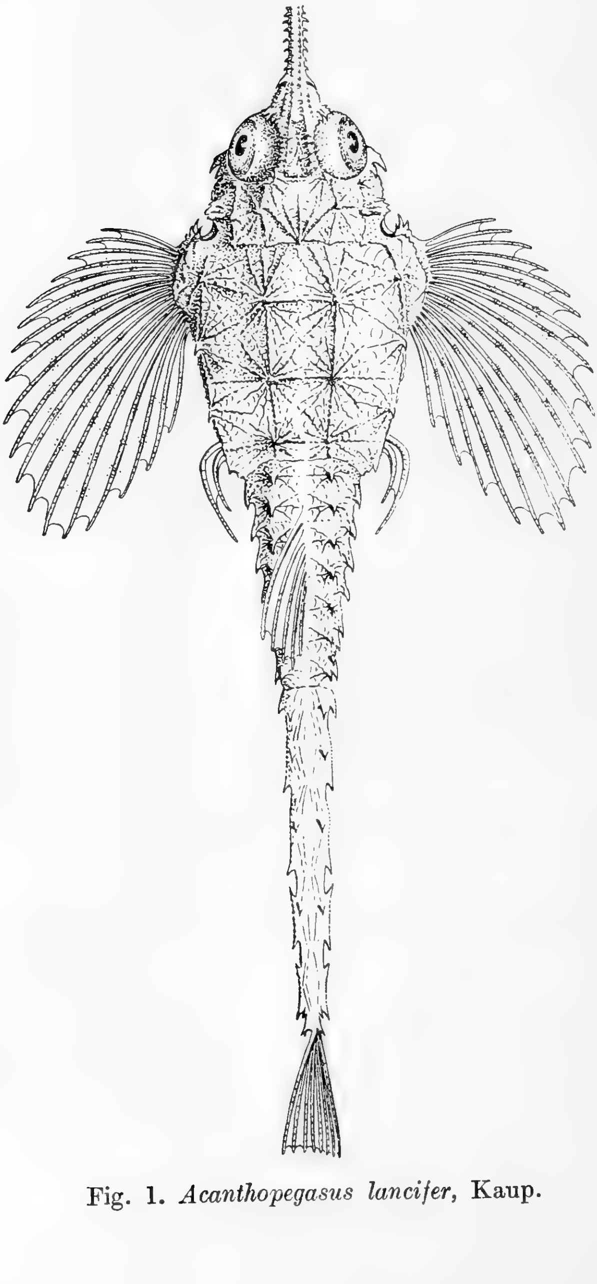

Fig. 1. *Acanthopegasus lancifer*, Kaup.

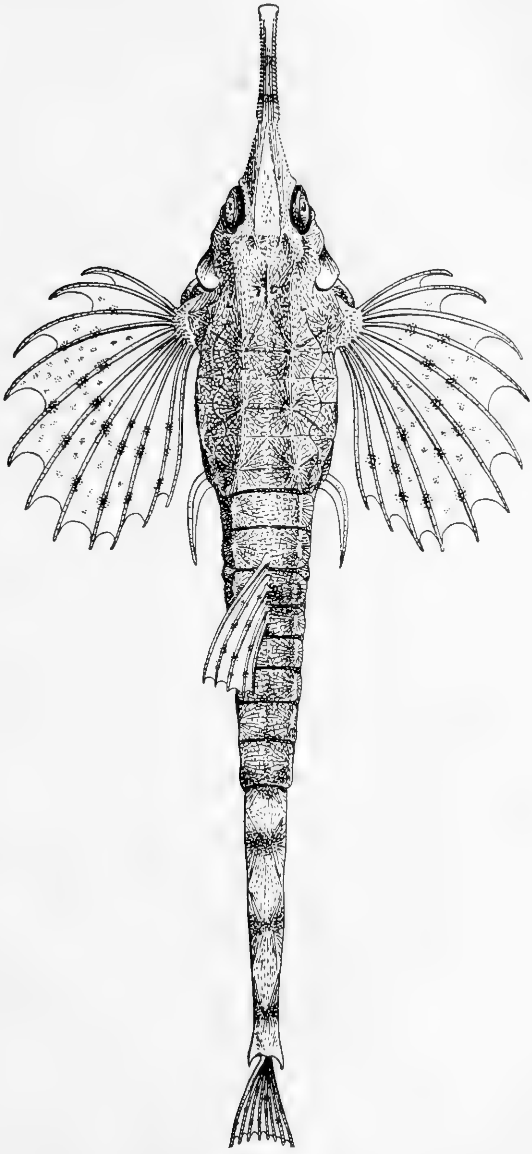

Fig. 2. *Parapegasus natans,* Linnæus.

Parapegasus natans, *Linnæus.*

(Fig. 2.)

Pegasus natans, Linnæus, Syst. Nat., Ed. 12, i., 1766, p. 418. *Id.*, Richardson, Voy. "Sulphur," i., 1845, p. 118, pl. 1, fig. 5-10. *Id.*, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 148.

Parapegasus natans, Dumeril, Hist. Nat. Poiss., ii., 1870, p. 493.

Six specimens, 74-144 mm. long, vary in the relative lengths of their rostrums. In three, the distance from the eye to the tip of the snout is almost equal to, or shorter than that from the eye to the ventral fins; the others have the rostrum longer, it being equal to, or a little less than the length from the eye to the vent. A Western Australian specimen is also much more rugose than the others, but does not otherwise differ from them.

They also exhibit some variation in the development of the lateral spines of the tail. In younger specimens the last three segments are armed with spines directed backwards and forwards; these disappear with age, becoming involved in the general anchylosis which occurs in the posterior rings.

The accompanying figure represents a specimen 114 mm. long from Queensland.

Locs.—Thirteen miles south-east from Cape Capricorn, Queensland.

Seven miles south of Double Island Point, Queensland.

Swan River, Western Australia.

Malay Archipelago.

Family MACROURIDÆ.

Genus Macruronus, *Günther.*

Macruronus novæ-zelandiæ, *Hector.*

Macruronus novæ-zelandiæ (Hector), Waite, Rec. Cantb. Mus., I., 1911, p. 180, pl. xxx., fig. 1. *Id.*, McCulloch, Rec. Austr. Mus., ix., pt. 3, 1913, p. 358.

Eight large specimens, 800-930 mm. long, from the edge of the bank, on the Victorian coast, between Gabo Island and Flinders Island, 150-250 fathoms.

Family BERYCIDÆ.

Genus Beryx, *Cuvier.*

Beryx splendens, *Lowe.*

Beryx splendens, Lowe, Proc. Zool. Soc., 1833, p. 142, and Fish. Madeira, 1843-1860, p. 47, pl. viii. *Id.*, Goode and Bean, Oceanic Ichth., 1895, p. 176, pl. liii., fig. 197 (references).

A young example, eight inches long from the tip of the snout to the end of the middle caudal rays, does not appear to differ from the descriptions and figures quoted above. The longer body and fewer dorsal rays readily separate it from *B. decadactylus*, Lowe.

Loc.—Thirty miles south-west of Gabo Island, Victoria, 240 fathoms; 12th September, 1914.

Beryx decadactylus, *Lowe.*

Beryx decadactylus (Lowe), McCulloch, Biol. Res. "Endeavour," ii., pt. 3, 1914, p. 96.

Two examples, 253 and 295 mm. long to the end of the middle caudal rays, are somewhat smaller than those previously recorded from Australian waters.

Locs.—South of Cape Everard, Victoria, 180-200 fathoms; 7th June, 1914.

Thirty miles S.S.E. of Gabo Island, Victoria, 238 fathoms; 2nd October, 1914.

Family ANTIGONIIDÆ.

Genus Antigonia, *Lowe.*

Antigonia rhomboidea, *sp. nov.*

(Plate xviii., fig. 1.)

D. ix. 29; A. iii. 28; V. i. 5; P. 1+12; C. 12. Depth from the first dorsal spine to that of the ventral 0·03 greater than the length from the snout to the hypural; head 2·6 in the same length. Eye 2.7 in the head, longer than the snout, which is 3·1 in the same. Interorbital space 3·9, caudal peduncle 2·7 in the head. Pectoral 1·1, ventral spine 1·4, and first anal spine 2·3 in the head.

Body very compressed and elevated, forming a sharp angle at the origin of the dorsal fin. The profile is straight from the upper lip to above the middle of the eye, thence rising rapidly and forming a hump on the nape. Lower profile slightly convex from the lower jaw to the ventral spine ; abdominal margin oblique, the origin of the anal being below the level of that of the ventral.

Head closely covered with small ctenoid scales, which extend onto the maxilla and lower jaw, leaving only the lips bare. Sides of occiput with radiating, bony ridges, which extend forward above the eye to before the nostrils. Occipital crest with similar denticulated ridges extending up the anterior margin of the hump. Preorbital with the anterior margin denticulate, and a series of radiating ridges. Angle of preoperculum broadly rounded, serrated, and bearing curved bony ridges ; an inner preopercular margin forming a right angle below and finely denticulated. Operculum unarmed, with a shallow excavation on the upper posterior margin. Maxilla small, but little oblique, not reaching backward to the verticle of the anterior nostril. Nostrils placed in front of the upper portion of the eye, the anterior in a low tube, the posterior an open pore. Scales in about seven rows on the cheeks.

Body closely covered with strongly ctenoid scales, which are very coarse on the ventral surface. They extend up the anterior margin of each spine of the fins, and also along the lower surfaces of the ventral rays, where they are particularly spiny. Small, but similar, scales cover the lower third of the soft dorsal and anal fins. Lateral line forming a high arch below the anterior dorsal spines, thence running obliquely downward to the middle of the side and extending along the caudal peduncle. About fifty-eight scales between the operculum and the hypural.

Anterior spines of each fin coarsely striated. Third dorsal spine longest and strongest, the remainder decreasing regularly backwards ; the tips of all are broken off or damaged. Anterior dorsal rays higher than the posterior spines, the others becoming regularly lower backwards. Anal fins similar in form to the dorsal. Pectoral pointed, the upper rays longest. Ventral spine long and strong, reaching backwards to the first anal ray. Caudal slightly emarginate, the upper rays a little longer than the lower ones.

Colour.—Generally pink in life, becoming pinkish-grey below. The scaly base of the soft dorsal and the body immediately below it with numerous, rather indefinite, yellow, subvertical bars ; similar bars on the body around the pectoral region. In formalin the whole fish is whitish, the abdominal region being whiter than the rest.

Described and figured from a single specimen, 115 mm. long from the tip of the snout to the end of the middle caudal rays. It differs from *A. steindachneri*, Jordan & Evermann, *A. eos*, Gilbert, and *A. capros*, Lowe, in having fewer dorsal and anal rays. *A. malayanus*, Weber, has only eight dorsal spines, and is a narrower, rounder fish. It is near *A. fowleri*, Franz, and *A. rubescens*, and may prove to be identical with one of them, but the form of the body apparently distinguishes it from both.

Loc.—Between Gabo Island and Cape Everard, Victoria, 200-250 fathoms ; October, 1914.

ANTIGONIA RUBICUNDA, *Ogilby*.

(Plate xviii., fig. 2.)

Antigonia rubicunda, Ogilby, New Fish. Queensland Coast, 1911, p. 103.

D. ix. 28-29 ; A. iii. 26-27 ; P. 1+12 ; V. i. 5 ; C. 12. Depth from the first dorsal spine to that of the ventral equal to the length from the snout to the hypural ; head 2·7 in the same. Eye 2·2 in the head, much longer than the snout, which is 3·6 in the same. Interorbital width 3, depth of caudal peduncle 2·5 in the head. Third dorsal spine, 1·06, ventral spine 1·2, pectoral 1·1 in the head.

A. rubicunda differs from *A. rhomboidea* in the general form of the body and in having larger scales. The difference in form is illustrated on plate xviii. ; it is rounder in *A. rubicunda*, and the abdominal margin is less oblique, the insertion of the anal spine being on a higher level than that of the ventral. There are about forty-five scales between the operculum and the hypural instead of fifty-eight as in *A. rhomboidea*. In all other details the two species are very similar.

The two small specimens, 62-65 mm. long, on which Ogilby's description was based, are the only ones known. They were described on board the "Endeavour," so that it is not surprising to find several errors in the description. Ogilby has wrongly counted the number of spines and rays of the fins, while some of the proportions given by him are also incorrect.

Loc.—Thirteen miles N. 50° E. of North Reef, Queensland, 70 fathoms ; 15th July, 1910.

Family PRIACANTHIDÆ.

Genus Priacanthus, *Cuvier*.

Priacanthus velabundus, *sp. nov.*

(Plate xix.)

D. x., 12; A. iii., 12; P. 16-17; V. i., 5; C. 16. L. lat. 54-59+4-6. Head 2·8, height of body at origin of anal 2·1 in the length from the snout to the hypural. Snout 1·6, interorbital width 1·3 in the eye, which is 2·6 in the head. First dorsal spine 4·2 in the last, which is 1·2 in the head. Second dorsal ray slightly longer, ventral fin 0·6 longer than the head. Third anal spine 1·5, second anal ray 1·1, pectoral 1·6, and depth of caudal peduncle 3·1 in the head.

Body compressed, elevated, somewhat oblong in shape. The upper profile is straight on the snout, and gilbous above the middle of the eye, whence it rises gradually to about the eighth dorsal spine. Preorbital edge strongly spinate. Preoperculum denticulated on both margins, the lower teeth being the strongest; the angle is armed with a strong flat spine which has some smaller ones near its base. Operculum with two bony ridges terminating in very weak flat spines. The hinder edge of the operculum is smooth, but the lower portion of the interoperculum and the suboperculum are finely serrated. Maxillary broadly expanded, truncate posteriorly, and reaching to below the end of the first third of the eye. Suprascapula with an elevated ridge, terminating in a strong spine; its upper edge serrated. Posterior nostril very large, placed directly before the eye. Anterior nostril small, valvular, and opening internally into the posterior one by means of a complex tubular process. Lower jaw longer than the upper one, the chin produced.

Teeth small, conical, depressible, in three or four rows in each jaw anteriorly, and biserial laterally. Minute teeth are present on the vomer and anterior portion of each palatine; tongue toothless.

Entire head and body closely covered with rather small, strongly ctenoid scales, which extend forward to the end of the snout and the chin, where they are coarsely spinate. On the sides of the body they are somewhat trilobed, and larger than elsewhere. Those at the bases of the dorsal and anal fins are much enlarged and form upstanding plates with extremely spinate edges. There are fifty-four to fifty-nine scales on the lateral line as far as the hypural, and four to six more on the base of the tail; there are sixty-seven to seventy-six rows of scales along the middle of the body, including six on the base of the tail.

The spines and rays of the dorsal, anal, and ventral fins are all more or less rough with minute spinules, while each of the spines is also cut into numerous grooves. The dorsal spines increase uniformly in length backwards ; the first is placed a little behind the verticle of the hinder orbital margin. The anterior rays are the highest, the others decreasing rapidly backwards; the base of the soft dorsal is little more than half as long as that of the spinous portion. Anal originating below the last two dorsal spines, and terminating behind the verticle of the last ray ; its form is similar to that of the dorsal. Pectorals short, the rays slightly roughened at their bases ; the upper ones the longest. Ventrals greatly produced, reaching to the base of the fifth anal ray ; their margins are rounded, and the last rays are wholly connected with the body by membrane. Caudal rays smooth, the margin of the fin slightly rounded.

Colour.—Brassy-coloured in formalin, clouded with some grey blotches on the upper half of the body. Membrane of spinous dorsal and anal dark, becoming black between the ends of the anterior rays. Ventrals black, the rays lighter. Margin of caudal dark grey.

Described and figured from a specimen 197 mm. long ; a second example, 173 mm. long, does not differ from the type.

P. velabundus differs from all other species of the genus in being not much less than half as high as long. In this and other characters it resembles *Pseudopriacanthus*, Bleeker, but differs from that genus in having the posterior dorsal spines longer than the median ones, and a well-developed preopercular spine.

Locs.—Off Burrewarra Point, near Bateman's Bay, New South Wales, 60 fathoms ; 29th May, 1914.

Between Cape Naturaliste and Geraldton, Western Australia, 20-100 fathoms.

Family APOGONICHTHYIDÆ.

Genus Amia, *Gronovius.*

Amia fasciata, *Shaw.*

The several colour forms of *Amia fasciata* named *novemfasciata*, *compressa*, *aroubiensis*, and *robusta* can only be separated from each other with difficulty, and they are perhaps best regarded as subspecies ; they cannot be regarded as varieties of *A. fasciata*, as has been done by Günther, because the typical form of that species varies in itself, and its variations do not overlap the characters of the supposed subspecies. I have examined a representative series of some hundreds of specimens from several widely separated localities and am convinced that several of the forms are either true species or distinct sub-species ; the others are not so clearly defined.

Radcliffe has drawn up a key in which structural differences between the several forms are noted, but I find these unreliable and variable with growth. The following is a key to the subspecies in the Australian Museum collection :—

a. Body usually with three distinct longitudinal bands ; another may be present on the back, and one along the belly.

b. The three principal bands extend onto the caudal fin, where the upper and lower converge abruptly ; no secondary bands between the others ; the median band generally thickened and darker below the second dorsal, not or scarcely expanded at the caudal base........................*novemfasciata.*

bb. The bands not or scarcely extending beyond the caudal base.

c. The three principal bands very broad, ending abruptly at the caudal base ; no secondary, intermediate bands.....................*aroubiensis.*

cc. Bands narrower, terminating less abruptly ; a secondary band present or absent anteriorly.

d. A distinct secondary band anteriorly between the median and dorso-lateral ones, which curves upwards and joins the latter ; some irregular spots at the caudal base..........*compressa.*

dd. Secondary band, if present, not joining the one above it.

e. Median band forming a round black spot at the caudal base.....................*fasciata.*

ee. Median band not or but slightly expanded at the caudal base...................*stevensi.*

AMIA FASCIATA, *Shaw.*

subsp. FASCIATA, *Shaw.*

Mullus fasciatus, Shaw, in White, Voy. N.S.Wales, 1790, p. 268 and plate.

Apogon fasciatus, Günther, Brit. Mus. Cat. Fish., i., 1859, p. 241 (Australian specimens). *Id.*, Steindachner, Sitzb. Akad. Wiss. Wien, liii. i., 1866, p. 427. *Id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 267. *Id.*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii., 1879, p. 370. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 343.

Amia fasciata, Bleeker, Nederl. Tijdschr. Dierk., ii., 1865, p. 71. *Id.*, Radcliffe, Proc. U.S. Nat. Mus., xli., 1911, p. 249, pl. xxi.-xxii.

Apogon cooki, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 344, and vii., 1882, p. 236.

Amia robusta, Radcliffe, Proc. U.S. Nat. Mus., xli., 1911, p. 254, fig. 2.

This species ranges from Tasmania northwards to the Philippine Islands. Shaw's type was taken in or near Port Jackson[1]; specimens from North Queensland were later described by Macleay as *Apogon cooki*, while exactly the same form has been recently described and figured as *Amia robusta* by Radcliffe. But a most critical examination of specimens of equal size from Torres Strait and Tasmania fails to reveal any differences between them.

A. fasciata alters considerably with age, the depth changing from 2.82 to 2.28 in specimens 60-135 mm. long. The bands are also broader in the young; the dorso-lateral one touches the lateral line in small specimens, while it is well above it in adults.

Locs.—Launceston, Tasmania; Port Jackson, New South Wales; Moreton Bay; Masthead Island, off Port Curtis; Dunk Island and Green Island, near Cairns; Endeavour River (types of *A. cooki*), Queensland; Murray Island, Torres Strait; Mapoon, Gulf of Carpentaria.

AMIA FASCIATA, *Shaw*.

subsp. NOVEMFASCIATA, *Cuvier & Valenciennes*.

Amia novemfasciata (Cuvier & Valenciennes), Jordan & Seale, Bull. U.S. Fish. Bur., xxv., 1906, p. 242, fig. 36. *Id.*, Radcliffe, Proc. U.S. Nat. Mus., xli., 1911, p. 251, pl. xxiii.

Apogon fasciatus, Günther, Journ. Mus. Godeff., ii., 1873, p. 19, pl. xx., fig. B.

A large series of specimens are in the Australian Museum from the following localities:—Murray Island, Torres Strait; Samoa (coll. Jordan & Seale); New Hebrides, several localities; Tongatabu, Friendly Islands; Bougainville Island, Solomon Group.

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1. As is proved by the context of White's "Journal."

AMIA FASCIATA, *Shaw.*

subsp. AROUBIENSIS, *Hombron & Jacquinot.*

Apogon fasciatus, Günther, Journ. Mus. Godeff., ii., 1873, p. 19, pl. xx., fig. A.

Amia aroubiensis (Hombron & Jacquinot), Jordan & Seale, Bull. U.S. Fish. Bur., xxv., 1906, p. 241, fig. 35. *Id.*, Radcliffe, Proc. U.S. Nat. Mus., xli., 1911, p. 250, pl. xxii.

Three specimens are in the Australian Museum, two of which are from Murray Island, Torres Strait; the other was collected in Suva, Fiji.

AMIA FASCIATA, *Shaw.*

subsp. COMPRESSA, *Radcliffe.*

Amia compressa, Radcliffe, Proc. U.S. Nat. Mus., xli., 1911, p. 246, pl. xx., xxi.

Four specimens of this well-marked form are in the Australian Museum from the Malay Archipelago and Bougainville Island, Solomon Group.

AMIA FASCIATA, *Shaw.*

subsp. STEVENSI, *subsp. nov.*

(Plate xvi., fig. 2.)

Amia novemfasciata var., Jordan & Seale, Bull. U.S. Fish. Bur., xxv., 1906, fig. 37 (not *A. novemfasciata*, Cuv. and Val.).

Amia robusta part, Radcliffe, Proc. U.S. Nat. Mus. xli, 1911, p. 256.

This form was considered to be a variety of *A. novemfasciata* by Jordan and Seale, and later identified with *A. robusta* by Radcliffe. I have examined sixty-two specimens, 24-100mm. long, from various parts of the New Hebrides; they are easily separated from *A. novemfasciata* by the lack of the caudal markings characteristic of that form, while they never have the round black caudal spot of *A. robusta* (=*A. fasciata*). Some specimens approach *A. aroubiensis*, but differ in having the bands narrower and ending less abruptly at the base of the tail.

The median band is often somewhat expanded and darker at the base of the caudal. An indefinite secondary band may be present or absent anteriorly between the dorso-lateral and the median bands. The black band on the dorsal may be either broad or narrow like that of the anal. The accompanying figure represents one extreme of variation, while the other is illustrated by Jordan and Seale.

Locs.—Hew Hebrides, collected by Dr. A. D. C. Cummins and Staff Paymaster P. B. Stevens, R.N.

Suva, Fiji.

Amia nigripes, *Ogilby.*

(Plate xv., fig. 2.)

Amia nigripes, Ogilby, Ann. Qld. Mus., x., 1911, p. 49, pl. v., fig. 2.

The accompanying figure represents a specimen 69 mm. long, in which the ventral fins are somewhat larger than those of ten others 61-92 mm. long.

Locs.—Three to seven miles off Hervey Bay, Queensland, 9-11 fathoms; 27th July, 1910.

Twenty-five miles south-east of Double Island Point, Queensland, 33 fathoms; 28th June, 1910.

Two small specimens are in the Australian Museum from the mouth of the Tweed River, northern New South Wales.

Amia septemstriata, *Günther.*

Apogon septemstriatus, Günther, "Challenger" Rept., Zool., i., 1880, p. 38, pl. xvi., fig. A.

A single specimen, 85 mm. long, agrees perfectly with the original description and figure of this species. It was trawled near Bowen, Queensland, but the exact locality and depth was not recorded.

Amia ellioti, *Day.*

Apogon ellioti, Day, Fish. India, pt. 1, 1875, p. 63, pl. xvii., fig. 1.

Apogon arafuræ, Günther, "Challenger" Rept., Zool., i., 1880, p. 38, pl. xvi., fig. C.

Four specimens, 89-99 mm. long, do not differ from one of the types of *A. ellioti* from Madras, which is in the Australian Museum. They also agree very well with the description and figure of *A. arafuræ*.

Loc.—Twenty miles N. 62° E. of Gloucester Head, Queensland, 35 fathoms; August 2nd, 1910.

AMIA QUADRIFASCIATA, *Cuvier & Valenciennes.*

Apogon quadrifasciatus, Cuvier & Valenciennes, Hist. Nat. Poiss., ii., 1828, p. 153. *Id.*, Günther, Brit. Mus. Cat. Fish., i., 1859, p. 239. *Id.*, Kner, Reise "Novara," Fische, 1865, p. 43. *Id.*, Weber, "Siboga" Exped., lvii., 1913, p. 226.

Amia quadrifasciata, Bleeker, Atlas Ichth., vii., 1873-6, p. 88, pl. cccxxxv., fig. 1.

Apogon kiensis, Jordan & Snyder, Proc. U.S. Nat. Mus., xxiii., 1901, p. 905, fig. 9.

Apogon monogramma, "Challenger" Rept., Zool., i., 1880, p. 38, pl. xvi., fig. B.

An excellent series of sixty-six specimens, 47-115 mm. long, shows that the colour marking of this species is very constant, though the bands are broader and darker in the young ; there is usually an indefinite secondary band between the two principal ones anteriorly in smaller specimens. None have the first dorsal partially black, as described by Günther, though the margin is grey in some.

The depth of the body increases considerably with age, it being 3-2.5 in the length in specimens 55 and 115 mm. long. The anterior dorsal spine is also wanting in the young, it being first developed in specimens about 60 mm. long ; occasionally an extra spine is present between the two dorsal fins, so that the number varies from six to eight.

The "Endeavour" series is so complete that I am convinced that these differences are only due to variation with growth. Jordan and Snyder's figure of *A. kiensis* represents the younger stage, while that of Bleeker illustrates the adult. *A. monogramma*, Günther, is also evidently synonymous with *A. quadrifasciata* ; only one lateral band is mentioned in its description, but the figure shows two, and some specimens in my series tally very well with the illustration.

Locs.—Off Moreton Island, Queensland, 8-15 fathoms ; August 31st, 1910.

South-east of Double Island Point, Queensland, 33 fathoms ; June 28th, 1910.

Off Frazer Island, Queensland, 14-16 fathoms ; 29th July, 1910.

Platypus and Harvey Bays, Queensland, 7-10 fathoms ; 28th July, 1910.

Near Gloucester Head, Queensland, 19-35 fathoms ; August 2nd, 1910.

A single specimen is in the Australian Museum from Mosman Bay, Port Jackson.

Family CARANGIDÆ.

Genus Seriola, *Cuvier*.

Seriola grandis, *Castelnau*.

Kingfish : Yellow-Tail.

(Plate xxxv., fig. 1.)

Seriola grandis, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 114, and Proc. Linn. Soc. N.S. Wales, iii., 1879, pp. 352, 364. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 540. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 119, and 1890 (1891), p. 32. *Id.*, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 26.

Seriola lalandi, Castelnau, Proc. Linn. Soc. N.S. Wales, iii., 1879, p. 352. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 539. *Id.*, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 26, and Ed. Fish. N.S. Wales, 1893, p. 82. *Id.*, McCoy, Prodr. Zool. Vict., Dec. xviii., 1889, pl. clxxii. *Id.*, Waite, Mem. Austr. Mus., iv., 1, 1899, p. 71. *Id.*, Stead, Ed. Fish. N.S. Wales, 1908, p. 89 (not of Cuvier & Valenciennes).

D. vi.-vii. i. 31-34 ; A. ii. i. 20-22 ; P. 1+20 ; V. i. 5 ; C. 17. Depth 4·6 in the length from the premaxillary symphysis to the end of the middle caudal rays ; head, to end of opercular lobe, 3·9-4·2 in the same. Snout 2·8-3 in the head. Eye 6-6·7 in the head, a little less than half the interorbital width, which is about equal to the length of the snout, and 3 in the head. Width of maxillary equal to the eye-diameter. Fourth dorsal spine 1-1·2 in the eye. Anterior dorsal ray 2-2·1, anterior anal ray 2·7-2·9, pectoral about 2, ventral 1·7-1·9 in the head. Depth of caudal peduncle almost equal to the eye diameter, 6·7-7 in the head.

Body slender, compressed, the dorsal and ventral profiles almost evenly arched. Jaws equal anteriorly ; maxillary reaching to below anterior third of eye, broad and truncate posteriorly with the angles rounded. Hinder margin of preoperculum subvertical, the angle broadly rounded. A few scales on the temporal region and upper portion of operculum ; cheeks and area behind the eyes also scaly, head otherwise naked ; naked border of preoperculum as broad as the scaly portion of the cheek. Nostrils close together, nearer the eye than the end of the snout.

Minute villiform teeth form a band on each ramus of the jaws ; the bands are wider on the mandible than on the premaxillaries, and are expanded on each side of the symphyses, but become rapidly narrower backwards. A triangular patch of similar teeth on the vomer, with an elongate posterior extension; an elongate-ovate patch on each palatine bone, and on the tongue. Gill-rakers elongate, sixteen on the lower limb of the first arch; the longest are more than three-fourths the eye-diameter.

Body closely covered with small cycloid scales, which are irregularly arranged; they extend forward on the nape to a point in advance of the preopercular margin. Dorsal and anal fin each with an ensiform scaly sheath anteriorly; a broad, sub-quadrate patch of scales covers the base of the caudal, and extends almost to the ends of the median rays. Lateral line a little arched anteriorly, reaching the median line of the body below the second fourth of the soft dorsal fin, thence straight to the middle of the caudal peduncle; it is slightly keeled on the latter, the keel being more developed in the smaller than in the larger specimen. Upper and lower surfaces of caudal peduncle with a slight pit at the base of the fin.

Spinous dorsal commencing above the middle or hinder half of the pectoral; its median spines are the highest. Anterior portions of dorsal and anal fins produced into angular lobes; median rays shortest, the posterior ones increasing somewhat in length. Pectoral short, pointed above, the margin rounded. Ventrals inserted a little behind the pectorals, pointed, the hinder margin truncate. Caudal deeply forked.

Colour.—Upper half of body dark, the lower silvery, the junction of the two colours somewhat sharply defined; in life a yellow stripe commences behind the eye, and traverses the median line of the body. Fins without definite markings.

Described from two specimens 433 and 725 mm. long from the snout to the end of the median caudal rays; the larger example is figured.

This species has been confused with the Atlantic *S. lalandi*, Cuv. & Val., but it differs from Jordan and Evermann's figure[1] of that species in being more slender, and in having the upper profile of the head less convex. It is possibly identical with *S. aureovittata*, Schlegel, as suggested by McCoy, but the illustrations[2] of that species indicate that the Japanese fish is somewhat deeper in form than the Australian one.

1. Jordan & Evermann—Bull. U.S. Nat. Mus., No. 47, 1896, p. 903, pl. cxl., fig. 382.
2. Schlegel—Faun. Japon., Poiss., 1845, p. 115, pl. lxii., fig. 1. *Id.*, Tanaka, Cat. Fish. Japan, 1913, p. 126, fig. 90.

Locs.—I am indebted to Dr. Mark C. Lidwill for the large example here figured, which he captured on a rod and line at Port Stephens, New South Wales. The smaller specimen was caught on a hand-line from the "Endeavour" off North Reef, Queensland, on 13th July, 1910.

SERIOLA SIMPLEX, *Ramsay & Ogilby.*

(Plate xxxvii., fig. 3.)

Seriola simplex, Ramsay & Ogilby, Proc. Linn. Soc. N.S. Wales, x., 1886, p. 757.

The only known specimen of this species is the type, of which the origin is unknown though it was supposed to have been taken in Port Jackson. Though at first separated from *S. grandis,* it was later united with that species by Ogilby[1], though he gave no reason for his action. The specimen is 197 mm. long, and differs considerably in form from my smallest example of *S. grandis,* 433 mm.; it is possible that the difference is due to alteration with growth, but until a series of intermediate examples can be examined it is better to regard the two as distinct.

Genus TRACHURUS.

TRACHURUS NOVÆ-ZELANDIÆ, *Hutton.*

Cowanyoung. Horse Mackerel.

(Pl. xxxiv., fig. 3.)

Trachurus trachurus, Hutton, Fish. N. Zeal., 1872, p. 16, pl. iii., fig. 23 (*T. novæ zelandiæ,* C. & V., in synonymy: not *T. trachurus,* Linn.).

Trachurus trachurus, McCoy, Prodr. Zool. Vict., dec. ii., 1878, pl. xviii. *Id.,* Johnston, Proc. Roy. Soc. Tasm., 1882, pp. 85, 119, and 1890, p. 32.

Decapterus leptosomus, Stead, Ed. Fish. N.S. Wales, 1908, p. 87 (not *D. leptosomus,* Ogilby).

Trachurus declivis, Waite, Mem. Austr. Mus., iv., 1899, p. 72. *Id.,* McCulloch, Zool. Res. "Endeavour," i., 1911, p. 79 (not *T. declivis,* Jenyns).

The Cowanyoung of New South Wales fishermen is identical with the Horse Mackerel of Tasmania and New Zealand. It has been confused with the Yellow-tail, *Trachurus declivis,* Jenyns, but differs from that species in its form, colouration

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1. Ogilby—Ed. Fish. N.S.Wales, 1893, p. 82.

and habits. It is evidently near *T. trachurus*, Linn., but its relation to that species can only be determined by a comparison of series of specimens from European and Australian seas.

Hutton has included the name *T. novæ zelandiæ,* among others, in the synonymy of the New Zealand species, which he identified as *T. trachurus.* He credited this name to Cuvier and Valenciennes, but I have failed to find any reference to it other than his own. The New Zealand fish, of which I have examined a specimen, appears to be neither *T. trachurus* nor *T. declivis*, and I therefore accept the name *T. novæ-zelandiæ* for it. I also identify the Cowanyoung and the Horse Mackerel of Australia and Tasmania with Hutton's species.

The accompanying figures illustrate the differences between *T. novæ-zelandiæ* and *T. declivis.* In the former the body is elongate and cylindrical, the depth in adults being 4·7-5·2 in the length from the premaxillary symphysis to the end of the middle caudal rays ; the lateral line scutes are broader and more numerous than in *T. declivis*, while the colour is dark-greenish blue on the back and silvery below. In fifteen specimens I count the following :—D. viii. 1/30-35 ; A. ii. 1/28-30 ; L. lat. 29-35+6-8+39-42. Length to eighteen inches.

T. novæ-zelandiæ occurs in large shoals in the open sea of southern Australia and Tasmania, which occasionally enter harbours and estuaries. The young are found in the bays and harbours of both New South Wales and Tasmania, and, according to Johnston, they form the chief food of the Tasmanian kingfish, *Jordanidia solandri*, Cuv. & Val. Twenty-three specimens, 95-405 mm. long, are preserved from the following localities :—

Between Gabo Island and Cape Everard, Victoria, about forty miles from land, 150-250 fathoms.

Off the east coast of Flinders Island, Bass Strait.

Bay of Fires, Tasmania, 40 fathoms ; 30th June, 1914.

Circular Head, North-western Tasmania ; 5th September, 1911.

Off the mouth of the Murray River, South Australia, 20 fathoms ; 17th August, 1909.

Great Australian Bight, 100-120 fathoms and surface ; March, 1912.

Between Cape Naturaliste and Geraldton, Western Australia, 20-100 fathoms.

This fish seems to be confined to the surface of the sea; the specimens occurring in the deeper hauls doubtless entered the net as it was being hauled in.

I am indebted to Mr. T. F. Cheeseman, Director of the Auckland Museum, for a New Zealand specimen of this species, which he secured in the local fish market.

Trachurus declivis, *Jenyns.*

Yellow-Tail. Bung.

(Pl. xxxiv., fig. 2.)

Caranx declivis, Jenyns, Zool. "Beagle," iii., 1841, p. 68, pl. xiv.

This species differs from *T. novæ-zelandiæ* in having the body shorter, broader and more compressed; the depth in adults is 4·0-4·4 in the length from the premaxillary symphysis to the middle caudal rays. The scutes of the lateral line are narrower and less numerous, and the colour is yellowish-green on the back. Ten specimens have been counted as follows:—D. viii., 1/30-34; A. ii. 1/26-31; L. lat. 26-28+7-9+35-38. Length to thirteen inches.

The Yellow-tail is abundant in Port Jackson, and it occurs all round the coasts of the southern half of Australia, from south-western Australia to southern Queensland. Specimens are in the Australian Museum from near Sydney and Fremantle. A few were taken by the "Endeavour" when the net was lowered in shallow water at the following stations:—

Mouth of Wide Bay, Queensland.

Investigator Strait, South Australia, 12-20 fathoms; February, 1912.

Genus Caranx, *Lacépède.*

Caranx ferdau, Forskal.

Caranx ferdau (Forskal), Günther, Journ. Mus. Godeff., v., 1876, p. 134, pl. lxxvii.-lxxviii.

Carangoides ferdau, Jordan & Evermann, Bull. U.S. Fish. Bur., xxiii. i., 1905, p. 198, fig. 77.

Four specimens are preserved in the Australian Museum, 208-363 mm. long from the premaxillary symphysis to the end of the middle caudal rays. They agree very well with the figures quoted above, though the body and vertical fins are very dark in the two larger examples.

Locs.—Norfolk Island, one specimen. Lord Howe Island, two specimens. Manly, near Sydney, one specimen.

Caranx ignobilis, *Forskal.*

Caranx ignobilis (Forskal), Klunzinger, Sitzb. Akad. Wiss. Wien., lxxx. i., 1879, p. 377.

Carangus ignobilis, Jordan & Evermann, Bull. U.S. Fish. Bur., xxiii. i., 1905, p. 188, fig. 72 (synonymy).

Caranx lessonii, Cuvier & Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 113.

A fine specimen is in the Australian Museum from Port Hedland, north-western Australia, and another from Cape York. Klunzinger has recorded this species from Port Darwin and Cleveland Bay, while it has been described as *C. lessonii* from "New Holland" by Cuvier & Valenciennes.

Caranx bucculentus, *Alleyne & Macleay.*

Wide-mouthed Trevally.

Carangus bucculentus (Alleyne & Macleay), Ogilby, Mem. Qld. Mus., iii., 1915, p. 73, pl. xxii.

Twenty specimens, 123-175 mm. long from the tip of the upper jaw to the end of the middle caudal rays, do not exhibit any variation.

Locs.—Eleven to fourteen miles N. 59° W. of Pine Peak, Queensland, 25 fathoms.

Four to twenty miles off Bustard Head, Queensland, 11-21 fathoms.

Caranx georgianus, *Cuvier & Valenciennes.*

Trevally.

(Plate xx.)

Caranx georgianus, Cuvier & Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 85. *Id.*, Jenyns, Zool. "Beagle," iii., 1841, p. 71. *Id.*, Richardson, Zool. "Erebus & Terror," Fish., 1848, p. 135, pl. lviii., fig. 1-3. *Id.*, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 440. *Id.*, Klunzinger, Arch. Nat., xxxviii. i., 1872, p. 31, and Sitzb. Akad. Wiss. Wien., lxxx. i., 1879, p. 378. *Id.*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 117, and

Proc. Linn. Soc. N.S.Wales, iii., 1879, pp. 352, 364. *Id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 327. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 533, and viii., 1883, p. 204. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), pp. 85, 119. *Id.*, Ogilby, Ed. Fish. N.S.Wales, 1893, p. 80, pl. xxiv. *Id.*, Stead, Ed. Fish. N.S.Wales, 1908, p. 87, pl. lvii.

Caranx nobilis, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 532.

D. viii. 1/27 ; A. ii. 1/22 ; P. 19 ; V.i.5 ; C. 17. Depth before the second dorsal 3·04-3·07, head 3·1-3·4 in the length from the tip of the snout to the end of the middle caudal rays. Opening of adipose eyelid 5.3-5.6 in the head, and 2-2·1 in the snout, which is 2.5-2.8 in the head. Interorbital width much less than twice as wide as the eye-opening, 1·4 in the snout. Length of pectoral a little greater than the depth of the body, 2·9-3 in the length. Third dorsal spine 2·2, second dorsal ray 3-3·2 in the head.

Body elongate-ovate, the dorsal and anal profiles almost evenly curved. Snout rather long, pointed. Maxillary not reaching the anterior margin of the eye. Adipose eyelid well developed, with a large opening. Scales are present on the cheeks and operculum, and on an area above and behind the eye which extends forward to above the middle of the pupil. A series of short, stout, conical teeth in each jaw. Vomer and palatines with patches of minute teeth ; the tongue is also finely roughened.

Vent at or beyond the tips of the ventrals, a little in front of the anal spines.

Body covered with small scales, which either extend over the breast or leave a minute patch on the lower surface bare. Lateral line broadly arched anteriorly, the curve being about one-fourth longer than the straight portion. There are eighteen to twenty-two keeled scales which are confined to the posterior two-thirds of the straight portion ; they are broadest on the caudal peduncle, their breadth being equal to one-third the width of the eye opening.

A strong procumbent spine precedes the dorsal fin, which is more or less hidden in the skin. Third dorsal spine longest, not quite reaching the first ray. Anterior dorsal and anal rays longer than the others, but not produced into lobes ; the last rays of both fins are enlarged and somewhat separated from the others, and their membrane is deeply excised.

Anterior rays protected by a moderately high scaly sheath which becomes lower, and finally disappears posteriorly. Caudal deeply forked. Pectoral falcate, reaching nearly to or a little beyond the anterior straight portion of the lateral line.

Colour.—Silvery, darker above. Operculum with a well-defined, round, black spot. Caudal lobes darker towards the tips.

Described from two specimens 253 mm. long from the tip of the snout to the end of the middle caudal rays. One is from Port Jackson, New South Wales, and the other from Fremantle, Western Australia; the latter is figured.

I have examined a well-graduated series of thirty-one young specimens, 60-170 mm. long, and find them to be separable into two forms, which probably represent two distinct species. In one, the depth is equal to or but little longer than the head, and always less than one-third the length from the premaxillary symphysis to the end of the middle caudal rays; the other form has a much deeper body, its depth being much greater than the length of the head, and considerably more than one-third the length. A critical comparison of specimens of equal size, however, fails to reveal any other structural differences.

A similar, but less striking dimorphism is exhibited by ten larger examples, 230-440 mm. long, but my material is not sufficiently well preserved to enable me to determine whether they represent two species. The slender form described and figured here is apparently the true *C. georgianus*, though I have not seen any specimens with twenty-eight or more dorsal rays as described by Cuvier & Valenciennes. The deeper specimens are evidently *C. platessa*; this form is figured by Richardson as *C. georgianus*[1].

Caranx nobilis was evidently founded on a large specimen of *C. georgianus*. The typical specimen is apparently lost, and no others bearing Macleay's name are now preserved in his museum, but his description agrees very well with Cuvier and Valenciennes' species.

Locs.—Specimens are in the Australian Museum from Moreton Bay, Queensland; Lord Howe Island; Port Jackson, New South Wales; Adelaide, South Australia; Fremantle,

1. Richardson—Zool. "Erebus & Terror," Fishes, 1848, p. 135, pl lviii., fig. 1-3.

Western Australia. Young examples were trawled off Flinders Island, Investigator Group, South Australia, in thirty-seven fathoms.

Caranx leptolepis, Cuvier & Valenciennes.

(Plate xxi.)

Caranx leptolepis, Cuvier & Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 63. *Id.*, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 440. *Id.*, Day, Fish. India, 1878, p. 225, pl. li., fig. 4.

Caranx cheverti, Macleay, Proc. Linn. Soc. N.S.Wales, i., 1877, p. 324, pl. x., fig. 1.

D. viii. 26-27 ; A. ii. 23 ; P. 19 ; V.i.5 ; C. 17. L.lat. 100.

Height before the second dorsal fin 3·1-3·3 in the length from the premaxillary symphysis to the end of the middle caudal rays ; head 3·7-3·8, pectoral 3·1-3·3 in the same. Eye 3·4-3·7 in the head, equal to or shorter than the snout, which is 3-3·4 in the head. Third dorsal spine 2·1-2·3, second dorsal ray 2·1-2·6 in the head.

Body rather elongate, its dorsal and ventral profiles evenly arched. Snout of moderate length, the lower jaw projecting slightly when the mouth is closed ; maxillary not or just reaching the verticle of the anterior margin of the eye. Adipose eyelid well developed, its opening less than half the width of the eye. Scales are present on the cheeks and opercles, and they extend forward on the upper surface to above the anterior fourth of the eye.

Teeth villiform and exceedingly minute according to Macleay ; they are not visible in my specimens except on the tongue.

Vent midway between the ventral fins and the anal spines, or a little nearer the latter.

Body covered with small scales, which extend over the breast, leaving only a minute patch on the lower surface bare. Lateral line broadly arched, its curve being about one-fourth longer than the straight portion. There are about twenty-two keeled scales, which cover more than half the straight portion of the lateral line ; they are broadest on the caudal peduncle, their greatest breadth being equal to one-fourth the width of the eye.

A well-developed procumbent spine precedes the dorsal fin, which is more or less hidden in the flesh. Third dorsal spine longest; the fourth nearly reaches the first ray when adpressed. Anterior rays longer than the others, but not produced to form a lobe. Anal similar to the dorsal, and both fins have a scaly sheath covering the bases of the rays anteriorly. Caudal deeply forked. Pectorals falcate, not reaching across the curve of the lateral line. Ventrals reaching well beyond the vent, but not to the anal spines.

Colours.—Silvery blue above, silvery white below. A large, rounded, black blotch covers the upper opercular margin and extends onto the suprascapular region.

Described from two specimens, 145 and 195 mm. long from the tip of the snout to the end of the middle caudal rays; the accompanying figure represents the larger example, which was taken near Pine Peak, Queensland. I have compared them with the typical specimen of *Caranx cheverti* in the Macleay Museum, and find no difference between them, while they also agree with Indian specimens of *C. leptolepis* in the Australian Museum which were identified by Dr. Day.

Locs.—The "Endeavour" collection includes thirty-eight specimens from eleven to fourteen miles N. 59° W. of Pine Peak, Queensland, 25 fathoms; 1st August, 1910, on a muddy bottom. Macleay's type was obtained at Katow, New Guinea. Günther records a specimen from Australia which was collected by Macgillivray; it was probably captured in Queensland waters.

CARANX AFFINIS, *Rüppell.*

Caranx affinis, Rüppell, Neue Wirbelth., Fisch., 1835, p. 49, pl. xiv., fig. 1. *Id.*, Day, Fish. India, 1878, p. 219, pl. xlix., fig. 4.

Carangus affinis, Jordan and Evermann, Bull. U.S. Fish. Comm., xxiii., pt. 1, 1905, p. 195, fig. 76.

Two examples from Broome, north-western Australia, do not differ from an Indian specimen which was identified as *C. affinis* by Dr. Day. The species is beautifully figured by Jordan and Evermann, though their illustration does not show the last dorsal and anal rays partially detached from the preceding ones, as they are in my specimens.

CARANX MALAM, Bleeker.

(Plate xxii.)

Selar malam, Bleeker, Nat. Tijdschr. Ned. Ind., i., 1851, p. 362.

Caranx malam, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 434. *Id.*, Kner, Reise "Novara," i., Fische, 1865, p. 154.

Caranx nigripinnis, Day, Fish. India, 1878, p. 225, pl. li., fig. 5.

D. viii. 25 ; A. ii. 21-22 ; P. 20-21 ; C. 17 ; V. i. 5. Scutes on l.lat 59.

Height before the second dorsal fin 2·9-3 in the length from the premaxillary symphysis to the end of the middle caudal rays ; head 3·9-4, pectoral 3·3-3·4 in the same. Eye 5·1-5·2 in the head, equal to or slightly shorter than the snout, which is 4·7-5·1 in the head. Interorbital width greater than the eye and the snout, 3·9-4·1 in the head. Fourth dorsal spine 2·3-2·6, third dorsal ray 2-2·1 in the head.

Body elongate-ovate, the dorsal and ventral profiles evenly curved. Snout rather short, obtuse. Maxillary reaching the vertical of the anterior margin of the eye or to below its first third. Adipose eyelid well developed, its opening about half as wide as the eye. Scales are present on the upper portion of the operculum, and a few are left on the cheeks ; a small patch on the side of the nape above and behind the eye. Teeth in a single row in each jaw ; they are elongate and somewhat compressed, closely set, and united by a cartilaginous substance which leaves only their tips free. Two or three minute vomerine teeth can be detected in some specimens but not in others ; true palatine teeth are apparently wanting, but minute teeth are present on the skin of the roof of the mouth. Tongue with distinct, minute teeth.

Vent situated between the ends of the ventral fins.

Body covered with minute scales, which extend over the breast, leaving only a very small patch on the lower surface bare. Lateral line strongly arched anteriorly, the curve being less than half as long as the straight portion, and ending below the first dorsal ray. There are about fifty-nine keeled scales, which extend along the whole length of the straight portion ; they are broadest below the hinder portion of the dorsal fin, and are equal to about half the width of the eye.

Procumbent dorsal spine deeply imbedded in the skin ; fourth spine longest, almost reaching to the first ray when adpressed. Anterior dorsal and anal rays a little longer than the others, but not forming lobes. Pectoral reaching far beyond the curve of the lateral line to above the anterior portion of the anal. Ventrals extending a little beyond the vent, not nearly reaching the anal spines. Caudal deeply forked.

Colour.—Silvery, darker above. Two specimens have seven to nine, broad, dark bars descending from the back to the lateral line which are bilaterally symmetrical in one, and differently disposed on each side in the other; two other specimens are without traces of these bands. A large, rounded, dark, blotch on the upper part of the operculum. First dorsal greyish, the other fins lighter, with microscopic grey dots.

The above description is mainly based on two examples 165 and 234 mm. long from the premaxillary symphysis to the end of the middle caudal rays. The figure represents the smaller specimen.

I have compared these specimens with one of the types of *C. nigripinnis*, Day, which is part of Day's collection in the Australian Museum, and find no differences between them. Day's specimen has several minute vomerine and palatine teeth, though his description states that these are absent; his figure also illustrates the head as lower and the snout more acute than it is. Another specimen in the same collection is labelled as a co-type of *C. malam*, Bleeker, which does not differ from the type of *C. nigripinnis*.

Locs.—Three to seven miles S. 42° E. of Double Island Point, Queensland, 32 fathoms; 16th July, 1910.

Eleven to fourteen miles N. 50° W. of Pine Peak, Queensland, 24-26 fathoms; 1st August, 1910.

Caranx radiatus, *Macleay.*

Fringed Trevally.

(Plate xxiii.)

Caranx radiatus, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 537. *Id.*, Kent, Great Barrier Reef, 1893, p. 289, pl. xvi., fig. 1, and Naturalist in Australia, 1897, p. 169.

Caranx compressus, Macleay, *Loc. cit.*, viii., 1883, p. 204 (*nec C. compressus*, Day).

D. vii. i. 22; A. ii. i. 19-20; P. 20; V. i. 5; C. 17. L.lat. 38-45.

Height before the second dorsal 2·7 in the length from the premaxillary symphysis to the end of the middle caudal rays; head 3.8, pectoral 2·9, fifth dorsal ray 2·7, and fifth anal ray 3·3 in the same. Eye about 4, third dorsal spine almost 2, and ventral fin 1·4 in the head.

Body ovate, the dorsal and ventral profiles evenly curved. Snout rather short, obtuse. Maxillary reaching to below the end of the anterior third of the eye. Adipose eyelid well developed, largely covering the eye. Scales are present on the cheek and upper portion of the operculum, and there is a small rounded patch above and behind the eye. A single series of short, cardiform teeth in each jaw; the premaxillaries have also a band of villiform teeth behind these, those near the symphysis being somewhat enlarged. Microscopic granular teeth are present on the vomer, palatines and tongue.

Vent midway between the ventral spine and the second anal spine.

Body covered with moderately large, adherent cycloid scales, which also extend over the breast, leaving only a minute patch on the lower surface bare. Lateral line strongly arched anteriorly, the curve being about half as long as the straight portion. There are thirty-eight to forty-five keeled scales which extend along the whole length of the straight portion of the lateral line; they are broadest a little before the end of the dorsal fin, their breadth being equal to a little more than half the length of the eye.

No procumbent dorsal spine; third spine longest, reaching the first ray. All but the last dorsal and anal rays are greatly elongate, and their greater portion is free from the membrane; they are divided to their tips, and can be concealed in a very broad scaly sheath. Caudal forked. Pectoral falcate, extending to about the ninth plate of the lateral line. Second and third ventral rays elongate, reaching the anal spines.

Colour.—Olive green above, silvery below, with or without six or more dark vertical bands extending from the back to the middle of the sides. A large black opercular blotch. Tips of anterior dorsal rays blackish. End of upper caudal lobe black.

Described and figured from a specimen 203 mm. long from the premaxillary symphysis to the end of the middle caudal rays. I have compared it with the type of the species in the Macleay Museum and find the two to be quite similar.

Two co-types of *Caranx compressus* are in the Australian Museum collection, but the types appear to have been lost. They are quite similar to the specimen described above, but they differ from Macleay's description in having fewer anal rays, which, together with those of the dorsal, are elongate in both examples ; the sharp ridge on the head referred to by Macleay is only caused by the flesh drying upon the cranial crest, and is not evident in the well-preserved Western Australian specimen.

Loc.—Port Hedland, north-western Australia. The type of C. *radiatus* was taken at Rockingham Bay, Queensland, and Kent has recognised the species both in Queensland and Western Australia. The specimens identified as *C. compressus* were taken in the lower portion of the Burdekin River, Queensland.

Caranx altissimus, Jordan & Seale.

(Plate xxiv.)

Caranx altissimus, Jordon & Seale, Proc. Davenport Acad. Sci., x., 1907, p. 7, pl. iii.

? *Caranx cirrhosus,* Cuvier & Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 216 (part), pl. ccl.

D. viii., i./18-19 ; A. ii., i./18 ; P. 19 ; V. i. 5 ; C. 17. Height before the second dorsal fin almost half the length from the premaxillary symphysis to the end of the middle caudal rays ; head 3·5 in the same. Eye almost three in the head.

Body elevated, compressed, covered with minute scales which extend forward below to a line from behind the ventrals to the pectorals, leaving the breast naked. Lateral line arched anteriorly, becoming straight below the middle of the soft dorsal fin ; straight portion $1\frac{1}{2}$-$1\frac{1}{3}$ in the length of the curve. There are thirty-four to thirty-eight scales on the straight portion of the lateral line, of which about twenty-five are more or less keeled and acute ; they are broadest on the caudal peduncle, though their greatest breadth is less than half its depth. Maxillary reaching to or just beyond the anterior margin of the pupil ; it is dilated distally, being almost half as wide as the eye. Preorbital rather broad, about two-thirds the width of the eye. Lower jaw longer than the upper, the chin prominent.

Anterior dorsal and anal rays greatly produced, the former reaching the end of the fin or beyond the tips of the middle caudal rays, and the latter extending to or beyond the base of the caudal. Pectoral reaching across the curve of the lateral line.

Colour.—Silvery, with traces of four or five broad darker cross-bars. A dark opercular spot. Anterior margins of dorsal spines and the first ray black ; the remaining fins colourless.

Two specimens 130-137 mm. long from the premaxillary symphyses to the end of the middle caudal rays, only differ in the relative lengths of the dorsal and anal rays ; the anterior profile is also slightly more arched in one than in the other.

These specimens do not quite agree with the description of *C. altissimus*, but it must be noted that Jordan and Seale's description and figure differ in several details. They count twenty-one anal rays, but their figure only shows nineteen ; the maxillary only reaches the anterior orbital margin according to the description, but in the figure it extends to below the pupil. The ventral fins are somewhat longer than in my specimens, and the anterior dorsal and anal rays were damaged in the types, so that it is not known whether they were produced as in the specimens described above.[1]

The fish figured by Cuvier and Valenciennes as *C. cirrhosus* was evidently very similar to the specimens referred to here ; the figure shows the preorbital bone as somewhat narrower and the anterior profile less rounded than in my specimens, but in all other details it agrees very well with them. *C. altissimus* differs from the closely allied *C. aurochs*, Ogilby, in having the preorbital bone broader, and the straight portion of the lateral line much shorter ; the anterior anal ray is also more produced and filamentous.

Loc.—Southern Queensland ; the exact locality is unknown.

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1. *C. altissimus* has been recorded from Manila by Jordan and Richardson (Check-list Fish. Philippine Is., 1910, p. 20). A local specimen is in the collection of the Bureau of Science, Manila, which Dr. Alvin Seale has examined for me. He counts ii. i. 19 rays in the anal fin ; the longest dorsal ray is less than a fifth of the total length of the fish, and that of the anal is still shorter.

Caranx aurochs, Ogilby.

Black-crested Trevally.

Citula aurochs, Ogilby, Mem. Qld. Mus., iii., 1915, p. 79, pl. xxv.

Five specimens, 131-150 mm. long to the end of the middle caudal rays, do not differ from the type of this species with which I have compared them. The elongate dorsal ray is shorter in one than in the others, not reaching the end of the fin ; in all other details they are quite similar.

Locs.—Eleven tō fourteen miles N.W. of Pine Creek, Queensland, 24-26 fathoms.

Twelve miles N.E. of Bowen, Queensland, 19-25 fathoms.

Caranx malabaricus, Bloch & Schneider.

Caranx malabaricus (Bloch & Schneider), Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 436. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, v., 1881, p. 533. *Id.*, Day, Fish. India, 1878, p. 221, pl. i., fig. 2.

Caranx cæruleopinnatus, Rüppell, Neue Wirbelth., Fische, 1835, p. 47, pl. xiii., fig. 2 (*nec* Cuvier & Valenciennes).

Thirty-one specimens, 153-180 mm. long from the premaxillary symphysis to the end of the middle caudal rays, do not differ from an Indian example in the Australian Museum which was identified by Dr. Day ; they also agree with the figures quoted above. They exhibit some little variation in the depth of the body, length of the snout, size of the eye, and development of the anterior dorsal and anal rays ; these latter are always somewhat produced, but in a few specimens they reach to or a little beyond the middle of the fins when laid back.

Loc.—Eleven to fourteen miles N. 59° W. of Pine Peak, Queensland, 24-26 fathoms ; 1st August, 1910.

Caranx chrysophrys, *Cuvier & Valenciennes.*

Long-nosed Trevally.

Citula chrysophrys (Cuvier & Valenciennes), Ogilby, Mem. Qld. Mus., iii., 1915, p. 77, pl. xxiv.

Six specimens, 117-169 mm. long to the end of the middle caudal rays, vary somewhat in depth ; measured before the second dorsal, it is 2-2·3 in the above length. The anterior dorsal and anal rays are produced in all, but are considerably longer in some than in others. All have 1/20 dorsal and 1/16 anal rays.

Locs.—Twenty miles off Bustard Head, Queensland, 20 fathoms.

Wide Bay, Queensland.

Caranx humerosus, *sp. nov.*

(Plate xxv.)

D. viii. i. 21 ; A. ii. i. 19 ; V. i. 5 ; P. 20 ; C. 17. Lat. line scutes 27-31. Height before the second dorsal fin 2·7 in the length from the premaxillary symphysis to the end of the middle caudal rays ; head 3·7 in the same. Eye 3·6 in the head, equal to the snout, and a little greater than the interorbital width, which is 4 in the head. Pectoral 0·2 longer than, first dorsal ray almost as long as the head. Fourth dorsal spine 2·7, second anal ray 1·3 in the head.

Body rather deep, compressed. Dorsal profile considerably arched, the lower oblique, almost straight from the anal fin to the snout. Snout sharp. Maxillary broad, reaching to below or beyond the middle of the eye ; the space separating it from the lower orbital border is about half as wide as the eye. Adipose eyelid little developed, largest behind. Scales are present on the upper part of the operculum and on the cheek ; a few are on the side of the head above the operculum ; all the rest of the head bare. Teeth villiform, in bands on the jaws ; minute teeth are present on the vomer, palatines and tongue.

Vent situated between the posterior fourth of the ventral fins or just beyond their tips.

Body covered with small scales, which extend forward to a line from the pectorals to the middle of the ventrals, leaving all the breast naked. Lateral line forming a low arch anteriorly, its curve being about as long as the straight portion, and ending below or a little in advance of the middle of the second dorsal fin. The keeled scales extend along the whole length of the straight portion ; they are broadest on the caudal peduncle, their breadth being equal to about one-third the length of the eye.

Third or fourth dorsal spine longest, not reaching the anterior ray when adpressed. Anterior rays produced and forming a lobe which is longer in small specimens than in larger ones. Anal similar to the dorsal, though the anterior lobe is shorter. Pectoral not quite reaching across the curve of the lateral line in small specimens, slightly beyond it in larger ones. Ventrals reaching to or beyond the vent, but not to the anal spines. Caudal deeply forked.

Colour.—In the young the body is crossed by five very broad dark bands, and there is a large and striking dark blotch above the shoulder. A broad dark area on the upper part of the operculum, and the dorsal profile above the eyes is blackish. First dorsal fin black. Ventrals and anterior portions of the dorsal and anal dusky. A small axillary spot. In the larger specimens only a few of these markings are retained, both the body and fins being lighter coloured.

A series of forty-eight specimens, 126-200 mm. long from the premaxillary symphysis to the end of the middle caudal rays, exhibits some variation in the depth of the body, it being generally deeper in the young, and 2.6-2.9 in the length ; the dorsal profile is somewhat more arched in some than in others ; the anterior dorsal rays are longer in the young, reaching back nearly to the end of the base of the fin, whereas they only attain the middle in larger specimens. The specimen figured is 148 mm. long and is selected as the type.

This species is closely allied to *C. oblongus*, Cuvier and Valenciennes, of which I have a specimen from the Philippines. It differs in having a much larger maxillary, and the lateral line scutes less numerous.

Locs.—Eleven to fourteen miles N. 59° W. of Pine Peak, Queensland ; 24-26 fathoms. 1st August, 1910.

Bustard Bay, Queensland ; 11-21 fathoms. 8th July, 1910.

Near Bowen, Queensland.

Caranx boops, *Cuvier & Valenciennes.*

Caranx boops, Cuvier & Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 48. *Id.*, Day, Fish. India, 1878, p. 218, pl. xlix., fig. 2. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, viii., 1883, p. 266.

Carang gervaisi, Castelnau, Res. Fish. Australia (Vict. Offic. Rec. Philad. Exhib.), 1875, p. 18.

Castelnau's description of his *C. gervaisi* from Cape York is very incomplete, but such proportions as are given and the details of the lateral line agree very well with those of *C. boops*. This latter species has not been recorded from Australia, but it has been recognised from China Strait, south-eastern New Guinea, by Macleay.

Caranx kalla, *Cuvier & Valenciennes.*

Herring-Trevally.

Alepes kalla (Cuvier & Valenciennes), Ogilby, Mem. Qld. Mus., iii., 1915, p. 62, pl. xx.

Forty-three specimens, 120-155 mm. long from the tip of the upper jaw to the end of the middle caudal rays. They do not differ from a specimen from Madras which was identified as *Caranx kalla* by Dr. Day.

Loc.—Seven miles N.E. of Bowen, Queensland, 16 fathoms.

Genus Decapterus, *Bleeker.*

Decapterus russellii, *Rüppell.*

Mackerel Scad.

Decapterus russellii (Rüppell), Ogilby, Mem. Qld. Mus., iii., 1915, p. 59, pl. xix.

A single specimen, 159 mm. long to the end of the middle caudal rays.

Loc.—Bustard Bay, Queensland, 15-21 fathoms.

Genus Megalaspis, *Bleeker.*

Megalaspis cordyla, *Linnæus.*

Scomber rottleri, Bloch, Ichth., pt. 10, 1797, pl. cccxlvi.

Caranx rottleri, Day, Fish. India, 1878, p. 213 (references and synonymy).

A young specimen, 155 mm. long, does not differ from a larger example from Madras, identified as *Caranx rottleri* by Dr. Day.

Loc.—Seven miles N.N.E. of Bowen, Queensland, 16 fathoms.

Genus ULUA, *Jordan & Snyder.*

ULUA MANDIBULARIS, *Macleay.*

Caranx mandibularis, Macleay, Proc. Linn. Soc. N.S.Wales, viii., 1883, p. 356.

The two typical specimens of this species are preserved in the Macleay Museum, and a co-type is in the Australian Museum. They are very similar to the figure of *U. richardsonii*[1], but have the frontal profile a little more convex, the eye larger, and a few more anal rays. Macleay has described the head as being free from scales, but there are really numerous small scales on the cheeks and upper parts of the opercles.

Loc.—Port Moresby, British New Guinea.

Genus ALECTIS, *Rafinesque.*

ALECTIS INDICA, *Rüppell.*

Plumed Trevally : Diamond Fish : Silvery Moon-fish.

Alectis indica (Rüppell), Ogilby, Mem. Qld. Mus., iii., 1915, p. 83, pl. xxvi.

Caranx gallus, Kent, Naturalist in Australia, 1897, p. 153, figure.

Sixty-three young examples, 100-135 mm. long to the end of the middle caudal rays, agree with an Indian specimen in the Australian Museum from Dr. Day's collection ; they are well illustrated by Kent's figure quoted above. They exhibit very little variation, though some are slightly more angular than others ; all have six, more or less distinct, broad, vertical bars crossing the body and tail, and narrower intermediate ones are also often present.

Locs.—Seven miles N.N.E. of Bowen, Queensland, 16 fathoms.

Four to twenty miles N.E. of Gloucester Head, Queensland, 19-35 fathoms.

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1. Jordan & Snyder—Mem. Carnegie Mus., iv., pt. 2, 19, p. 39, pl. liii.

Family LUTIANIDÆ.

Genus Lutianus, *Bloch*.

Lutianus erythropterus (*Bloch*), *Day*.

Lutjanus erythropterus, Bloch, Ichtyologie, 1797, pl. ccxlix.

Lutianus erythropterus, Day, Fish. India, 1878, p. 32, pl. x., fig. 1-2.

A small example, 135 mm. long, has the characteristic marking of the young of *L. erythropterus* as described and figured by Day. This author examined the types of the species in the Berlin Museum, which do not agree with Bloch's figure.

Loc.—Eleven miles N. 59° W. of Pine Peak, Queensland. 24-26 fathoms ; 1st August, 1910.

Lutianus chrysotænia, *Bleeker*.

Lutianus chrysotænia, Bleeker, Atlas Ichth., viii., 1876, p. 50, pl. cccii., fig. 4. *Id.*, Waite, Rec. Austr. Mus., vi., 1905, p. 62.

Mesoprion chrysotænia, Weber, Zool. Forschr. Austr., v., 1895, p. 262.

Three specimens, about 325 mm. long, were taken on lines at North Reef, and Masthead Island, in the Capricorn Group. The species has been recognised from Houtman Abrolhos, Western Australia, by Waite, and from Thursday Island by Weber. Another specimen is in the Australian Museum from Broome, North-Western Australia.

Lutianus fulviflamma, *Forskal*.

Lutianus fulviflamma (Forskal), Day, Fish. India, 1875, p. 42, pl. xii., fig. 6. *Id.*, Bleeker, Atlas Ichth., viii., 1876, p. 65, pl. cccxliv., fig. 3. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 342. *Id.*, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 10, and Ed. Fish. N.S. Wales, 1893, p. 14. *Id.*, Stead, Ed. Fish. N.S. Wales, 1908, p. 61.

Notes on the differences between this species and *L. russelli* are given under the latter heading.

Locs.—A large example was caught on a line at North Reef in the Capricorn Group, Queensland. I have also examined five others from Southern Queensland; one from Port Moresby, New Guinea; one from the Philippine Islands; two from Madras, India, being identified by Dr. Francis Day. The species has been recognised from Port Denison, Queensland, by Klunzinger, and from the northern portion of the coast of New South Wales by Ogilby and Stead.

LUTIANUS RUSSELLI, *Bleeker.*

Lutianus russelli, Bleeker, Atlas Ichth., viii., 1876, p. 71, pl. ccc., fig. 2. *Id.*, Day, Fish. India, 1875, p. 41, pl. xii., fig. 5. *Id.*, Jordan & Thompson, Proc. U.S. Nat. Mus., xxxix., 1911, p. 450, fig. 3.

Lutianus johnii, Ogilby, Cat. Fish. N.S.Wales, 1886, p. 9. *Id.*, Waite, Mem. N.S.Wales Nat. Club, 1904, p. 29. *Id.*, Stead, Ed. Fish. N.S.Wales, 1908, p. 61. (Not *L. johnii*, Bloch).

The differences between this species and *L. fulviflamma* are only apparent when a series of each is compared. I have examined eleven specimens of each species 125-330 mm. long, and find the distinguishing characters noted by Jordan and Thompson to be constant. The greater part of the black lateral blotch is above the lateral line in *L. russelli*, and all my specimens have fourteen or fifteen dorsal rays. In *L. fulviflamma* the greater part of the dark blotch is below the lateral line, and there are only thirteen dorsal rays. Further, the contour of the back is more arched in *L. russelli*, and it has more scales between the lateral line and the back and on the cheek.

I have examined the specimen recorded as *L. johnii* from the Richmond River, New South Wales, by Ogilby, and find it to be identical with *L. russelli*. It differs from *L. johnii* in having the scales above the lateral line oblique instead of horizontal.

Locs.—A large specimen was taken on a line at North Reef in the Capricorn Group, Queensland. Other specimens are in the Australian Museum from Moreton Bay, Queensland; Richmond River, New South Wales; Akyab, India (Francis Day Coll.).

Genus Aprion, *Cuvier & Valenciennes.*

Aprion virescens, *Cuvier & Valenciennes.*

Aprion virescens, Cuvier & Valenciennes, Hist. Nat. Poiss., vi., 1830, p. 544, pl. clxviii. *Id.*, Bleeker, Atlas Ichth., viii., 1876, p. 77, pl. ccxciii., fig. 3.

A large specimen, nearly 600 mm. long, agrees very well with Bleeker's figure. It was taken on a line on Gardner Bank, east of Frazer Island, Queensland. The species has not hitherto been recognised from Australia.

Family ENOPLOSIDÆ.

Genus Enoplosus, *Lacépède.*

Enoplosus armatus, *Shaw.*

Old Wife.

Chætodon armatus, Shaw in White, Voy. N.S.Wales, 1790, p. 254, fig. 1.

Enoplosus white, Lacépède, Hist. Nat. Poiss., iv., 1802, p. 541.

Enoplosus serotinus, de Vis, Ann. Qld. Mus., No. 10, 1911, p. 29.

Through the kindness of Dr. R. Hamlyn-Harris, Director of the Queensland Museum, I have been permitted to examine the type of *Enoplosus serotinus*, de Vis. It is in very bad condition, but does not differ in any way from *E. armatus*. It has eight spines in the first dorsal instead of seven as described, while the length from the snout to the base of the tail is 148 mm. instead of 163. It was said to have been collected at Cairns, North Queensland, but this locality is almost certainly wrong, since the species is not otherwise known farther north than Wide Bay.

Two very large examples are preserved in the "Endeavour" collection measuring 262 mm. from the tip of the snout to the end of the middle caudal rays. They only differ from smaller examples in having the dorsal spines shorter and the anterior dorsal and anal rays longer. In the young the fourth spine is about 2·2 in the length of the head and body ; in the larger specimens it is 3·8 in the same. The depth of the body varies in different individuals from 2-2·17 in the length from the snout to the hypural joint.

Locs.—Wide Bay, Queensland.

Twenty-four miles S.S.E. of Eagle's Nest, Victoria, 45 fathoms ; 12th June, 1914.

Family HISTIOPTERIDÆ.

Genus QUINQUARIUS, *Jordan*.

Pentaceros, Cuvier and Valenciennes, Hist. Nat. Poiss., iii., 1829, p. 30 (*P. capensis*, Cuv. & Val.). Not *Pentaceros*, Schultze, 1760.

Quinquarius, Jordan, Proc. U.S. Nat. Mus., xxxii., 1907, pp. 236, 238 (*Q. japonicus*, Döderlein).

Quadrarius, Jordan, *Loc. cit.* (*Pentaceros decacanthus*, Günther).

The name *Quinquarius* was proposed by Jordan to replace *Pentaceros*, which is preoccupied. He also established another genus *Quadrarius* for *Pentaceros decacanthus*, Günther, which only differs from *P. capensis* in the number of its dorsal and anal spines ; but the discovery of other allied species in which the number of spines differs from both *Quinquarius* and *Quadrarius* indicates that this character is not of generic value.

Pseudopentaceros, Gill[1] (=*Gilchristia*, Jordan)[2], with *Pentaceros richardsoni*, Smith,[3] for its type, is possibly also identical with *Quinquarius*, in which case Gill's name would have to be used. Smith's figure of the species, however, suggests that there are other characters besides the increased number of dorsal spines to distinguish it.

QUINQUARIUS HENDECACANTHUS, *sp. nov.*

(Plate xxvi., figs. 1-3.)

D. xi./13-15 ; A. iv./10-11 ; V. i./5 ; P. 17 ; C. 17. Height 1·8 in the length from the snout to the base of the caudal rays ; head 2·8 in the same. Eye 2·9 in the head, almost equal to the interorbital width, and but little shorter than the snout, which is 2·6 in the head. Fourth dorsal spine 1·2, second dorsal ray 2·5, second anal ray 2·3 in the head. Pectoral 1·08, ventral spine 1·9, and caudal peduncle 3 in the head.

Body compressed, elevated, with the ventral surface somewhat flattened, the width in front of the ventral spines is about half the length of the head. A few scales on the cheeks are disposed in about five rows. All the rest of the head and scapular regions are covered by strong rugose bones, which are more or less radiately striated. Upper profile of head

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1. Gill—Mem. Acad. Sci. Wash., vi., 1893, p. 116.
2. Jordan—Proc. U.S. Nat. Mus., xxxii., 1907, p. 236.
3. Smith—Illustr. Zool. S. Africa, Pisces, 1849, pl. xxi.

almost straight, the line being broken only by the obtusely elevated supraocular margins ; interorbital space a little concave. Snout pointed, margin of the preorbital bone serrated. Maxillary small and weak, reaching to below the posterior nostril. Lips thick, fleshy, and papillose. Posterior margin of preoperculum nearly vertical, the angle rounded and more or less produced backwards ; both margins finely serrated. Operculum unarmed. Nostrils nearer the eye than the end of the snout, the anterior tubular, the posterior a simple opening.

Teeth in a band on each jaw, depressible, the outer ones enlarged, cardiform, and curved. A broad patch of villiform vomerine teeth ; palatines and tongue toothless.

Body scales differing in structure in different parts. On the upper anterior portion of the back, breast and abdomen they have the central portion thickened, and more or less tubercular, with the surface rugose with ridges radiating backwards. From these, they gradually change to thin, flat scales on the sides which are microscopically rugose, and have ctenoid margins. The bases of the dorsal and anal fins are covered by low, scaly sheathes. The lateral line rises rapidly towards the back anteriorly, and forms a high arch to below the end of the soft dorsal, whence it runs along the middle of the caudal peduncle. There are forty-five to forty-seven rows of scales between the origin of the lateral line and the hypural joint.

Dorsal spines very strong and coarsely carinate ; the fourth is the highest, and the others decrease regularly backwards. The second and longest ray is not much higher than the last spine, and the margin of the soft dorsal is rounded. Anal originating below the middle of the soft dorsal, its spines and rays similar to those of that fin. Ventral spine very strong, inserted below the sixth and seventh dorsal spines ; the rays reach the vent. Upper pectoral rays longest, not quite reaching the verticle of the vent. Caudal truncate.

Colour.—Yellowish olive, the scales with lighter centres. Membrane of the ventral fins blackish.

Described from a specimen 246 mm. long, which is selected as the type ; it is figured on Pl. xxvi., fig. 1.

A young example, 103 mm. long, differs from the larger specimen described above so greatly that, in the absence of an intermediate series, one would hardly regard the two as belonging to the same species. The bones covering the head are separated from one another and more rugose, and some bear spines and tubercles ; the supraorbital ridge supports a large tubercle from which striæ radiate over the frontal bones, and there is also a group of small spinules in front of it ; the median posterior scute on the nape also bears a central tubercle, as does the post-temporal bone; the lower margin of the preoperculum is intensely spiny, the spines forming a prominent group on the lowermost portion (Pl. xxvi., fig. 2). All the scales of the head and body are very thick, tubercular, and coarsely sculptured ; those of the breast and abdomen are greatly enlarged, and have deep grooves between them. The lower surface of the breast is flat and triangular, its breadth being equal to its length (Pl. xxvi., fig. 3).

Locs.—Eight specimens were preserved from the following localities :—

Thirty-three miles S. by W. of Cape Everard, Victoria, 160-200 fathoms ; 19th September, 1914.

S.S.E. of Gabo Island, Victoria, 176-200 fathoms ; 15th September, 1914.

Great Australian Bight, Long. 130°50′ E., 230-300 fathoms ; 6th May, 1913.

Family LATRIDIDÆ.

