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BRITISH MUSEUM (NATURAL HISTORY).

BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910.

NATURAL HISTORY REPORTS.

ZOOLOGY. VOL. VII.

MOLLUSCA.
POLYCHAETA.
CHAETOGNATHA.

LONDON:
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1923–1934.

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PART V.—ANATOMY OF GASTROPODA (except the Nudibranchia).

BY

NELLIE B. EALES, B.Sc., Ph.D. (Lond.),
Lecturer in Zoology, University College, Reading.

WITH 12 FIGURES IN THE TEXT.

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1923.

Price Six Shillings.

[*Issued 27th October, 1923.*]

British Museum (Natural History).

This is No. 3. *of 25 copies of "Terra Nova" Zoology, Vol. VII., Mollusca, Part V., printed on Special paper.*

MOLLUSCA.

PART V.—ANATOMY OF GASTROPODA (EXCEPT THE NUDIBRANCHIA).

BY NELLIE B. EALES, B.Sc., Ph.D. (Lond.).
(*Lecturer in Zoology, University College, Reading.*)

WITH FORTY-TWO FIGURES IN THE TEXT.

I.—INTRODUCTION.

THE following account of the anatomy of the Gastropoda collected by the "Terra Nova" deals with twenty-nine species, belonging to twenty genera; several of these, e.g. *Neoconcha, Trichoconcha,* and *Sublacuna,* have not been investigated anatomically before.

The vertical range of the species is from near the surface (*Toledonia, Neobuccinum, Helcioniscus, Cominella*) to a depth of 250–300 fathoms (*Amauropsis, Margarites, Margarella, Capulus, Neoconcha, Marseniopsis, Marginella*). Most of the specimens were collected in McMurdo Sound, Ross Sea, and are therefore Antarctic. A few are from New Zealand and one (*Margarites iris*) was dredged off the Falkland Islands.

Most of the specimens were well preserved, especially when the shell was already broken at the time of preservation. In completely retracted specimens the condition of the animal was not good. If in future collectors would break the shell of one or more specimens of each species, so as to allow the fixative to penetrate, the task of the anatomist would be both easier and more profitable.

In the description of the radula the word "cusp" is used to denote the main projection or projections from the recurved portion of the tooth. Small lateral serrations upon the cusp or cusps are called denticles. By some systematists both cusps and denticles in the above sense are designated denticles without distinction.

I desire to express my most sincere thanks to the members of the staff of the British Museum (Natural History), who have given me every possible assistance in my work. Mr. G. C. Robson has been especially helpful as regards the relevant literature and in supervising the work generally.

The specimens sent to me had been determined by the late Mr. E. A. Smith, and the Prosobranchiate species were included in his report ("Terra Nova" Exped. Zool. vol. II, No. 4, 1915), references to which are given after the name of each species.

II.—LIST OF SPECIES.

(*a*) *Prosobranchiata.*

DOCOGLOSSA	Patellidæ	*Helcioniscus radians* (Gmelin).
,,	Lepetidæ	*Lepeta coppingeri* (Smith).
RHIPIDOGLOSSA	Trochidæ	*Margarites dulcis* (Smith).
,,	,,	*Margarites iris*, Smith.
,,	,,	*Margarites gemma*, Smith.
,,	,,	*Margarella refulgens* (Smith).
TAENIOGLOSSA	Capulidæ	*Capulus subcompressus*, Pelseneer.
,,	,,	*Neoconcha vestita*, Smith. *N. insignis*, Smith.
,,	,,	*Trichoconcha mirabilis* (Smith).
,,	Calyptræidæ	*Crepidula monoxyla* (Lesson).
,,	,,	*Sigapatella calyptræformis* (Lamarck).
,,	,,	*S. tenuis* (Gray).
,,	Naticidæ	*Amauropsis rossiana*, Smith.
,,	,,	*Sublacuna indecora*, Thiele.
,,	Lamellariidæ	*Marseniopsis conica* (Smith). *M. mollis* (Smith). Two unnamed species.
,,	Eulimidæ	*Eulima exulata*, Smith.
RACHIGLOSSA	Buccinidæ	*Neobuccinum eatoni*, Smith.
,,	,,	*Cominella adspersa* (Bruguière).
,,	Muricidæ	*Trophon shackletoni*, Hedley. *T. longstaffi*, Smith.
,,	Volutidae	*Volutharpa charcoti* (Lamy).
,,	Marginellidæ	*Marginella hyalina*, Thiele.

(*b*) *Opisthobranchiata.*

TECTIBRANCHIA	Aceratidæ	*Toledonia major* (Hedley).
,,	,,	*Toledonia brevior*, Smith.
BASOMMATOPHORA	Ancylidæ	*Latia neritoides*, Gray.

III.—DESCRIPTIONS OF ANATOMY.

DOCOGLOSSA.

Patellidæ.

Helcioniscus radians (Gmelin). (II, p. 78.)

Bay of Islands, New Zealand.

One specimen. Length 21 mm., width 17 mm. The specimen is a small one, as Suter gives the measurements 44 × 34 mm.

The anatomy of *Helcioniscus* has been described by Schuster (1913), and by Thiem (1917), who described the large *H. ardosiæus* from Juan Fernandez. In general, *Helcioniscus* closely resembles *Patella*, but differs in that the pallial gill cordon is interrupted anteriorly, so that the cordon is horseshoe-shaped like the shell muscle: from each end of the branchial cordon a vein runs to the auricle.

The shell muscle consists of about fourteen fasciculi, a number frequently found in *Patella*. The frilled lips, the tentacles, and the open cup-shaped eyes are similar to those of *Patella*. The mantle edge is pigmented in characteristic fashion; external to the shell muscle is a broad band of pigment; the extreme edge is marked by two parallel, narrow bands of pigment. Ventral to the mantle edge lies a shallow groove, bearing at intervals small, strongly pigmented tentacles; these appear to be all of the same size, and are not large and small as in *Patella*. Large mucous glands occur near the edge of the mantle and are visible to the naked eye as clear ovate bodies, often interrupting the pigment stripes; somewhat similar but smaller glands are borne on the under side of the mantle, ventral to the pallial tentacles. Both sets of glands are embedded in connective tissue and discharge by ducts which penetrate between the epithelial cells of the mantle. Epithelial glands also occur in this region, but no cilia are present. The nuchal cavity is pigmented along three sides. On the under surface of the mantle skirt lie the pallial gills, forming, as above described, a horseshoe-shaped cordon whose free ends reach the posterior limit of the nuchal cavity; about two hundred gills are present, each consisting of a flat, triangular plate of tissue covered with a delicate epithelium and rich in blood lacunæ; on the inner side are branches of the afferent ctenidial vessels, and on the outer side factors of the efferent ctenidial vessels.

On the side of the foot, about midway between its margin and the insertion of the mantle, lies a shallow groove, just visible to the naked eye, and by its continuous character distinguishable from the uneven puckerings caused by contraction; this is the lateral sensory streak. It has been described in the young *Patella* (Davis and Fleure, 1903, p. 31), where it is glandular, and in *Nacella*. In *Helcioniscus* it is not glandular in the adult.

The general disposition of the gut is similar to that in *Patella*. Radula and intestine are relatively much longer than in *Patella* ; the former is 11 cms. long, five times the length of the body: it is coiled on the right side of the body in four double coils, arranged like those of the intestine of a tadpole: in *Patella* the radula is simply folded back on itself. The palatal plate (mandible) is very small and imperfect and is but slightly chitinized. The cartilages of the buccal mass are feebly developed; they comprise seven pairs of very soft, white cartilages (fig. 1). Three pairs (1, 2, 3) are small nodules of cartilage situated posteriorly; probably they correspond collectively to the posterior cartilages of *Patella*. The fourth pair (4)

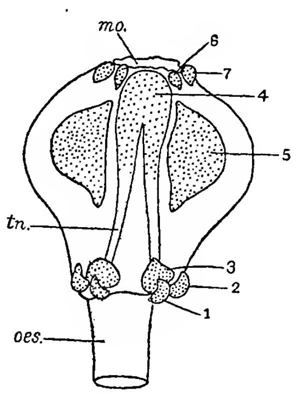


FIG. 1.

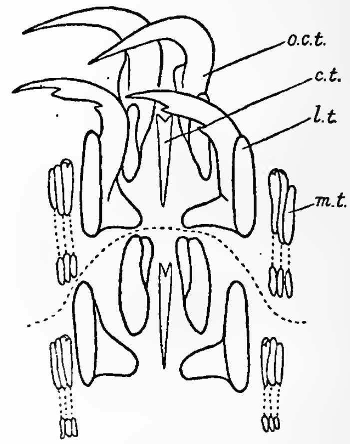


FIG. 2.

FIG. 1.—*Helcioniscus radians.* Cartilages of the buccal mass. × 8. The cartilage is dotted. 1–7, cartilages of the buccal mass. *mo.* mouth. *oes.* œsophagus. *tn.* tendon.

FIG. 2.—*Helcioniscus radians.* Two rows of teeth from the radula. × 50. The rows are separated by a dotted line. The lower row shows the base of the outer central and lateral, but not the cusp. The bridge connecting the anterior and posterior portion of each marginal is represented by a dotted line. *c.t.* central tooth. *l.t.* lateral tooth. *m.t.* marginal tooth. *o.c.t.* outer central tooth.

form the anterior cartilage, which is much smaller than in *Patella*; they unite in the mid-ventral line beneath the radula and form a cushion for it; posteriorly they diverge and a stout tendon is attached to each. The fifth pair (5) are the largest, and are the triangular antero-lateral cartilages. The sixth and seventh pairs (6 and 7) are small nodules situated ventrally; probably they correspond to the ventro-lateral cartilage of Amaudrut.

The radula of *Helcioniscus* (fig. 2) is somewhat difficult of interpretation, but the arrangement of its teeth becomes clear on comparison with other members of the Patellidæ. The tendency in this family seems to be towards the reduction of the number of teeth in a row, with the gradual disappearance of the central (i. e. median central) tooth or teeth and the enlargement of the outer central and the laterals.

Patella vulgata shows the largest number of functional teeth in a row, namely six out of a possible twelve ; in this species the laterals are placed only slightly posterior to the centrals so that a single row forms an arch and not a straight line. In *Helcioniscus*, which lies almost at the other extreme, the number of functional teeth in a row is reduced to four, and of these, two, the laterals, are placed so far behind the other two, the outer centrals, as to appear at first sight to belong to a distinct row. Amongst members of the Patellidæ * we have the following :

Patella vulgata	3.1.4.1.3.	1.4.1. functional, marginals with cusps.
Patella oculis	2.1.5.1.2.	median central very narrow.
Patella patriarcha	3.1.5.1.3.	
Helcion pectinatum	3.1.5.1.3.	marginals with cusps.
Helcion pellucidum	3.1.4.1.3.	
Helcioniscus radians	3.1.3.1.3.	median central very narrow, outer centrals and laterals functional.
Nacella, sp.	2.1.3.1.2.	

The median or rachidian tooth in *Helioniscus* is small, extremely narrow, and so slightly chitinized as to be undoubtedly functionless ; its broadest end is anterior, and here it is frequently forked ; posteriorly it tapers away between the outer centrals. The outer centrals and the laterals resemble one another in their general shape, and Schuster (1913, p. 303) calls them the inner and outer laterals. Comparison with other members of the Patellidæ leads to the conclusion that there is only a single pair of laterals, set, as in *Patella*, posterior to the row of centrals. The outer central (inner lateral of Schuster) has a roughly quadrangular base, from whose inner side an attenuated and feebly chitinized portion projects forwards : on the base are set a longitudinal cutting surface and a stout, strongly chitinized, and sharply pointed claw, whose simple cusp is directed backwards. The laterals possess a triangular base, each triangle having a long outer and a short posterior side ; on the outer side of the triangle is an elongated and flattened cutting surface, whose direction is antero-posterior ; internal to it is situated a very stout claw similar to that on the outer central, but with one or two pairs of lateral denticles. The marginals are very poorly developed and are pale yellow in colour ; each is divided transversely into a larger anterior and a smaller posterior portion, the two being connected by a slender bridge, giving the appearance of alternating rows of large and small marginals ; the innermost marginal, and more rarely the middle one, has a short, blunt cusp.

The remainder of the gut closely resembles that of *Patella*. There are, however, only two salivary glands, discharging by two laterally placed ducts. Davis and Fleure (1903, p. 27) call these " buccal glands," but as they open into the œsophagus there seems no reason why they should not be named " salivary glands," as in other

* The formulæ and specific names are taken from the Gwatkin collection in the British Museum.

Prosobranchs. Between the ducts lie a pair of glands, which are really no more than crypts or pockets on the dorsal side of the œsophagus; these may be homologous with the glandular patches found on the wall of the œsophagus in certain Rhipidoglossa (e. g. *Fissurella*).

In the blood vascular system the chief difference from *Patella* is that the two branchial veins do not unite before entering the auricle.

Lepetidæ.

Lepeta coppingeri (Smith). (II, p. 62.)

Station 348. McMurdo Sound; 200 fathoms.

One specimen, the shell of which measures 5 mm. by 4 mm.

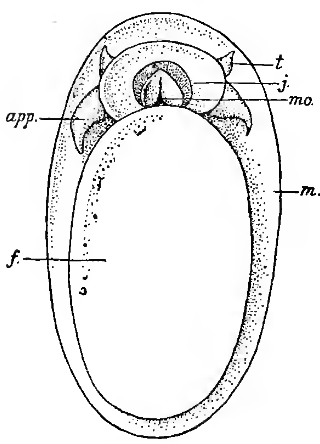


Fig. 3.—*Lepeta coppingeri.* Ventral view of the animal removed from the shell. × 12. *app.* cephalic appendage. *f.* foot. *j.* jaw. *m.* mantle. *mo.* mouth. *t.* tentacle.

This little, deep-water form has a pure white patelliform shell. The head (fig. 3) bears a pair of short, blunt tentacles and a pair of backwardly directed cephalic appendages which are much larger than the tentacles (cf. Pelseneer, 1906, p. 146, fig. 126). Eyes, ctenidia, and pallial gills are absent. The foot is narrow and elliptical. The oral depression is deep, and in the specimen examined the mouth is partly evaginated, exposing the unpaired, dorsally placed mandible (fig. 3, *j*).

The radula has been described by Tryon (1891, p. 67). The radular formula is 2.0.1.0.2, the central tooth being very well developed.

Sections show that both the mantle and the foot are glandular. There is no trace of the lateral pedal streak which occurs in many other Docoglossa. The general anatomy resembles that of *Patella.* The voluminous gonad contains spermatozoa.

RHIPIDOGLOSSA.

Trochidæ.

Margarites dulcis (Smith). (II, p. 63.)

Station 331. McMurdo Sound; 250 fathoms.

Three specimens, all completely retracted. Width of shell, 9 mm.

The operculum is thin and quite circular in shape. As a rule, the epipodial tentacles are seven in number, but one specimen has eight on the left side and seven on the right. Each tentacle bears a small, fleshy lobe on its ventral side at the base; on the dorsal side the epipodium projects over the tentacle in the form of a crenate, flattened plate. The head and cervical epipodial lobes are symmetrical. The ocular appendage and cephalic crests (palmettes or frontal lobes) are very small.

The mandibles are only very slightly chitinized. The radular formula resembles that of *Trochus* (Robert, 1900), and is ∞.5.1.5.∞; there are about fifty marginal teeth on each side (fig. 4). Central and laterals are stout; they are narrower above, and have recurved cutting surfaces bearing a variable number of serrations or denticles; they have broad, overlapping bases; the main portion of each tooth is rectangular, the broad base being formed by a wing-like projection on the outer side. The innermost marginals bear denticles on their cusps, but towards the outside of the ribbon they become simpler; all are elongated and stick-like. The central and laterals do not possess the feeble leaf-like cusps found in *Trochus zizyphinus* and in the species of *Margarites* described below; their short, well-defined cusps indicate that they are functional teeth, and this is borne out by their persistence on the portion of the radula that was in use when the animal was killed. Since the central and laterals are functional, one would not expect the inner marginals to be abnormally developed, as they are in those forms whose central and laterals are foliaceous (cf. *M. iris* and *M. gemma*, below).

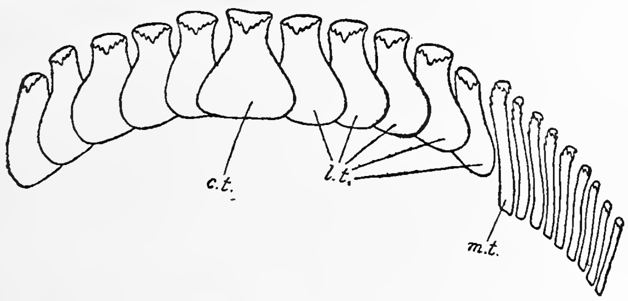


Fig. 4.—*Margarites dulcis*. Radula: part of a row of teeth, showing a few marginals of one side. × 245. *c.t.* central tooth. *l.t.* lateral tooth. *m.t.* marginal tooth.

The "salivary glands" are very small, and consist of a pair of pouches situated anteriorly to the cerebral commissure. The cæcum is rather long, with a recurved tip, but is not spirally coiled.

The nervous system resembles that of *Trochus*. The cerebral commissure is broad and flat; the pedal ganglia are much elongated, and lie side by side just within the foot.

Margarites iris, Smith. (II, p. 91.)

Station 38. Off the Falklands (52° 23′ S., 60° 50′ W.); 125 fathoms.

One specimen. Width of shell, 12 mm.

There are seven epipodial tentacles; each is pectinate on its outer side and overlaps the one in front of it. The epipodial lobes dorsal to the tentacles are crenate, as in *M. dulcis*, but they form a continuous fold. The mantle is thin, with a slightly thickened rim. The eyes are very large; the tentacles are short, rounded, and blunt. There are no cephalic epipodial lobes or siphons, but the sides of the body are channelled for the current of water that passes in on the left and out on the right side. The ctenidium is flattened.

No trace of salivary glands could be found. Mandibles and radula are both strongly chitinized, though less so than in *M. gemma*. The mandibles consist of four chitinous pieces, of which two are large, with serrated anterior margins, and two are very small (fig. 5, *o.j.* and *i.j.*). The rods of which the mandible is composed become free on the edge, hence the serrations, each being the end of one rod.* The radular sac is median, long, and bifid at its extremity, but is not coiled. The radula is very similar to that of *M. gemma*, but is smaller and much less highly chitinized. Central and laterals bear foliaceous cusps with denticulate margins. The first and second marginals are very short and stout, and denticulate on their inner margins; the remaining marginals are of the usual stick-like shape, and very slender. It should be noted that in those forms with foliaceous central and laterals, the radular pattern differs according to the portion of the radula examined. The above description applies to that portion of the radula within the radular membrane, i. e. a portion not yet in use. The portion of the ribbon in use differs in that the delicate cusps of the eleven central teeth, being quite unfitted for rasping, have disappeared, leaving only the rectangular bases of these teeth. As the stick-like marginals are little better adapted for continuous wear, it is not surprising to find, in forms possessing foliaceous central and laterals, that the first and second marginals become strongly developed as the main rasping teeth of the ribbon.

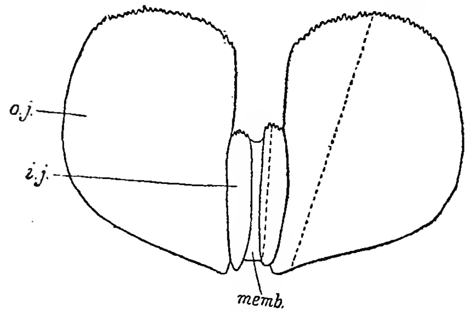


FIG. 5.—*Margarites iris.* Jaws. The dotted line indicates the direction of the parallel rows of rods. × 30. *i.j.* inner portion of jaw. *memb.* membrane connecting jaws. *o.j.* outer portion of jaw.

The nervous system resembles that of *M. dulcis*, but the ganglia are smaller and the commissures are relatively more slender.

Margarites gemma, Smith. (II, p. 62.)

Station 194. Off Oates Land (69° 43′ S., 163° 24′ E.); 180–200 fathoms.

One specimen, much damaged, with the shell missing and the visceral whorl broken off. The body was covered with caked mucus, so that the specimen required a good deal of cleaning up. Width of operculum, 11 mm. Length of foot, 18 mm. This is the largest species of the three.

The subdivision of the epipodial lobes mentioned in *M. iris* is here carried to an extreme, so that the seven tentacles are hardly recognizable. Each tentacle is divided primarily into about four lobes, and each lobe is densely papillate. Moreover, the portion of the foot between the tentacles and the whole of the lateral portion of the foot are also papillate, though less densely so than the tentacles themselves, so that a compact mass of short papillæ covers the whole of the side of the foot and completely masks the subdivision into lobes. The anterior epipodial lobes,

* Each cell of the mandibular epithelium secretes a curved chitinous rod, free at its distal end. These rods are packed side by side, and collectively form a flat plate.

on the contrary, are thin, without papillæ or regularly crenate margin ; that on the right differs from that on the left, as in some species of *Trochus* (cf. Pelseneer, 1899, p. 46). The left lobe is simple; the right forms a kind of funnel, with two flaps holding it in place ; water enters on the left side and makes its exit on the right. The cephalic tentacles are long, and bear longitudinal, shallow grooves with delicately papillate edges. The eyes are very large. The cephalic crests are small but distinct. The mouth region projects forward for a considerable distance between the tentacles, far more so than in the other species of this genus described above. The edges of the mouth are papillate ; in the mid-ventral line the edge is split by a vertical cleft, and from the left wall of the cleft extends a thin, smooth-edged flap, which passes to the right, becomes attached to the upper portion of the foot, and ends freely over the right cervical epipodial lobe. From the sides of the mouth paired flaps, thin and straight-edged like the ventral lobe, pass outwards and backwards, and gradually merge into the body-wall at the level of the eyes. On the right side a channel is formed, bordered by the ventral lobe and by the lateral flap ; the channel leads to the mouth itself. The significance of this curious asymmetry cannot be determined with only one specimen for investigation ; if the channel had to do with the intake of food, one would expect to find it on the left side and not on the right, for water entering the mantle cavity passes in on the left side ; excretory and genital products are discharged into the right side of the mantle cavity near the base of the right tentacle, so that there is good reason for the separation of the buccal and pallial regions.

The mantle edge is frilled. The ctenidium projects on the left side and the anus on the right.

The œsophageal pouches are very large. The jaws are very dark brown in colour, and resemble those of *M. iris* in shape. The radular sac is bifid. The radula (fig. 6) is more highly chitinized than in the two species already described, and this applies especially to the first and second marginal teeth. All the marginals are dark brown in colour. The central has a very broad base, at least twice the breadth of the first lateral, and possesses a delicate leaf-shaped central cusp beset with regularly arranged denticles. The laterals have quadrangular bases and narrow, foliaceous cusps, with denticles similar to those of the central. The first and second marginals are very stout, and dark brown in colour ; each possesses a claw-like cusp, whose inner margin has rounded corrugations hardly large enough to deserve the name of denticles. Most of the remaining marginals are of the foliaceous, stick-like type, with denticulate tips, but the outer ones differ from those of the other species of *Margarites* by being spatulate in shape.