Genus Latridopsis, *Gill.*

Latridopsis, Gill, Proc. Acad. Nat. Sci. Philad., 1862, p. 115 (*Latris ciliaris*, Forster).

This genus differs from *Latris* in having no vomerine teeth. The pectoral fin is also differently formed, the upper rays being longest, instead of the median ones, as in *Latris*.

Latridopsis forsteri, *Castelnau.*

Red, White, and Silver Bastard Trumpeter.

(Plate xxvii.)

Latris forsteri, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 77. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), pp. 72-76, 113. *Id.*, Stead, Ed. Fish. N.S. Wales, 1908, p. 70.

Latris bilineata, Castelnau, *Loc. cit.*, p. 79. *Id.*, Johnston, *Loc. cit.*

Latris inornata, Castlenau, *Loc. cit.*, p. 79. *Id.*, Johnston, *Loc. cit.*

? *Latris ramsayi*, Ogilby, Proc. Linn. Soc. N.S.Wales, x., 1885, p. 229, and Cat. Fish. N.S.Wales, 1886, p. 20.

Latris ciliaris, Waite, Mem. Austr. Mus., iv., i, 1899, p. 85. *Id.*, Stead, Ed. Fish. N.S.Wales, 1908, p. 70, pl. xxxix. (Not of Forster.)

Latris ciliaris, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1879, p. 351. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 426. *Id.*, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 20. *Id.* Waite, Mem. N.S.Wales Nat. Club, i., 1904, p. 32 (after Richardson, perhaps not *L. ciliaris*, Forster).

? *Latris ciliaris*, Kent, Rept. Fish. Dept. Tasmania, 1886, p. 14.

D. xvi.i.39; A.iii.31; P.10+8; V. i.5; C. 15. L. lat. 115.

Head, from snout to end of opercular flap, 3·5 in the length to the hypural joint; depth before the ventrals 2·6 in the same. Eye 5·3, interorbital space 3·5, and preorbital 4·8 in the head.

Body compressed. The dorsal profile rises rapidly from the snout to the first dorsal spine, and is slightly convex above the eye; thence it ascends gradually to the origin of the soft dorsal. The lower profile is almost similar to that of the back; it is obtusely keeled between the ventral fins and the vent, and less so on the breast. Caudal peduncle short and broad, its depth 3·4 in the length of the head. Interorbital space very convex and scaly, the scales extending forward to the level of the nostrils. Preorbital broad and naked. Nostrils placed a little behind the middle of the snout, close together, the anterior large and oval, the posterior small. Maxillary reaching almost to the level of the posterior nostril. All the opercles are closely covered with minute scales, which become much larger on the cheeks. Operculum unarmed. Margins of the preoperculum smooth, the angle broadly rounded.

Strong conical teeth form a single row in each jaw; a secondary row of minute teeth is present on the anterior part of the upper jaw. Vomer, palatines, and tongue toothless.

Body covered with rather small, cycloid scales. There are one hundred and fifteen rows on the lateral line between the operculum and the caudal rays, eleven between the lateral line and the middle of the back, and twenty-five between it and the abdominal edge. The bases of both dorsals and the anal fin are covered by a sheath of minute scales. The scales extend onto the base of the caudal and up between its rays; lower portion of pectoral also scaly.

Spinous dorsal about as long as the soft portion. Its margin is arched, the spines increasing in length to the fifth, which is 3·09 in the head; the following spines decrease gradually to the sixteenth, the seventeenth being a little longer than the preceding one. Anterior rays a little higher than the longest spine, 2·6 in the head; the margin of the fin is straight, the rays decreasing regularly backwards to the last, which is short. Anal spines small, the third the longest, and about half as long as the first ray; soft portion of anal similar to that of the dorsal, the first ray 3·4 in the head. Fifth pectoral ray longest, 1·3 in the head; the hinder margin of the fin is rounded, the simple rays not projecting beyond it. Ventrals short, pointed, the first ray almost half as long as the head. Caudal deeply forked.

Colour.—Olive green above the lateral line, silver on the sides. On the upper half a narrow, yellowish olive band extends along the body between each row of scales; these bands are traceable on the lower portion also, but they are silver coloured. The fins are more or less dusky, the second dorsal, caudal, and upper portion of the pectoral having deep blackish margins. In a fresh state the anal has a very narrow white border, and the lips are yellowish.

Described from an example 447 mm. long from the tip of the snout to the end of the caudal fin.

Assuming that the descriptions[1-2] and figure[3] of *Latridopsis ciliaris* are correct, *L. forsteri* differs from that species in having the preopercular margin entire instead of ciliated, and more than one hundred scales between the operculum and the hypural joint. *L. ciliaris* was first obtained in New Zealand, but Richardson[3] described and figured a specimen which was said to have been taken in Port Jackson. It would appear that no other example having the characters ascribed to his fish has since been taken in Australian waters, all later records of *L. ciliaris* from here being based on specimens which agree with Castelnau's description of *L. forsteri*. The fish referred to by Waite in the "Thetis" Report is identical with the one described above; while I consider Stead's figure also represents the same species. Two local examples in the Macleay Museum labelled as *L. ciliaris* are *L. forsteri*. The other records of *L. ciliaris* from New South Wales are unreliable, and though it was identified from

1. *Anthias ciliaris*, Bloch and Schneider, Syst. Ichth., 1801, p. 310.
2. *Sciæna ciliaris*, Forster, Descript. Anim., ed. Lichtenstein, 1844, p. 86.
3. *Latris ciliaris*, Richardson, Voy. Erebus and Terror, Fishes, 1845, p. 37, pl. xxxvi., fig. 6-7.

Tasmania by Kent[1] it may be noted that Johnston failed to find it there.[2]

I follow Johnston (*Loc. cit.*) in uniting *L. bilineata* and *L. inornata*, Castelnau, with *L. forsteri*, while *L. ramsayi*, Ogilby, is probably only a variety of *L. forsteri*, as suggested by its author in 1886.

The specimen described by Kent as *Latris mortoni*[1] is evidently related to, and possibly identical with, *L. lineata*, Forster, rather than *Latridopsis forsteri*. Judging by the description, it has most of the structural details of the former, though it resembles both species in its colour-marking. Kent noted that it was possibly a hybrid between the two, but the presence of vomerine teeth indicates its affinity to *Latris lineata*.

Loc.—N.N.E. of Sisters Islands, Bass Strait, 70-80 fathoms ; 20th April, 1914.

Family CALLIONYMIDÆ.

Genus Dactylopus, *Gill.*

Dactylopus dactylopus, *Cuvier & Valenciennes.*

(Plate xxviii.)

Dactylopus dactylopus (Cuvier & Valenciennes), Ogilby, Proc. Roy. Soc. Qld., xxiii., 1910, p. 46.

The collection includes three specimens, 94-156 mm. long, of which two are females, and one is a male. Another female is in the Australian Museum.

The three females are very similar, and have the general colour marking shown in the accompanying figure. The male, which is the largest specimen, differs in having the anterior dorsal spines much longer and largely free from the membrane ; the first extends back almost to the end of the last dorsal ray when both are adpressed. The caudal fin is also longer and more angular, the median rays being $2\frac{1}{3}$ in the length to the hypural, instead of nearly 3. Both dorsal fins and the caudal are more elaborately marked than in the females, being ornamented with many irregular ocelli, while the tail also bears numerous oblique bars on its upper half.

Locs.—The specimen figured is a female, 107 mm. long, from Shark Bay, Western Australia. The three "Endeavour" specimens were trawled off Hervey Bay, Queensland, 9-11 fathoms ; 27th July, 1910.

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1. Kent—Rept. Fish. Dept. Tasmania, 1886, p. 13 (see Journals and Printed Papers of the Parliament of Tasmania, viii., 1886, No. 37).
2. Johnston—Proc. Roy. Soc. Tasm., 1882 (1883), p. 72.

Family GEMPYLIDÆ.

Genus JORDANIDIA, *Snyder*.

Jordanidia, Snyder, Proc. U.S. Nat. Mus., xl., May 26, 1911, p. 527 (*J. raptoria*, Snyder).
Rexea, Waite, Rec. Cantb. Mus., I., pt. 3, June 24, 1911, p. 235 (*R. furcifera*, Waite).

According to Snyder, there were no ventrals in his specimen of *J. raptoria*, while those of *R. furcifera* are composed of four weak spines. They are present in seven of my specimens of the latter species, 320-450 mm. long, though they vary somewhat in development; in a larger example, 560 mm. long, they are reduced to an indistinct scale-like structure which scarcely projects from the skin. Snyder also detected small scales on the hinder part of the body only, the rest of the head and body being "apparently smooth"; it is probable that the anterior scales were rubbed off his specimen since they are more or less distinct in *R. furcifera*. In all other details *Jordanidia* and *Rexea* are very similar, and I have no hesitation in uniting them.

JORDANIDIA SOLANDRI, *Cuvier & Valenciennes*.

Tasmanian King-fish; *King Barracouta*.

Scomber macrophthalmus, Solander, M.S.
Gempylus solandri, Cuvier & Valenciennes, Hist. Nat. Poiss., viii., 1831, p. 215.
Thyrsites solandri, Günther, Brit. Mus. Cat. Fish., ii, 1860, p. 352. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), pp. 82, 117. *Id.*, Kent, Nat. in Austr., 1897, p. 172.
Thyrsites micropus, McCoy, Ann. Mag. Nat. Hist. (4), xi., 1873, p. 338.
Rexea furcifera, Waite, Rec. Cantb. Mus., i., pt. 3, 1911, p. 236, pl. lii.

I am indebted to Mr. B. B. Woodward for a copy of Solander's M.S. description of his *Scomber macrophthalmus*, upon which Cuvier and Valenciennes based their *Gempylus solandri*. The definition of the latter is very short, and the species has been considered to be synonymous with *Promethichthys prometheus*, Cuvier & Valenciennes. Solander's description, however, is very complete, and gives details of all the more important characters, including the remarkable branched lateral line, dorsal and anal finlets, minute ventrals, etc., and I have no hesitation in following Johnston in associating it with the Tasmanian King-fish.

Solander's notes were based on a specimen captured on December 9th, 1769, during his voyage to Australian waters with Captain Cook. According to Cook's Journal, edited by Wharton[1], the "Endeavour" lay off Doubtless Bay in the north of New Zealand on that date, and he noted that "the natives came off to the ship . . . . . and sold us fish of different sorts sufficient to give all hands a little."

Through the kindness of Mr. J. A. Kershaw, I have been enabled to examine an authentic specimen of *Thyrsites micropus*, McCoy, in the National Museum, Melbourne. It is stuffed, and measures 785 mm. from the snout to the end of the middle caudal rays. It was received from Tasmania in January, 1873, and was identified by Professor McCoy ; no other specimen bearing his label being known, it may be regarded as the type of his species. It does not differ from the specimen here identified as *J. solandri*, though the posterior rays of the dorsal and anal fins have become more or less separated from the others in drying, on account of which McCoy counted six and four finlets in these fins.

Nine specimens, 295-560 mm. long, exhibit but little variation in the construction of their fins. The posterior spine of the first dorsal is sometimes very small, and the two anterior rays of the second dorsal and anal are not always easily detected. The posterior dorsal and anal rays are more widely spaced than the others, their condition being better shown by Snyder in his figure of *J. raptoria*[2] than by Waite's illustration of *Rexea furcifera*. I count them as follows :— D. xviii., 2/16-17+2 ; A. 2/14-15+2.

J. solandri is closely allied to the Japanese *J. raptoria*, but differs in having a smaller eye and a broader interorbital width. The ventrals are apparently better developed in the younger stages, and the lateral line is sinuous posteriorly instead of straight.

Locs.—According to Johnston, this species was exceedingly abundant in Tasmania, but it has since become so rare that none are now brought into the markets at Hobart. The "Endeavour" obtained it at the following localities :—

Edge of bank between Gabo Island and Cape Everard, Victoria, 150-250 fathoms.

Eighteen miles east of Babel Island, Bass Strait ; August, 1911.

Eastern edge of Bass Strait, 100-220 fathoms ; December, 1912.

1. Wharton—Captain Cook's Journal, 1893, p. 170.
2. Snyder—Proc. U.S. Nat. Mus., xlii., 1912, pl. lii., fig. 2.

Family TRICHIURIDÆ.

Genus LEPIDOPUS, *Gouan*.

LEPIDOPUS CAUDATUS, *Euphrasen*.

Frost Fish.

Lepidopus caudatus (Euphrasen), Day, Fish. Gt. Brit. and Ireland, i., 1880-1884, p. 156, pl. li., fig. 2 (synonymy).
Lepidopus argyreus, Cuvier & Valenciennes, Hist. Nat. Poiss., viii., 1831, p. 223, pl. ccxxiii.

Thirteen specimens, 480-1580 mm. long, only differ from Day's description in having the first dorsal spine placed over the hinder part of the preoperculum instead of the posterior half of the opercle. When fresh they are uniformly silver in colour, and darker on top of the head ; the dorsal fin is largely colourless, but has a narrow black margin, and two black blotches anteriorly between the rays. After long preservation in formalin the silver colour is entirely destroyed, and eight longitudinal yellow bands appear, one of which is broader than the others, and extends along the whole length of the lateral line ; a precisely similar marking is illustrated in Goode & Bean's figure of *Evoxymetopon tæniatus*.[1]

Locs.—Thirty-two miles S.E. of Genoa Peak, Victoria, 200 fathoms ; 2nd October, 1914.

Seventeen miles S.W. of Gabo Island, Victoria, 240 fathoms ; 14th September, 1914.

Sub-genus BENTHODESMUS, *Goode & Bean*.

Benthodesmus, Goode & Bean, Proc. U.S. Nat. Mus., iv., 1881, p. 380, and Oceanic Ichth., 1895, p. 204 (*Lepidopus elongatus*, Clarke).

The genus *Benthodesmus* appears to me to be hardly worthy of recognition. Goode & Bean have enumerated several characters to distinguish it from *Lepidopus*, but some of them, such as the rudimentary occipital crest, more slender head, and more numerous rays are merely due to its more slender form ; others such as the simple anal scales and forward position of the ventrals are not maintained in my specimen of *B. elongatus*. I have compared a young *Lepidopus caudatus* with *B. elongatus*, and find the structures essentially identical, though the largely developed mental prominence, lack of gill-rakers on the third and fourth arches, and the forward position of the vent may perhaps maintain *Benthodesmus* as a sub-genus.

1. Goode & Bean—Oceanic Ichth., 1895, p. 204, pl. lviii., fig. 214.

Lepidopus (Benthodesmus) elongatus, *Clarke.*

Lepidopus elongatus, Clarke, Trans. N. Zeal. Inst., xi., 1879, p. 294, pl. xiv. *Id.*, Günther, "Challenger" Rept., Zool., xxii., 1887, p. 38.

A beautifully preserved example, 767 mm. long, agrees perfectly with Clarke's description and figure of this species.

Loc.—South of Gabo Island, Victoria, 200 fathoms.

Family SCORPÆNIDÆ.

Genus Neosebastes, *Guichenot.*

Neosebastes, Guichenot, Mém. Soc. Nat. Sci. Cherbourg, xiii., 1868, p. 83 (*Sebastes panda*, Richardson). *Id.*, Jordan and Starks, Proc. U.S. Nat. Mus., xxvii., 1904, p. 120.

Jordan and Starks have noted that their *N. entaxis* differs from Guichenot's definition of *Neosebastes* in having the lower pectoral rays simple instead of branched, and suggest that it may represent a distinct genus. This character is variable, however, young specimens of *N. panda* having the lower rays simple, while they are branched in adults ; other species also exhibit the same variation with growth.

The following is a key to the Australian species of the genus :—

a. A deep, naked, nuchal groove. Pectoral margin evenly rounded.................................*panda.*

aa. No deep, naked, nuchal groove.

- *b.* More than forty pores in the lateral line. Depth, one-third the length without caudal. Pectoral margin evenly rounded...................*scorpænoides.*
- *bb.* Less than forty pores in the lateral line. Depth more than one-third the length.
  - *c.* Pectoral margin evenly rounded. Supraorbital spines large, overhanging the eye.......*thetidis.*
  - *cc.* Some of the lower pectoral rays longer than those above them. Supraorbital spines smaller, not overhanging the eye.
    - *d.* Soft dorsal with a large black spot..*incisipinnis.*
    - *dd.* Soft dorsal without a black spot..*nigropunctatus.*

Neosebastes panda, *Richardson.*

Sebastes pandus, Richardson, Ann. Mag. Nat. Hist., ix., 1842, p. 216, and Zool. "Erebus & Terror," Fishes, 1846, p. 70, pl. xli., fig. 3-4.

Richardson's figure of this species was prepared from a dried specimen, and some of the proportions are consequently incorrect. The caudal peduncle is drawn much too long, and the curve of the back is too rounded; the upper profile of the head is also much less steep than in specimens preserved in liquid.

Young specimens, 127 mm. long, differ from adults 310mm. in length, in having the dark markings on the body and fins more pronounced, and in having longer dorsal spines; in the small examples the third spine equals the height of the body, whereas it is proportionally shorter in the larger ones.

Locs.—Doubtful Island Bay, south-western Australia, 20-25 fathoms.

Great Australian Bight, west of the meridian of Eucla, 70-120 fathoms.

Neosebastes thetidis, *Waite.*

Rough Perch. Thetis-fish.

Sebastes thetidis, Waite, Mem. Austr. Mus., iv., I., 1899, p. 100, pl. xx.

Sebastodes thetidis, Waite, Mem. Nat. Club N.S. Wales, 2, 1904, p. 47.

This species has been placed in *Sebastodes* by Waite, but it differs from that genus in having a well-developed cephalic armature, and in particular in having strong recurved spines on the suborbital stay. It evidently belongs to *Neosebastes*, having all the generic characters of *N. panda*.

This fish is very abundant in waters of 60-100 fathoms deep off the eastern coast of Tasmania. It is known as the Rough Perch by the fishermen on the "Endeavour," but is always cast back into the sea as being of no value for food. When brought to the surface its abdomen becomes greatly distended by the internal gases, and it floats upside-down upon the water.

Colour.—In life, reddish brown above, pink below, with two darker cross-bars and some spots on the upper half of the sides. Dorsals, anal, pectoral and caudal fins more or less yellow, with dark greenish cross-bands. Pectoral pink. Iris golden.

Locs.—Nine specimens, 155-330 mm. long, were preserved from the following localities :—

East of Babel Island, Bass Strait, 65-75 fathoms.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Great Australian Bight, west of the meridian of Eucla, 70-120 fathoms.

Neosebastes incisipinnis, *Ogilby*.

(Plate xxix.)

Neosebastes incisipinnis, Ogilby, New Fish. Q'ld. Coast, 1911, p. 104.

D. xii. i. 8 ; A. iii. 5 ; P. 20-21 ; V. i. 5 ; C. 15. L.lat. 33. Length of head from premaxillary symphysis to end of opercular lobe, 2·2 in the length to the hypural ; depth 2·8 in the same. Eye 2·8 in the head. Interorbital space about half as wide as the eye, and less than the length of the snout, which is 1·4 in the eye. Least depth of caudal peduncle a little less than the length of the snout. Third dorsal spine 1·9, second dorsal ray 2·4, and longest pectoral ray 1·7 in the head. Second anal spine 2·7, second anal ray 2·05, and second ventral ray 1·7 in the head.

Interorbital space deeply concave, with two more or less distinct ridges which diverge backwards. No occipital groove. Maxillary reaching to below the middle of the eye or not quite so far backward. Preorbital armed with numerous strong spines on its margin, and one or two smaller ones on its upper surface. Sub-orbital stay with two groups of spines. Preopercular margin broadly rounded, with one long, carinate spine directed backward, and three others on the lower border. Operculum with two strong flat spines, the lower carinate. A small spine above the anterior nostril. Upper anterior margin of the eye with a stout spinule, the posterior portion with a ridge which is divided into five or six spines. A low nuchal ridge ending in a spine on either side, and several other spines are present above the suspension of the opercles. All the upper portions and sides of the head covered with rough scales, leaving only the lips and lower jaw naked. Jaws of equal length, the lower with a symphyseal knob, on either side of which is a pore ; three other pores are present on each ramus of the mandible. Anterior nostril with a small tentacle.

Teeth villiform, forming bands in the jaws which are broader on the premaxillaries than on the mandible. A V-shaped band on the vomer, and an elongate one on each palatine bone.

Back but little elevated, almost straight. Caudal peduncle slender. Body covered with rather large, ctenoid scales, which increase in size backwards ; they do not extend onto the bases of any of the fins. Lateral line curved in its extreme anterior portion, thence running obliquely to the middle of the caudal peduncle. There are forty-two to forty-three, or thirty rows of scales below the lateral line, according to the direction in which they are counted.

Dorsal fin commencing on the neck a little behind the verticle of the posterior orbital margin ; the third and fourth spines are the longest, the others decreasing in length to the twelfth ; the thirteenth is nearly twice as long as the preceding one, and about half as long as the second ray. Margin of the soft dorsal rounded. Second anal spine longest, very strong and sulcate, and more than three-fourths as long as the rays. Pectoral almost reaching the verticle of the vent ; six or seven of its lower rays are thickened, and either simple or more or less branched according to the age of the specimen ; the fourteenth to sixteenth rays are longer than those above them, and their tips project beyond the margin of the fin. Ventrals rather elongated, the second ray reaching almost to, or a little beyond the vent. Caudal rounded, though the lower rays are longer than the upper ones.

Colour.—Light brown above in formalin, whitish below. The body is crossed by two irregular darker bars, and bears many smaller spots and lines. Head similar to the body. Upper surface of eye with rounded whitish spots on a darker ground colour. Dorsal blotched with lighter and darker markings, the tips of the membrane behind the spines white. Second dorsal with a large black ocellus covering the basal portions of the posterior rays ; upper half of the fin grey, with a narrow white margin. Basal half of anal whitish, the outer portion dark grey. Pectoral light-coloured, with fine grey lines crossing the rays. Distal portion of ventrals greyish. Caudal with a dusky band crossing its distal half, with or without dark spots on the basal portion.

Eighteen specimens, 180-255 mm. long, are preserved, which are referred to by Ogilby. His description was based on three specimens trawled off Cape Moreton, where many others were obtained, but none from that locality were forwarded to the Australian Museum. The foregoing description chiefly refers to a specimen 232 mm. long from three miles south-east of Double Island Lighthouse, which is the example figured.

Locs.—Twenty-five miles south-east of Double Island Point, Queensland, 33 fathoms ; 28th June, 1910.

Three miles south-east of Double Island Lighthouse, Queensland, 32 fathoms ; 16th July, 1910.

Wide Bay, Queensland.

NEOSEBASTES NIGROPUNCTATUS, *sp. nov.*
(Plate xxx.)

Br. 7; D. xii. i. 8; A. iii. 6 (5); V. i. 5; P. 14+7; C. 15. L. lat. 35. Head, from premaxillary symphysis to end of opercular lobe, 2·3 in the length to the hypural joint; depth 2·6 in the same. Eye equal to the length of the snout, 3·5 in the head, and nearly twice as wide as the interorbital space, which is 6·1 in the head. Least depth of caudal peduncle 3·7 in the head. Third dorsal spine 1·7, second dorsal ray 2·4, second anal spine 2·6, and second anal ray 2·3 in the head. Longest pectoral ray, second ventral ray, and median caudal rays almost equal in length, about 1·5 in the head.

A very small nasal spine above the anterior nostril. Antero-superior orbital spine wanting, represented by a knob on the orbital margin; upper posterior border with two low spines, and a few more are present near the hinder margin of the orbit. A small nuchal spine, and several others on the exposed suprascapular margin. A small spine above the suspension of the preoperculum. Preorbital with two groups of comparatively small marginal spines, and one on its upper surface. Suborbital stay armed with two spines, one below the eye, and the other below the posterior orbital margin. Preoperculum broadly rounded, with a strong posterior spine which is carinate and bears a secondary spine on its upper surface; three other spines on the inferior border. Operculum with two spines, the lower the largest and carinate.

Head covered with rough scales which extend well forward, leaving only the end of the snout and the mandible bare; they are largest on the middle of the operculum and on the cheeks. Interorbital space deeply concave, partly naked, with two ill-defined bony ridges diverging backwards. No nuchal groove. Nostrils close together, the anterior with a tentacle. Mandible with three large pores on each ramus, and a smaller one on either side of the symphysis. Teeth villiform, in bands in the jaws, the upper series broader than the lower ones. A narrow Λ-shaped patch on the vomer, and an elongate band on each palatine; in the largest specimen the vomerine teeth are wanting and the palatine bands are reduced.

Back but little elevated, arched anteriorly, then falling in an almost straight line to the end of the dorsal fin. Caudal peduncle rather slender. Body covered with moderately large, ciliated scales, which do not extend onto the fins; they are smaller on the base of the pectoral and on the breast than elsewhere. There are about forty-five transverse rows immediately below the lateral line between the end of the operculum and the base of the tail; only thirty-five are pierced by the lateral line.

Dorsal fin commencing on the neck, a little behind the verticle of the eye ; third spine longest, the others decreasing in length to the twelfth ; thirteenth half as long as the rays. Margin of soft dorsal somewhat rounded ; the posterior ray deeply cleft, almost forming two rays. All the spines of the fins deeply grooved. Anal below the soft dorsal, terminating slightly in advance of it ; second spine longest, very strong, more than three-fourths as long as the second ray ; soft portion rounded, the posterior ray deeply cleft or divided into two. Pectoral not reaching the verticle of the vent ; the hinder margin of the upper half is rounded, but the fifteenth to seventeenth rays project beyond the others ; the seven lower rays are thickened and more or less branched. Ventrals elongate, reaching almost to or a little beyond the vent. Caudal subtruncate with the angles rounded, or slightly rounded ; the lower rays may be longer than the upper ones.

Colour.—Light yellow in formalin, probably red in life, with irregular darker spots on the scales which tend to form the marking characteristic of other species of the genus ; more or less numerous small, blackish dots at the bases of the scales are scattered over the upper half of the sides and head. Spinous dorsal with cloudy darker areas on the membrane, the tips behind the spine whitish. Outer half of membrane of soft dorsal and ventrals greyish. Pectorals, anal, and caudal with more or less distinct darker spots on the rays, which tend to form bands ; the caudal has a median dusky area in the smallest specimen.

Described from three specimens 240-360 mm. long. Apart from the variations noted they are very similar, though the dorsal spines are much higher in the young than in the older specimen ; the third spine is 1.3 in the height of the body in the smallest example, and 1.8 in the largest. The specimen figured is 327 mm. long, and is selected as the type.

Locs.—Great Australian Bight, west of the meridian of Eucla, 70-120 fathoms ; March, 1912.

South of Kangaroo Island, South Australia.

Genus Helicolenus, *Goode & Bean.*

Helicolenus percoides, *Richardson.*

Red Perch, Red Gurnet Perch, Gurnet, Sea Perch.

Sebastes percoides, Richardson, Ann. Mag. Nat. Hist., ix., 1842, p. 384, and Zool. "Erebus & Terror," Fishes, 1845, p. 23, pl. xv. *Id.*, McCoy, Prodr. Zool. Vict., Dec. iv., 1879, pl. xxxiii.

Scorpæna (*Helicolenus*) *percoides*, McCulloch, Rec. Austr. Mus., vi., 1907, p. 350.

A series of forty specimens, 110-320 mm. long, is preserved which exhibits great variation in the colour-marking. Some examples, particularly those of larger size, have large dark blotches and smaller dots on the back, which are arranged as shown in Richardson's figure. In others the markings are less distinct, while in the smaller specimens the whole head and body is almost uniformly light coloured, only a few dots and lines being present to indicate the position of the dark blotches of the adult.

I have already noted (*loc. cit.*) variation in the length of the dorsal spines, they being either shorter or much longer than the dorsal rays ; they are generally longest in young specimens, but they may be either short or long in examples of the same size from the same locality.

Locs.—This species is abundant in moderately deep water off the Victorian and Tasmanian coasts.

Shoalhaven Bight, New South Wales, 15-45 fathoms.
East of Babel Island, Bass Strait, 65-75 fathoms.
North coast of Tasmania, 25 fathoms.
Oyster Bay, Tasmania, 40-60 fathoms.
North-west of Greenly Island, South Australia, 44 fathoms.
Great Australian Bight, Long. 126° 45¼′ E., 130-320 fathoms.
Great Australian Bight, Long. 129° 28′ E., 350-450 fathoms.

Sub-family APISTINÆ.

The closely allied genera *Apistus*, Cuvier, and *Apistops*, Ogilby, may be distinguished as follows :—

Scales with three or more pointed marginal lobes. Antero-supraorbital bone coarsely carinate. Three mandibular barbles. Pectoral longer, reaching beyond the anal rays . . . . *Apistus*.

Scales cycloid, with rounded margins. Antero-supraorbital bone nearly smooth. Five mandibular barbles. Pectoral shorter, not reaching the anal rays . . . . *Apistops*.

Genus APISTOPS, *Ogilby*.

Apistops, Ogilby, Ann. Qld. Mus., 10, 1911, p. 54 (*Apistus caloundra*, de Vis).

Ogilby has described the lateral line as incomplete in *Apistops*, but it is continued onto the base of the caudal fin in the typical specimen of *A. caloundra*, though its tubules are weaker and more widely spaced posteriorly than anteriorly.

APISTOPS CALOUNDRA, *de Vis.*

(Plate xxxv., fig. 2.)

Apistus caloundra, de Vis, Proc. Roy. Soc. Qld., ii., 1886, p. 145. *Id.*, Ogilby, Ann. Qld. Mus., 10, 1911, p. 54.

Through the kindness of Dr. R. Hamlyn-Harris, Director of the Queensland Museum, I have been able to examine and figure the typical specimen of this species, which is the only one known. Ogilby counted fifty-two rows of scales along the body ; I find only forty-seven immediately below the lateral line, which is composed of twenty-five tubules.

Loc.—Caloundra, Queensland.

Genus APISTUS, *Cuvier.*

APISTUS CARINATUS, *Bloch & Schneider.*

(Plate xxxi.)

? *Scorpæna carinata,* Bloch & Schneider, Syst. Ichth., 1801, p. 193 (*fide* Day).

Apistus carinatus, Day, Fish. India, 1875, p. 155, pl. xxxvii., fig. 4 (synonymy).

Apistus macrolepidotus, Ogilby, New Fish. Qld. Coast, 1911, p. 108.

Forty-one specimens, 111-165 mm. long, are included in the collection which Ogilby has referred to his *A. macrolepidotus.* I have carefully compared them with two examples of *A. carinatus* from Dr. Day's collection from Madras, and find that they agree in every detail. Their colour marking varies in intensity, some being very pale and others dark, and the dorsal spot may extend over from three to six spines. There are usually fifteen dorsal spines, but some have sixteen ; Day counted fourteen to sixteen. Ogilby described 10+1 pectoral rays and Day 12+1 ; I find 11+1 in both Indian and Australian specimens. There are forty to forty-two rows of scales according to Ogilby, and seventy according to Day ; the number varies greatly according to their position above or below the lateral line, and also in which direction they are counted, but I find no differences in the scales of the Indian and Australian specimens.

Locs.—The specimen figured is a large example 165 mm. long, from east of Frazer Island, Queensland, 25 fathoms. Forty others are preserved from various localities between Low Bluff and Cape Gloucester, Queensland, 15-33 fathoms.

Genus PENTAROGE, *Günther*.

PENTAROGE MARMORATA, *Cuvier & Valenciennes*.

(Plate xxxvi., fig. 2.)

Apistus marmoratus, Cuvier & Valenciennes, Hist. Nat. Poiss., iv., 1829, p. 416. *Id.*, Valenciennes, Reg. Anim. Ill. Poiss., 1843 ?, pl. xxiv., fig. 3. *Id.*, Richardson, Trans. Zool. Soc., iii., 1849, p. 99.

Pentaroge marmorata, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 132. *Id.*, Steindachner, Sitzb. Akad. Wiss. Wien, lvii., 1868, p. 984. *Id.*, Klunzinger, Arch. Nat., xxxviii. i., 1872, p. 28. *Id.*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 82, and ii., 1873, p. 132. *Id.*, Klunzinger, Sitzb. Akad. Wiss. Wien, lxxx. i., 1879, p. 366. *Id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 439. *Id.*, Woods, Fish. & Fisher. N.S. Wales, 1882, p. 49. *Id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 115, and 1890 (1891), p. 31. *Id.*, Waite, Rec. Austr. Mus., vi., 3, 1906, p. 201.

The lengths of the spines of both the fins and the head vary greatly in this species, and there may be either twelve or thirteen in the dorsal. The markings also differ very much in several specimens from various localities, both in form and in intensity, though their disposition is much the same in all ; in some the larger dark blotches are brown, and surrounded by more or less abundant marbling, while in others they are deep black on a plain white ground.

This species is known from Tasmania, Victoria, and south-western Australia. Macleay and Tenison Woods have recorded it from Port Jackson, but their records need verification, since they confused it with the common Fortescue, *Centropogon australis*, Shaw ; as noted by Ogilby[1] nobody has since collected *Pentaroge* in New South Wales. The type specimen was said to have been taken at Timor, which record is also doubted by Ogilby, while Klunzinger had examples from Port Darwin as well as King George Sound and Port Phillip. The specimen figured here was taken in the Swan River, Western Australia, and is 137 mm. long.

Loc.—Eleven specimens, 100-162 mm. long, are in the "Endeavour" collection from off Port Albert, Victoria, 9 fathoms.

1. Ogilby—Proc. Roy. Soc. Qld., xviii., 1903, p. 13.

Genus Minous, *Cuvier & Valenciennes.*

Minous versicolor, *Ogilby.*

(Plate xxxii.)

Minous versicolor, Ogilby, New Fish. Qld. Coast, 1911, p. 111.

D. viii-ix.[1] 12-13; A. 10-11; P. 11+1; V. i.5; C. 12. Head, from tip of lower jaw to end of opercular lobe 2·2 in the length from the premaxillary symphysis to the hypural joint; height 2·6 in the same. Orbit 3·8, shorter than the snout, which is 3·1 in the head. Interorbital space 4·9 in the head. Pectoral 1·3, first dorsal spine 3, last dorsal spine 2·6 in the head. Fifth dorsal ray 2·3, and ninth anal ray 2·6 in the head.

Head with granular bony processes; the intermediate skinny areas covered with minute tubercles. Snout with two diverging ridges on each side, which unite posteriorly and form the anterior boundary of an antero-orbital groove. Preorbital with a star-shaped cluster of ridges on its upper surface, and two marginal spines of which the posterior is much the largest. Bony stay of cheek with a median tubercle from which ridges radiate backwards and forwards. Anterior portion of supraorbital bone carinate and granular; supero-posterior orbital margin with two granular tubercles. A deep interorbital groove defined by longitudinal, granular ridges. A broad, shallow occipital groove. A prominent nuchal granular ridge on each side, which forms an obtuse spine posteriorly. A granular tubercle above the suspension of the preoperculum, another above the operculum, and one on the suprascapular. A strong carinate preopercular spine, above which is an angular projection on the margin of the preoperculum; five others are present on the inferior border, of which the two lower ones are more or less quadrate. Operculum with two ridges which do not terminate in spines.

Lips covered with rounded papillæ; the mandible with a number of short tentacles near the symphysis and a longer barbel near the middle of each ramus. Eye with three branched cirri on its upper portion. Teeth villiform, in bands on the jaws, and forming two groups on the vomer.

Body naked, smooth except on the breast and anterior portion of the back, where it is tubercular like the head.

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1. Ogilby counted nine and ten dorsal spines, but of five specimens four have nine and one has eight.

Lateral line marked by simple pores, which extend in a line from the suprascapular to the upper portion of the caudal peduncle.

Dorsal fin commencing on the nape above the margin of the preoperculum ; the first two spines are more widely separated than the others, and their membrane is deeply notched ; the first is longer than the second and third, the others increase in length backward. Base of soft dorsal a little shorter than that of the spinous portion ; all the rays are simple, the median ones the longest. Anal coterminal with the dorsal and of similar form to the soft portion. Pectoral rays simple, the lower ones somewhat thickened ; the fifth is the longest and reaches to about the middle of the anal ; lower free ray large and thick, reaching the vent or the origin of the anal. Ventral rounded, with a broad base, reaching the origin of the anal. Caudal rounded, its rays simple.

Colour.—Whitish in formalin, with plum-coloured stripes and oblique bars. Two rather irregular stripes extend along the body, the upper one following the lateral line. Several more or less regular oblique bands cross the dorsal fin, which may or may not join the upper body-stripe ; margin of dorsal fin blackish. Pectoral dark with lighter cross-bars. Ventral and anal dusky, the outer portions blackish. Caudal with two or three cross-bars.

The above description is largely based on a specimen 103 mm. long, which is one of the two used by Ogilby in drawing up his description ; it is the specimen figured. Four others of about the same length are preserved. I have compared them with an Indian example of *M. monodactylus*, Bl. Schn., from Dr. Day's collection, and four others from Japan which Prof. Jordan identified as *M. adamsi*, Richardson. They are all very similar, and probably represent only local races of one species : the Indian specimen is rather more elongate than the others, and has a narrower interorbital space ; the cephalic structures, though similarly arranged, differ slightly in the three forms, while the Japanese and Australian specimens have more or less characteristic features in their colour-marking. All these details are subject to considerable variation, however, and a large series of specimens from various localities may show that they are not of specific importance.

Locs.—Seven miles N.N.E. of Gloucester Head, Queensland, 19-35 fathoms.

Platypus Bay, Queensland, 7-9 fathoms.

Family PLATYCEPHALIDÆ.

Genus Platycephalus, *Bloch & Schneider.*

Platycephalus arenarius, *Ramsay & Ogilby.*

Sand Flathead.

(Plate xiii., fig. 1; fig. 3.)

Platycephalus arenarius, Ramsay and Ogilby, Proc. Linn. Soc. N.S.Wales, x., 1886, p. 577. *Id.*, Stead, Ed. Fish. N.S.Wales, 1908, p. 113.

D. viii. 13; A. 13; P. 20; V. i. 5; C. 13. L. lat. 74. Head, to end of opercular lobe, 3·1 in the length to the hypural joint. Snout 3·4 in the head. Eye 1·6 in the snout, and 5·7 in the head. Interorbital width 1·8 in the eye. Third dorsal spine 2·2, second dorsal ray 2·5, longest pectoral ray 2·1, and fourth ventral ray 1·5 in the head.

Ridges of the head low, smooth, not ending in spines. A minute anterior orbital spine. Interorbital space flat. Two ridges extend backward from the orbits, which join a broken series of smaller ridges on either side of the small median one. A low series extends from the eye to the suprascapular.

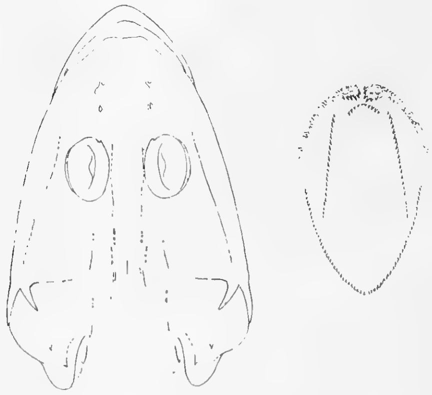

Fig. 3.

Anterior nostril tubular. Two strong preopercular spines, the lower the longest, the other directed obliquely upwards. Maxillary extending to below the anterior third of the eye. Teeth well developed: they are canine-like on either side of the premaxillary symphysis, but rapidly change to villiform ones which form a band on either side; mandibular teeth conical, uniserial; vomerine teeth in a single series, forming an arch, the outer ones large and canine-like; palatine teeth uniserial, conical.

Body covered with small ctenoid scales, which extend forward to the front margin of the eyes. Lateral line scales not differentiated from the others, unarmed. There are about eighty or one hundred and ten rows above the lateral line, according to the direction in which they are counted.

Origin of the first dorsal behind the end of the operculum: first spine minute, third longest; second ray longest, the others decreasing gradually in length. Anal commencing a little behind, and terminating well behind the second dorsal; its rays shorter than those of the dorsal, the third the highest, the others decreasing slightly in length backwards. Ventrals reaching to, or a little beyond the origin of the anal. Caudal rounded.

Colour.—Grey above in formalin, closely speckled with rounded, darker grey spots. Spines and rays of dorsal fins with grey spots. Anal whitish, the membrane between the posterior rays blackish. Pectorals and ventrals spotted. Caudal white, with five striking black stripes, which increase in width below; the upper ones are oblique, the lower horizontal.

Described and figured from a specimen 271 mm. long. Twenty-four others, 225-340 mm. long, exhibit but little variation; the eye is somewhat larger in some than in others, and the interorbital space is from half to two-thirds as wide as the orbital diameter.

Locs.—Northern New South Wales.

Twenty-two miles S.W. of Double Island Point, Queensland, 29 fathoms.

Five miles S.E. of Boomerang Hill, Fraser Island, Queensland, 15 fathoms.

Wide Bay and Platypus Bay, Queensland.

Family CHAUNACIDÆ.

Genus CHAUNAX, *Lowe.*

CHAUNAX FIMBRIATUS, *Hilgendorf.*

(Plate xxxiii., fig. 1-1a.)

Chaunax fimbriatus, Hilgendorf, Gessellsch. Naturf. Freunde, 1879, p. 80.

D. i.i., 12; A. 7; P. 13; V. 4; C. 8. Depth slightly more than one-third the length from the tip of the upper jaw to the hypural joint; breadth about half the same length. Head, measured from the symphysis of the upper jaw to the gill opening, 1·6 in the length to the hypural. Eye shorter than its distance from the tip of the snout, and less than half the interocular space. Sixth dorsal ray and third anal ray subequal in length, and slightly shorter than the fifth pectoral ray. Depth of caudal peduncle rather greater than the length of the eye.

The general form varies in different specimens according to their condition, but in a well-preserved example it is depressed as shown in the accompanying figure ; the ventral surface is almost flat. Maxillary not reaching backwards to the verticle of the anterior margin of the eye. Nostrils placed a little above the level of the middle of the eye ; the anterior is tubular, the posterior a simple opening. Gill-opening situated beneath the fifth or sixth dorsal ray. Each jaw with a band of villiform teeth. There are also two patches on the vomer, and one on each palatine of still smaller teeth.

Head and body covered with soft, loose skin, which is thickly beset with upstanding spinules ; their bases are usually enveloped in the skin, and they are much more minute on the ventral surface than elsewhere. The lateral line system is as usual in the genus, consisting of deep, smooth channels, partially bridged at regular intervals by overlapping spinular scales ; the latter almost meet from either side, and protect minute pores beneath them. A channel commences on either side of the snout and extends backwards to behind the eye, whence it bends downwards, and continuing backwards sweeps down behind the gill opening to the latero-inferior surface of the tail ; it is lost on the base of the third lower caudal ray. Another groove joins the first on the upper surface of the snout and descends first onto the maxillary and then backwards along the middle of the cheek ; it gives off two incomplete branches below and one above, which connects with the corresponding one of the other side across the back, by means of several widely-spaced pores. A third series commences below the chin and runs downwards to the latero-inferior edge of the body ; it is lost above the base of the pectoral fin. The margins of the grooves on the lower parts of the body and tail are more or less thickly beset with white dermal filaments. Others may be present on the lower lip, chin, and sides of the tail.

First dorsal spine short and thick, with a more or less fimbriate apex ; it can be depressed into a smooth, somewhat circular hollow between the anterior margins of the eyes. Second dorsal spine entirely hidden beneath the skin ; its position is indicated by a swelling on the middle of the back. Anterior dorsal ray very small and almost hidden in the skin ; the others increase in length to the sixth and then gradually decrease again. They are mostly simple, but the posterior ones may be divided ; the two last are placed very close together. Anal situated below the end of the dorsal; its third ray is the longest, and some of the posterior ones are divided. Pectoral small, with simple rays, of which the fifth is the longest. Ventrals each composed of four simple rays, the ends of which are curled upwards; they can be entirely withdrawn into the skin at will. Caudal rounded; its rays are thick, spinulose, and more or less divided.

Colour.—Yellowish in formalin, probably pink in life; the back and sides are closely mottled with round greyish spots. Eye opalescent. Fimbriæ of first dorsal spine blackish in larger specimens.

Described from four specimens, 120-215 mm. long; the figure is prepared from a well-preserved example, 132 mm. long. I have compared these specimens with a Japanese example of *C. fimbriatus*, which Dr. C. H. Gilbert very kindly forwarded to this museum, and have found them identical in all details. Günther regarded *C. fimbriatus* as synonymous with *C. pictus*, Lowe, but my specimens differ from his figure of that species[1] in the relative lengths of the body and tail, as well as in the positions of the gill-opening, dorsal and pectoral fins.

Locs.—East of Flinders Island, Bass Strait, 70-100 fathoms; 4th December, 1913.

South of Gabo Island, Victoria, 100-150 fathoms; 16th December, 1912.

South of Cape Everard, Victoria, 90-150 fathoms; 9th April, 1914.

CHAUNAX PENICILLATUS, *sp. nov.*

(Plate xxxiii., fig. 2.)

Two specimens, 74 and 112 mm. long, only differ from *C. fimbriatus*, as described above, in the structure of their rostral tentacles. These have short thick peduncles, which are densely fimbriated, and they almost completely fill the cavity into which they are received. The upper surface of the tentacles and the hinder margin of the cavity are black; the under surfaces of the fimbriæ are white. The differences in the tentacles of the two species are illustrated on plate xxxiii. Both specimens of the new species have fewer dermal filaments than the examples of *C. fimbriatus*, they being developed only on the anterior portion of the head, but this character appears to be variable in the other species. D. 12; A. 6-7; P. 13; C. 8+1; V. 4.

1. Günther—"Challenger" Rept., Zool., xxii., 1887, p. 58, pl. x., fig. a.

The smaller specimen had swallowed an *Apogonops*, which was about 63 mm. long; it was rolled up into a large ball in the stomach. According to a note received from Mr. C. T. Harrison, the rostral tentacle of the larger specimen appeared to be faintly luminous when it was first taken out of the trawl, although it was then nearly dead.

Locs.—South from Gabo Island, Victoria, 100-150 fathoms; 16th December, 1912.

Thirty-three miles S. by W. of Cape Everard, Victoria, 160-200 fathoms; 19th September, 1914.

Family TETRAODONTIDÆ.

Genus Tetraodon, *Linnæus.*

Tetraodon firmamentum, *Schlegel.*

Tetrodon firmamentum, Schlegel, Fauna Japonica, 1847, p. 280, pl. cxxvi., fig. 2. *Id.*, Castelnau, Proc. Linn. Soc. N.S.Wales, iii., 1879, p. 357. *Id.*, Macleay, Proc. Linn. Soc. N.S.Wales, vi., 1881, p. 341.

Tetrodon gillbanksii, Clarke, Trans. N. Zeal. Inst., xxix., 1897, p. 245, pl. xiv.

Three examples, 223-400 mm. long, only differ from Schlegel's figure in having the white spots rather more numerous; they are also more numerous and proportionately larger in the younger specimens than in the large one, being equal to or slightly broader than the interspaces between them, instead of narrower, as described by Günther.

I am indebted to the Director of the Wellington Museum, Dr. J. Allan Thomson, for an excellent photograph of the specimen of *Tetrodon gillbanksii*, which is referred to by Clarke as having been sent to that institution. This leaves no doubt in my mind that that species is identical with *T. firmamentum*, with which it appears to agree in every detail.

Locs.—This species was first made known from Australian waters by its inclusion in a list of Sydney fishes by Castelnau. Macleay later obtained an example from Port Jackson, while I have seen one which was stranded on Bondi Beach, near Sydney, after a storm. The "Endeavour" specimens were trawled off Twofold Bay, New South Wales, in 45 fathoms.

Genus Spheroides, *Dumeril.*

Spheroides tuberculiferus, *Ogilby.*

(Plate xxxiv., fig. 1.)

Spheroides tuberculiferus, Ogilby, Mem. Qld. Mus., i., 1912, p. 61, pl. xiv., fig. 1.

D. 9 ; A.7 ; P. 14-15 ; C. 8. Head, from the upper lip to the upper end of the gill-opening, 3·3·1 in the length from the upper lip to the base of the caudal. Eye 4·2-4·5 in the head. Snout, from middle of upper lip to anterior margin of eye, 2·3 in the head, and not quite twice as long as the eye. Longest dorsal ray 1·8-1·9, longest anal ray 2·3 in the head. Longest pectoral ray 2·1, and median caudal ray 1·4-1·6 in the head. Least depth of caudal peduncle a little less than the length of the eye, 4·5-4·9 in the head.

Chin prominent, square-cut, sometimes projecting beyond the jaws ; its depth almost equal to the length of the eye. Nostrils opening on either side of a rounded papilla, which is placed in a depression. Eye nearer the gill-opening than the end of the snout, its upper margin slightly raised above the cephalic profile ; lower lid free, the upper adnate to the ocular membrane. Gill-opening margined with a number of small, overhanging papillæ ; the inner flap concealed or visible only as a small angular projection.

Skin of the head and body more or less coarsely plicated, as is the back of the tail behind the dorsal fin ; sides and lower surface of tail, and sometimes the cheeks also, smooth. Dorsal surface, from behind the nostrils to a little before the dorsal fin, armed with coarse spinules ; a band of similar spinules behind the pectoral fin, and a few scattered ones in front of the gill-opening ; abdomen spiny from behind the chin to just before the vent. A well-developed fold extends from the chin to the base of the caudal.

Dorsal and anal pointed, the origin of the former a little before the verticle of that of the latter. Median caudal rays a little longer than those on either side of them, the outer ones also slightly produced. Upper pectoral rays longest, the margin rounded.

Colour.—Somewhat variable : either grey or blackish on the back, and closely speckled with small dark dots which increase in size laterally, becoming rounded spots on the sides ; some specimens have irregular whitish spots intermingled with the darker ones. Lower surface white. Dorsal, anal, and pectoral fins without markings ; caudal dusky towards the margin, the tips of the lower rays darker than the rest. Young with four darker cross-bars ; the first behind the eyes, the second curving backwards between the pectorals, the third less curved and including the base of the dorsal, the fourth crossing the caudal peduncle.

I have examined ten specimens of this species, 79-220 mm. long, including a co-type received from Mr. Ogilby. They indicate that the original description is not quite accurate in several details, so I have redescribed them here; the accompanying figure represents the largest specimen, which was trawled in Western Australian waters by the "Endeavour."

Locs.—Between Cape Naturaliste and Geraldton, Western Australia.

Nine to twenty miles off Bustard Head, Queensland, 14-20 fathoms.

Twenty-two miles S.W. of Double Island Point, Queensland, 29 fathoms.

Specimens are in the Australian Museum collection from Cottesloe Beach, Swan River, and Shark Bay, West Australia; and Moreton Bay, Queensland.

Family MONACANTHIDÆ.

Genus CANTHERINES, *Swainson.*

CANTHERINES MOSAICUS, *Ramsay & Ogilby.*

(Plate xxxvii., figs. 1, 2.)

Monacanthus mosaicus (Ramsay & Ogilby), Waite, Mem. Austr. Mus., iv., 1, 1899, p. 93, pl. xvii., fig. 1.

Seven specimens, 87-413 mm. long, show that this species alters considerably in form with growth. The body is orbicular in the young, but becomes more elongate with age; the depth is 1·2 and 1·8 in the length to the hypural in the smallest and largest specimens. A ventral expansion of the abdomen is present in some of the youngest examples, but is reduced in specimens 110 mm. long, and is almost lost in the larger ones. The forehead is swollen in some of the small specimens, making the snout more or less concave above, but this character is variable. Finally the armature of the dorsal spine is much stronger in the young than in the adult, the four rows of spinules being minute in the largest specimen. The figures on Plate xxxvii represent the largest and smallest of the "Endeavour" specimens.

Locs.—Shoalhaven Bight, New South Wales, 16-45 fathoms.

Twofold Bay, New South Wales, 20 fathoms.

Twenty miles south of Cape Everard, Victoria, 69 fathoms.

East coast of Flinders Island, Bass Strait.

Marsden Point, Kangaroo Island, South Australia.

South-east of Flinders Island, South Australia, 37 fathoms.

I have also seen a young specimen from Albany, South-western Australia.

1915

Commonwealth of Australia

Department of Trade and Customs

FISHERIES

Biological Results of the Fishing Experiments carried on by the F.I.S. "Endeavour," 1909-14.

H. C. Dannevig,
Commonwealth Director of Fisheries

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V. Report on the Polychæta obtained by the F.I.S. "Endeavour" on the coasts of New South Wales, Victoria, Tasmania and South Australia.

PART I.

BY

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Plates XXXVIII.–XLV.

REPORT ON THE POLYCHÆTA.

PART I.

I.—INTRODUCTION.

AT the request of the Curator of the Australian Museum, Mr. R. Etheridge (acting for the Hon. the Minister for Trade and Customs), I undertook the examination of the series of Polychæta which were dredged by the Federal Investigation Ship " Endeavour," chiefly off the east coast of Tasmania and the southern and eastern coasts of Australia. Owing to my University duties, I have only a few months in the summer available for research work of a continuous character, so that it has only been possible to work through about two-thirds of the material. Hence any general summary of the results must stand over till the publication of the second part.

Our knowledge of the Polychæta of the Australian seas is very meagre. We know something of those occurring in Port Jackson from the work of Professor W. A. Haswell,[1] published a good many years ago in a series of papers in the " Proceedings of the Linnean Society of New South Wales." He includes an account of several of the species which had been previously described by Schmarda[2], who collected in this region and elsewhere, and by other early zoologists as Baird, Kinberg and de Quatrefages, each of whom had described one or more species which had been incidentally and occasionally collected by early voyagers or collectors.

As to the worms from deeper water, our knowledge is confined to what is recorded in that monumental volume in the series of " Challenger " Reports by Professor W. C. M'Intosh.[3]

It may be well to give this list of worms obtained during that voyage.

Station 158, considerably south of Australia, Lat. 50° 1′ S., Long. 123° 4′ E., 1800 fathoms ; Globigerina ooze.

Hyalinoecia benthaliana, M'Intosh.
Grubianella antarctica, M'Intosh.

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1. Haswell—Proc. Linn. Soc. N.S. Wales, iii., 1879 ; *Id., Ibid.*, vii., 1883 ; *Id., Ibid.*, ix., 1885 ; *Id., Ibid.*, x., 1886 ; *Id., Ibid.*, (2), vi., 1892.
2. Schmarda—Neue Wirbellose Thiere, 1861.
3. M'Intosh—Chall. Rep., Zool., xii., 1885.

Station 160, south of Australia, Lat. 42° 42′ S., Long. 134° 10′ E., 2600 fathoms; red clay.

Eunoa abyssorum, M'Intosh.
Polynoe ascidioides, M'Intosh.

Station 162, Bass Strait, Lat. 39° 10′ S., Long. 146° 37′ E., 38 fathoms; sand and shells.

Polynoe platycirrus,[1] M'Intosh.
Thalanessa oculata, M'Intosh.
Staurocephalus australiensis, M'Intosh.
Eunice vittata, D. Chiaje.
Eunice pycnobranchiata, M'Intosh.
Eunice bassensis, M'Intosh.

Station 163A, Twofold Bay, Australia, 150 fathoms; green mud.

Phyllodoce duplex, M'Intosh.
Sabellaria (Pallasia) giardi, M'Intosh.
Terebella grubei, M'Intosh.

Station 163B, off Port Jackson, 35 fathoms; hard ground.

Aphrodita australis, Baird.
Thalanessa fimbriata, M'Intosh.
Eunice aphroditois, Pallas.
Sabella fusca, Grube.

Station 186, Torres Strait, Lat. 10° 30′ S., Long. 142° 18′ E., 8 fathoms; coral mud.

Lepidonotus cristatus, Grube.
Eupompe australiensis, M'Intosh.
Eunice torresiensis, M'Intosh.
Eunice tribranchiata, M'Intosh.
Hyalinoecia tubicola, Muller, var. *papuensis*, M'Intosh.
Thelepus, sp.

With the first and the last stations we have here no concern, as they lie outside the limits of the cruise of the "Endeavour."

But we may consider the remaining stations, for they were approximately covered by this vessel.

Out of the fifteen species obtained at these four stations by the "Challenger" at depths from 35-2600 fathoms, all but four were new to science.

1. So written in the text, but in this list and in that of bathymetrical distribution it is written "*platycirrata*."

Of the twelve new species then found, so far as the present material has been examined, the "Endeavour" collection contains four, namely, *Stauronereis* (*Staurocephalus*) *australiensis*, *Polynoe platycirrus*, *Eunice pycnobranchiata*, and *E. bassensis*, the last, having been founded for a small fragment, it is now fully described for the first time.

Two world-wide species, *Eunice siciliensis* and *Hyalinoecia tubicola*, are also represented, while *Hesione splendida* and *Nephthys macrura* are known from other parts of the world.

New species of the interesting and rare Lumbriconereid genera, *Oenone* and *Lysarete* are here established. But perhaps the most interesting feature of the collection is the abundance of the polynoid genus *Physalidonotus*, originally discovered in New Zealand, and later on in Japanese waters. I find it necessary to make four new species, and it will probably be found to be widely distributed through the Pacific Ocean.

From the subjoined list it will be seen that I have found it necessary to establish eleven new species, while two others are possibly new to science.

Under each species here recorded I have added the geographical distribution so far as the literature at my disposal enables me to do so.

LIST OF SPECIES.

Family HESIONIDÆ.

Hesione splendida, Savigny.

Family APHRODITIDÆ.

Sub-family POLYNOINÆ.

Polynoe platycirrus, M'Intosh.
Lepidonotus hedleyi, sp. nov.
Lepidonotus willeyi, sp. nov.
Physalidonotus rugosus, sp. nov.
Physalidonotus laevis, sp. nov.
Physalidonotus turritus, sp. nov.
Physalidonotus paucibranchiatus, sp. nov.
Harmothoe etheridgei, sp. nov.
Scalisetosus australiensis, sp. nov.

Family SIGALIONIDÆ.

Sub-family SIGALIONINÆ.

Thalanessa oculata, M'Intosh.
Sigalion, sp. incert.

Sub-family ACOETINÆ.

Eupompe australiensis, M'Intosh.

Family ALCIOPIDÆ.

Halodora, sp. ?

Family NEPHTHYDIDÆ.

Nephthys macrura, Schmarda.

Family AMPHINOMIDÆ.

Chloeia inermis, Quatrefages.
Notopygos labiatus, M'Intosh.

Family STAURONEREIDÆ.

Stauronereis australiensis, M'Intosh.

Family EUNICIDÆ.

Sub-family EUNICINÆ.

Eunice siciliensis, Grube.
Eunice bassensis, M'Intosh.
Eunice pycnobranchiata, M'Intosh.

Sub-family ONUPHIDINÆ.

Hyalinoecia tubicola, Muller.

Family LUMBRICONEREIDÆ.

Lumbriconereis sphaerocephala, Schmarda.
Lumbriconereis gulielmi, sp. nov.
Oenone haswelli, sp. nov.
Lysarete australiensis, sp. nov.

II.—Description of the Genera and Species.

Family HESIONIDÆ.

Genus Hesione, *Savigny*.

Hesione splendida, *Savigny*.

Hesione splendida, Savigny, System. des Annelides, 1820, p. 40, pl. iii., fig. 3.

Hesione ceylonica, Grube, Proc. Zool. Soc., 1874, p. 327.

Hesione pacifica, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 184.

Hesione ehlersi, Gravier, Nouvelles Archives de Museum Paris, 1900, p. 175.

A comparison of the descriptions of the above species inclines me very strongly to the opinion that they are synonymous. I can find no definite characters that serve to distinguish the one from the other. True, one author gives some detail that is not mentioned by another. In the case of Savigny's account, for example, an inspection of the figures alone has led some authors to regard that species as blind and as being without prostomial tentacles; but, as Grube has pointed out, these organs are mentioned in the diagnosis of the genus *Hesione* on the previous page of the work, and as this species is the type, eyes and tentacles must have been present, though overlooked by the artist. Grube has also, on more than one occasion, made it clear from a careful perusal of the diagnosis and of the figures, that the species has four pairs of peristomial cirri. I note that in the drawing, too, the preanal cirri are not included, though reference is made in the text to them.

M'Intosh notes that his species is nearly allied to Savigny's, though the "body is more elongate and the shape of the head is different."

Grube[1] writes of *H. ceylonica*:—"Species cum *Hesione splendida*, Sav., maxime congruens, sed dorso fuscius lineato, haud transverse sulcatc, cirrisque tentacularibus longioribus differens," and Willey[2] has that it "is probably a geographical form of *H. splendida*."

1. Grube—Proc. Zool. Soc., 1874, p. 327.
2. Willey—Ceylon Pearl Oyster Fisheries, pt. iv., Suppl. Rep., xxx., —Polychæta, 1905, p. 266.

It is curious that Gravier in referring to Savigny's species on p. 179, repeats the error about the tentacles which had been pointed out previously by Ehlers and Grube.

So far as I can see the only differences are in reference to these errors and the dimensions of the various forms. They all agree in being uniformly coloured without pattern, such as occurs in most of the other species typified by *H. pantherina*, Risso.

A re-examination of the species is desirable.

The following is a description of the single specimen obtained by the " Endeavour " :—

Length, 47 mm. ; widest at mid-body, 8 mm., or including the parapodia 19 mm. From this point it tapers towards each end, the first segment measuring 4 mm. and the last 3 mm.

The anus is situated at the end of a funnel turned dorsally, and this funnel is preceded by a preanal segment, which is dark brown, the rest of the body being a pale yellowish tint. The worm is, perhaps, like Savigny's type, " margaritaceous " or " pearly " in life.

The usual division-lines are noticeable, separating a median dorsal area from lateral areas, and the sides are swollen at the points to which the parapodia are attached.

On the under surface the median area is dotted with brown pigment. This is not mentioned by other authors, but it does not seem to me a specific character ; this dotted area is interrupted by pale circular spots at each intersegmental line (possibly over the ganglia).

The head is a good deal compressed owing to pressure against the bottom of the tube ; the prostomium is broader than its length, and its width is about one-third that of the peristomium, which is intimately fused with its anterior end. It is bilobed, with two pairs of eyes, and anteriorly a pair of minute tentacles which are easily overlooked, but can be detected on using a Leitz dissecting microscope, No. 16. Each is a transparent somewhat elongated conical organ. The peristomium, composed of four segments fused, is as wide as the first chætigerous segment. It carries eight couples of long peristomial cirri on each side, the dorsal cirri being about twice as long as the ventral, and the longest reaching as far back as the fourth chætigerous. The first ventral cirrus is shorter than the others.

These cirri have enlarged cirrophores, and the flagellum is minutely annulated.

The 16 parapodia have the usual form, and each carries a long dorsal cirrus, springing from an enlarged cirrophore; the filament being about three times the length of the parapodium, that is, as long as the width of the body. The four anterior parapodia are smaller, the first much shorter, than the rest.

The chætophoral sac has at its antero-dorsal margin a short filamentous "ligule" into which the black aciculum projects. This is easily overlooked unless the foot is mounted with the anterior surface upwards. It is not shown in M'Intosh's figure of the foot.

The chætæ are pale yellow, and of the usual form.

The ventral cirrus reaches beyond the end of the parapodium almost to the tips of the chætæ.

The preanal segment carries dorsal and ventral cirri but no distinct parapodium. The subanal cirri, borne by the anal funnel, are as long as the dorsal cirri anteriorly.

Loc.—Off Babel Island, Bass Strait, 50-80 fathoms.

Distribution.—Red Sea, Indian Ocean, Pacific Ocean (Tongatabu).

Family APHRODITIDÆ.

Sub-Family POLYNOINÆ.

Genus Polynoe (*sensu latu*),[1] *Savigny*.

Polynoe platycirrus, *M'Intosh*.

Polynoe platycirrus, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 111, pl. iii., fig. 4, pl. xvi., fig. 2, pl. xix., fig. 3, pl. viiiA., figs. 14, 15, pl. ixA., fig. 1. *Id.*, Potts, Trans. Linn. Soc., Zool. xiii., 1910, p. 336.

The material consists of two entire individuals and the greater part (anterior end included) of a third.

A complete specimen measures 75 mm. in length by 9 mm. across the elytra and 12 mm. over the ventral chætæ.

1. The whole subject of the delimitation of the genera of the Polynoinæ seems almost in as much confusion as at the time Grube wrote his classic paper "Bermerkungen Fam. Aphroditen Polynoina," in 1875.

These differ from the type in the colour of the elytra, which are uniform pale pinkish brown. They lack the "four darker longitudinal belts" which, being continuous with those of the other elytra, give the striping which M'Intosh regarded as characteristic of the species.

I find also that there are 24 pairs of elytra in both the entire individuals, instead of "about 23 pairs" recorded by M'Intosh. They are on the parapodial segments 1, 3, 4, 6, 8, etc., up to 42, 44 and on 45. This last scale, then, is in an unusual position, being on a consecutive instead of on an alternate segment.

There are seven postelytral cirriferous segments, giving in all 52. M'Intosh's largest specimen measured only 45 mm. in length by 10 mm. "total breadth," and his drawing shows 48 parapodia on each side.

It is possible, then, that they were not fully grown. It is not unlikely, it seems to me, that in these species with longish bodies the number of segments and even of the elytra may increase with age. Thus Potts records that specimens measuring 30 and 33 mm. had 19 or 22 pairs of elytra respectively.

In all other respects my specimens agree with M'Intosh's, especially in the unique structure of the dorsal cirrus, which is flattened from side to side, so as to be band-like. This is of more weight than any trifling difference in size or colour.

I may add one or two notes in extension of the former accounts. The parapodium is practically uniramous, for the notopodium is represented by a very small lobe on the anterior of the upper surface containing an aciculum and some two or three very small chætæ such as M'Intosh figures and which recall those of *L. simplicipes*, Haswell.

The neuropodial lobe carries a large number of stout chætæ in two groups—a supra- and a sub-acicular group—which are distinctly separate when seen from the side of the animal. But all are alike in structure, the supra-acicular group consists of 4-5 horizontal rows, with 2-3 in a row, giving a total of about 14-15 chætæ in a middle foot.

The sub-acicular group are in 8-9 tiers, of three in the upper and lower tiers and five in the middle ones, a total of 38-40. These chætæ are bifid, with 20 pectinated frills, and agree precisely with M'Intosh's figure.

Locs.—Off Babel Island, Bass Strait, 50-80 fathoms.

Off Gabo Island, Victoria, 200 fathoms.

Distribution.—The "Challenger" specimens came from off East Moncœur Island, Bass Strait, 38 fathoms, and off Twofold Bay, New South Wales, in 120-150 fathoms. Another is recorded from 2,200 fathoms from Station 163, quite close to this latter locality.

These three "Challenger" stations, then, are practically the same as the two stations from which the "Endeavour" obtained the above material.

Indian Ocean (Potts).

Genus LEPIDONOTUS, *Leach* (*sensu stricto*), *Kinberg*.

LEPIDONOTUS HEDLEYI, *sp. nov.*

(Plate xxxviii., figs. 1-7.)

It is with some little hesitation that I make a new species for the single individual, which bears some resemblances to *L. lissolepis*, Haswell, and to *L. purpureus*, Potts, to which I refer below.

The specimen is ill preserved, and superficially resembles *Harmothoe etheridgei* in its grey colour.

It measures 20mm. by 9mm. over the chætæ, as measured on the ventral surface, for the animal is flattened, somewhat distorted, and the elytra displaced so that dorsal measurements are uncertain. The elytra are uniformly pale gray, translucent, oval, thin and a good deal crumpled; they overlap but slightly fore and aft, and do not entirely cover the back. The dorsal surface of the body is marked by transverse bands of dark pigment; each band is composed of a series of very narrow lines close together, crossing the body in the alternate annuli (for as in other Polynoids each segment is biannulate as in many Earthworms); and each band is of the same width as the intervening uncoloured band.

The elytra (Pl. xxxviii., fig. 1) appear to be smooth under a lens, but are really sparsely covered with uniformly arranged low conical tubercles which have an oval base, so that they present under a low magnification a characteristic appearance of elongated refringent dots with a slit along its middle (Pl. xxxviii., fig. 3).

Each elytron (Pl. xxxviii., fig. 1) is oval with a slight anterior emargination, and is rather broader externally; the circular white areola is nearly central. The anterior region of each is pigmentless and transparent, the pigment is rather darker round the areola especially in the posterior region. The pigment occurs as minute black granules in certain round cells rather widely scattered amongst clear empty cells (Pl. xxxviii., fig. 2). There is no fringe.

The notopodium (Pl. xxxviii., fig. 4) is small, and contains about 12 pale almost colourless chætæ, all alike, with incomplete spiral frills: for in some aspects the serrulations appear to be limited to one side.

The neuropodium is bluntly pointed, with yellow-golden chætæ, thicker than the notopodials, about 24 or 25 in number; these have a subapical tooth, and from 9 to 15 pectinated frills, according to their position in the bundle; the most distal frill having large teeth (Pl. xxxviii., figs. 6, 7).

The dorsal cirrus is pale brown for about half way along its length, then white, with a dark band a little below the tip, giving the appearance of a subterminal swelling.

The prostomium is typically lepidonotan; it is as long as its breadth. The anterior eyes are at its widest point; the posterior pair are far back, close to the nuchal fold.

The tentacles are smooth; the median is lacking. The laterals are long slender, and colourless, except for a pale grey ring below the subterminal swelling.

Remarks.—In *L. lissolepis*, Haswell, from Port Stephens, the elytra are described as "smooth, rather delicate, dark slatey-brown, the pigment being arranged in minute dense lobed corpuscles instead of in separate granules." This appears to be quite different from the arrangement above described, and his figure of the chætæ is too poor to be sure that it agrees, except in a rough way, with those of the present species.

L. purpureus, Potts,[1] is also only briefly described. Its colour, however, is said to be "purple brown," and the pigment is "concentrated in little masses" between clear cells, giving a honeycomb appearance.

The surface of the elytron is "strewn with little chitinous tubercles showing a slight median depression."

His figure is not very clear, though if the dark circular things are meant for the tubercles they do not agree with those before me.

But both these seem from other features to be nearly allied to one another and to the present.

1. Potts—*Loc. cit.*, p. 331.

Loc.—Forty miles west of Kingston, South Australia, 30 fathoms.

Lepidonotus willeyi, *sp. nov.*

(Plate xxxviii., figs. 8-15.)

? *Lepidonotus carinulatus,* Willey, Ceylon Pearl Oyster Fisheries, part iv., Suppl. Rep., xxx.,—Polychæta, 1905, p. 248. *Id.*, Potts, Trans. Linn. Soc., Zool., (2), xiii., 1910, p. 331.

A single imperfect specimen which measures 9mm. by 4mm. over the chætæ, and only 2·5 across the body ventrally. It is imperfect posteriorly, as it contains only 19 pairs of parapodia, and 10 elytrophores. The elytra are, with the exception of 3 or 4 pairs, lacking.

The specimen is a poorly preserved male.

Under a lens the colourless elytra are covered in their exposed regions by pale brown roundish tubercles of relatively large size on the lateral area, and on the areola, which is somewhat raised. A patch of pale reddish brown pigment occurs above the scar.

The anterior concealed region is covered with much smaller hemispherical tubercles (Pl. xxxviii., fig. 8). The large tubercles, which appear to be round under a lens, are on focussing seen to be polygonal at the base, and to be produced into a variable number, and variably arranged short blunt processes.

Perhaps these correspond to Willey's "echinulate" tubercles, though the spines shown by him are sharper at the point.

Towards the external margin there occur a few rows of "spinulate" tubercles, short columns of various sizes, terminating in a variable number of sharp spines (Pl. xxxviii., figs. 9, 11).

The elytra are fringed only on the external margin with coarse, relatively long cylindrical processes.

All these outgrowths of the elytra are covered by abundance of very fine particles, which masks their details to a great extent.

The prostomium is relatively long, narrowed posteriorly, with the anterior eye laterally at the greatest width, which is about midway along the side ; the posterior eye is about midway between this and the hinder end of the prostomiium

The median tentacle is broken, the laterals are relatively short, and, excluding the base, each is equal to the length of the prostomium ; there is apparently no sub-terminal swelling, though as the animal is soft, it may be present in life ; they are smooth and colourless. The palps are pale brown with a white tip.

The dorsal cirri have a subterminal swelling, though feebly developed, and the pigmented ring below it no doubt adds to the effect. The parapodium (Pl. xxxviii., fig. 12) consists of a small notopodium only slightly prominent, and a large neuropodium whose lower margin slopes upwards to meet the upper at a blunt point, at which is the short acicular ligule. The notopodial chætæ are of two kinds, which differ only slightly from one another. The upper (*a*) are about 12 in number, shorter than the second kind, but of unequal lengths ; they are arranged in a semicircle above the bases of these. Each terminates in a blunt smooth apex, at a little distance from which the usual frills commence (Pl. xxxviii., fig. 13). The second kind (*b*) are about 7 in number, longer, but of the same diameter ; the tip, however, is extremely fine, and appears to be flexible ; the frills are continued to the apex (Pl. xxxviii., fig. 14).

The neuropodial chætæ are 24 in number, with a sub-apical tooth, and about five frills, of which the uppermost has stouter denticulations than the rest (Pl. xxxviii., figs. 15, 15a)

Remarks.—Willey described a species from Ceylon under the name *L. carinulatus*, Grube, and Potts identifies one from the Indian Ocean under the same name. And at first I supposed that I had a specimen of Grube's species before me, as it agrees very closely with the account given by these two zoologists.

The chief reason for disagreeing with Willey's determination of his species is the presence of a sub-apical tooth on the chætæ, for Grube makes no mention of it, either in his original diagnosis of the species, to which neither of the above authors refer, nor in his second account of specimens from the Philippines.

Indeed, the original account[1] contains the following description of the chætæ—" inferiores fere 24-nae, apice graciliori simplici—sub eo vix dilatatæ, dentibus 4 serratæ, extremo majore."

1. Grube—Anneliden des rothen Meeres (Ehrenberg gesammelt). Monatsber. Kgl. Akad. Wiss. Berlin, 1869, p. 7.

He here speaks of a "simple apex." Had he meant to imply that there was a tooth below the apex, he would surely have used the words "apice bidente" as in his diagnosis of *P.* (*Harmothoe*) *grisea*, on p. 9.

Grube's account of the elytron in his second memoir[1], however, seems certainly to apply to that of the specimen before me, and to those which Willey and Potts describe. He says that they appear, under a feeble magnification ("schwach bewaffnet Augen"), as presenting a network of closely arranged tubercles, which appear rounded, but are in reality polygonal, and each is crossed by a small low "keel" or light stripe. But are we justified in identifying a worm as *L. carinulatus*, because it has elytra of apparently the same pattern, when the more important chætæ are so different ?

I think, therefore, that Willey and Potts had before them specimens of this new species, *L. willeyi*, and not Grube's species. It is true that Willey describes on the elytra of his worm some large rounded tubercles as "echinulate," but Potts does not find any such marked echinulations, nor are they present in this individual. Probably the short rounded outgrowths above described represent these spines. Potts' account agrees precisely with what I have seen.

Loc.—Off Maria Island, Tasmania, 78 fathoms (with *Eunice pycnobranchiata*, *Physalidonotus rugosus*, and *Glycera*, sp.).

Genus Physalidonotus, *Ehlers*.

The genus was established by Ehlers[2] for the reception of a worm described in detail by W. M. Thomson[3] in 1900 under the name of "*Lepidonotus giganteus*, Kirk," which had been previously named by Quatrefages "*Aphrodita squamosa*." The leading peculiarity to which the Ehlers' term refers is the possession of branchial "papulæ" on the sides of the parapodia, such as occur in the Acoetan genus, *Eupolyodontes*, and the existence of a definite dorsal channel below the elytra for the passage of the respiratory current backwards to its exit between the last pair of elytra; the mesial portion of the elytra being supported by certain low tubercles or pads of (? muscular) tissue along the back.

1. Grube—Annulata Semperiana, 1878, p. 26.
2. Ehlers—Neuseeland. Annelid., 1904, p. 9.
3. Thomson—Proc. Zool. Soc., 1900, p. 974.

A translation of Ehlers' diagnosis is:—"Polynoinæ with 20 pairs of leathery, rugged elytra covering the back; three tentacles with large basal joints at the anterior margin of the prostomium; a nuchal caruncle; chætæ between the peristomial cirri; finely denticulated dorsal capillary chætæ on a short dorsal foot-lobe, and stout chætæ with serrate frills in the ventral lobe; with bladder-like evaginations around the base of the cirro- and elytro-phores."

Previous to Ehlers' memoir, Moore[1], in 1903, had described two species of *Lepidonotus* from the coastal slope of Japan, viz., *L. chitoniformis* (p. 405) and *L. branchiferus* (p. 409), which clearly belong to this same genus. He pointed out their "evident relationship to *L. giganteus*, Kirk, from New Zealand," and suggested that the three species "might very properly be segregated as a distinct generic group."[2]

Amongst the material from the "Endeavour" dredgings I find four new species of this remarkable branchiate genus, and am therefore able to add one or two characters to the diagnosis of Ehlers and to delete two.