Margarella refulgens (Smith). (II, p. 64.)

Station 331. McMurdo Sound ; 250 fathoms.

Several specimens, all completely retracted. Diameter of shell of largest specimen, 5 mm.

This species has a circular operculum with excentric nucleus. The epipodial lobes are small and simple, with narrow, cervical portions. The tentacles are slender, and the eyes are relatively very large. The frontal lobes (cephalic crests) are well developed. The ocular appendage is very slender.

The mantle cavity is small, and the mantle edge is papillate. The ctenidium is extremely delicate, and is visible through the transparent mantle.

The radula (fig. 7) resembles that of *Margarites*, but possesses its own characteristic features. The central has a quadrangular and almost square base, and is twice as long as the base is broad; towards its free end it tapers considerably, and the cusp is extremely narrow; a large median denticle forms the tip of the cusp; the lateral serrations are always smaller than the median denticle; they vary in number. The

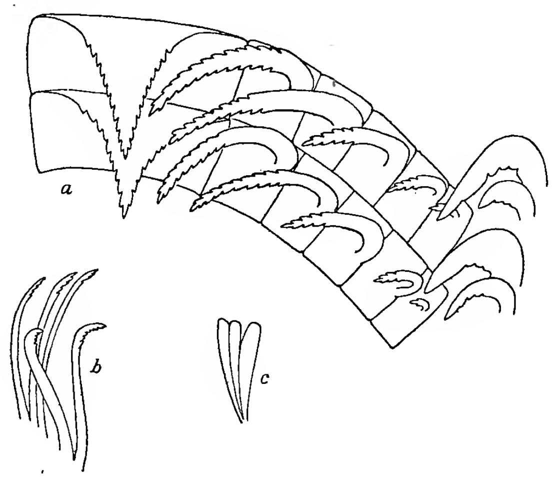


Fig. 6.

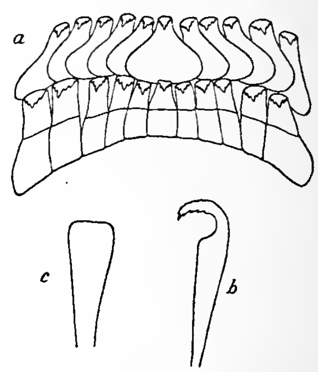


Fig. 7.

Fig. 6.—*Margarites gemma.* Radula. (*a*) Part of two rows of teeth, showing the central, right laterals, and the first two marginals of the right side. (*b*) A group of inner marginals. (*c*) Three outer marginals. × 185.

Fig. 7.—*Margarella refulgens.* Radula. (*a*) Two rows of centrals and laterals. The upper row shows the wing-like expansions of the base, the lower row the shape of the base when not hidden by the wings. (*b*) An inner marginal. (*c*) An outer marginal. × 185.

narrowness of the cusp of the central is emphasized by the presence of two enormously expanded "wings" on the lower part of the tooth, which overlap the first pair of laterals and cover their bases completely. The laterals resemble one another in general structure; the cusp is denticulate, with a prominent median denticle; the base is quadrangular, and on the outer side is a broad wing overlapping the adjacent tooth. The first lateral is the smallest, and the remainder increase in size in succession, so that the fifth or outermost is the largest; the base of the fifth lateral is less regular in shape than that of the others. The marginals vary in shape according to their position in the row, becoming simpler as their distance from the central and laterals increases; the innermost marginals have a long, slender cusp, directed inwards and denticulate on both sides, beneath which the tooth broadens to form a blunt projection; the outer ones have no cusp, and are spatulate in shape.

TAENIOGLOSSA.

Capulidæ.

Capulus subcompressus, Pelseneer. (II, p. 66.)

Station 316. McMurdo Sound; 190–250 fathoms.

Two specimens. Width of shell, 5 mm.

The shell has a horny edge; the apex is spirally coiled. The mantle cavity is very small. The long lip characteristic of the genus is well developed and has a deep median groove running along its dorsal, or oral, side. The tentacles are cylindrical, and are ridged on the surface; each bears an eye on the outer side near the base.

In general, the anatomy resembles that of the European species, *C. hungaricus* (Linn.). The radula is very pale yellow in colour; it consists of less than thirty rows of teeth. The central and laterals are finely denticulate, the marginals are smooth (fig. 8).

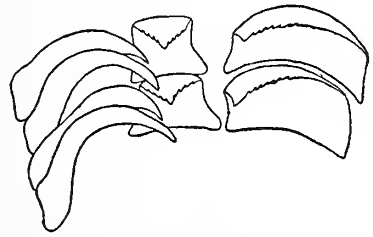


Fig. 8.—*Capulus subcompressus.* Two rows of the radula. The lateral is shown on the right, the marginals on the left. × 245.

Neoconcha vestita, Smith. (II, p. 68.)

Stations 316, 356. McMurdo Sound; 50–250 fathoms.

Six specimens.*

The calcareous portion of the shell is thin, but is covered by a very thick and spongy periostracum. The operculum is composed of concentric horny layers and has a marginal nucleus; it is much too small to fit the large aperture of the shell.

The snout is well developed, and is broad and slightly flattened dorso-ventrally. The two tentacles are very stout at the base, but taper to pointed tips and are curved inwards; they are set laterally on the head and the sessile eye is situated on the outer side of the base of each. The penis is present in all the specimens; it is slightly longer than the tentacle, and is narrower; it curves over the back, is grooved along its inner side, and has a spatulate apex. Ventral to the elliptical mouth lies a long rostrum or "lip"; this is a prolongation of the floor of the mouth; the groove that traverses it longitudinally reaches the mouth, as in other Taenioglossa that have this structure. The rostrum can be withdrawn into a deep pocket lying between the snout and the foot; in preserved specimens it is usually retracted. The foot is short and broad, rounded anteriorly; it is very thick and fleshy. The

* In one specimen a curious structure, probably an abnormality, was present. On the left side of the head, at the same level as the penis on the right, and springing from the body-wall, was a Y-shaped structure which was folded back towards the ctenidium. The stalk of the Y was short, and forked to form two equal, rounded lobes whose opposed sides were provided with a shallow groove, the two grooves being continuous at the point of divergence of the lobes, but not running down into the stalk or to the body-wall. It had no connection with any internal organs, and was present in only one specimen. Although in the position of a siphon it did not appear to have any connection with the branchial apparatus, and can only be regarded as an abnormal growth.

anterior pedal groove is deep. The mantle is not pigmented; it is very thick, but becomes thinner towards the edge, which is simple and devoid of tentacles. The mantle cavity is not very large. The ctenidium consists of about forty triangular leaflets. The bipectinate osphradium is about one-third the length of the ctenidium. The hypobranchial gland is well developed, and is short and wide. The attachment surface of the columellar muscle is dumb-bell shaped.

The buccal mass is well developed and is attached by stout tendons to the body-wall, one large tendon on each side being especially conspicuous because it passes through the nerve ring. A pair of pouch-like salivary glands is present, but these do not extend backwards as far as the nerve ring. The jaws are very slender and

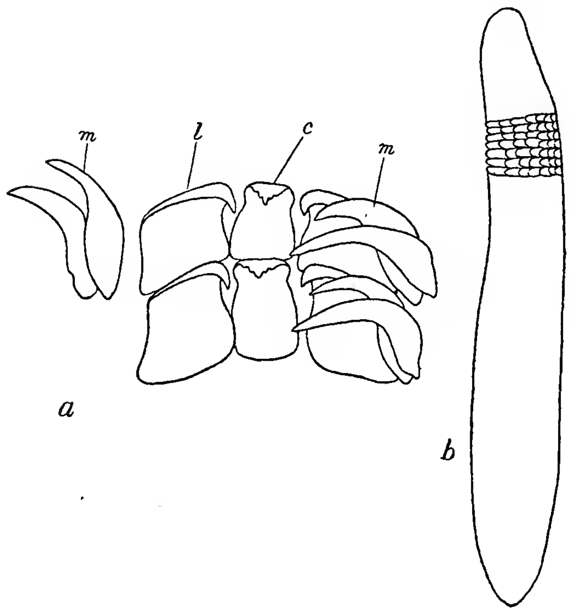


Fig. 9.

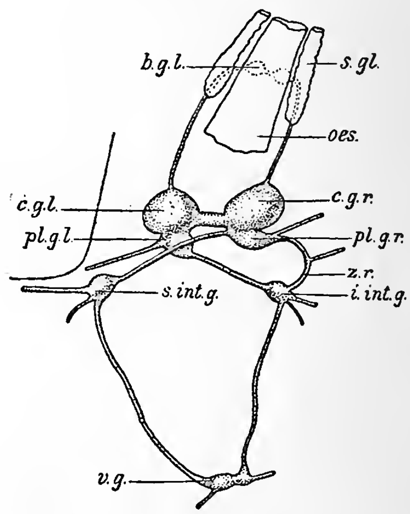


Fig. 10.

Fig. 9.—*Neoconcha vestita.* (*a*) Radula; two rows of teeth. *c.* central. *l.* lateral. *m.* marginal. (*b*) Jaw; note that the rows of rods are arranged at right angles to the long axis of the jaw. × 60.

Fig. 10.—*Neoconcha vestita.* The nervous system. The pedal ganglia are not figured. × 6. *b.g.l.* left buccal ganglion. *c.g.l.* left cerebral ganglion. *c.g.r.* right cerebral ganglion. *i.int.g.* sub-intestinal ganglion. *oes.* œsophagus. *pl.g.l.* left pleural ganglion. *pl.g.r.* right pleural ganglion. *s.gl.* salivary gland. *s.int.g.* supra-intestinal ganglion. *v.g.* visceral ganglion. *z.r.* dextral zygoneury.

are transversely elongated. They are yellow in colour and consist of blunt rods (fig. 9, *b*). The radula is composed of about thirty rows of teeth, all strongly chitinized (fig. 9, *a*). The central is longer than broad, with a slight "waist" beneath the median cusp; the base is broader and is rounded off posteriorly; the cusp has small denticles in young teeth, but these denticles wear off with age and the older teeth have lost them. The lateral has a squarish base with a strong, claw-like cusp directed inwards towards the central; the outer long side of the cusp shows a corrugated border in young teeth. On each side the two marginals are alike; they are claw-shaped, without denticles; they overlap the lateral, and the tip of the outer one reaches to the central. The radular sac is slightly bifid at the extremity. The œsophagus is long, and from its irregularly twisted shape appears to be capable of considerable expansion; longitudinal internal ridges show through its transparent walls. At the point of entrance of the œsophagus into the broad, thick-walled stomach the alimentary canal bends forward at an acute angle. The stomach is not sacculated; it receives a small bile duct near the entrance of the œsophagus and a large bile duct on its ventral wall; just beyond this point occur first a circular and then a longitudinal fold in the wall; the latter fold is continued into the intestine and merges into one of the numerous longitudinal folds of that portion of the canal.

The nervous system (fig. 10) most resembles that of the Capulidæ. The cerebral ganglia are slightly unequal, the right being larger than the left; the commissure is distinct; most of the cerebral nerves are much flattened. The right pleural ganglion (*pl.g.r.*) is not distinctly separated from the right cerebral ganglion. The supra-intestinal ganglion lies close under the left body-wall. The sub-intestinal ganglion (*i.int.g.*) lies on the right side of the œsophagus. A crescent-shaped zygoneurous connective (*z.r.*) is present on the right side, but not on the left. The cerebro-buccal connectives are long, and are recurved anteriorly to allow of expansion in the head region. The buccal or stomato-gastric ganglia occupy their usual position between the œsophagus and the buccal mass. The pedal ganglia are large, and are closely united in the middle line.

Although a penis is present in all the specimens the internal genital organs vary considerably. The gonad consists of much-branched, rounded cæca, which in some specimens lie entirely on the surface of the visceral mass, in others ramify between masses of liver substance. The gonaduct is sinuous in some, in others it is shorter and straighter; its terminal portion varies from a small duct with sacculated walls to an enormous structure with folded glandular walls.

Neoconcha insignis, Smith. (II, p. 68.)

Station 355. McMurdo Sound; 300 fathoms.

One specimen in shell. One damaged specimen without shell.

The anatomy of this species completely justifies its inclusion, based on conchological features, in the genus *Neoconcha*. The general build is slighter and more delicate than that of *N. vestita*. The tentacles are long, slender, and pointed, the eyes large, the penis narrow and acuminate. There is a long, frilled "lip" with pointed apex. The mandibles are dark brown and are more distinct than in *N. vestita*, but the radular teeth are so similar to those of that species that a careful comparison shows only relative differences (fig. 11, *a–d*). The denticles on the young centrals are less distinct than in *N. vestita* and the older centrals possess smooth edges. On the lateral the cusp is more sharply pointed and the stout hook is even stouter. The difference in size of the marginals is more pronounced; as in *N. vestita,* the outer marginal exceeds the inner marginal in length.

The nervous system resembles that of *N. vestita.*

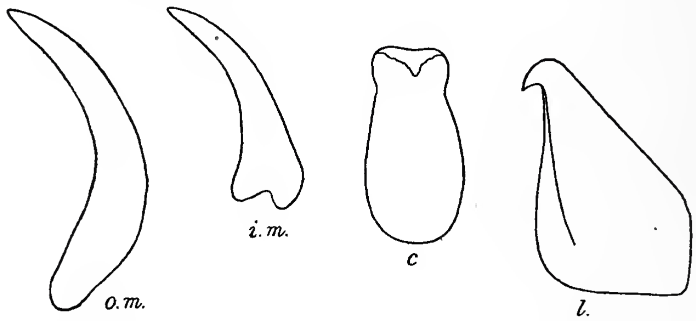


FIG. 11.—*Neoconcha insignis.* Radular teeth. *c.* central. *l.* lateral. *i.m.* inner marginal. *o.m.* outer marginal. × 60.

Trichoconcha mirabilis (Smith). (II, p. 68.)

Station 316. McMurdo Sound; 190–250 fathoms.

One specimen in shell. One damaged specimen without shell.

The foot is short and rounded, with truncated anterior margin and a very deep anterior groove. The operculum is very small; it has a marginal nucleus. The columellar scar is elongated and is almost symmetrical, but is slightly wider on the right side. The mantle is very thick, with a tough, wrinkled rim which may indicate the presence of short, retractile tentacles. The mantle cavity is small and its roof is much thickened by the rectum and rectal gland, the kidney, and the lamellated mucous gland. The ctenidium consists of triangular leaflets. The osphradium is bipectinate and asymmetrical, with long leaflets on the left side of the axis and short ones on the right side; it is covered by a longitudinal fold of the mantle. There is a moderately long snout. A deep pocket between the snout and the foot lodges the long lower lip, whose tip is directed backwards into the pocket, so that when the lip is retracted the dorsally placed groove continuous with the mouth faces ventralwards. Both the lip and the snout are much contracted in both specimens, but the ridged surface is probably indicative of great extensile power. The whole head is extremely muscular. The tentacles are stumpy, with wide bases and rounded tips. The large eyes are situated about one-fourth of the way up the outer side of each tentacle. The penis is shorter than the tentacle and is recurved, slender, and grooved; the groove is continuous with an external seminal groove connecting the genital aperture and the base of the penis.

The buccal mass is very large, with stout tendons. There is a pair of elongated salivary glands, which open into the buccal mass on each side of the œsophagus by paired ducts; posteriorly the glands reach the nerve ring, but do not traverse it. The jaws are very short and meet in the mid-dorsal line. The radula (cf. Smith, 1907) is greenish in colour. The central (fig. 12) has a very long median cusp which reaches beyond the posterior edge of the short, quadrangular base to overlap the central of the next row; the apex of the cusp is smooth, but the remainder is beset with minute serrations which wear off in old teeth. The lateral is very broad and short, with a large asymmetrical cusp directed towards the central; the short or inner side of the cusp is smooth, the long outer side denticulate; the base is incised on its inner side and is prolonged into a descending projection on its outer side. The marginals are almost equal in size and are similar in shape; although they are long and slender they do not overlap the central; they do not bear denticulations.

The œsophagus is provided with thick, wavy, longitudinal ridges on its inner wall. The stomach resembles that of *Neoconcha*. A small bile duct discharges into the stomach near the entrance of the œsophagus, and a very large bile duct enters

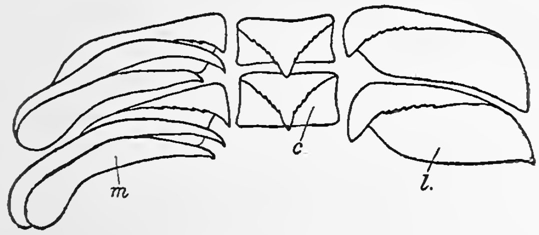


Fig. 12.

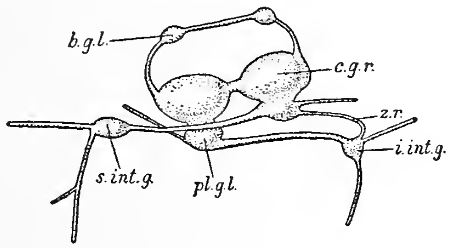


Fig. 13.

Fig. 12.—*Trichoconcha mirabilis.* Radula; two rows of teeth. The marginals of the right side are not shown. *c.* central. *l.* lateral. *m.* marginal. × 60.

Fig. 13.—*Trichoconcha mirabilis.* The nerve ring and related ganglia. The pedal ganglia are not figured. × 6. *b.g.l.* left buccal ganglion. *c.g.r.* right cerebral ganglion. *i.int.g.* sub-intestinal ganglion. *pl.g.l.* left pleural ganglion. *s.int.g.* supra-intestinal ganglion. *z.r.* zygoneurous connective.

ventrally at the point where the stomach passes insensibly into the intestine; from this point a fold in the wall, apparently of the nature of a typhlosole, runs along the intestine.

The ganglia forming the nerve ring are distinct (fig. 13). The cerebral ganglia are very large with short commissures. The pleural ganglia are relatively small and are closely opposed to the cerebrals. The small supra-intestinal ganglion (*s.int.g.*) lies close to the body-wall and gives off the usual nerves to the ctenidium and to the visceral ganglion. The sub-intestinal ganglion (*i.int.g.*) is larger than the supra-intestinal. Dextral zygoneury is present. The buccal ganglia are situated a short distance in front of the cerebrals and are widely spaced, with a flat commissure.

The gonad consists of branched tubular cæca; it occupies a large surface area on the visceral hump. The gonaduct is convoluted, and expands near the external aperture into a broad chamber lined by internal lamellæ; in one specimen it was full of spermatozoa.

Calyptræidæ.

Crepidula monoxyla (Lesson). (II, p. 81.)

Station 134. Spirits Bay, New Zealand; 11–20 fathoms.

Seventeen large and two small specimens from the mouths of shells inhabited by Hermit Crabs. Diameter of large specimens about 12 mm., length 15 mm.

The mantle and head region are very variable; they are highly contractile, and are much flattened. The tissues are delicate and transparent, so that many of the internal organs can be seen through the body-wall and mantle (fig. 14).

The head has a rather short snout, and bears short, blunt tentacles, with eyes on their outer sides near the base. In the larger specimens there is a small penis on the right side; in the smaller ones the penis is relatively large, and is functional. On each side of the head is a thin flap resembling the cervical epipodial lobe of the Trochidæ; this flap arises anteriorly from the ventral surface, and runs backwards and upwards as far as the two ends of the shell muscle. Dorsal to the flap on the left side is a ridge on the body-wall, beneath which lies the food-groove, as described by Orton (1912) in *Crepidula fornicata*. The columellar muscle (*col. m.*) consists of a transverse band of fibres lying between the snout and the foot; it is attached to the anterior third of the shell in two places, which are situated almost symmetrically one on each side of the body.

The foot is very broad, truncated anteriorly, and rounded posteriorly. From the middle of the anterior border of the foot projects a short, narrow portion with recurved, lateral prolongations; this contains the anterior pedal groove, which is very shallow.

The mantle projects on all sides beyond the body, so that when the animal is extracted from its slipper-like shell and viewed from the dorsal side, head, foot, and visceral hump are completely covered except for the curious "tail,"* and (in some specimens) the ctenidium.

The mantle cavity is roughly triangular in shape, and is extensive. The large ctenidium fills the left side of the cavity and often projects from under the mantle on the right side; its narrow filaments are therefore of considerable length. Anteriorly the gill axis has been carried round to the right (fig. 14, dotted line). On the inner side of the mantle, parallel to the axis of the ctenidium, a fold occurs, whose function, judging from its shape and relationships, appears to be that of directing the water current over the gill; at the anterior extremity this fold is provided with a fleshy lappet. That portion of the mantle anterior to the left insertion of the shell muscle is free from the body-wall, and so, therefore, is the ctenidium. Posteriorly, mantle and visceral mass are fused; at the point of union the groove running along the ctenidial axis runs forward at an acute angle to become the food groove leading to

* Cf. fig. 14. This appendage, which is a backwardly directed portion of the visceral hump, fits into the shell below the septum of the latter.

the mouth. A narrow hypobranchial gland is present. On the right side of the mantle cavity and discharging on its roof, are the gonaduct, kidney, and anus. The osphradium consists of disconnected elements which have lost their bipectinate character and appear bead-like.

Very small jaws are present. The radula (fig. 15) has about twenty rows of teeth. The central is narrow, with a stout cusp beset with denticles. The lateral is very broad, with short, asymmetrical cusp directed towards the central; both sides of the cusp are denticulate. The marginals are large, elongated, and narrow; they overhang the lateral and reach to the central; denticles are present only on the outer

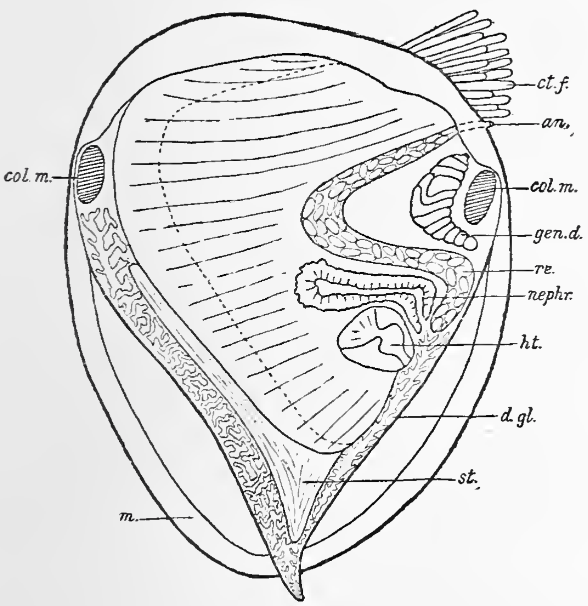


Fig. 14.