In the first place he includes the presence of chætæ on the peristomium; but these Bourne[3] long ago showed to occur in the genus *Lepidonotus*, and other early authors have recorded them.

The "Nackencarunkel" is also attributed to the genus; but in this I fancy Ehlers was misled by Thomson's figure of the head (Pl. 51, fig. 4) where he shows the first of the series of dorsal tubercles or elytron supports, labelled "d.t.1," and which he explains as "the first dorsal tubercle in the respiratory channel." It overlaps the base of the prostomium, but is not analogous with the "caruncle" of Amphinomids.

Additional characters are as follows:—

(1.) All the species agree in having the elytra attached by a long, narrow oval cartilaginoid tissue in the elytrophore, which is set transversely to the body axis in line with the foot, and leaves a very distinct, long oval scar on the elytron; whereas in all other species of Polynoinæ and Aphroditinæ, so far as the figures inform me, the elytrophore and its scar is a more or less circular thing; but in *Iphione muricata*, Savigny shows (Pl. iii., fig. 1) them as oval.

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1. Moore—Proc. Acad. Nat. Sci. Philadelphia, 1903, p. 401.
2. He notes, too, that "*L. branchiata*, Treadwell (Bull. U.S. Fish. Comm., xx., 1903, p. 186), from Porto Rico, possesses similar branchiæ, but the setæ and elytra are different."
3. Bourne—Trans. Linn. Soc., Zool., ii., 1883, p. 347.

(2.) In all the species so far examined the elytron is fringed with long filamentous processes, usually termed "cilia," over the posterior, the lateral and part of the anterior margin.

(3.) The ventral chætæ are not as figured by Thomson, but are bearded, as correctly shown by Moore for his species; and a re-examination of several individuals of *P. squamosus* shows that the short "frills," so characteristic of the Polynoids, are in reality formed by the bases of these long hairs. It may be mentioned that Thomson, in his description of the chætæ (p. 981), writes:—"Rows of minute filiform spines, but bearing no comb-like plates," and his figure shows short hair-like processes. All the specimens at my disposal are of rather large size, and these hairs have been worn away, leaving short frills composed of very minute and very thin and numerous processes, of unequal lengths. It is clear that Thomson had this in view, and recognised that the chætæ differed from the usual type.

Such bearded chætæ occur also in *Iphione spinosa* as figured by M'Intosh in the "Challenger" Report.

(4.) It appears to be characteristic to possess on the upper surface of the cirriferous segments and encroaching on the feet large transversely oval cushions (the dorsal "tubercles" of Grube), similar to, but smaller than, the elytrophoral cushions. In the figures of Polynoids, of which the naked dorsal surface is carefully drawn, these, though present, are much less conspicuous. Their great development here seems to be related to the improved respiratory system, evidently serving to direct the incurrent water between the feet on its way to the respiratory channel on the back, and so ensuring that it passes over the gills which are set along the faces and upper surfaces of the feet.

(5.) In all the species the elytra are supported mesially by a series of small "pads" along the back[1]—two pairs or two single ones in each segment, which, as in other Polynoids, are biannulate.

The first two pads are median and belong to the first parapodial segment; then follows a double series, median in position and close together, which extends till the tenth, thirteenth, or even, in one species, to the fifteenth segment, after which comes a median series, which ceases in the nineteenth segment. The channel thus formed along each side of this row of pads continues till the last elytron on the

1. Similiar pads are shown in a few other Polynoids, e.g., *Harmcthoe tuberosa*, Ehlers.

twenty-second segment, above which is the "excurrent aperture" noted by Thomson as being formed by excavations on the mesial margins of the last pair of elytra, which margins are slightly upturned to limit a definite aperture.

(6.) The large tufts of very fine dorsal chætæ are so arranged as to meet the neighbouring tufts, before and behind, and these chætæ are covered with numerous fine hairs or long denticulations in which the fine particles become entangled as they are being carried inwards by the current. They serve, in fact, as a filtering apparatus.

(7.) Again, around the base of the dorsal cirrus, in all the species, is a large gland from which the cylindrical cirrophore arises, and thus divides the gland into two portions.[1] This gland is separated from the dorsal cushion by a distinct space on which in some species are the dorsal gills. May it be that this gland secretes a mucous material which also entangles fine particles which have escaped the filtering action of the chætæ? One finds delicate strands of stuff, with entangled particles, in between the feet and between the cushions.

The genus is in one respect at least more nearly related to the Aphroditinæ than to the Polynoinæ, namely in the form of the intestinal cæca, which are long and branched, and the ends reflexed, and lying below the "cushion" and elytrophores, whereas in the Polynoinæ these organs are shorter, simpler, and apparently not bent backwards.

The genus is, then, a specialised Polynoid in which certain modifications have occurred in the feet as well as in other parts of the body in the direction of perfecting the respiratory functions; and it presents an interesting instance of adaptation to its mode of life.

All the species come from some depth. The New Zealand forms are usually found in from 20-40 fathoms of water, with a bottom of ooze or fine sand. It is true that we sometimes find the animal on shore, but it may be that it has been carried there after a storm, for they are only occasionally found when shore-collecting. I have found them inside fishes.

The two Japanese species were obtained from 30-63 fathoms; and the new species occur in deep water, down to 200 fathoms.

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1. A similar gland occurs in other Polynoid genera.

Physalidonotus rugosus, *sp. nov.*

(Plate xxxviii., figs. 16-22 ; Plate xxxix., figs. 23-25.)

A stout oval Polynoid, measuring 48 mm. in length by 22 mm. across the elytra, and 27 mm. over the ventral chætæ. The diameter of the body alone measured over the ventral surface is 10 mm. The height at about the middle is 9 mm.

The 12 pairs of elytra completely cover the back and overlap considerably in the fore and aft direction. They are attached firmly, are of a cartilaginoid consistency, shiny white below. The region of each which is covered by its predecessor is smooth and nearly white ; the rest of the exposed surface is extremely rough, with smaller and larger tubercles and papillæ of various shades of brown ; but a small area just in front of the "areola" is rather conspicuous, owing to the pale ground colour, with small, pale tubercles. The external or lateral region is thinner than the rest, and where it covers the parapodium may be folded upwards owing apparently to the contraction of the body wall and elytrophore.

The "areola," or scar as it is sometimes called—that is, the area by which it is attached to the elytrophore, is an elongated oval, transverse to the long axis of the body. At the mesial or upper end of this areola is a small group of 4-6 long sub-cylindrical spinose papillæ, terminating in an enlargement covered with conical spines (Pl. xxxviii., fig. 19). These "areolar papillæ" measure from 1.0 to 1.5 mm. in length.

In addition, there may be one or two isolated similar papillæ near the external end of the areola.

The entire free edge, *i.e.*, the lateral and posterior margins, is fringed with similar papillæ, shorter on the posterior but longer on the lateral edge, where they measure from 1.5 to 1.75 mm. Moreover, they are not confined to the latter edge, but some 2-3 rows of rather smaller papillæ occur on the surface of this region close to the edge (Pl. xxxviii., fig. 18).

These long laterally placed papillæ form a very conspicuous fringe overlying the notopodial chætæ. They are pale, transparent, and probably colourless in life.

The shape of the elytron in the mid-body is roughly a rectangle with rounded corners, and with a slight excavation on the anterior margin ; its long axis is transverse to that of the body.

The first elytron is sub-circular and bears the long papillæ on its anterior edge as well as in the usual position.

The second is reniform, having a very deep concave excavation of its anterior margin, which fits round the first elytrophore.

So much can be observed with the naked eye ; microscopic examination reveals the fact that amongst the large tubercles and long papillæ are smaller tubercles, stellate in form, of various sizes and of various shades of brown and stages of development. Many have a radiate base, or with spines close to the base, from which springs a column, terminating in radiating spines 3-5 in number (Pl. xxxviii., figs. 20, 21).

The long marginal papillæ are in reality long inverted cones with a narrow base of attachment and slightly expanded end, which is produced into two or three or more long spines, and the sides also bear spines. In the type they are more numerous and blunt, and resemble the pictures in children's books of an ogre's club.

The actual margin of the elytron is fringed with delicate hair-like "cilia" around the lateral, posterior, and the outer portion of the anterior margin.

The gills.—The branchial organs are thin-walled, finger-shaped hollow outgrowths of the body-wall, and may be termed "papulæ" (a word in common use for similar organs in the Asteroidea). These papulæ commence on the third parapodium, where there is a single one on the anterior and on the posterior face, but they soon become more numerous ; then for a few segments before ceasing they decrease in number, and die out after the 23rd segment, which carries the last pair of elytra.

The arrangement, which may be regarded as normal for this species, as seen at about the middle of the body (Pl. xxxix., fig. 25), is as follows :—

On the anterior face of the parapodium there is a row of four papulæ, commencing at the "cushion" and sloping downwards along the anterior limit of the upper surface of the foot, the most distal of the row lying close to the base of the notopodium. There is a second row at a lower level, consisting of two (or occasionally three) papulæ, of which the distal is the larger and lies below the upper distal papula ; the proximal is removed by some little space from the axilla.

On the posterior face the arrangement is somewhat different ; there is a row of three commencing at the cushion, and the distal papula is close to the base of the cirrus (in the cirriferous segments). There may also be a couple of small papulæ springing from the posterior face of the cushion. A lower row of two, the proximal near the axilla, the distal about half-way down the side of the foot. This row is nearly vertical, running down the axillary angle between the two feet (Pl. xxxviii., fig. 22).

The arrangement on the elytriferous segments is nearly the same, though there are usually three papulæ in the lower row on the posterior face, the proximal or uppermost being close to the axilla.

The parapodium has the form represented by Thomson's figure and illustrated here on Pl. xxxix., fig. 38—it possesses two bundles of chætæ ; the notopodial bundle consists of a very large number of closely set, very fine, almost silky and very flexible bristles, which project as a pencil or brush, spreading outwards in all directions, and touching those of the neighbouring feet (Pl. xxxix., fig. 25). Under the microscope they are seen to bear a double series of very fine and rather long "cilia" or short hairs, which are covered with fine particles of mud, and evidently act as a sieve.

The neuropodial chætæ are stout and brown, about 30 in number, arranged in 10-12 tiers of 2-3 in a tier. They differ remarkably from the normal Polynoid chætæ, and resemble those figured by Moore for *P. chitoniformis.*

The usual "pectinated frills" (of A. G. Bourne) are replaced by transverse rows of very long, very fine hairs, which spread out on each side. It is impossible, I find, to count the rows, as they successively overlap, but there are at least 12-15 or perhaps more (Pl. xxxix., figs. 23, 24).

The aciculum of the neuropodium pierces the foot near its upper margin, and there is here above it a short tongue-shaped lip. There are only about five or six chætæ above the aciculum.

The dorsal cirrus arises from a swollen base, which appears to be a gland ; it is more largely developed behind than in front of the base. The usual cirrophore and style are distinguishable in the cirrus, which presents no structural characteristic.

The cirrus is slender in proportion to the size of the animal. The head agrees in general with that figured by Thomson for *P. squamosus.*

The prostomium (Pl. xxxviii., fig. 16) is about as broad as its length, widest behind the middle, and limited anteriorly by a slightly impressed line across the bases of the lateral tentacles; it is notched for the insertion of the median tentacle.

Both pairs of eyes are far back; the anterior eye on each side is at the widest part of the prostomium, and forms a distinct protuberance; the posterior is just behind it.

The tentacles are pale brown, for about half their length from the base, followed by a colourless region, with a narrow band of darker pigment below the swelling. The palp is ciliated in seven rows, as figured by Thomson. The relative proportions of the parts are shown in the figure.

The "elytral pads" on the dorsum are double over the 2nd to 13th parapodial segments.

Other specimens measured have the following dimensions:—

(1) 20 mm. by 11 mm. over the elytra, and 15 mm over the chætæ.

(2) 25 mm. by 14 mm. over the elytra, and 17 mm. over the chætæ.

(3) 40 mm. by 16 mm., with a height of 8 mm.

Remarks.—The species resembles *P. squamosus* in size and general appearance of the elytra, but that species lacks the supra-areolar papillæ, for in all my material of different sizes and from various localities around the New Zealand coasts, this region of the elytron is comparatively smooth, though there are a few rather large papillæ just posterior to this areola. But in the present species they form a very conspicuous tuft.

At the same time there is a fair range of variability as to the rugosity of the elytra, seen in the material from Tasmania.

In a specimen measuring 40 mm. by 16 mm., with a height of 8 mm., they are less strongly marked than in the type, as they are smaller, and to the naked eye not so distinctly marked off from the more posterior papillæ. One can easily trace a gradation in this individual between the posterior stellate tubercles and the longer papillæ which carry the spines.

The long papillæ which in the type cover the external portion of the surface of the lateral region, are here fewer and even absent on some elytra. But I find no feature that marks this individual off definitely from the type, such as any difference in the arrangement of the branchial papulæ.

In the smaller individuals the spines on the marginal papillæ are sharper and fewer than in the larger type.

The colour varies somewhat in tone ; some are paler, others darker ; in some the smaller tubercles are almost black, in others brown. But colour is not a thing of importance in these worms, and in an individual, the successive elytra present differences in these respects.

Locs.—Off Maria Island, Tasmania, 78 fathoms. A single specimen, which has been selected as the type.

East of Maria Island, Tasmania, 78 fathoms.

East of Babel Island, Bass Strait, about 70 fathoms.

South of Mt. Cann, Victoria, 75 fathoms.

East coast of Flinders Island, Bass Strait.

Physalidonotus laevis, *sp. nov.*

(Plate xxxix., figs. 26-32.)

Two specimens were obtained, the larger of which has the following dimensions:—Length, 32 mm. by 13 mm. across the elytra and 15 mm. over the chætæ, with a height near the middle of the body of 6 mm.

The second individual is darker in colour, and measures only 20 mm. by 10 mm. across the elytra.

The elytra are pale brown, and appear to the naked eye relatively smooth as compared with *P. rugosus* and others. The exposed surface is covered with small colourless stellate tubercles, which are quite minute anteriorly (Pl. xxxix., fig. 28) ; they increase in size towards the areola and the posterior border, but none attain the same large proportions found in *P. squamosus* or *P. rugosus.* Even those on the external margin are short.

Over the upper end of the areola these stellate tubercles are more densely aggregated, are slightly larger and taller than those in the posterior region, but not greatly so (Pl. xxxix., fig. 31).

The marginal papillæ are somewhat different from those in *P. rugosus* ; they are cylindrical rather than obconical, with a few large spines at the free end (Pl. xxxix., fig. 29) ; the largest of the spines is usually a continuation of the axis of the papilla, the others radiating more or less at right angles from it. But on the posterior margin many of the papillæ have five nearly equal spines radiating horizontally, one of which is larger than the rest.

As in other species, the ground colour of the elytron is white, and the surface covered with variously coloured stellate tubercles of a regular form, some of which may contain black pigment; these stars may be carried by short cylindrical bases. Near the external, anterior margin are a few soft, uncoloured, simple conical papillæ (Pl. xxxix., fig. 30).

In the larger individual the elytra are a good deal paler than in the shorter one, owing, of course, to the less amount of the black pigment in the tubercles, or rather to the fewer black stars.

The gills.—On the anterior face of the parapodia, there is a row of 3 or 4 papulæ in a line, starting from one at the outward corner of the cushion, the distal one of the row being near the notopod. There may also be, on the cirriferous segments, an additional papula at a lower level on the face of the foot about half way along. On the posterior face there is a large papula close to the cushion, larger than any of the others, which in cirriferous segments is clavate rather than finger-shaped (Pl. xxxix., fig. 32).

At a lower level is a row of smaller papulæ, commencing at the axilla, and inclined downwards; in the cirriferous there are two, and the elytriferous three, in this row.

The prostomium is as broad as its length, broadest almost at its hinder border. The two pairs of eyes are even further back than in *P. rugosus*, very close together, the anterior at rather a higher level than the posterior; they are oval in outline, with the longer axis vertical, and is best seen in side view (Pl. xxxix., figs. 26, 27).

The tentacles are broken off in the larger specimen (the type), and in the smaller only one lateral tentacle remains. This is reddish brown right up to the swelling, which is white; the tentaculophore is vandyke-brown.

The tentacle is proportionately as long as that of *P. rugosus*.

As in other species, the hinder margin of the prostomium is overlapped by the first "pad" for the elytra.

The double "pads" occur on segments 2-13 inclusive.

Locs.—Twenty-five miles south-west of Cape Everard, Victoria. This specimen has been selected as the type.

Off Gabo Island, Victoria, 200 fathoms, with *P. paucibranchiatus*.

PHYSALIDONOTUS TURRITUS[1], *sp. nov.*

(Plate xxxix., figs. 33-35.)

Four specimens of this small species, one of which measures 12 mm. in length by 6 mm. across the elytra.

The characteristic marginal obconical papillæ are relatively large for the size of the worm ; they are shorter and wider than those in the preceding species.

There is a row of 3-4 large cylindrical papillæ over the areola ; each springs from a distinctly stellate base, and terminates in a crown of rounded lobes, rather than spines. The width of these papillæ is less than half the height (Pl. xxxix., fig. 33).

Along the posterior margin there is a row of very irregular spinose papillæ, and at the external margin a few large papillæ, some of which, towards the anterior edge, are nearly cylindrical, others towards the posterior side are inverted cones, with a very narrow base of attachment, widening out terminally. All these bear blunt spines.

The general surface of the elytron is covered by closely arranged low stellate tubercles, small in the anterior region, larger towards the areola, and still larger on the posterior region, where they are also of more irregular form and size. In colour they are varied, some being nearly black.

On the covered portion the tubercles are very small and rounded.

The margin, as usual in the genus, is fringed with relatively long "cilia," longer on the external than on the posterior margin.

The gills.—On the anterior face there are two papulæ close together, about midway along the foot, and one shorter one on the cushion. On the posterior face there is only one papula, that a long one springing from the base of the cushion, but in a cirriferous segment there is, in addition, a second one close to the base of the cirrus (Pl. xxxix., fig. 35).

The prostomium is broader than long, widest at its middle, where the anterior pair of eyes is situated, the other pair lies immediately behind them (Pl. xxxix., fig. 34).

The tentacles are uniformly pale brown, the median more than twice the length of the laterals. (In these measurements the basal "tentaculophore" is not included).

1. "Furnished with towers," so named from the castle-like form of the large papillæ on the elytra.

The elytral "pads" on the dorsum are double in segments, 2-13.

Loc.—Twenty miles east of Babel Island, Bass Strait, 65 fathoms.

PHYSALIDONOTUS PAUCIBRANCHIATUS[1], *sp. nov.*

(Plate xxxix., figs. 36-38; Plate xl., figs. 39-42.)

A single individual measuring 23 mm. in length by 9 mm. over the elytra, and 11 mm. over the chætæ.

The shape is similar to that of the other species, a broad oval. The elytra are pale, almost white, with a pinkish tint, or even a faint purplish tint in some of the anterior elytra.

In the pre-areolar region the tubercles are small and dark, many nearly black, stellate, and very sparsely distributed, as, indeed, they are all over the elytron.

There are no special areolar papillæ, but just behind this region is a row of 5-6 much larger multiradiate papillæ, most of which are dark greenish, nearly black to the naked eye, which show up conspicuously on the pale background.

These large papillæ are close together in a line running along the length of the elytron, reaching nearly from the mesial and to the external border.

The posterior region is almost free from tubercles, as they are few and scattered, stellate in form, much smaller than those in the post-areolar row; but close to the posterior margin is a single row of large papillæ about half the size of the post-areolar row, the number and distribution of which naturally varies. In some of the elytra this posterior series extends nearly to the mesial border, but usually ceases at the upper end of the level of the areola.

The mesial surface above the areola is sparsely covered with small dark spiny tubercles.

Further, the lateral region, especially towards the anterior border, has very few tubercles, but is sparsely covered by long filamentous processes similar to those constituting the marginal fringe, but of greater length (Pl. xl., fig. 42); a few of shorter length are found also in the external portion of the posterior region.

The papillæ are much shorter than in the previous species, even the largest are short, low cylindrical columns of considerable width, terminating in a nearly flat top, wider than the base, the margin of which is produced into a variable number of short rays. In those of slightly less size, these

1. In reference to the fewness of the branchial papulæ.

rays are more sharply pointed, suggesting that those of the larger are worn down. The low tubercles behind the areola have a rounded attachment, and are terminally dilated and produced into three or more, rarely four, sharp spines.

The impression conveyed by a close study of the series is that the larger are derived from the smaller by increase in number of rays or spines.

The branchial papulæ are much less developed than in the other species (Pl. xxxix., fig. 37). On all the feet, within the branchial region of the body, there is a couple of short papulæ close together on the anterior face, the distal being somewhat the larger.

On the posterior face of the cirriferous feet there is a single short papula springing from the cushion, but this is absent in the elytriferous feet.

The chæta has a construction just below the "frilled" region, which does not occur in the other species (Pl. xxxix., fig. 36).

The head.—The prostomium is as broad as its length, perhaps rather broader; the tentacles are broken.

But a characteristic feature about the eyes is their approximation (Pl. xl., figs. 39, 40). The two on each side are in contact, near the hinder part of the side. When seen from above only one pair appears to exist, but from the side an anterior eye is seen lower down the side, and rather smaller than the posterior. It may be that it is the anterior eye that has travelled backwards, if one may judge from the relative size of the eyes.

The double elytral "pads" extend on to the 15th segment.

Loc.—Off Gabo Island, Victoria, 200 fathoms, with *Polynoe platycirrus* and *Physalidonotus laevis.*

Genus Harmothoe (*sensu latu*), *Kinberg.*[1]

Harmothoe (Eunoa) etheridgei, *sp. nov.*

(Plate xl., figs. 43-51.)

A single individual whose body is of the usual shape, the sides almost parallel, and nearly equally tapering at each

1. Malmgren's genera, as has been pointed out by others, are founded on such points as the relative size of the notopodium, the presence or absence of a tooth on the neuropodial chaeta, and the presence or absence of a fringe to the elytra. It is well known that these features all occur in various species of *Lepidonotus*, yet no one, I think, has attempted to subdivide that genus on these minute differences. Hence I follow Willey ("Southern Cross" Polychæta, 1902, p. 263) among others, in using *Harmothoe*, rather in Kinberg's sense, though it is not easy to distinguish that from his *Antinoe*.

end, though the posterior is slightly narrower than the anterior.

The worm measures 25 mm. by 8 mm. over the elytra, and 9 mm. over the neuropodial chætæ.

It has 38 parapodial segments, and 15 pairs of elytra. The elytra are on the usual segments 1, 3, 4, 6 - - - 20, 22, 25, 28, 30, the last elytron is followed by 5 parapodial segments.

Most of the dorsal cirri, as well as the subanal cirri are absent.

The body wall is unpigmented ; the chætæ are pale yellow.

The elytra are grey, overlap fore and aft, as well as right and left, covering the back, and hiding even the bases of the notopodial chætæ.

They are rather soft to the touch, and are fringed. The first one is grey all over, rather darker near the dorsal region.

The rest have the anterior region white, the exposed region pale grey, becoming darker towards the dorsal region, and posteriorly, but paler again in the lateral region.

This exposed portion is covered sparsely with small dark rounded conical tubercles (Pl. xl., fig. 47). Near the posterior margin there is a row of widely separated white. *i.e.*, unpigmented, and probably transparent in life, long, finger-shaped papillæ. These are absent on the first elytron. On the anterior elytra there may be as many as eight of these soft papillæ ; on the majority I note some 4-6, while on the posterior ones only three are present. When viewed under a microscope the tip of each is seen to be formed by a short conical cap of highly refringent chitin ; at the base, too, is a ring of chitin, the greater part of which is thin and evidently pliable, for many of them are bent (Pl. xl., fig. 48). There are also now seen a number of short filamentous processes, on the surface near the posterior margin, similar to the fringe, but of less length. The fringe extends on to the hinder margin, but the filaments are shorter and less crowded than on the external margin.

The areola is white, circular and subcentral. The elytra are subcircular, with the usual anterior emargination.

The parapodia.—The neuropodium is produced into a long rounded point, which bears at its apex a small digitiform supra-acicular "ligule" (Pl. xl., fig. 51). On its upper surface the neuropodium carries the sessile notopodium. The chætæ in both lobes are very numerous.

The notopodial chætæ, about 50 in number, are stouter than the neuropodial, and are radiately arranged; the upper and anterior are shorter than the rest, but of the same form; they have a blunt point below which is a large number of rows of minutely pectinated frills (Pl. xl., fig. 49).

The neuropodial chætæ, about 70 in number, are in 7 or 8 tiers, with 3-6 (or even 7) in each tier (Pl. xl., fig. 50); the smaller number in the upper and lower, the larger number in the middle tiers. There are some 23-25 frills in the longer upper chætæ. The lower chætæ have, as is usual, fewer frills than the upper, and are altogether shorter.

There is no evidence of a subapical tooth (therefore it would be placed in Malmgren's genus, *Eunoa*). Nor are there any stout pectinations in the distal frill.

The dorsal cirri are covered with short cylindrical papillæ.

The head is typically Harmothoid, but the peaks are rather widely separated (Pl. xl., fig. 46). The prostomium is longer than broad, the anterior eyes are lateral at about the middle of the side, and the posterior are far back, close to the hinder margin.

The tentacles are finely ciliated, the subterminal swelling feebly marked. The median tentacle is much stouter than the laterals, and about twice their length.

The palps are longer than the median, as also are the peristomial cirri. The tentacles, like the cirri, are transparent.

Yellow chætæ are visible on the upper side of the base of the peristomial cirri.

Remarks.—M'Intosh described in the "Challenger" Report a species, *Eunoa abyssorum*, from the south of Australia, in 2000 fathoms, which in some respects seems to resemble the present species. But as that individual had no elytra, and as the chætæ differ in some details, and the form was eyeless, it seemed desirable to establish a new species for it.

In *Eunoa opalina*, from the Strait of Magellan, M'Intosh describes and figures "soft papillæ" on the elytra, but they are short and broad. He refers also to the "pellucid" tentacles, and the widely separated peaks of the prostomium.

But his figures of the chætæ show differences in that the apex of the neuropodial is much more hooked and sharper at the tip, and that of the notopodial is longer and sharper than in the present.

Loc.—Off Gabo Island, Victoria, 200 fathoms, with *Polynoe platycirrus*, *Physalidonotus laevis*, and *P. paucibranchiatus*.

Genus Scalisetosus, *M'Intosh.*

Scalisetosus australiensis, *sp. nov.*

(Plate xliv., figs. 114-117.)

A very poorly preserved fragment, deprived of its elytra, most of the prostomial outgrowths, all its dorsal cirri, while many of the parapodia are injured. It is pale in colour, without any pigment. The 28 segments measure 10 mm. in length, with a diameter of 2 mm. across the body, and 3·25 mm. over the parapodia.

The prostomium (Pl. xliv., fig. 114) consists of a pair of oval lobes separated by a wide deep groove; the anterior margin is well marked, and the tentacles spring from below it. Only the bases of these remain, the median rises at a rather higher level than the laterals, and the tentaculophores appear to be very short. The two pairs of eyes have a pale brown colour.

The elytrophores occur on the chætigerous segments 1, 3, 4, 6, 8, etc. I cannot say where the change, if any, occurs, owing to the damage in the hinder segments of the fragment.

Both the elytrophores and cirrophores overhang the parapodia much more than is usual in the family, indeed, they overhang the notopodia, which is a small lobe (Pl. xliv., fig. 115). The neuropodium has a long anterior pointed lip. The ventral cirri are narrow filaments.

The chætæ are colourless; they are alike in form in both lobes, but those in the dorsal lobe are much shorter. These chætæ are quite characteristic of the genus (Pl. xliv., fig. 116); at the point where the shaft commences to bear the pectinated frills, it is distinctly enlarged, and bears a conspicuous single large frill, which under a low power looks like a tooth, but fine grains of mud are present in the cup formed by it. The remaining frills have the appearance of a series of small teeth. The apex is free, and in the dorsals simple, but in many of the ventral chætæ there is a minute subapical tooth.

The frills (Pl. xliv., fig. 117) are very short and delicate, and each has but little height, is very indistinct, and slopes downwards more abruptly than is usual in the family.

The genus was formed by M'Intosh for a single specimen, *S. ceramensis*,[1] and Moore has found it off the coast of Japan, his species, *S. formosus*,[2] is, like mine and the type species, very imperfect, and we know nothing of the elytra in the genus. But the chætæ are so characteristic that there is no mistaking it.

Loc.—Southern coast of Australia.

Family SIGALIONIDÆ.

Genus Thalanessa, *Baird.*

Thalanessa oculata, *M'Intosh.*

(Plate xlv., figs. 118-123.)

Thalanessa oculata, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 142. *Id.*, Treadwell, Bull. U.S. Fish. Comm., xxiii., 3, 1906, p. 1157.

A single individual was obtained which is smaller than the type. It measures 30 mm. in length by 1 mm. across the body, and 3 mm. over the parapodia. It is a good deal shrunken, as if it had been placed in very strong spirit. There are 61 segments, but it is apparently imperfect.

The account in the "Challenger" is so full that I need not add any further data, but I have given figures in addition to those already published, namely of a typical foot (Pl. xlv., figs. 119, 120), and of the peculiar anterior feet, in which the membranous expansion of the neuropod and digitate notopodial processes are so well developed. The parapodia are remarkably long; their appearance will be gathered from the figures herewith (Pl. xlv., figs. 121-123).

M'Intosh's figure of the elytron is not quite typical; it represents an anterior one, while those in the greater part of the body are not exactly "reniform," as he describes them. Each has a deep excavation on the anterior margin, but the outer or ventral boundary is much longer than the upper, and the scale covers almost four segments as shown (Pl. xlv., fig. 118). It is attached to the elytrophore near its anterior dorsal margin.

I find that the body-wall is splashed with pale nut-brown markings on each side of the anterior segments, which are visible through the transparent elytra, which themselves

1. M'Intosh—Chall. Rep., Zool., xii., 1885, p. 103.
2. Moore—Proc. Acad. Nat. Sci. Philadelphia, 1903, p. 403.

have a patch of paler brown at the anterior lobe and along the posterior margin; otherwise they are colourless and transparent.

M'Intosh states that the number of processes to the elytral papillæ are five or six; I find that in the mid-body elytra there may be as many as eight or nine in those papillæ in the middle of the series.

Remarks.—Haswell's *T. microceras* differs in a number of features.

Loc.—South of St. Francis Island, South Australia, 35 fathoms.

Distribution.—Off East Moncœur Island, Bass Strait, 38 fathoms; Tongatabu, 18 fathoms; off Hawaii, 20-142 fathoms.

Genus Sigalion, *Milne-Edwards.*

Sigalion, *sp. incert.*

A fragment without head or tail, consisting of about 50 segments of a diameter of 1.5 mm. across the body and 3 mm. over the parapodia. Its length it is difficult to estimate, as it is much curved. I am unwilling to name the present fragment, but it does not agree precisely with any hitherto recorded.

Loc.—Forty miles south of Cape Wiles, South Australia, 100 fathoms.

Sub-Family ACOETINÆ.

Genus Eupompe, *Kinberg.*

Eupompe australiensis, *M'Intosh.*

Eupompe australiensis, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 135.

A single specimen, imperfect posteriorly, was in an extraordinary condition. It consists of the anterior end with 30 segments, but only the last five were visible, as the worm was completely turned inside out, with the head forwards and inwards. It was only on slitting open the mass of apparent muscle, which I supposed to be the partly digested body-wall, that I discovered the head and all its outgrowths well preserved inside.

The pharynx was attached to this mass by a long ligamentous cord, formed apparently by the buccal cuticle drawn out into a filament.

Loc.—Twenty miles east of Babel Island, Bass Strait, 65 fathoms.

Distribution.—M'Intosh records it from "Station 168 (apparently off Cape York, Australia, and probably in Endeavour Strait)."

Family NEPHTHYDIDÆ.[1]

Genus NEPHTHYS, *Cuvier*.

NEPHTHYS MACRURA, *Schmarda*.

(Plate xl., fig. 57.)

Nephthys macrura, Schmarda, Neue Wirbellose Thiere, i., 2, 1861, p. 91. *Id.*, Ehlers, Neuseeland. Annelid., 1904, p. 14.

Nephthys virigini, Kinberg, Annulata nova, 1865, p. 239.

Nephthys trissophyllus, Grube, Monatsber. Akad. Wiss. Berlin, 1877, p. 533. *Id.*, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 159.

Ehlers has been able by comparison with the types of the three authors to establish the synonymy as above.

In spite of certain differences between the fragment described below and the accounts of the authors above cited, I identify it with this species, with which it agrees, in the characters of the foot especially, more closely than it does with any other species in the literature available to me.

A cephalic fragment containing 30 chætigerous segments measures 15 mm. in length by 2.75 mm. across the body and 3.5 mm. over the parapodia.

The colour is a uniform pale pinkish brown.

The prostomium, which is without eyes, is shield shaped, truncated in front, pointed behind; its length is to its breadth rather more than as 3 : 2 (Pl. xl., fig. 57). On each side near the hinder end is a rounded "nuchal organ." The anterior angles are produced into a pair of short triangular tentacles, and from the under surface two others arise of slightly greater size, directed outwards.

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1. As the word "Nephthyidæ," sometimes used for this family, is employed for a family of Alcyonarians, the above form seems desirable.

The first segment carries a parapodium as usual, and the ventral cirrus is rather larger than that on the following.

The anterior eight feet differ from the rest in lacking the gill, which makes its appearance on the ninth.

The base of the foot is not quite so high as that of the body.

The pharynx was wholly withdrawn. On opening the body it is seen to reach to the eighteenth segment. The organ was slit open and mounted. The entrance to the pharynx is surrounded by a circle of 20 rather long, closely set, bifurcated, filamentous papillæ, with a single shorter one in the dorsal and ventral mid-line.

The buccal region presents 20-22 longitudinal rows of similar but shorter papillæ, which decrease in size towards the mouth. These rows commence at alternating levels (cf. M'Intosh, Pl. xxvi., fig. 4), and those on the dorsal surface commence immediately behind the pharyngeal papillæ ; those on the ventral a good deal further back. These rows diminish in number towards the mouth, where only 14 can be counted.

I cannot detect in the mounted preparation any evidence of the bifurcation of these rows of papillæ, as the mouth is approached, such as are figured by M'Intosh and by Ehlers ; though otherwise there is a considerable degree of agreement. May it be that as the animal grows the length of the buccal rows increase and then bifurcate ? It is difficult in this retracted state to compare their arrangement with that figured by M'Intosh of the everted organ.

About midway along the pharynx is the usual dorsal and ventral brown conical denticle.

I have stated that there are differences between this form and the accounts of the species. Not only so, but the figures given by M'Intosh are not altogether in accord with those of Ehlers.

In the first place the shape of the prostomium is longer in the fragment before me than in most of the figures. In M'Intosh's figures the proportion of length to breadth differs according to the state of eversion of the pharynx—explicable perhaps by the fact that when fully averted the prostomium is stretched laterally (cf. Pl. xxvi., figs. 1, 3, 5).

In fig. 3 the length to breadth is about as 3:2 ; but in others the two approximate, and in Ehlers' (Pl. 1., fig. 10) the breadth is the greater. Moreover, he does not show an angle at the posterior end, which is distinct enough in M'Intosh's drawings; and Grube in his diagnosis of *N. trissophyllus* writes:—"Lobus cephalicus parvus, quadratus, segmento buccali penitus impressus," which I read to mean that it impinges "deeply" into the buccal segment.

Again, there are details about the lobes of the notopodium in which exact agreement is lacking; for instance, Ehlers shows two smaller lobes below the large one; only one is figured in M'Intosh; nor did I find a second in this individual. At the same time Ehlers notes that in the abundant material that he had the variations in details are so great that if they had been found separately different species might have been established.

The colour of the larger individuals is, according to Ehlers and Grube, somewhat variegated, darker brown, either in lines or spots or over the dorsum generally, on a paler ground. But M'Intosh notes that amongst his material "the smaller examples are pale," and presumably of uniform tint.

Ehlers was able to compare his specimens with Kinberg's type, and to assure himself of the identification of Grube's with Kinberg's species (1897) and later with Schmarda's (1904).

If I am correct in this identification, the species is an interesting example of an Australio-subantarctic distribution, analogous with what Ehlers noted amongst the Polychætes of New Zealand and as I found amongst the Auckland Islands worms.[1]

Loc.—Forty miles east-north-east of Babel Island, Bass Strait, 1200 fathoms.

Distribution.—Kerguelen; Fuegia; Magellan Strait; New Zealand.

Family AMPHINOMIDÆ.

Genus Notopygos, *Grube.*

Notopygos labiatus, *M'Intosh.*

Notopygos labiatus, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 19. *Id.*, Treadwell, Bull. U.S. Fish. Comm., xxiii., 3, 1906, p. 1164.

Of two individuals of a worm which I refer to this species, one, well preserved, measures 39 mm. in length, so that it is larger than the type; it is widest about the middle, where

1. Benham—Report on Polychæta, Subantarctic Islands of New Zealand, 1909, p. 236.

it is 9 mm. across the ventral surface, whence it tapers fore and aft. The width of the 4th chætigerous is 4 mm., and at the hinder end is 3 mm. It is pale in colour, with little sign of pigmentation; the caruncle is yellowish, and along the line of union of the crest with the basal lamella is a line of dark purple; the same colour is present on the cirrophores of the dorsal cirri and at the base of the branchial cirri.

The chætæ, which are said to be pale green in the type, are here colourless, glassy, though in a less well preserved specimen they are pale yellow.

This suggested that perhaps I had Haswell's *N. flavus*[1] before me, and the almost total absence of serrations on the chætæ inclined me to that view, but he states that amongst the dorsal bristles some are simple, while in the genus typically all are forked. I find no simple ones.

Potts[2] has recently tabulated the species according to the presence or absence of serrations. In the present case I can only find serrations on the ventral chætæ of the anterior segments, and then they are so ill-defined that under a low power (Leitz, Oc. 3, Obj. 3) they are not recognisable. Under a higher combination, however, there are seen, as M'Intosh figures them, as minute step-like interruptions in the margin of the larger prong.

Except for this small difference, my specimens agree with M'Intosh's so closely that I do not feel justified in making a new one.

Locs.—Southern coast of South Australia.

North of Cape Borda, Kangaroo Island, 40 fathoms.

Distribution.—South of the Philippine Islands; Hawaii.

Genus Chloeia, *Savigny*.

Chloeia inermis, *Quatrefages*.

Chloeia inermis, Quatrefages, Hist. Nat. des Annelides, i., 1865, p. 389.

This worm I have taken on several occasions on the coasts of New Zealand, though I do not think that it has been recorded since Quatrefages wrote his brief account of it. Its leading feature is the absence of bifurcation and of serrations on the chætæ.

1. Haswell—Proc. Linn. Soc. N. S. Wales, III., 1879, p. 343.
2. Potts—Trans. Linn. Soc., Zool., xii., 1909, p. 358.

The present specimen measures 42 mm., with a diameter of 10 mm. at its broadest, which extends from about the 15th to 20th segments. It contains 29 segments.

The dorsal and ventral chætæ are alike, though the ventrals are much finer, straight, thick-walled, hollow, with a simple point. A few of the ventrals have a minute subapical tooth ; or this may be represented by a " step " where the tooth has been worn away.

Loc.—Off South Cape, Tasmania, 75 fathoms.

Distribution.—New Zealand.

Family ALCIOPIDÆ.

Genus Halodora, *Greeff.*

Halodora, sp. ?

(Plate xl., figs. 52-55 ; Plate xli., fig. 56.)

I have no recent literature on this group, so that I am unable to compare the present worm with those previously described. I attribute them to the genus *Halodora*, Greeff, as the head does not project beyond the eyes ; the introvert is without denticles, and there is no " cirriform lip " to the parapodia, while the chætæ are compound. It differs from *H. reynaudii*, Audouin & Milne-Edwards, in various respects.

The material consists of two cephalic fragments, two tails and an intermediate region of the body, belonging to one of the two individuals ; the portions are much coiled, and measurements are difficult to make with accuracy.[1] But the worm seems to be about 40 mm. in length, with a diameter of 1 mm. or 2 mm. over the parapodia. It is widest anteriorly where the width is 2 mm. over the eyes, and tapers slowly posteriorly.

The worm then is long and narrow, with large brown spots on each segment laterally, just behind the base of the parapodia ; the cephalic eye is of enormous size, and rich brown in colour, the pupil faces downwards and outwards.

Each of the anterior segments is crossed by a narrow band of brown pigment, of a width about equal to the anteroposterior width of a parapodium, and on the first seven or eight segments it is continued from side to side, linking the lateral spots ; but in the following segments it is broken in

1. One cephalic fragment has twenty-three segments and measures 12 mm. in length ; one head-less fragment has fifty segments followed by twenty-four very small regenerated segments.

the middle, and further back the length of each moiety of the band gets less and less, though they persist till nearly the hinder end, and at the same time the depth of the brown diminishes.

Neither caudal portion shows any anal cirri.

The whole worm shows evidence of much shrinkage due to the strong alcohol in which it is preserved.

The head.—The prostomium is depressed between the eyes, and is traversed by a convex ridge at its anterior end, which appears to represent a median tentacle, for I can see no definite appendage in the middle line (Pl. xl., fig. 55). The paired tentacles lie on the underside of the sloping prostomium ; the upper pair is almost in line with the upper surface of it ; each is very short, rounded, and nearly as broad as it is long. The lower pair are directed downwards ; each is cylindrical and about 3-4 times as long as the upper one.

The peristomium.—The lower lip is a thin transverse fold notched in its middle, and somewhat produced on either side.

There are three pairs of "peristomial" (or better, "metastomial") cirri. Behind the peristomium is a segment, which bears on each side an oval thickened whitish pad, whence arise two cylindrical processes, one external and ventral, lying against the under surface of the eye ; the other is much smaller, and directed outwards. Behind these again is a faintly marked segment, which bears a pair of larger and stouter cirri, directed backwards.

The next segment bears the first distinct parapodium, but I can detect no chætæ. The dorsal lobe is produced into a foliaceous process or dorsal cirrus, resting against the hind wall of the eye ; the small ventral cirrus resembles the following. This segment is banded with brown dorsally, and has but a small lateral brown spot on each side.

The parapodium of the following segments is uniramous, with pointed lips (Pl. xl., figs. 52, 53) ; it bears dorsally and ventrally a large foliaceous cirrus, the former the larger. The aciculum is colourless, with a slightly curved tip ; the chætæ are likewise colourless, of the usual delicacy : they are jointed, with a long simple appendix (Pl. xli., fig. 56).

Loc.—East coast of Flinders Island, Bass Strait.

Family STAURONEREIDÆ.

Genus STAURONEREIS,[1] *Verrill.*

STAURONEREIS AUSTRALIENSIS, *M'Intosh.*

(Plate xli., figs. 58-66.)

Staurocephalus australiensis, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 232. *Id.*, Treadwell, Bull. U.S. Fish. Comm., xxiii., 3, 1906, p. 1173.

A single entire individual, which I believe belongs to this species, which M'Intosh founded on a posterior fragment.

The worm is nearly white, and is probably pink in life. It measures 75 mm. in length, with a diameter of 5 mm. over the body, and 10 mm. over the parapodia. It consists of a head with 145 chætigerous segments, whose length is about one-eighth the width of the body in the anterior half, and one-fifth posteriorly. The body is slightly wider anteriorly, tapering slowly backwards. The dorsal surface is convex ; the ventral flat with a median furrow.

The semicircular prostomium is of small size, its base being about a quarter the width of the peristomium (Pl. xli., fig. 58).

The tentacles are moniliform, with 9 rings, terminally rounded, the last ring being longer than the others. They are relatively thick and short, scarcely reaching beyond the lateral margin of the body ; or when pressed back, to the posterior margin of the first chætigerous.

There is a pair of downwardly directed palps, not moniliform, but the apex is constricted from the rest ; the rest is smooth, but a good deal contracted so that irregular furrows cross it. It is only a little longer than the tentacle, but a good deal stouter (Pl. xli., fig. 60).

There are two pairs of eyes, the anterior pair, the larger, lie at the side of the prostomium, in front of the base of the tentacles ; the hinder pair behind the tentacles, nearer to the midline. They lie below the edge of the peristomial margin, which overlaps the prostomium (Pl. xli., fig. 59). When this hood is lifted backwards the transverse slit-like openings to the nuchal organs are displayed, and in the middle line is seen the small rounded connection between the prostomium and peristomium.

1. Ehlers points out why this name must take the place of Grube's *Staurocephalus* and *Anisoceras* (Die Polychæten d. magellan u. chilen. Strandes, 1901, p. 146).

The mouth is partially blocked up by a pair of large oval convex oral pads, separated by a deep groove in the middle line, as is figured by Ehlers in *S. cerasina.*

The peristomium is longer than the nuchal segment, dorsally and laterally, but on the ventral surface it is shorter, where it forms the lower lip, which, like the lateral lip, is longitudinally furrowed.

The parapodia are long, nearly half the width of the body, the dorsal cirri are longer, and as wide at the base as the length of the segment (Pl. xli., fig. 61); each is semi-cylindrical, being flattened on the under and convex on the upper surface, so as to appear "flattened"; it is constricted near its end into a knob-like appendix, which in posterior segments is wider than the main stem, so that the cirrus has the appearance of a penis.

The first parapodium is small, and is borne, of course, by the segment following the nuchal. It has no dorsal cirrus; the second foot has a relatively short cirrus, but on following segments the cirri are of practically uniform length, are directed nearly horizontally outwards, lying alongside the body like a fringe. The ventral cirrus is short, stumpy, and as wide as the segment is long.

The body carries at its hinder end two pairs of subanal cirri; the upper is annulated with 9 rings, and is as long as the dorsal cirrus of the penultimate segment; the lower cirri are short, smooth, and rather longer than the neighbouring ventral cirri.

The parapodia, seen under a lens, present three rounded lips, a larger posterior and two rather shorter anterior lips (Pl. xli., fig. 62).

A figure is given of the tenth foot. Studied under a microscope, the posterior lip is seen to be slightly notched. The parapodium is supported by a single golden aciculum, and a couple of very slender bristles enter the dorsal cirrus, and reach almost to the subterminal constriction.

The chætæ are in two bundles; the supra-acicular bundle contains about 6 long curved capilliform bristles, with fine serrations along its upper convex margin.

In the sub-acicular bundle there are about 30 chætæ, which are jointed, *i.e.*, "gomphotrichs"; the long appendix has a subapical tooth of nearly the same size as the terminal hook; the wing is finely denticulated along the greater part of its length (Pl. xli., fig. 64).

In the second foot the appendix of the gomphotrich is narrower and nearly twice as long as that on the tenth foot.

The jaws.—The lower jaws have a curved anterior edge, which is without denticulations. The pair are only feebly connected together. The upper series consists of the usual small black paragnaths, which are in three rows on each side (Pl. xli., fig. 65):—(*a*) The dorsal-most or internal row consists of about 30 relatively stout, prominent, curved denticles, the anterior few of which have lateral serrations on each side (Pl. xli., figs. 66a, 66b); the shape of these will be understood from the figures. (*b*) The outer row contains about twice as many denticles of much smaller size; they are straight, denticulated along both edges, and overlie the bases of the internal row; each is supported by a minute rectangular plate, the series of which are set close together, and form the ventral or innermost limit of the series (Pl. xli., fig. 66a). (*c*) A third row is made up of about 30 two-rooted pieces, with the divergent roots directed outwards, which seem to lie over the second row (Pl. xli., fig. 66d).

Remarks.—M'Intosh describes the species from a posterior fragment measuring 11 mm. in length by 5 mm. across its anterior truncated end. He figures the foot (Pl. xxxvi., fig. 6), which differs from the hinder foot of the present specimen, only in the apparently smaller size of the terminal knob of the dorsal cirrus. But he says that the cirri are "flattened," and as the chætæ agree, and the worm was obtained in the neighbourhood of East Moncœur Island, the probability is that we have the same worm before us.

It may be noted that Haswell[1] described a species under the name *Staurocephalus australis*, from Port Jackson, which, amongst other features, differs from *S. australiensis* in the proportions of the head, for the prostomium has a base nearly as wide as the peristomium, and narrowing forwards between the tentacles. But, as no doubt the drawing is made from a freshly killed specimen, while mine is from a much contracted one, the difference may be discounted to some extent. However, the neuropodial chætæ are stated to have an appendix which is only "obscurely notched" at its apex. As the species is littoral, I hesitate to identify it with M'Intosh's.

Haswell notes that *S. loveni*, Kinberg, was also obtained at Port Jackson in 12 fathoms, but it differs from *S. australis* in that the palps are twice the length of the tentacles.

1. Haswell—Proc. Linn. Soc. N. S. Wales, x., 1886, p. 747.

How far such proportions are useful systematic features apart from other more permanent characters is doubtful.

Ehlers[1] gives a fully illustrated account of *S. cerasina*, which in regard to the head, at any rate, resembles this species from Tasmania.

Loc.—Storm Bay, Tasmania.

Distribution.—Hawaii (Treadwell).

Family EUNICIDÆ.

Sub-Family EUNICINÆ.

Genus EUNICE, *Cuvier.*

EUNICE SICILIENSIS, *Grube.*

Eunice siciliensis, Grube, Actinien, Echinodermen, u. Wurmer, 1840, p. 83. *Id.*, Ehlers, Die Börstenwürmer, 1864-68, p. 353.

Eunice adriatica, Schmarda, Neue Wirbellose Thiere, i., 2, 1861, p. 124.

Eunice tœnia, Claparede, Glan. Zool. parmi les Annelides, 1864, p. 120.

Eunice valida, Gravier, Nouv. Arch. Museum Paris, 1900, p. 264 (*fide* Crossland, Proc. Zool. Soc., i., 1904, p. 323).

This widely distributed species is represented by three fragments, one of which bears a head with 173 chætigerous segments, measuring 120 mm. by 8 mm.; the segments are very short, being about one-ninth of the diameter of the body.

The second fragment has neither head nor anus; consists of 180 segments measuring 90 mm.; the segments are still shorter, only about 1-18th of the diameter.

The third fragment contains 57 segments with a length of 50 mm.

In all details these agree with the accounts of the species, though it is larger than those that I have studied from the Kermadec Islands.

1. Ehlers—Die Polychæten d. magellan. u. chilen. Strandes, 1901, p. 147.

From a second locality comes a dark green, ill-preserved female worm in eight fragments, the total length of which amounts to 1160 mm. without a head or tail, and the breadth is from 3.5 to 5 mm.

Locs.—Off Gabo Island, 200 fathoms.

South-west of Gabo Island, 75 fathoms.

Distribution.—Mediterranean; Red Sea; Indian Ocean; Pacific Ocean.

Eunice pycnobranchiata, *M'Intosh.*

(Plate **xlii.**, figs. 79, 80.)

Eunice pycnobranchiata, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 294.

The twelve specimens obtained from various stations show, as M'Intosh indicated, a certain amount of variation in those features which are used for specific characterisation, and it may be as well to give a general account of the species, filling up a few of the lacunæ in the original description.

The colour of the preserved specimens is either a rich reddish or coppery brown with iridescence, or a paler flesh tint or even grey. In three individuals the pale ground colour is marked by irregular and irregularly distributed splotches of red, usually transversely disposed anteriorly, but becoming smaller and more numerous and more scattered in the mid-body and posterior segments.

In some cases the fourth chætigerous and in others the second is quite pale, probably white in life; while in the majority this pale segment is not present.

The size varies from 200 mm. by 8 mm. in a very soft specimen to 110 mm. by 5.5 mm. in hardened specimens for the same approximate number of segments, 146-150; while, of course, smaller specimens occur with fewer segments.

Taking for description a deep coppery brown individual, rather soft, measuring 190 mm. by 8 mm. across the body, the peristomium is 6 mm. and the breadth over the parapodia is 10 mm. There are 147 segments. The widest region is a short distance behind the peristomium, thence it tapers very slowly to the hinder end.

The fourth chætigerous is pale.

The tentacles are moniliform, rather deeply notched, and the furrows indicated by a pale brown line; even in those specimens in which, owing to preservation, the moniliform character is not evident, the brown rings exist. The median tentacle has, in this case, 18 swellings, the admedian 16, and the lateral 8, and the length of the three has the same proportion ; but in one other I noted 13, 10, and 8 respectively. It is likely that the tips are fragile, so that this detail and the relative lengths in regard to the number of segments, such as it is sometimes the custom to give for species of *Eunice*, has little importance, as Crossland has already remarked.

The palp is divided horizontally into a smaller upper lobe and a larger lower lobe.

The peristomium is as long as the nuchal and the first two chætigerous segments together ; its diameter is 6 mm. and is much more than its length. The upper lateral edge of the lower lip is, as M'Intosh stated and figured, prominent and visible from above as it is separated from the side of the peristomium by a deeper notch than is usual in the genus (Pl. xlii., fig. 80).

The nuchal cirri are indistinctly moniliform, having about eight rings ; generally they do not quite reach the anterior margin of the peristomium.

There is a pair of smooth subanal cirri equalling in length the last 10 segments.

The dorsal cirri are not annulated, but are irregularly constricted, especially in the anterior feet, in which they are of larger size than further back. Under a lens they have the appearance of annulation, but microscopic study shows that this is merely a result of muscular constriction ; while it may be noted, by a comparison of successive cirri or of cirri on opposite sides of the body in the same segment, that these constrictions are quite irregular in their spacing and in their number. In the figure illustrating M'Intosh's account (Pl. xxxix., fig. 13) the cirri are shown annulated, but in that of the foot (figs. 14, 15) these annuli are not represented.

The gills in this individual commence on the fifth chætigerous segment.[1]

In the fifth there is but one filament, that is the axis of the future gill ; on the seventh, there are four filaments ; the maximum number is reached on the 10th, with six filaments ; the lowest being here longer than the dorsal cirrus. This

1. I use the word "segment" always as meaning a "chætigerous segment," and exclude from the enumeration of segments the two first segments, the peristomial and nuchal.

maximum is retained till the 26th segment ; for the next 12 segments present five filaments ; the number then sinks to 4 (segments 39-70), to 3 (in segments 71-95), after which the number decreases rapidly, and only the last three or four segments are without gills.

The gill as a whole has a very characteristic appearance, indicated by the specific name—" thick-gilled " (Pl. xlii., fig. 79) ; the gill filaments, whether few or many, are coarse, arise from the axis close together, and even in some cases touching one another, and under a low-powered dissecting lens the gill has some resemblance to a folded or wrinkled membrane.

There is a considerable range of variation in detail, to which I refer later, but the above is generally typical, though the maximum number of filaments may reach 8 or even 10 in some individuals.

The gill may be described as " small," whether the number of filaments be few or many ; they only reach a short distance up the much arched side of the body even when placed upright against it. Usually they are not so directed in these specimens ; they are ranged alongside the body, usually with the free ends forwards.

The parapodia do not present any special features ; they are supported by two, or sometimes three, black acicula, and on the 30th segment or thereabouts (for this point varies) an inferior black bidentate acicular chæta appears, which is of course continued to the end of the body. Under the microscope this is seen to be a dark brown with golden margins, though under a dissecting lens it is black and very conspicuous. The chætæ are illustrated by M'Intosh, and need no further description.

The jaws are white below, the lower always, the upper jawlets sometimes, but the denticulations are always white tipped. On the right side the large dental plate (II) has six teeth, of which the proximal and the distal are smaller than their neighbours. Plate IV is hoodlike, with nine or ten rounded denticulations ; plate V has a singled tooth. On the left side, II has five teeth, IV is curved, has five, V has one, and the unpaired plate (III) has seven teeth.

The jaws, as is now well known, vary within limits as to the precise number of denticulations of the plates, and M'Intosh gives instances.

Remarks.—I have specimens from the coast and seas round New Zealand which belong to this species, though those which I sent to Ehlers for identification were named by him as *E. antennata,* Savigny. Those, however, which I have as duplicates agree precisely with these Australian forms, and if Crossland's analysis of Savigny's species be accurate, Ehlers' identification must be incorrect. In the first place Crossland[1] states that the acicula and tridentate acicular chætæ are not black but yellow, that the gills are "large," and that they are figured as nearly meeting across the back; that in the posterior segments, after a decrease in the number of gill filaments, which are quite slender, there is an increase before dying out at or near the hinder end. Ehlers[2] gives an account of a worm under the name *E. antennata* from Chilian shores (p. 126) which does not agree wholly with Crossland's account, for the acicula are black, and Ehlers says nothing about the increase in the posterior gills. Moreover, in *E. antennata,* Savigny, not only are the tentacles moniliform, but the dorsal cirr also, anteriorly multiannulate, posteriorly triannulate. At the same time the Australian species has the same lower lip as Crossland figures for *E. antennata,* and it appears that the two are pretty nearly allied.

Locs.—East of Maria Island, Tasmania, 78 fathoms.

Near Storm Bay, Tasmania.

Ten miles north of Circular Head, Tasmania.

East coast of Flinders Island, Bass Strait.

Off Babel Island, Bass Strait, 50-80 fathoms.

North-east of Babel Island, Bass Strait, 100-170 fathoms.

Fifteen miles north-west of Cape Jervis, South Australia, 17 fathoms.

Between Port Stephens and Newcastle, New South Wales.

Distribution.—New Zealand (Foveaux Strait; Massacre Bay, on west coast); Pegasus Bay, on east coast.

Variations.—The gills vary (*a*) as to the point of commencement, and (*b*) as to the maximum number of filaments. Out of the twelve anterior ends I find that in six they commence on the sixth chætigerous segment, in four on the fifth, while in two they do not begin till the seventh, and then as quite small stout filaments. The largest number of filaments usually occurs on about the eighth to the thirtieth segments; and it is only to the last two individuals in the list that this

1. Crossland—Proc. Zool. Soc., i., 1904, p. 316.
2. Ehlers—Die Polychœten des Magell. u. Chilen. Strandes, 1901, p. 126.

area of maximum development is more extensive, reaching to the seventieth. It may be noted that both these individuals are "spotted" with red, and are from the same locality; but No. 12 occurs with another more normal in colouration, and normal so far as the gills are concerned (No. 6). The maximum number of filaments in the fore body is usually five or six, but in one, otherwise normal (No. 3), it rises to seven, and even here and there to nine, while in another instance (No. 4) it is ten or occasionally eleven. On the other hand, in No. 5 the number of filaments is as low as two.

In all but one specimen, and that one of the "abnormals," the number of filaments decreases slowly and fairly regularly towards the hinder end, and the gill is continued to the extremity or is only absent on the last half-dozen segments, which are, of course, very small. In the abnormal individual (No. 11) the gill after decreasing, increases near the hinder end to seven filaments, and further back to eight before undergoing the usual terminal decrease.

The two "abnormals" differ then not only in the colouration but also in some matters concerning the gill; yet an examination of one of them (No. 12) the jaws are precisely like that which I studied in detail (No. 1), and in all other respects these two agree with the rest. It appears to be merely a local variation.

The form of the gill in all these twelve is very uniform: the filaments broad, closely set, nearly or quite touching one another, or in some case overlapping. When fully developed the lower filaments are longer than the dorsal cirrus; one or more of them may bifurcate; not infrequently the axis projects but slightly beyond the uppermost filament, as if it were capable of budding off additional filaments at this point. In one individual the gill is much smaller than usual (No. 10) and the filaments more delicate and further apart.

Other variations, such as length, depend on the state of preservation. The colour in some is copper. The white "collar," too, is remarkably sporadic; it might at first sight seem rather a characteristic feature, but such a "collar" appears as a variation in other species such as *E. aphroditois*. M'Intosh notes that in his specimens a "collar" exists on segment II in those from Twofold Bay, while it is absent in the Bass Strait specimens.

The segment in which the acicular chæta first occurs is also subject to variation, though usually somewhere about the thirtieth, it may occur either before or after that segment. These variations are tabulated below.

VARIATION IN GILLS IN *E. pycnobranchiata.*

Number of worm.	Commence in segment.	Maximum No. of filaments fore body.	Extent of maximum No. of filaments.	No. of filaments at about 80th segment.	Total number of segments.
1	V.	6	VIII. to XXVI.	3	146
2	V.	4	VII. to XXIII.	2	147
3	V.	7 (8.9)	VIII. to XXVI.	4 (on last)	68 (imp.)
4	V.	5 (6)	VIII. to XXV.	2 (on last)	70 (imp.)
5	VI.	2	VI. to XXXVI.	1 (on LXX)	78
6	VI.	9 (10.11)	XII. to XXVIII.	4	115
7	VI.	5	VIII. to XXX.	3 (on last)	71 (imp.)
8	VI.	4	VIII. to XXVII.	1	115 (imp.)
9	VI.	5	VIII. to XXI.	..	45 (imp.)
10	VI.	4	VII. to XXX.	2 (3)	100
11	VII.	6	XVI. to LXX. [1]	5	150 [2]
12	VII.	4	X. to LXX.	3	145

Numbers in brackets indicate that in their area of maximum development these numbers occur on occasional segments irregularly; (imp.) indicates that the worm is incomplete posteriorly.

VARIATIONS IN OTHER ORGANS IN *E. pycnobranchiata.*

Number of worm.	Dimensions in mm.	State of preservation.	Number of segments.	Colour.	White segment.	Segment at which acic. ch. appears.
1	190×8	s	146	reddish brown	IV.	XXX. & XXXII. [3]
2	110×5.5	h	147	,,	IV.	XXIX.
3	80×8	h	68 (imp.)	,,	IV.	XXXII. & XXXIV. [3]
4	75×5	s	70 (imp.)	,,	IV.	XXX.
5	38×3	s	78	pale r. br.	II.	XXII.
6	180×8	s	115	,,	0	XXIX.
7	60×5	h	71 (imp.)	,,	II.	XXIX.
8	110×6	h	115 (imp.)	pale grey	0	XXXI.
9	30×4	h	45 (imp.)	pale r. br.	0	XXVII.
10	70×4	h	100	nearly white	0	XXVII.
11	190×9	s	150	v. pale with red splotches	0	XXX.
12	200×8	s	145	,,	0	XXXIV.

h=hard, well preserved. s=soft, ill preserved.
imp.=incomplete posteriorly.

Nos. 1-5, Maria Island; 6, 12, Babel Island; 7, Cape Jervis; 8, Stores Bay; 9, Circular Head; 10, New South Wales coast; 11, north-east Babel Island.

1. The number of gill filaments is occasionally only five.
2. The number of gill filaments rises to seven on segment xc., it is eight at c; and then decreases to five at cxxx, and gradually dies out.
3. On the two sides.

EUNICE BASSENSIS, *M'Intosh.*

(Plate xli., figs. 67-74 ; Plate xlii., figs. 75-78.)

Eunice bassensis, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 298.

It is with some hesitation that I attribute the material to this species, for M'Intosh's account is necessarily brief and imperfect, as he had only a single fragment of the posterior end of a worm upon which to found the characters of the species, which are thus drawn only from the structure of the foot and chætæ. But as that fragment was obtained from near the localities in which the "Endeavour" material was collected, and as these agree well with the few features mentioned by him, it seems probable that we are dealing with his species.

My material consists of one entire individual, eight cephalic fragments of less or greater length, two anal fragments, and three pieces from somewhere near the middle of the worm.

The entire individual was studied.

It is a fairly well preserved, though somewhat contracted, female, filled with eggs ; it measures 140 mm. in length, with a diameter of 5 mm. over the body, and a height of 5 mm. It contains 112 segments in addition to the "head."

Its colour is dark brown, highly iridescent, but the majority of the specimens are quite a pale grey.[1]

The prostomium has the usual ventral median furrow, and each lobe is traversed by an obliquely horizontal furrow separating a smaller upper from a larger lower lobe.

The tentacles are very definitely annulated, with deeply pigmented grooves between the swellings (Pl. xli., fig. 68). The proximal swellings are shorter and less rounded than the distal, due, perhaps, to differences of contraction. The median tentacle has 17+n swellings ; it isiincomplete here, the admedians 21 and the laterals 14, in addition, in each case, to the cylindrical cirrophore.

In another individual the numbers are 27, 21, and 12, and in a third 25, 20, and 15.

1. The dark tint of this individual may be due to it having been preserved in the same tube as some other organism from which the pigment has been dissolved and stained the worm ; for I have had specimens of pale Echinids, which have been preserved with Comatulas, and have become stained dark brown.

The peristomium and nuchal segment together are broader than their length, which is about equal to $2\frac{1}{2}$ chætigerous segments.

The peristomium is slightly excavated on the dorsal surface; the lower lip is not so deeply notched as it is in *E. pycnobranchiata*, and its upper margin is not visible from above (Pl. xli., fig. 67).

The nuchal cirri present 8 annulations; they fail to reach the anterior margin of the peristomium by a space about equal to the length of the nuchal segment.

The dorsal cirri are also distinctly moniliform, and relatively stout. Anteriorly, there are four dilations, the terminal being elongated, and under a dissecting lens may appear to be constricted, but in a preparation this is seen to be only a "bend," not really a constriction.

As in the tentacles, the furrows are pigmented.

After about the 6th segment, and throughout the rest of the body, only three dilations exist, but there appears to be some variation in this, for in some individuals, the feet of which were mounted, four appear (Pl. xli., fig. 70). The anterior dorsal cirri are particularly stout.

The ventral cirri of about the first half dozen feet are short, rounded sub-spherical lobes; further back this lobe bears a short stout bluntly rounded conical appendage, while over the greater part of the body the latter elongates and the basal lobe decreases.

The anal cirri, also moniliform, have a length equal to the last 10-12 segments.

The gills commence on the 6th chætigerous segment (in this and all the anterior ends available), and are continuous to the posterior end of the animal. In this individual the first gill has 4 filaments—the maximum is 10—and this number occurs over the segments 8-9, after which there is a gradual and fairly regular decrease, with here and there an occasional addition of one filament. Thus on segments 40-60 there are 4 filaments; on 61 only 3; on 90 the number is again 4, but on segment 100 the number once more scales to 3, and then to 2, and to 1 at the last few segments.

This cannot be regarded as a "posterior enlargement" of gills, such as occurs in one or two other species (see below).

As to the relation between the size of the gill, even at its maximum stage of development, one cannot regard them as "large"; they only reach about half way up the side of the body towards the middle line, even when held vertically up by forceps (Pl. xli., fig. 69).

The filaments are rather thick, springing close together in this and other individuals, but in others they are relatively more delicate (*cf* Pl. xli., fig. 70; Pl. xlii., fig. 78).

The gill seems to be much contracted, and the lower filaments do not reach to the end of the dorsal cirrus, but in other specimens in which they are better preserved, the lower gill filaments are longer than the dorsal cirrus.

The chætæ present no special peculiarities. I find the following numbers, in addition to the 4 or 5 minute "combs" in the uppermost part of the bundle, there are 6 or 7 capilliforms without a flange, somewhat flattened and sword-shaped; then two golden acicula, with occasionally a third one, below which are 12 "gomphotrichs" (*i.e.*, jointed or compound chætæ), which decrease in number in the posterior feet (Pl. xli., fig. 71). After about the thirty-sixth foot a subchætal spine or acicular-chætæ appears.

The subchætal spine is golden, bidentate in the early segments, but tridentate in most of the feet (Pl. xli., figs. 72-74).

Owing to the golden colour of the spine it is difficult to detect on the worm under a dissecting lens, and thus difficult to state quite definitely the segment on which it occurs (but as this may vary, see above for *E. pycnobranchiata*). In this specimen it is not present on the thirty-sixth, but is on the fortieth segment; in another individual I find it in the thirty-sixth; in a third in the thirty-eighth.

The jaws.—The lower jaws have large thick white plates at the distal end, which are irregularly undulating at the free edge, so as to form three projections of irregular size (Pl. xlii., fig. 77).

The upper jaws are dark brown, but in smaller specimens a paler brown; the tip of the "forceps," and of the various denticulations of the other sclerites, are white and calcified.

The forceps (zange) are slender, with the tip curved upwards (Pl. xlii., fig. 76). The articulation between forceps and its carrier is marked by a dark brown band, which is very conspicuous when the jaws are of the paler tint.

The left dental plate (jawlets of the second pair) (II.), has 4 teeth, the distal largets, the others decreasing proximally (Pl. xlii., fig. 75).

The left unpaired (III.) has 6 teeth, the two proximal are quite small and less pointed than the rest. This plate lies alongside the large dental plate, as in some other species.

The fourth left is hoodlike, with 5 teeth; the base of the hood is dark brown.

The fifth is triangular, with a single recurved white tooth.

On the right side, the dental plate (II.) has 5 teeth, decreasing in size from the most anterior; the hoodlike fourth has 8 or 9 teeth, of which the one at each end of the series is very little developed; the fifth plate is like that on the left side. All the teeth are tipped with white.

In four individuals examined I find that these numbers are constant.

SOME COMPARATIVE MEASUREMENTS OF *E. bassensis*.
(Cephalic fragments.)

	Number of segments.	Dimensions in mm.	Maximum No. of gill filaments.
1	84	60×5	4
2	66	21×2	4
3	65	70×5	10
4	46	40×4	6
5	110	90×4	12
6	70	60×4	8 (9)
7	45	..	7 (8)

Nos. 1-4, 6, 7.—East coast Flinders Island; 5, Entrance to Oyster Bay.

Remarks.—Certain differences exist between my specimens and the fragmentary type. The foot figured by M'Intosh (Pl. xxxix., fig. 16), shows no prominent chætophoral sac, the chætæ seem to spring from the general contour of the body. Surely this must be an error of the artist, as it is totally unlike the general character of an Eunicid parapodium. But the most noticeable difference is in the size of the gill, which has nine filaments. Unfortunately M'Intosh gives us no idea of the size of the worm, nor does he say whether the foot figured came from the anterior end of the fragment or not. His fragment was two inches in length, and if one examines the present material at this distance from the anus, the gill has but six filaments. We must then presume that his specimen was portion of a larger worm.

At any rate, none of the other species obtained from this neighbourhood or elsewhere agrees so closely with ours.

In a recent article Crossland (1904) has tentatively suggested that *E. bassensis* is a synonym of *E. antennata*, Savigny (1820). But if my identification be correct, *E. bassensis* differs from that species as described and figured by the authors, Savigny, Gravier (1900), and Crossland, in the following features :—

(1) *E. antennata* appears to be a small species. Savigny[1] gives its length as 3 inches. Crossland states that those from Zanzibar are 100 by 5 mm. (including the feet), those from the Maldives are 80 x 4 mm., and less.

E. flaccida, Grube,[2] which Crossland identifies with this, was fragmentary ; the 67 segments measure 35 x 2 mm ; while Grube's variety *gracilis* measured 78 x 2.5 mm. for a worm with 85 segments. Compare this with our first individual, where the 84 segments measure 60 by 5 mm. In other words, this Tasmanian species is evidently a larger worm.

(2) Crossland[3], in his drawing of the head (Pl. xxii., fig. 1) from above, shows that the upper edge of the lower lip is prominent, and is visible from above, as in *E. pycnobranchiata*, while there is no excavation of the anterior margin of the peristomium.

(3) The gills are shown as nearly meeting dorsally, which is far from being the case in any of our individuals.

(4) The form of the ventral cirrus, as given by him, is represented (text fig. 60, p. 317) in the 10th segment as long and narrow, without the swollen base which is so evident in ours, and it projects further beyond the lip of the chætophoral sac than in ours.

(5) The dorsal cirrus is apparently much more slender.

(6) The nuchal cirrus is shorter.

(7) According to Crossland's figure of the acicular chæta the main tooth forms nearly a right angle with the axis, and it may be noted that Gravier's[4] figure of *E. flaccida* (p. 256) is less than a right angle, whereas in the present species this angle is much more open.

(8) The jaws of *E. antennata* show a considerable range of variation ; and if I understand Crossland's formulæ on p. 316 "6—7 : 10+9—8" to mean "left dental plate (II) has six

1. Savigny—System. Annelides, 1820, p. 50, pl. v., fig. 1.
2. Grube—Annel. d. rothen Meeres, Monatsber. k. preuss. Akad. Berlin, 1889, p. 491 (separate copy, p. 11).
3. Crossland—Proc. Zool. Soc., 1904, I., p. 312.
4. Gravier—Nouv. Arch. Mus. Paris, 1900, p. 255.

teeth, the right seven, the unpaired (III) has ten, the left anterior (IV) nine, and the right eight—then none of his variations of the dental plate have so few teeth as 4-5, which appears to be constant in the present species, and though the anterior plate (IV) varies, none of them agree with ours, which show no variation amongst themselves.

Some of these differences may be due to age or to the mode of preservation, but others, such as the chæta and the jaws, seem diagnostic, and the accumulation of the small differences as well as the geographical distribution justifies one in making a new species. At the same time it is clearly allied closely to Savigny's species from the Red Sea and the Indian Ocean.

E. antennata is a Red Sea and Indian Ocean species, and though Ehlers[1] records a worm under this name from the Chilian coast, he states that it has black acicular chætæ instead of the golden that characterises *E. antennata*, as Savigny noted in his account; and it presents one or two other differences, as in the jaws. The same author[2] has also recorded this species from the New Zealand coasts (1907, p. 12), but my material from which I sent him the specimen belongs to *E. pycnobranchiata*.

Crossland's ground for including Australia in the distribution of *E. antennata* rests on his examination of the specimen labelled by Grube himself as "*E. paucibranchiata*," which was obtained from this region. He gives no reference to the paper in which Grube describes a species under this name. Grube[3] himself named a species "*paucibranchis*" but in a later article[4] identifies this with *E. australis*, Quatrefages[5] (which belongs to a different group of the genus in which the gills are limited to a few segments in the anterior region of the body).

Now one of the characters of Savigny's species is said by Crossland to be the increase in size of the gill and in the number of its filaments behind the middle of the body immediately previous to the ultimate gradual decrease[6]. As I have stated, I find no evidence in my material for this

1. Ehlers—Die Polychæten d. Magell. u. chilen. Strandes, 1901, p. 126.
2. Ehlers—Neuseeland. Annel., 1907, p. 12.
3. Grube—Schless. gesellsch., 1866, p. 64.
4. Grube—Mittheil. ub. d. Fam. d. Euniceen—Schless. gesellsch., 1877, p. 20.
5. Quatrefages—Hist. Nat. d. Annel., p. 321.
6. Savigny does not show this phenomenon in his figure, nor mention it in the text, though he says that the gills may be absent in 20-30 last segments.

increase in size. It is true that there may be an increase in number of filaments by one over a variable and inconstant region of the body, but such increase seems to me to be a mere variation, and one knows it to occur in several species in which the gills extend over a long portion of the worm.

Locs.—East coast of Flinders Island, Bass Strait.

Entrance to Oyster Bay, Tasmania.

Oyster Bay, Tasmania, 20-40 fathoms.

Ten miles north of Circular Head, Tasmania.

Breaksea Island, Port Davy, Tasmania.

North of Cape Borda, Kangaroo Island, 40 fathoms.

Sub-Family ONUPHIDINÆ.

Genus Hyalinoecia, *Malmgren.*

Hyalinoecia tubicola, *Muller.*

Nereis tubicola, Muller, Prodromus Zool. Dan., 1766, p. 217.

Onuphis tubicola, Audouin & Milne-Edwards, Ann. Sci. Nat., xxviii., 1833, p. 225. *Id.*, Ehlers, Die Börstenwürmer, 1864-68, p. 297 (with synonymy).

Northia tubicola, Johnston, Cat. Brit. Mus., 1865, p. 136.

Hyalinoecia tubicola, M'Intosh, Chall. Rep., Zool., xii., 1885, p. 335.

Three individuals in their transparent tubes, two of which measure 108 mm. by 5 mm. at the broader end and 4 mm. at the other: the third is rather shorter.

The worm removed from the tube is 50 mm. in length ; it consists of a head with 64 chætigerous segments ; another is 75 mm. in length ; the third is 55 mm. In this last the tentacles were stretched to the fullest, so were easily measured.

I suspected that the worm would be *H. benthaliana*, M'Intosh[1], and although his account is not very full and is in some respects unsatisfactory—for instance, he gives no measurements—after comparing the worms with the various accounts of the European species, I have no doubt that it is

1. M'Intosh—Chall. Rep., Zool., xii., 1885, p. 339.

the same. It is already known to be very widely distributed, and the details given for *H. benthaliana* seem to me scarcely sufficient to distinguish it from Muller's species.

It appears from the various accounts that the relative lengths of the three middle tentacles is subject to variation. By some authors they are described or shown as approximately equal, while others give a greater length for the median, as, for example, Ehlers[1]. Again, the size of the worm, the position of the first gill, the number of denticulations on the jaw plates, show a fair range of variability.

In the present case it may be as well to record the facts. The filamentous gill commences on the 22nd chætigerous segment. The jaw plates of the second pair (II) on the right side bear 11, on the left 12 denticulations ; IV have 8 and 9 or 10 respectively ; the unpaired one has 13.

The present worms agree more closely with the typical form as described by M'Intosh and St. Joseph[2] than with any of the "varieties" described by the former author ; especially in the denticulations of the jaw plates as well as in the segment on which the gills commence.

Loc.—Off Babel Island, Bass Strait, 50-80 fathoms.

Distribution.—The typical form and its "varieties" have been obtained in the European seas ; in the Atlantic ; from the Pacific ; on the coast of Japan (Moore)[3] and of California (Moore)[4] ; from New Zealand (Ehlers)[5] ; from Torres Strait (M'Intosh). I have no literature dealing in detail with other regions.

It has already been suggested by Willey[6] that *H. camiguina*, Grube[7], from the Philippines, Ceylon and the Indian Ocean (Crossland)[8] is merely "a local form" of the European species, and it seems not unlikely that *H. brevicirris*, Grube,[9] from Moreton Bay on the east coast of Australia is also a variety of this species, for the account only differs in one or two features of proportions of parts. If these two be included, then the species may be said to be distributed everywhere outside the Arctic and Antarctic seas.

1. Ehlers—Die Börstenwürmer, 1864-68, p. 297.
2. St. Joseph—Am. Sci. Nat., (8), v., 1898, p. 241.
3. Moore—Proc. Acad. Nat. Sci. Philadelphia, 1903, p. 444.
4. Moore—*Loc. cit.*, 1911, p. 280.
5. Ehlers—Neuseeland. Annelid., 1907, p. 1D.
6. Willey—Ceylon Pearl Oyster Fisheries, pt. iv., Suppl. Rep., xxx.,—Polychæta, 1905, p. 274.
7. Grube—Annulata Semperiana, 1878, p. 42.
8. Crossland—Proc. Zool. Soc., 1904, p. 281.
9. Grube—Monatsber. Akad. Wiss. Berlin, 1877, p. 528.

Family LUMBRICONEREIDÆ.

Genus Lumbriconereis, *Blainville.*

Lumbriconereis sphaerocephala, *Schmarda.*

Notocirrus sphaerocephala, Schmarda, Neue Wirbellose Thiere, I., 2, 1861, p. 116.

Lumbriconereis sphaerocephala, Ehlers. Abhandl. Gesell. Wiss. Gottingen, Neuseel. Annal., 1904, p. 33.

A single imperfect specimen of small size and dark coppery brown in colour, with a high iridescence, appears to belong to this species. The prostomium is, however, rather longer than broad, and, therefore, less nearly spherical than in Ehler's description; this may be a matter of preservation. I have preparations of this species, which is common on New Zealand coasts, and it agrees well with them.

Loc.—East of Babel Island, Bass Strait, about 70 fathoms.
Distribution.—New Zealand; Chatham Islands.

Lumbriconereis gulielmi,[1] *sp. nov.*

(Plate xlii., figs. 81-88; Plate xliii., figs. 89-94.)

Two imperfect individuals of large size, one consisting of the head and 58 chætigerous segments, measures 70 mm. in length, with a diameter of 7 mm. It is narrower anteriorly where it is only 3 mm. across the peristomium The other specimen consists of 133 segments and the head, and has a length of 99 mm. There is little evidence of a posterior tapering, for at its truncated end it still measures 6 mm. in width.

The worm is nearly cylindrical, its height being 6-7 mm. The segments are short as usual, being about 1-6th to 1-7th of the diameter of the body.

The colour is coppery brown, with a bright green iridescence and the chætæ are glistening brown.

The prostomium (Pl. xlii., figs. 81, 82) is a rounded cone as broad as its length, with no conspicuous eyes, but in their place a curved transverse row of 6-8 small black spots close together on each side of the base, and extending laterally so as to be visible from the side. In the second individual, which is in a better state of preservation, these pigment spots are less distinct; they form a row right across the base of the prostomium, and are not confined to the sides.

1. I have taken the liberty of naming this fine species after the veteran zoologist, Professor William C. M'Intosh.

On the underside the prostomium presents a pair of rounded lobes (? palps) immediately in front of the mouth (Pl. xlii., fig. 82).

The peristomium and nuchal segment are separated dorsally and laterally by a furrow, but merge into one another ventrally, as the furrow bends forwards on each side nearly at right angles, and thus delimits a ventral lip which is marked by longitudinal furrows.

The peristomium is about twice the length of the nuchal segment, whose length is equal to that of the first chætigerous. The parapodia of a few anterior segments have a representative of a dorsal cirrus in the form of a small rounded lobe into which a small bundle of fine bristles enter. The feet as seen from above under a dissecting lens have from the first a long posterior lip, which is antero-posteriorly compressed so as to be lamelliform; it is quite narrow in a well preserved specimen, but rather thicker in the other (Pl. xliii., fig. 89). In the latter this lip is bent upwards in many of the feet, but in the other specimen its bluntly rounded apex is directed outwards (Pl. xlii., figs. 86, 87); its upward bend is, I think, due to pressure against the wall of the containing tube. The upper margin is nearly horizontal, though it is slightly concave, while its lower margin slopes upwards from below. The feet in the first half-dozen segments are smaller than the following. The posterior lip is curved backwards in the greater part of the body. While the lip in the anterior segments is much compressed and very thin, it becomes, somewhere about the fortieth, shorter and thicker, and this proceeds till it is in the posterior segments short and quite thick (Pl. xliii., fig. 89). The anterior lip likewise changes somewhat in its form. Both lips are very vascular, but the vessels in the posterior lip are more numerous and more clearly seen owing to its thinness.

The capillary chætæ, many of which are brown and iridescent, project a good way beyond the larger lip, and this especially in the case of the upper chætæ. In the anterior 40-50 feet all the chætæ are flanged capilliforms, bent upwards from a point just below the commencement of the flange (Pl. xlii., fig. 86).

But at or about the 50th foot most of the lower capilliforms are replaced by hooks, with a long hood formed by a pair of wings (Pl. xlii., fig. 84); and by about the 60th the uppermost capilliforms are similarly replaced by one or usually by two hooded hooks (Pl. xlii., fig. 85).

Some of the capilliforms in the anterior feet have a flange on both sides, of which one is shorter than the other. In the hinder feet, however, the chæta itself is shorter and the flange less extensive (Pl. xliii., figs. 90, 91) The hooks have one large terminal rounded tooth which does not form a marked angle with the shaft ; on its back are some 5-6 very small closely set denticulations separated by parallel linear gaps, so as to resemble a comb (Pl xliii., figs. 92, 93). The shaft enlarges for a considerable distance before the end, it is then suddenly narrowed below the hook so as to form a deep bay. The wings are of still more considerable extent, arising below the enlarged region of the shaft, and projecting from the back as well as in front of the hook.

Further details as to the feet show that the 10th foot has about 20 long, upwardly curved flanged bristles terminating in a fine point beyond the flange. All are alike, but those above the acicula are longer (Pl. xliii., fig. 94), projecting beyond the tip of the posterior lip, while the lower ones do little more than reach this tip. The upper ones are golden brown, glistening in reflected light ; the lower are golden yellow. Between the two groups are 4-5 golden acicula whose points do not project beyond the skin.

In the 55th foot the uppermost chætæ are six in number, not so long as those in the anterior feet ; in the sub-acicular bundle are five hooks and one flanged capilliform (Pl. xlii., fig. 84).

The acicula now have brown tips.

In the 125th foot the supra-acicular part of the bundle contains only two large upwardly directed winged hooks (Pl. xlii., fig. 85), below which are three flanged capilliforms, differing somewhat from those anteriorly. In the sub-acicular bundle are 5-6 winged hooks, of the same structure as the upper ones, but slenderer. The acicula are now reduced to two, which are stouter than in the anterior feet ; one is golden, the other black.

The pharynx reaches to the 10th chætigerous segment. The lower jaws are brown, covered anteriorly with the usual thin white transparent plate of lime, which is marked on its upper surface with fine longitudinal lines, and on the under surface with a number of concentric lines ; the anterior edge is white, and obliquely curved ; the pair are united for nearly their whole length. The upper jawlets are black, each denticle being tipped with white. The forceps, that is the first pair, are relatively slender (Pl. xlii., fig. 88). The right dental plate (II) has six teeth, the most distal of which is the smallest, the next is the largest, and, with the exception of the third, which is also small, they decrease regularly in size proximally. All are bluntly rounded. The left plate has five teeth. The third pair has two large rounded teeth; the fourth pair has one indistinct tooth.

Remarks.—The species is considerably larger than the majority, and although both individuals are imperfect the diameter indicates that the species is one of the largest. It has some resemblance to *L. heteropoda*, Marenzeller,[1] which is a Pacific species, especially in the character of the feet, from which, however, it differs most conspicuously in the fact that the jaws of Marenzeller's species have but four denticulations on each of the large dental plates.[2] The form, too, of the ventral hooks seems from the rather divergent figures of Marenzeller and of M'Intosh[3] to have a less extensive enlargement and less extensive wing; while the details of the apex are also unlike. It is also noteworthy that Marenzeller states that his species is eyeless, while M'Intosh finds a pair of eyes obliquely set but hidden by the anterior margin of the peristomium. The colour, according to the former author, is "yellowish grey, with a feeble bronze iridescence in the middle of the back," which is in marked contrast to the colouration of this species. But how far is colour important by itself? From a comparison of the feet I supposed that the present worms belonged to this species, but there is some discrepancy between the accounts and figures given by the two authors referred to, so that I have given a somewhat detailed account of the species. It may quite probably be synonymous.

Locs.—Oyster Bay, Tasmania, 26 fathoms.

Twenty miles east of Babel Island, Bass Strait.

Genus OENONE, *Savigny.*

OENONE HASWELLI, *sp. nov.*

(Plate xliii., figs. 95-102; Plate xliv., fig. 113.)

Four individuals, two of them are complete, two are anterior fragments. A complete specimen measures 140 mm.

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1. Marenzeller—Denksch. Math. Naturwiss. Akad. Wien, xli., 1879, p. 30.
2. Moore (Proc. Acad. Nat. Sci. Philadelphia, 1908, p. 346) notes that the jaws vary somewhat in the number of denticulations, but gives no details.
3. M'Intosh—Chall. Rep., Zool., xii., 1885, p. 255.

in length, with a diameter of 6 mm. at its widest; across the feet it measures 9 mm., and the height is 6 mm. The body is convex dorsally and flat ventrally.

The segments are very short, being about one-tenth of the diameter of the body, and separated by deep furrows.

The worm contains 247 segments, tapering forward, from the 25th to a diameter at the peristomium of only 2·5 mm., and posteriorly where the last segment is 1 mm. in diameter. Its colour is brown, without any iridescence.

A second complete specimen measures 120 by 5 mm.; the jaws are partly protruded, and the appearance of the head from above recalls the drawing given by Savigny of *O. lucida.*

A third, fragmentary, is 50 by 5 mm.; the head is much retracted; and a fourth consists of head and 70 segments measuring 80 by 5 mm.

The prostomium is a bluntly rounded cone; its length is equal to its breadth; it carries three minute conical tentacles, hidden under the overhanging anterior margin of the peristomium (Pl. xliii., figs. 95, 96).

There are two pairs of eyes, the anterior larger, rather lateral in position and oval in shape; the posterior small, admedian and round, lying in front of the bases of the two admedian tentacles, and, like them, hidden.

It was not until I had slit open the dorsum, in order to study the jaws, that I detected the tentacles, but having discovered them, I found it possible to see their tips in other specimens, on forcing back the peristomial margin.

The under surface of the prostomium has a very deep median groove, which widens outwards posteriorly. There are no "palps" (Pl. xliii., fig. 97).

The peristomium (the only footless segment) is, on its dorsal surface, but little longer than the first chætigerous segment, but on the ventral surface it lengthens out posteriorly, so that in the mid-line it is about twice the length it has laterally. The median region, forming the lower lip, is marked out from the lateral by a pair of longitudinal furrows, starting from the anterior margin, and then curving outwards to die out. There is a slight median notch, which, however, is better seen in a specimen in which the prostomium is retracted, and therewith the peristomium stretched.

The sides of the peristomium are somewhat grooved, and these also are obliterated when the prostomium is retracted.

The parapodia are prominent; the dorsal cirri are relatively large from the first, are vertically extended and flattened antero-posteriorly, leaf-shaped in outline; constricted at the attachment, with rounded apex; the cirrus increases in size further back, so that by the 29th it is as long as the posterior lip of the chætophoral sac, and later comes to exceed this in length (Pl. xliii., fig. 99).

Seen under a dissecting lens the dorsal cirrus has the appearance of being folded along its length, as Savigny's drawing suggests; this appearance is due to the large size of the blood vessel which traverses it, and of the lateral vessels which spring in numbers from it. The internal margin, directed towards the body, rises nearly straight upwards, but the outer margin has a gentle convex curve, which suddenly turns inwards at the base, where it connects with the foot.

The chætophore has two fleshy lips, the posterior of which is at least twice as long as the anterior, and much higher; it is produced outwards as a somewhat conical lobe. There is no ventral cirrus.

The parapodium is supported by (usually) two yellow acicula; the chætæ are few. In the anterior feet they are all capilliform, but in the posterior feet two or three golden acicular chætæ replace some of the ventral capilliforms.

The capilliforms in the upper part of the bundle are longer than those below, decreasing gradually in length from above downwards. Those in the upper part are almost straight or with a gentle curve (which may be artifact), and have only a feebly developed, obliquely striated flange, but in the sub-acicular bundle the capilliforms are bent upwards near their end, and have a wider flange (Pl. xliii., fig. 100).

Somewhere about the 50th segment the acicular chætæ appear (most of the chætæ in the lower part of the feet are broken short so that it is difficult to be certain as to the exact segment). These are usually two in number, sometimes three, and the two are not alike; the upper one has the notch separating the two teeth, nearly in line with the axis, that it is almost terminal; but in the lower chætæ it is more lateral, and the teeth larger (Pl. xliii., figs. 101, 102).

From the 13th foot to the 25th, all the chætæ are capilliforms, arranged in supra-acicular and sub-acicular bundles; in the 25th the supra-acicular bundle consists of (*a*) an upper group of long bristles, 4-5, and (*b*) a lower of 4 rather shorter ones. The sub-acicular bristles are still shorter.

In the 53rd foot, the supra-acicular chætæ are—(*a*) 2 very long, and (*b*) 4 medium capilliforms. Sub-acicular—5 short capilliforms and 2 acicular chætæ.

53rd supra-acicular—(*a*) 2 very long, and (*b*) 4 medium capill. Sub-acic.—5 short capill. and two acicular chætæ.

The pharynx is long, narrow, cylindrical, extending to the 19th segment.

The lower jaw pieces are short and broad, with a large biting region, which in its outer half is transverse, and on its inner half obliquely inclined backwards. The area of union of the right and left pieces is about one-third of the total length.

The jaws are dead black, the supports are very slender rods, longer than the whole series of upper jawlets.

The upper series (Pl. xliv., fig. 113) consists of five pieces on each side: the basal pair (I.) are unlike; the left one has an anterior long claw-like fang, the internal margin of the base is straight, and bears 12-13 short sharp denticulations.

The right piece (I.) has no claw; it is a transversely disposed plate, with its internal margin produced fore and aft, so as to be nearly twice the length of the plate itself, and this edge bears 13 denticulations.

The next piece (II.) on the right side, extends alongside the basal piece, and under a dissecting lens might readily be overlooked. It is a broad clawed plate, the internal straight margin is produced into 12-13 teeth, the distal ones, small, commence close to the claw, the proximal larger. This internal toothed margin is bent upward, and thus is not readily seen till the plates are moved about.

The corresponding left plate (II.) has a long stout claw, with 9 denticulations, of which the proximal and the distal are small, and those in the middle stout.

On the left side, the next (III.) has a large claw with six teeth, the largest in the middle.

The fourth (IV.) similar, but rather smaller, with six teeth. The fifth (V.) has a single terminal claw, and no subsidiary denticulations.

On the right side the plates III., IV., and V. are similar, but the third (III.) has seven teeth.

Remarks.—The existence of three tentacles would indicate that the worm belongs to the genus *Aglaurides*, but the asymmetry of the jaws, especially the presence of the clawless plate on the right side, agrees with what occurs in the species of *Oenone.*

There appear to be only three species of this genus hitherto described, *O. lucida*, Savigny[1], *O. diphyllidia*, Schmarda[2], and *O. pacifica*, Fischli[3]. The worm described by Willey[4] from Ceylon as *Aglaurides fulgida*, Savigny, is not a a member of that genus according to the view of most zoologists, for it has the Oenonian arrangement of jaw plates, which in *Aglaurides* are more nearly symmetrical.

Willey seems to have overlooked the difference in the character of the jaws as diagnostic of *Oenone*, for he supposes that the only point of difference between the two genera lies in the presence or absence of the tentacles ; and it is noteworthy that in order to see these, he had to cut the peristomium, as I have had to do. I suggest that it belongs to the genus *Oenone.*

Savigny, in his diagnosis of the genus *Oenone*, uses (p. 55), as Ehlers has already noted, the phrase " Antennes point saillantes et comme nulle." I understand this to mean that Savigny had recognised the existence of tentacles, and wished to emphasise their small size—so small are they that " they do not project ; there appear to be none."

With the four species the present one cannot be confused, owing to the details of the teeth.

Aglaurides, too, has two distinct footless segments. *Oenone* has but one, which, however, is double ventrally, and the formation of the lower lip appears, from Ehlers' account, to differ.

From *O. diphyllidia*, as described by Ehlers[5], the present species differs in the form of the prostomium, in the shorter and thicker feet (compare his Pl. xxxiv., fig. 4), in the wider dorsal cirrus, and in details as to the number of denticulations on the various jaw plates.

Locs.—East coast of Flinders Island, Bass Strait.

Between Port Stephens and Newcastle, New South Wales, 20-60 fathoms.

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1. Savigny—System. Annelides, 1820, p. 55.
2. Schmarda—Neue Wirbellose Thiere, I., 2, 1861, p. 120.
3. Fischli—Abhandl. Senckenberg. Naturforsch. gesellsch., xxv., 1900, p. 108.
4. Willey—Ceylon Pearl Oyster Fisheries, pt. IV., Suppl. Rep., xxx.,—Polychæta, 1905, p. 284.
5. Ehlers—Mem. Mus. Comp. Zool. Harvard, xxxi., 1887, p. 109.

Genus Lysarete, *Kinberg.*

Lysarete australiensis, *sp. nov.*

(Plate xliii., figs. 103-109; Plate xliv., figs. 110-112.)

An anterior fragment, consisting of the head and 70 chætigerous segments of what is evidently a very large worm. It measures 110 mm. in length, with a breadth of 10 mm. over the body, and 14 over the parapodia; the height is 9 mm. The peristomium is 6 mm. across, and the diameter thence increases, till at the 10th segment it has attained its full measure, which is retained for the remainder of the fragment. The segments are 1-5th the diameter of the body.

The colour of the worm is a rich dark copper brown, with a well marked green iridescence.

The prostomium is a short rounded cone, slightly broader than long; its length is equal to that of the peristomium, nuchal and first chætigerous segments (Pl. xliii., fig. 103). It bears three short cylindrical tentacles, which arise in a curve; the median, which is inserted behind the others, is longer than the admedian and is nearly as long as the peristomium and nuchal segment. These tentacles lie backwards in a deep groove excavated in the upper surface of the peristomium, nuchal and first chætigerous segments. It is broad in front, where the overhanging margin of the peristomium is interrupted, while the posterior region of this segment is excavated, and this excavation is successively narrower in the two following segments (Pl. xliii., fig. 104).

There are two pairs of eyes, both of very small size; the anterior are difficult to see owing to the deep pigmentation of the skin of the prostomium; they lie outside the bases of the admedian tentacles. The second pair lie between the median and admedian tentacles, and can only be seen when these are turned forwards.

The surface of the first three segments is marked by numerous short irregular longitudinal furrows.

The under surface of the prostomium presents no groove, but at the base, on each side, is a large prominent convex lobe, triangular at its origin (Pl. xliii., fig. 105). One apex is directed backwards, the opposite side is forwards, a second side faces inwards; the third, backwards and outwards. Between these palps and behind them are several transverse folds, probably due to the partial eversion of the pharynx.

The peristomium is slightly longer than the nuchal segment, from which it is separated by a definite furrow dorsally and laterally ; but on the ventral surface the intersegmental furrow suddenly bends forwards to form the outline of a "processus oralis," so that the median part of the lower lip appears to be formed by the nuchal segment.

The lower lip is traversed by short longitudinal furrows along its ventral and lateral margins.

The body is nearly cylindrical (Pl. xliii., fig. 106) ; the parapodia are prominent and widely separated ; the posterior lip of the chætophore is large, foliaceous, and pointed.

The dorsal cirrus in the earlier feet is small, being little more than a cylindrical papilla, much shorter than the anterior lip of the chætophore (Pl. xliv., fig. 110) ; it is not till about the 20th segment that it attains the length of this lip (Pl. xliv., fig. 111), and by about the 40th it is as long as the posterior lip and even longer. It has now lost its cylindrical form, has become flattened in the antero-posterior direction, and is highly vascular, and projects outwards almost horizontally (Pl. xliv., fig. 112).

A few small chætæ, as usual in the family, enter the base of the dorsal cirrus and are accompanied by a black aciculum. There is no ventral cirrus, unless the rounded side of the body is regarded as such ; it is separated from the ventral region by a definite groove.

The chætæ, which are brown, are all capilliform (Pl. xliii., fig. 108), with a very slight flange, but are of two sizes : those in the supra-acicular bundle are much longer than the sub-acicular ones. There are usually four black acicula in the main part of the foot.

In the first and second feet I find the following numbers of chætæ :—The supra-acicular chætæ are 10, the sub-acicular 8-10 ; in the twenty-first 7 and 14 respectively ; in the sixty-sixth foot the numbers are 6 and 8 respectively.

The jaws are very dark brown in colour ; the "support" is quite short, not as long as the proximal upper jaw-plate ; each half is a right-angled triangle, the vertical side of which is median, the hypothenuse external, and frayed out, as it were, into a number of delicate short threads.

The right and left jaw plates are symmetrical, five on each side. The proximal plate (I) on both sides is long and narrow, bidentate, or rather has two large claw-like fangs at its anterior end, the posterior of which is only slightly smaller than the other. There are no marginal denticulations. II. has the ordinary form of a broad plate with five teeth. III. is short, with three teeth, the proximal being small. IV. is bidentate ; and V. has but a single tooth.

The fifth plate is so closely placed against the fourth that on a first inspection they seemed part of a single plate.

The lower jaws are long and anteriorly broad ; they lie wholly in front of the support of the upper jawlets, and each is divisible lengthwise into two approximately equal regions ; the outer region is brown, the inner white, being calcified and marked by fine longitudinal lines.

Remarks.—This species differs from the only other species, *L. brasiliensis*, Kinberg[1] in the following features : in the number of teeth on the jaw plates, in the dimensions of the dorsal cirrus and posterior lip, both of which are narrower than in the present species. Ehlers,[2] who figures this species, says that the worm is whitish-grey.

Loc.—South by south-west of Mt. Cann, Victoria, 55-70 fathoms.

1. Kinberg—Annulata nova, 1864.
2. Ehlers—Florida Anneliden, 1887, p. 107.

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Commonwealth Director of Fisheries

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VI. Report on the Hydroida collected in the Great Australian Bight and other Localities.

PART III.

BY

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Plates XLVI.—XLVII.

REPORT ON THE HYDROIDA.

Part III.

I.—Introduction.

In this third and concluding Report on the Hydroida collected by the "Endeavour" are enumerated all the species observed (except two or three forms represented only by very imperfect specimens), with their localities, and, in the case of those not already dealt with, their synonymy and such other notes as it is thought might be of interest. Under the names of species which have been described in Parts I and II will be found references to the pages of those parts where they are treated of, with, in some cases, further remarks on specimens observed later.

Altogether sixty-four species or varieties are represented in the collections, of which twenty-two species and four varieties were considered to be new. All of these were described in the two former Reports, except *Sertularella tasmanica*, *S. undulata*, *Sertularia pusilla*, *Nemertesia ciliata*, var. *cruciata*, *Aglaophenia divaricata*, var. *cystifera*, and *Cladocarpella multiseptata*, which are the only new forms described in the present Report. In two or three instances the new material has enabled me to describe the gonangia of other species of which the gonosome was previously unknown.

The following is a list of the species observed :—

Order GYMNOBLASTEA.

Family HYDROCERATINIDÆ.

Clathrozoon wilsoni, Spencer.

Order CALYPTOBLASTEA.

Family CAMPANULARIIDÆ.

Campanularia pumila, Bale.

Family CAMPANULINIDÆ.

Thyroscyphus marginatus, Bale.
Thyroscyphus simplex (Lamouroux).

Family HALECIIDÆ.

Halecium flexile, Allman.

Family LAFOËIDÆ.

Perisiphonia exserta (Busk).
Cryptolaria arboriformis, Ritchie.
Cryptolaria angulata, Bale.
Hebella calcarata (L. Agassiz).
Hebella calcarata (L. Agassiz), var. *contorta*, Marktanner-Turneretscher.
Lafoëa gracillima (Alder).

Family SERTULARIIDÆ.

Sertularella gaudichaudi (Lamouroux).
Sertularella gayi (Lamouroux).
Sertularella tasmanica, sp. nov.
Sertularella undulata, sp. nov.
Sertularella indivisa, Bale.
Sertularella neglecta, Thompson.
Sertularella divaricata (Busk).
Sertularella adpressa, Ritchie.
Sertularella lata (Bale).
Thuiaria sinuosa, Bale.
Synthecium subventricosum, Bale.
Hypopyxis distans, Bale.
Selaginopsis dichotoma (Allman).
Diphasia subcarinata (Busk).
Sertularia minima, Thompson.
Sertularia pusilla, nom. nov.
Sertularia loculosa, Bale.
Sertularia operculata, Linné.
Sertularia elongata, Lamouroux.
Sertularia unguiculata, Busk.
Sertularia geminata, Bale.
Sertularia maplestonei, Bale.
Sertularia macrocarpa, Bale.

Family PLUMULARIIDÆ.

Plumularia campanula, Busk.
Plumularia zygocladia, Bale.
Plumularia buski, Bale.
Plumularia procumbens, Spencer.
Plumularia sulcata, Lamarck.
Plumularia asymmetrica, Bale.
Nemertesia ciliata, Bale.
Nemertesia ciliata, Bale, var. *cruciata*, var. nov.
Kirchenpaueria producta, Bale.
Halicornopsis elegans (Lamarck).

Cladocarpella multiseptata, gen. et sp. nov.
Aglaophenia divaricata (Busk).
Aglaophenia divaricata (Busk), var. *cystifera*, var. nov.
Aglaophenia decumbens, Bale.
Aglaophenia tasmanica, Bale.
Aglaophenia billardi, Bale.
Aglaophenia dannevigi, Bale.
Aglaophenia carinifera, Bale.
Aglaophenia cupressina, Lamouroux.
Aglaophenia (*Thecocarpus ?*) *armata*, Bale.
Aglaophenia (*Thecocarpus*) *megalocarpa*, Bale.
Aglaophenia (*Thecocarpus*) *tenuissima*, Bale.
Aglaophenia (*Thecocarpus*) *calycifera*, Bale.
Halicornaria vegæ, Jäderholm.
Halicornaria tubulifera, Bale.
Halicornaria birostrata, Bale.
Halicornaria urceolifera (Lamarck).
Halicornaria urceolifera (Lamarck), var. *scandens*, Bale.
Halicornaria furcata, Bale, var. *intermedia*, Bale.
Halicornaria superba, Bale.

The species represented were almost wholly collected in the waters to the south of the Continent, from the Great Australian Bight to the Eastern Slope (to the east of Bass Strait and Tasmania), the chief exceptions being three or four species which were collected near Port Curtis, Queensland.

II.—Nomenclature.

As a matter of convenience the species are arranged under the genera and families with which it has been customary to associate them ; at the same time it is recognised that in several cases (especially among the Sertulariidæ), modifications of some of these genera will in all probability meet with general acceptance ; but while the prevailing differences of opinion obtain, full consideration of these points may well be deferred. This will be further referred to under the respective families. I have found Stechow's[1] concise tabular view of the whole of the genera of the Hydroida very useful for reference, though I do not concur as to the validity of some of the genera included in it.

III.—Literature.

I have done my best to obtain such recent literature as might be expected to contain references to our Australian

1. Stechow—Hydroidpolypen der japanischen Ostküste, II. Teil—Abh. math-phys. Klasse K. Bayer Akad. Wissensch., III. Suppl.-Bd., 1913.

Hydroida, but not always with success. Of the more important papers which I have been unable to obtain, most refer to northern species; in one or two cases, however, notably in that of Professor D'A. W. Thompson's Report on the Hydroida of the "Vega" Expedition, all my efforts to secure copies have failed, and I mention the circumstance in case any of the species which I have described as new may prove identical with any therein described. A list of the literature to which reference is made will be found at the end of this Report.

IV.—Description of the Genera and Species.

Order GYMNOBLASTEA.

Family HYDROCERATINIDÆ.

Genus Clathrozoon, *Spencer*.

Clathrozoon wilsoni, *Spencer*.

Clathrozoon wilsoni, Spencer, Trans. Roy. Soc. Vict., ii., 1891, pp. 121-129, pls. xvii.-xx. *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), vi., 1893, p. 96. *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 810.

Some very robust colonies were collected, attaining a height of over a foot.

Locs.—South Australian coast.

Great Australian Bight, 80-100 fathoms.

Order CALYPTOBLASTEA.

Family CAMPANULARIIDÆ.

Genus Campanularia, *Lamarck*.

Campanularia pumila, *Bale*.

Campanularia pumila, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 4, pl. i., figs. 6-8.

A *Campanularia* in the Lamarckian sense, but wanting the gonosome.

Loc.—Great Australian Bight, parasitic on *Synthecium subventricosum*, Bale, 40-100 fathoms.

Family CAMPANULINIDÆ.

Genus Thyroscyphus, *Allman.*

Thyroscyphus marginatus, *Bale.*

Campanularia marginata, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 54, pl. i., fig. 2. *Id.*, Bartlett, Geelong Nat., (2), iii., 1907, p. 62, fig. —.

"*Campanularia*" *marginata,* Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 289.

Thyroscyphus marginatus, Bale, Proc. Roy. Soc. Vict., (n.s.), xxvii., 1914, p. 91.

The specimens, like all others hitherto observed, are without the gonosome.

Loc.—Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Thyroscyphus simplex (*Lamouroux*).

Laomedea simplex, Lamouroux, Hist. Polyp. Cor. Flex., 1816, p. 206. *Id.*, Deslongch., Encyc. Méth., Zooph., 1824, p. 482.

Campanularia simplex, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 58.

Campanularia tridentata, Bale, Proc. Roy. Soc. Vict., (n.s.), vi., 1893, p. 98, pl. iii., fig. 3.

Sertularella tridentata, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, p. 46, fig. 21.

Thyroscyphus tridentatus, Hartlaub, Zool. Jahrb., xiv., 1901, p. 369, pl. xxi., fig. 14, pl. xxii., fig. 23. *Id.*, Ritchie, Trans. Roy. Soc. Edin., xlvii., 1909, p. 74, fig. 1-1b.

Thyroscyphus simplex, Billard, C. R. Acad. Sci., cxlviii., 1909, p. 1065; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), ix., 1909, p. 312. *Id.*, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 292. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 288.

Parascyphus simplex, Ritchie, Ann. Scot. Nat. Hist. Edinb., xx., 1911, p. 160, fig. 1.

This species, which was previously known only from Australia and New Zealand, has been recorded by Ritchie from the British coast and the South Atlantic. The present specimens include the gonangia, hitherto unknown. These are borne on the lower part of the shoots, and, in my specimens, vary from one to four. They are of an elongated ovate form, smooth, apparently not compressed, and the top is rounded, with a small circular aperture, which has the rim thickened, but not forming an elevated collar. Their length is about 1.4 mm., their diameter at the widest part, which is not far from the summit, about .6 mm.

Locs.—Forty miles west of Kingston, South Australia, 30 fathoms.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Family HALECIIDÆ.

Genus Halecium, *Oken.*

Halecium flexile, *Allman.*

Halecium flexile, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., Hydroida, pt. II., 1888, p. 11, pl. v., fig. 2, 2a. *Id.*, Jäderholm, Arkiv. f. Zool. k. svenska Vetenskapsakad., i., 1903, p. 265. *Id.*, Thornely, Report on Pearl Fisheries of the Gulf of Manaar, Suppl. Rep. viii., 1904, p. 112. *Id.*, Hartlaub, Zool. Jahrb., Suppl. vi., iii., 1905, p. 611, figs. J3, K3. *Id.*, Jäderholm, Schwedischen Südpolarexp., v., 1905, p. 13. *Id.*, Billard, C.R. Acad. Sci., cxlvii., 1908, p. 1355; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 3. *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 811. *Id.*, Stechow, Abh. math.-phys. Klasse der K. Bayer Akad. der Wissensch., iii. Suppl.-Bd., 1913, p. 81, figs. 45-49. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 286.

Halecium gracile, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 759, pl. xiv., figs. 1-3; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), vi., 1893, p. 99. *Id.*, Clarke, Bull. Mus. Comp. Zool. Harvard, xxv., 1894, p. 74. *Id.*, Jäderholm, Arkiv. f. Zool. k. svenska Vetenskapsakad., i., 1903, p. 266, pl. xii., figs. 2-3. *Id.*, Billard, Actes Soc. Linn. Bordeaux, lxi., 1906, p. 70; *Id.*, Billard, Bull. Mus. d'Hist. Nat., 1906, p. 329; *Id.*, Billard, Exp. Antarct. franç., 1906, p. 10; *Id.*, Billard, Exp. Sci. du "Travailleur" et du "Talisman", viii., 1906, p. 163. *Id.*, Motz-Kossowska, Arch. Zool. exp. et gén., (5), vi., 1911, p. 335, figs. vii.-viii.

Halecium parvulum, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 760, pl. xiv., figs. 4-5. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 218, pl. iii., fig. 22. *Id.*, Farquhar, Trans. N.Z. Inst., xxviii., 1896, p. 461.

Halecium balei, Fraser, Bull. Lab. Nat. Hist. State Univ. Iowa, vi., 1911, p. 46.

No. 16, *Halecium sp.*, Inaba, Zool. Mag. Tokyo, 1890, figs. 41-45.

Not *Halecium gracile,* Verrill, Report on the Invertebrate Animals of Vineyard Sound, 1874, p. 729. *Id.*, Nutting, Bull, U. S. Fish. Comm., 1901, p. 358, fig. 54.

The specimens observed were small and monosiphonic, agreeing with the form originally described by me as *H. gracile.* In treating it as synonymous with the much larger *H. flexile* of Allman, I follow Billard, who has examined the type in the " Challenger " collection.

Locs.—Forty miles west of Kingston, South Australia, 30 fathoms.

Ten miles north of Circular Head, Tasmania.

Family LAFOËIDÆ.

The species here referred to the Lafoëidæ belong to the genera *Perisiphonia*, *Cryptolaria*, *Hebella*, and *Lafoëa.* These genera, with others nearly allied to them, are generally recognised as members of the family ; Levinsen, however, giving it a more comprehensive signification, would assign to it also " the species referred to *Synthecium, Hypopyxis, Staurotheca,* and the inoperculate species referred to *Dictyocladium, Selaginopsis, Sertularia* and *Sertularella.*"[1] Species belonging to these groups are dealt with in this Report under the Sertulariidæ.

Genus Perisiphonia, *Allman.*

Perisiphonia exserta (*Busk*).

Cryptolaria exserta, Busk, Quart. Journ. Micro. Sci., vi., 1858, p. 130, pl. xix., fig. 3-3b.

Perisiphonia filicula, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., 1888, Hydroida, pt. II., p. 44, pl. xxii., figs. 1-4.

Zygophylax (*Perisiphonia*) *filicula,* Clarke, Mem. Mus. Comp. Zool. Harvard, xxxv., 1907, p. 16.

Perisiphonia exserta, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 834, pl. lxxxvii., fig. 3. *Id.*, Stechow, Abh. math.-phys. Klasse K. Bayer Akad. der Wissensch., iii. Suppl.-Bd., 1913, p. 117. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 290.

1. Levinsen—Systematic Studies on the Sertulariidæ—Vidensk. Medd fra den naturh. Foren, lxiv., 1913, p. 286.

Cryptolaria exserta was described by Busk in one of the series of papers entitled "Zoophytology" which were published in the "Quarterly Journal of Microscopical Science" during his co-editorship. J. Y. Johnson, whose name has been commonly, but erroneously, appended to the species, had no connection with it beyond sending the specimens from Madeira to Mr. Busk.

Ritchie, after examining "Challenger" specimens of *P. filicula*, Allman, is satisfied of their identity with *P. exserta*, but dissents from the suggestion of Pictet and Bedot that *P. pectinata*, Allman, is not distinct from *P. filicula*. Ritchie enumerates a number of discrepancies between the "Challenger" specimens and Allman's description and figure, and in each instance the present specimens confirm Ritchie's account.

To the previous descriptions I may add, with regard to the ramification, that the pinnæ, which to the naked eye appear opposite, do not originate at precisely the same level, but one is higher than the other by the length of a hydrotheca. Sometimes a secondary pinna springs from a primary one close to its origin.

The gonosome has not been observed hitherto, unless, as Ritchie thinks probable, Pictet and Bedot's *P. pectinata* is really to be referred to the present species. Coppiniæ were present on one or two of our specimens, extending to over half an inch in length. The cells are sharply polygonal, except the short distal portion, which projects in the form of a small rounded dome; the aperture is small and circular, and one side of the rim is produced into a conical horn. From among the cells spring many crooked slender filaments, each supporting a few distant sarcothecæ.

Locs.—Oyster Bay, Tasmania, 60 fathoms.

Great Australian Bight, Long. 130° 40′ E., 160 fathoms.

Thirty-five miles south east of Bruni Island, Tasmania, 150-230 fathoms.

Genus Cryptolaria, *Busk.*

Cryptolaria arboriformis, *Ritchie.*

Cryptolaria arboriformis, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 824, pl. lxxxiv., fig. 1, pl. lxxxvii., fig. 7. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 289.

Specimens of this hydroid were obtained which fully agreed with Ritchie's account in regard to the weather-beaten aspect and the dark brown colour. These, however, were overrun by a species of *Lafoëa*, the stolons of which so completely swathed the hydrosoma that no portion of the supplementary tube system of the *Cryptolaria* was visible except at the extremities of some of the smaller branches. I am indebted to Mr. Briggs for portions of his specimens from Thouin or Wineglass Bay, near Freycinet Peninsula, Tasmania, which being free from the *Lafoëa*, enable me to observe the normal structure.

These specimens are pale in colour, the dark brown seen in the "Endeavour" specimens residing mainly in the stolons of the *Lafoëa*. In both cases I found a few very young lateral branches, which exhibited the structure before the supplementary tubes had enveloped them.

A branch at its origin consists of a single slender tube of a length about equal to that of a hydrotheca. On the formation of the first hydrotheca the branch abruptly doubles its width, the hydrotheca being about equal to the axial tube in diameter. The hydrotheca is directly in line with the proximal part of the axial tube, which makes a sharp curve round its base. By the time the second hydrotheca is formed fasciculation has commenced, two delicate stolons being given off from the base of the first hydrotheca, one on each side, and running along the branch outward. Other tubes originate from the later-formed hydrothecæ, and these, together with tubes which proceed from the stem along the branch, make up the fascicle. In the "Endeavour" specimens I observed a couple of very young branches, of two to three hydrothecæ, on which the *Lafoëa* had not yet encroached; these displayed the two first supplementary tubes, but had not developed further, and in none of these specimens could any other portion be found available for observation without hindrance by the *Lafoëa*, which so completely invested the polypary that almost every branch was swathed with it nearly or quite to the extremity, even the latest-formed hydrotheca often supporting a hydrotheca of the *Lafoëa*. Even the gonangia become completely covered by the parasite, which apparently by its close investment, prevents the development of the fascicle-tubes of the *Cryptolaria* to a great extent. The most advanced *Lafoëa*-stolons are generally nearly straight, but on the older portions, and where they have a wider area on which to spread, as on the gonangia, they are most tortuous in their ramifications.

To Ritchie's account of the hydrothecæ I would only add that in some specimens they are continued outward somewhat further than he describes them, and as the produced portion continues in a uniform curve it follows that the aperture is directed outward instead of upward; I have even seen instances where a still further prolongation results in the aperture looking somewhat downward. In these cases the extension of the hydrotheca is due to the necessity of keeping the aperture free when surrounded by a very dense fasciculation.

The gonangia (which have not previously been observed) are borne along the stem or the main branches, often in a longitudinal series and sometimes on both sides. They are adnate in their entire length, and may even overlap. Their length much exceeds their width, average specimens reaching about 2.2 mm., with a diameter of only about .3 mm. The summit is arched over, and the sub-terminal orifice, which is directed outward, is transversely elliptical. Occasionally the arched top is continued in a uniform curve, so that the aperture looks downward. Being adnate to the hydrocaulus they follow its direction, so that if, for example, they meet with a branch in the course of their growth they continue along it, and are accordingly bent at nearly a right angle. In some instances they are in an inverted position. The fascicle-tubes run over them, and often envelop them completely, except the aperture, and in the "Endeavour" specimens the stolons of the *Lafoëa* cover them with a tortuous network, often of more than one layer.

Six or seven gonozooids were observed, in each case only one in a gonangium. From the base of the capsule rises the blastostyle, which bears the gonozooid on one side at a short distance up, and is then continued in the form of a very slender cord till it nears the orifice, where it gradually expands into the conical plug usually found in that position. The gonozooid is very small relatively to the size of the gonangium, none of those seen attaining more than about .45 mm. in length. The two or three which were in the best condition for examination appeared to have four longitudinal radial canals, and a four-lobed orifice.

I have not observed the large round openings said by Ritchie to exist between the fascicle-tubes, but round openings are common in the "Endeavour" specimens; these, however, are superficial, and consist of the bases of *Lafoëa* hydrothecæ which have been broken off. It is just possible that Ritchie's specimens may have been invested by *Lafoëa*-stolons from which the hydrothecæ had been lost; this would account for the round openings as well as for the dark colour. No one observing such a specimen would imagine the brown stolons to be other than an integral part of the *Cryptolaria.*

Locs.—Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Twenty-one miles N. 62° E. of Babel Island, Bass Strait, 74 fathoms.

Cryptolaria angulata, *Bale.*

Cryptolaria angulata, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 166, pl. xxxv., fig. 1.

Locs.—Great Australian Bight, 100 fathoms.

Great Australian Bight, Long. 127° 20′ E., 180 fathoms.

Genus Hebella, *Allman.*

Hebella calcarata (*L. Agassiz*).

Laodicea calcarata, L. Agassiz, Contr. Nat. Hist. U.S., iv., 1862, p. 350.

Lafoëa calcarata, A. Agassiz, N. Amer. Acalephæ, 1865, p. 122, figs. 184-194. *Id.*, Hargitt, Amer. Nat., xxxv., 1901, p. 387, fig. 24.

Lafoëa scandens, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 758, pl. xiii., figs. 16-19. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 341, fig. 21.

Hebella scandens, Marktanner-Turneretscher, Ann. K.K. Hofmus. Wien, v., 1890, p. 214, pl. iii., fig. 16. *Id.*, Farquhar, Trans. N.Z. Inst., xxviii., 1896, p. 460. *Id.*, Campenhausen, Abh. Senckenb. naturf. Gesellsch. Frankfurt-a-M., 1897, p. 307? *Id.*, Hartlaub, Zool. Jahrb., Suppl. vi., iii., 1905, p. 587. *Id.*, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 285. *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), xxvi., 1913, p. 117, pl. xii., fig. 10.

Lictorella scandens, Borradaile, Fauna & Geogr. Maldive & Laccadive Archipel., ii., 1905, p. 840.

Hebella cylindrica (in part), Pictet, Rev. suisse Zool., i., 1893, p. 41, pl. ii., fig. 36. *Id.*, Versluys, Mém. Soc. Zool. France, xii., 1899, p. 31.

Lafoëa calcarata (in part), Billard, Bull. Mus. d'Hist. Nat., 1904, p. 481; *Id.*, Billard, Exp. Sci. du "Travailleur" et du "Talisman," viii., 1906, p. 174.

Hebella calcarata (in part), Billard, Arch. Zool. exp. et gén., (4), vii., 1907, p. 339. *Id.*, Ritchie, Proc. Zool. Soc., 1910, p. 810. *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 816.

Hebella calcarata, Nutting, Bull. U.S. Fish. Comm., xix., 1901, pp. 353, 378, figs. 56, 94. *Id.*, Fraser, Bull. Bureau of Fisheries, xxx., 1912, p. 371, fig. 34.

Not *Lafoëa cylindrica*, von Lendenfeld, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 912, pl. xl., figs. 4-5.

In my paper in the " Proceedings of the Royal Society of Victoria "[1] for 1913 I have given reasons for concluding that Pictet and subsequent observers were almost certainly wrong in identifying *H. scandens* (Bale) with *H. cylindrica* (von Lendenfeld), while suspending judgment with regard to its identity with *Hebella calcarata* (Agassiz). Since then I have, through the kindness of Dr. Fraser, received specimens of *H. calcarata*, comparison of which with *H. scandens* shows that the affinity between the two forms is even closer than the published descriptions would seem to indicate. I cannot resist the conclusion that (unless differences in the gonosome should be discovered) they must be regarded as varieties of a single species.

The hydrothecæ are quite similar, and I found a single mature gonotheca of *H. calcarata*, which did not differ perceptibly from those of *H. scandens*. The distinctions practically narrow themselves down to the unbranched habit of the former, while *H. scandens* branches freely, and to the frequent arrangement of the hydrothecæ of *H. calcarata* in opposite pairs, while those of *H. scandens* are always single. The typical *H. calcarata* usually occurs on opposite-celled Sertularians, and its general rule of growth (subject, however, to many exceptions), is that the creeping stem runs up the front of the hydrocaulus of the host, and gives off a pair of opposite or nearly opposite hydrothecæ just above those of the latter. *H. scandens* is mostly found on *Sertularella divaricata*, and, when it makes its nearest approach to regularity, gives off a single hydrotheca above each of those of the *Sertularella*. It would appear reasonable to assume that the difference is simply an accommodation to the habit of the host-species ; I have, however, met with one or two cases where the host was an opposite-celled Sertularian while the hydrothecæ of the *Hebella* were in no case opposite.

On the other hand, I found on a specimen of *Pasythea* from Bondi, New South Wales, a single colony which had the

1. Bale—Proc. Roy. Soc. Vict., (n.s.), xxvi., 1913, pp. 118-120.

hydrothecæ opposite, just as in the American forms, from which they differed only in their somewhat smaller size.

In Marktanner-Turneretscher's specimens the hydrothecæ do not seem to be opposite or in pairs, although growing on an opposite-celled *Synthecium.* Warren shows the hydrothecæ in pairs, nearly opposite, on a subalternate-celled *Thuiaria.*

From Fraser's account it seems doubtful whether the description of *H. calcarata* as unbranched is justified. Probably the unbranched condition is due to the fact that the specimens examined were usually on hydroid hosts which were themselves unbranched. In *H. scandens* branching occurs freely. On *Sertularella* it runs up the rachis, and not only does it send off side branches to the successive pinnæ, but on a single pinna it very often divides into two, one running up each side, and in many instances these are united by short transverse ramules.

While most of my specimens have been found on *Sertularella divaricata,* I have met with single colonies on *Diphasia subcarinata, Sertularia macrocarpa, Thyroscyphus tridentatus,* and, as already mentioned, a smaller form on *Pasythea quadridentata.* Marktanner-Turneretscher found specimens on *Synthecium campylocarpum,* and Ritchie on *S. orthogonium* (the same species ?), and *Sertularella adpressa.* Borradaile's examples were on *Synthecium tubiger* (=*S. orthogonium* ?); Billard's on *Thuiaria tubuliformis* and *Thyroscyphus vitiensis*; Pictet's on *Sertularia vegæ* and *S. tubitheca*; and Warren's on *Thuiaria tubuliformis.* American specimens are most common on *Sertularia cornicina* and *Pasythea quadridentata.*

My specimens of *H. scandens* have the hydrothecæ mostly from .52 to .56 mm. in length, with widths of from .16 to .19 mm.; the American specimens of *H. calcarata* average about .59 mm. long and .19 mm. wide, and the small form from Bondi, New South Wales, is only about .44 mm. long and .15 mm. wide.

Loc.—Forty miles west of Kingston, South Australia, 30 fathoms, on *Thyroscyphus tridentatus.*

Hebella calcarata (*L. Agassiz*),

var. contorta, *Marktanner-Turneretscher.*

Hebella contorta, Marktanner-Turneretscher, Ann. K.K. Hofmus. Wien, v., 1890, p. 215, pl. iii., fig. 17a, b. *Id.,* Campenhausen, Abh. Senckenb. naturf. Ges.

Frankfurt-a-M., 1897, p. 307. *Id.*, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 285, pl. v., figs. 16, 17.

Hebella cylindrica (in part), Pictet, Rev. suisse Zool., i., 1893, p. 41.

Hebella scandens (in part), Bale, Proc. Roy. Soc. Vict., (n.s.), xxvi., 1913, p. 117.

Not *Lafoëa cylindrica,* von Lendenfeld, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 912, pl. xl., figs. 4-5.

(See also, under *H. calcarata,* references to Billard and Ritchie, who rank *H. contorta* as a synomyn of *H. calcarata*).

There is room for a difference of opinion as to whether *H. contorta,* which is distinguished from *H. calcarata* by the smaller size and somewhat twisted form of the hydrothecæ, should be regarded as a distinct species. My specimens do not fully agree with Marktanner-Turneretscher's account, the hydrothecæ being only about .37-.40 mm. in length as against .46 mm., while the diameters are the same (about .15 mm.); they are also rather less twisted (and in some cases not at all). I have found them only on *Sertularia unguiculata,* and the habit is peculiar, in that the main creeping stolon, which runs up the rachis of the *Sertularia,* bears no hydrothecæ, but gives origin only to lateral branches, which run along the pinnæ of the host, and from which spring the hydrothecæ. Generally each pinna has its branch, for so far as the *Hebella* extends, and it is curious to observe how the stolon directs its growth from each pinna to the next; after giving off a branch to one pinna it grows diagonally across the broad rachis of the host straight to the base of the next, where it again branches, and so on in a succession of zig-zags till it terminates, or till it assumes a less regular course. Occasionally it divides into a number of small stolons, which anastomose freely, forming a network. The branches which run along the pinnæ of the host are not usually central, but seem to prefer the side, and although the hydrothecæ of the *Sertularia* are in opposite pairs, I have not in any case seen those of the *Hebella* paired. Sometimes an alternate disposition can be discerned, successive hydrothecæ springing slightly to right and left on the slender stolon.

Loc.—Ten miles north of Circular Head, Tasmania, on *Sertularia unguiculata.*

Genus Lafoëa, *Lamouroux*.

Lafoëa gracillima (*Alder*).

Campanularia gracillima, Alder, Ann. Mag. Nat. Hist., (2), xviii., 1856, p. 361, pl. xiv., figs. 5, 6 ; *Id.*, Alder, Trans. Tynes. Nat. F. Club, iii., 1857, p. 129, pl. vi., figs. 5, 6.

Lafoëa gracillima, G. O. Sars, Vidensk.-Selsk. Forhandl., 1873, p. 115, pl. iv., figs. 19-21. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 217, pl. iii., figs. 18, 19. *Id.*, Bonnevie, Norweg. N. Atl. Exped., Hydr., 1899, pp. 64, 65, pl. v., fig. 2a. *Id.*, Nutting, Bull. U.S. Fish. Comm., 1901, p. 356, fig. 49. *Id.*, Hartlaub, Zool. Jahrb., xiv., 1901, p. 358, pl. xxi., figs. 1-3 ; *Id.*, Hartlaub, Zool. Jahrb., Suppl. vi., iii., 1905, p. 594, fig. P2. *Id.*, Jäderholm, K. svenska Vet.-Akad. Handl., xxviii., 1902, p. 9 ; *Id.*, Jäderholm, Schwed. Südpolarexp., v., 1905, p. 21, pl. ix., figs. 2-3 ; *Id.*, Jäderholm, Mém. Acad. Imp. Sci. St. Peters., (8), Classe Phys.-Math., xviii., 1908, p. 13, pl. ii., fig. 15 ; *Id.*, Jäderholm, K. svenska Vetenskapsakad. Handl., xlv., 1909, p. 74, pl. vii., figs. 6-8. *Id.*, Clarke, Mem. Mus. Comp. Zool. Harvard, xxxv., 1907, p. 13. *Id.*, Ritchie, Trans. Roy. Soc. Edin., xlv., 1907, p. 531 ; *Id.*, Ritchie, Trans. Roy. Soc. Edin., xlvii., 1909, p. 76, fig. 2 ; *Id.*, Ritchie, Rec. Ind. Mus., v., 1910, p. 8 ; *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 817. *Id.*, Billard, Exp. Sci. du " Travailleur " et du " Talisman ", viii., 1906, p. 176. *Id.*, Broch, Fauna Arctica, v., 1909, p. 156, figs. 17-18. *Id.*, Fraser, Bull. Lab. Nat. Hist. State Univ. Iowa, vi., 1911, p. 52. *Id.*, Vanhöffen, Deutsche Südpolarexp., xi., 1910, p. 312. *Id.*, Kramp, Danmark-Exp. til Grønlands Nordostkyst, v., 1911, p. 371.

Calicella fruticosa, Hincks, Ann. Mag. Nat. Hist., (3), viii., 1861, p. 293.

Lafoëa fruticosa, Hincks, Hist. Brit. Hydroid Zooph., 1868, p. 202 (in part), pl. xli., fig. 2, 2a (not 2b). *Id.*, Bale, Cat. Austr. Hyd. Zooph., 1884, p. 64, pl. ii., fig. 1 (after Hincks). *Id.*, Thompson, Hydr. Zooph. of the " William Barents " Exped., 1884, p. 7, pl. i., figs. 17, 18. *Id.*, Allman, Rep. Sci. Results " Challenger " Exped., Zool., xxiii., Hydroida, pt. II., 1888, p. 34, pl. xvi., fig. 2, 2a.

Lafoëa capillaris, G. O. Sars, Vidensk.-Selsk. Forhandl., 1873, p. 115, pl. iv., figs. 22-24.

Hincks, in his " British Hydroid Zoophytes,"[1] treated *L. gracillima* (though with some doubt) as a variety of *L. fruticosa* (Sars), but observers in the northern seas, who are familiar with both forms, are now practically unanimous in rejecting the determination. Following Hincks I included *L. fruticosa* in the " Catalogue " as an Australian species, but *L. gracillima* must now take its place. Allman and Thompson have also followed Hincks' nomenclature.

Hincks writes:—" I have examined the *Lafoëa* from Bass's Straits in Mr. Busk's collection, referred to by Alder (North. & Durh. Cat.), and have little doubt that it is identical with the present species." Alder had written:—" A *Campanularia* from Bass's Straits, of which Mr. Busk has kindly sent me a drawing, is very similar to this, if not identical." The hydroid from Bass Strait, which Busk mentioned in the " Voyage of the Rattlesnake," under the name of *Campanularia dumosa* is presumably that referred to by Alder and Hincks.

Family SERTULARIIDÆ.

In the First Part of this Report I have dealt with the Sertulariidæ from the point of view which was usually adopted prior to 1893, when systematists were agreed that the proper basis for generic distinction was the mode in which the hydrothecæ are arranged in the colony. This unanimity was disturbed in 1893, when Levinsen advanced the view that a truly natural arrangement must depend on certain characters of the individual hydrothecæ, namely the opercular structure and the correlated condition of the hydrotheca-margin. The views propounded by Levinsen were at once adopted by several observers (mostly those whose principal work lay among the northern species), but were rejected by others; and in 1897 Schneider, in his paper on the hydroids of Rovigno, strongly upheld the validity of the system founded on the arrangement of the hydrothecæ, or what Levinsen calls the colonial or zoarial characters.

Ever since Levinsen put forward his views the classification of the Sertulariidæ has been in a condition which can only be described as chaotic. Many observers, while unprepared to accept his conclusions without reserve, have nevertheless felt obliged to recognise their validity to a greater or less extent, dependent on individual opinion, and the result has been that few are precisely in accord on all points, so that there are almost as many systems of classification as there are observers.

1. Hincks—Hist. Brit. Hydroid Zooph., 1868, p. 202.

In his last work—" Systematic Studies on the Sertulariidæ " (which only reached me after much of Part I. was in print), Levinsen combats the objections which have been made to his system, and recapitulates and further elaborates his views at considerable length, and with such force and cogency as can scarcely fail to impress any student of the Sertulariidæ who examines them. Levinsen relies entirely on the opercular apparatus for his generic distinctions, disregarding altogether the colonial characters ; so that he recognises, for instance, no distinction between a *Pasythea* and a *Sertularia*, or between a *Sertularella* and a *Selaginopsis*, if the opercula are alike in each case.

Of course, it does not necessarily follow from the acceptance of Levinsen's views regarding the importance of the operculum that his genera must be adopted throughout. Admitting that the colonial characters are of secondary significance, they may still be considered, and undoubtedly will, by some observers, be considered sufficiently important to furnish grounds for generic distinctions. This is evidently the opinion of Dr. Stechow, who has, since the date of Levinsen's last paper, published a list of the genera of the Hydroida,[1] in which, while mainly adopting Levinsen's divisions, he has included such genera as *Pasythea*, *Selaginopsis*, and *Dictyocladium*, which Levinsen expressly declares to be merely species of *Sertularia*, *Thuiaria*, and *Sertularella*. This combination, or intermixture of two diverse systems would logically lead to the further multiplication of genera, as will be apparent if we consider, for example, the characters of *Pasythea*. The hydrothecæ of this genus are not always paired, as Stechow describes them ; in *P. quadridentata* the paired condition exists, in *P. hexodon* it does not. I pointed out long ago that according to the colonial characters *P. quadridentata* is allied to *Sertularia*, while *P. hexodon* was as obviously akin to *Thuiaria*. The same conclusion may be arrived at from the zooecial characters, and Levinsen accordingly classes the former species as a *Sertularia*, and the latter as a *Thuiaria*. Now, if we admit, as Stechow does, that the differences between the opercula in *Sertularia*, *Odontotheca*, and *Thuiaria* are valid generic characters, then we must, on the same principle, admit that *P. hexodon* should be placed in a genus distinct from *P. quadridentata*, since the difference between these two species is precisely the same as that between *Sertularia* and *Thuiaria*. The same principle applies to *Dictyocladium* and *Selaginopsis* ; obviously a *Selaginopsis* with an operculum should be placed in a different

1. Stechow—Hydroidpolypen der japanischen Ostküste, II., 1913.

genus from a *Selaginopsis* without one; here, however, as Stechow accepts the presence of some form of operculum as a primary character of the whole family, it must be assumed that he excludes such species now assigned to *Dictyocladium* and *Selaginopsis* as are inoperculate; only he has then provided in his system no place for these species, any more than for the inoperculate species hitherto included in the genera *Sertularia* and *Sertularella*.

What has doubtless contributed largely to the reluctance of systematists to adopt Levinsen's views is the difficulty often found in determining the nature of the operculum in species with which we are only partially acquainted, and of which we may often examine many specimens without being able to detect any trace of such a structure, or, where such traces are visible, to ascertain the true form.

For example I have mentioned elsewhere that in *Thyroscyphus marginatus* one sometimes finds empty hydrothecæ with opercula sufficiently preserved to enable their character to be clearly made out, while in other cases hydrothecæ are found containing the hydranths in good condition but entirely devoid of opercula. Levinsen's contention that he can discern from the form of the hydrotheca-margin what that of the operculum has been, is no doubt correct in general, but I have seen hydrothecæ as to which I was quite unable to satisfy myself from the form of the border whether they belonged to Levinsen's genus *Odontotheca* or to *Sertularia*.

In regard to these two genera, I have great doubt as to the sufficiency of the distinction between them. In both cases the border of the hydrotheca has two lateral teeth, between which are two sinuses, the adcauline the larger in *Odontotheca*, the abcauline in *Sertularia*; in each sinus is fixed an opercular membrane. In *Sertularia* the abcauline membrane is, in most species, provided with a free distal valvular portion, which is wanting in *Odontotheca*. As, however, it is stated that some species of *Sertularia* are without the usual free valvular portion, while some species of *Odontotheca* possess it, it seems very doubtful whether the differences are sufficient to justify the creation of a new genus. The same remark applies to the genus *Hydrallmania*, as modified by Levinsen in accordance with the opercular characters; and I may add that even according to the colonial characters I see no sufficient ground for this genus: the hydrothecæ are as truly biserial as in the rest of the family, though both series are seated so near to the front as to be very nearly (but not exactly) in one line.

Considering, now, that notwithstanding differences of opinion as to details, it is generally agreed that the opercular characters must, to a greater or less extent, be utilised in limiting the genera, it appears that there are only two courses logically open to us. The first is to follow Levinsen in abandoning entirely the colonial characters. Then *Pasythea quadridentata* becomes a *Sertularia*, and *P. hexodon* a *Thuiaria*, while the species ascribed to *Selaginopsis* and *Dictyocladium* must be divided between *Sertularia*, *Sertularella*, *Thuiaria*, and a genus of Lafoëidæ for the inoperculate forms. The other course is to combine the colonial and the zooecial characters, as Stechow has done, but in that case we cannot follow him in retaining the old groups *Pasythea*, *Selaginopsis*, and *Dictyocladium*, each as a single genus. *P. hexodon* must be separated from *P. quadridentata* on exactly equal grounds to those on which *Thuiaria* is separated from *Sertularia*. *Selaginopsis* (with *Dictyocladium*) must be split up into several genera, according as the operculum resembles that of *Sertularia*, *Sertularella*, *Thuiaria*, and possibly yet other types, while in any case the inoperculate forms must be referred to a separate genus. It is doubtless true that characters which are of generic value in one group of species may be less constant and of minor importance in another, but in the particular case before us it is impossible to maintain that where the opercular characters have a generic value in the biserial forms, the identical characters should have less importance in multiserial forms.

I do not look forward to any early unanimity on these points, but Levinsen's arguments, and the numerous instances cited by him of transition-forms between the biserial and the multiserial forms, furnish very strong support to his views. Again, in such a form as *Pasythea hexodon*, how does the arrangement of the hydrothecæ in separate companies differ from the arrangement in many species of *Thuiaria* except that in the former the companies are separated by longer intervals? And in *P. quadridentata* we have in the one species every gradation from the typical form to a variety which differs in no respect from a true *Sertularia*.

Of course there are in some instances special characters, unconnected either with the hydrothecal arrangement or the opercular structure, which may be regarded as of generic importance, and here again unanimity of opinion is not likely to be soon arrived at. For example, the old genus *Dictyocladium* seems to me, as to Levinsen, to consist merely of a few species united by the trivial character of their union into a network by anastoming stolons, a feature often found in species of *Sertularella* and *Thuiaria*. *Thecocladium* is another genus founded on the regular occurrence of a feature not at all uncommon in other forms. *Hypopyxis*, as I have pointed out in Part II, is to be referred to Levinsen's genus *Thuiaria*, unless, which is doubtful, the pouch-like appendages should prove to be, as Allman supposed, sarcothecæ.

As the most convenient course, in the present unsettled state of the classification, the family is here taken to include the genera which it has been customary to assign to it, and the genera themselves are taken for the most part in their old signification. They comprise species of *Sertularia*, *Sertularella*, *Thuiaria*, *Selaginopsis* (*Dictyocladium*), *Hypopyxis*, and *Synthecium*. The last-named genus must, according to Levinsen, be removed to the Lafoëidæ, in consequence of the absence of an operculum, but Stechow regards the Synthecidæ as a distinct family. *Sertularia elongata*, and a number of other species in which also the hydrotheca-margin has six or more teeth but no operculum, are excluded by Levinsen from the Sertulari dæ, and are unprovided for in Stechow's classification ; for these species I propose the new genus LEVINSENIA. I follow Billard in placing *Dictyocladium dichotomum*, Allman, under *Selaginopsis* ; according to Levinsen's system it would be referred to *Sertularella*. Several of the *Sertulariæ* would come under Levinsen's genus *Odontotheca*, which I am disinclined to accept. And I may here remark that even if it be admitted that this genus is sufficiently distinct from *Sertularia*, the name *Odontotheca* has no claim to acceptance. The type is *S. operculata*, and L. Agassiz in 1862 proposed the genus *Amphisbetia* for this very species ; the latter name therefore has priority, and should be adopted if it is considered desirable to separate *S. operculata* and its immediate allies from the other *Sertulariæ*.

Genus LEVINSENIA, *gen. nov.*

Hydrophyton branched or rarely simple, hydrothecæ biserial, apertures with numerous teeth, operculum absent.

While it is still doubtful to what extent observers generally will accept the principles of classification enunciated by Levinsen, there is no doubt that the nature of the opercular structures must henceforth be regarded as of the first importance.

Regarding two of the species for which the genus *Levinsenia* is proposed Levinsen remarks as follows :—[1]" An opercular apparatus has not hitherto been found in *Sert. elongata* and

1. Levinsen—Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 265.

S. huttoni, both of which have the hydrothecal margin with 6-7 teeth, and if they possess an operculum I am most inclined to think that it consists of as many valves as there are teeth. In either case these two species cannot be referred to any of the hitherto described genera." It may also be observed that in Stechow's recent summary of the genera no place is found for *S. elongata* or its allies. It will probably be conceded therefore that there is justification for the establishment of a genus for such species as are excluded from the Sertulariidæ (as restricted) by the absence of an operculum, while the conspicuous denticulation of the hydrotheca-margin distinguishes them, if less decisively, from the genus *Synthecium*. If such a genus be not admitted the only alternative would seem to be the modification of the latter genus to make it include these forms.

According to Stechow's arrangement the family Synthecidæ comprises three genera—*Lytoscyphus*, *Synthecium* and *Hypopyxis*. I believe that the latter genus is erroneously associated with the Synthecidæ, as I have pointed out in discussing *H. distans*.[1] The genus now proposed will take its place beside *Synthecium*, and, as will be shown further on, there are not wanting signs of a connection between them more intimate than would be supposed at first sight.

It must be recognised that some of the forms which I now refer to *Levinsenia* have not been sufficiently examined to make it certain that they never develop an operculum, but some undoubtedly do not, and the others sufficiently resemble them to warrant their association pending fuller examination.

Besides the two species mentioned by Levinsen,—*S. elongata* and *S. huttoni*—I assign to *Levinsenia S. pluridentata* (Kirchenpauer), *S. insignis* Thompson, *S. acanthostoma* Bale, *S. crenata* Bale, along with the species described by Billard as possibly a sexual form of *S. elongata*, and which may in the meantime be described as *S. billardi*.[2] Of these *S. elongata* is most widely known, and it has been examined by several observers, who have not in any case noted the presence of an operculum. I have a beautifully mounted specimen, stained, and with the hydranths expanded as in life, and I cannot detect any trace of an opercular structure. Billard says nothing as to the presence or absence of an operculum in the form described by him. *S. acanthostoma* has been studied histologically by Warren, who says that there is not a trace of operculum. I believe this is the only member

1. Bale—Biological Results "Endeavour," ii., 4, 1914, p. 167.
2. Billard—Ann. Sci. Nat., Zool., (9), xi., 1910, p. 22, fig. 8.

of the group which has been subjected to a similarly searching examination. Of *S. crenata* I have seen only one or two specimens, in which I found no opercula. Whether *S. insignis* and *S. pluridentata* have an operculum has not been determined.

S. elongata is dealt with elsewhere in this Report, and in Part I, and as I have pointed out, it agrees precisely in habit with a number of other species which by Levinsen would be divided between the genera *Sertularia* and *Odontotheca*. If the teeth ever number other than six (as implied by Hutton and Coughtrey), it must I think be only an abnormal condition, which I have never met with. They are symmetrical, in so far that there are three on each side of the hydrotheca, yet the two sides are not absolutely alike, as the distal portions of the hydrothecæ are somewhat bent in such a way as to make the apertures face toward one side of the colony, so that, like most *Sertulariæ*, but unlike *S. acanthostoma*, the polypary has a distinct front and back aspect. This turning forward of the hydrothecæ is very pronounced in some specimens, but scarcely traceable in others, and when it occurs it is confined to the hydrothecæ on one side of the pinna. The teeth vary a good deal in length, and there is a rather wide extent of the border on the adcauline side free from them, while no median tooth is present.

In *S. billardi*, (which has the hydrothecæ very different in form from those of *S. elongata*, and more like those of *S. macrocarpa* and *S. bidens*), there are nine teeth. As in *S. elongata*, there is a gap between those nearest the adcauline margin, and as the number is odd, it follows that either the two sides are not symmetrical, or that there is a median tooth on the abcauline margin and four on each side. The latter appears from the figure to be the actual arrangement.
S. acanthostoma has no median tooth either on the adcauline or the opposite border, but has eight on each side, which correspond to those opposite them in all respects, so that the denticulation is quite regular, like that of an *Aglaophenia*, and the hydrothecæ are in one plane, and both aspects of the polypidom are alike.

S. pluridentata is described by Kirchenpauer without the number of teeth being specified. So far as can be judged from the figure there appears to be a median tooth both on the adcauline and abcauline borders, with three others on each side.

S. insignis is said by Thompson to have "about six" teeth.

S. huttoni is described as having "seven or eight" teeth.

S. crenata has ten teeth, more uniform in size than those of most of the preceding species. There is a median tooth on both the adcauline and the abcauline borders, and four on each side, the median teeth, however, are shorter than the rest, and sometimes tend to become obsolete.

Four of the species in the foregoing list agree in having a similar habit, not, I think, found elsewhere among the members of the old genus *Sertularia*. The pinnæ are in pairs and opposite, and associated with this character is the unusual feature that the hydrothecæ on the rachis are opposite, while those on the pinnæ are subalternate. They have the further character in common that the first hydrothecal internode on each pinna bears a single hydrotheca only, which is on the lower side. These species are *S. insignis*, *S. acanthostoma*, *S. huttoni*, and *S. billardi*. I think it very probable, however, that *S. insignis* and *S. huttoni*, which are respectively recorded from Australia and New Zealand, are one and the same.

S. pluridentata is, in the form of the hydrothecæ, very nearly allied to *S. acanthostoma*, but the pinnæ are irregular, not opposite.

In *S. crenata* the pinnæ are distinctly alternate. In the type specimen the rachis is divided alternately into internodes which support a single pinna with its axillary hydrotheca, or a pair of hydrothecæ only ; these obviously represent the ordinary Sertularian internode (as found in *S. elongata*), divided into two by a secondary node. The hydrothecæ on the pinnæ are subalternate, and, as in the oppositely-branched species, the first hydrothecal internode on each supports but one hydrotheca, on the lower side.

In the original specimen of *S. crenata* the teeth were all well developed, except that the two median ones were sometimes much reduced. But I have a specimen from an unknown locality, which I am doubtful whether to regard as a variety of *S. crenata* or as a merely abnormal colony, in which all the teeth are either much reduced, being indicated mostly only by slight undulations of the border, or are totally absent. In one or two hydrothecæ there are four of these undulations on each side, representing the eight lateral teeth of the normal form, and the median teeth are feebly indicated. In most cases, however, the latter are wholly wanting, and the lateral sinuations are very slight and irregular, while in others the sides are quite smooth, though usually a little more elevated than the points where the median teeth would ordinarily be situated; there is therefore nothing to distinguish the border of such a form from that of a *Synthecium*. The hydrothecæ in question are not immature, but of normal size, and though probably to be regarded simply as a pathological variation, they are none the less significant as indicating the affinities of the species.

Genus Diphasia, *Agassiz*.

Diphasia subcarinata (*Busk*).

Diphasia subcarinata, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 7 (synonymy).

This species, owing to its possession of an opercular valve consisting of a single adcauline flap, seems to be quite properly placed in the genus *Diphasia*, notwithstanding that Levinsen makes the absence of teeth on the hydrotheca-margin a characteristic of the genus (while admitting, however, that *D. digitalis* (Busk) has two feeble lateral teeth). *D. subcarinata* has very distinct and well-developed teeth, generally three in number, though in some of the "Endeavour" specimens one is sometimes obsolete.

The opercular membranes are very delicate, and many specimens are without a trace of them, but I have some in which they are retained, and it is a very peculiar feature that in many cases there are two distinct opercula, quite similar, but widely separated, one being situated about the middle of the divergent distal half of the hydrotheca, and the other just inside the aperture. The valve itself is simple, and does not extend fully across the hydrothecal cavity, but only about two-thirds of the distance. I have also seen more than two opercula; this, however, was in hydrothecæ in which a regeneration had occurred, and the two normal valves had been retained, while two new ones had been developed.

Locs.—Great Australian Bight, 40-100 fathoms.

Off Devonport and Launceston, Tasmania.

Forty miles west of Kingston, South Australia, 30 fathoms.

Twenty miles east of King Island, Bass Strait.

Genus SYNTHECIUM, *Allman.*

SYNTHECIUM SUBVENTRICOSUM, *Bale.*

Synthecium subventricosum, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 5, pl. i., figs. 3-5.

Loc.—Great Australian Bight, 40-100 fathoms, on large Plumularians.

Genus HYPOPYXIS, *Allman.*

HYPOPYXIS DISTANS, *Bale.*

Hypopyxis distans, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 167, pl. xxxv., figs. 2-5.

Unless further research should prove the pouch-like structures peculiar to this hydroid to be of greater importance than at present appears, it seems to me that the retention of the genus will not be justified. In that case the species will fall naturally into the genus *Thuiaria*, as understood by Levinsen. I have referred to the close correspondence between *H. distans* and *Sertularia tuba* (which latter Levinsen mentions among the *Thuiariæ*), and I may add that the chitinous prolongations below the hydrothecæ ("stalk-marks") are quite similar in the two forms, though in my figure of *S. tuba*, (being the superficial view only), they do not appear.

I have examined many hydrothecæ of *H. distans*, in the hope of finding some clue to the significance of the hydrothecal pouches, but have not succeeded. As to their origin, it is clear from their appearance in optical sections that their inner wall is composed of two layers of perisarc which are united. It is as if an invagination of the perisarc had occurred just above the base of the hydrotheca, directed upward, and that the two adjacent walls of the invagination had united, forming an erect perisarcal ridge, which is the inner wall of the pouch; or (which would have the same optical effect), as if a pouch-shaped protrusion of the hydrothecal wall had been directed downward, overlapping that part of the hydrotheca below it, and becoming closely united therewith. Whichever has happened, the whole has been ensheathed in a thin outer layer of perisarc, and the pouch remains as an extremely contracted chamber completely continuous with the general cavity of the hydrotheca.

Locs.—Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms; Long. 130° 40′ E., 160 fathoms; Long. 127° 20′ E., 180 fathoms.

Genus Selaginopsis, *Allman.*

Selaginopsis dichotoma (*Allman*).

Dictyocladium dichotomum, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., Hydroida, pt. II., 1888, p. 77, pl. xxxvi., fig. 2, 2a. *Id.*, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 277.

Selaginopsis dichotoma, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 16, fig. 5.

Hydrophyton monosiphonic, four or five inches in height, in one plane, and forming a network by the anastomosing of the numerous dichotomous divisions ; jointed usually at the origin of the branches, rarely elsewhere.

Hydrothecæ spirally arranged, each fifth one completing the spiral, so that there are four longitudinal series ; tubular, stout, curved outwards, adnate most of their length, or with one-third part free, very often continued outwards by five or six renewals for a distance equal to fully half their original length ; border very delicate, with three deep emarginations and a three-valved operculum.

Gonothecæ large, ellipsoid, erect, springing from the inner side of one of the branches just above a bifurcation, and occupying the axil ; encircled by a very wide spiral wing, the perisarc of which is double, with numerous internal radial thickenings ; mouth a narrow tube, slightly expanded at the end.

The description and figure of this interesting species in the "Challenger" Report are incorrect in a number of particulars, especially in regard to the form and arrangement of the hydrothecæ and gonothecæ. Billard has already pointed out some of these inaccuracies.

All the subdivisions of a colony are in one plane, as shown by Allman, and are united into a reticulum by frequent anastomoses. The ramification is strictly dichotomous, the two members of a bifurcation being about equal, and divergent at a similar angle. A distinct constriction occurs at the origin of one or both, and few other joints exist. The branches are extended beyond the hydrothecate portion into twisted tendrils, which terminate in attachment to the aperture of a hydrotheca on another branch.

With regard to the arrangement of the hydrothecæ, Billard justly remarks that while they are, as Allman indicates, in four rows, they are nearly equidistant, and not in groups of four, as shown in Allman's figure. A series of five makes a complete turn of the stem, the fifth being in line with the first. There are some irregularities, and as the hydrothecæ are nearer to those next them than to those above and below, the quadriserial arrangement is not conspicuous.