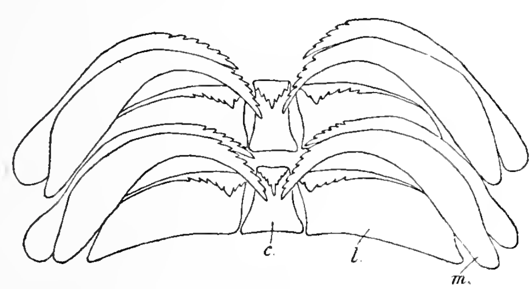


Fig. 15.

Fig. 14.—*Crepidula monoxyla.* The animal removed from its shell and viewed from the dorsal side. The organs are visible through the body-wall and the transparent mantle. The dotted line represents the attachment of the ctenidial filaments to the mantle roof. × 4. *an.* anus. *col.m.* columellar muscle. *ct.f.* ctenidial filament. *d.gl.* digestive gland. *gen.d.* genital duct. *ht.* heart. *m.* mantle. *nephr.* nephridium. *re.* rectum. *st.* stomach.

Fig. 15.—*Crepidula monoxyla.* Radula; two rows of teeth. *c.* central. *l.* lateral. *m.* marginal. × 185.

side of the cusp. The œsophagus is long and sinuous; it extends from the dorsal side of the buccal mass, through the nerve ring, to the "tail," without change of diameter; it opens on the dorso-lateral side of the stomach by a wide aperture protected internally by a fold. The stomach is bent back sharply on itself, crosses dorsal to the œsophagus, and then narrows towards the intestine; it is a large, thin-walled chamber, and receives three bile ducts, viz. one small one on its postero-dorsal side close to the œsophageal entrance, and two large ones situated close together in the mid-dorsal line. The intestine bends sharply to the right and then runs forward to the anus. The last bend of the intestine is superficial, like the stomach, but the part nearest the stomach is embedded in the digestive gland. The terminal portion of the rectum is free. The fæcal pellets are creamy white in colour, and of compact oval shape; they show through the walls of the rectum.

The nervous system of *Crepidula* has been described by various authors. In *C. monoxyla* the nerve ring conforms to the usual type. All the ganglia are distinct. The cerebro-buccal connectives are very long. A large pallial nerve is present on each side, and on the left side the branchial nerve, from the supra-intestinal ganglion, runs parallel to it. The supra-intestinal ganglion lies immediately over the œsophagus, and is joined to the right pleural ganglion by a short connective. Double zygoneury is present, connectives joining the supra-intestinal ganglion to the left pleural ganglion and the sub-intestinal ganglion to the right pleural ganglion.

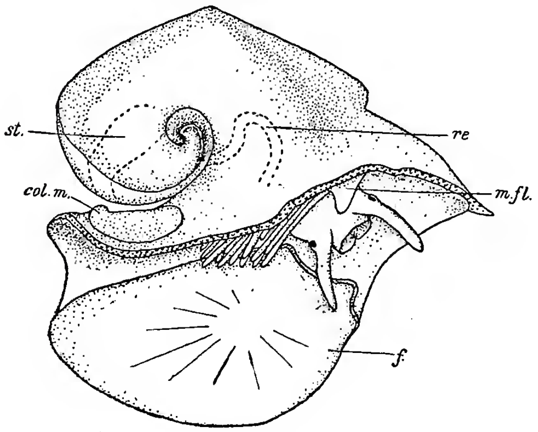


FIG. 16.

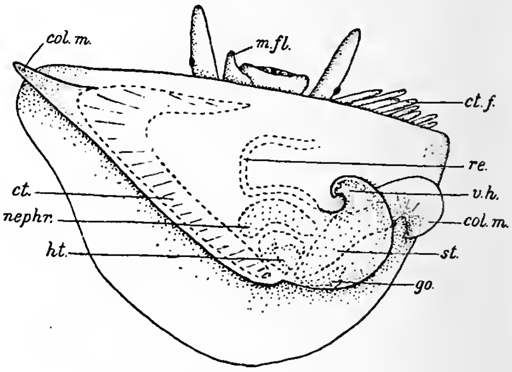


FIG. 17.

FIG. 18.

FIG. 16.—*Sigapatella calyptræformis.* The animal removed from the shell and viewed from the side. Dotted lines represent the outlines of organs seen through the body-wall and mantle. × 4. *col.m.* columellar muscle. *f.* foot. *m.fl.* mantle flap. *re.* rectum. *st.* stomach.

FIG. 17.—*Sigapatella calyptræformis.* The animal extracted from the shell and viewed from the dorsal side. In the central part of the figure dotted lines represent the outlines of organs seen through the body-wall and mantle. × 4. *col.m.* columellar muscle. *ct.* ctenidium. *ct.f.* ctenidial filament. *go.* gonad. *ht.* heart. *m.fl.* mantle flap. *nephr.* nephridium. *re.* rectum. *st.* stomach. *v.h.* visceral hump.

FIG. 18.—*Sigapatella calyptræformis.* Outline of the attachment surface of the columellar muscle. × 4.

Sigapatella calyptræformis (Lamarck). (II, p. 83.)

Station 134. Spirits Bay, New Zealand; 11–20 fathoms.

Seven specimens, varying from 16 to 29 mm. in diameter. The shell, with its flat reduced spire, forms the place of attachment of many other animal forms, such as other Molluscs, Polyzoa, Sponges, Ascidians, &c.

The snout is short, truncated, and without appendages. The tentacles are moderately long, with the eyes near the base. The mantle is thick, not very transparent, with a thickened warty rim and a lip-like projection (fig. 16, *m.fl.*) overhanging the snout at the beginning of the ctenidial axis; this projection appears to form a siphon for the entrance of the water current over the gill.

The cervical epipodial lobes are well developed; the right lobe, which is larger than the left, extends to the ventral surface of the body. The penis is of moderate size. The body-wall between the mantle and the foot is strongly pigmented. The foot is rounded, with a shallow anterior pedal groove.

The visceral hump is prominent, and forms a keel-like projection on the back, ending in a forwardly directed visceral spire (figs. 16, 17). The columellar muscle is asymmetrical; on the right it is broad and sickle-shaped; on the left it tapers and ends in a projecting point on the left anterior border of the mantle. The direction of the sickle-shaped end is the reverse of that of the visceral spire (fig. 18).

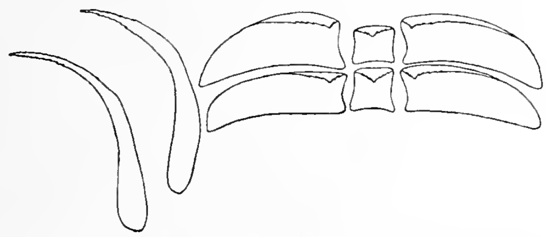


Fig. 19.—*Sigapatella calyptræformis.* Radula; two rows of central and laterals, and the left marginals of one row. × 185.

The osphradium is well developed and bipectinate. The radula (fig. 19) does not require any special comment. Central and laterals are quadrangular, the former almost square, the latter very broad. Central, laterals, and marginals are all finely denticulate. A linear band marks the edge of the radular ribbon. The stomach is short and broad, receives two bile ducts, and is furnished with a tongue-shaped valve guarding the entrance from the œsophagus.

Sigapatella tenuis (Gray). (II, p. 83.)

Station 134. Spirits Bay, New Zealand; 11–20 fathoms.

Two specimens, both broken, only one with a shell. Width of foot, 7 mm.

All the organs are much more delicate than those of *S. calyptræformis.* The side of the foot is not pigmented. The columellar muscle is horseshoe-shaped, and its broad end is not sickle-like. The osphradium is relatively large.

The buccal mass is poorly developed, and is scarcely wider than the œsophagus; it has no lateral muscular pouches. The radula resembles that of *S. calyptræformis,* but the denticles are more distinct.

Naticidæ.

Amauropsis rossiana, Smith. (II, p. 69.)

Stations 331, 338. McMurdo Sound; 207–250 fathoms.

Several specimens, all completely retracted, and therefore very brittle and difficult to dissect.

The periwinkle-like shell has thin, calcareous layers, but a thick, horny periostracum, which strips off easily and is dark brown incolour. The operculum is relatively large, ovate, and spiral, and is convex towards the animal; it fits very tightly over the mouth of the shell.

The anatomy closely resembles that of *Natica*. The tentacles are set widely apart, and between them a thin flap or veil projects over the snout. The mouth is transverse, and from its ventral border projects a short, grooved "lip." The foot, though highly developed and divided into regions as in *Natica*, is not so prominent as in that genus, though some of this difference may be accounted for by contraction. The mucous gland possesses well-defined lamellæ. The penis is very large, with a deep groove. The bipectinate osphradium has a wavy glandular tract running along each side of it, the two tracts uniting anteriorly.

A pouch with thick walls, and with internal partitions reducing the lumen, arises from the œsophagus, immediately posterior to the nerve ring. A similar pouch or crop has been described by Bouvier (1887, p. 203) in *Natica*. The pouch appears to be glandular, and is so large as to fill the space between body-wall and foot in this region, forming a very striking object in dissection.

Large, strongly chitinized jaws are present (fig. 20); each is roughly triangular in shape, and the two almost meet in the mid-dorsal line. The rods are arranged very regularly in diagonal, parallel rows; they are very large, and project freely from the anterior edge, giving this a ragged appearance, which is visible to the naked eye. The radula (fig. 21) is extremely characteristic; in general it resembles that of other Naticidæ, but it possesses features which appear fantastic and exaggerated. The central has a base which is broadest posteriorly and narrows towards the cusp; the posterior edge is curved and has two lateral projections; from the upper surface (i. e. that directed dorsalwards) projects a kind of platform, which springs from the region immediately behind the cusp and ends posteriorly with a wavy margin and two lateral prolongations, similar to, but smaller than, the basal prolongations. The central may be described as three-cusped, so large are the lateral denticles; the middle cusp is simple, and reaches to about half-way between the anterior and posterior edges of the base, although in old teeth it may reach three-quarters of this distance; the lateral prongs tend to get farther from the middle line as the tooth grows older, so that the tooth comes to resemble that of a Rachiglossan (e. g. *Volutharpa*, fig. 36). The lateral has an even more fantastic outline than the central; its base is roughly rectangular, with the side adjacent to the central concave, and with little processes projecting from at least three corners; the cusp is long, and, as is usual in the Platypoda, is asymmetrical, and directed towards the central; there is a narrow central apex to the cusp and a pair of stout lateral denticles. The two marginals differ greatly from one another; the inner is short and stout, with two sub-equal cusps formed by the forking of the apex; the outer has a rather broad base, but tapers sharply to a long, narrow point; both marginals, in overlapping the lateral, reach to the central.

The nervous system (fig. 22) is difficult to trace owing to the dense accumulation of connective tissue round it. It does not differ materially from that of *Natica* (Bouvier, 1887, p. 203). The triangular supra-intestinal ganglion (*s.int.g.*) is farther removed from the right pleural ganglion than in *Natica*, but the same curious sinistral zygoneury (*z.l.*) occurs. The facts that there is no pallial nerve from the left pleural ganglion, and that the nerve fulfilling this function springs from the supra-intestinal ganglion, led Bouvier to suppose that the zygoneury was due to a fusion of the left pallial nerve with the supra-intestinal ganglion, and this explanation seems to be valid here, for the pallial nerve branches off immediately after the zygoneurous connexion with the supra-intestinal ganglion. The cerebral-stomatogastric connectives are long and slender.