The hydrothecæ are not of the slender, round-based, flask-like form shown in the original figure, they are on the contrary rather stout, and when the free portion is short they resemble those of a typical *Thuiaria.* They vary notably in the length of the free portion ; in some fragments of the "Challenger" type, for which I have to thank Dr. Kirkpatrick, it is very short ; in the "Endeavour" specimens it is often fully one-third of the entire length. This takes no account of the increase by regenerations, which in the "Endeavour" specimens is very considerable, as it also is in the "Challenger" specimen figured by Billard. Allman's description of the hydrothecæ as having a "small circular even orifice" is inaccurate. The fact is that the delicacy and collapsibility of the perisarc at the orifice, together with the confused appearance caused by the remains of successive renewals, makes it generally difficult to determine the original form. Billard concludes that it is probably bilabiate. After examining many hydrothecæ, I have been able to fully satisfy myself in several cases that the border has three deep emarginations, between which it forms triangular sharp points. The aperture, as seen on looking directly into it, is somewhat triangular, but with the angles more or less rounded off, and one marginal point is at the top, and the other two at the lower corners. In the lines marking successive renewals, the points only are usually obvious, and the upper one often less so than the others. In the best specimens the three-valved operculum was very distinct. It will be apparent that the form of the aperture and the operculum is practically the same as in a typical *Sertularella*, such as *S. divaricata*, differing only in the extreme delicacy of the perisarc and in the slightly deeper emarginations.

The peduncles of the gonothecæ do not spring from the axils, as shown in Allman's figure. The gonotheca is erect and central between the two branches at a bifurcation, but the peduncle springs laterally from one of the branches, a little above the axil ; it is noteworthy also that in all the portions of colonies examined all the gonothecæ spring from the same side of the bifurcations.

The frill-like appendages surrounding the gonotheca are very wide, and as Billard has noted, they are strengthened by numerous radial internal thickenings. Surrounding the upper part of the capsule they present a singular resemblance to the old-fashioned ruff. A remarkable feature not hitherto noticed is that instead of a series of annulations such as are generally found in species of *Sertularella*, we have here a regular continuous spiral, making, when perfect, about seven or eight complete turns round the gonotheca. The terminal part of the topmost whorl rises quite abruptly at one side of the tubular neck, which it almost equals in height; it is here nearly erect, but as it descends towards the middle part of the gonotheca it spreads more outwards: towards the base it becomes narrower and finally ceases. In a few cases, especially near the base of the gonotheca, the continuity of the spiral may become interrupted, and two or three complete annulations may be found.

Besides *D. dichotomum* several other species have been referred to the genus *Dictyocladium*. As for *D. flabellum*, Nutting, and *D. reticulatum*, Kirchenpauer, Levinsen has already pointed out that they belong to the genus *Sertularella*, as defined by him, and it will be apparent from the foregoing description that *D. dichotomum* must keep them company. But according to Hickson and Gravely the hydroid named by them *Dictyocladium fuscum* (which Vanhöffen says is identical with *Selaginopsis affinis*, Jäderholm), has no operculum, and therefore cannot be associated with the three above mentioned. Whatever classification be adopted, I have at least no hesitation in rejecting the genus *Dictyocladium*, which is founded on no better ground than that of the colony forming a flabellate structure, united into a network by the anastomoses of the branches.

Locs.—Off South Cape, Tasmania, 75 fathoms.

Thirty-five miles south-east of Bruni Island, Tasmania, 150-230 fathoms.

Genus SERTULARIA, *Linné.*

Of the species here grouped provisionally under the old genus *Sertularia*, *S. minima* and *S. pusilla* form, with their allies *S. minuta* and *S. muelleri*, a distinct section characterised by the possession of orifices in the hydrocaulus, generally associated with tubular processes resembling minute sarcothecæ. They are small unbranched forms, with the opercular structure of *Sertularia* (Levinsen).

S. loculosa is a member of the group of which *S. marginata* (Kirchenpauer), better known as *S. inflata* (Versluys), is the most familiar representative. This also belongs to Levinsen's *Sertularia*.

Two pinnate forms belonging to the same section are *S. unguiculata* and *S. geminata*.

S. operculata is the type of Levinsen's proposed genus *Odontotheca*, as of Agassiz' earlier *Amphisbetia*, and with it, on account of the opercular characters, Levinsen has associated *S. macrocarpa* and *S. maplestonei*. The two latter are pinnate species, while *S. operculata*, with its allies *S. bispinosa* and *S. trispinosa*, and perhaps one or two others, form a sub-group distinguished from the other species by the peculiar ramification.

S. elongata, in which the hydrothecæ have six marginal teeth and no operculum, belongs to the proposed new genus *Levinsenia*.

Sertularia minima, *Thompson*.

Sertularia minima, Thompson, Ann. Mag. Nat. Hist., (5), iii., 1879, p. 104, pl. xvii., fig. 3-3b. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 89, pl. iv., figs. 9-10, pl. xix., figs. 12-13 ; *Id.*, Bale, Trans. and Proc. Roy. Soc. Vict., xxiii., 1886, p. 109. *Id.*, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 138, pl. xiii., figs. 3-4. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 231. *Id.*, Whitelegge in Etheridge, Mem. Aust. Mus., ii., 1889, p. 41. *Id.*, Farquhar, Trans. N.Z. Inst., xxviii., 1896, p. 462. *Id.*, Hilgendorf, Trans. N.Z. Inst., xxx., 1897, p. 209, pl. xx., fig. 1, 1a. *Id.*, Jäderholm, Schwed. Südpolarexp., v., 1905, p. 24, pl. ix., figs. 4-5. *Id.*, Thornely, Journ. Linn. Soc., Zool., xxxi., 1908, p. 83. *Id.*, Billard, C. R. Acad. Sci., cxlviii., 1909, p. 194 ; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 17. *Id.*, Jäderholm, Ark. för Zool., vi., 1910, p. 3, pl. i., fig. 2. *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 845. *Id.* Mulder and Trebilcock, Geelong Nat., (2), vi., 1914, p. 39, pl. iv., figs. 2-3a, 5-6.

Synthecium gracilis, Coughtrey, Trans. N.Z. Inst., vii., 1874, p. 286, pl. xx., figs. 26-31.

Sertularia pumila, Coughtrey, Trans. N.Z. Inst., viii., 1875, p. 301 ; *Id.*, Coughtrey, Ann. Mag. Nat. Hist., (4), xvii., 1876, p. 29.

Sertularia pumiloides, Bale, Journ. Micro. Soc. Vict., ii., 1881, pp. 21, 45, pl. xii., fig. 2.

Odontotheca minima, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 308.

? *Sertularia crinoidea*, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 141, pl. xvi., figs. 1-2.

S. minima is the best-known representative of a small group of species—comprising also *S. minuta*, *S. muelleri*, and *S. pusilla*—which agree in the simple habit, the bidentate hydrothecæ, and the squat high-shouldered compressed gonothecæ; and which also agree, as pointed out by Mulder and Trebilcock in a recent paper (cited above), in the presence near the base of the internodes of small circular orifices, generally associated with delicate tubular appendages projecting externally, and described as resembling rudimentary sarcothecæ.

In the type form the hydrorhiza has the transverse markings along the edges, consisting of perisarcal thickenings, which are familiar to observers as occurring in many small Sertularians and Plumularians, but in some forms these are wanting. In typical specimens from Port Phillip, Victoria, I find very few of the orifices above referred to; on some shoots none were present, on others I found one only, situated at or close to the base of the first internode. The lower internodes are commonly rather broader at the base than the rest, tending towards a rectangular form, and the orifices are mostly just at the angle. The tubules are quite rudimentary, consisting of an extremely narrow projecting rim. A New Zealand specimen is very similar, but the orifices are found here and there on other internodes than the proximal ones; the little receptacles are somewhat more developed, and are tubular or slightly expanding.

The variety formerly described as *S. pumiloides* is larger in all its parts, both in the trophosome and the gonangia. Its hydrorhiza may be a simple filiform tube, or, as in a specimen from Queenscliff, Victoria, may have a series of lateral contractions, so that it appears scalloped along both margins. The little tubes are as in the last-mentioned form, and rare except on the proximal internodes.

Another form, which we may call var. *intermedia*, links the present species with *S. minuta*. Its internodes are compact and square at the base, and the hydrothecæ have a decided constriction and oblique fold on the outer side, a little above the base. These characters are very commonly found in the proximal internodes of the type form; here, however, they are more pronounced and extend throughout. The tubules are well-developed, slightly expanding, projecting from the lower angles, and, as in *S. minuta*, they occur on both sides and on all or nearly all the internodes. The hydrorhiza is typical.

Fuller investigation will be necessary to determine the true function of the apertures or receptacles described above, also to ascertain whether they are sufficiently constant to be of service in the discrimination of species or varieties. In my specimens of *S. muelleri* they are fairly frequent, but though the circular smooth-edged orifices are distinct enough I failed to find any trace of tubes surrounding them ; indeed they often have, in this species, the appearance of being closed in by an excessively thin pellicle of perisarc. It is just possible that they may correspond to the minute conical protuberances found on the apophyses of many Plumularians, the function of which is doubtful.

S. furcata, Trask, is evidently very closely allied to *S. minima*, and judging from some of the published figures of the former it seems possible that the two species may ultimately have to be united.

Billard, who has examined the type of *S. crinoidea*, Allman, is of opinion that it is not specifically distinct from *S. minima*.

Loc.—Nuyts Archipelago, Great Australian Bight, 10 fathoms.

Sertularia pusilla, *nom. nov.*

(Plate xlvi., figs. 3-6.)

Sertularia minima, Thompson, var. *tubatheca*, Mulder and Trebilcock, Geelong Nat., (2), vi., 1914, p. 40, pl. iv., fig. 1-1d.

Not *Sertularia tubitheca*, Allman, Mem. Mus. Comp. Zool. Harvard, v., 1877, p. 24, pl. xvi., figs. 5-6.

Shoots about 6-8 mm. in height, unbranched, sometimes divided into regular internodes, each bearing one pair of hydrothecæ, but often with nodes indistinct or quite wanting on parts of the hydrocaulus or throughout.

Hydrothecæ in pairs, opposite, tubular, regularly curved, mostly in contact in front, separate behind, moderately divergent ; aperture looking outward and upward, with two pointed angular lateral lobes.

Minute tubular sarcothecæ (?) on the lower portions of some of the internodes.

Gonothecæ one on a shoot, borne by the proximal internode ; somewhat compressed, ovate or oblong, with the shoulders rounded, and a distinct collar, very slightly elevated, with minute internal denticles.

This minute species somewhat resembles *S. tenuis*, but the hydrothecæ are less divergent and not conical, while the gonothecæ are of a similar type to those of *S. muelleri* and *S. minima*. In regard to the divisions of the internodes there is much variation among the members of the same colony ; in some shoots each pair of hydrothecæ occupies a distinct internode, in others some or all of the nodes are obsolete, though the hydrocaulus at these points is constricted exactly as when the nodes are distinct ; in other cases again it is quite smooth and unconstricted.

I have no doubt that the species is identical with the *S. minima* var. *tubatheca* of Mulder and Trebilcock, though these observers appear to have seen specimens all of which were divided into regular internodes of the first order. They note the presence of the minute tubular processes, the existence of which in *S. minima* and *S. minuta* they were the first to point out. I find these appendages in my specimens, but on some only of the internodes, and there is mostly only a single one on an internode, which is situated immediately below the base of one of the hydrothecæ.

According to Mulder and Trebilcock the hydrorhiza may have the linear marginal markings characteristic of *S. minima* and many other species, or may be simply tubular.

I collected specimens at Williamstown, Victoria, many years ago, and have seen no others except a fragment or two among the " Endeavour " material. Gonothecæ were present on the Williamstown specimens.

Loc.—Off Devonport and Launceston, Tasmania.

SERTULARIA LOCULOSA, *Bale*.

Sertularia loculosa, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 91 (part), pl. iv., figs. 5-6, pl. xix., fig. 9 ; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), xxvi., 1913, p. 121, pl. xii., figs. 7-8. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 306, fig. 8, pl. xlviii., fig. 37.

Sertularia turbinata, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 19 (in part).

? Sertularia turbinata, Ritchie, Proc. Zool. Soc., 1910, p. 821.

Not *Sertularia loculosa*, Busk, Voy. " Rattlesnake," i., 1852, p. 393. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 91 (part), pl. ix., fig. 12. *Id.*, Jäderholm, Ark. för Zool., i., 1903, p. 285.

Not *Dynamena turbinata*, Lamouroux, Hist. Polyp. Cor. Flex., 1816, p. 180.

A fragment or two of this species were found among debris from some of the material which had been dried, and the locality is doubtful.

It would come under the genus *Sertularia*, as restricted by Levinsen.

Sertularia unguiculata, *Busk.*

Sertularia unguiculata, Bale, Biological Results "Endeavour," ii., 1, 1914, pp. 11, 16 (synonymy).

According to Levinsen's classification this species would remain in the genus *Sertularia.*

The teeth of the hydrothecæ vary extremely in length. They are usually longest in the small forms with widely divergent hydrothecæ, the outer tooth especially having the characteristic claw-like form very pronounced. But in the long slender variety mentioned in Part I. many of the hydrothecæ on the proximal portions of the pinnæ have the teeth so much abbreviated that when viewed in front the border might, without careful examination, be supposed entire ; at the same time the more distal hydrothecæ might at the first glance be deemed to have the outer tooth only, the inner one being much blunter and seen foreshortened. The closer examination of this form strengthens my surmise that the *Thuiaria heteromorpha* of Allman may be only a variety of *S. unguiculata* analogous to the above-mentioned.

The hydranths have about 20 tentacles.

Locs.—Ten miles north of Circular Head, Tasmania.

Eastern Slope, Bass Strait, 80-300 fathoms.

Sertularia geminata, *Bale.*

Sertularia geminata, Bale, Cat. Austr. Hyd. Zooph., 1884, p. 78, pl. v., figs. 6-7, pl. xix., fig. 15 ; *Id.*, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 10. *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 22. *Id.*, Mulder and Trebilcock, Geelong Nat., (2), vi., 1914, p. 6.

Desmoscyphus orifissus, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 143, pl. xvii., figs. 1-4.

Allman's habit-figure of *D. orifissus* represents *S. geminata* very perfectly, but the magnified figure shows the hydrothecæ much inflated at the base, on which account Allman considered his specimens distinct. Billard, however, after examining the "Challenger" types, reports that they do not agree with the figure, and are not separable from *S. geminata.*

The species appears to conform to the characters of the genus *Sertularia*, as restricted by Levinsen.

Locs.—South coast of South Australia.

Twenty miles east of King Island, Bass Strait.

SERTULARIA OPERCULATA, *Linné.*

" *Sea-Hair,*" Ellis, Corall., 1755, p. 8, pl. iii., fig. 6.

Sertularia operculata, Linné, Syst. Nat., 1758, p. 808. *Id.*, Ellis and Solander, Zooph., 1786, p. 39. *Id.*, Esper, Fortsetz. der Pflanz., 1794-1806, ii., pl. iv., figs. 1-2. *Id.*, Lamarck, Anim. sans Vert., ii., 1816, p. 118. *Id.*, Johnston, Brit. Zooph., 2nd ed., 1847, p. 77, pl. xiv., fig. 2-2a. *Id.*, Busk, Voy. "Rattlesnake," i., 1852, p. 392. *Id.*, Hincks, Brit. Hydr. Zooph., 1868, p. 263, pl. liv., figs. a-c. *Id.*, Thompson, Ann. Mag. Nat. Hist., (5), iii., 1879, p. 106 (in part). *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 67, pl. vi., fig. i., pl. xix., fig. 3. *Id.*, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., Hydroida, pt. II., 1888, p. 61, pl. xxx., fig. 1-1a. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus., Wien, v., 1890, p. 231. *Id.*, Pfeffer, Ergeb. deutscher Polarexp., Allg. Theil., ii., 1892, p. 116. *Id.*, Farquhar, Trans. N.Z. Inst., xxviii., 1896, p. 462. *Id.*, Jäderholm, Arkiv. för Zool., i., 1903, p. 284. *Id.*, Nutting, Amer. Hydr., Sert., 1904, p. 54, pl. ii., figs. 3-5. *Id.*, Hartlaub, Zool. Jahrb., Suppl. vi., iii., 1905, p. 664, figs. Y^4, Z^4, A^5. *Id.*, Bartlett, Geelong Nat., (2), iii., 1907, p. 60, fig. —. *Id.*, Billard, Ann. Sci. Nat., Zool., (9), vi., 1907, p. 218 ; *Id.*, Billard, C. R. Acad. Sci., cxlviii., 1909, p. 1065 ; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), ix., 1909, p. 323 ; *Id.*, Billard, Ann., Sci. Nat., Zool., (9), xi., 1910, p. 18. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 305. *Id.*, Ritchie, Trans. Roy. Soc. Edinb., xlvii., 1909, p. 82. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 295.

Sertularia usneoides, Pallas, Elench., 1766, p. 132.

Nigellastrum usneoides, Oken, Lehrb. der Naturg., 3 Teil, Zool., i., 1815, p. 93.

Sertularia serra, Lamarck, Anim. sans Vert., ii., 1816, p. 118.

Dynamena serra, Blainville, Man. d'Act., 1834, p. 484.

Dynamena brevicella, Lamouroux, Encyc. Méth., Zooph., 1824, p. 288. *Id.*, Quoy et Gaimard, 1824, p. 613.

Sertularia brevicella, Milne-Edwards, Lamarck's Anim. sans Vert., 2nd ed., 1836, p. 154.

Dynamena operculata, Lamouroux, Hist. Pol. Cor. Flex., 1816, p. 176 ; *Id.*, Lamouroux, Expos. Méth., 1821, p. 12. *Id.*, Blainville, Man. d'Act., 1834, p. 483, pl. 83, fig. 5, 5a. *Id.*, Esper, Die Pflanz., 1788-1830, iii., p. 191. *Id.*, Krauss, Cor. und Zooph. der Südsee, 1837, p. 27.

Amphisbetia operculata, L. Agassiz, Cont. Nat. Hist. U.S., iv., 1862, p. 355.

Dynamena fasciculata, Kirchenpauer, Verhandl. der K. L.-C. d. Akad., xxxi., 1864, pp. 8, 12, fig. 7.

Odontotheca operculata, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 308.

? *Dynamena pulchella*, D'Orbigny, Voy. Amér. Mérid., v., 5, Zooph., 1839-1846, p. 26, pl. xi., figs. 9-11.

? *Sertularia pulchella*, Nutting, Amer. Hydr., Sert., 1904, pl. ii., fig. 6 (not fig. 7) after D'Orbigny. *Id.*, Hartlaub, Zool. Jahrb., Suppl. vi., iii., 1905, p. 667, figs. B^5, C^5 after D'Orbigny.

? *Sertularia crinis*, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 139, pl. xiv., figs. 1, 2.

The specimens belong to the bidentate form, which I cannot but regard as typical, for although Johnston and Hincks concur in describing the species as possessing normally one long tooth on the hydrotheca-margin, with a minute denticle on each side of it, observers generally mention only the bidentate form, and I have myself seen no other.

Excepting the closely allied *S. bispinosa* and *S. trispinosa*, and one or two doubtful forms, I know of no other species of *Sertularia* quite like the present in habit. Though branching profusely, there is no distinction of stem and branches ; all the divisions are alike, the ramification is strictly dichotomous, and the two members of each bifurcation are about equal, and are in divergent planes. The gonangia are rather narrow in proportion to their length, and I have never seen them compressed and widened upwards like those of *S. bispinosa*.

Sertularia usneoides, Pallas, has long been recognised as identical with *S. operculata*, while *S. serra*, Lamarck, and *Dynamena brevicella*, Lamouroux, are included among the synonyms on the authority of Billard, who has examined the types. Kirchenpauer's *Dynamena fasciculata* also is obviously no other than the present species.

Dynamena pulchella, D'Orbigny, has usually been considered another synonym, but Nutting, who regarded it as identical with *S. furcata*, Trask, treats it as distinct. The identity of *D. pulchella* and *S. furcata* cannot now, I think, be maintained; the former is, as Fraser has pointed out, much and irregularly branched, and attains a length of a quarter of a metre, while its hydrothecæ differ from those of *S. operculata* only in having the two teeth about equal. *S. furcata*, on the other hand, is shown by the accounts of Clark, Torrey, Fraser, and Stechow to be a dwarf unbranched form of the *Desmoscyphus*-type. There is no doubt that *D. pulchella* is identical with *S. operculata*, or at least very closely allied to it; as for *S. furcata*, I cannot see any definite distinction between it and *S. minima*.

Billard regards *S. crinis*, Allman, as identical with *S. operculata*, having found on examination of Allman's types that the form of the hydrothecæ and the gonothecæ is the same as in the latter species; and he remarks that it suffices to see Allman's figures to recognise the identity of the two. This, however, can only apply to the minute structure, the habit of *S. crinis* being very different from that of *S. operculata*. In the latter, as already mentioned, there is no distinction between stem and branches, all the ramifications of the colony being alike. In *S. crinis*, according to Allman's figure, there is a main stem four or five inches in height, with several principal branches, from which arise numerous tufted dichotomously divided branchlets. On the stem and main branches the hydrothecæ are from about five to fifteen times as distant from each other as are those on the small branchlets. Dr. Kirkpatrick, who has kindly examined the type for me, states that there is a distinct main stem from origin to apex, consisting of long smooth internodes apparently without or with only one pair of hydrothecæ. These peculiarities seem sufficient to establish the claim of *S. crinis* to rank, if not as a separate species, at least as a distinct variety of *S operculata*, the latter view being taken by Dr. Kirkpatrick.

Locs.—Twenty miles east of King Island, Bass Strait.

Off Devonport, Tasmania.

Ten miles north of Circular Head, Tasmania.

SERTULARIA MAPLESTONEI, *Bale*.

Sertularia maplestonei, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 16 (synonymy).

Odontotheca maplestonei, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 308.

Loc.—Hunter Group, Bass Strait, 15 fathoms.

SERTULARIA MACROCARPA, *Bale.*

Sertularia macrocarpa, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 14 (synonymy).

Odontotheca macrocarpa, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 308.

Loc.—Bass Strait.

SERTULARIA ELONGATA, *Lamouroux.*

Sertularia elongata, Lamouroux, Hist. Pol. Cor. Flex., 1816, p. 189, pl. v., fig. 3-3c. *Id.*, Deslongschamps, Encycl. Méth., Zooph., 1824, p. 681. *Id.*, Krauss, Cor. und Zooph. der Südsee, 1837, p. 29. *Id.*, Busk, Voy. "Rattlesnake," i., 1852, p. 388. *Id.*, Thompson, Ann. Mag. Nat. Hist., (5), iii., 1879, p. 107, pl. xviii., fig. 2-2c. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 75, pl. vi., figs. 7-8, pl. xix., fig. 7; *Id.*, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 770; *Id.*, Bale, Biological Results "Endeavour," ii., 1, 1914, pp. 8-10. *Id.*, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 140, pl. xv., figs. 1-6. *Id.*, Marktanner-Turneretscher, Ann. K.K. Hofmus. Wien, v., 1890, p. 230. *Id.*, Farquhar, Trans. N.Z. Inst., xxviii., 1896, p. 461. *Id.*, Hilgendorf, Trans. N.Z. Inst., xxx., 1897, p. 208, pl. xix., fig. 3-3b. *Id.*, Billard, Ann. Sci. Nat., Zool., (9), vi., 1907, p. 217, fig. 2; *Id.*, Billard, C. R. Acad. Sci., clxviii., 1909, p. 1065; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), ix., 1909, p. 323; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 22, fig. 9 (not 8). *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 845. *Id.*, Mulder and Trebilcock, Geelong Nat. Vict., (2), vi., 1914, p. 8, pl. i., figs. 7-10.

Sertularia scandens, Lamouroux, Hist. Pol. Cor. Flex., 1816, p. 189.

Sertularia lycopodium, Lamarck, Anim. sans Vert., 1816, p. 117.

Sertularia millefolium, Lamarck, Anim. sans Vert., 1816, p. 116.

Dynamene abietinoides, Gray in Dieffenbach, Travels in New Zealand, ii., 1843, p. 294.

Sertularia abietinoides, Hutton, Trans. N.Z. Inst., v., 1872, p. 257. *Id.*, Coughtrey, Trans. N.Z. Inst., vii., 1874, p. 285, pl. xx., figs. 16, 18-20 ; *Id.*, Coughtrey, Trans. N.Z. Inst., viii., 1875, p. 300. *Id.*, Pfeffer, Erg. d. deutscher Polarexp., ii., 1892, p. 116.

Most specimens of *S. elongata* can be definitely assigned to either the large or the small variety, though intermediate forms occur. The two varieties were by Lamouroux named respectively *S. elongata* and *S. scandens*, and by Lamarck *S. lycopodium* and *S. millefolium*. I have referred to this species in Part I[1], and it has been so often described that little need be said of it here. No operculum has been detected, consequently in the system of classification proposed by Levinsen it is excluded from the genus. The hydranths have about 16-18 tentacles.

Billard, in his Revision of part of the British Museum Hydroids, (Ann. Sci. Nat., Zool., (9), xi., 1910, page 22), has described some colonies which he found among clusters of *Sertularia elongata* from Australia in the Bowerbank Collection, and which, owing to this association, he has hesitated to describe as a new species, though they differ from *S. elongata* in the opposite ramification, in the opposite position of the cauline hydrothecæ, in the number of the marginal teeth, as well as the form of the hydrothecæ, in the presence of an unpaired hydrotheca on the proximal part of each pinna, and finally in the totally different form of the gonangia Billard thinks it just possible that this may be a curious case of sexual dimorphism.

I do not think this theory tenable, for several reasons. In the first place, of course, is the fact of the complete unlikeness of the two species in every detail. This of itself should, I think, be considered conclusive against any evidence short of tracing the two to the same hydrorhiza. Then it must be remembered that *S. elongata* is an extremely common species, the most abundant indeed on the southern Australian coast, and it is scarcely credible that one of its sexual forms should have hitherto escaped observation except in this single instance, especially as the difference in the ramification would be apparent to the naked eye.

Another important consideration is that this is not an entirely isolated form, but is a representative of a group of species, all of which agree in their most characteristic features. Billard refers to one of these—*S. huttoni*, Marktanner-Turneretscher—and to this may be added *S. acanthostoma*, Bale, and *S. insignis*, Thompson.

1. Bale—Biological Results "Endeavour," ii., 1, 1914, p. 9.

Further reference to these and other related forms will be found under the description of the proposed genus *Levinsenia*, all the species of which have six or more teeth on the hydrotheca-margin, and, so far as is known, no operculum.

Loc.—Nuyts Archipelago, Great Australian Bight, 10 fathoms.

Genus Thuiaria, *Fleming*.

Thuiaria sinuosa, *Bale*.

Thuiaria sinuosa, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 772, pl. xviii., figs. 9, 10 ; *Id.*, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 12. *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 844, pl. lxxxv., fig. 4. *Id.*, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 297. *Id.*, Mulder and Trebilcock, Geelong Nat., (2), vi., 1914, p. 9. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 294, pl. xxv., fig. 1.

Though obviously belonging to this species the specimens differ from the type in having the curvature of the hydrothecæ very slight or, more commonly, entirely wanting. The apertures are ill-defined, in consequence of the extreme delicacy of the perisarc towards the margin.

Locs.—Great Australian Bight, Long. 127° E., 100 fathoms.

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Genus Sertularella, *Gray*.

Though Levinsen's views regarding the genus *Sertularella* are to some extent combated by Nutting and other observers, who demur to admitting multiserial species (*Dictyocladium*), and admit some which Levinsen would exclude, there appears to be practical unanimity regarding those forms which have the characteristic three- or four-valved operculum and a biserial and alternate arrangement of the hydrothecæ ; even when their division into long internodes supporting numerous hydrothecæ would bring them strictly within the limits of the genus *Thuiaria*, as formerly understood. Such species, included in the present collection, are *Thuiaria lata* and *Sertularella adpressa*, which are certainly not, at any stage of their growth, divided into single-celled internodes, the feature which I have urged in Part I. should be regarded as characteristic of the genus, from the point of view of the colonial characters. Accordingly I now rank these forms in the genus *Sertularella*, and this I consider tantamount to admitting that *all* biserial forms with the characteristic opercular structure should be so placed; for although the alternate arrangement of the hydrothecæ is insisted on by some, it can scarcely be maintained that a species possessing the other characters should be excluded simply because the hydrothecæ are not alternate.

The species in this collection may be accordingly divided into two main groups: the typical *Sertularellæ*, in which each internode supports one hydrotheca, and the species above-named, with numerous hydrothecæ on an internode; *S. divaricata*, in some of its forms, is distinctly intermediate. If Levinsen's grouping be strictly followed *Dictyocladium dichotomum* will represent a third section.

SERTULARELLA GAUDICHAUDI (*Lamouroux*).

Sertularia gaudichaudi, Lamouroux, Quoy et Gaimard, p. 615, pl. xc., figs. 4, 5.

? *Sertularia picta*, Meyen, Nov. Act. Leop.-Car. Acad., xvi., Suppl. i., 1834, p. 201, pl. xxxiv., figs. 1-3. *Id.*, Hartlaub., Abh. Nat. Ver. Hamb., xvi., 1900, p. 77, pl. v., fig. 14, pl. vi., figs. 17, 18, 20.

Sertularella polyzonias, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 104, pl. iii., fig. 1, pl. xix., fig. 25; *Id.*, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 763. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 291, fig. 5 A, B, pl. lxvii., figs. 18-20. *Id.*, Stechow, Zool. Jahrb., xxxii., 1912, p. 358.

Sertularia laxa, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., 1888, Hydroida, pt. II., p. 55, pl. xxvi., fig. 2, 2a. *Id.*, Pictet et Bedot, Res. camp. scient. Prince de Monaco, fasc. xviii., 1900, p. 22.

Sertularella mediterranea, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, pp. 86, 47, fig. 22, pl. v., figs. 10, 11, 15, 16.

Sertularia polyzonias (in part), Vanhöffen, Deutsche Südpolar-Exp. 1901-1903, xi., Zool. iii., 1911, p. 322, fig. 39.

Sertularella gaudichaudi, Billard, Ann. Sci. Nat., Zool., (9), ix., 1909, p. 317, fig. 5; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 11; *Id.*, Billard, Arch. de. Zool. exp. et gén., 51, 1912, p. 464.

?? Not *Sertularella polyzonias* (Linné).

The relations between *Sertularella mediterranea*, Hartlaub (which Billard finds to be identical with *Sertularia gaudichaudi*, Lamouroux) and *S. polyzonias* are greatly in doubt. Stechow, Warren, and Vanhöffen regard them as belonging to one species, but Billard considers *S. mediterranea* as sufficiently distinguished by the presence of internal teeth in the hydrotheca. This, however, is not in accordance with the definitions of Hartlaub, who says that *S. polyzonias* also possesses these appendages, though they are not so strongly developed as in *S. mediterranea*, and *may* be entirely wanting. He mentions further that he has seen specimens which he is in doubt whether to place under *S. mediterranea* or *S. polyzonias.* All this may be regarded as favouring the view of those observers who consider the two species identical; but on the other hand it seems equally reasonable to suppose that Hartlaub was wrong in assigning to *S. polyzonias* any of the specimens with internal teeth, and that Billard's view is the correct one. Stechow's reason for believing the species the same was that he had found specimens with internal teeth—therefore to be referred to *S. mediterranea*—but with an external marsupium on the gonotheca, the latter condition being characteristic of *S. polyzonias.* This, however, is quite in accordance with Hartlaub's statement that *S. polyzonias* may have internal teeth, which both Stechow and Billard omit to notice.

The position then seems to be that Hartlaub makes the presence or absence of the marsupium the prime specific character, while Billard regards the internal teeth as of more importance.

Dr. Ritchie, who has kindly sent me British specimens of *S. polyzonias*, informs me that he has examined colonies of that species from a number of widely separated localities, and has in no case found internal teeth present.

All the Australian specimens which I have so far observed possess these teeth, and therefore conform to Billard's description of *S. gaudichaudi* (*S. mediterranea*); I therefore refer them to that species, leaving for future settlement the question of its identity or otherwise with *S. polyzonias.*

I only saw one fragment among the "Endeavour" material, and am doubtful as to its locality; it agreed, however, with Port Phillip specimens which I formerly described as *S. polyzonias.* The shoots are simple or with few and irregular branches, given off below the hydrothecæ, just as in *S. polyzonias*[1]; the hydrothecæ are adnate for about half their length. In certain minor particulars they differ from Billard's description; thus the hydrothecæ are in one plane

1. In the specimen of *S. polyzonias* sent to me from Scotland by Dr. Ritchie, about half the branches spring from the interior of hydrothecæ.

(but this agrees with *S. mediterranea*), the base of the branches is only slightly twisted, or not at all, and the annulation of the gonotheca extends over a greater part of its length. According to Billard the typical *S. gaudichaudi* and *S. mediterranea* have the outer tooth of the hydrotheca longer than the others, so that the aperture appears oblique ; this character is present in our specimens to such a slight extent as to be scarcely noticeable, and in many hydrothecæ it is not discernible at all. All these characters are of known inconstancy, and the differences would not justify a specific separation. The gonothecæ may have either three or four pointed teeth on the summit, and this in the same shoot.[1] The type form, according to Billard, has four, while the form described by Allman as *S. laxa* is said to have three. It is on Billard's authority that the latter is referred to *S. gaudichaudi*.

It is noticeable that in this species, although there are four marginal teeth, the internal ones number only three, and the same condition obtains in *S. microgona* and *S. angulosa*, as well as in the species next to be described. Hartlaub, it is true, describes *S. mediterranea* as having *four* internal teeth, but as he does not draw any distinction in regard to this character between that species and the internally toothed forms which he refers to *S. polyzonias*, it seems permissible to suspect that this is an oversight. The Bass Strait specimen with internal teeth, which he refers to *S. polyzonias*, is probably the same as the present form. All my specimens are distinctly smaller throughout than British examples of *S. polyzonias*.

The distinction between *S. polyzonias* and *S. gaudichaudi*, if finally upheld, will invalidate the record of the former as a member of the Australian fauna. Its inclusion in the " Catalogue of the Australian Hydroid Zoophytes " was solely on the evidence of specimens with internal teeth (though this feature was not observed till later), and I am not aware of any other record of the occurrence of *S. polyzonias* in Australia except Hartlaub's, referred to above. Up to the present, therefore, the existence of the typical *S. polyzonias* has not been established, and it is quite probable that many others of the locality-records which have contributed to procure for it the character of ubiquity may have also referred to forms such as that here classed as *S. gaudichaudi*.

1. In a single shoot of *S. polyzonias* I find gonangia with three, four, and five teeth.

Sertularella tasmanica, *sp. nov.*

(Plate xlvi., fig. 2.)

Hydrocaulus about one inch in height (or more ?), stem fascicled towards the base, branches irregularly pinnate, springing from below the hydrothecæ ; stem and branches divided by oblique twisted joints into long internodes, each bearing a hydrotheca close to the summit ; proximal internodes of the branches very long, smooth or slightly undulated at their origin.

Hydrothecæ in a single plane, large, divergent, urceolate, adnate for more than half their length ; border slightly expanding, with four marginal teeth ; three strong internal vertical teeth, two below the two upper emarginations of the border and the third below the abcauline marginal tooth.

Gonosome—?

This species has the general habit of *S. polyzonias* and *S. gaudichaudi*, with the latter of which I was at first inclined to place it. It is distinguished by the fasciculation of the stem, which, however, did not extend far above the base. The fascicle is formed, as Hartlaub points out in the case of allied species, by the development of supplementary tubes which originate at various points on the stem and grow downward. The hydrothecæ are larger than those of *S. gaudichaudi*, their usual length being, between extreme points, about .815 mm., and they also differ from those of that species in having a much larger proportion—nearly two-thirds—of their length adnate. The border is of the same form as that of *S. polyzonias*, and transverse to the hydrotheca ; only rarely is there discernible a slight tendency to the obliquity which, according to Billard, is a feature of *S. gaudichaudi*. The internal vertical processes are large and prominent. The portion of the internode below the hydrotheca is very variable in length, about .450 mm. being common ; the first internode of a branch, however, is much longer, sometimes attaining as much as 1.8 mm. between its origin and the base of the first hydrotheca. These internodes may have a few faint undulations close to their origin, but are more commonly quite smooth.

Loc.—Off South Cape, Tasmania, 75 fathoms.

Sertularella gayi (*Lamouroux*).

Sertularia gayi, Lamouroux, Exp. Méth., 1821, p. 12, pl. 66, figs. 8-9. *Id.*, Deslongchamps, Encyc. Meth., Zooph., 1824, p. 682. *Id.*, Milne-Edwards, Lamarck's Anim. sans Vert., 2nd ed., ii., 1836, p. 152.

Sertularella gayi, Hincks, Brit. Hydr. Zooph., 1868, pp. 237, 238, fig. 29, pl. 46, fig. 2. *Id.*, Verrill, Amer. Jour. Sci. and Arts, (3), v., 1873, pp. 9, 14. *Id.*, Allman, Trans. Zool. Soc., viii., 1874, pp. 471, 474, pl. lxvi., fig. 3, 3a (var. *robusta*) ; *Id.*, Allman, Mem. Mus. Comp. Zool. Harvard, v., 1877, p. 22, pl. xv., figs. 3-5 (var. *robusta*). *Id.*, Sars, Bidr. til Kunds. om Norg. Hydr., 1874, p. 109. *Id.*, Kirchenpauer, Abh. Nat. Ver. Hamb., viii., 1884, p. 41. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, p. 61. *Id.*, Nutting, American Hydroids, pt. II., Sertularidæ, 1904, p. 78, pl. xiv., figs. 1-7. *Id.*, Billard, Exp. Sci. du "Travailleur" et du "Talisman," Hydroides, viii., 1906, p. 184, fig. 9, p. 185 (var. *robusta* and var. *elongata*). *Id.*, Jäderholm, Kungl. svenska Vetenskapsakad. Handl., 45, 1909, p. 100, pl. xi., fig. 13.

Sertularia ericoides var., Pallas, Elench., 1766, p. 127.

Sertularia polyzonias var. β, Johnston, Brit. Zooph., 2nd ed., 1847, p. 61, pl. x., fig. 2.

Sertularella annulata, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., Hydroida, pt. II., 1888, p. 52, pl. xxiv., fig. 2, 2a. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, p. 54.

Sertularella Gayi (Lamouroux), var. *Allmani*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 10, fig. 3.

The hydrothecæ are large and nearly smooth, with very inconspicuous teeth ; the gonothecæ with the annulations irregular, often almost wanting, and usually with three short teeth on the summit.

Loc.—Eastern slope, Bass Strait, 80-300 fathoms.

Sertularella undulata, *sp. nov.*

(Plate xlvi., fig. 1.)

Hydrocaulus unbranched, about ¼ inch in height, divided by oblique twisted joints into internodes of very variable length, each supporting a hydrotheca at the summit and having its lower portion strongly undulated.

Hydrothecæ short, stout, free for half their length or more, proximal half smooth, distal half with a strong annular ridge or shoulder, above which the hydrotheca is somewhat narrower, and a second slighter annulation close to the wide aperture, border square, with four small teeth, between which are shallow emarginations ; no internal teeth.

Gonosome.—?

A small colony of this species was found growing on one of the specimens of *S. tasmanica.* The longest shoots consisted of seven or eight internodes. The hydrothecæ are seated high on the internodes, the tops of which reach only to about their middle. The first internode is about as long as the hydrotheca ; the more distal ones may attain more than twice their length. Below the hydrothecæ, and for a distance equal to about the length of the latter, the internodes are narrowed downwards ; the rest of their length is slender and of about uniform thickness, and for the most part strongly undulated ; the undulations often extending up nearly as far as the hydrotheca.

The hydrothecæ have no distinct annulations below the shoulder, which is a somewhat prominent annular ridge, and above which the hydrotheca is rather abruptly contracted, but to a slight extent only ; between the shoulder and the aperture is another annulation, which is of about the same diameter as the expanded border. The width of the aperture from point to point is very little less than that of the hydrotheca at its thickest portion, a rather exceptional condition among the quadridentate species. The emarginations of the border do not usually run in a uniform curve from point to point, but are somewhat flattened (as seen in profile), and the teeth are more or less nipple-shaped.

One of the shoots is continued into a stolon, and on this are borne a new shoot and also two isolated single hydrothecæ.

Loc.—Off South Cape, Tasmania, 75 fathoms.

SERTULARELLA INDIVISA, *Bale.*

Sertularella indivisa, Bale, Journ. Micro. Soc. Vict., ii., 1881, p. 24, pl. xii., fig. 7 ; *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 105, pl. iii., fig. 5, pl. xix., fig. 27 ; *Id.*, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, pp. 764, 765. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 224. *Id.*, Billard, Bull. Mus. d'Hist. nat., 1905, p. 334.

Sertularella solidula, Bale, Journ. Micr. Soc. Vict., ii., 1881, p. 24, pl. xii., fig. 8 ; *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 106, pl. iii., fig. 6, pl. xix., fig. 28 ; *Id.*, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, pp. 764, 765. *Id.*, Whitelegge in Etheridge, Mem. Austr. Mus., ii., 1889, p. 41. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, pp. 71, 41, 56, 76, 125, pl. iv., figs. 3, 13, 14, 27, pl. vi., fig. 13 ; *Id.*, Hartlaub, Zool. Jahrb., xiv., 1901, p. 371. *Id.*, Stechow, Abh. math.-phys.

Klasse K. Bayer Akad. Wissensch., iii. Suppl.-Bd., 1913, p. 136, figs. 108-110; (*Sertularella*, No. 10, Inaba, Zool. Mag. Tokyo, 1890, figs. 26-28).

Sertularella variabilis, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 764, pl. xv., figs. 5-9. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1890, p. 66.

Sertularella Sieboldi, Kirchenpauer, Abh. Nat. Ver. Hamb., viii., 1884, p. 49, pl. xvi., fig. 5, 5a. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, p. 69, pl. iv., fig. 12.

Sertularella Mülleri, Kirchenpauer, Abh. Nat. Ver. Hamb., viii., 1884, p. 49, pl. xvi., fig. 7-7b. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, p. 70, pl. ii., figs. 43-45, 59.

Not *S. indivisa*, Stechow, Abh. math.-phys. Klasse K. Bayer Akad. Wissensch., iii. Suppl.-Bd., 1913, p. 134, figs. 106, 107; (*Sertularella* No. 9, Inaba, Zool. Mag. Tokyo, 1890, figs. 22-25).

Hartlaub has united *S. indivisa*, *S. solidula*, and *S. variabilis* under the name of *S. solidula*, and in view of the extreme range of variation found among these forms, I cannot but concur in his judgment. The species, however, must be named *S. indivisa* instead of *S. solidula*, the former name having priority.

Hartlaub also considers it probable that the *S. sieboldi* and *S. muelleri* of Kirchenpauer belong to the same species. It would be impossible to identify them from Kirchenpauer's account, but Hartlaub's descriptions and figures seem to me to support his opinion.

S. exigua, Thompson, is also ranked by Hartlaub as a synonym, on the strength of specimens marked *S. exigua* in the Kirchenpauer collection. *S. exigua*, however, has four-toothed hydrothecæ, consequently Kirchenpauer's specimen must be incorrectly referred to that species.

Inaba's Species 9, which Stechow refers to *S. indivisa*, is also a four-toothed form, and, therefore, its reference to *S. indivisa* is inadmissible.

The "Endeavour" specimens agree pretty closely with the typical *S. indivisa*, but are very thin and delicate. Most of them were growing on *S. adpressa*, Ritchie.

Locs.—Oyster Bay, Tasmania, 60 fathoms.

Forty miles west of Kingston, South Australia, 30 fathoms.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Twenty miles east of King Island, Bass Strait.

SERTULARELLA DIVARICATA, (*Busk*).

Sertularella divaricata, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 20, pl. ii., figs. 1-9 (synonymy). *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 291.

Locs.—Twenty miles east of King Island, Bass Strait.

Eight miles east of Sandon Bluff, Queensland, 35-40 fathoms.

Ten miles north of Circular Head, Tasmania.

Great Australian Bight.

Hunter Group, Bass Strait.

SERTULARELLA NEGLECTA, *Thompson*.

Sertularella neglecta, Thompson, Ann. Mag. Nat. Hist., (5), iii., 1879, p. 100, pl. xvi., fig. 1. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 110, pl. iii., fig. 3, pl. xix., figs. 22, 23. *Id.*, Kirchenpauer, Abh. Nat. Ver. Hamb., viii., 1884, p. 48. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 224. *Id.*, Hartlaub, Abh. Nat. Ver. Hamb., xvi., 1900, pp. 69, 16, 20, 26, 56, 112, pl. ii., figs. 25, 53.

Sertularella Sonderi, Kirchenpauer, Abh. Nat. Ver. Hamb., viii., 1884, p. —, pl. xvi., fig. 4.

? *Sertularella trimucronata*, Allman, Journ. Linn. Soc., Zool.. xix., 1885, p. 135, pl. x., figs. 1, 2. *Id.*, Hartlaub, Abh, Nat. Ver. Hamb., xvi., 1900, p. 48, fig. 24; *Id.*, Hartlaub, Zool. Jahrb., Suppl. vi., iii., 1905, p. 626, fig. Q^3.

I have added *S. trimucronata*, Allman, to the synonyms, as I cannot find in Allman's account anything to differentiate it from the present species.

Locs.—Forty miles west of Kingston, South Australia, 30 fathoms.

Off Murray mouth, South Australia, 20 fathoms.

Eleven miles 74° W. of Cape Martin, South Australia, 21 fathoms.

SERTULARELLA LATA, *Bale*.

Thuiaria lata, Bale, Journ. Micro. Soc. Vict., ii., 1881, pp. 26, 45, pl. xiii., fig. 2; *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 120, pl. vii., fig. 4; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), vi., 1893, p. 103, pl. iv., fig. 1; *Id.*, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 12. *Id.*, Kirkpatrick, Sci. Proc. R. Dublin Soc., (n.s.), vi., 1890, p. 604.

Sertularella lata, Levinsen, Vidensk. Medd. fra den naturh. Foren, 64, 1913, p. 312.

Not *Sertularella lata*, Billard, Arch. de Zool. exp. et gén., (4), vii., 1907, p. 346, fig. 4.

I have referred to this species in Part I under its original name of *Thuiaria lata*, but for the reasons already stated I now class it under the genus *Sertularella*.

With regard to its specific affinities much confusion exists. A number of hydroids have been referred to the species by different observers, some of which may possibly be rightly placed, while others have the gonangia so unlike those of *S. lata* in every particular that it is difficult to understand why they should have been associated with it. Apparently there are two species[1] (at least) closely resembling each other in the trophosome, but differing widely in the form of the gonangia. No fertile specimens of *S. lata* have been observed except a single one from Port Phillip, Victoria, collected by the late Mr. J. Bracebridge Wilson.

The following list includes the forms which have been regarded by other observers as specifically identical with *S. lata* :—

Sertularia tridentata, Lamouroux, Hist. Polyp. Cor. Flex., 1816, p. 187.

Thuiaria diaphana, Busk, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 145, pl. xviii., figs. 1-3.

Thuiaria hyalina, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii., Hydroida, pt. II., 1888, p. 69, pl. xxxiii., fig. 2-2a.

Sertularella lata, Nutting, Amer. Hydr., II., Sertulariadæ, 1904, p. 85, pl. xviii., fig. 10 ; *Id.*, Nutting, Bull. U.S. Fish. Comm., 1905, p. 948.

Sertularella Torreyi, Nutting, Bull. U.S. Fish Comm., 1905, p. 949, pl. iv., fig. 4, pl. xi., figs. 2-3.

Sertularella lata, Billard, Arch. de Zool. exp. et gén., (4), vii., 1907, p. 346, fig. 4.

Sertularella speciosa, Congdon, Proc. Amer. Acad. of Arts and Sci., xlii., 1907, p. 476, figs. 24-28.

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1. Another species having similar hydrothecæ is *Thecocladium flabellum*, Allman. Billard's figure of this species (Ann. Sci. Nat., Zool., (9), xi., 1910, p. 12) really more resembles *S. lata* than does his figure of "*Sertularella lata*," (Arch. de Zool. exp. et gén., (4), vii., 1907, p. 346), and would indeed serve admirably for *S. lata* except for the peculiarity of the pinnæ springing from hydrothecæ.

Sertularella tridentata, Billard, Ann. Sci. Nat., Zool., (9), ix., 1909, p. 312 ; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 14.

Sertularella tridentata, Stechow, Abh. math.-phys. Klasse K. Bayer Akad. Wissensch., iii. Suppl.-Bd., 1913, p. 137, figs. 111-113 ; (*No.* 17 *Thuiaria sp.*, Inaba, Zool. Mag. Tokyo, 1890, figs. 46-48).

Of the foregoing, *Sertularella tridentata*, Lamouroux, is said by Billard, who has examined the type specimens, to be identical with the form described by him in 1907 as *S. lata*, hence he has since considered the latter a synonym of *S. tridentata*. Lamouroux' specimens, not including the gonangia, may be doubtful, but if really identical with Billard's species, they are not the true *S. lata*.

Nutting says that the specimens assigned by him to *S. lata* are the same as Allman's *Thuiaria hyalina*, types of which he has examined ; the absence, however, in both cases of the gonangia renders the identification doubtful. It should be noted that Allman describes the hydranth of *T. hyalina* as only partially retractile, the upper portion, including the tentacular crown, being incapable of withdrawal into the hydrotheca, even when most fully retracted. In *S. lata*, on the contrary, the hydranths are found fully withdrawn into the hydrotheca, and occupying little more than the lower half of its cavity.

Inaba's species, which Stechow has referred to *S. tridentata*, is also without the gonangia. The figures resemble *S. lata*, but the aperture of the hydrotheca does not approximate so closely to the vertical position. It cannot be identified with *S. lata* with any certainty.

There remains Billard's *S. lata* or *S. tridentata*, with *T. diaphana*, Busk, *S. Torreyi*, Nutting, and *S. speciosa*, Congdon, and it is probable that these forms constitute a single species, the gonangia, as well as the hydrothecæ, being of the same type throughout. Billard's figure of the trophosome differs from *S. lata* in the hydrothecæ being more bent outward and having the apertures looking more upward. The most distinctive feature of this form, however, as of the others here associated with it, is the character of the gonangia. These are cylindrical in the upper half and gradually tapering below, not contracted at the summit, but even, according to Allman and Congdon, somewhat flaring. Surrounding the upper half are a number of longitudinal plications, between which the wall of the gonangium is convexly curved outwards. There is no trace of bilateral symmetry, and the form bears a striking resemblance to that of the gonangium of *Orthopyxis wilsoni*, Bale.[1] Nutting also refers to this similarity to the gonangia of some of the Campanularians.

From this type the gonangia of *S. lata* differ in every character. In the first place the bilateral development is conspicuous, the gonangia having distinct dorsal and ventral aspects, the latter of which is directed inward. From a little above the middle the gonangium tapers gradually to the peduncle ; it is also narrowed upwards, but in a less degree, and the narrowing at this part is mostly on the dorsal side, which is continued upward considerably higher than the ventral, and at the summit rounded over to the oblique concave termination, which is thus contracted at the dorsal border, but little or not at all in front. There is nothing in any way resembling the plicated condition found in the other species, but on the other hand there are regular transverse undulations (generally more pronounced than I have figured them), which are strongest at the dorsum, and become shallower towards the venter, where they are often not traceable. The gonangia are not erect on the pinnæ, but lie along them, with the venter almost appressed to them.

The pinnæ are usually long, attaining about three-quarters of an inch, and narrow at the point of origin. The distal internodes often bear only three hydrothecæ, but very rarely less. The hydrothecæ have four shallow emarginations ; the intermediate points are usually distinct at the sides, but less pronounced above and below. The aperture is nearly vertical in typical specimens, in others somewhat less so. The terminal hydrotheca in each internode has the aperture directed slightly more upward than the others.

Locs.—Off St. Francis Island, Great Australian Bight, 30 fathoms.

Great Australian Bight, 80-120 fathoms and 130-190 fathoms.

SERTULARELLA ADPRESSA, *Ritchie*.

Sertularella adpressa, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 837, pl. lxxxv., fig. 5, pl. lxxxviii., figs. 1, 2, 9. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 291, pl. xxv., fig. 2.

This species has been fully described by Ritchie, and the present specimens, for the most part, answer perfectly to the

1. Bale—Proc. Roy. Soc. Vict., (n.s.), xxvii., pl. xii., fig. 5.

description. The gonothecæ, however, are narrower than those figured; here and there one is seen which in lateral view agrees with the figure, but this is exceptional; while the frontal aspect is far narrower, its width being usually just about the same as that of the pinna with its hydrothecæ, and the same width is maintained throughout, except just at the base.

The hydrothecæ are somewhat similar to those of *S. divaricata*, but are of narrower proportions, more regularly curved, and with the aperture smaller. In most cases regeneration has occurred repeatedly, and the later peristomes are generally decidedly smaller than the primary one, as well as slighter in texture.

There are no nodes, or very few, in the pinnæ; the hydrothecæ being in long uninterrupted series, such as were formerly considered characteristic of the genus *Thuiaria*.

Locs.—Oyster Bay, Tasmania, 60 fathoms.

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Family PLUMULARIIDÆ.

This is by far the most important family represented in the collections, whether regarded in relation to the variety of the forms observed, or to the beauty and luxuriance of many of the species, or to the abundance of the colonies. Several species, both among the Statoplea and the Eleutheroplea, attain over a foot in height, and three or four reach two feet, possibly more. Out of thirty species the genera *Nemertesia*, *Kirchenpaueria*, and *Halicornopsis* are represented by one each; the rest, with one exception, are divided among the genera *Plumularia*, *Aglaophenia* (with *Thecocarpus*) and *Halicornaria*. The exception is a small form closely allied to *Cladocarpus*, for which a new genus is proposed under the name *Cladocarpella*.

Genus Plumularia, *Lamarck*.

The genus *Plumularia*, as I have been used to regard it, would include a number of forms which, by Allman and others, were considered to be types of distinct genera. Such are *Antennella*, *Acanthella*, *Heteroplon*, and *Halopteris*. I have already referred to *Antennella*, which is a convenient division, but subject to the disadvantage that in studying a newly discovered specimen one cannot be certain whether it is a true *Antennella* or merely an unbranched form of some pinnate species.

Acanthella, like *Acanthocladium* among the Statoplea, is distinguished only by having its upper hydrocladia abortive, and terminating in, or replaced by, pointed spines.

Heteroplon is a synonym for those species of *Plumularia* in which the anterior mesial sarcothecæ are rigid instead of freely moveable, a condition which, as I pointed out long ago, is as common as the contrary. It may, of course, be held that this character is sufficient to found a genus upon (though the difference between the fixed and the moveable sarcotheca depends merely on the thickness of the basal part, and every intergradation occurs); no one, however, has adopted the genus since Allman, and it is only mentioned here since it appears in Stechow's recent list of the genera. Even Allman, when proposing the genus, at the same time described as a *Plumularia* (*P. laxa*) the common *P. campanula*, which has similar sarcothecæ to *H. pluma*. If Allman's figure of the latter species in front view[1] be compared with my front view of *P. campanula*,[2] it will be seen that the anterior sarcothecæ are as similar as if copied from the same individual. Allman also describes as *P. armata* a species which, according to Billard, has sarcothecæ of the same type, though differently represented in Allman's figure.

Of course the admission of the rigid sarcotheca as a good generic character would involve, for those who admit the genus *Antennella*, the creation of a new genus for those unbranched forms having moveable anterior sarcothecæ (the type form, *A. secundaria*, having them fixed), and similarly the genus *Monotheca* of Nutting would have to be subdivided, since of about eight forms known to me five have the anterior sarcothecæ moveable, while three have them in the form of stout rigid processes of the internode.

Halopteris is another type with fixed sarcothecæ, but its chief peculiarity was supposed to be the possession by the lateral sarcothecæ of a long tubular stem, adnate to the hydrotheca. In 1887 I suggested that this was probably only a peduncle, or process from the internode, differing only in its greater length from those found in *P. catharina*, *P. campanula*, and many other species. Nutting has confirmed this surmise in regard to Allman's species, and I have specimens of a nearly allied form—*P. balei*, Bartlett—which seems exactly similar to *H. carinata* so far as the lateral sarcothecæ are concerned, and in this the structures in question are also undoubtedly peduncles. *Antennella balei*,

1. Allman—Rep. Sci. Results "Challenger" Exped., Zool., vii., Hydroida, pt. I., 1883, pl. viii., fig. 2.

2. Bale—Proc. Linn. Soc. N.S. Wales, (2), III., 1888, pl. xx., fig. 2.

Billard, is another form with the same characteristic. I fully agree with Billard that these genera (except perhaps *Antennella*) are entirely superfluous.

The presence of an intrathecal ridge in *Plumularia* and its immediate allies is, though not nearly so frequent as in the Statoplea, by no means so exceptional as some observers have suggested, and it occurs on both the adcauline and the abcauline sides of the hydrotheca.[1] An abcauline ridge, of the same type as that of *Lytocarpus philippinus*, is found in *P. diaphragmata* and *P. jedani*, Billard, and the same form occurs in *P. balei*, Bartlett, as well as in *Kirchenpaueria mirabilis* and *K. producta*, which Billard includes in *Plumularia*. In all these cases the ridge is a distinct shelf extending across a large portion of the hydrothecal cavity. In the peculiar group which includes *P. asymmetrica* and *P. alata* we find these two species possessing an abcauline ridge less developed than that of the group last mentioned. In *P. habereri* var. *mediolineata*, Billard, occurs the first slight rudiment of the ridge which in the allied *P. asymmetrica* attains a fuller development. Among the species in which the ridge is adcauline is *P. filicaulis* ; in one form it is rudimentary, in another it extends nearly half through the hydrotheca, and it may be noted that though on the adcauline side, it is not in that portion of the hydrotheca which is in contact with the internode, but in the free portion. *P. lucerna*, Mulder and Trebilcock, is said to have a similar ridge ; I doubt, however, whether this species is distinct from *P. filicaulis*. In *P. goldsteini* the adcauline ridge is rudimentary. In the section *Monotheca* I have found only the adcauline ridge, which springs from a point close to the termination of the hydrocladium. In *P. obliqua* it is rudimentary ; in the form which I have called var. *robusta* it is somewhat more developed. Again, in *P. compressa* it is very narrow, while in the closely allied *P. australis* it extends half through the hydrotheca, and in *P. spinulosa* it is still wider.

As a guide to the affinities of the species I cannot attach any importance to the presence of the intrathecal ridge, since we often find it present in one species while another, evidently very nearly allied, may have no trace of it. Such instances are *P. asymmetrica*, Bale, and *P. hertwigi*, Stechow, among the species with bilobed hydrothecæ ; and *P. balei*, Bartlett,

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1. I use the terms "adcauline" and "abcauline" instead of "posterior" and "anterior," as there are instances, both in the Statoplea and the Eleutheroplea, where the adcauline ridge cannot with propriety be described as posterior.

and *Halopteris carinata*, Allman, in the *Halopteris* group. For similar reasons, but little significance can be attached to the polysiphonic or monosiphonic condition of the hydrocaulus. The presence of "intermediate internodes" in the hydrocladia is not even of specific importance in such species as *P. campanula*, where these internodes may be distinctly defined in parts of the polypidom, while in other portions the nodes dividing them from the hydrothecal internodes may be obsolete. But the presence of intermediate internodes in *P. setacea* and its allies, and their absence in such species as *P. badia*, are more constant characters.

On the whole, I am disposed to think that the best primary sectional division of the genus (setting aside *Antennella* and *Monotheca*) would be into two groups, one containing those forms in which hydrothecæ are borne on the rachis as well as on the pinnæ, the other for all the species in which no hydrothecæ are borne on the rachis. This group, in which the genus reaches its highest development, includes the minor groups represented respectively by the well-known *P. setacea*, *P. badia* and the aberrant *P. asymmetrica*. The other main group, of which *P. catharina* and *P. campanula* are typical, I would distinguish by the sectional name THECOCAULUS. It is the more primitive type, being the next stage of development from the unbranched *Antennella*. I may here refer to a question of terminology, namely the use of the term "hydrocladium." Billard includes in the genus *Antennella* "les espèces de Plumulariidæ réduites aux hydroclades, se détachant de l'hydrorhize, ou même de la base d'un hydroclade primaire," while Jäderholm says that in *Antennella* there are no hydrocladia, but only hydrotheca-bearing stems. Billard's expression might be held to imply that *Antennella* is a degenerated form of *Plumularia*, while Jäderholm evidently regards it as a primitive form which has not developed branches. Of course it might be urged that any part of the polypary which bears hydrothecæ is a hydrocladium, but this would imply that in a pinnate specimen of *P. campanula*, for example, the pinnæ, the branches, and even the polysiphonic stem, were all hydrocladia, obviously a reductio ad absurdum. I think, therefore, that in this species the simple shoots, (*P. indivisa*) should be described as *stems*, while the lateral branches, whether scattered or regularly pinnate, are hydrocladia, which in their turn may bear secondary hydrocladia. According to Billard the true *Antennella* is a species which does not exist in the pinnate form, and I think that in the majority of species at least, it is a primitive, not a degenerated form. Nevertheless I am acquainted with three

Plumularians in which such degeneracy seems probable. These are *Plumularia filicaulis, Halicornaria humilis,* and another dwarf species of *Halicornaria*, belonging to the *ascidioides*-group. In all these instances a colony consists of a number of simple shoots, bearing hydrothecæ, with here and there a pinnate shoot. As in these species the rachis bears no hydrothecæ the simple shoots cannot, of course, be regarded as stems, but as hydrocladia springing directly from the hydrorhiza, and the species must be looked upon as degenerated forms, of which the *Halicornariæ* at least, which are both parasitic species, show abundant evidence in their irregular and depauperated aspect.

Of the few species of *Plumularia* represented in this collection *P. campanula*, *P. buski*, and *P. zygocladia* belong to the section *Thecocaulus*, and they agree also in possessing the character assigned by Allman to *Heteroplon*. *P. sulcata* is also a *Thecocaulus*, but is quite peculiar in its ramification, as well as in other particulars. *P. procumbens* belongs to what I have regarded as the typical *Plumulariæ*, and agrees with the *setacea*-group in having intermediate internodes on the hydrocladia.

P. asymmetrica belongs to a group in which there are no cauline hydrothecæ, but which differs considerably from the *setacea*-type, especially in having the margin of the hydrotheca bilobed. Its allies are *P. hertwigi*, Stechow, *P. habereri*, Stechow, and *P. alata*, Bale.

Plumularia campanula, *Busk.*

Plumularia campanula, Busk, Voy. "Rattlesnake," i., 1852, p. 401. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 124, pl. x., fig. 5; *Id.*, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 776, pl. xx., figs. 1-6 ; *Id.*, Bale, Trans. and Proc. Roy. Soc. Vict., xxiii., 1887, p. 94 ; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), vi., 1893, p. 113 ; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), xxvi., 1913, p. 133. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v. 1890, p. 255. *Id.*, Farquhar, Trans. N.Z. Inst., xxviii., 1896, p. 466. *Id.*, Billard, C.R. Acad. Sci., cxlvii., 1908, p. 759.

Plumularia indivisa, Bale, Journ. Micro. Soc. Vict., ii., 1881, pp. 39, 46, pl. xv., fig 1.

Plumularia laxa, Allman, Rep. Sci. Results "Challenger" Exped., Zool., vii., Hydroida, pt. I., 1883, p. 19, pl. i., figs. 5-6.

Plumularia torresia, Von Lendenfeld, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 477, pl. xiii., figs. 13, 14, pl. xiv., fig. 16.

Plumularia rubra, Von Lendenfeld, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 476, pl. xiii., figs. 11, 12, pl. xiv., fig. 15.

Locs.—Twenty miles east of King Island, Bass Strait.

Oyster Bay, Tasmania, 60 fathoms.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

PLUMULARIA BUSKII, *Bale.*

Plumularia buskii, Bale, Biological Results, "Endeavour," ii., 1, 1914, p. 28 (synonymy). *Id.*, Billard, Les Hydr. de l'Exped. du Siboga, I., Plumularidæ, 1913, p. 21, fig. xi., pl. i., fig. 15. *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 304.

Plumularia nuttingi, Billard, Arch. Zool. exp. et gén., (5), viii., 1911, p. lxvi., fig. 8.

Locs.—Forty miles west of Kingston, South Australia, 30 fathoms.

Sanders Bank, Kangaroo Island, 28 fathoms.

South Australian coast.

Off St. Francis Island, South Australia, 30 fathoms.

Twenty miles east of King Island, Bass Strait.

PLUMULARIA ZYGOCLADIA, *Bale.*

Plumularia zygocladia, Bale, Biological Results " Endeavour," ii., 4, 1914, p. 171, pl. xxxvi., fig. 2.

Loc.—Thirty-eight miles north-east of North Reef Lighthouse, Capricorn Group, off Port Curtis, Queensland, 74 fathoms.

PLUMULARIA SULCATA, *Lamarck.*

Plumularia sulcata, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 172, pl. xxxv., figs. 6-7 (synonymy). *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 306, pl. xi., fig. 1.

Locs.—Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Bass Strait, 40 fathoms.

PLUMULARIA ASYMMETRICA, *Bale.*

Plumularia asymmetrica, Bale, Biological Results " Endeavour," ii., 1, 1914, p. 29, pl. iv., figs. 2-3.

Locs.—Great Australian Bight, 130-190 fathoms, and 80-120 fathoms.

Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms.

PLUMULARIA PROCUMBENS, *Spencer.*

Plumularia procumbens, Bale, Biological Results " Endeavour," ii., 1, 1914, p. 29 (synonymy). *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 305, pl. x., fig. 1.

Besides specimens of the usual form, several were obtained which were more lax in habit, with sparser ramification, and the ultimate branchlets apparently more nearly pinnate in arrangement. The branches are not confined to one plane, but rather straggling, and there is nothing to indicate a procumbent habit.

Spencer mentions that the primary stem, which occupies the centre of the fascicle, is unjointed, having, as he surmises, lost its jointing after being enveloped by the supplementary tubes. In branches consisting of about a dozen tubes I find the jointing of the primary one generally distinct, but in a few instances it is obscure or wanting. The primary tube is exactly the same in structure as the small monosiphonic branchlets, any one of which may form the nucleus of a polysiphonic branch.

My former description of the ultimate branchlets as springing from all sides of the larger branches is not strictly accurate. Though really diverging in several directions they are, in their origin, confined to the two sides, where they are given off in pairs (a pair on each side alternately). As the two branchlets constituting a pair diverge widely from each other, they are in two planes on each side of the branch. This at least is the typical arrangement, but there is much irregularity, thus two pairs may follow on the same side, a single branchlet may be produced instead of a pair, or one may be abortive, while the amount of divergence also varies. The branchlets do not spring directly from the branch, but from the apophyses of the hydrocladia. These are stout and bracket-like, as in *P. badia* and *P. cornuta*, and when they give origin to a pair of branchlets one of the latter springs from each side, so that the hydrocladium is situated between the two branchlets. I have not seen in any other species exactly the same form of ramification.

Locs.—Fifty miles south of St. Francis Island, South Australia, 30 fathoms.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Great Australian Bight, 80-120 fathoms, and 40-100 fathoms.

Genus NEMERTESIA, *Lamouroux.*

With Nutting, I regret that the old-established name *Antennularia* should be abandoned in favor of *Nemertesia*; some observers, however, have always adhered to the latter name, which was published by Lamouroux in 1812, and must, therefore, take priority of *Antennularia*, which dates from 1816.

The only species observed—*N. ciliata*—differs widely in habit from its congeners; the expanded hydrosoma, with its branches in one plane, and its numerous little pinnately-arranged branchlets with their scarcely-visible hydrocladia, giving it more the aspect of a *Plumularia.*

The species described by Billard as *Sibogella erecta*[1] is also provided with a multitude of little branchlets, but they differ from those of *N. ciliata* in being in several planes instead of pinnately arranged, and further in being given off from the primary tube, while those of *N. ciliata* spring from the supplementary tubes.

NEMERTESIA CILIATA, *Bale.*

Nemertesia ciliata, Bale, Biological Results " Endeavour," ii., 4, 1914, p. 170, pl. xxxvi., fig. 1. *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 307, pl. x., fig. 3.

Hydrophyton reaching about a foot in height and four or five inches in width, compressed, profusely branched, polysiphonic, branches originating from the supplementary tubes; branchlets very numerous, mostly monosiphonic, biserial, from opposite to alternate, approximate, divided into distinct internodes of varying lengths, each of which, except the proximal one or two, supports from one to six or eight whorls of hydrocladia. Hydrocladia usually somewhat irregular on the proximal portions of the branches, on the other portions

1. Billard—Les Hydr. de l'Exped. du Siboga, I., Plumularidæ, 1913, p. 61.

arranged in regular whorls of three or four, those in each whorl alternating in position with those above and below; divided into hydrothecate long internodes and intermediate short ones bearing sarcothecæ only.

Hydrothecæ very small, cup-shaped, shallow, adnate up to the margin, which is smooth.

Sarcothecæ large, wineglass-shaped, bithalamic, canaliculate, moveable; one in front of each hydrotheca, two laterals above it, one on each intermediate internode, and two in the axil of each hydrocladium, usually one on the proximal internode of each branch and one or two on the apophysis. A conical open prominence on the apophysis of each hydrocladium.

Gonothecæ borne at the bases of the hydrocladia, campanulate, very thin and delicate.

Colour—Light brown.

The above description amends and supplements that in Part II in some minor points.

From such forms as *N. ramosa* the species is strongly differentiated by its habit, the pinnate arrangement of the branchlets being very characteristic. A main trunk with all its ramifications occupies a single plane, but where the stem divides into two or three such trunks near the base these may be each in a separate plane. The ultimate branchlets, which fringe each side of the larger branches at very short intervals, may reach an inch or more in length without further subdividing; when small they are monosiphonic, and most of them remain so, others become enveloped in the proximal portions by supplementary tubes derived from the parent branch, and so develop into polysiphonic branches giving origin to fresh branchlets.

A new branchlet commences with a stout apophysis given off by one of the supplementary tubes, then follows a short internode, or occasionally two, without hydrocladia. The first few hydrocladia are generally more or less irregular, those which represent the first whorl, or even the first four or five whorls, being placed unevenly instead of at a uniform height, and only gradually is the normal arrangement attained. The most usual condition is for all the whorls of a single branch to consist of either three or four hydrocladia, but while, as already mentioned, they may be in fours up to a certain point of a branch and in threes beyond it, I have seen no instance of whorls of three being succeeded distally by whorls of four.

The hydrothecæ are among the smallest known in the order; those of *Plumularia procumbens* and *P. badia* are the only ones which I have observed of so small a size.

The sarcothecæ have the border very slightly sinuated or cut down on one side, or they may be described as having the aperture somewhat oblique, the sinuation being so wide and shallow as to be scarcely distinguishable. The term "canaliculate," therefore, is scarcely applicable, but is used for want of a better, and to indicate the affinity between such sarcothecæ and those with a deep lateral sinus, to which the term more strictly applies. The lateral sinuation is more or less distinctly traceable in all species of *Plumularia* and *Nemertesia* observed by me.

The gonothecæ are small and excessively thin, so that few of them retain their original form. Those which were best preserved resembled the hydrothecæ of an *Obelia*, being widest at or close to the aperture, which is even, and not oblique. They are quite open, and do not appear to have possessed an operculum. Their length is only from 370 to 440 μ. *N. janini*, Lamouroux, possesses a small gonotheca of very similar form.

Locs.—Oyster Bay, Tasmania, 60 fathoms.

Thirty-five miles south-east of Bruni Island, Tasmania, 150-230 fathoms.

NEMERTESIA CILIATA, *Bale*, *var.* CRUCIATA, *var. nov.*

Similar to the type, except that the hydrocladia are mostly in pairs, each pair alternating in position with those above and below.

Excepting on the proximal portions of the branches the arrangement of the hydrocladia in alternate pairs is very general, though occasionally a branch bears them in sets of three, in which case there is often more or less irregularity among them. The branches seem to begin, more frequently than in the type, with two or three internodes devoid of hydrocladia, and, as in the type, the first few hydrocladia on a branch are irregular in position. A frequent arrangement is for two hydrocladia, nearly opposite, to begin the series, followed by three, all at different heights, the rest being in alternate pairs; many other variations, however, occur. No gonangia were seen.

The arrangement of the hydrocladia which characterizes the present variety is found also in *Antennularia cymodocea*

Busk,[1] *Heteropyxis tetrasticha*, (*Lowenia tetrasticha*, Meneghini)[2], and *N. decussata*, Kirchenpauer.[3] Of these *A. cymodocea* is distinguished from our species (and probably from all others) by the very peculiar structure of the hydrocladia, which, according to Kirkpatrick,[4] "are short, and composed of five or six joints, each bearing a cupped sarcotheca, and on the last joint a hydrotheca, adnate and dovetailed into the joint ; a second hydrotheca is only exceptionally present." Kirkpatrick also mentions that the calycle is .1 mm. in length, which is about double that of *N. ciliata*. Further, *A. cymodocea* is said by Busk to be an unbranched species.

N. tetrasticha cannot be confused with *N. ciliata*, as its hydrocladia consist of hydrothecate internodes solely, and only one mesial sarcotheca occurs between every two hydrothecæ.

N. decussata has more affinity with the hydroid before us, its habit, however, is very different. It has thick polysiphonic stems from half an inch to an inch long, which divide quite irregularly one or more times into smaller polysiphonic branches, and these are continued, sometimes bifurcating, into long monosiphonic branchlets which may attain two or three inches in length without again subdividing. It is stated that each pair of hydrocladia occupies a separate internode of the branch, contrary to the condition in *N. ciliata*. According to Kirchenpauer's figures the hydrothecæ are larger than in most species, while in *N. ciliata* they are almost the minimum size for the family. The gonangia of *N. ciliata* contrast strongly with those of Kirchenpauer's species, which are of the lageniform type found in *Plumularia setacea*.

Locs.—Off South Cape, Tasmania, 75 fathoms.

Twenty-five miles north-east of Babel Island, Bass Strait, 70-100 fathoms.

Genus Kirchenpaueria, *Jickeli*.

In Part I., under *Kirchenpaueria producta*, I have already discussed the validity of this genus. There are three ways of regarding it. First, it may be recognised as a distinct genus, to be known as *Kirchenpaueria*, unless the name *Diplocheilus* should prove to have priority—a question still unsettled.

1. Busk—Report British Association for 1850, (1851), pt. 2, p. 119.
2. Meneghini—Memor. dell' Instit. Venet., 1845, p. 183, pl. xiv., fig. 2.
3. Kirchenpauer—Abh. Nat. Ver. Hamburg, vi., 1876, pp. 52, 54, pls. ii., iii., and vii., fig. 24-24c.
4. Kirkpatrick—Sci. Proc. R. Dublin Soc. (n.s.), vi., 1890, p. 610.

Second, the species may all be included under *Plumularia*, which is the view adopted by Billard. Third, the species may be divided, those with an intrathecal ridge being placed under *Diplocheilus*, the others under *Kirchenpaueria*. This is the arrangement adopted by Stechow, in his general summary of the genera.

For the last division I can see no justification. As I have pointed out in a preceding page, the intrathecal ridge is a feature not at all uncommon in the genus *Plumularia*, and in several instances it precisely resembles that of *K. producta* and *K. mirabilis*. It is obviously of no greater physiological significance in those species than in *Plumularia*, *Lytocarpus*, *Aglaophenia*, *Halicornaria*, or *Sertularia*, from which genera no observer proposes to exclude a species on account of the presence or absence of an intrathecal ridge; and I cannot imagine any reason for applying a different rule to *Kirchenpaueria* alone among the hydroid genera.

For Billard's position there is, I think, more to be said; nevertheless, although the arrangement of the sarcothecæ in *Plumularia* is far less constant than in the Statoplea, the presence of at least one supracalycine pair is so nearly universal as to afford some justification for the separation of the species wanting that character, especially as those species are peculiar also in the possession of naked median sarcostyles. It is true that among the many *Plumulariæ* described by Billard in his "Report on the Siboga Expedition" there is one—*P. ventruosa*—which is without lateral sarcothecæ, while it is not stated whether any median sarcostyle is present; possibly this also should be referred to the present genus.

While the relationship between *Plumularia* and *Kirchenpaueria* is obvious, there is evident also a close affinity between the latter genus and *Halicornopsis*, indeed it is by the great difference in the general facies, dependent nevertheless on minor details, rather than by important structural characters, that the two genera are distinguished.

KIRCHENPAUERIA PRODUCTA, *Bale*.

Kirchenpaueria producta, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 59 (synonymy).

In the list of synonyms I have included a reference to Inaba's figure of "*Plumularia producta*" in the Tokyo Zoological Magazine for 1890; this must be deleted. As Stechow has pointed out in his revision of Inaba's species, the specimens examined by that observer belonged really to *K. mirabilis* (*Diplocheilus mirabilis*, Allman). This is apparent from the figures of the gonothecæ given by Inaba in a later paper, and reproduced by Stechow. My description of the gonothecæ of *K. mirabilis* was not published till 1893, after Inaba's later paper was written, and although I had described those of *K. producta* in 1888, Inaba evidently had not seen my paper of that year when he described the supposed *P. producta*.

Loc.—Bass Strait.

Genus HALICORNOPSIS, *Bale*.

HALICORNOPSIS ELEGANS (*Lamarck*).

Halicornopsis elegans, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 56 (synonymy). *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 296; *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 309.

Locs.—Twenty miles east of King Island, Bass Strait.

Off South Cape, Tasmania, 75 fathoms.

South coast of Australia.

East of Babel Island, Bass Strait, 65-70 fathoms.

Circular Head, Tasmania, 15 fathoms.

Forty miles west of Kingston, South Australia, 30 fathoms.

Ten miles north of Circular Head, Tasmania.

Off St. Francis Island, South Australia, 30 fathoms.

Twelve to fifteen miles S. 40° E. of Eddystone Lighthouse, 60-62 fathoms.

Fifteen miles south of St. Francis Island, 30 fathoms.

Thirty-five miles south-east of Bruni Island, Tasmania, 150-230 fathoms.

Eastern Slope, Bass Strait, 80-300 fathoms.

Great Australian Bight, 100 fathoms.

Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms.

Genus CLADOCARPELLA, *gen. nov.*

Hydrosoma as in *Cladocarpus*, but with some of the internodes of the hydrocladia (other than the proximal ones) giving off secondary ramules, the internodes of which consist of closed ventricose receptacles, with one or two lateral sarcothecæ.

This genus is proposed for the reception of a species nearly related to *Cladocarpus* (?) *bathyzonatus*, Ritchie, and is characterized by the secondary ramules which spring from the hydrocladia. Assuming that these are phylactocarps, they differ from those of *Cladocarpus* in not being limited to the proximal internode, and also in several being borne on the same hydrocladium. They originate on that part of the internode which is between the node and the base of the hydrotheca, and they may occur on two or three internodes in succession ; I have not seen any on the proximal internodes. Only three were observed, but there were scars marking the positions where others had fallen. Each of the three consisted of one very short internode, unarmed, succeeded by two longer ones, clavate in form, consisting of a small closed receptacle, ventricose on one side, beyond which projected one or two lateral sarcothecæ. The aspect of the ends of these ramules was such as to indicate that their growth might have been continued.

It is impossible to be certain as to the exact relationship of these ramules to the gonosome, as no gonangia were present, nor any signs to indicate where they might have been detached. The internodes, with their lateral sarcothecæ projecting from one or both sides, are suggestive of atrophied hydrothecæ, but apart from their small size (about one-third the length of a hydrotheca), and their wholly different form, the little ventricose receptacles consist of the internodes themselves, and are not divided off from them as hydrothecæ would be. In view of the incomplete aspect of the ramules it seems just pos ible that the gonangia may have been borne terminally upon them.

Cladocarpella multiseptata, *sp. nov.*

(Plate xlvii., figs. 1-5.)

Hydrocaulus about two inches in height, stem very slender, slightly fascicled at base, divided by long oblique nodes into internodes of very variable length ; hydrocladia at unequal distances, biserial, alternate, both series borne on the front of the stem and directed forward ; internodes long, nodes oblique.

Hydrothecæ very long, slender, gradually expanding from the middle to the aperture ; hydropore in the base of the cell, next to the abcauline side, subtended by a small curved flap of perisarc ; aperture at right angles, with a blunt anterior tooth, narrowed in the middle, the rest of the border with very minute irregular crenations, and adnate to the lateral sarcothecæ. Hydrothecal internode with about 9-14 septal ridges, transverse or nearly so, except the proximal one, which is very oblique.

Mesial sarcotheca a little below the hydrotheca, short, conical in lateral view, oblong in front view; terminal aperture a transverse slit crossing the end of the sarcotheca and slightly enlarged at the angles, inferior aperture rather large, with sub-tubular border; cauline and lateral sarcothecæ similar to the mesial, the cauline numerous, arranged in a single series along the whole front of the stem.

Gonangial (?) secondary ramules given off from some of the internodes of the hydrocladia, consisting of a short proximal internode and two (or more ?) longer ones, the latter ventricose, with one or two lateral sarcothecæ.

This species is closely allied to *Cladocarpus* (?) *bathyzonatus*, Ritchie, and I have had some doubt as to the propriety of separating it. It is so extremely slender and so readily tangled that it is not easy to isolate complete colonies, and I did not succeed in getting any perfect to the base. One only had on the lower portion a single supplementary tube, the rest, so far as they extended, were monosiphonic. The greatest disparity exists between the distances of the nodes, which are conspicuous and very oblique; measuring by the number of sarcothecæ, which are at nearly uniform distances along the stem, we find internodes bearing any number from one up to twelve or thirteen, and there are similar variations in the number of sarcothecæ which intervene between two hydrocladia. Some of the shorter internodes support sarcothecæ only. These irregularities are most marked in the lower portions of the stems; on the distal portions a comparatively regular sequence may prevail, the internodes there supporting usually a hydrocladium and nine to twelve sarcothecæ.

The two series of hydrocladia are both directed so strongly towards the front that, placed on a slide, they fall to one side, and their arrangement appears uniserial unless closely examined, when it is seen that they spring alternately from right and left of the median row of sarcothecæ.

The hydrothecal internodes are about .80 mm. long (the hydrothecæ themselves being about .60 mm.), and the hydrothecæ are like those of *C.* (?) *bathyzonatus* except that their proportionate length is greater, their abcauline wall not so narrowed in at the central part, and the anterior tooth different in form. The little perisarcal flap opposite the hydropore is as described by Ritchie. The sarcothecæ also agree with those of Ritchie's species, except that I did not observe so much diversity in the terminal orifices. In the lateral view a sarcotheca appears pointed, in the front view it has a broad blunt termination; at each angle of this, and visible in the lateral view, is a very small elliptic orifice, and these orifices are united by a transverse slit crossing the end of the sarcothecæ. All the sarcothecæ are of similar form, and in the laterals especially the terminal apertures are commonly so minute as to be indistinguishable under a low power. The lateral orifices are circular and distinct. These two species are among the few Statopleans in which the anterior sarcothecæ are not quite in contact with the hydrotheca. Many of the most recently formed hydrothecæ, though otherwise complete, are without a trace of the septal ridges in the internodes, which develop gradually, becoming, in the older portions, completely annular.

C. (?) *bathyzonatus*, as described by Ritchie, seems a much more compact form. The distance between two hydrocladia (on the same side) is said to be about one mm., in *C. multiseptata* it is about 7 mm. In *C.* (?) *bathyzonatus* there are one, or more usually two, sarcothecæ between two hydrocladia; in the present species there are about 9-12. These figures refer in both cases to the distal parts of the colonies; the lower part of the cladate tube of Ritchie's species is said to be destitute of hydrocladia, the corresponding portion of *C. multiseptata* is also bare, but only because it has been deduded. *C* (?) *bathyzonatus* seems to be more distinctly polysiphonic in habit, and its hydrocladia apparently have not the markedly secund disposition found in the species before us.

Loc.—Thirty-eight miles north-east of North Reef, Capricorn Group, off Port Curtis, Queensland, 74 fathoms.

Genus AGLAOPHENIA, *Lamouroux.*

Of the species referred in this Report to the genus *Aglaophenia*, *A. divaricata* and *A. decumbens* are evidently nearly related, so far as can be ascertained in the absence of the gonosome of the latter, which will probably prove to be, like that of *A. divaricata*, furnished with separate narrow ribs, armed with two series of sarcothecæ, and unprovided with hydrothecæ; *A. billardi*, *A. tasmanica*, and *A. dannevigi* belong to what may be termed the *crucialis* group, possessing large closed corbulæ, without hydrothecæ; *A. cupressina* has affinities with the same group, but stands alone in some respects; *A. megalocarpa*, *A. armata*, *A. calycifera*, and *A. tenuissima* have the corbulæ closed, but with hydrothecæ on the leaflets, and therefore belong to the genus *Thecocarpus* of some authors (but not of Nutting); and *A. carinifera* probably belongs to the same group.

The only species of which the generic position may be a matter of doubt are those of the last group. In Nutting's classification the corbula-bearing species are divided into two genera—*Aglaophenia*, comprising those forms in which the corbula is closed, composed of broad leaflets, and unprovided with hydrothecæ; and *Thecocarpus*, in which the corbula is open, composed of narrow rod- or sabre-shaped ribs, with a hydrotheca at the base of each rib. The species at present under consideration form an intermediate group, having the closed broad-leaved corbula characteristic of the restricted genus *Aglaophenia*, but bearing hydrothecæ as in *Thecocarpus*. In 1907, however, Billard described a species, *T. giardi*,[1] with similar corbulæ, and referred it to *Thecocarpus*, remarking that previously only species were known in which the ribs were free and the corbula open.[2]

According to Billard, then, the presence or absence of the hydrothecæ at the bases of the ribs is the sole criterion for dividing the species, and even this is not constant, as the same observer has described species in which the hydrothecæ are present in the female corbulæ only; while in the form which I have described under the name of *A. carinata*, and which Billard finds identical with *Plumularia brachiata*, Lamarck, the receptacles at the bases of the leaflets, which Billard considers hydrothecæ, but which seem to me to be sarcothecæ, are often replaced by two or several undoubted sarcothecæ, the structure, so far as those particular leaflets are concerned, being then the same as in the *crucialis* group.

Stechow admits the genus *Thecocarpus* in the same sense as Nutting, dividing the corbula-bearing species into three groups—(1) species with open corbulæ and a hydrotheca at the base of each rib=*Thecocarpus*, Nutting; (2) species with open corbulæ and no hydrothecæ=*A. whiteleggei*, and other species constituting the *divaricata* group; (3) species with closed corbulæ and no hydrothecæ=*Aglaophenia*. This grouping, however, is obviously incomplete, no provision being made for the fourth subdivision, namely, for the species with closed corbulæ but with hydrothecæ, such as those before us.

Evidently if the genus *Thecocarpus* is to be accepted at all it must be in the sense in which Billard adopted it, and Nutting's diagnosis should be modified accordingly.

1. Billard—Arch. de Zool. exp. et gén., (4), vi., Notes et Revue, p. lxxix.

2. This was an oversight, as I had in 1881 described *A. heterocarpa* (now known to be identical with *Plumularia brevirostris*, Busk), in which the corbula is similar to that of *A. pluma*, but with a well-developed hydrotheca on each leaflet.

Nutting has noticed that among the corbula-bearing species, when the proximal part of the gonocladium bears one hydrotheca only, that one is generally normal, but that where there are several hydrothecæ in that position they are usually more or less modified; also that in *Aglaophenia* the former type prevails, in *Thecocarpus* the latter. I find that the same rule applies generally (though not universally) to the Australian species. In *A. megalocarpa*, *A. armata*, and *A. tenuissima* there are below the corbula several hydrothecæ, which are modified to a greater or less extent; in *A. calycifera* the hydrothecæ themselves are little if at all altered, but the internodes supporting them differ from the normal hydrothecal internodes in being longer, and in the absence of septal ridges. In *A. brevirostris*, on the other hand, there is only a single hydrotheca, not distinctly modified, so that the condition is the same as in *Aglaophenia* proper; it is noteworthy, however, that in this species there are generally one or two modified hydrothecæ on the distal part of the gonocladium, which projects beyond the corbula.

In the *crucialis* group there are no hydrothecæ at all on the gonocladium, the proximal internodes supporting only a row of large sarcothecæ, like the proximal part of a branch, and the same condition is found in *A. phyllocarpa* and *A. brachiata*. None of the numerous American species comprised in Nutting's monograph exhibit this character, which appears to be confined to typical *Aglaopheniæ*, unless *A. brachiata* is an exception.

Species which are known to belong to the *divaricata* group are *A. divaricata* (Busk), *A. acanthocarpa*, Allman, *A. laxa*, Allman, *A. plumosa*, Bale, and *A. whiteleggei*, Bale. The same type prevails throughout all these species. The corbula-ribs are narrow, armed on each side with sarcothecæ, which are longer than those usually found in the other groups, the lowest two sarcothecæ on the distal side are without corresponding ones on the other side, and of these two sarcothecæ the first one is usually bifid or double, a feature which Allman accounts for by supposing it to represent the lateral pair of the suppressed hydrotheca. Of the species mentioned I have only observed the gonosome in *A. divaricata* (including *A. mccoyi*), *A. laxa*, and *A. plumosa*, but Allman's figure of *A. acanthocarpa* and Stechow's of *A. whiteleggei* show the same structure, and though Hilgendorf's figure of *A. laxa* does not exhibit similar regularity, I find it in the specimen which I have examined. The hiatus caused by the absence of the two lowest sarcothecæ on the proximal side corresponds to the gap which in the *crucialis* group and other species is caused by the abrupt narrowing-in of the leaflets at the base, so that openings are left along the sides of the corbula. In the *crucialis* group and in *Thecocarpus* these openings are guarded by the lateral spurs, which project across them, and which support in the former a series of sarcothecæ, in the latter a hydrotheca.

It is observed by Nutting that the closed corbula is often erroneously described as having the distal edges only of the leaflets bordered by sarcothecæ, and he finds that in all cases where he has dissected the corbulæ the proximal edges also, though overlapped by the distal edges of the contiguous leaves, support a series of sarcothecæ, which project into the corbula. My experience (mainly of Australian species) is the contrary of this. I have not found the condition above described in any species, except very partially in *A. calycifera*. The general rule is that when the leaves are united the distal edge of one leaf overlaps the proximal edge of the next, and is fringed with sarcothecæ; frequently the overlapping portion is expanded into a free wing (often very large), which then bears the marginal sarcothecæ, and if the free extension rises above the corbula, so as to have both edges free, then both edges bear sarcothecæ. Similarly, if the leaflets become separate throughout, as in certain (presumably male) corbulæ of *A. parvula*, or separated at intervals only, wherever the edges are free sarcothecæ may be developed. On the other hand there are species—e.g., *A. megalocarpa*—which have the margins of the component leaves united smoothly, without any sarcothecæ whatever, while a row of sarcothecæ may run up the middle of the leaf instead, and a secondary leaf or crest may also spring from the same part. In some forms many sarcothecæ may be scattered irregularly over the surface.

The presence of a supernumerary leaf has often been noted, but in some species more than one such leaf may be present, and they may occur at the distal as well as the proximal extremity of the corbula. In the closed corbulæ of *A. parvula* the first leaflet on one side gives origin to a secondary free leaflet which runs along the side of the corbula parallel with the rachis. The corbulæ in general appear more prone to abnormal developments than the trophosomes, and irregularities of growth are, in some species, very common; for example, I have seen in more than one species a secondary corbula given off laterally from the middle of the primary one.

Aglaophenia divaricata (*Busk*).

Plumularia divaricata, Busk, Voy. "Rattlesnake," i., 1852, p. 398.

Aglaophenia divaricata, Kirchenpauer, Abh. Nat. Ver. Hamb., v., 1872, p. 26. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 162, pl. xv., fig. 8, pl. xvii., fig. 7 ; *Id.*, Bale, Trans. and Proc. Roy. Soc. Vict., xxiii., 1887, pp. 97, 110 ; *Id.*, Bale, Biological Results " Endeavour," ii., 1, 1914, p. 49. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 267. *Id.*, Billard, C. R. Acad. Sci., cxlviii., 1909, p. 368 ; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 54. *Id.*, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 866. *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 315.

Plumularia ramosa, Busk, Voy. " Rattlesnake," i., 1852, p. 398.

Aglaophenia ramosa, Kirchenpauer, Abh. Nat. Ver. Hamb., v., 1872, p. 38, pls. i., ii., fig. 17. *Id.*, Hincks, Pop. Sci. Review, xiii., 1874, p. 235. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 164, pl. xviii., figs. 15, 16.

Lytocarpus ramosus, Allman, Journ. Linn. Soc., Zool., xix., 1885, p. 154, pl. xxv., figs. 1-3.

? *Aglaophenia brevicaulis*, Kirchenpauer, Abh. Nat. Ver. Hamb., v., 1872, p. 41, pl. i., fig. 20, pl. v., fig. 19.

Not *Aglaophenia ramosa*, Allman, Mem. Mus. Comp. Zool. Harv., v., 1877, p. 39, pl. xxiii., figs. 1-4.

Hydrophyton slender, polysiphonic, attaining four or five inches in height, much branched, branches widely divergent on all sides, more rarely in one plane, springing from the supplementary tubes. Hydrocladia alternate, one on each internode, both series directed towards the front, and rising at an angle of about 40-45 degrees ; nodes slightly oblique.

Hydrothecæ cup-shaped, set at an angle of 40-45 degrees ; a narrow intrathecal ridge about the middle of the adcauline side, with a slight fold from it partly surrounding the hydrotheca ; hydropore very large ; border with four teeth on each side, and a long incurved one in front, back adnate. Hydrothecal internode with a strong curved septal ridge in the middle.

Mesial sarcotheca variable in length, projecting at a wide angle, adnate to the hydrotheca as far as the margin and mainly rising from it, free part tapering in lateral view, tapering or not in front view, with distinct terminal and inferior apertures, and an orifice opening into the hydrotheca. Lateral sarcothecæ more or less conical, adnate up to the hydrotheca-margin, with a short free part directed forward ;

those at the ends of the pinnæ generally much enlarged, lateral and terminal apertures distinct. Cauline sarcothecæ larger than the laterals, two on the rachis at the base of each hydrocladium.

Gonangial pinna replacing a hydrocladium, the first internode bearing a hydrotheca. Corbula open, with about 15-20 strongly arched pinnules on each side, each springing from a separate internode of the rachis and furnished with two lateral series of long slightly curved opposite tubular sarcothecæ; the two proximal ones on the distal side of each pinnule without corresponding ones on the other side, and the first one often bifid; nodes between the pairs of sarcothecæ usually indistinct or wanting; two sarcothecæ on the rachis at the base of each pinnule.

Colour.—Dark brown to black.

My suggestion of 1887 that *A. divaricata* and *A. ramosa* would probably prove identical is confirmed by Billard's examination of the type of *A. ramosa*, which he finds to agree exactly with the description of *A. divaricata*. Busk in separating them seems to have been mainly influenced by differences in the habit of his specimens, but much variation exists in this, as in other characters. Generally the ramification is quite irregular, but specimens occur with all the branches distinctly in one plane.

Small specimens, up to about half an inch, may be monosiphonic; the first supplementary tube is stouter than the primary one, which it partially envelops, and from it spring the branches, their first nine or ten internodes supporting no hydrocladia, but each bearing in front a large sarcotheca. The very dark colour which characterises the typical form is due to the remains of the soft parts, and is readily removed by liquor potassæ.

A very characteristic feature is the large size of the aperture between the hydrotheca and the internode, which extends from the base of the hydrotheca to the intrathecal ridge, and from side to side of the hydrotheca. Owing to the size of this aperture the intrathecal ridge, which borders it, is situated further from the base than usual, and when, as is commonly the case, the lateral sarcothecæ are long, their bases become coterminous with the ridge, hence, as Ritchie points out, the septal ridge which subtends the bases of the lateral sarcothecæ, and that which is opposite to the intrathecal ridge, are one and the same. The prolongation of the lateral sarcothecæ back to the intrathecal ridge is, however, not invariable; in many cases there is a distinct interval between them. The intrathecal ridge is generally very narrow.

The mesial sarcotheca may be nearly straight, or slightly arched, and stands off at a wide angle from the hydrotheca, which it somewhat exceeds in length. The increase in size of the lateral sarcothecæ on the last internode or two of a hydrocladium is more marked than I have seen it in any other species, and it is not rare to find those on a terminal internode almost equalling in diameter the hydrotheca itself, while the next hydrocladium may be normal throughout.

The corbulæ are similar to those of *A. acanthocarpa*, Allman, but the bifid condition of the first unpaired sarcotheca on each pinnule is by no means invariable. These corbulæ resemble those of *A. plumosa*, Bale (a species not otherwise closely related to the present), but the pinnules in *A. plumosa* are less arched, the corbula being somewhat compressed.

Locs.—Oyster Bay, Tasmania, 60 fathoms.

Twenty miles east of King Island, Bass Strait.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Sanders Bank, Kangaroo Island, South Australia, 28 fathoms.

Forty miles west of Kingston, South Australia, 30 fathoms.

Hunter Group, Bass Strait.

AGLAOPHENIA DIVARICATA (Busk), *var.* MCCOYI, *Bale.*

Aglaophenia McCoyi, Bale, Journ. Micro. Soc. Vict., ii., 1881, pp. 36, 46, pl. xiv., fig. 2.

Aglaophenia divaricata, Bale, (in part), Cat. Austr. Hydr. Zooph., 1884, p. 162, pl. xv., fig. 7, pl. xviii., fig. 6.

Hydrophyton smaller than in the type; hydrothecæ with a wide intrathecal ridge, the anterior tooth furnished with a delicate erect crest; mesial sarcotheca with the distal portion erect and widened at the summit in a crescentic form.

Corbulæ as in the type.

In the "Catalogue" I united *A. mccoyi* with *A. divaricata*, as I found that certain specimens of the latter appeared to be transition forms. The specimens in question, however, though approximating to *A. mccoyi* in the broad mesial sarcothecæ, undoubtedly belonged to *A. divaricata*, and I have not so far met with other intermediate forms. There seems, therefore, sufficient ground to treat *A. mccoyi* as at least a distinct variety.

In other respects than those enumerated above the variety agrees with *A. divaricata*. It is a dwarf form, the largest specimen which I have met with measuring one and a half inches, but it is usually only about half that height. These small forms have generally not more than one accessory tube in the stem. The most characteristic feature is the form of the mesial sarcotheca, which follows the curve of the hydrotheca nearly to the margin and then curves upwards. The intrathecal ridge is a distinct partition extending half through the hydrotheca in an oblique direction, parallel with the border.

I can find no difference whatever in the corbulæ.

This variety does not occur among the "Endeavour" specimens.

Aglaophenia divaricata (*Busk*), *var.* acanthocarpa, *Allman ?*

? *Aglaophenia acanthocarpa*, Allman, Journ. Linn. Soc., Zool., xii., 1876, p. 274, pl. xxi., figs. 1-4.

Aglaophenia divaricata, var., Bale, Cat. Austr. Hydr. Zooph., 1884, p. 164.

Distinguished from the type by the presence of an oblique septal ridge in the internode, starting from the base of the lateral sarcothecæ, and by the smaller and more sharply triangular teeth of the hydrotheca-border.

The life-size figure given by Allman of *A. acanthocarpa* does not agree well with any specimen of this group which I have observed, still it recalls Busk's description of *A. ramosa*, which he says has the branches "rising in great numbers almost immediately from the mass of radical fibres." In other respects my specimen (from Port Jackson, New South Wales), agrees very fairly with Allman's account. As already mentioned, many specimens of *A. divaricata* occur in which the bases of the lateral sarcothecæ do not, as in typical forms, coincide with the base of the intrathecal ridge; the same condition prevails in the present form, but there is a strong septal ridge, in addition to the median one which alone exists in the type. The intrathecal ridge is an extremely narrow shelf, and gives origin to a fold in the hydrotheca-wall, very much as in the type.

In these specimens the lateral sarcothecæ towards the ends of the hydrocladia are not nearly so much enlarged as is usually the case with the typical *A. divaricata.*

Billard formerly suggested the identity of *A. acanthocarpa* with *A. divaricata*, and the present variety seems to bridge the difference which appeared to exist between them. I do not, however, concur in the reference of *A. laxa*, Allman, to the same species, nor do I think that *Thecocarpus laxus* of Billard's "Siboga" Report is the same as *A. laxa*. Hilgendorf[1] has described the corbula of a species which he considers to be *A. laxa*, and specimens of this species, which Mr. Briggs has kindly sent to me, come decidedly nearer to Allman's account than does *Thecocarpus laxus*. The corbula is of the same type exactly as that of *A. divaricata* and *A. acanthocarpa*, and bears no hydrothecæ. Where the specimens differ from Allman's account is in the septal ridges of the hydrothecal internodes, the one which Allman says is opposite the base of the hydrotheca being absent, while the front one is oblique; in short the condition is just as figured for *A. acanthocarpa*. In both *A. laxa* and *A. acanthocarpa*, as in *A. divaricata*, the intrathecal ridge, with its corresponding septal ridge, is set at or near the middle of the internode, instead of near the base of the hydrotheca, as in *T. laxus* and most other species. In *T. laxus* the third tooth on each side of the hydrotheca is widely everted, which is contrary to the condition in *A. laxa*. The latter has smaller and narrower hydrothecæ than *A. acanthocarpa*, and the front is somewhat incurved between the anterior tooth and the mesial sarcotheca, which does not extend to the aperture. In *var. acanthocarpa*, as in other forms of *A. divaricata*, the hydropore extends quite from side to side of the hydrotheca, so that in a lateral view the proximal half of its cavity appears completely continuous with that of the internode; this is not so noticeable in *A. laxa*, though here also the hydropore is very large, which accounts for the forward position of the intrathecal ridge. The latter is a mere fold in the hydrotheca-wall, the shelf-like portion on the adcauline side being even more rudimentary than in any of the varieties of *A. divaricata*. The anterior tooth of the hydrotheca has frequently an erect crest.

I have met with *var. acanthocarpa* (?) only in material from Port Jackson, New South Wales.

AGLAOPHENIA DIVARICATA (*Busk*),

var. CYSTIFERA, *var. nov.*

Distinguished from the type by the great enlargement of the upper of the two cauline sarcothecæ which are borne by the hydrocladiate internodes of the rachis.

1. Hilgendorf—Trans. N.Z. Instit., xliii., 1911, p. 541, figs. 1-3.

This form, in its minute structure, does not differ greatly from the type, except in the peculiarity above mentioned. The upper sarcotheca is much enlarged, and forms an egg-shaped receptacle projecting laterally outwards; the series of median sarcothecæ which are borne on the proximal part of a branch (before the hydrocladia begin) are also very large.

I have seen a specimen with the top of the stem produced into a tendril-like stolon.

Loc.—South Australia.

Aglaophenia decumbens, *Bale.*

Aglaophenia decumbens, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 48, pl. iv., fig. 4, pl. vi., fig. 6. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 300; *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 315.

The height of specimens observed after the description was written is about a foot. The stem is very slender (only about half a millimetre), and nearly equal throughout most of its length. Only the lowest three inches were bare, the rest of the stem bearing numerous irregular branches about one half to one inch apart. Secondary and occasionally tertiary branches were observed.

The gonosome was not present, either in the "Endeavour" specimens or in those since recorded by Briggs from near Cape Pillar, Tasmania. There is a decided affinity between the species and *A. divaricata*; it may therefore be anticipated that the corbulæ will prove to be of the open type found in that species.

In Briggs' specimens, from two Tasmanian localities, the anterior teeth of the hydrothecæ are without the outward bend which I have figured; this feature therefore is probably exceptional.

Loc.—Oyster Bay, Tasmania, 60 fathoms (not Bass Strait, as stated in the original description).

Aglaophenia macrocarpa, *Bale.*

Aglaophenia macrocarpa, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 791, pl. xxi., figs. 3, 4; *Id.*, Bale, Biological Results "Endeavour," ii., 1, 1914, pp. 32, 36, 38-41, pl. iii., fig. 1, pl. vi., fig. 1, pl. i., figs. 1-2.

Aglaophenia crucialis, Ritchie, Mem. Austr. Mus., iv., 16, 1911, p. 864, pl. lxxxvi., fig. 1.

? *Aglaophenia crucialis*, Lamouroux, Hist. Polyp. Cor. Flex., 1816, p. 169.

A. macrocarpa, which is not represented in the "Endeavour" collections, has been mentioned in Part I. for the purpose of discussing its relationship with the other members of the *crucialis*-group—*A. dannevigi*, *A. billardi*, *A. tasmanica*, and *A. crucialis.* I have since received some further material including, from Mr. Briggs, fragments of specimens considered to be *A. crucialis*, and others of *A. macrocarpa*, with drawings of the latter and notes on the Museum specimens; and from Dr. Ritchie, mounted specimens of the "Thetis" form figured by him as *A. crucialis.*

A specimen from Maroubra Bay, forwarded by Mr. Briggs, is a typical *A. macrocarpa*, agreeing with my former examples in all essentials; the gonosome is not present. I have figured in Part I. portion of a specimen in the Australian Museum, and Mr. Briggs has favoured me with drawings of another and much more perfect specimen, which is of precisely similar habit, the stem and branches being thick, and the latter curving upwards and even inwards towards the ends, while standing well out in front from the stem, towards which they face. Other specimens differ a good deal in habit, the hydrocaulus being more slender and the branches straighter; such a form is that figured by Ritchie, which, however, as Mr. Briggs informs me, has the branches facing back towards the stem or parent branch from which they spring, just as in the typical *A. macrocarpa.* The hydrothecæ differ from that form only in being slightly larger and in possessing the intrathecal tooth, which is sometimes strongly developed; its absolute inconstancy, however, in *A. billardi* and *A. tasmanica* shows it to be a negligeable character in distinguishing the species. The lateral lobes of the border are well developed, and in some cases they tend towards an angular form instead of being smoothly rounded as usual.

The affinity between *A. macrocarpa* and *A. tasmanica* is very close, and this is especially evident now that the male corbulæ of the two are known to be of similar type, (unlike those of *A. billardi*). Which of these forms (if either) is to be referred to *A. crucialis* is doubtful, since we are not informed which of them it resembles in habit, nor what is the character of its corbulæ.

Aglaophenia billardi, *Bale.*

Aglaophenia billardi, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 33, pl. iii., fig. 3, pl. vi., fig. 3.

Trifling differences in the habit of this species and *A. tasmanica*, referred to in the original descriptions, do not prove sufficiently constant to be of much value in determining the species. The most reliable distinction, so far as the trophosome is concerned, is in the longer and narrower hydrothecæ of *A. billardi*. It is now known that the male corbulæ differ in the two species (see *A. tasmanica*).

Locs.—Great Australian Bight, 40-100 fathoms, 130-190 fathoms, and 80-120 fathoms.

Great Australian Bight, Long. 130° 40′ E., 160 fathoms.

AGLAOPHENIA TASMANICA, *Bale*.

Aglaophenia tasmanica, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 37, pl. iii., fig. 2, pl. vi., fig. 2. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 300, pl. xxvi; *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 316.

In some of the specimens a good deal of variation exists in regard to the length of the mesial sarcothecæ, which are sometimes not longer, proportionately to the hydrothecæ, than those of *A. billardi*. In specimens collected near Cape Pillar, Tasmania, Mr. Briggs has found the male corbulæ, of which he has obligingly forwarded me examples. Considering that *A. tasmanica* and *A. billardi* are such extremely close allies, and that their female corbulæ do not differ in any important particular, it would naturally be expected that a corresponding likeness would be found between the male corbulæ; such, however, is not the case. Those of *A. billardi* are cylindrical, closed throughout, and of equal diameter from end to end, while in *A. tasmanica* they are, as Mr. Briggs has pointed out, narrowed towards the end in consequence of the leaflets becoming gradually shortened, and also separate, just as in *A. dannevigi* and *A. macrocarpa*.

In the female corbulæ the lateral spurs, which spring outward and forward from the distal edges of the corbula-leaves attain a large size, and in some cases I have noticed that their distal portions, which are incurved towards the rachis, coming into contact with the proximal parts of the next spurs, attach themselves to them, so as to form a series of joined arches along each side of the gonocladium.

The male corbulæ have the last four or five leaflets on each side separate, broadly truncated, and progressively shorter and shorter, till the final pair are reduced close down to the lateral spurs, which are not shortened, but extend forward beyond the termination of the corbula-rachis.

Locs.—Oyster Bay, Tasmania, 20 fathoms.

North-east of Babel Island, Bass Strait, 100-170 fathoms.

East of Babel Island, Bass Strait, about 70 fathoms.

Twenty-one miles N. 65° E. of Babel Island, Bass Strait, 73 fathoms.

Off Babel Island, Bass Strait, 60 fathoms.

Twenty-five miles north-east of Babel Island, 70-100 fathoms.

Off Green Cape, 470 fathoms.

Eastern Slope, Bass Strait, 80-300 fathoms.

Aglaophenia dannevigi, *Bale.*

Aglaophenia dannevigi, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 41, pl. iii., fig. 4, pl. vi., fig. 4.

Locs.—Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Great Australian Bight, 130-300 fathoms.

Aglaophenia carinifera, *Bale.*

Aglaophenia carinifera, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 181, pl. xxxviii., figs. 1-2.

In the absence of the gonosome the reference of this species to the genus *Aglaophenia*, as restricted, is of course provisional. I have mentioned its resemblance to *A. brachiata* (Lamarck), which I regard as a typical *Aglaophenia*, while Billard considers it a *Thecocarpus*; the similarity, however, depends mainly on the presence of an anterior keel on the hydrotheca, a character found in several groups. In the form of the hydrotheca-margin it resembles the *crucialis*-group, and if the figure of the front view is compared with those of the members of that section it will be seen that little difference exists. The structure of the stem-fascicle also agrees with that of those species, not with that of *A. brachiata*.

Locs.—Great Australian Bight, 130-190 fathoms; 80-120 fathoms; and 100 fathoms.

Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms.

Aglaophenia cupressina, *Lamouroux*.

(Plate xlvii., figs. 6-8.)

Aglaophenia cupressina, Lamouroux, Hist. Polyp. Cor. Flex., 1816, p. 169 ; *Id.*, Lamouroux, Encyc. Méth., ii., 1824, p. 16 ; *Id.*, Lamouroux in Quoy and Gaimard, 1824, p. 612, pl. 91, figs. 1-3. *Id.*, Kirchenpauer, Abh. Nat. Ver. Hamb., v., 1872, p. 27, pl. i., fig. 12. *Id.*, Billard, Ann. Sci. Nat., Zool., (9), v., 1907, p. 331, fig. 5 ; *Id.*, Billard, C. R. Acad. Sci., clxvii., 1908, p. 940 ; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), ix., 1909, p. 330 ; *Id.*, Billard, Ann. Sci. Nat., Zool., (9), xi., 1910, p. 56 ; *Id.*, Billard, Les Hydr. de l'Exped. du Siboga, I., Plumularidæ, 1913, p. 107, fig. xcvi., pl. vi. *Id.*, Stechow, Zool. Jahrb., xxxii., 1912, p. 372.

Plumularia bipinnata, Lamarck, Anim. sans Vert., 1816, p. 126.

Plumularia MacGillivrayi, Busk, Voy. "Rattlesnake," i., 1852, p. 400.

Aglaophenia MacGillivrayi, Kirchenpauer, Abh. Nat. Ver. Hamb., v., 1872, pp. 27, 35. *Id.*, Allman, Rep. Sci. Results "Challenger" Exped., Zool., vii., Hydroida, part I., 1883, p. 34, pls. x, xx, figs. 4-6. *Id.*, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 170, pl. xviii., figs. 12-14. *Id.*, Marktanner-Turneretscher, Ann. K. K. Hofmus. Wien, v., 1890, p. 268. *Id.*, Kirkpatrick, Sci. Proc. R. Dublin Soc., n.s., vi., 1890, p. 604 ; *Id.*, Kirkpatrick, Ann. Mag. Nat. Hist., (6), v., 1890, p. 12. *Id.*, Campenhausen, Abh. Senckenberg. naturf. Ges. Frankfurt-a-M., xxiii., 1897, p. 315. *Id.*, Weltner, Hydr. von Amb. u. Thursday Id., in Semon Zool. Forsch. in Austr. u. dem Malays. Arch., 1900, p. 587.

Aglaophenia spicata, Kirchenpauer, Abh. Nat. Ver. Hamb., v., 1872, p. 27, pl. i., fig. 11, pl. iv., fig. 11.

? *Aglaophenia bellis*, Thornely in Willey's Zool. Results, pt. iv., 1900, p. 456.

Anisocalyx (*Aglaophenia*) *cupressina*, Costa, Fauna del Regno di Napoli, Zoofiti, 1838, p. 19.

(Not *Aglaophenia spicata*, Lamouroux, Hist. Polyp. Cor. Flex., 1816, p. 166).

Hydrophyton polysiphonic, about fifteen inches in height, stem and main branches thick, fringed with very numerous small pinnately-disposed opposite branchlets, in one plane, and facing one way, forming angles with the stem and large branches of about 50°; each branch springing from an internode of the primary jointed stem, and replacing a hydrocladium. Hydrocladia short, alternate, one on each internode, both series directed towards the front and rising at an angle of about 50°; nodes transverse or very slightly oblique, often indistinct.

Hydrothecæ at an angle of about 30°, deep, very narrow between the median and lateral sarcothecæ; a slight fold or ridge directed obliquely forward near the base, and an extremely fine curved line starting from the top of the lateral sarcotheca and running to the base of the hydrotheca; border generally with the rudiment of an anterior tooth, sides with minute irregular crenations or sinuations, usually with one slightly larger tooth on each side near the front, back entire, adnate. Hydrothecal internode with very strong divergent septal ridges opposite the intrathecal fold and the base of the lateral sarcothecæ, often united by a longitudinal ridge at the back of the internode.

Mesial sarcotheca about as long as the hydrotheca, very thick, adnate up to the margin, divided into two loculi by an oblique nearly complete septum; aperture terminal, with a blunt rounded lobe on each side. Lateral sarcothecæ wide, reaching the border of the hydrotheca or slightly beyond it, terminal and lateral apertures united. Cauline sarcothecæ rather small, two at the base of each hydrocladium.

Gonangial pinna replacing a hydrocladium, the first internode bearing a hydrotheca. Corbula consisting of about seven or eight pairs of leaflets, springing from separate internodes of the rachis as narrow pinnules, but expanding above into wider leaflets, which unite to form a closed corbula; distal edge of each leaflet with a prominent series of closely-ranked sarcothecæ, the rows curved strongly forward; a short broad lateral process projecting from the distal edge of each leaflet just above its origin, bearing about three sarcothecæ, and overlapping the small openings between the bases of the leaflets, the latter marked with linear perisarcal thickenings.

This remarkable species, so distinct and characteristic alike in its habit and in its minute structure, is in certain points related to the *crucialis*-group. As in that group its branches and corbulæ take the place of hydrocladia, and there is the same tendency to the paired condition, less however in the corbulæ than in the branches. The branchlets usually take the place of two successive hydrocladia, so that they are as nearly as possible opposite. The sides of the hydrotheca-border are also very similar to those of *A. billardi* and *A.*

tasmanica, though less regular. The very short closely-ranked hydrocladia are very distinctive, no less than the peculiar form of the hydrothecæ and the median sarcothecæ, some of the descriptions of which have been by no means correct. This, as Allman pointed out, is the case with Kirchenpauer's statement that the mesial sarcotheca exceeded in width the hydrotheca itself. Allman's account of the hydrotheca-margin as being quite smooth is also erroneous, according to Billard, who has examined the original "Challenger" specimens. The oblique line which crosses the hydrotheca near the base, is the ordinary intrathecal fold found in a similar position in most species of *Aglaophenia*, but the longitudinal line is not, I think, found elsewhere. It runs from the top of the lateral sarcotheca to the base of the hydrotheca, and in a strict profile view it keeps parallel with the abcauline side of the hydrotheca, crossing the intrathecal fold. It is an extremely fine line, so delicate that it may easily be overlooked, except at its origin above the lateral sarcotheca, where it is slightly thicker; and in many of the hydrothecæ I failed to distinguish it.

There are commonly only two septal ridges in the internode, though in a few cases I have seen a third, which was almost coincident with the proximal node. In one of the rough sketches made by Mr. Busk an internode is seen with apparently four ridges; this results from the specimen being seen obliquely, so that the ridges on both sides of the internode are visible at once. The dorsal ridge, which unites the two transverse ones, is a very distinct feature in a back view of the hydrocladium when strongly marked; in some specimens, however, it is weak and obscure.

The lateral sarcothecæ are much like those of *A. billardi*, etc., except that they are considerably stouter in proportion to their length. The septum dividing the mesial sarcotheca has in side view, as Billard remarks, a sigmoid form; it has a narrow opening on the side next the hydrotheca. The terminal aperture, with its lateral lobes, is evidently formed, as in many other species, by two apertures cutting into each other.

The gonangial structures are really less exceptional in character than the trophosome, the series of large dish-shaped receptacles along the upper side of the corbula, shown in the "Challenger" Report, having no real existence. There are none of the large expanded free portions of the corbula-leaves, such as are found in most of the species described in these Reports; the distal edges, with their closely-ranged sarcothecæ, only projecting slightly outwards. The series of sarcothecæ, after running obliquely up the sides of the corbula, when they reach the upper side curve strongly forward towards the distal end, those from the opposite sides meeting at a small angle. The narrowing of the leaflets, at their basal portion, leaves a series of openings, much smaller, however, than in some of the other species, and the lateral spurs which protect these openings are short and somewhat flabellate, usually with a sarcotheca about the middle of the front margin, and one, less advanced, at each side of it. The linear thickenings of the perisarc, which are shown in Allman's figure, are commonly very irregular, and often much less conspicuous and even wanting in part. The sex could not be determined, and it is possible that some difference may exist between the male and female corbulæ ; in species where such differences are known, however, they depend on the open condition of the male corbulæ, or the more profuse development of the secondary appendages of the female ; and differences of these sorts have apparently not been noticed so far in connection with the present species. According to Billard the gonocladium, on its proximal portion, supports one or two hydrothecæ, slightly or not modified ; in my specimens I found a single one.

Loc.—Reef at North-west Island, off Port Curtis, Queensland.

AGLAOPHENIA (THECOCARPUS) ARMATA, *Bale.*

Aglaophenia armata, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 175, pl. xxxviii., figs. 3-4. *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 314, pl. x., fig. 2.

On account of the indefinite character of the small receptacles on the corbula-leaves, I have expressed some doubt as to their hydrothecal nature. Corroborative evidence, however, that the species is properly placed is the presence on the proximal part of the gonocladium of several modified hydrothecæ, this being, according to Nutting, a character found in *Thecocarpus*, but not in typical species of *Aglaophenia.*

Locs.—Thirty-eight miles north-east of North Reef Lighthouse, Capricorn Group, off Port Curtis, Queensland, 74 fathoms.

Thirteen miles north-east of North Reef, 70-74 fathoms.

AGLAOPHENIA (THECOCARPUS) TENUISSIMA, *Bale.*

Aglaophenia tenuissima, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 179, pl. xxxvii., figs. 1-2. *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 317, pl. xi., fig. 2.

Locs.—Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms.

Great Australian Bight, Long. 130° 40′ E., 160 fathoms.

Great Australian Bight, Long. 127° 20′ E., 180 fathoms.

Eastern Slope, Bass Strait, 80-300 fathoms.

Aglaophenia (Thecocarpus) calycifera, *Bale.*

Aglaophenia calycifera, Bale, Biological Results "Endeavour," ii., 4, 1914, p. 178, pl. xxxvii., figs. 3-4.

The nodes of the hydrocladia are described as "transverse"; a more correct description, in the great majority of cases, would be "slightly oblique."

Locs.—Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms.

Great Australian Bight, Long. 130° 40′ E., 160 fathoms.

Aglaophenia (Thecocarpus) megalocarpa, *Bale.*

Aglaophenia megalocarpa, Bale, Biological Results "Endeavour," ii., 1, 1914, p. 45, pl. iv., fig. 1, pl. vi., fig. 5.

The peculiar positions of the hydropore and the intrathecal ridge, along with the form of the lateral sarcothecæ, to which I have referred as so exceptional, are exactly paralleled in some of the forms which Billard, in his "Report on the Siboga Plumulariidæ," has ranked as varieties of *Thecocarpus myriophyllum*. From all those forms the hydrothecæ of *A. megalocarpa* differ in the denticulation of the border, and in the crest on the median tooth.

Loc.—Great Australian Bight, 80-120 fathoms.

Genus Halicornaria, *Busk.*

Of the species of *Halicornaria* comprised in the collection *H. superba* and *H. furcata var. intermedia* belong to the *ascidioides*-group, distinguished by the position of the abcauline intrathecal ridge; *H. urceolifera* and *var. scandens* belong to the *longirostris*-group, in which the intrathecal ridge is wanting; *H. vegæ* and *H. tubulifera* form a group, new to the Australian region, having no intrathecal ridge, and distinguished by the peculiar and characteristic ramification, which moreover is polysiphonic; and *H. birostrata* is distinct from all the others in the position of the intrathecal ridge, in the forked anterior sarcothecæ, and in other particulars.

All attempts to find a constant distinction between *Halicornaria* and the allied genera, dependent on the trophosome alone, have been failures. The monosiphonic habit is not constant, and it is found in some *Aglaopheniæ*. I formerly relied on the presence of sarcothecæ behind the axils of the hydrocladia, but I have recently found the same character in several species of *Aglaophenia* and *Thecocarpus*.

One character only is common to every *Halicornaria* which I have examined, and to no other genus, the presence namely of little perisarcal points on the margins of the hydropore, or on one margin only.

HALICORNARIA BIROSTRATA, *Bale*.

Halicornaria birostrata, Bale, Biological Results " Endeavour, ii., 1, 1914, p. 49, pl. iv., fig. 5, pl. vii., fig. 6.

Loc.—Great Australian Bight, 40-100 fathoms.

HALICORNARIA VEGÆ, *Jäderholm*.

Halicornaria vegæ, Bale, Biological Results " Endeavour," ii., 4, 1914, p. 185, pl. xxxvi., figs. 4-5 (synonymy).

Loc.—Great Australian Bight, Long. 130° 40′ E., 160 fathoms.

HALICORNARIA TUBULIFERA, *Bale*.

Halicornaria tubulifera, Bale, Biological Results " Endeavour," ii., 4, 1914, p. 187, pl. xxxvi., fig. 3.

Loc.—Great Australian Bight, Long. 130° 40′ E., 160 fathoms.

HALICORNARIA SUPERBA, *Bale*.

Aglaophenia superba, Bale, Journ. Micro. Soc. Vict., ii., 1881, pp. 31, 45, pl. xiii., fig. 4-4b.

Halicornaria superba, Bale, Cat. Austr. Hydr. Zooph., 1884, p. 175, pl. xiii., fig. 1, pl. xvi., fig. 4 ; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), vi., 1893, p. 107 ; *Id.*, Bale, Proc. Roy. Soc. Vict., (n.s.), xxvi., 1913, p. 145. *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 312.

A single specimen was observed, about nine inches in height, with two or three branches near the summit.

Locs.—Forty miles west of Kingston, South Australia, 30 fathoms.

Twenty miles east of King Island, Bass Strait.

Halicornaria furcata, *Bale, var.* intermedia, *Bale.*

Halicornaria intermedia, Bale, Biological Results " Endeavour," ii., 1, 1914, p. 53, pl. v., fig. 2, pl. vii., figs. 3-4. (Not *Halicornaria intermedia*, Billard, Les. Hydr. de l'Exped. du Siboga, I., Plumularidæ, 1913, p. 65, pl. iv., fig. 37).

Halicornaria furcata, Bale, var. *intermedia*, Bale, Biological Results " Endeavour," ii., 1, 1914, Addendum, p. 1. *Id.*, Briggs, Rec. Austr. Mus., x., 10, 1914, p. 298, pl. xxv., fig. 3 ; *Id.*, Briggs, Proc. Roy. Soc. N.S. Wales, xlviii., 1915, p. 310.

As mentioned in a supplementary slip inserted in Part I., it became necessary to cancel the specific name *intermedia* owing to Billard's having used the same name while my Report was awaiting publication ; and in preference to proposing another specific name I ranked the form provisionally as a variety of *H. furcata*, pending further knowledge of the affinities of that species.

Among the later material received were a number of colonies, most of which agreed fully with the original description ; but in one or two instances a variation occurred, in which each internode of the rachis bore a single hydrocladium only.

The variety is habitually associated with *Aglaophenia tasmanica*, and both hydroids are, up to the present, only recorded from the Tasmanian region. Each was obtained in eight dredgings, in seven of which they were growing together. In the collection from Cape Pillar, Tasmania, reported on by Mr. Briggs, as well as in a number of colonies from near Freycinet Peninsula, Tasmania, they were similarly associated, and Mr. Briggs considers that the *Halicornaria* always occurs as an epizoon on *A. tasmanica*.

Locs.—Oyster Bay, Tasmania, 20 fathoms.

North-east of Babel Island, Bass Strait, 100-170 fathoms.

East of Babel Island, about 70 fathoms.

Twenty-one miles N. 65° E. of Babel Island, 73 fathoms.

Off Babel Island, 60 fathoms.

Twenty-five miles north-east of Babel Island, 70-100 fathoms.

Off Green Cape, 470 fathoms.

Thirty-six miles S. 58° W. of Cape Wickham Lighthouse, 72 fathoms.

HALICORNARIA URCEOLIFERA (*Lamarck*).

Halicornaria urceolifera, Bale, Biological Results " Endeavour," ii., 4, 1914, p. 183, pl. xxxvii., figs. 5-6 (synonymy).

Loc.—Great Australian Bight, 80-120 fathoms.

HALICORNARIA URCEOLIFERA (*Lamarck*),

var. SCANDENS, *Bale.*

Halicornaria urceolifera (Lamarck), var. *scandens*, Bale, Biological Results " Endeavour," ii., 1, 1914, p. 51, pl. v., fig. 4, pl. vii., fig. 5; *Id.*, Bale, Biological Results " Endeavour," ii., 4, 1914, p. 184.

Loc.—Great Australian Bight, 40-100 fathoms.

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NOTE.

Since the foregoing pages were in print I have received from Messrs. Mulder and Trebilcock their paper on " Victorian Hydroida, Part V.," from the " Geelong Naturalist," in which reference is made to some of the species mentioned in the present paper. One of the new forms described—*Sertularella annulaventricosa*—is almost certainly the same as *S. undulata* (*ante*, p. 284). *Plumularia setoceaformis*, n. sp. is evidently founded on a small specimen of *P. procumbens*, Spencer. A figure is given of " *Hebella scandans*," growing on *Sertularia unguiculata* as described herein (see *H. calcarata*, var. *contorta*). It is mentioned that hydrothecæ are borne on the primary stolon where it crosses the nodes of the *Sertularia*, a feature which I have not seen in my specimens.

I have also received from Dr. Fraser his paper on " Some Hydroids of the Vancouver Island Region, and Notes on some Alaskan Hydroids." *Halecium flexile*, Allman, and *H. parvulum*, Bale, which, following Billard, I have united, are recorded by the writer as distinct species.

ERRATA.

Part I. (Vol. ii., Pt. 1), page 16, sixth line from bottom, for " p. 459 " read " p. 463."

Part I. (Vol. ii., Pt. 1), page 53, line 25 from top, for " fig. 4 " read " figs. 3-4."

Part II. (Vol. ii., Pt. 4), page 172, line 21, for " Proc. Roy. Soc. Edin." read " Proc. R. Phys. Soc. Edin."

1915

Commonwealth of Australia

Department of Trade and Customs

FISHERIES

Biological Results of the Fishing Experiments carried on by the F.I.S. "Endeavour," 1909-14.

H. C. Dannevig,
Commonwealth Director of Fisheries

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VII.—The Continental Shelf of the East Coast of Australia

BY

THE LATE H. C. DANNEVIG,

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VII.—THE CONTINENTAL SHELF OF THE EAST COAST.

From the soundings on the charts of the East Coast it will be seen that a submerged step or shelf of moderate depth is interposed between the mainland and the great ocean abyss of 2,000 to 3,000 fathoms or more, which almost completely surrounds the Continent like an enormous valley of great width and depth. It is generally recognised that this shelf has its origin partly through volcanic faults or breaks, and partly through elevation and depression in relation to sea level. Other and more mechanical agencies are constantly tending to modify the character of this shelf ; erosion from the coast and river deposits is providing fresh building material with a tendency to *elevate* the shelf, while the currents and waves endeavour to remove all loose and flotsam matter. It is evident therefore that apart from an " original " formation of ancient date, there are constant changes taking place for which the action of waves and ocean currents are mainly responsible.

Between the southern portion of the Coral Reef and the Queensland Mainland is a comparatively wide area of shallow water, 15 to 30 fathoms being the usual depth. The bottom consists almost uniformly of coral sand and is perfectly smooth and free from obstruction. Coral reefs form the margin towards the ocean deep, and they are the principal producers of the material from which this portion of the continental shelf is constituted.[1] It is at Sandy Cape, however (Lat. 25° S.), that the more typical shelf commences and continues southwards along the coast. For the first three hundred and sixty miles (or south to Smoky Cape in Lat. 31° S.) the shelf presents peculiarities which gradually disappear further south.

These peculiarities are that the shallow portion of the shelf continues seawards for a considerable distance so that, for instance, at Double Island, the depth is only 50 fathoms. At this depth the shelf may here be said to terminate, as the more or less rocky and always steep edge slopes off very quickly towards great depths. Northwards from Cape Moreton the shallow portion of the ledge is mainly covered with coral sand, which southwards gives way to a somewhat coarse yellow sand, occasionally interspersed with gravelly beds where the currents are strong, as off Point Danger.

1. Hedley, C., and Taylor, T. G.—*Rep. Austr. Assoc. Adv. Sci.*, xi., (1907), 1909, pp. 397-413.

From 60 to 100 fathoms, apart from being narrow and rocky, the shelf is frequently so steep as to form part of the general slope downwards to abyssal depths.

Southwards from Smoky Cape the relative proportion between the inner and the outer areas become reversed. At the Cape itself the shelf is narrow and divides into two equal belts ; the shallow area of less than 50 fathoms and a deeper stratum with an average depth of 70 fathoms. From here southwards this outer stratum becomes gradually wider at the expense of the inshore or secondary ledge and a maximum width of which is found in the Newcastle Bight, where the inshore ledge is seven to eight miles wide, while the outer extends for another twenty-one miles before breaking off into the deep. Simultaneous with the appearance of the outside ledge at Smoky Cape the depth of the " break off " increases quickly to about 100 fathoms and remains so for the remainder of the coast south to Gabo Island.

An interesting, and, as will be shown, very important feature of the outside ledge is the nature of the bottom, which in most parts, consists of fine sand mixed with mud. Rocks are very rarely met with and are practically confined to the outer margin ; but the inshore narrow strip of less than 50 fathoms is in most parts rough and so also is the area between the two ledges where in some parts there appears an almost vertical rocky wall fully one hundred and twenty feet high and running parallel to the coast.

These conditions continue southwards for nearly four hundred miles to near Twofold Bay, the only interruption being opposite projecting headlands, where the influence of confined currents prevent the accumulation of deposits and leave the " foundation "—the rocks and boulders—practically bare. The nature of the shelf near Twofold Bay and southwards to Gabo Island differs in a marked degree from the conditions just described, for here the " slope " is even and continuous seawards to approximately 100 fathoms, and while the area *inside* the 50 fathoms is perfectly smooth and covered with sand and mud, the *outer* portion is rough and near the edge has the semblance of a stone quarry. On one occasion when for the purpose of some investigations the " Endeavour " was anchored eleven miles to the east from Green Cape considerable difficulty was experienced in recovering the kedge anchor used ; the wire cable employed was caught under several ledges in such a manner that it became necessary to steam in a circle to free it, and the anchor, when recovered, was twisted almost beyond recognition.

Southwards from Gabo Island the shelf widens out considerably, and consists entirely of the outer or deeper strata, which, between 50 and 300 fathoms, is miles wide. The edge gradually bends westwards parallel with the coast until opposite the mouth of the Snowy River, where at a distance of about thirty miles from land it turns abruptly to the south. On approaching the bend the shallow area (of less than 50 fathoms) has gradually extended at the expense of the outer ledge, and while the former continues westward through Bass Strait and connects Victoria and Tasmania, the latter extends as a relatively narrow belt along the eastern slope past Flinders Island and along the east coast of Tasmania.

The bottom conditions south and west from Gabo Island are similar to what has been described on the east coast; the shallow section is either rough or covered with coarse sand, while the deeper ledge is covered with fine deposits. The outer edge, however, is occasionally rocky and the contour rather irregular. South from Cape Everard in particular has been located a deep indentation presenting abrupt and sharp margins. This also is the case to the east from the Sisters Islands and at a place further south, where pronounced irregularities have been located and where rocks protrude.

The survey work of the "Endeavour," as will be seen, has furnished a considerable amount of additional data in reference to the Continental Shelf of the East Coast, and while it remains for the expert geologist to explain, if possible, the peculiar conditions mentioned, it may here be of interest to summarise the seemingly most important features.

The tendency to subdivision into an inner and outer section can hardly be accidental, but will probably be found to be due to one or all of the three following causes—currents, wave action, and elevation or depression of the Continent. The work of the "Endeavour" has furnished a considerable amount of data since the shelf was last discussed, and it is of interest in the light of the additional information to review the situation. After discussing two cross sections of the shelf, one off Sydney and the other off Ulladulla, or about one hundred miles further south, Mr. C. Hedley[1] came to the conclusion that the shelf is being produced by eroded matter from the coast being carried seawards and tipped over the outer edge by the current; he concludes that as in the two cases examined by him the outer edge must be soft and more or less elevated above a solid foundation. The case, how-

1. Hedley, C.—The Submarine Slope of New South Wales—*Proc. Linn. Soc. N.S. Wales.*, xxxv., 1910, pp. 12-17, pls. i. & ii.

ever, does not now appear as simple as that, for the edge of the shelf is frequently found to be remarkably hard with sharp and high rocks protruding. It is obvious that erosion must take place particularly within the tidal range where the greatest number of waves are at work, but erosion due partly to friction must also occur down to whatever depth the wave action may extend. It is common knowledge amongst fishermen that the nature of the bottom may alter frequently and quickly in depths of 30 and 40 fathoms as the result of severe gales; and in our own experience it has happened that at a depth of 40 fathoms an area became unworkable after a severe storm through the previously covered-up rocks being temporarily exposed. Scottish crab fishermen will frequently find a considerable proportion of their pots actually smashed after a gale when fishing at a depth of 20 to 30 fathoms in the open sea, so there is no doubt as to the efficiency of the waves at that depth. How far this action may be traceable is hard to say, but as along the outer ledge the fine deposits are in depths of 55 to 80 fathoms it may be assumed the influence of the waves seldom reaches these depths, if at all. The inner or shallow ledge down to perhaps 40 fathoms may be considered an excavation produced by erosion and twisted by the sweeping currents produced locally and temporarily by each succeeding gale. The surface of this portion of the shelf is frequently hard, the bare and ragged rocks being exposed, but at times extensive areas of coarse sand are met with; fine (and therefore more portable) sediment is generally removed by the more constant currents along the coast. The nature of these currents will shortly be referred to; at present it is sufficient to observe that from the eastward a fairly strong stream strikes the Australian coast about the latitude of Sandy Cape in Queensland. A principal arm is diverted southwards along the coast, and is instrumental not only in removing the fine deposits from inshore, including river erosions, but has also an important effect upon the formation and maintenance of the "outer ledge." This, it will be remembered, is covered with fine silt, mud and clay, in varying admixtures, and the stream flowing parallel to the coast carries with it those sediments from a northern origin to a southern destination. The south-flowing current acts like a soft broom along the shelf; it is weak enough along its inner margin to permit sediment deposition in more than 60 fathoms, yet strong enough along the edge of the bank to prevent excessive accumulation in that part. Examination of this current has shown that it extends to a depth of several hundred fathoms and is frequently accentuated along the curvation of the edge, where for the first time it comes into contact with the submerged shoulder of the continent. Very little shore deposit is in consequence allowed to settle there, except, perhaps, in crevices and where eddies are formed and all prominent points remain exposed.

From the Admiralty Charts it will be seen that the fine 60 to 80 fathoms deposit is practically absent until south from Smoky Cape. In fact it is only southwards from Port Stephens that these beds become prominent and constant. This locality is, however, two hundred to three hundred miles south from the mouth of such voluminous rivers as the Tweed, Richmond and Clarence, each of which conveys enormous quantities of fine silt into the ocean. Examination of the shelf opposite these rivers shows that near land there is a bed of fine sand which no doubt owes its origin to the rivers, but outside of this is a broad stratum of gravelly bottom which cannot be assumed to have traversed across the intermediate fine sand. This bed cannot in consequence be looked upon as in course of formation (building up), but is maintained by the current in a bare and exposed condition. While the heavy river sand settles within a few miles of the land, the lighter silt is carried southwards at an average rate of about fifty miles a day. In this light it is easy to understand why practically no silt is met with along the northern portion of the coast as far as Sandy Cape, for the current, which afterwards becomes changed with eroded *débris* from the rivers and the coast generally, is as yet "virgin," and bare on its first contact with the continent. The Brisbane River brings down quantities of fine sediment, but this is practically all deposited in Moreton Bay, which acts as a huge settling tank to that river. From Port Stephens southwards we meet with fine deposits on the outer ledge in increasing quantities until south from Gabo Island, where the final and largest eddy is formed; the accumulation of silt is proportionately very great and extends for nearly thirty miles from land.

That the inshore ledge out to approximately 40 fathoms is the direct result of wave and current action appears certain, and the process must be constantly going on. This, however, does not account for the existence of the outer and deeper ledge, where at present no erosion takes place, but building up may even be traced (as settlement of fine deposits—mud, sand, etc.). It is evident also that the whole shelf is mainly moulded on the rocky foundation, the unevenness of which frequently protrudes, particularly along the outer edge, and may be traced to a depth of seven hundred fathoms.

The origin of the outer portion of the ledge cannot be directly attributed to the action of wave or current except in conjunction with still another factor. In many parts, but particularly southwards from Port Jackson, the two ledges are separated by a fairly abrupt and rocky wall, and the impression is conveyed that the outer ledge is similar to the inner, excepting for the greater depth (and corresponding difference of deposit). It may be conceived, therefore, that the whole of the south-eastern portion of the Continent has sunk to the extent of presenting the inner ledge as a relatively new feature, while previously the other was shallow enough to be under the influence of the eroding factors, or, in other words, the present deep water ledge formerly constituted the shallow area, and the dry land extended seawards to the present line of demarcation between the two ledges. At present there are indications of slight *elevation* of the eastern portion of the Continent, but there is also evidence that formerly the south-east portion was much higher than at present. A geologist, Mr. Griffith Taylor, once informed me that in the interior of Australia he had discovered extinct river beds flowing westward as continuations of the existing rivers of the western slope. After descending the mountains these streams have now all been diverted in a southerly direction and ultimately discharge into the Murray, whilst formerly they evidently reached Lake Eyre and the South Australian Gulf. A "tilting" or depression of the south-east corner would explain all this.

VIII.—BASS STRAIT.

BY

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COMMONWEALTH DIRECTOR OF FISHERIES.

VIII.—BASS STRAIT.

THE depression of the Continent, of which evidence has here been suggested, extends southwards, and accounts for the existence of Bass Strait. That Tasmania at one period was connected with the Australian coast appears now to be fully acknowledged, for the evidence in support thereof has gradually become so overwhelming as to leave no room for doubt.

Serious consideration of this matter was probably in the first instance prompted by the difficulty of explaining the presence of the Aborigines in Tasmania from the circumstance that these people were exceedingly primitive, and not possessed of any apparent knowledge of boat construction.

In 1890 Mr. A. H. Lucas, before the Australasian Association for the Advancement of Science, drew attention to the fact that in Victoria there is considerable dissimilarity between the fauna north and south of the dividing range; while in 1892 Prof. W. Baldwin Spencer recognised not only the importance and validity of this demarcation, but also pointed out that between the southern Victorian fauna and that of Tasmania there is in many instances a very striking similarity.[1]

Geological evidence, pointing in this direction, has from time to time been furnished by various writers. Dr. A. W. Howitt, amongst others, dealt fully with the matter in 1898, and demonstrated that southern Victoria has suffered a depression of at least two hundred and seventy feet within recent geological times, and similar conclusions have been arrived at in regard to the north coast of Tasmania. The depression indicated was suggested to be slightly greater than the present depth of Bass Strait, and the sea must, under these conditions, have been excluded from the present Bass Strait area. Howitt also published a contour map showing the 50 fathom line and the 100 fathom line as suggested by the present Admiralty Chart, and he indicated the approximate appearance of Southern Victoria with Tasmania connected. In this plan he indicated a line running from Wilson Promontory across the eastern islands to the north-east corner of Tasmania as the shallowest continuous section (not more than 32 fathoms), and in further discussion he also suggests that the indentation between Cape Otway and King Island represents the locality where rivers would have formerly discharged into the ocean. My own

1. The author did not add the bibliographical references to this, perhaps after all, incomplete draft. The references to the literature of this subject placed at the end have been supplied by Mr. C. Hedley—EDITOR.

investigations confirm this conclusion, and as will afterwards be shown there is considerable evidence yet of the submerged river beds.

It is of interest, however, to first consider some other theories advanced; the latest is by Dr. F. Noetling (1910), who has endeavoured to prove that in the central area between Victoria and Tasmania there existed a very extensive inland lake, which he considered was perfectly cut off from the ocean by extensive barriers to the east and west. On assumption of the gradually increasing water area, Dr. Noetling constructed a series of diagrams showing the relation between land and water in the Strait for every successive 5 fathom line from 20 to 50 fathoms; but as this painstaking work is based upon the Admiralty Chart, which, in many instances, is too erratic for such detailed investigation, it is not surprising that errors in detail have crept in. These are mostly unimportant except in two principal points, viz.: (1) that the maximum depth is wrong, and (2) that the doctor has been led to connect a north-eastern extension from King Island with Phillip Island and Western Port in Victoria, thus establishing a western barrier across the strait in addition to the eastern from Wilson Promontory. A freshwater lake of great expanse is thereby created in the centre of Bass Strait area, and for this there is no justification in the light of the more recent surveys made by the "Endeavour," which strongly point to a water passage along the Victorian side westward into the ocean. Some years ago I commenced to construct diagrams from the Bass Strait charts, but experience obtained in the "Endeavour" soon made it apparent that the chart soundings cannot, in many instances, be relied upon. It is generally found that our soundings, and particularly those under 35 fathoms, show a greater depth than indicated in the charts; also it is found that the undulations indicated do not always exist. In explanation thereof it should be remembered that the compilation of the chart soundings has been a gradual process since the Strait was discovered, and with the different methods employed at the various periods some irregularities are sure to creep in. It is probable also that some slight changes in the distribution of the bottoms may have taken place, so it is inadvisable to follow the details of the Admiralty Chart too minutely. Diagrams[1] . . . are based upon exact soundings taken by the "Endeavour." The figures have not yet been reduced to low water mark, but as the maximum error would only be a few feet it is sufficient

1. The diagrams referred to are not forthcoming. It is possible Mr. Dannevig had them with him at the time the vessel was lost.—EDITOR.

for the present purpose to take the records as they stand. The sections which are foreshortened suggest that (1) in the central area the bottom is very level and the slopes gentle, and (2) that irregularities are most pronounced in places where the waters are confined and tides strongest. Such localities are to the north, west and south from King Island, where the flood and ebb tides rush past at two to four knots per hour. This great force is itself sufficient to carry away and displace all portable material, such as silt and fine sand within moderate depths, and the bottom is undulating and rough in those parts. The heavy Southern Ocean rollers coming in from the west contribute also considerably to this disturbance.

Another rough area is the Banks Strait, where on account of the narrowness of the waters the flood and ebb tides run from four to five knots, and when opposing any sea cause a great commotion that prevents any silting of anything but the heaviest materials, including coarse sand.

On account of the close relationship between the nature of the bottom and the tides, it is obvious that independent currents will have a similar influence, proportionate to their strength and continuity, and it has been necessary to study the general water circulation within the Strait and immediate surroundings in order to obtain an explanation to the present distribution of the various deposits—the occurrence of channels, basins and banks.

The flood tides enter Bass Strait from four points, viz., north and south past King Island, through Banks Strait, and between the island groups situated between Flinders Island and Wilson Promontory. The ebb pours out again through the same channels. Bass Strait is consequently the meeting place of many waters apart from what rivers discharge into it, and the water circulation is somewhat complex. For the purpose of simplicity we may first consider the flood tides as entering in the west and east. The former assume a north-easterly direction on passing King Island, and the northern branch pushes on past Cape Otway towards Port Phillip and Western Port, where small arms enter various inlets. The main body is swayed to the east and south-east towards the centre of the Strait and is joined by the southern branch entering between King Island and the Three Hummocks.

The flood from the east assumes a south-west course ; a small arm follows the Victorian coast westward in the direction of Port Phillip, but the main body strikes for the north coast of Tasmania, where it is joined by the waters coming through Banks Strait.

It will be seen that the general meeting ground between these two main tide waves is about the middle of the Strait, approximately between Low Head in Tasmania and Cape Schanck in Victoria. It should here be observed that while the western flood inclines towards Victoria and enters the northern section of the common meeting ground, the eastern stream approaches the southern portion of the same neutral ground, only from the opposite direction. Wherever these streams reach this centre their waters are gradually forced into a rotary movement, the direction being from west through north and east, or against the sun.

When later on the tide has ebbed sufficiently back through the channels by which it entered, the "mound" of water in the central area will simply flatten out; no rotary movement in the reverse direction has so far been observed in connection with the ebb.

While the tidal streams come and go from east and west, there are other causes which independently affect the water circulation. The normal current within the eastern approaches to Bass Strait flows from north-east to south-west and south. It provides the waters which by the eastern flood tide was pushed into the nearest section of the Strait, and in return picks up the ebb tide and presses it southwards along the east coast of Tasmania. In its southward passage the east coast current may be said to sway to and fro at the mouth of the Strait and without making any effort to penetrate the Straits to any appreciable extent.

To the west from the Strait, however, the conditions are different. Here a current from the Southern Ocean presses against the southern coast of Victoria and King Island, and although its greater volume is diverted to south-east and south long before reaching land sufficient force remains to establish a general "drift" through the Strait from west to east. This current is in the open ocean accentuated by the dominating westerly winds, and as this wind direction prevails in the Strait to the extent of about 16,000 miles per annum (Melbourne Observatory) its influence will make itself felt also upon the local waters. Another factor of some consequence is the powerful wave action associated with the prevailing winds which materially assist in distributing the deposits.

The circumstances here related have left their mark upon the physiography of the Straits in many respects.

Nature of the Bottom, Elevations and Depressions of the Bottom.—As previously stated, the shelf to the west from

King Island and adjacent regions is rocky on account of the strong currents and heavy seas, and the accumulation of anything but coarse sand is prevented in the passage to the south from King Island, where in most places the rocks are laid bare. Eastwards from this entrance we find finer sand (and shell) thrown forward like a ridge or bar, which in a semicircle extends from King Island to Tasmania. A small eddy is formed in the corner between Circular Head and the Three Hummocks, where in consequence fine sand and mud are met with, but the area is not great.

To the north from King Island the main body of water enters the Strait in a north-easterly direction, and here also do we find a central channel with rough bottom, where coarse sand gradually replaces the outside rocky conditions. At the north end of the island the flow of the waters is accentuated and cut into the western edge of the bank, throwing the sand eastward so that an extensive bank or shoal is met with to the north-east and east from the island and extending far into the Strait. The bottom here consists of moderately fine sand and shell.

The channel mentioned continues first in the direction of Port Phillip, with a gradually decreasing depth from 60 to 48 fathoms; it then sweeps to the east past Western Port, and following for some distance the contour of Victoria it ultimately terminates in a central basin to the north from Tasmania, where the depth ranges from 45 to 53 fathoms. The surveys of the "Endeavour" suggest that the shallowest portion at present of this channel is 44 or 45 fathoms (to the south from Western Port). While, as explained, the strong water currents will have a tendency to remove deposits within their tracks, so will the more quiescent conditions invite accumulation; this, however, will also be proportionate to the nature of the materials and distance from source of supply. In the western section we find the relatively shallow "tail" bank to the east and north-east from King Island, and also, as mentioned, between the latter place and the Three Hummocks. These accumulations being adjoining, the supply from the west consists mainly of the heaviest material, and the nature of the sand becomes finer towards the centre of the Strait, where the depth is also the greatest.

The central area of Bass Strait is now left for consideration. The channel entering from the west along the Victorian coast has already been referred to, and may readily be traversed from the diagram. As far as can be ascertained the shallowest portion of that channel is 44 to 45 fathoms, to the south from

Phillip Island, and the deepest 53 fathoms, sounded in many places by the "Endeavour," particularly northwards from the mouth of the Tamar River. From diagram .... it is apparent this southern basin area was very wide and flat, reminding one of low-lying marsh land of great extent, while the channel towards the Victorian border had much steeper grades laterally.

When also taking into consideration that subsequent to the "flood" a much greater amount of erosion has taken place in the northern and western area than in the central area, it may be assumed that the more confined river valley silted up to a much greater extent than the southern basin, and this will to a large extent account for the present disparity in levels. But another factor may also be taken into account, viz., as it is assumed that the general "dipping" of the Continent has been in a south-east direction with a pivot or hinge somewhere to the north-west, it follows that by such a mode of depression the southern or Tasmanian section would sink more than the northern or Victorian area. The distance in a south-east direction from the north-western shallowest bend of the channel to the deeper central area is approximately one hundred and twenty miles, so that the angle of depression in order to equalise the whole difference would only amount to approximately 5′ of arc, or at the rate of 1 in 15,200.

There is certainly no support for Dr. Noetling's suggestion that a barrier approximately one hundred and fifty feet above the level of the central basin extended between King Island and Western Port, and consequently there is no evidence of his lake.

On the contrary, we find that a number of rivers from North Tasmania would converge towards a centre (as indicated by Noetling), but instead of forming a gigantic lake they would join with a magnificent river running to the north, north-west, and west along the present coast of Victoria, and ultimately enter the ocean somewhere to the east of Cape Otway. Into this river, which might suitably be named the Tamar Major, would also flow tributaries from the now extinct eastern and western slopes of the Bass Strait basin, so the approximate catchment area, extending from central Tasmania, in the south and the Victorian Dividing Range (or further) in the north, would cover more than 50,000 square miles, producing 150,000 millions of cubic feet of water for a rainfall of only one inch.

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FISHERIES

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CORRECTIONS.

Vol. ii., Pt. 1, page 16, sixth line from bottom, for " p. 459 " read " p. 463."

Vol. ii., Pt. 1, page 53, line 25 from top, for " fig. 4 " read " figs. 3-4."

Vol. ii., Pt. 4, page 172, line 21, for " Proc. Roy. Soc. Edin." read " Proc. R. Phys. Soc. Edin."

Vol. iii., Pts. 1–6, front cover for "Biological Results" read "Zoological Results."

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EXPLANATION OF PLATE I.

Fig. 1.—*Spiroloculina dorsata*, Reuss, var. *circularis*, var. nov. Station 36, east of Tasmania, 777 fathoms. × 52.

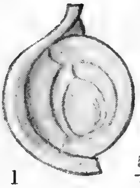
Fig 2.—*Spiroloculina grata*, Terquem, var. *reticosa*, var. nov. Forty miles south of Cape Wiles, S.A., 100 fathoms. × 26.

Fig. 3.—*Cornuspira carinata*, Costa, sp., var. *expansa*, var. nov. Forty miles south of Cape Wiles, S.A., 100 fathoms. × 26.

Fig. 4.—*Marsipella cylindrica*, H. B. Brady. East of Tasmania, 1122 fathoms. × 26.

Fig. 5.—*Marginulina costata*, Batsch, sp. Forty miles south of Cape Wiles, S.A., 100 fathoms. × 52.

Fig. 6.—*Cristellaria tricarinella*, Reuss. Vaginuline variety. Forty miles south of Cape Wiles, S.A., 100 fathoms. × 52.



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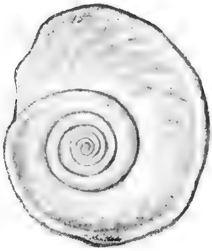

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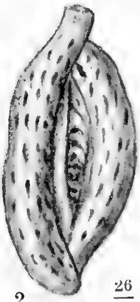

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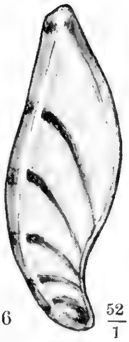

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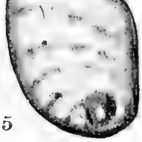

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F. CHAPMAN, del. ad nat.

EXPLANATION OF PLATE II.

(All figures on this plate magnified 52 diameters.)

Fig. 1.—*Pontocypris attenuata*, G. S. Brady. Left valve. Station 36, east of Tasmania, 777 fathoms.