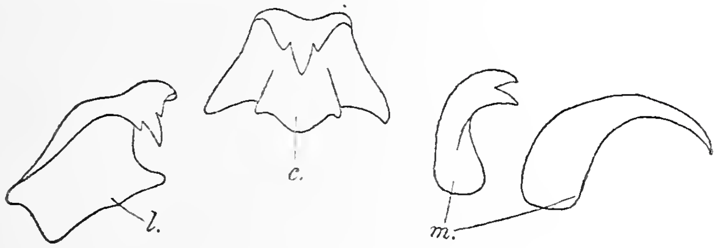
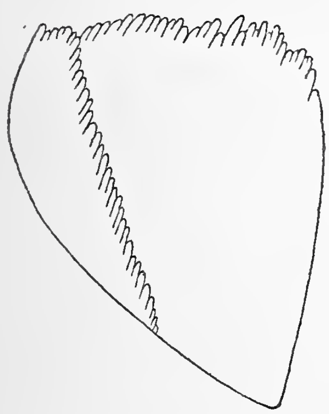


FIG. 21.



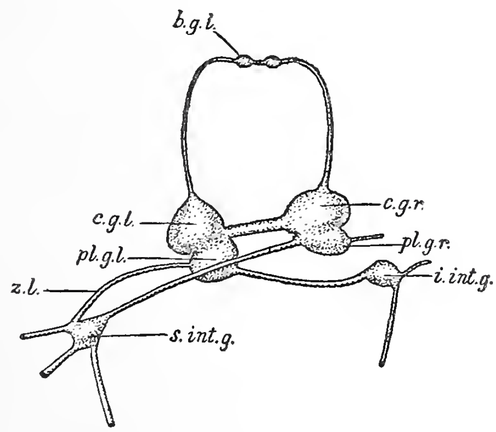


FIG. 20. FIG. 22.

FIG. 20.—*Amauropsis rossiana.* Left jaw. One row of rods is drawn to show the diagonal disposition of the rows. × 60.

FIG. 21.—*Amauropsis rossiana.* Central (*c*), lateral (*l*), and two marginal teeth (*m*) from the radula. × 250.

FIG. 22.—*Amauropsis rossiana.* Nerve ring and related ganglia. The pedal ganglia are not shown. × 6. *b.g.l.* left buccal ganglion. *c.g.l.* left cerebral ganglion. *c.g.r.* right cerebral ganglion. *i.int.g.* sub-intestinal ganglion. *pl.g.l.* left pleural ganglion. *pl.g.r.* right pleural ganglion. *s.int.g.* supra-intestinal ganglion. *z.l.* sinistral zygoneurous connective.

Sublacuna indecora, Thiele. (II, p. 66).

Station 340. Ross Sea (76° 56′ S., 164° 12′ E.); 160 fathoms.

One specimen, 4·5 mm. broad.

This is one of the most interesting types in the "Terra Nova" collection, as the anatomy of this genus, apart from a description of the radula by Thiele (1913, p. 195), was formerly unknown. The name *Sublacuna* suggests that, on purely conchological grounds, the species was thought to be related to *Lacuna* and to belong to the family Littorinidæ. Thiele recognized that the radula of *Sublacuna* differs from that of *Lacuna*, and a study of the anatomy of the "Terra Nova" specimen, though very imperfect owing to its small size and poor preservation, bears out his conclusion that *Sublacuna* is not nearly related to *Lacuna*. The characters that could be ascertained with certainty are sufficient to show that *Sublacuna* possesses affinities with the Naticidæ.

The shell is delicate and very brittle. The operculum (fig. 23) is spiral, and is partly horny and partly calcareous as in *Amauropsis*; the calcareous portion readily breaks and separates from the horny portion, whose rim is turned up at right angles like that of the leaf of a *Victoria regia* water-lily. The foot has a free lobe anterior to the main portion; this is probably the propodium (cf. *Natica*), but it was much contracted in the specimen and appears to be not very highly developed.

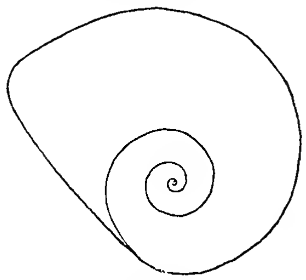


Fig. 23.

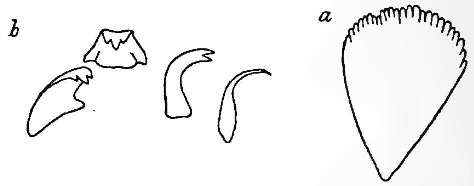


Fig. 24.

Fig. 23.—*Sublacuna indecora*. Operculum. Note the straight growing edge, which resembles that of *Amauropsis*. The upturned portion is not drawn. × 30.

Fig. 24.—*Sublacuna indecora*. (*a*) Left jaw. × 60. (*b*) Central, lateral, and two marginal teeth of the radula. × 250.

Eyes are not present. The snout is very short and is hidden by the tentacles, whose bases meet in the mid-dorsal line. This is the only feature of any importance in which *Sublacuna* differs from other members of the Naticidæ. The penis is large, with a deep open groove continuous with a groove on the body-wall. A large crop is present. The jaws (fig. 24, *a*) resemble those of *Amauropsis* in shape and in the diagonal disposition of the parallel rows of rods. The radula consists of about forty rows of very small teeth, which are pale yellow in colour (fig. 24, *b*). The central has a broad base which narrows towards the cusp; the latter has three large denticles; the base bears a projection similar to that described in *Amauropsis*, but simpler in shape. The lateral has an incised inner margin and its cusp bears three prongs. The first marginal is forked at the apex, the outer marginal is sharply pointed. A comparison of the figures of the radulæ of *Sublacuna* and *Amauropsis* will show the remarkable resemblance between the two.

The interior of the specimen was too small and too soft to make a study of the nerve ring possible. The gonaduct is sinuous.

Sublacuna may be placed in the Naticidæ, with which it agrees in the following characters: the shape and structure of the spiral operculum, which is both horny and calcareous, the pattern of the jaws and radula, the division of the foot into propodium and foot proper, and the presence of a crop. It differs from other Naticidæ in the absence of a "veil" over the snout and in the coalescence of the tentacle bases in the mid-dorsal line.

Lamellariidæ.

Marseniopsis conica (Smith). (II, p. 66.)

Station 356. McMurdo Sound; 50 fathoms.

Two specimens, both female. Length 33 mm., breadth 21 mm., height 20 mm.; foot 20 × 10 mm.

The foot is narrow, with the usual deep anterior pedal groove and recurved anterior edges. The mantle is very thick and fleshy, especially at the sides; it is smooth and completely encloses the delicate shell, and extends beyond the foot on all sides. On the left-hand side, just anterior to the head, a deep cleft occurs in the mantle, crossing it at first obliquely and then bending upwards, extending half-way up the side; this is the inhalant cleft or "siphon." A fleshy valve is present on the posterior wall of the cleft at the point where the latter curves upwards. The opening of the cleft does not project beyond the surface of the mantle. No exhalant fold is present. The tentacles are short and slender, the eyes sessile and on the outer side of their bases. The ctenidium is visible on the ventral surface, its long, slender leaflets projecting on the right side. The osphradium is bipectinate, but unequally so. On cutting through the mantle, which is thinner dorsally but much thicker at the sides, the shell is exposed; this is very delicate and consists of an outer horny layer which is quite transparent, and an inner brittle calcareous layer which readily fragments; there are about two and a half whorls in the shell.

After removing the shell, the visceral hump is seen. On the surface appear the digestive gland (liver), and the gonad, together with the last portion of the intestine. Embedded in the visceral hump are the foliate stomach, the true stomach, the intestine, and the rectum; to see these the liver and gonad must be dissected away. The remainder of the alimentary canal and a portion of the foliate stomach lie in the head and neck, i. e. in the part anterior to the visceral hump.

The buccal mass contains a protrusible "proboscis" which is retracted in both specimens. The aperture of the proboscis is guarded by a pair of short, broad mandibles, rather more than three times as broad as long; each bears the usual rods, which in this genus are arranged with characteristic regularity, their lozenge-shaped bases forming a distinct pattern. The radula is long and sinuous, and its sac projects backwards from the buccal mass on the right side (fig. 25, *rad.*). The radular formula is 2.1.1.1.2; about forty-five rows of teeth are present (fig. 26, *a*). The central has a long median cusp whose sides bear about four sharp denticles; the base is slightly broader posteriorly. The lateral is large and stout, about twice the length of the central and curving over it; the sides are recurved; the cusp is very strong, with two, three, or occasionally four denticles on each side, only those of one side being as a rule visible in side view; the base is quadrangular and incised posteriorly. The marginals are without denticles; the inner is larger than the outer; both are slightly curved towards the lateral, and they taper off from fairly broad bases.

The œsophagus bends towards the left as it leaves the buccal mass, the radula occupying the right side at this point. The œsophagus passes immediately through

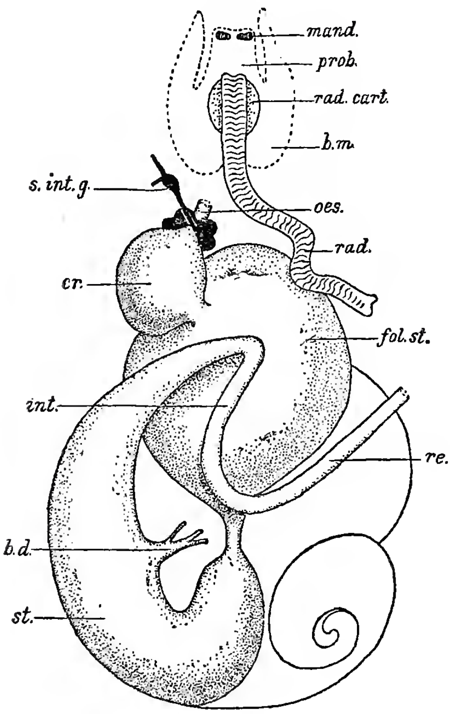


Fig. 25.

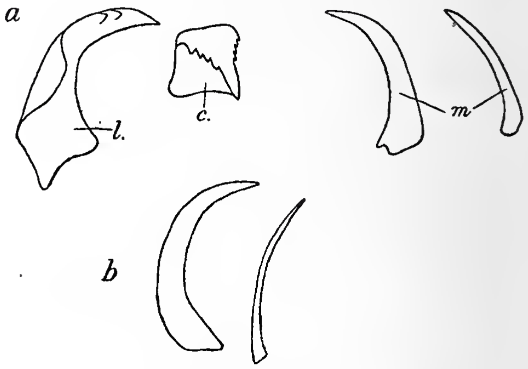


Fig. 26.

Fig. 25.—*Marseniopsis conica.* Dissection of the alimentary canal. The buccal mass has been cut open to show the jaws and radula. The œsophagus, which arises from the dorsal side of the buccal mass, has been cut away except for a small portion close to the nerve ring. Only the outline of the visceral mass is shown. The foliate stomach lies ventral to the body whorl of the visceral hump and not within it. The digestive gland has been dissected away to expose the stomach and intestine. The terminal portion of the rectum is not drawn. × 3. *b.d.* bile duct. *b.m.* buccal mass. *cr.* crop. *fol.st.* foliate stomach. *int.* intestine. *mand.* mandible (jaw). *oes.* œsophagus. *prob.* proboscis. *rad.* radula. *rad.cart.* radular cartilage. *re.* rectum. *s.int.g.* supra-intestinal ganglion. *st.* stomach.