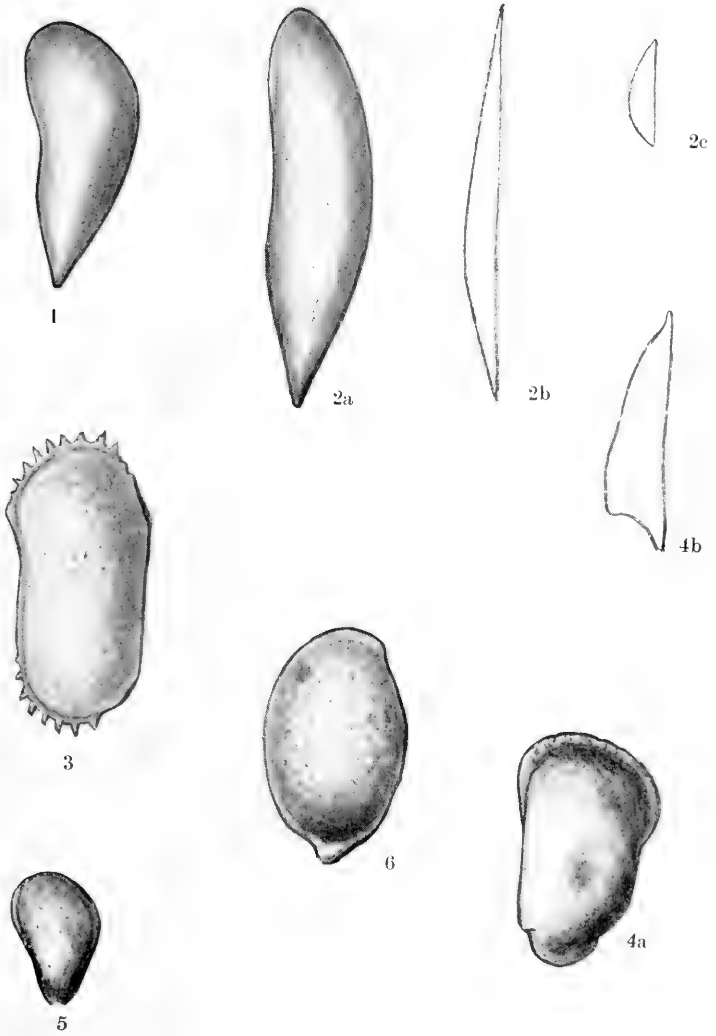
Fig. 2.—*Macrocypris gracilis*, sp. nov. *a*, left valve ; *b*, outline of edge view ; *c*, outline of end view. Station 36, east of Tasmania, 777 fathoms.

Fig. 3.—*Bairdia angulata*, G. S. Brady. Left valve. Station 36, east of Tasmania, 777 fathoms.

Fig. 4.—*Cythere cytheropteroides*, G. S. Brady. *a*, left valve ; *b*, outline of edge view. Station 36, east of Tasmania, 777 fathoms.

Fig. 5.—*Eucythere declivis*, Norman, sp. Left valve. Forty miles south of Cape Wiles, S.A., 100 fathoms.

Fig. 6.—*Loxoconcha australis*, G. S. Brady, var. *tasmanica*, var. nov. Right valve. Station 36, east of Tasmania, 177 fathoms.



F. Chapman, del. ad nat.

EXPLANATION OF PLATE III.

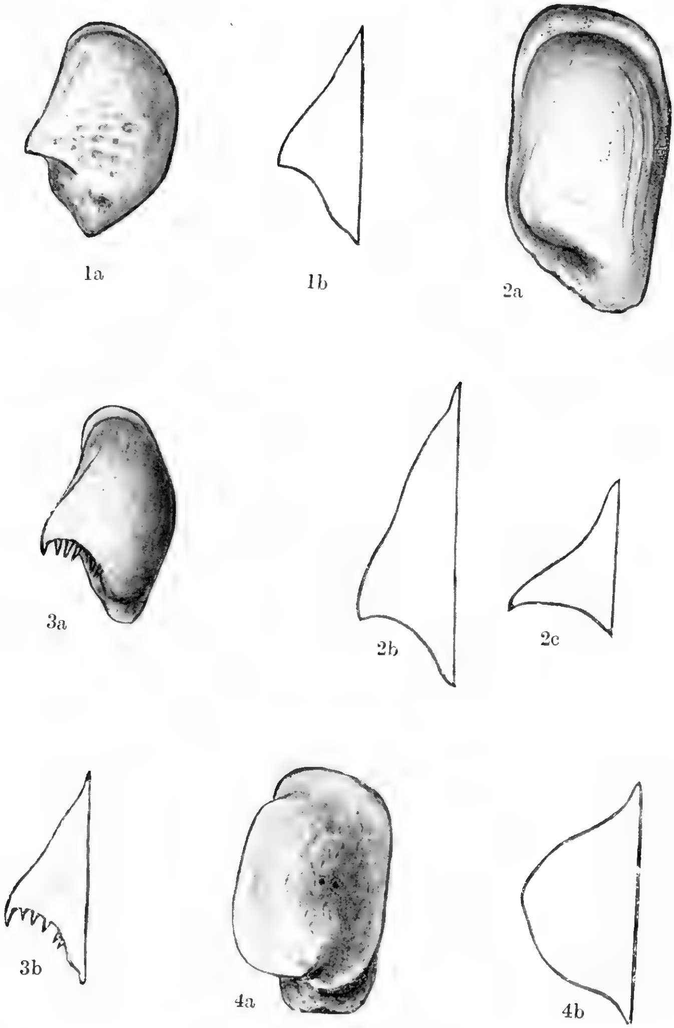
(All figures on this plate magnified 52 diameters.)

Fig. 1.—*Cytheropteron abyssorum*, G. S. Brady, var. *wilesensis*, var. nov. *a*, left valve; *b*, outline of edge view. Forty miles south of Cape Wiles, S.A., 100 fathoms.

Fig. 2.—*Cytheropteron dannevigi*, sp. nov. *a*, left valve; *b*, outline of edge view; *c*, outline of end view. Station 36, east of Tasmania, 777 fathoms.

Fig. 3.—*Cytheropteron fimbriatum*, sp. nov. *a*, left valve; *b*, outline of edge view. Station 36, east of Tasmania, 777 fathoms.

Fig. 4.—*Bythocythere velifera*, G. S. Brady. *a*, left valve; *b*, outline of edge view. Forty miles south of Cape Wiles, S.A., 100 fathoms.



F. CHAPMAN, del. ad nat.

EXPLANATION OF PLATE IV.

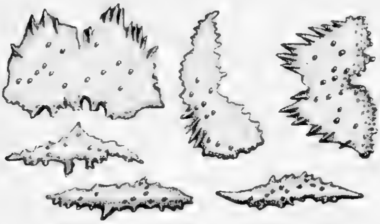
Fig. 1.—Spicules of *Mopsea plumacea*, sp. nov.; from the specimen figured on Plate vii.

Fig. 2.—Spicules of *Mopsea repens*, sp. nov.; from the specimen figured on Plate viii.

Fig. 3.—Spicules of *Plumarella australis*, sp. nov.; from the specimen figured on Plate x.

Fig. 4.—*Amphilaphis plumacea*, Thomson and Mackinnon. Photograph of a specimen 17·5cm. in height, from the south east coast of Australia.

Fig. 5.—*Ctenocella pectinata* (Pallas). Branches showing distinct median furrow. Photograph of a specimen from eight miles east of Sandon Bluff, Queensland, 35-40 fathoms.



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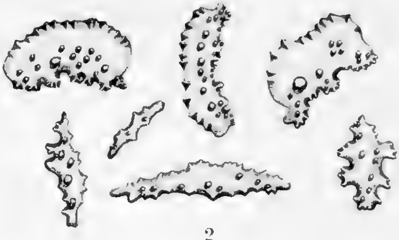

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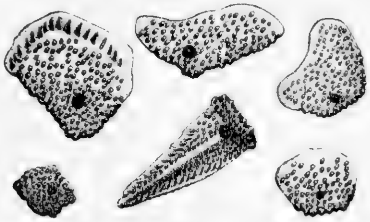

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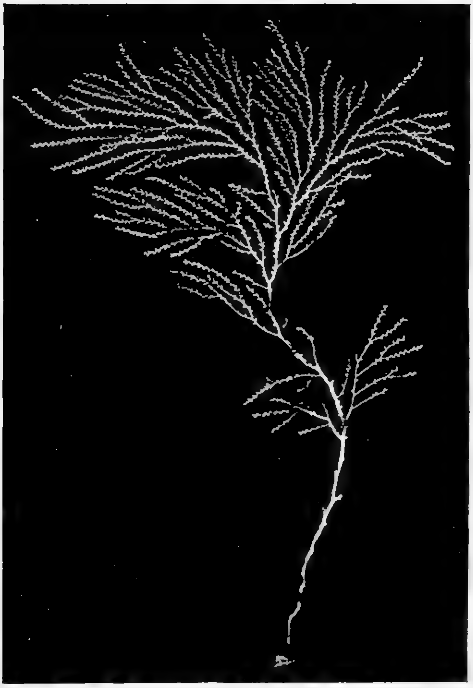

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E. A. BRIGGS, del. and photo.

EXPLANATION OF PLATE V.

Fig. 1.—*Isis hippuris*, Linnæus. Part of a colony showing the palmate terminations of the twigs. Photograph of a specimen 7cm. in height, from off the coast of Queensland.

Fig. 2.—*Isis hippuris*, Linnæus. Photograph of a specimen 13·3cm. in height, from Murray Island, Torres Strait.

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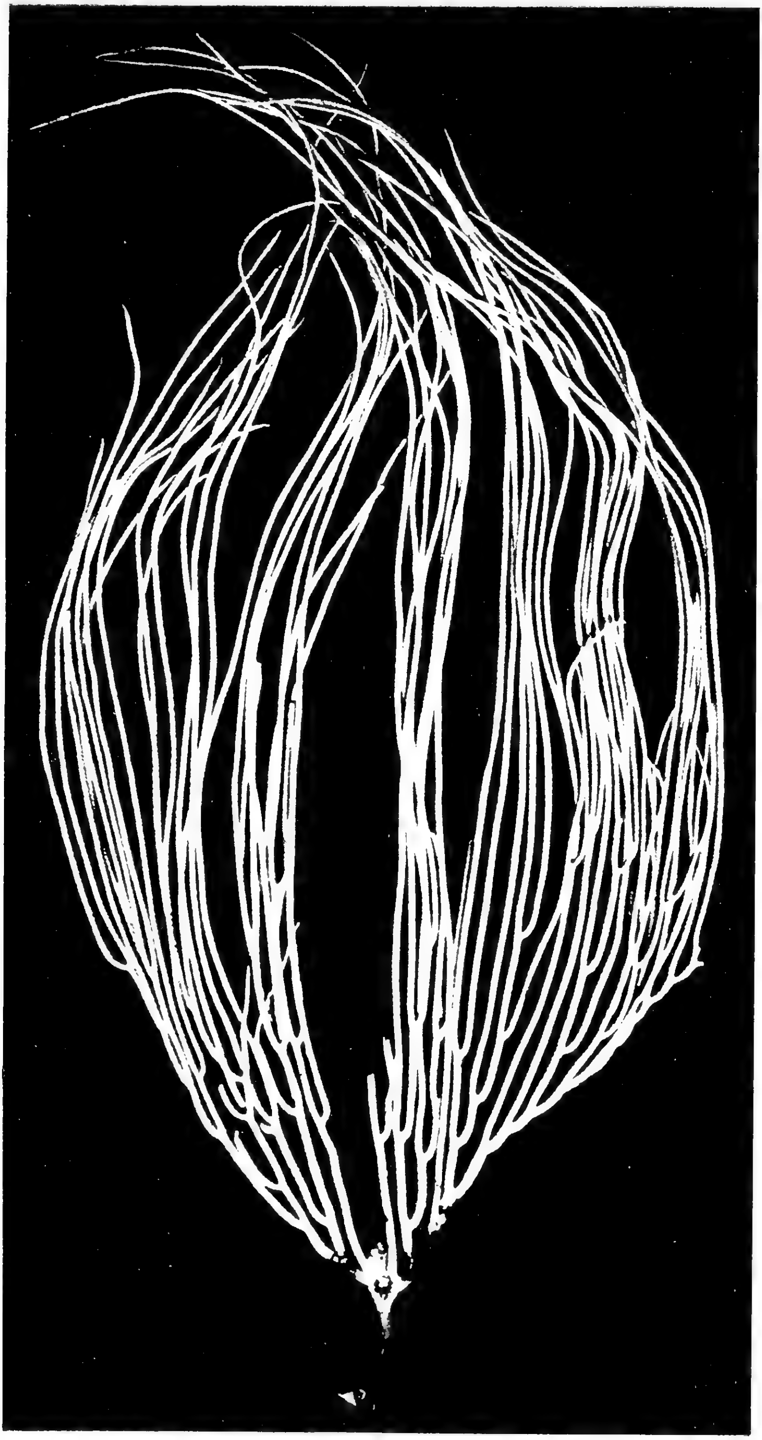
E. A. BRIGGS, photo.

EXPLANATION OF PLATE VI.

Mopsea australis, Thomson and Mackinnon. Photograph of a specimen 37·5cm. in height, from fifteen miles N. 35° E. of Saddle Hill, New South Wales, 34-35 fathoms.



E. A. BRIGGS, photo.

EXPLANATION OF PLATE VII.

Mopsea plumacea, sp. nov. Photograph of the type, 22·5cm. in height, from the South Australian Coast.

E. A. BRIGGS, photo.

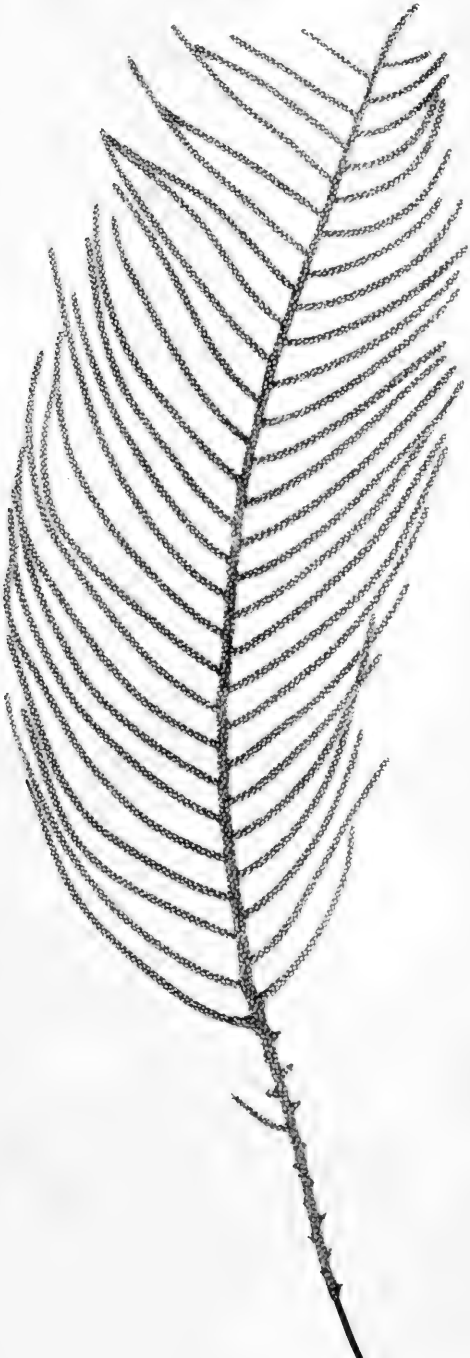
EXPLANATION OF PLATE VIII.

Mopsea repens, sp. nov. Photograph of the type, 13·5cm. in height, from thirty-six miles S. 58° W. of Cape Wickham, King Island, Bass Strait, 72-80 fathoms.

E. A. BRIGGS, photo.

EXPLANATION OF PLATE IX.

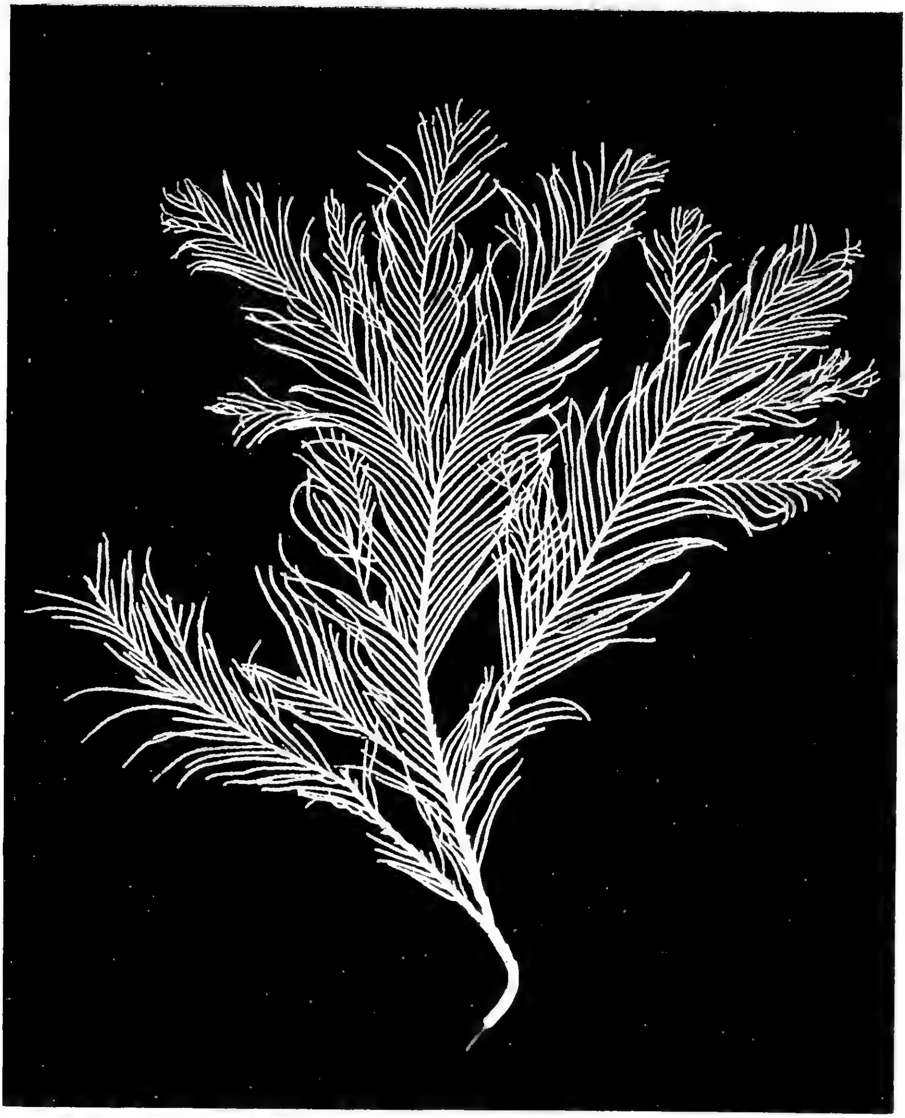
Plumarella thetis, Thomson and Mackinnon. Photograph of a specimen 26cm. in height, from fifteen miles N. 35° E. of Saddle Hill, New South Wales, 34-35 fathoms.



E. A. Briggs, photo.

EXPLANATION OF PLATE X.

Plumarella australis, sp. nov. Photograph of the type, 43cm. in height, from fifty miles south of Cape Wiles, South Australia, 75 fathoms.



E. A. BRIGGS, photo.

EXPLANATION OF PLATE XI.

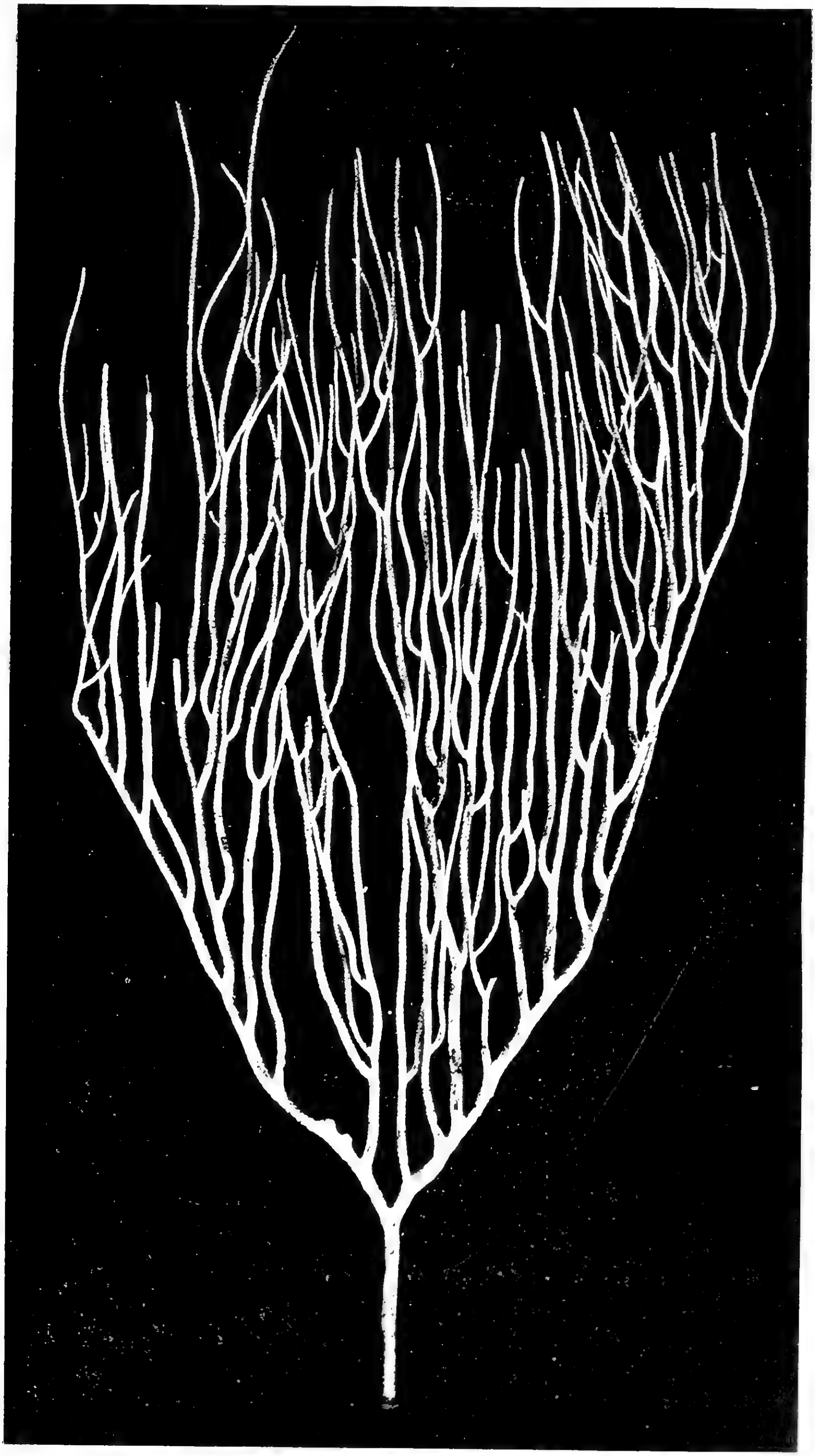
Fig. 1.—Axis of *Isis hippuris*, Linnæus. Photograph of a specimen 9 cm. in height, from Murray Island, Torres Strait.

Fig. 2.—Basal portion of *Plumarella australis*, sp. nov. Photograph of a specimen 24·7cm. in height, from fifty miles south of Cape Wiles, South Australia, 75 fathoms.

E. A. BRIGGS, photo. 1 2

EXPLANATION OF PLATE XII.

Ctenocella pectinata (Pallas). Photograph of a specimen 42cm. in height, from eight miles east of Sandon Bluff, Queensland, 35-40 fathoms.



E. A. BRIGGS, photo.

EXPLANATION OF PLATE XIII.

Fig. 1.—*Platycephalus arenarius*, Ramsay and Ogilby. A specimen 271 mm. long, from twenty-two miles S.W. of Double Island Point, Queensland.

Fig. 2.—*Centrophorus scalpratus*, sp. nov. Type, 870 mm. long, from the Victorian coast.

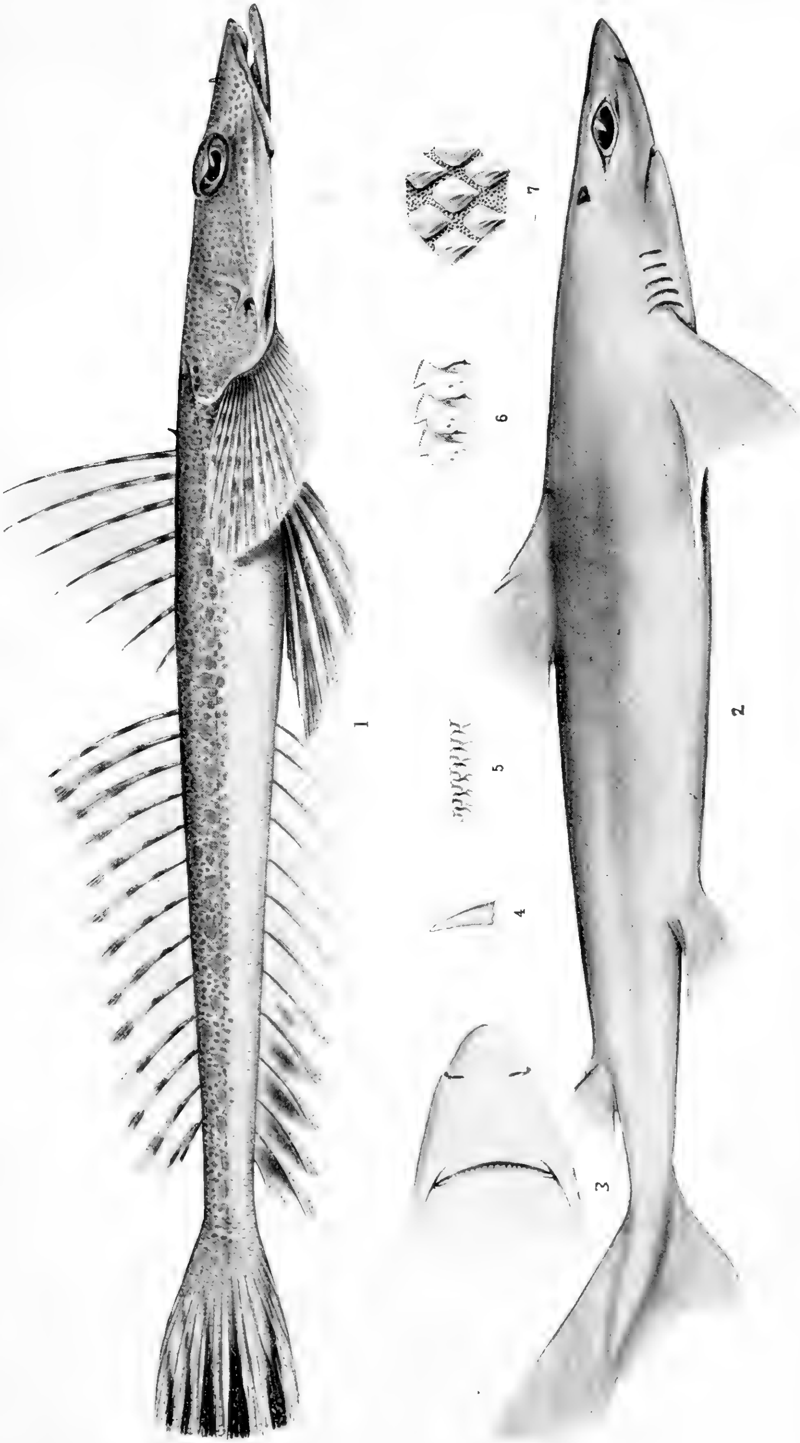
Fig. 3.—Lower view of head of same specimen as Fig. 2.

Fig. 4.—Anterior dorsal spine of same specimen as Fig. 2.

Fig. 5.—Upper teeth of same specimen as Fig. 2.

Fig. 6.—Lower teeth of same specimen as Fig. 2.

Fig. 7.—Scales from upper portion of side of same specimen as Fig. 2.



A. R. McCULLOCH, del.

EXPLANATION OF PLATE XIV.

Fig. 1.—*Centrophorus harrissoni*, sp. nov. Type, 760 mm. long, from near Gabo Island, Victoria.

Fig. 2.—Lower view of head of same specimen as Fig. 1.

Fig. 3.—Upper and lower teeth of same specimen as Fig. 1.

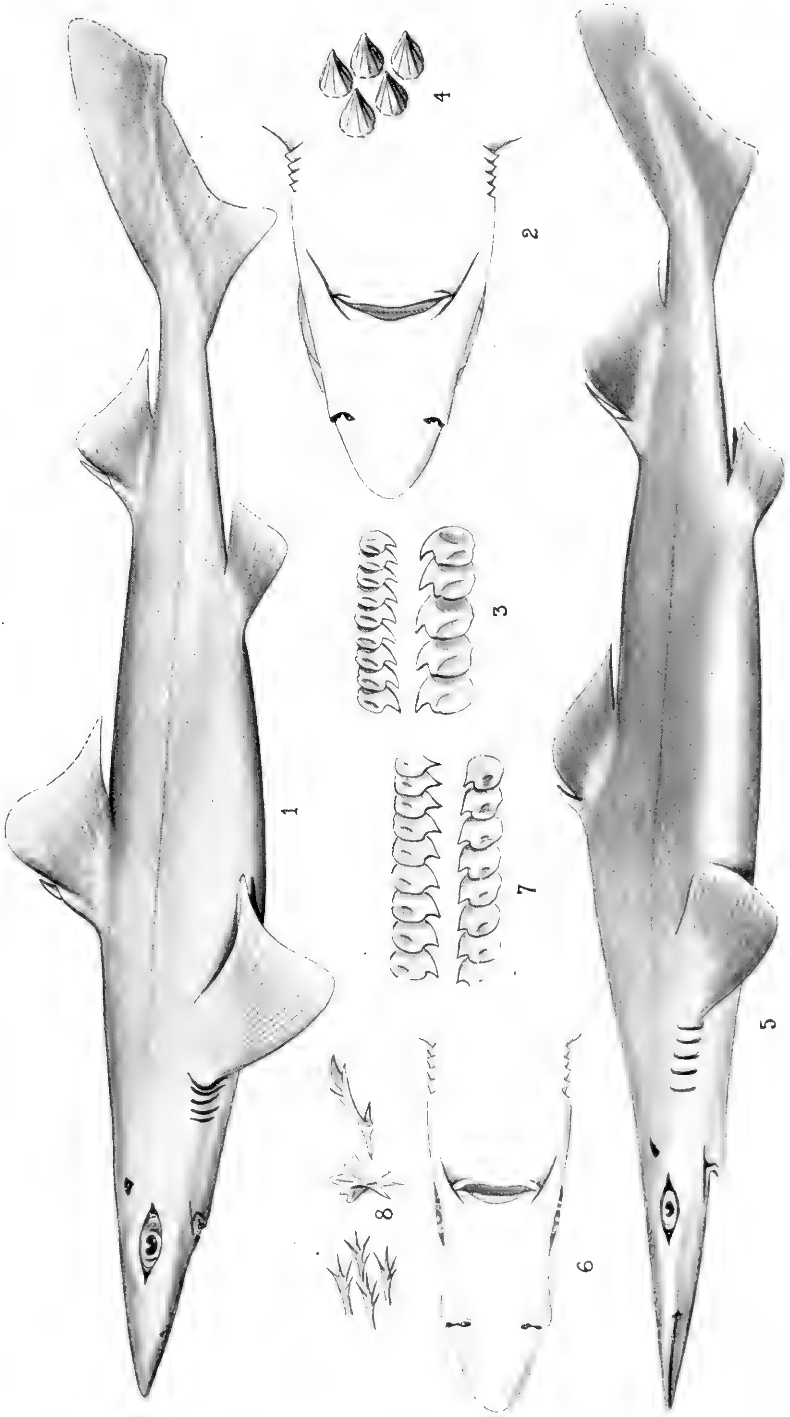
Fig. 4.—Scales from upper portion of side of same specimen as Fig. 1.

Fig. 5.—*Acanthidium quadrispinosum*, sp. nov. Type, 683 mm. long, from south of Gabo Island, Victoria.

Fig. 6.—Lower view of head of same specimen as Fig. 5.

Fig. 7.—Upper and lower teeth of same specimen as Fig. 5.

Fig. 8.—Scales from upper portion of side of same specimen as Fig. 5.

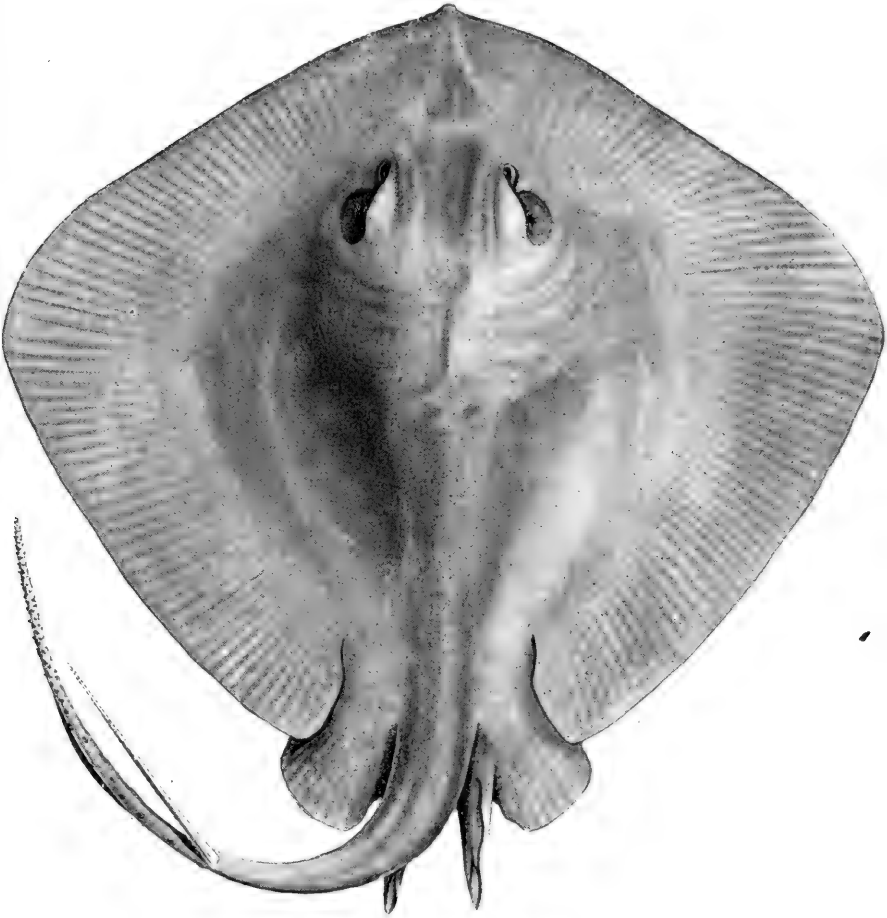


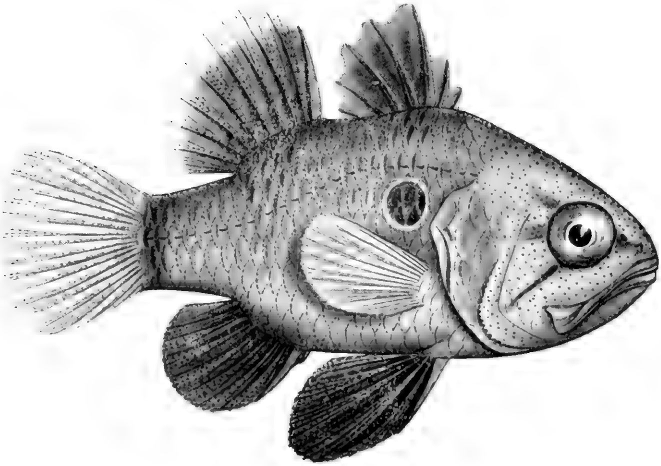
A. R. McCulloch, del.

EXPLANATION OF PLATE XV.

Fig. 1.—*Dasyatis brevicaudatus,* Hutton. A specimen 1080 mm. wide, from off Babel Island, Bass Strait.

Fig. 2.—*Amia nigripes,* Ogilby. A specimen 69 mm. long, from twenty-five miles south-east of Double Island Point, Queensland.





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A. R. McCulloch, del.

EXPLANATION OF PLATE XVI.

Fig. 1.—*Dasyatis fluviorum*, Ogilby. A specimen 271 mm. wide, from the Brisbane River, Queensland.

Fig. 2.—*Amia fasciata*, Shaw, subsp. *stevensi*, subsp. nov. Type of the subspecies, 79 mm. long, from the New Hebrides.

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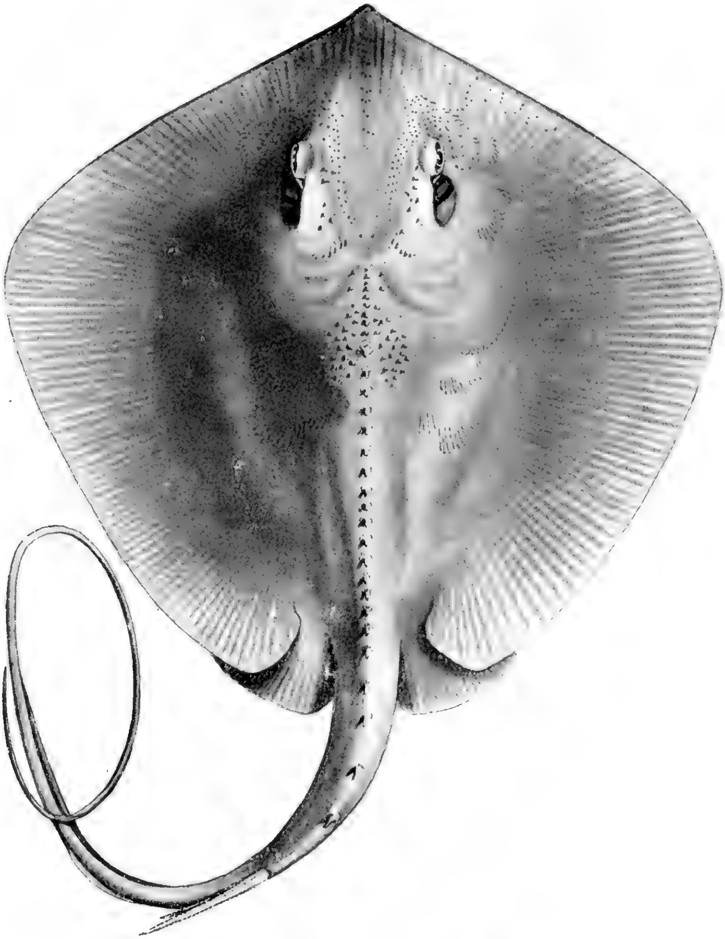

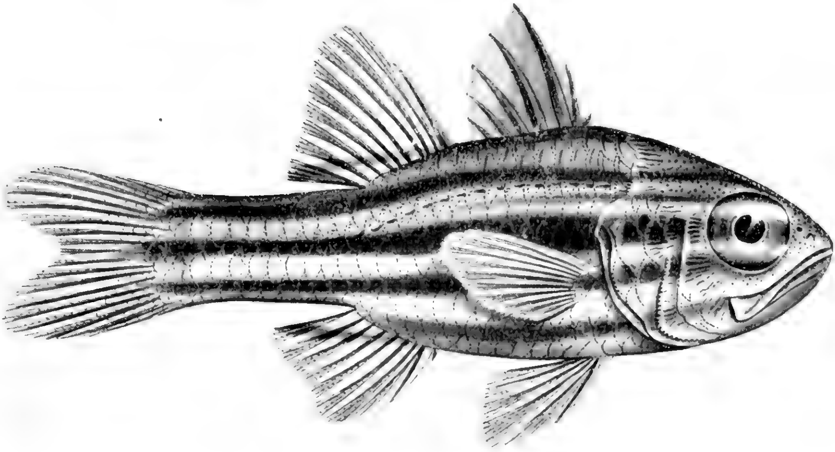

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A. R. McCulloch, del.

EXPLANATION OF PLATE XVII.

Fig. 1.—*Dasyatis brevicaudatus,* Hutton. Under surface of same specimen as figured on Pl. xv., fig. 1.

Fig. 2.—*Dasyatis fluviorum,* Ogilby. Under surface of same specimen as figured on Pl. xvi., fig. 1.

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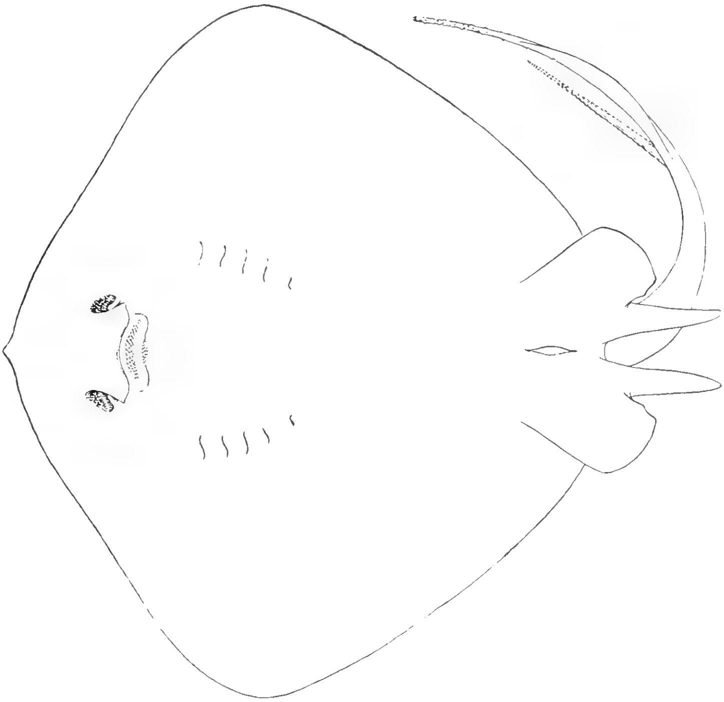
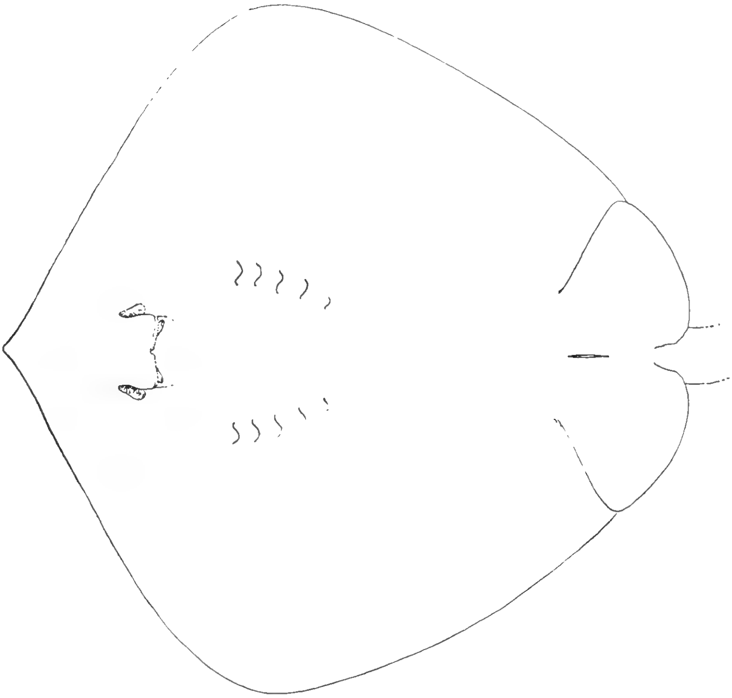




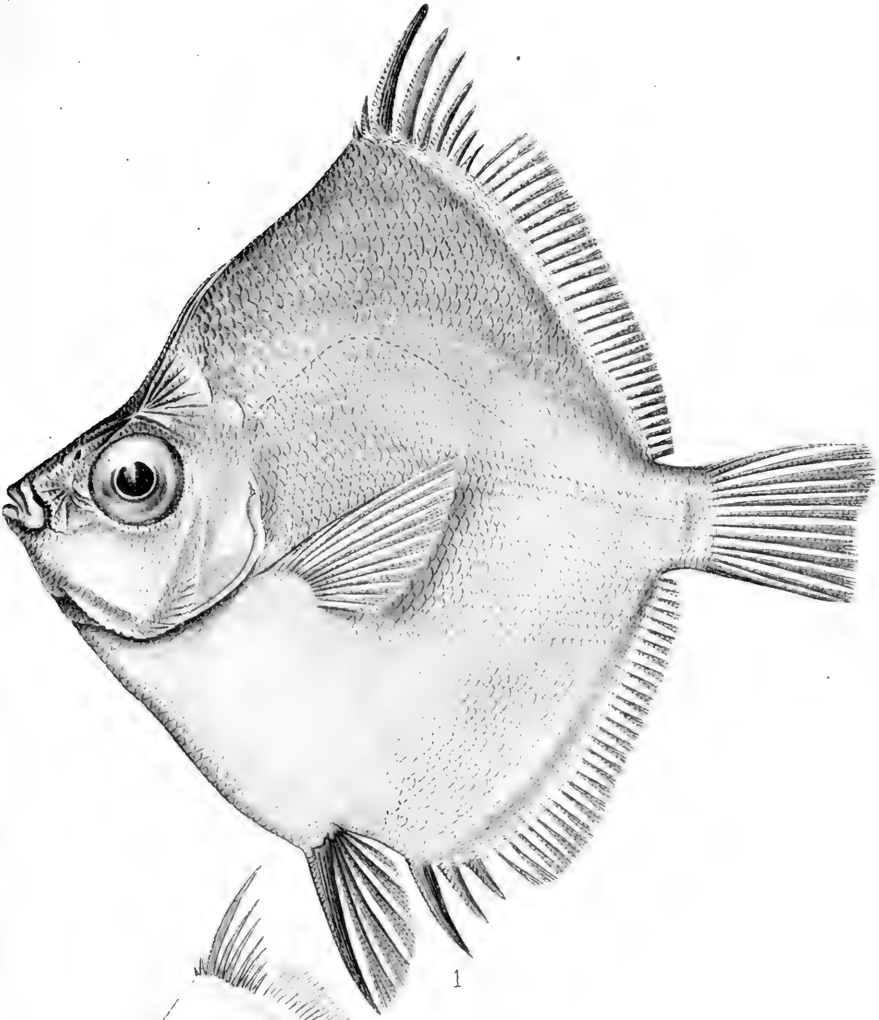
A. R. McCulloch, del.

2

EXPLANATION OF PLATE XVIII.

Fig. 1.—*Antigonia rhomboidea*, sp. nov. Type, 115 mm. long, from between Gabo Island and Cape Everard, Victoria.

Fig. 2.—*Antigonia rubicunda*, Ogilby. Type, 65 mm. long, from north-east of North Reef, Queensland.



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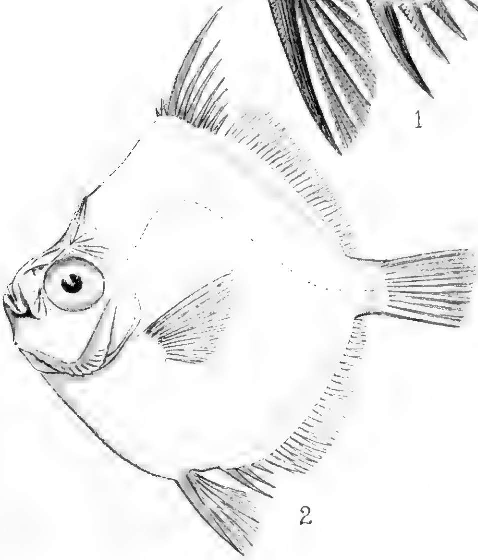

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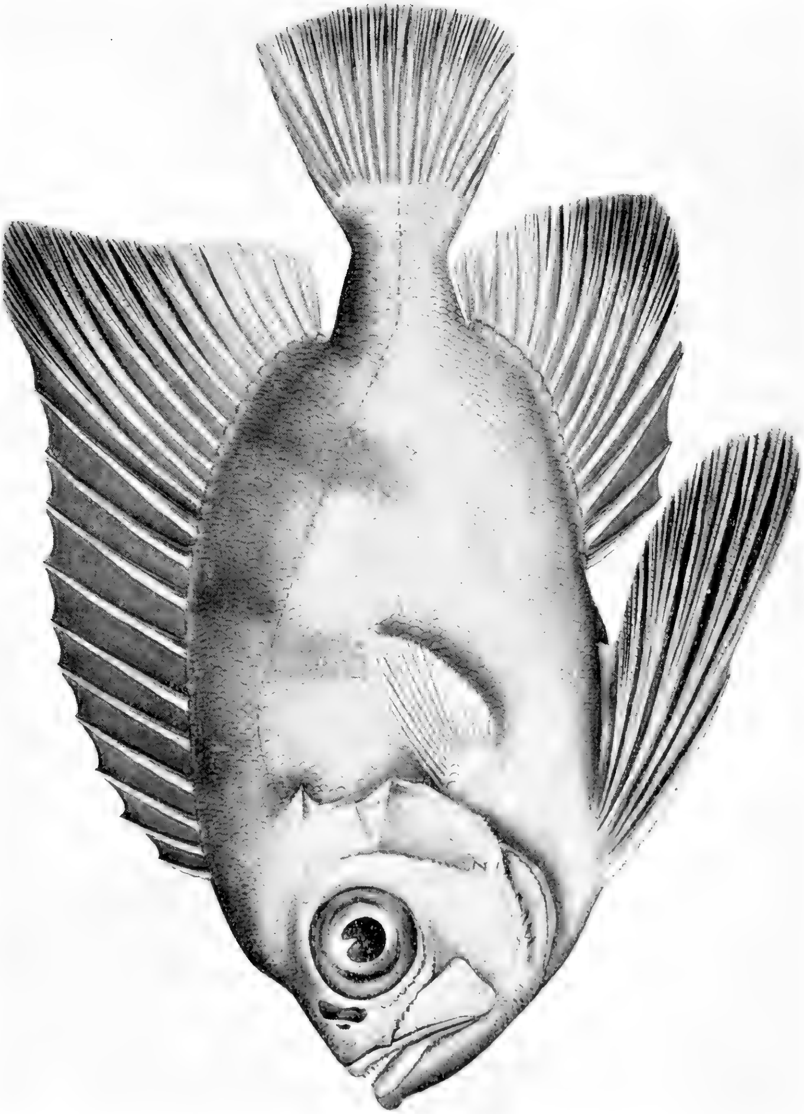
A. R. McCulloch. del.

EXPLANATION OF PLATE XIX.

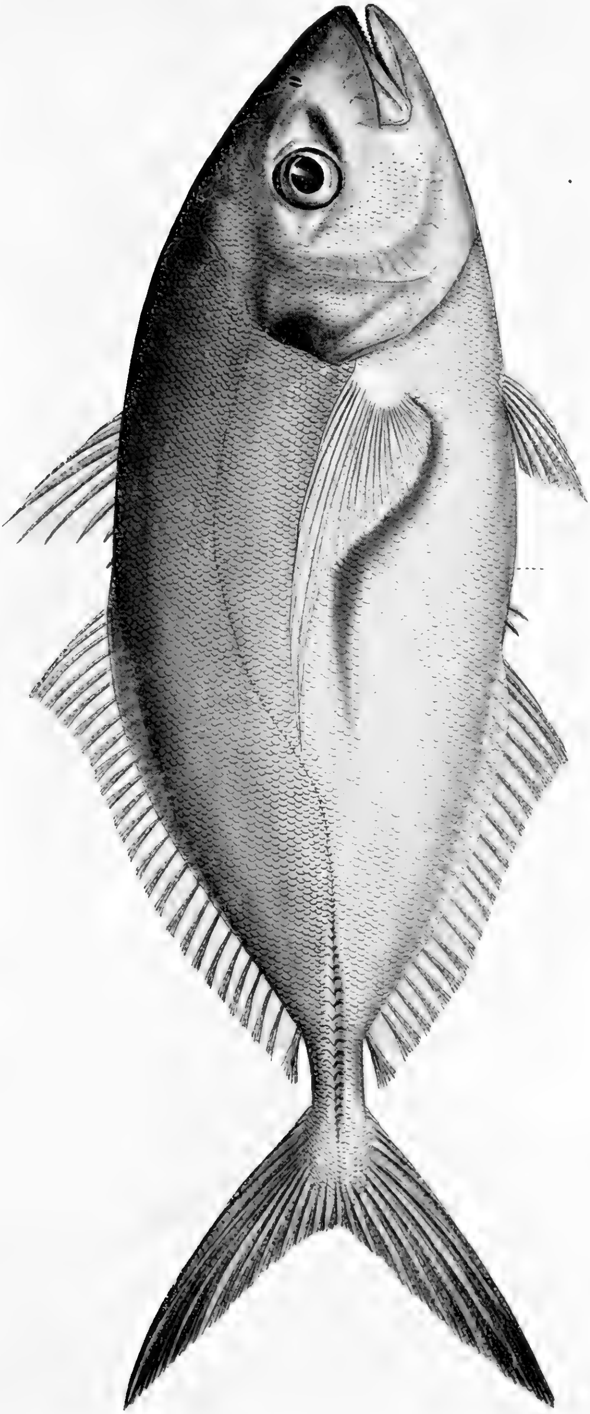
Priacanthus velabundus, sp. nov. Type, 197 mm. long, from off Burrawarra Point, New South Wales.



PHYLLIS CLARKE, del.

EXPLANATION OF PLATE XX.

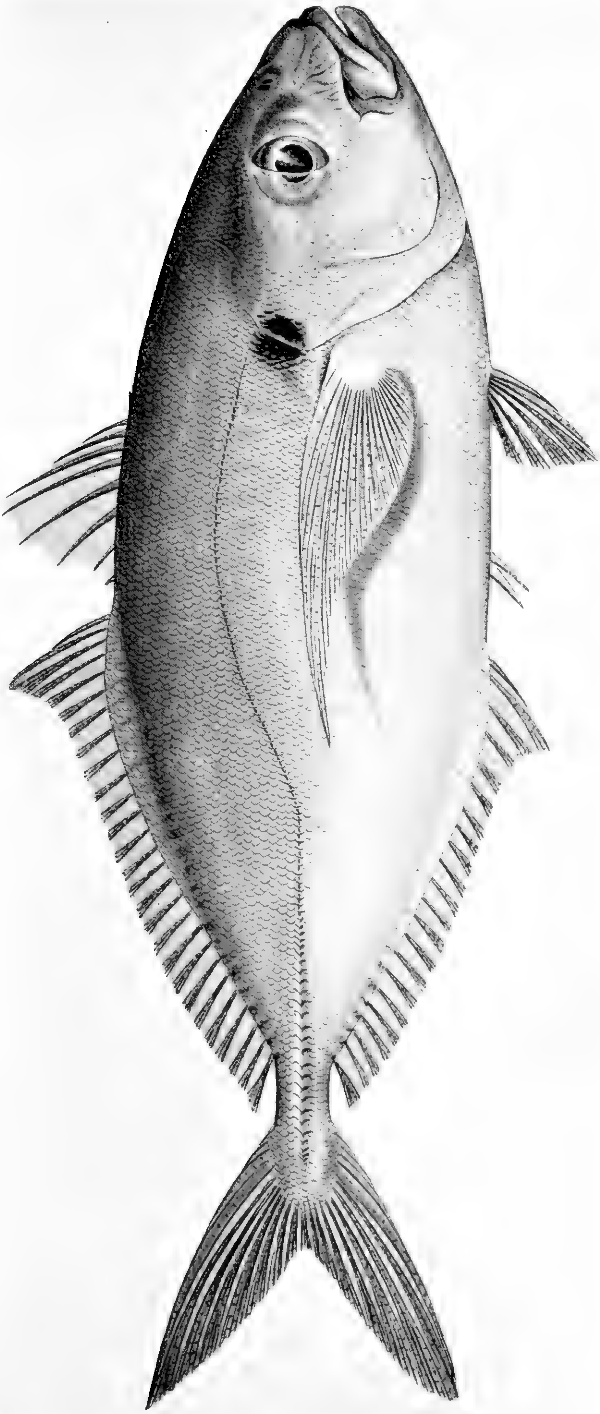
Caranx georgianus, Cuvier and Valenciennes. A specimen, 253 mm. long, from Fremantle, Western Australia.



A. R. McCULLOCH. del.

EXPLANATION OF PLATE XXI.

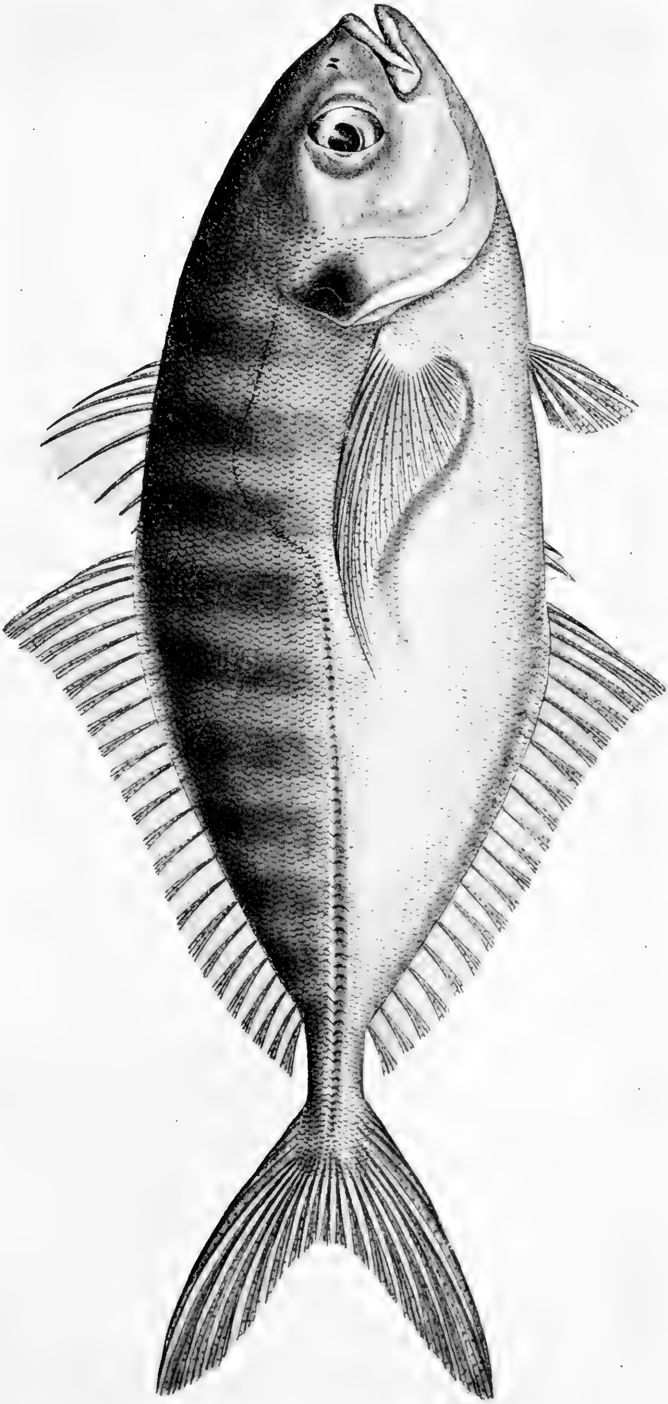
Caranx leptolepis, Cuvier and Valenciennes. A specimen 195 mm. long, from north-west of Pine Peak, Queensland.



A. R. McCulloch, del.

EXPLANATION OF PLATE XXII.

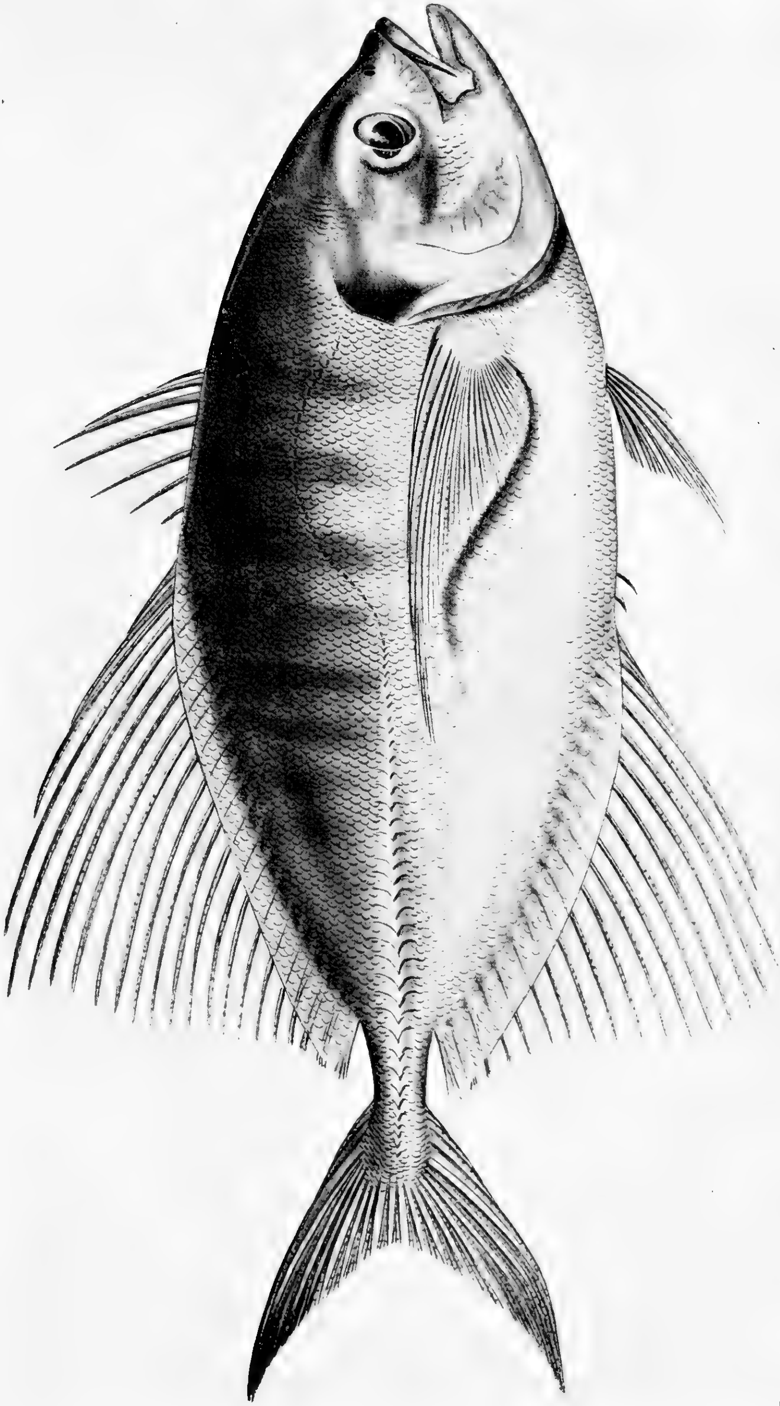
Caranx malam, Bleeker. A specimen 165 mm. long, from south-east of Double Island Point, Queensland.



A. R. McCulloch, del.

EXPLANATION OF PLATE XXIII.

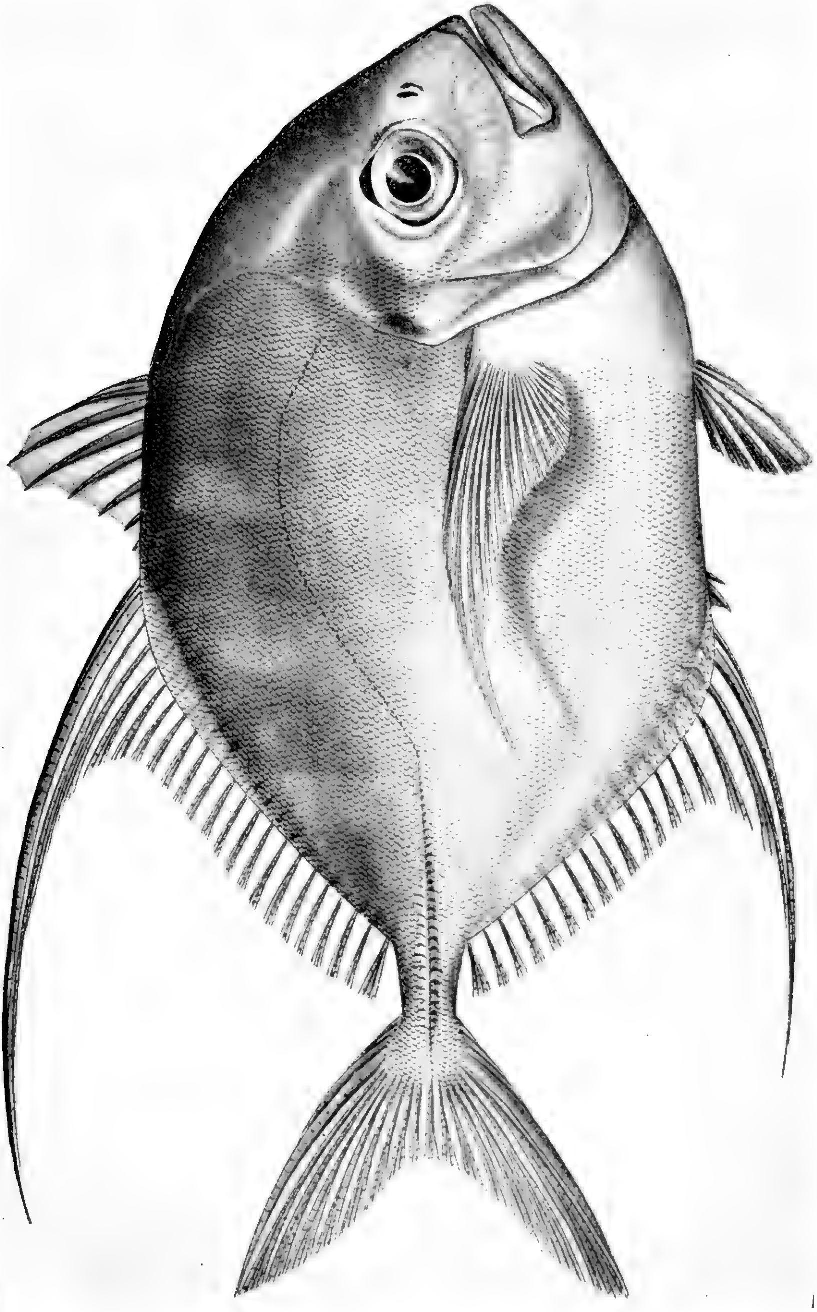
Caranx radiatus, Macleay. A specimen 203 mm. long, from Port Hedland, north-western Australia.



A. R. McCulloch, del.

EXPLANATION OF PLATE XXIV.

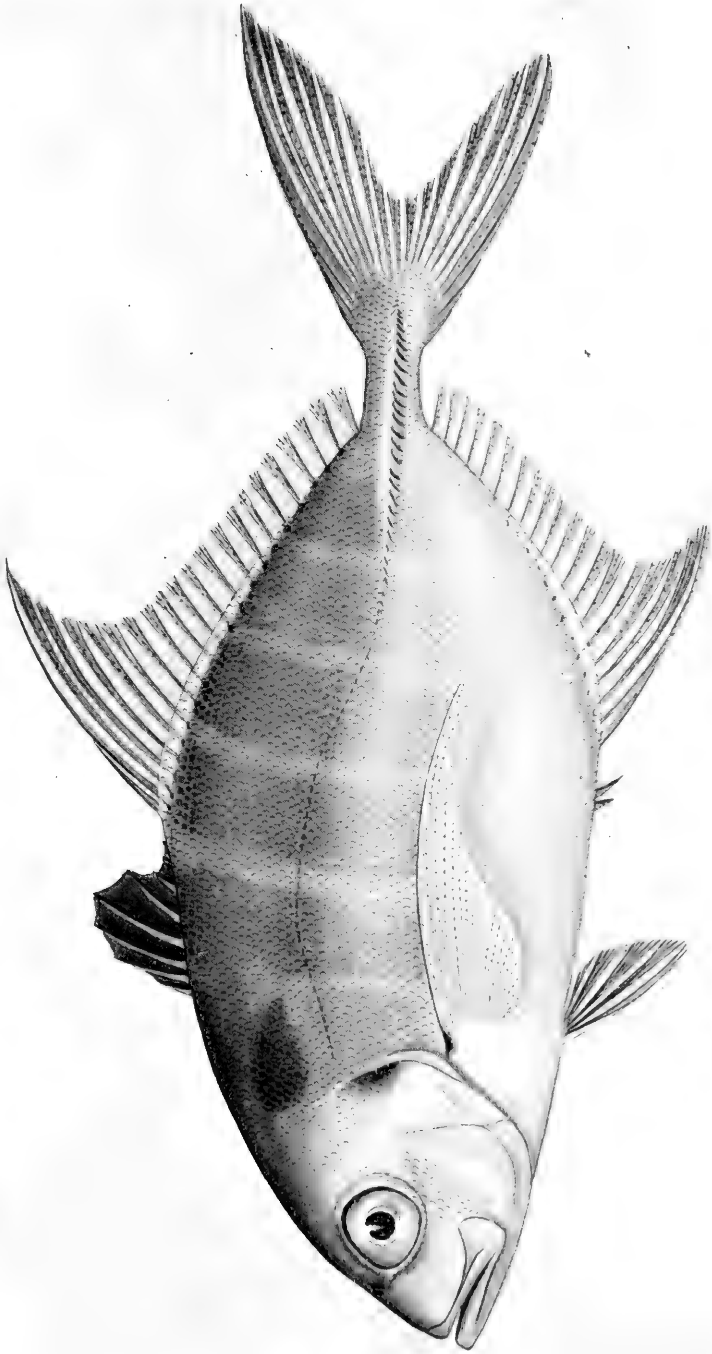
Caranx altissimus, Jordan and Seale. A specimen 130 mm. long, from southern Queensland.



A. R. McCulloch, del.

EXPLANATION OF PLATE XXV.

Caranx humerosus, sp. nov. Type, 148 mm. long, from Bustard Bay, Queensland.



A. R. McCulloch, del.

EXPLANATION OF PLATE XXVI.

Fig. 1.—*Quinquarius hendecacanthus*, sp. nov. Type, 246 mm. long, from south-west of Cape Everard, Victoria.

Fig. 2.—Head of a young specimen, 103 mm. long, from the Great Australian Bight.

Fig. 3.—Breast of the same specimen as Fig. 2.

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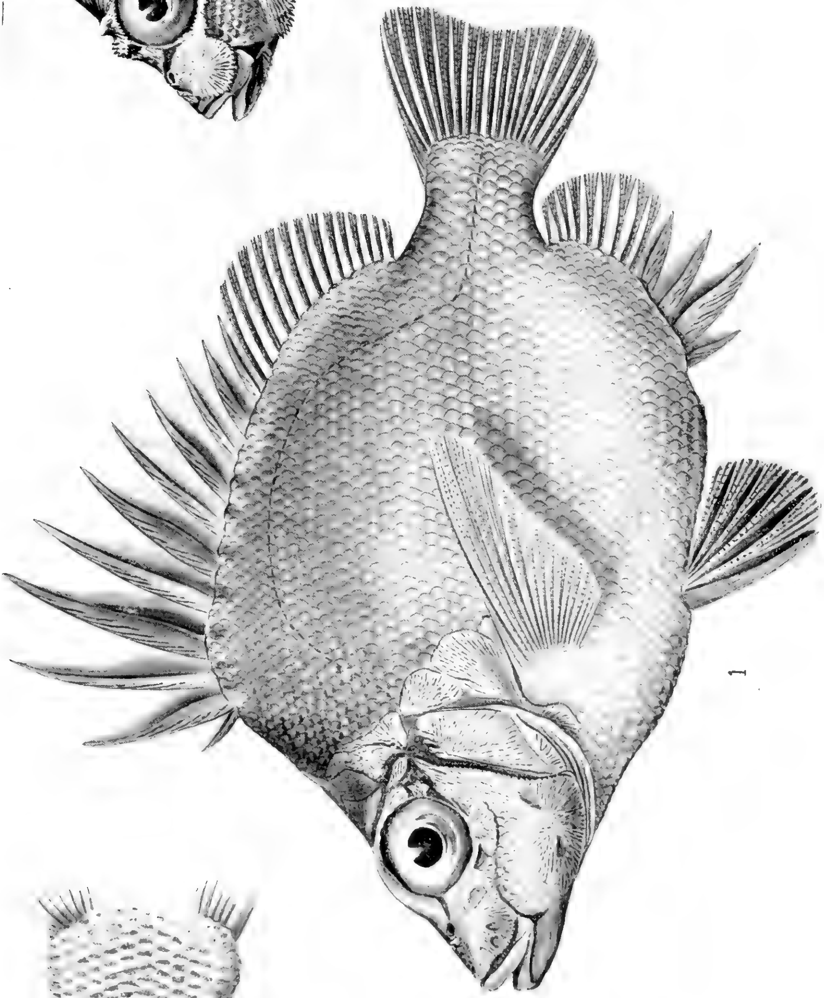

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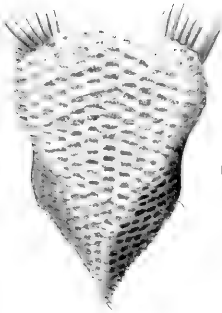

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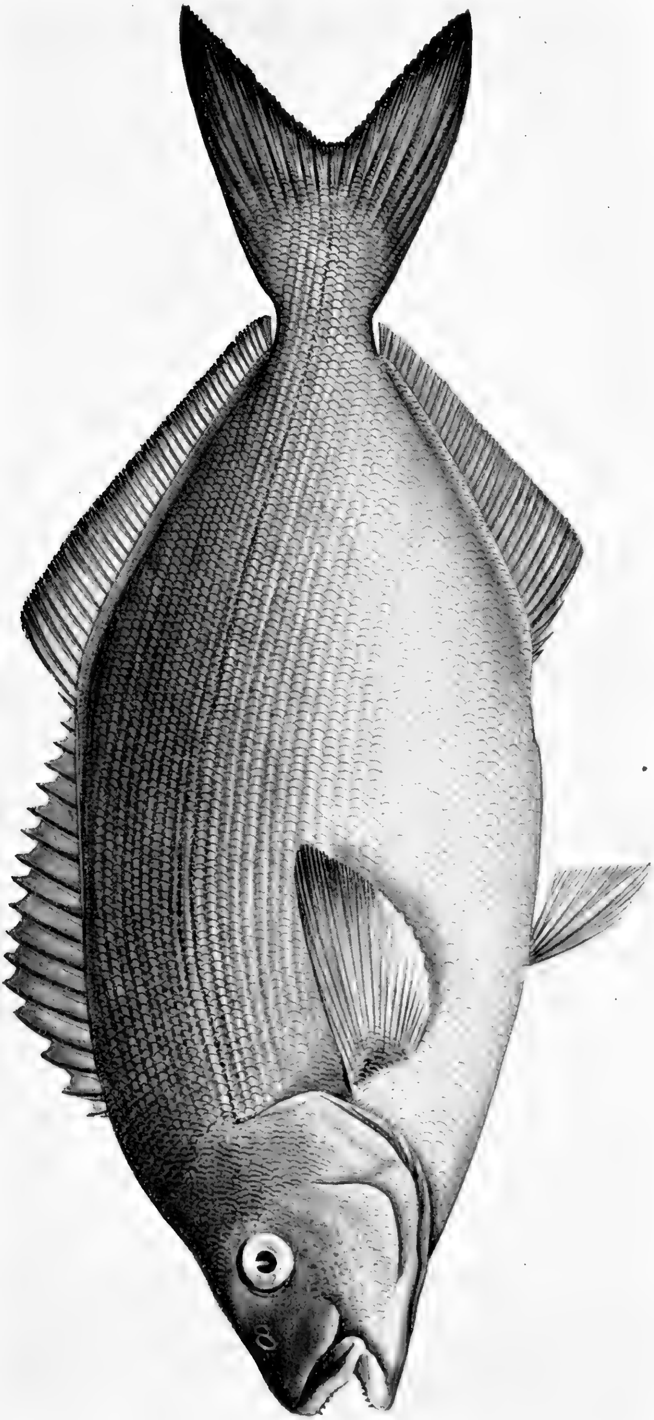
A. R. McCulloch, del.

EXPLANATION OF PLATE XXVII.

Latridopsis forsteri, Castelnau. A specimen 447 mm. long, from north-north-east of Sisters Islands, Bass Strait.