Fig. 26.—(*a*) *Marseniopsis conica.* Isolated central (*c*), lateral (*l*), and marginal (*m*) teeth of the radula. × 60. (*b*) *Marseniopsis mollis.* Isolated marginal teeth of the radula. × 60.

the nerve ring, which is also displaced towards the left; after traversing the ring, it swells into a crop (fig. 25, *cr.*), about equal in size to the buccal mass. The crop has an opening on its right side into a thick-walled chamber, the "foliate stomach" (fig. 25, *fol.st.*), which occupies a very large space in the neck and anterior portion of the visceral mass. As the crop opens on the left side of the foliate stomach, there is a blind anterior end to the latter. The foliate stomach, as its name implies, is a chamber whose inner walls are provided with leaf-like folds; these are so numerous and project inwards so far that the whole chamber appears to be solid. No food was present in the foliate stomach in the two specimens examined, but its glandular walls suggest that digestion begins here. Posteriorly the food leaves by a very narrow median canal connecting the foliate stomach and the true stomach (fig. 25, *st.*); the latter commences at the posterior portion of the visceral hump, where it rises near the surface, though still covered by the digestive gland, runs forward along the left side of the visceral hump to the antero-median position, and passes insensibly into the intestine. The narrow canal between foliate stomach and true stomach enlarges suddenly, so that the general shape of the stomach is a wide, curved chamber, tapering slightly at the intestinal end. At the entrance (œsophageal end) of the stomach lies a deep pocket, embedded in the substance of the digestive gland and ventral to the bulk of the stomach; a large bile duct (*b.d.*) conveys the digestive fluid from the gland to the right or concave side of the stomach. The intestine has a knee-bend in the middle line in the antero-dorsal position, from which it runs backwards on the surface and then forwards again with a semicircular sweep towards the rectum, which leaves the visceral mass on its right side and runs forward to open at the anus. The portion of the alimentary canal within the visceral hump lies wholly within the last voluminous whorl of the shell, no part of it occupying the spiral coils of the latter.

The nervous system is similar to that described by Bergh (1886 (1)) in *Marsenia prodita* and in *Marseniopsis pacifica* (Bergh, 1886 (2)). The displacement of the nerve ring towards the left has already been noted. The supra-intestinal ganglion (fig. 25, *s.int.g.*) is situated anterior to the cerebral, the connective between the former and the right pleural ganglion crossing dorsally over the left cerebral ganglion. Double zygoneury is present.

The female reproductive organs are similar to those described by Bergh in other diœcious Marseniadæ. About six very small seminal reservoirs are present on the oviduct.

Marseniopsis mollis (Smith). (II, p. 66.)

Station 338. McMurdo Sound; 207 fathoms.

One specimen, a male. Length 45 mm., breadth 36 mm., height 29 mm.

The mantle covering is soft, smooth, and rounded, and very thick and fleshy. The greatest breadth of body is at the sides, and not where the mantle touches the ground, as in the former species. The foot is 30 mm. long and 13 mm. broad; the tail projects slightly, but is invisible from the dorsal surface of the animal. The inhalant cleft in the mantle is short, and is almost vertical and median; it does not project beyond the anterior face of the mantle, and is valveless. It is curious that in this species and in the next unnamed species the left tentacle lies deep in this cleft.

The eye lies on the outer swollen base of the tentacle. The penis is long and flattened, with a spatulate apex; it is about two-thirds as long as the foot; it is bent backwards, and is visible from below.

The shell is transparent, and possesses no calcareous layer; it comprises about two complete whorls. The connective tissue covering the visceral hump is slightly pigmented, but there is no trace of colour elsewhere.

The alimentary canal resembles that of *M. conica*, with slight differences such as a sinuous instead of a crescent-shaped stomach. The jaws are nearly four times as broad as long, and their pattern is much less regular than that of *M. conica*, owing to the crowding of the rods. The radula consists of about thirty rows of teeth; the central and laterals are very similar to those of *M. conica*, but the marginals differ, the inner being much more curved and almost sickle-shaped, the outer very narrow and nearly straight (fig. 26, *b*).

The nervous system needs no comment.

The male reproductive system differs from that described by Bergh in *M. murrayi* ("Challenger" Report, p. 24), the differences chiefly affecting the *vas deferens*. The testis is very voluminous, and consists of regularly packed tubules. The *vas deferens* is divisible into five distinct portions:

1. A much-convoluted portion twisted into a compact mass within the visceral hump and arising by numerous ductules from the testis.
2. A portion that swells on its right side into a thick-walled glandular sac, which lies on the surface of the visceral hump and on its anterior border. This swelling appears to correspond to the prostate of Bergh, but differs from that described by him in *M. murrayi* in that it is not long and coiled within the convolutions of the first part of the *vas deferens* but is free from the convoluted mass.
3. A thick-walled part just within the body-wall, anterior to the columellar muscle, sinuous but not coiled.
4. A second coiled portion, with very tough walls, lying within the anterior part of the body and twisting backwards and forwards with long coils over the foliate stomach; it gradually decreases in width as it approaches the penis. This portion does not occur in *M. murrayi*, but is described by Bergh as being present in *Marsenia* and *Marseniella*.
5. A straight portion which traverses the length of the penis and opens on a little papilla near the tip.

Marseniopsis, sp.

Station 355. McMurdo Sound; 300 fathoms.

One specimen, female. Length 14 mm., breadth 9 mm., height 8 mm.

The species resembles *M. mollis* and *M. conica* in general characters. The upper side of the mantle is, however, covered with projections of two kinds, namely, numerous small, scattered, mammillated projections, and about twelve large, wart-like ones. The warts bear papillæ on their sides, and are most numerous posteriorly. There is a sharp line of division between the upper and the under portions of the mantle, the latter being quite smooth. In the characters of the mantle this species resembles *Lamellariopsis* of Vayssière (1908), but an investigation of the internal anatomy does not appear to justify its separation from the genus *Marseniopsis.*

The inhalant groove of the mantle arises on the left side, but passes almost mesially, projecting as a little spout directed forwards and upwards. When viewed from the dorsal side the animal has the appearance of a warted pear with a short stalk. The mantle cleft has no valve. The foot is 8 mm. long and 4 mm. broad. The mantle is not very thick. The shell has about three and a half whorls, with the apex far back and slightly to the right ; the chitinous layer is very thin, and beneath it lies the calcareous portion. When the shell is removed the various organs show very plainly through the body-wall. The ctenidial leaflets are comparatively short ; the osphradial leaflets, which, as usual, are longer on the outer side of that organ, are very thick.

The internal anatomy is similar to that of the other species of *Marseniopsis.* The jaws are three and a half times as broad as long. The radula consists of about thirty rows of teeth. The central has a rather blunt cusp and a variable number (usually three to five) of lateral denticles, the number differing even on right and left sides of the same tooth. The lateral tooth is of the usual shape, with two pairs of denticles beneath the strong cusp. The marginals are very slender, but are similar in shape to those of the other species of the genus. The stomach is relatively smaller than in the species described above. The nervous system resembles that of *M. conica,* but the supra-intestinal ganglion occupies a more posterior position.

In the reproductive system the accessory genital glands are well developed, but are too much caked together to allow of their separation without damage. The seminal reservoirs are not arranged in a linear series as in *M. conica,* but spring in a bunch from the walls of the oviduct ; eleven reservoirs, each swollen at its blind end, occur in the specimen examined.

Marseniopsis, sp. (second unnamed species).

Station 314. McMurdo Sound ; 222–241 fathoms.

Two specimens. Length 11 mm., breadth 8 mm., height 7 mm.

The mantle is slightly rough, and is prolonged forwards into a median, spout-like, inhalant aperture, which does not project upwards as in the other species of this genus. The mantle has no distinct edge beneath, but rounds itself off towards the ventral side. The inhalant aperture has a valve-like projection on each side, that on the right side being situated nearer the apex of the spout than that on the left.

The foot is not sunk in the mantle as in the species described above, but projects completely, as do also the tentacles. The " tail " reaches to the posterior border of the mantle, but is not visible from the dorsal aspect. The shell consists of two and a half whorls, and is partly horny, partly calcareous.

The general anatomy resembles that of the other species of *Marseniopsis*, but the jaws are relatively shorter and broader, being only twice as broad as long. The rods of which the jaw is composed are very long, with the usual regularly arranged, diamond-shaped bases. The radula possesses about fifty rows of teeth. The central has a moderately long cusp, with three or four bead-like denticles. The lateral bears two or three sharp denticles on each side of the strong cusp. The marginals are slender, and are but slightly curved.

Eulimidæ.

Eulima exulata, Smith. (II, p. 64.)

Station 316. McMurdo Sound ; 190–250 fathoms.

Four specimens, about 8 mm. long and from 2 to 3 mm. broad.

The general anatomy is similar to that of the larger British species of the genus. The eyes are prominent, and show through the delicate polished shell; each is situated at the base of the tentacle and on its dorsal side. The tentacles are short and stout; they meet in the middle line at their bases, and are pointed at the tip. The proboscis is long, and is protruded in some of the specimens. The foot is very short, and is rounded in shape. The operculum is almost elliptical.

The ctenidium consists of about thirty short, thickened, triangular leaflets. As in other members of the family, the radula is absent. The œsophagus, which arises from the posterior end of the narrow, elongated buccal mass, is also very narrow, except just near its origin, where it is somewhat bulbous ; a constriction separates it from the buccal mass ; it bends sharply forwards and to the left, then bends back parallel to the first portion, and immediately passes through the nerve ring.

RACHIGLOSSA.

Buccinidæ.

Neobuccinum eatoni, Smith. (II, p. 72.)

Station 322. McMurdo Sound ; 20 metres.

Two male specimens. The apex of the spire missing, and the liver damaged in one. Operculum 2 cms. × 1·3 cms. Length of body whorl from suture to siphon, 3–4 cms.

In its general features *Neobuccinum* closely resembles *Buccinum* (Dakin, 1912), and therefore only those points in which it differs from the latter are noted. The growth layers in the operculum are not concentric, but terminate on the edges, curving slightly before doing so. The mucous glands show no trace of lamellæ, but this may be due to the condition of the specimens at the time of preservation. A flap occurs at the base of the pallial siphon and covers the area between the siphon and the ctenidium in such a way as to direct the water entering the pallial cavity over the osphradium before it reaches the ctenidium.

The radula (fig. 27) differs somewhat from that of *Buccinum* and shows characters intermediate between that genus and certain species of *Cominella* (fig. 28). The central or rachidian tooth possesses three well-marked cusps, of which the central cusp is slightly longer than the others. The laterals bear denticles on their inner cusps, but these are very irregular both as regards number and size.

The nerve ring resembles that of *Buccinum.* The buccal ganglia are, however, relatively larger.

The reproductive organs of the male are similar to those of *Buccinum.* The walls of the *vas deferens* are, however, much thicker, and the coils are more elaborate.

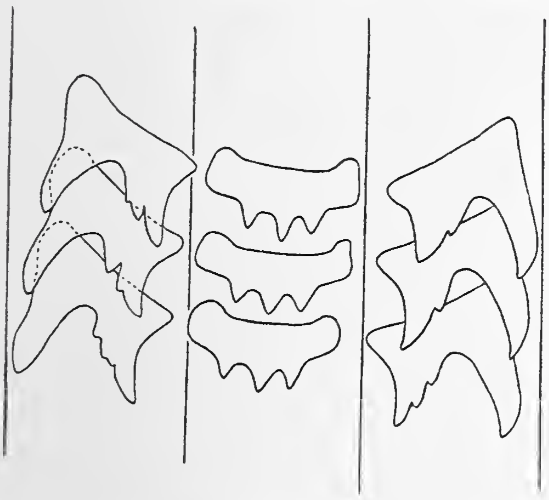


Fig. 27.