A. R. McCulloch, del.

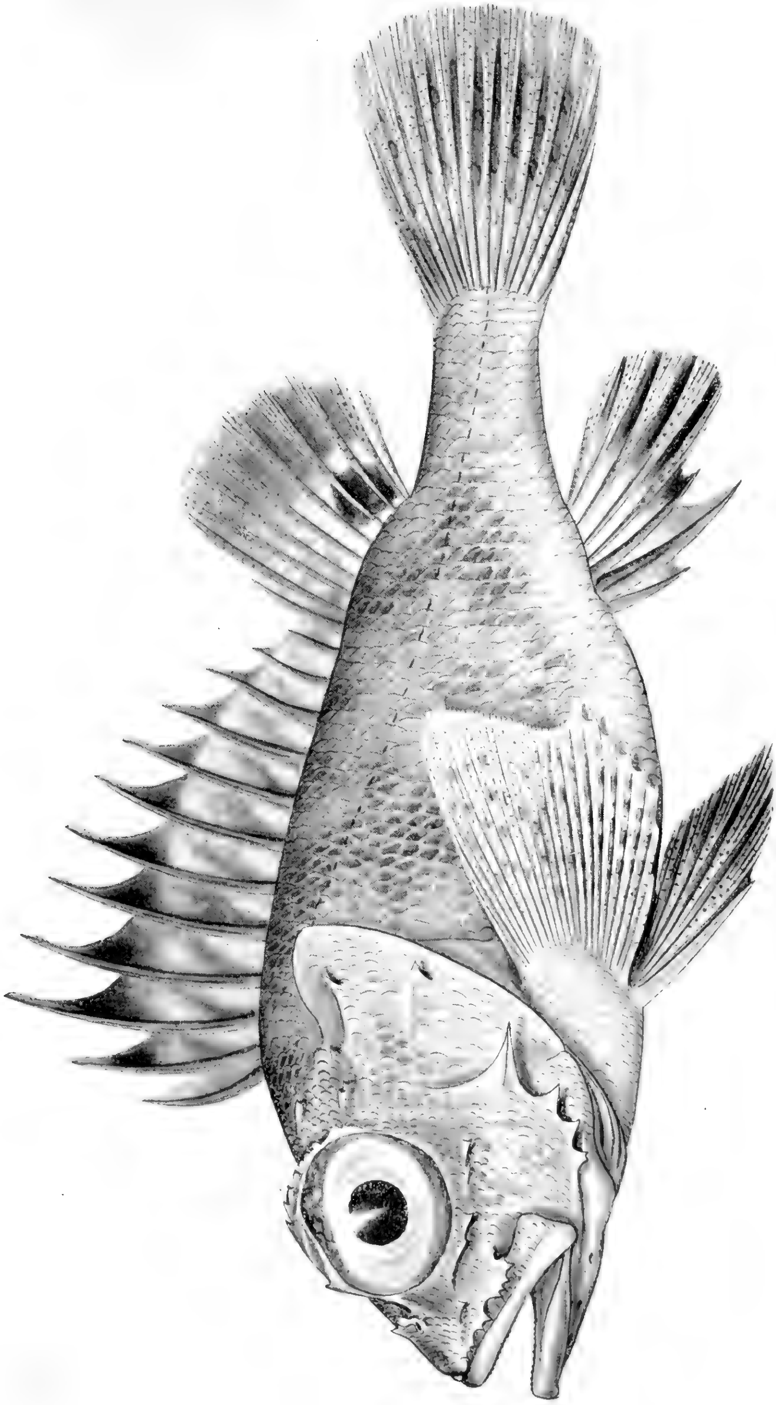
EXPLANATION OF PLATE XXVIII.

Dactylopus dactylopus, Cuvier and Valenciennes. A specimen 107 mm. long, from Shark Bay, Western Australia.

A. R. McCULLOCH. del.

EXPLANATION OF PLATE XXIX.

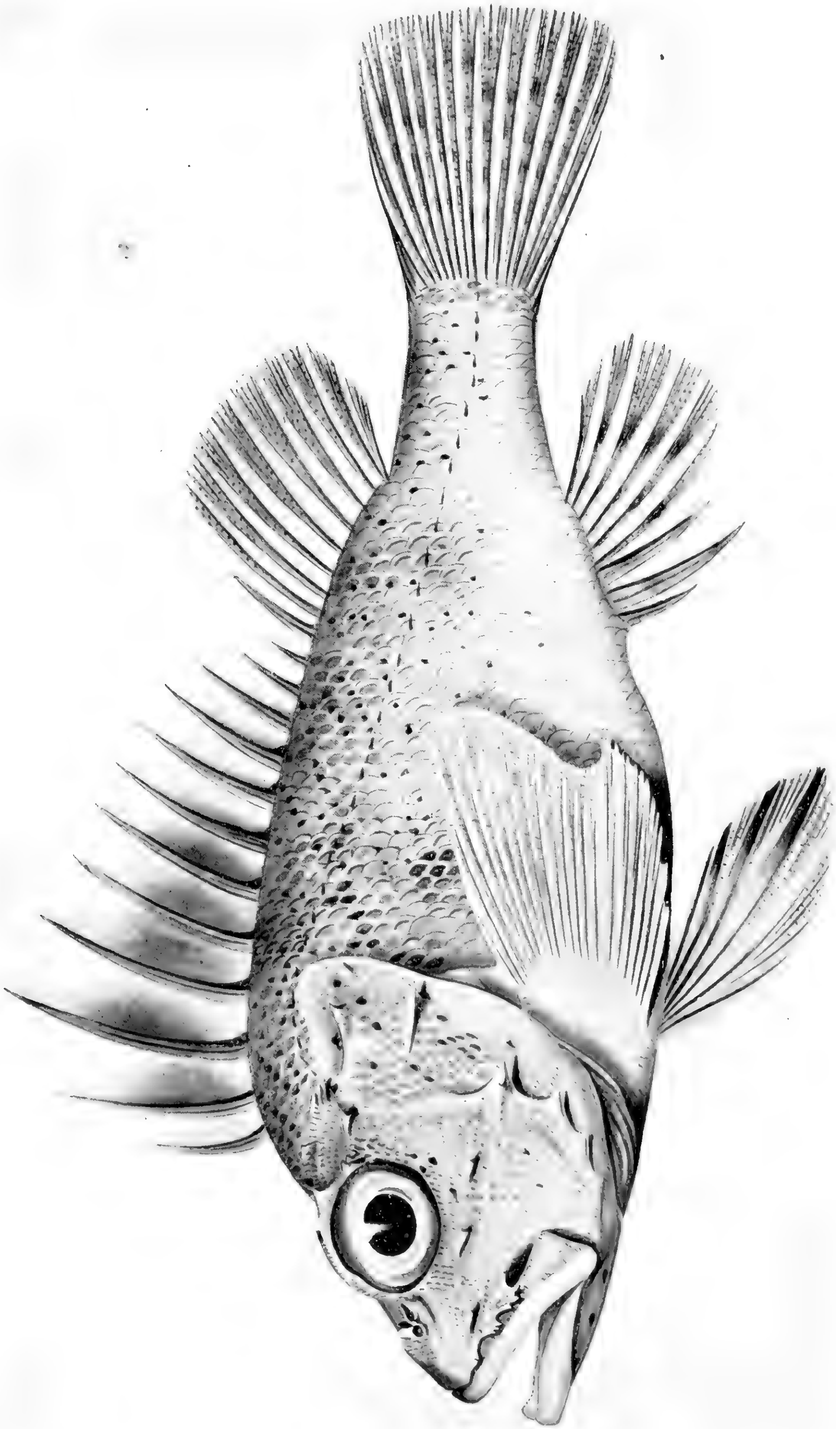
Neosebastes incisipinnis, Ogilby. A specimen 232 mm. long, from south-east of Double Island Lighthouse, Queensland.



A. R. McCulloch, del.

EXPLANATION OF PLATE XXX.

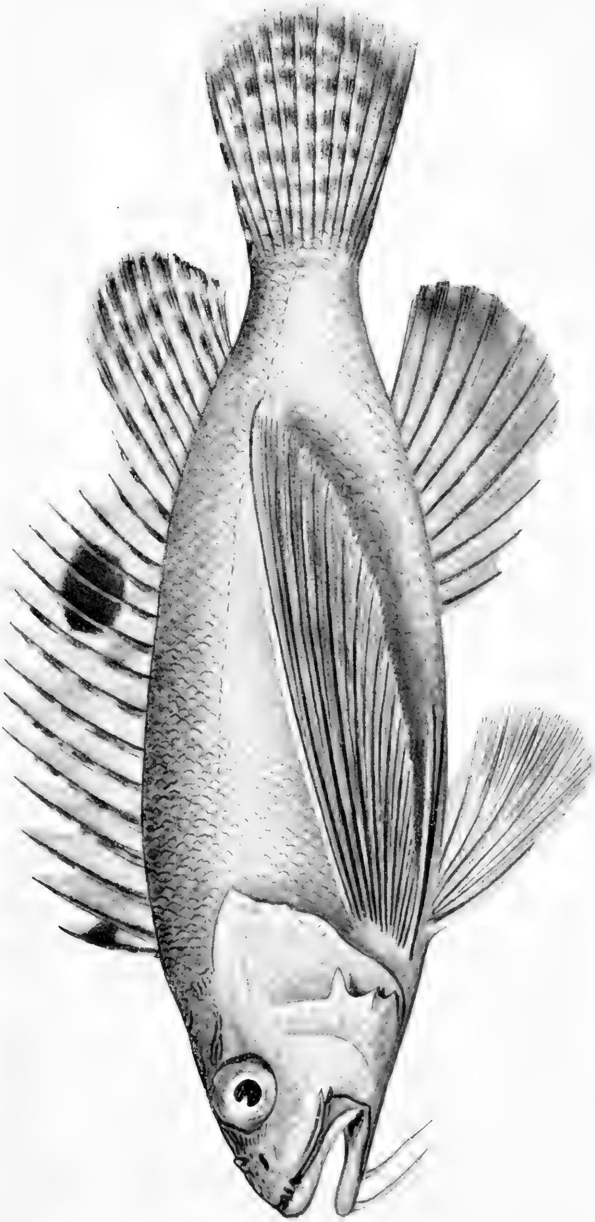
Neosebastes nigropunctatus, sp. nov. Type, 327 mm. long, from South of Kangaroo Island, South Australia.



A R McCULLOCH, del.

EXPLANATION OF PLATE XXXI.

Apistus carinatus, Bloch and Schneider. A specimen 165 mm. long, from east of Fraser Island, Queensland.



Phyllis Clarke, del.

EXPLANATION OF PLATE XXXII.

Minous versicolor, Ogilby. Type, 103 mm. long, from north-north-east of Gloucester Head, Queensland.

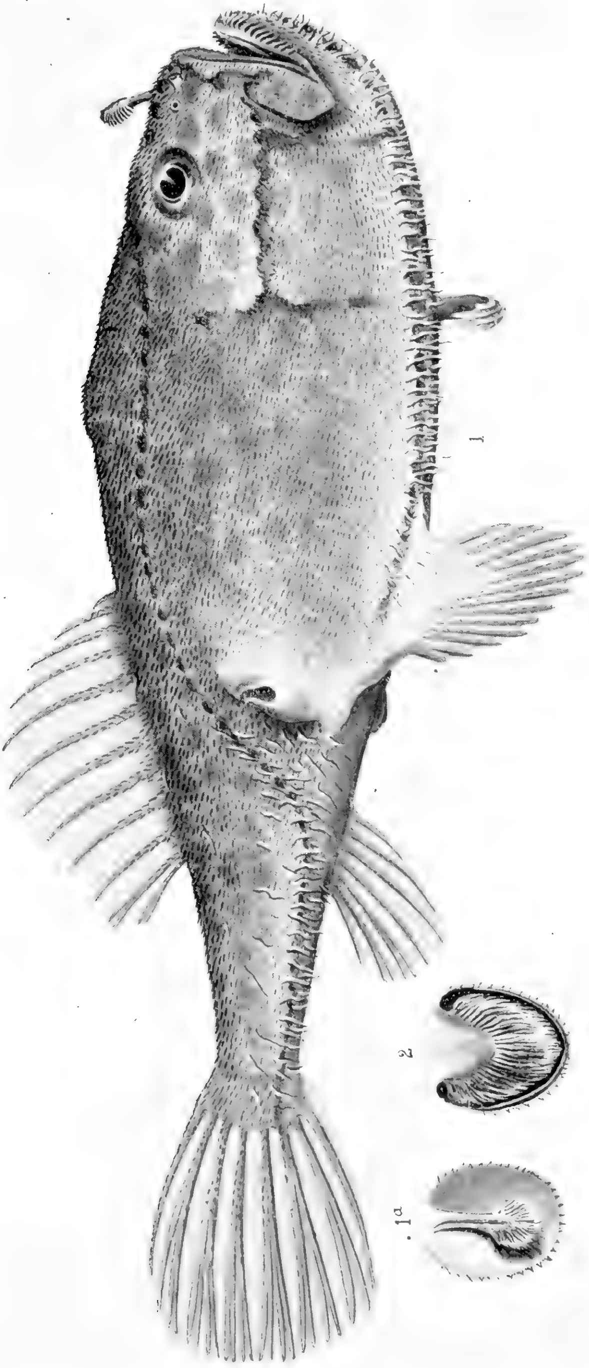
A. R. McCULLOCH, del.

EXPLANATION OF PLATE XXXIII.

Fig. 1.—*Chaunax fimbriatus*, Hilgendorf. A specimen 132 mm. long, from east of Flinders Island, Bass Strait.

Fig. 1a.—Rostral tentacle of same specimen as Fig. 1.

Fig. 2.—*Chaunax penicillatus*, sp. nov. Rostral tentacle of type, 112 mm. long, from south-west of Cape Everard, Victoria.



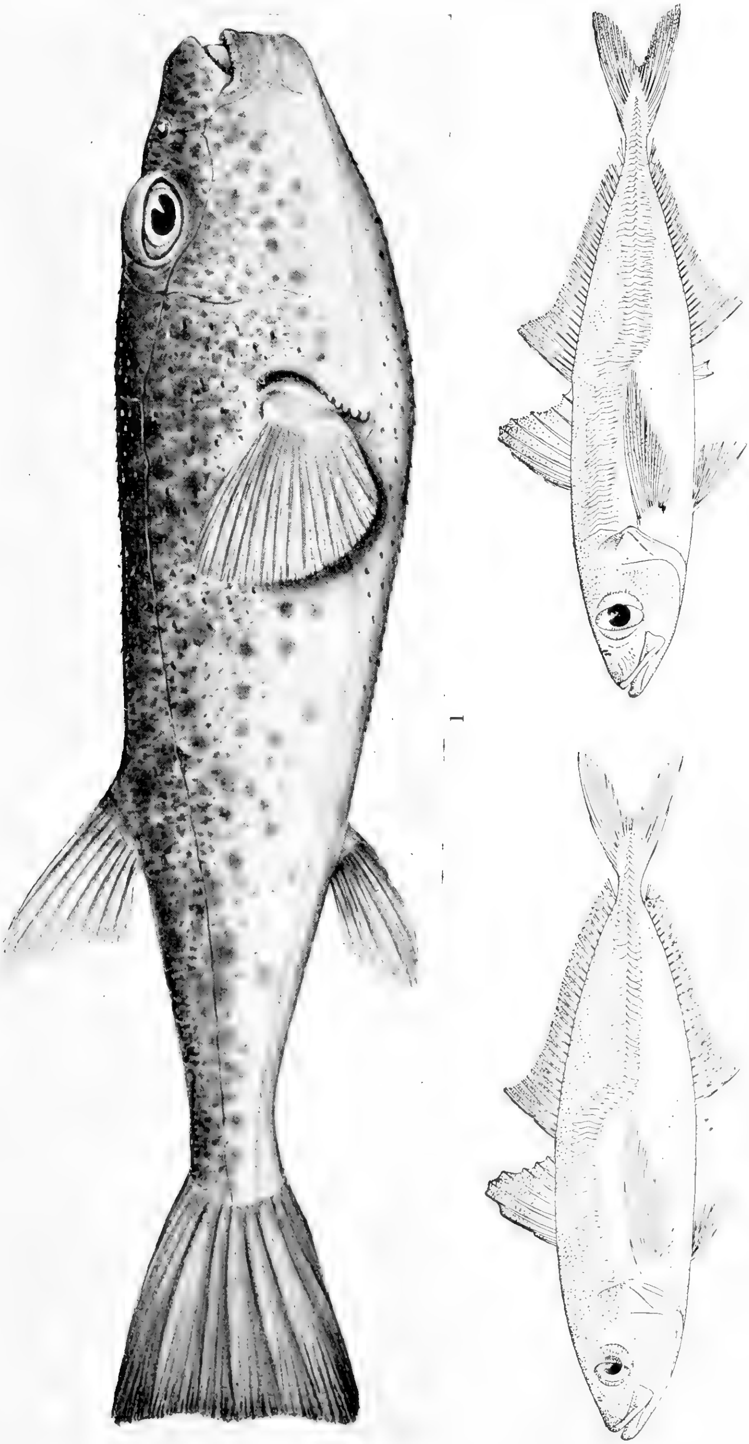
A. R. McCulloch, del.

EXPLANATION OF PLATE XXXIV.

Fig. 1.—*Spheroides tuberculiferus*, Ogilby. A specimen 220 mm. long, from between Cape Naturaliste and Geraldton, Western Australia.

Fig. 2.—*Trachurus declivis*, Jenyns. A specimen 215 mm. long, from Bondi, near Sydney.

Fig. 3.—*Trachurus novæ-zelandiæ*, Hutton. A specimen 222 mm. long, from Port Jackson.

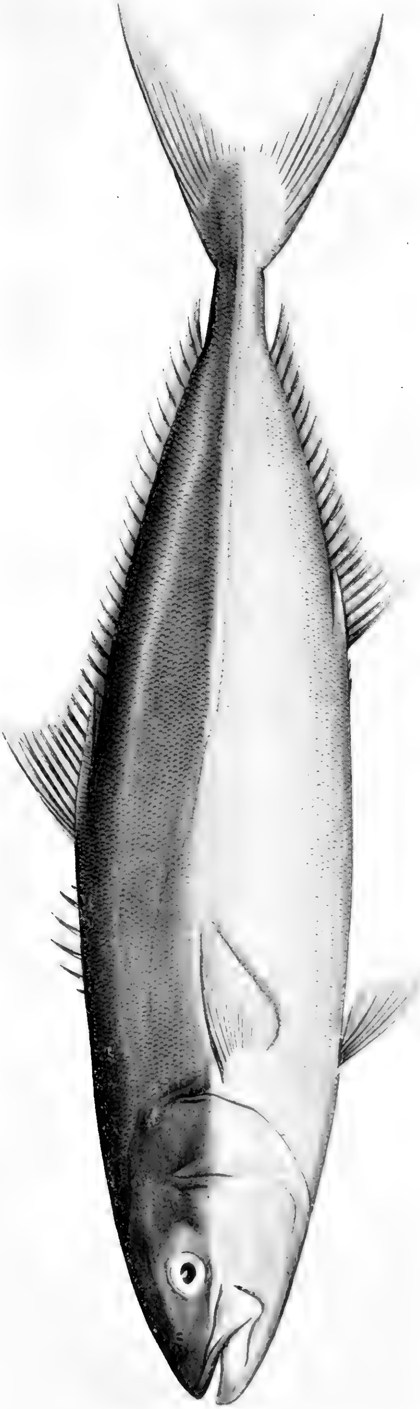


PHYLLIS CLARKE and A. R. McCULLOCH, del.

EXPLANATION OF PLATE XXXV.

Fig. 1.—*Seriola grandis*, Castelnau. A specimen 725 mm. long, from Port Stephens, New South Wales.

Fig. 2.—*Apistops caloundra*, de Vis. Type, 104 mm. long, from Caloundra, Queensland.



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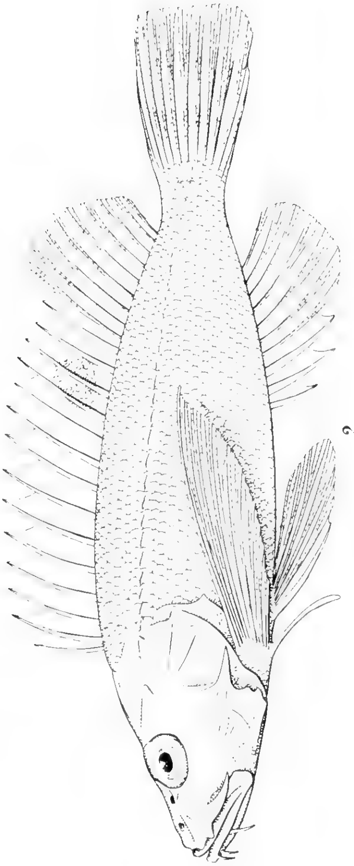

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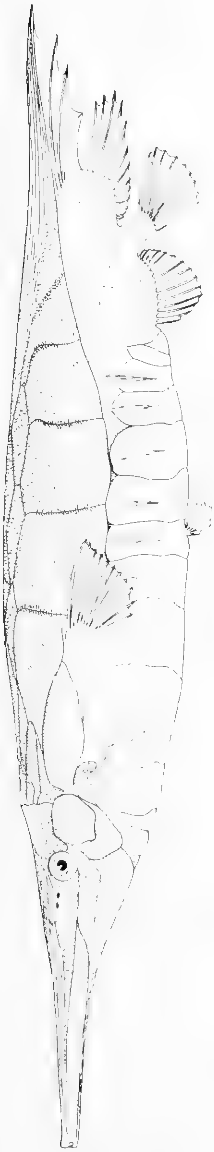
A. R. McCulloch, del.

EXPLANATION OF PLATE XXXVI.

Fig. 1.—*Centriscus cristatus*, de Vis. A specimen 224 mm. long, from south-east of Cape Capricorn, Queensland.

Fig. 2.—*Pentaroge marmorata*, Cuvier and Valenciennes. A specimen 137 mm. long, from the Swan River, Western Australia.



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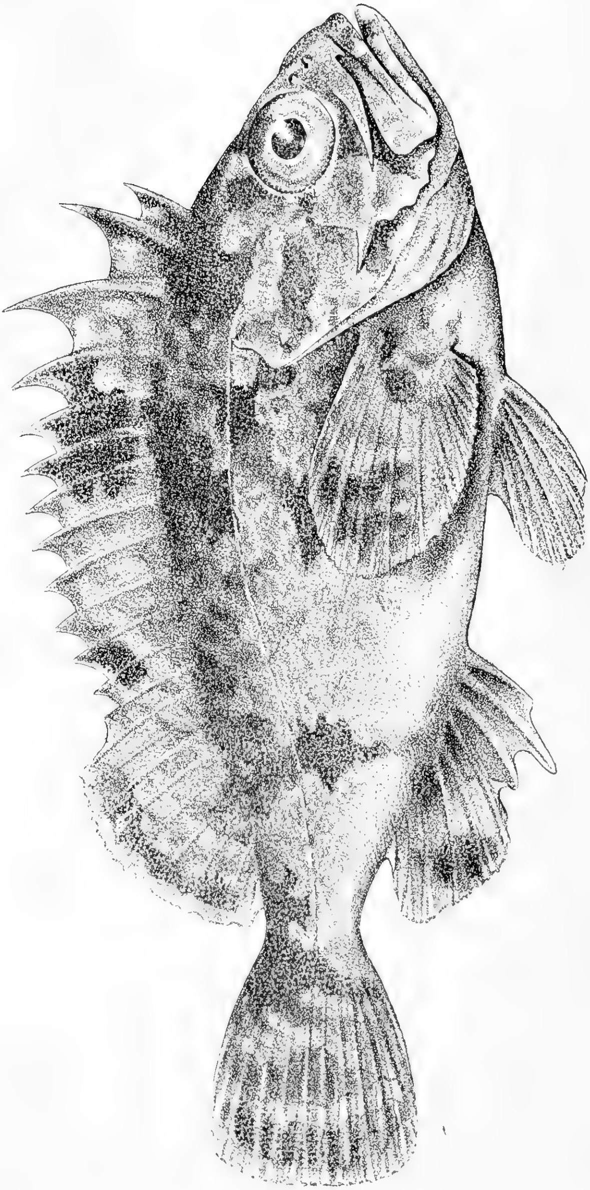

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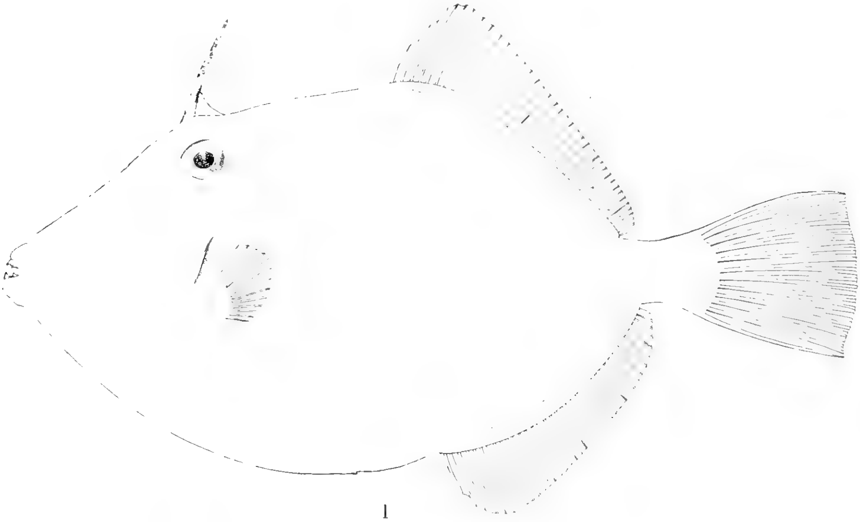
A. R. McCULLOCH, del.

EXPLANATION OF PLATE XXXVII.

Fig. 1.—*Cantherines mosaicus*, Ramsay and Ogilby. An adult specimen 413 mm. long, from Twofold Bay, New South Wales.

Fig. 2.—*Cantherines mosaicus*, Ramsay and Ogilby. A young specimen 87 mm. long, from Marsden Point, Kangaroo Island, South Australia.

Fig. 3.—*Seriola simplex*, Ramsay and Ogilby. Type, 197 mm. long, supposed to have been obtained in Port Jackson, New South Wales.



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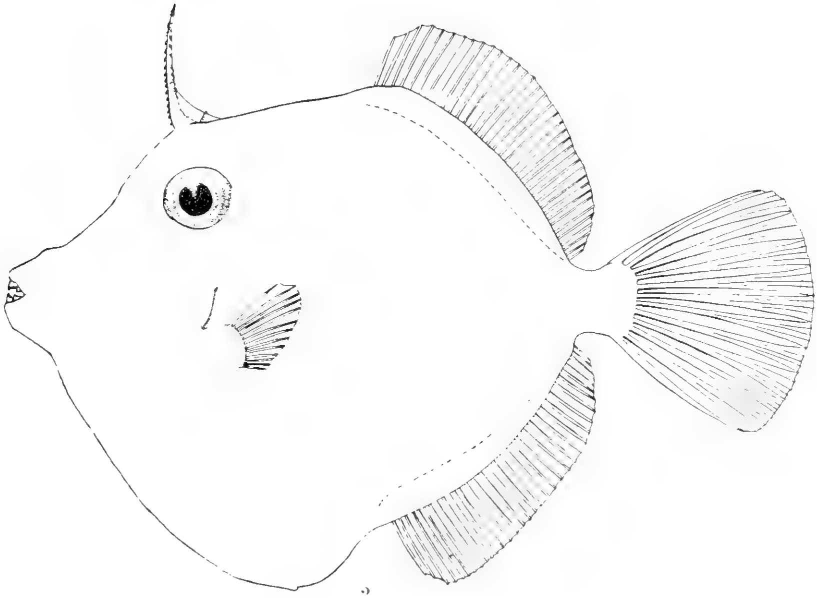

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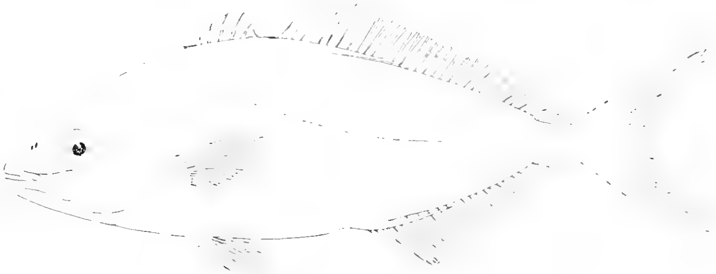


A. R. McCULLOCH, del. 3

EXPLANATION OF PLATE XXXVIII.

Lepidonotus hedleyi, sp. nov.

Fig. 1.—An elytron (× 8). *a.* the anterior margin. *e.* external margin.

Fig. 2.—A portion of its surface (× 250), showing the round pigment cells and empty cells; these lie at a lower level than the tubercles, two of which are shown.

Fig. 3.—Four tubercles from an elytron of different shapes (× 250).

Fig. 4.—A parapodium (× 20), seen from the anterior face; *gl.* Gland at the base of the dorsal cirrus.

Fig. 5.—A notopodial chæta (× 500). The pectinated frills in this and next figure are merely indicated by dotted lines.

Fig. 6.—A neuropodial chæta (× 250).

Fig. 7.—A neuropodial chæta from another aspect (× 250).

Lepidonotus willeyi, sp. nov.

Fig. 8.—An elytron (× 20), showing the limitation of the fringe to the external margin; *ant.* the anterior border.

Fig. 9.—Portion of the external margin of an elytron (× 250) showing some of the smaller tubercles.

Fig. 10.—Portion of the antero-dorsal area (× 250), with simple tubercles.

Fig. 11.—Some of the larger tubercles (× 250). *a.* from the external area; *b.* from near the middle; *c.* one of the largest in the posterior area.

Fig. 12.—A parapodium (× 35).

Fig. 13.—A notopodial chæta, with blunt apex (× 500). The pectinated frills where they cross the surface are omitted from this and the next.

Fig. 14.—One of the long notopodial chætæ, with a filamentous apex (× 500).

Figs. 15 and 15A.—Two aspects of a neuropodial chæta (× 360).

Physalidonotus rugosus, sp. nov.

Fig. 16.—The prostomium (× 10), the hinder border of which is overlapped by the first "pad" or elytral support.

Fig. 17.—An elytron (×$2\frac{1}{2}$), the characteristically elongated areola is indicated by dotted line. *Ant.*, anterior margin.

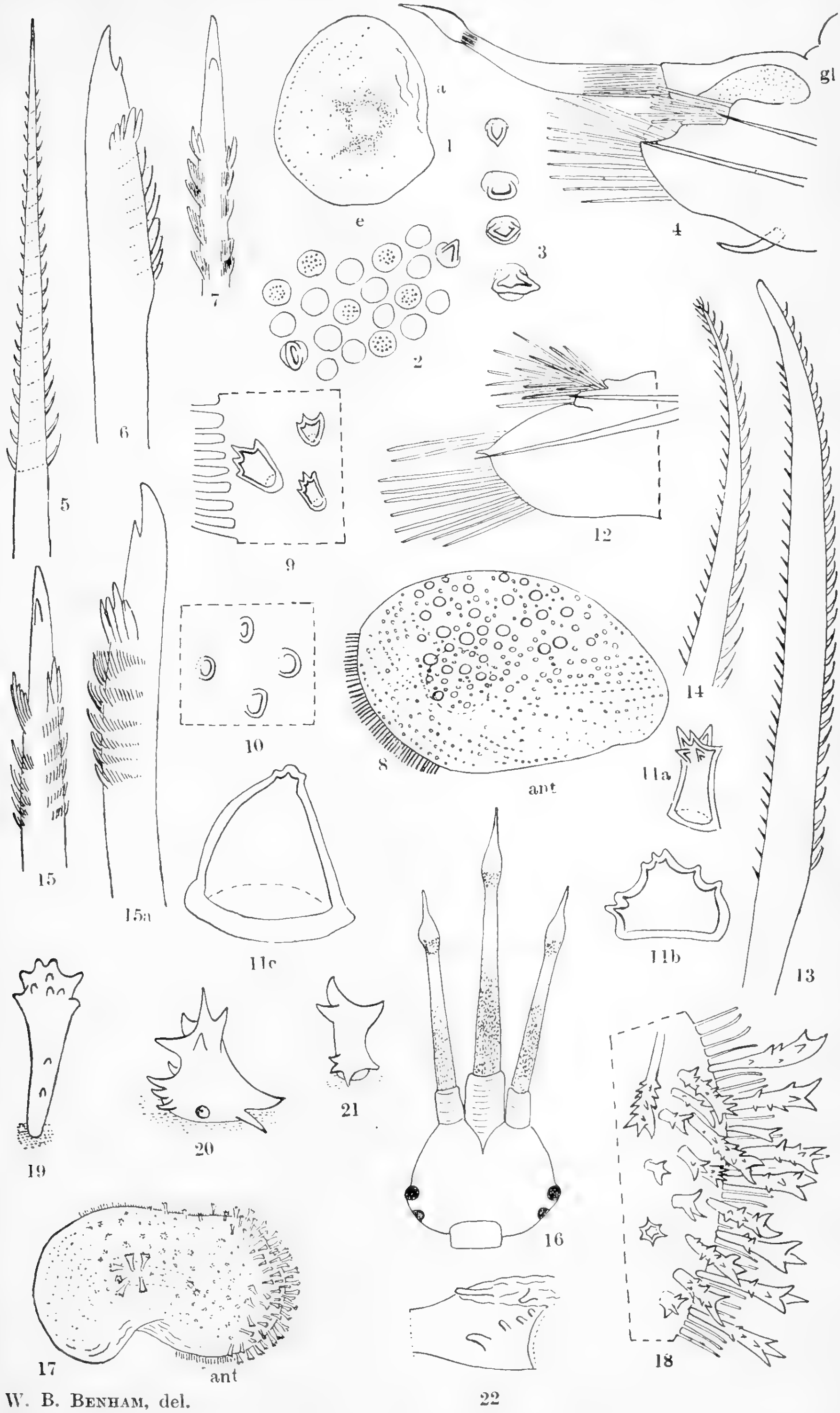
Fig. 18.—A portion of the external area and margin of an elytron (× 20).

Fig. 19.—One of the supra-areolar tubercles (× 20).

Fig. 20.—A tubercle from the posterior area (× 35).

Fig. 21.—Another tubercle from the posterior area (× 35).

Fig. 22.—Base of a cirriferous parapodium from behind to show the branchial papulæ (enlarged).



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EXPLANATION OF PLATE XXXIX.

Physalidonotus rugosus, sp. nov.

Figs. 23-24.—A neuropodial chæta from two aspects (× 90).

Fig. 25.—Two parapodia seen from above (× 5), showing the disposition of the branchial papulæ, the shape of the elytrophore, the large dorsal swelling on the cirriferous foot, and the gland at the base of the dorsal cirrus.

Physalidonotus laevis, sp. nov.

Fig. 26.—The prostomium from the side (× 10).

Fig. 27.—The prostomium from above (× 10), the posterior border is overhung by the first dorsal pad.

Fig. 28.—An elytron (× 4). The lower margin of the figure is anterior.

Fig. 29.—A portion of its external area (× 45).

Fig. 30.—A portion of its anterior area (× 45), showing the soft conical tubercles near the margin.

Fig. 31.—A couple of tubercles from the supra-areolar area (× 45).

Fig. 32.—Two parapodia (× 5), showing the arrangement of the papulæ.

Physalidonotus turritus, sp. nov.

Fig. 33.—An elytron (× 20).

Fig. 34.—The prostomium (× 10), overhung by the first dorsal pad.

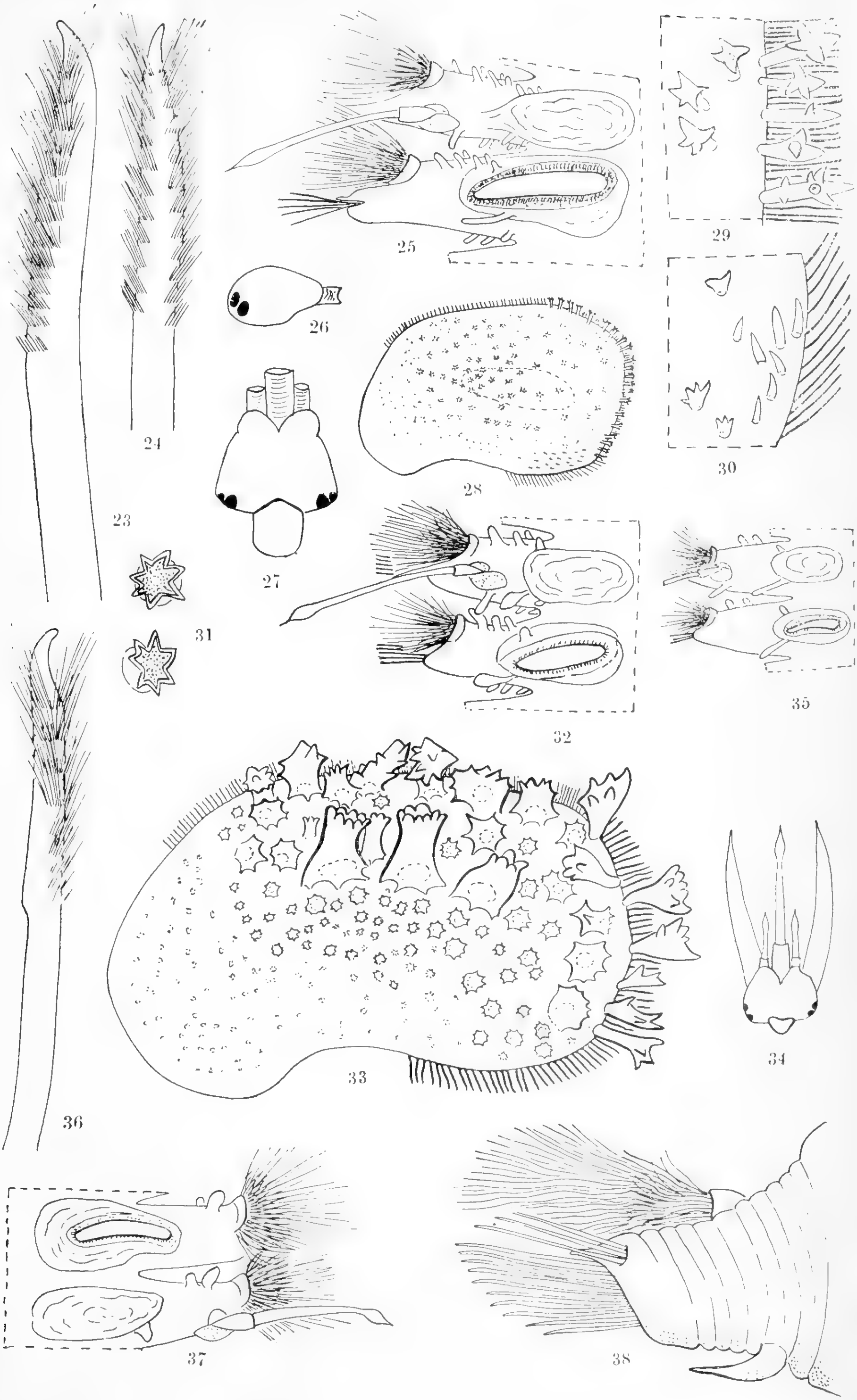
Fig. 35.—Two parapodia from above (enlarged), showing the papulæ.

Physalidonotus paucibranchiatus, sp. nov.

Fig. 16.—A neuropodial chæta (× 90), showing the constriction below the bearded region, characteristic of this species.

Fig. 37.—Two parapodia (× 10), showing the papulæ.

Fig. 38.—A parapodium (× 20), from its posterior face. This serves to illustrate the form characteristic for the genus.



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EXPLANATION OF PLATE XL.

Physalidonotus paucibranchiatus, sp. nov.

Fig. 39.—The prostomium from above (× 10).

Fig. 40.—The prostomium from the side (× 10).

Fig. 41.—An elytron (× 8). *Ant.* the anterior margin.

Fig. 42.—A portion of the surface near the external margin (× 20), showing the outer end of the areola (on the right), and the filamentous tubercles on the antero-external area.

Harmothoe etheridgei, sp. nov.

Fig. 43.—A neuropodial chæta (× 90).

Fig. 44.—A notopodial chæta (× 90).

Fig. 45.—One of the uppermost notopodial chætæ (× 90).

Fig. 46.—The prostomium and anterior segments (× 10).

Fig. 47.—The fifth elytron (× 10). *Ant.* anterior margin.

Fig. 48.—Tubercles of various shapes (× 45).

Fig. 49.—The tip of a notopodial chæta (× 360).

Fig. 50.—Tip of a neuropodial chæta (× 360).

Fig. 51.—A parapodium (× 20).

Halodora, sp. incert.

Fig. 52.—The fifth parapodium (× 35).

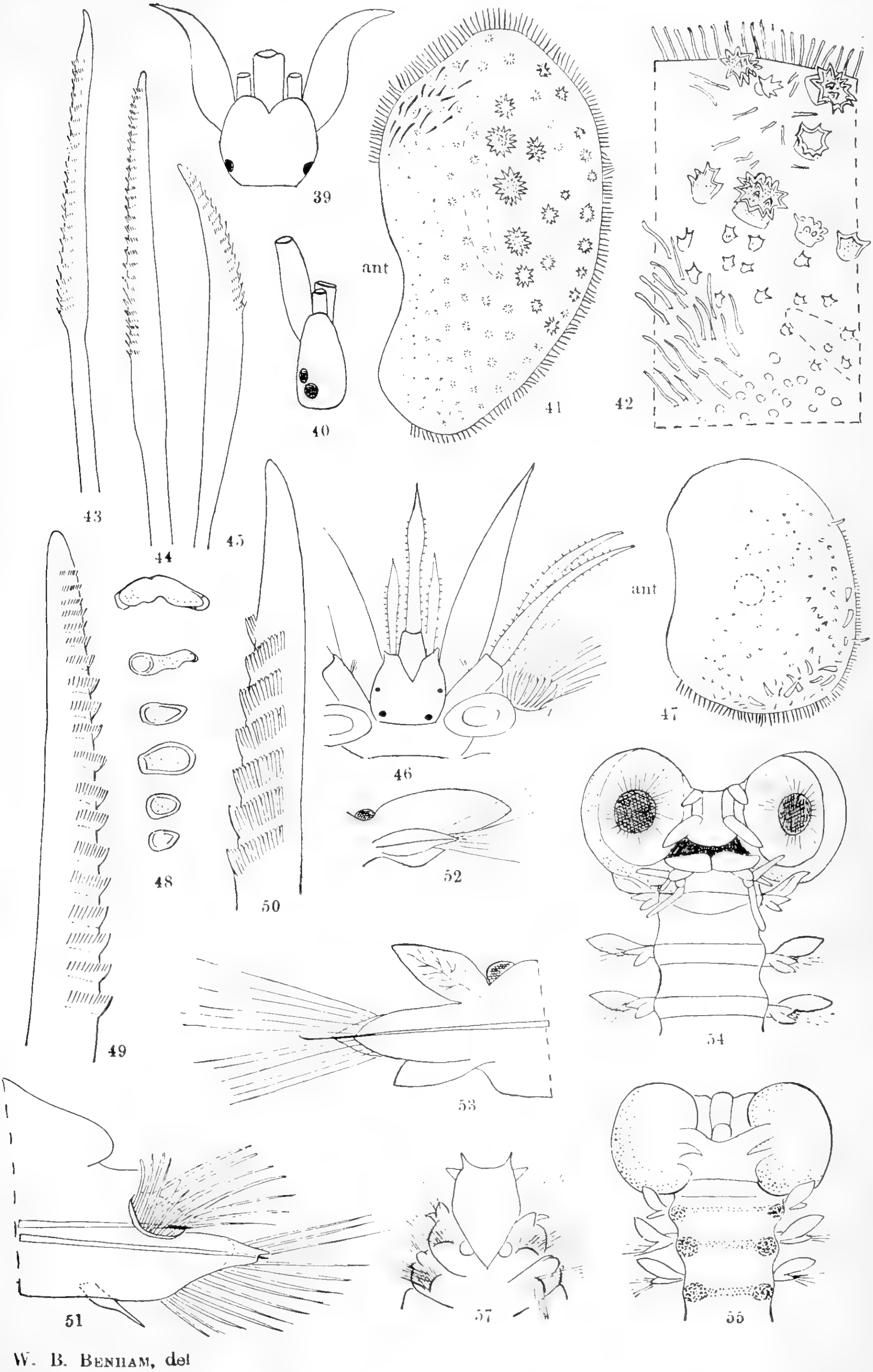
Fig. 53.—The fourteenth parapodium (× 35).

Fig. 54.—The head, ventral view (enlarged).

Fig. 55.—The head, dorsal view (enlarged).

Nephthys macrura, Schmarda.

Fig. 57.—The head (× 8), from a camera drawing.



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EXPLANATION OF PLATE XLI.

Halodora, sp. incert.

Fig. 56.—The middle region of a jointed chæta (× 360).

Stauronereis australiensis, M'Intosh.

Fig. 58.—The head, dorsal view (enlarged).

Fig. 59.—Head, dorsal view (more enlarged), with the peristomial flap turned back to show the slit-like entrance to the nuchal organ on each side.

Fig. 60.—Head, ventral view (enlarged).

Fig. 61.—Six segments (× 4), with the parapodia of one side; the dorsal cirrus on the penultimate segment has been cut across to show the characteristic flattening in this species.

Fig. 62.—The 36th parapodium (× 20).

Fig. 63.—A sub-acicular chæta from the 36th parapodium (× 250).

Fig. 64.—A sub-acicular chæta from the 10th parapodium (× 250).

Fig. 65.—The upper series of jawlets of the right side, as seen *in situ* (× 20).

Fig. 66.—Isolated jawlets (× 35), *a*, a group of jawlets of the outer and inner series; *b*, one of the jawlets of the inner series; *c*, anterior jawlets of the inner series; *d*, a triangular piece which rests on the base of the outer and inner series.

Eunice bassensis, M'Intosh.

Fig. 67.—The head from the side (× 8).

Fig. 68.—The anterior end (× 8); the tentacles of the right side and the parapodia of the left have been omitted.

Fig. 69.—A segment from the side (× 8) to show the relatively small size of the gill at its maximum development.

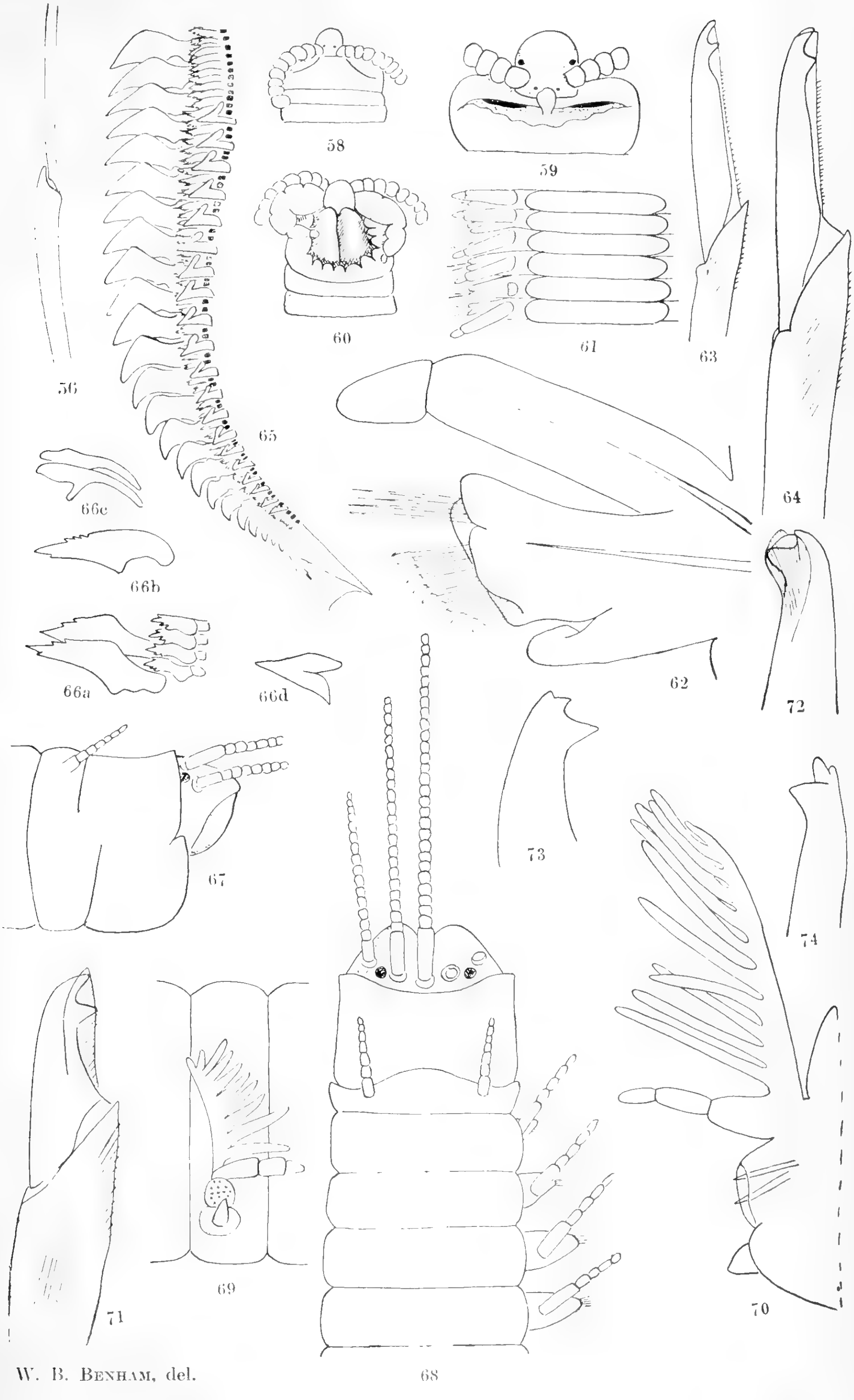
Fig. 70.—The twelfth parapodium (× 20), from a well preserved specimen. (*Cf.* fig. 78).

Fig. 71.—A chæta from the 40th parapodium (× 360).

Fig. 72.—The tip of an acicular chæta from the 40th foot (× 250); it is bidentate, and the wings are present.

Fig. 73.—A tridentate acicular chæta from a posterior foot (× 250). The wings are omitted.

Fig. 74.—A tridentate acicular chæta from the 53rd foot (× 250), the wings are omitted.



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EXPLANATION OF PLATE XLII.

Eunice bassensis, M'Intosh.

Fig. 75.—The upper jawlets disarticulated (× 20).

Fig. 76.—The "fangs" or basal members of the upper series of jawlets (× 20).

Fig. 77.—The left lower jaw, upper surface (× 20).

Fig. 78.—The twelfth parapodium from a much contracted specimen, showing the stouter form of the dorsal cirrus and the shortened gill filaments, as compared with Fig. 70.

Eunice pycnobranchiata, M'Intosh.

Fig. 79.—The eleventh parapodium (×20); the gill shows the characteristically thickened filaments; the chætæ are diagrammatically indicated.

Fig. 80.—Side view of the head (× 4), to show the deep incision between the lower and the lateral lips; the upper edge of the former is somewhat everted, so as to be visible from above.

Lumbriconereis gulielmi, sp. nov.

Fig. 81.—The head, dorsal view (× 4).

Fig. 82.—The head, ventral view (× 4).

Fig. 83.—The head, side view (× 4).

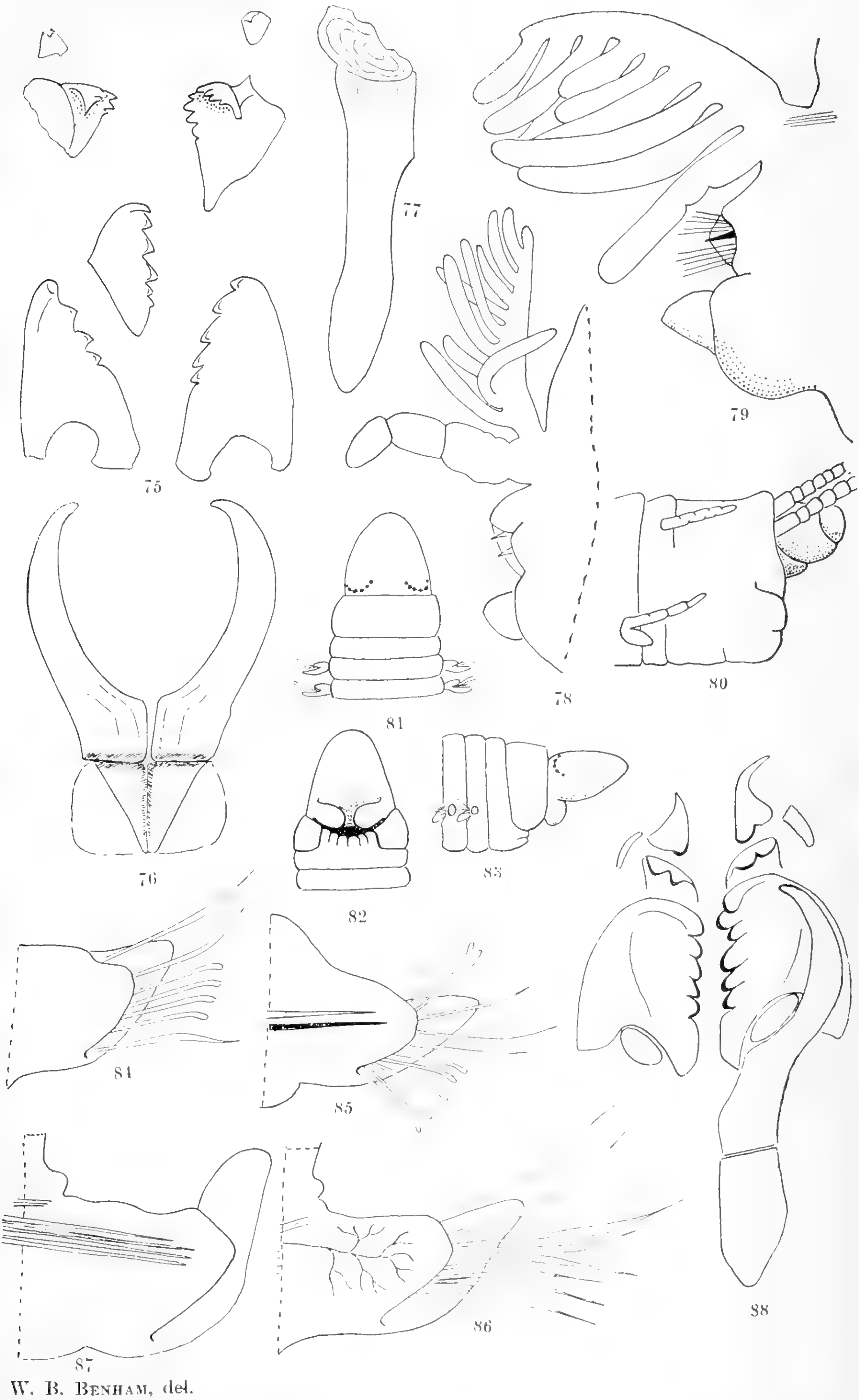
Fig. 84.—The 55th parapodium (× 20).

Fig. 85.—The 125th parapodium (× 20).

Fig. 86.—The 29th parapodium (× 20); blood vessels are indicated in the anterior lip.

Fig. 87.—The 29th parapodium of another individual (× 20), in which the large posterior lip has been pressed upwards by contact with the tube in which it had been preserved. Chætæ omitted.

Fig. 88.—The upper jawlets (enlarged), drawn *in situ* from above. The left "fang" is omitted.



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EXPLANATION OF PLATE XLIII.

Lumbriconereis gulielmi, sp. nov.

Fig. 89.—A series of left parapodia from above (× 7), from the 10th, 25th, 45th, and a posterior segment, in order to show the changes in form and development of the lips and the arrangement of the chætæ.

Fig. 90.—One of the middle chætæ from the 125th parapodium (× 70).

Fig. 91.—The lowermost chæta from the 29th foot (× 70).

Fig. 92.—An upper hook from the 125th parapodium (× 250).

Fig. 93.—One of the lower hooks from the 125th foot (× 250).

Fig. 94.—The uppermost chæta from the 10th parapodium (× 70).

Oenone haswelli, sp. nov.

Fig. 95.—The head from above (× 4).

Fig. 96.—The head from above after the peristomial flap has been slit up and turned aside to show the three small tentacles which lie below it (× 4).

Fig. 97.—The head from below (× 4).

Fig. 98.—The anterior end of another specimen in which the prostomium is retracted below the peristomial flap (× 4).

Fig. 99.—The 55th parapodium (× 20).

Fig. 100.—A sub-acicular chæta from a posterior parapodium (× 250).

Fig. 101.—An upper hook or acicular chæta from a posterior foot with the notch separating the two teeth terminal in position (× 360).

Fig. 102.—A lower acicular chæta from the same foot (× 360). The proximal tooth is here laterally situated; the wing is broken.

Lysarete australiensis, sp. nov.

Fig. 103.—The head from above (× $2\frac{1}{2}$). The three tentacles lie backwardly, directed in a groove.

Fig. 104.—The median region of the first three segments and part of the prostomium (× 5). The tentacles are cut away to show the posterior pair of eyes, and the excavation in the three segments in which the tentacles lie.

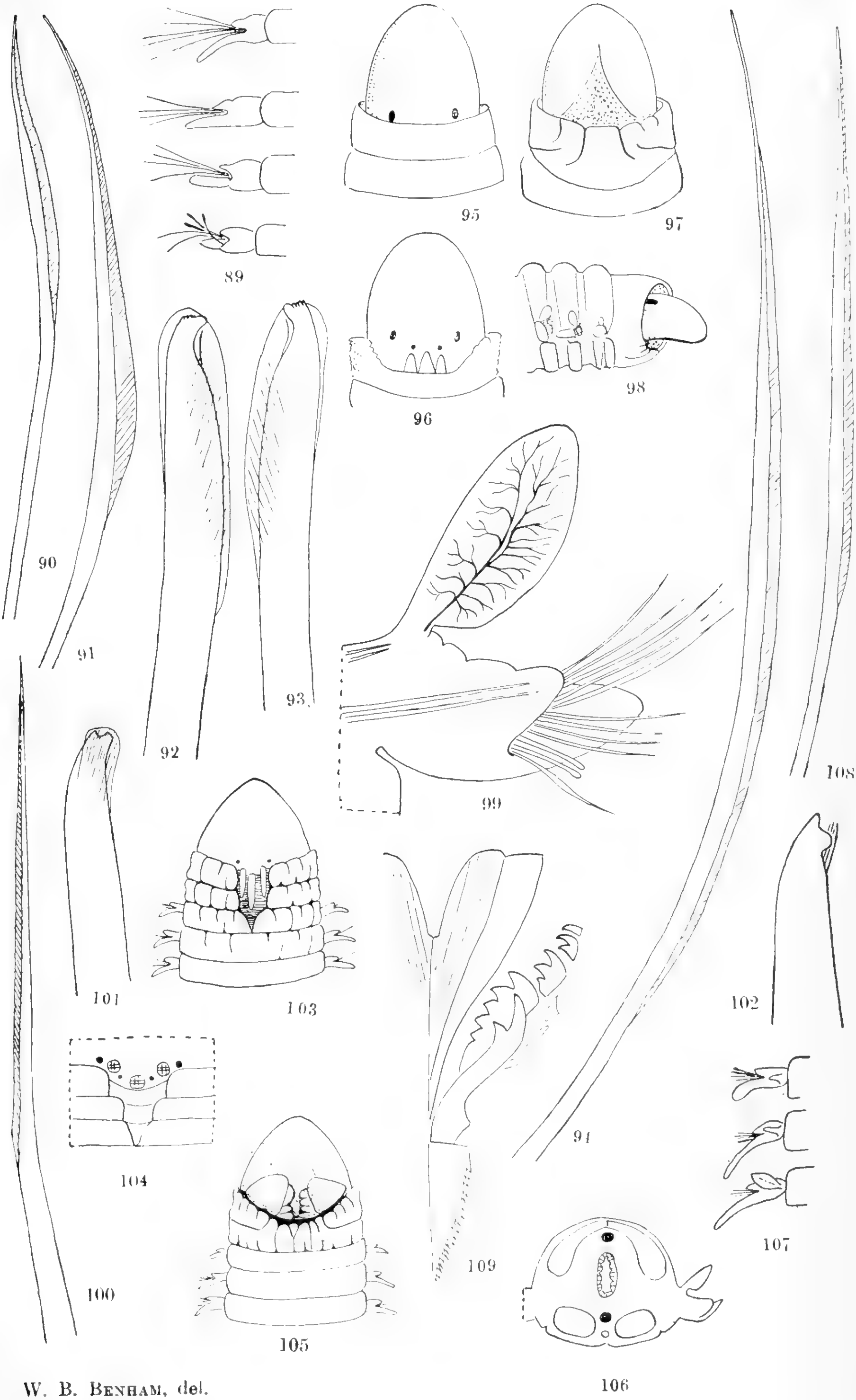
Fig. 105.—The head from below (× $2\frac{1}{2}$).

Fig. 106.—A transverse section through the body (× 2). The parapodium of the left side has been omitted.

Fig. 107.—The parapodia from segments 4, 16 and 37 (× 4) from above.

Fig. 108.—A supra-acicular chæta from the 10th parapodium (× 5).

Fig. 109.—The lower jaw and upper series of jawlets of the right side as seen *in situ* (× 5).



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EXPLANATION OF PLATE XLIV.

Lysarete australiensis, sp. nov.

Fig. 110.—The 10th parapodium (× 13).

Fig. 111.—The 21st parapodium (× 13).

Fig. 112.—The 66th parapodium (× 13), the fully developed condition; the chætæ are cut short; blood vessels are indicated in the dorsal cirrus.

Oenone haswelli, sp. nov.

Fig. 113.—The series of upper jawlets, disarticulated (× 17).

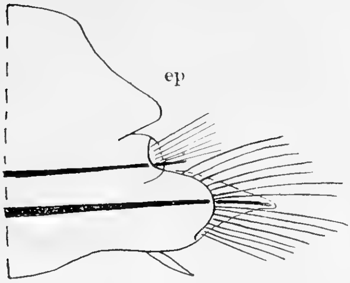
Scalisetosus australiensis, sp. nov.

Fig. 114.—View of the imperfect head (enlarged), *ph.*, the partially everted pharynx.

Fig. 115.—Parapodium, posterior face (× 20), *ep.*, elytrophore overhanging the notopodium.

Fig. 116.—A neuropodial chæta, from the upper part of the bundle (× 250). The very delicate frills are indicated in this and following figure by oblique lines.

Fig. 117.—A neuropodial chæta from the lower part of the bundle (× 250). The notopodial chæta are similar to this.



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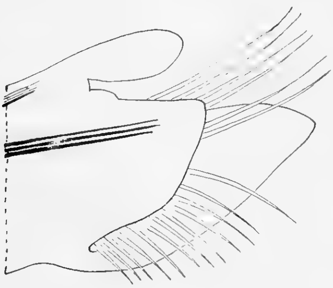
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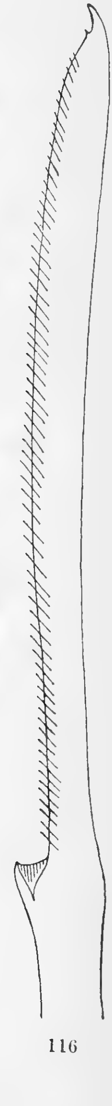
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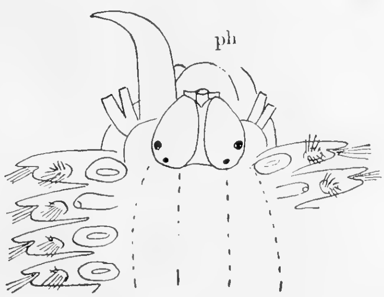

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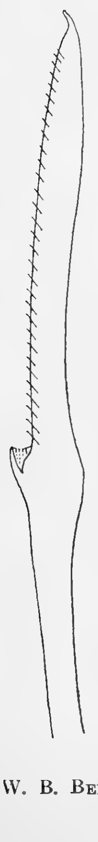
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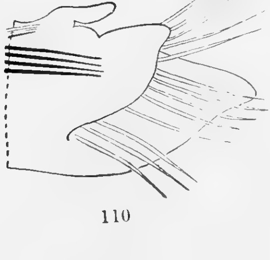
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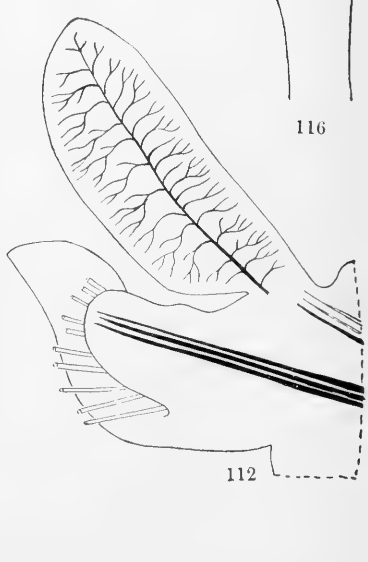
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EXPLANATION OF PLATE XLV.

Thalanessa oculata, M'Intosh.

Fig. 118.—View of an elytron from about the middle of the body, *in situ* (enlarged), showing the typical shape and its relation to the parapodia and segments. *ep.* elytrophore of this elytron. *ep′* elytrophores of the preceding and of the succeeding segments, one of the latter being covered by the elytron.

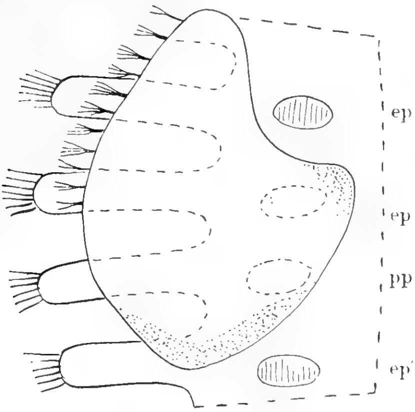
Fig. 119.—A parapodium from the mid-body (× 90). *a*, ciliated pad ; *b*, cirriform process of the notopod. The dotted structures are the characteristic membranous lips on the neuropod ; the chætæ are diagrammatically represented in that no attempt is made to give their shape.

Fig. 120.—Dorsal view of a normal, mid-body segment of the left side. *nrp.*, neuropod ; *ntp.*, notopod. The filamentous lip process of the latter is bent backwards.

Fig. 121.—Dorsal view of the first parapod of the left side (enlarged), showing the great development of the membranous lip. *p*, a horny capsule, many of which are attached to the chætæ along the body. (? egg capsule of mollusc).

Fig. 122.—Dorsal view of the fourth parapod, showing the digitiform processes on the notopod ; the two membranous lips of the neuropod are bent backwards.

Fig. 123.—The fourth parapod of the right side (× 90). *a*, ciliated pad ; *b*, group of digitiform processes on the notopod. The dotted structures are the membranous lips of the neuropod.



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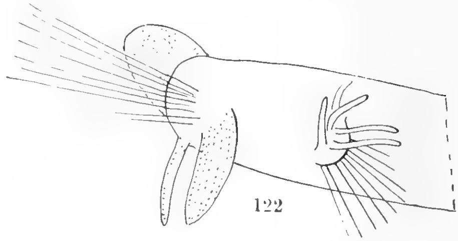
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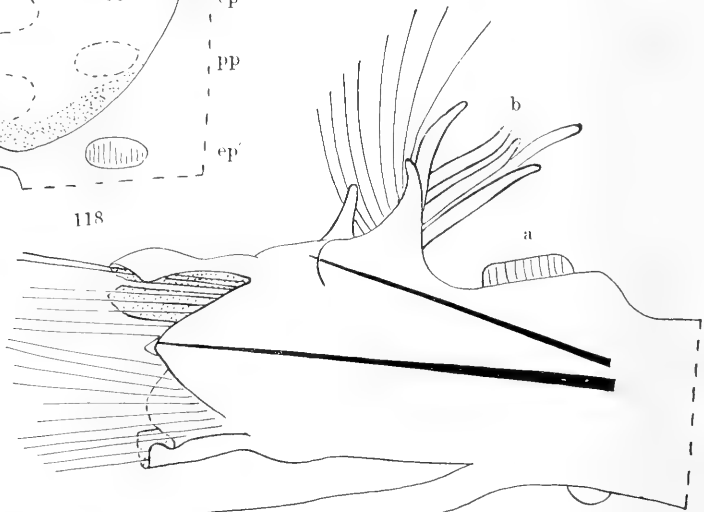

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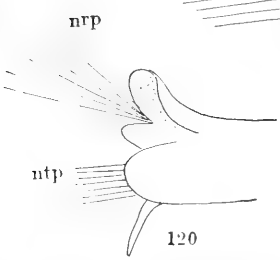

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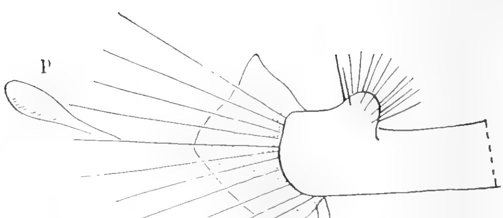

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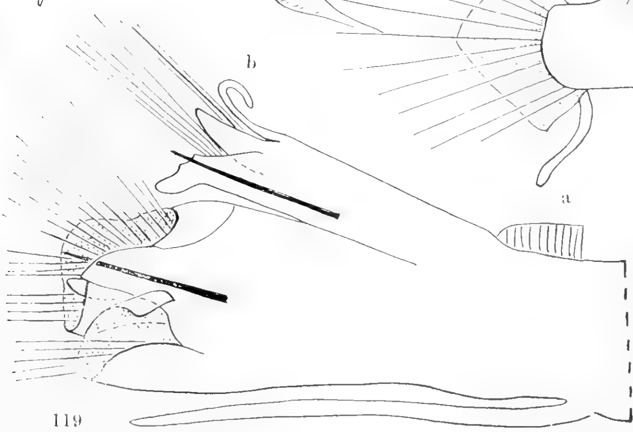

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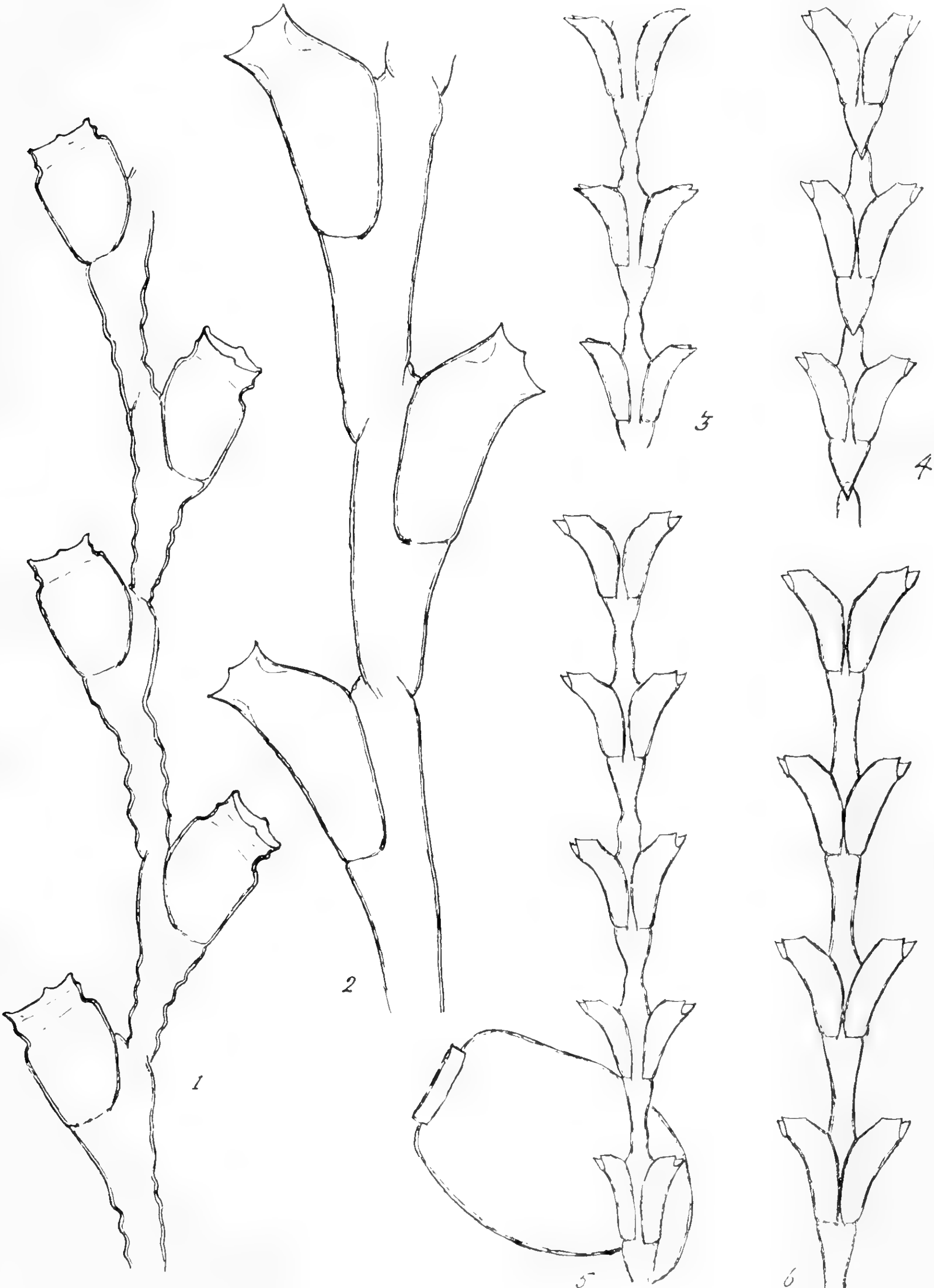
EXPLANATION OF PLATE XLVI.

Fig. 1.—*Sertularella undulata*, sp. nov.
Fig. 2.—*Sertularella tasmanica*, sp. nov.
Fig. 3.—*Sertularia pusilla*, nom. nov.
Fig. 4.— ,, ,, ,, ,,
Fig. 5.— ,, ,, ,, ,,
Fig. 6.— ,, ,, ,, ,,

Figs. 1-6 $\times$ 40.



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EXPLANATION OF PLATE XLVII.

Fig. 1.—*Cladocarpella multiseptata*, sp. nov.
Fig. 2.— ,, ,, ,,
Fig. 3.— ,, ,, ,,
Fig. 4.— ,, ,, ,,
Fig. 5.— ,, ,, ,,
Fig. 6.—*Aglaophenia cupressina*, Lamouroux.
Fig. 7.— ,, ,, ,,
Fig. 8.— ,, ,, ,,

Figs. 1-6 × 80.

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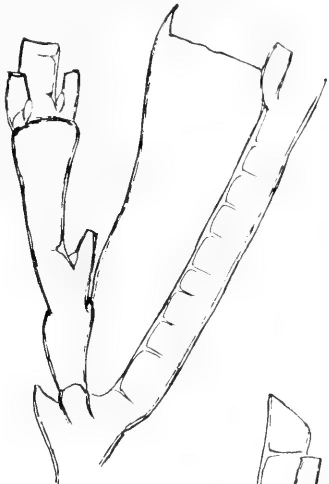

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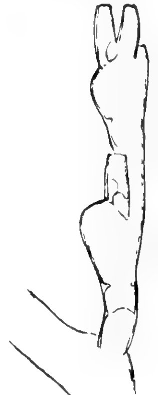

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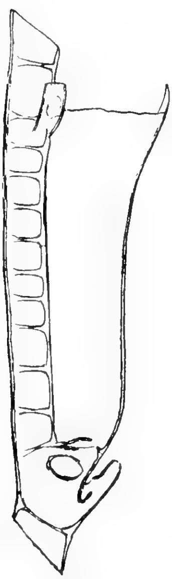

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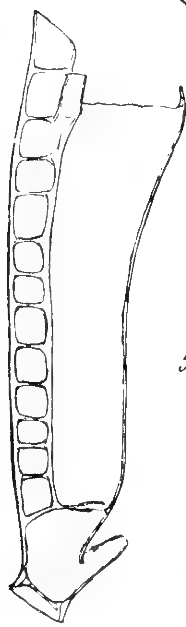

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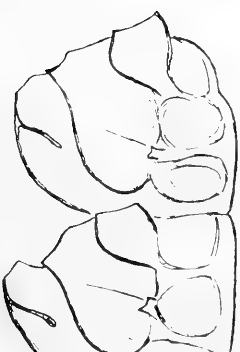

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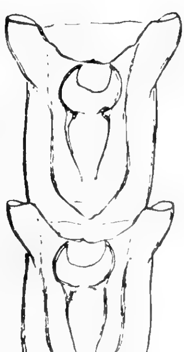

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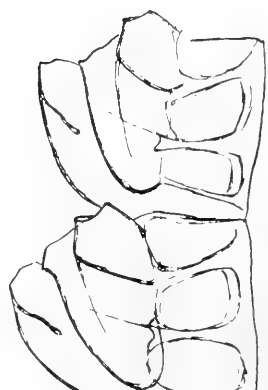

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