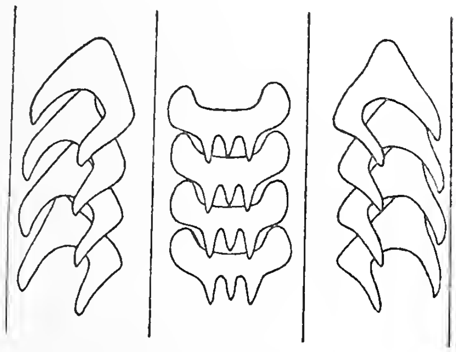


Fig. 28.

Fig. 27.—*Neobuccinum eatoni.* Radula; three rows of teeth. Drawn under the Edinger Projection Apparatus. × 55.

Fig. 28.—*Cominella adspersa.* Radula; three rows of teeth. × 55.

Cominella adspersa (Bruguière). (II, p. 85.)

Station 134. Spirits Bay, New Zealand; 11–20 fathoms.

Five specimens. Length 5–6 cms.

The shell is extremely thick. The mucous gland has broad lamellæ and evidently secretes abundantly. The tentacles and mouth region are small, and flattened dorso-ventrally. The whole animal is strongly pigmented and very tough.

The proboscis is stout, and pigmented. The radula (Cooke, 1917) shows very distinctly the three parallel chitinous bands on which the teeth are set (fig. 28). The rachidian tooth, as in *Neobuccinum eatoni*, bears three cusps, almost equal in size, but narrower and more closely set than in that species (cf. fig. 27); the central cusp tends to be shorter than those on each side of it; the base of the tooth is horseshoe-shaped. The laterals are stout, with two slightly curved cusps devoid of denticles. *C. adspersa* belongs, therefore, to Cooke's first or simple type.

The œsophagus (fig. 29, *oes.*) is thin walled; after passing through the nerve ring, it gives off a lateral, pouch-like cæcum with thick walls, and beyond this point it narrows again and an internal fold appears which is continued into the stomach. The stomach possesses two chambers set at an acute angle with one another; the first chamber (*st. 1*) is globular, projects towards the right side, and receives a short, thick bile duct (*bd. 1*) from the digestive gland ("liver"); its walls are very thick, and, owing to the elaboration of internal partitions, appear almost solid when opened. The second chamber of the stomach (*st. 2*) lies on the left side, the gut taking an acute bend forward and to the left at the junction of the two chambers; a second bile duct (*bd. 2*) opens into it on the right. This second chamber has a sacculated pouch at its posterior end; the sacculations are about seven or eight in number and are separated internally by ridges arising from the walls of the stomach. The fold in the wall of the œsophagus above mentioned runs down to the slightly constricted junction between the first and second divisions of the stomach and then divides into two, one portion of the fold passing into the wall of the first chamber and the other fusing with the wall of the most posterior of the sacculæ. The intestine is thin walled.

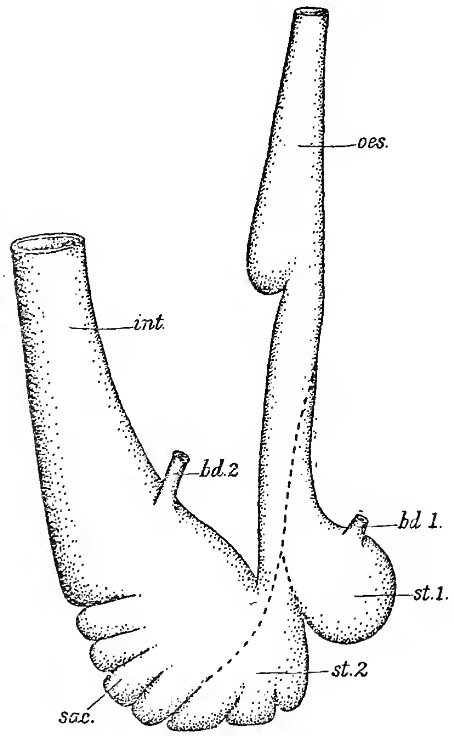


FIG. 29.—*Cominella adspersa.* Portion of the gut in the region of the stomach. The dotted line represents the internal longitudinal folds. × 6. *bd. 1.* first bile duct. *bd. 2.* second bile duct. *int.* intestine. *oes.* œsophagus. *sac.* sacculations of stomach. *st. 1.* first chamber of stomach. *st. 2.* second chamber of stomach.

The reproductive organs, both in the male and in the female, resemble those of *Buccinum.* In the female the oviducal gland is enormously developed. In the male the *vas deferens* is thick walled, but is much less coiled than in *Buccinum*; its aperture lies on a papilla which projects laterally near the tip of the penis.

Muricidæ.

Trophon shackletoni, Hedley.

Station 340. Ross Sea; 160 fathoms.

One specimen.

The operculum is thin, the foot much retracted and small. The mantle edge is smooth, unpigmented, and devoid of tentacles. The eyes are sessile and are situated on the outer side of the short, thick tentacles, about one-third of their length from the base. The siphon is one and a half times the length of the tentacles, and has a double frilled edge with a deep groove between the two borders; it bears no appendages. The ctenidium is slightly larger than the well-developed osphradium; it is crescent-shaped, and has long triangular leaflets projecting into the mantle cavity. The mucous gland secretes abundantly, but shows no trace of lamellæ in the specimen examined.

The proboscis is small and its muscles are poorly developed. The radula (fig. 30) is so minute that careful dissection under the dissecting microscope was necessary to find it at all; it has a faint yellowish tinge; it consists of about twenty-four rows of very small teeth. The rachidian tooth is short and wide, with seven rounded cusps, of which the central cusp is slightly longer than the others. The laterals are simple and are devoid of denticles. The pair of large, caked salivary glands are similar to those of the Buccinidæ. There is a swelling on the œsophagus just beyond the salivary glands (cf. *T. longstaffi*), and a lateral cæcum behind the nerve ring. Leiblein's gland is large.

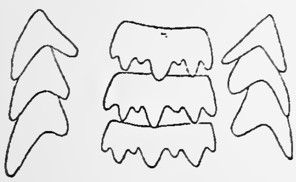


Fig. 30.

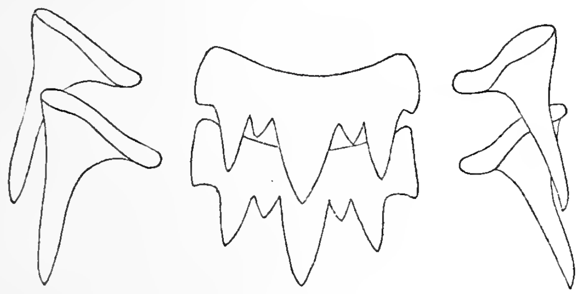


Fig. 31.

Fig. 30.—*Trophon shackletoni.* Radula; three rows of teeth. × 250.
Fig. 31.—*Trophon longstaffi.* Radula; two rows of teeth. × 185.

The ganglia of the nerve ring are distinct; in general they resemble those of the Buccinidæ, but the supra-intestinal ganglion occupies a more primitive position, remote from the ring; the pedal ganglia are very large.

Trophon longstaffi, Smith. (II, p. 73.)

Station 33. McMurdo Sound; 250 fathoms.

Seven specimens.

As this species is much larger than *T. shackletoni* it is more suitable for detailed dissection.

The eyes are situated on the outer side of the tentacles on short stalks. Other external features are similar to those of *T. shackletoni.* The radular sac projects backwards from the posterior end of the buccal mass. The radula (fig. 31) is well developed, with the centrals much stronger than the laterals; each central has five cusps, of which the middle one is the longest and the two outermost are second in length; the laterals are simple, with long, claw-like cusps that are devoid of denticles. The œsophagus bends first to the left and then to the right after passing through the nerve ring; it thus forms a complete loop. The salivary glands (fig. 32, *s.gl.*) are large, with wide ducts; each gland is compact, white in colour, and translucent, with a small, opaque, yellowish body with thick walls at the free end, connected with the main portion by a slender duct. The function of this little body is obscure; it is too thick walled for a reservoir and, morever, is in the wrong position for one. Immediately posterior to the entrance of the salivary ducts the œsophagus swells into a gizzard-like structure; the anterior portion of this is thin walled with a chitinous lining, the posterior portion very thick walled. Beyond the nerve ring a coiled cæcum (*caec.*) arises from the œsophagus. Leiblein's gland (*L. gl.*) is of a dark-brown colour; it is situated dorsal to the gut, is very voluminous, and fills the whole of the posterior part of the body cavity in this region; its coils are so compacted

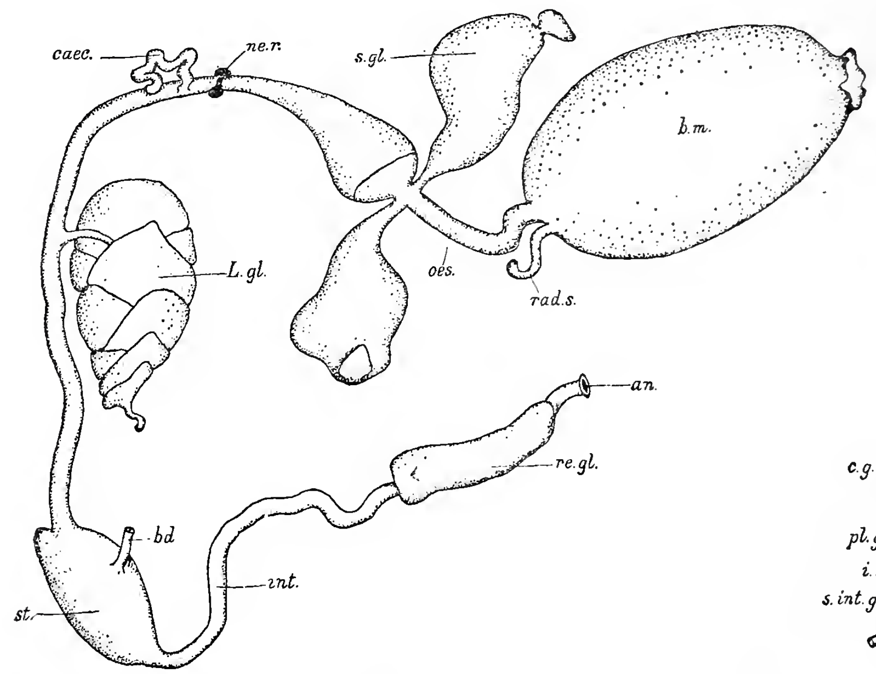


FIG. 32.

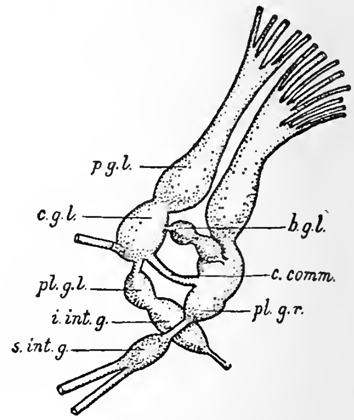


FIG. 33.

FIG. 32.—*Trophon longstaffi.* Alimentary canal and its glands. The position of the nerve ring is indicated. × 6. *an.* anus. *b.m.* buccal mass. *b.d.* bile duct. *caec.* cæcum. *int.* intestine. *L.gl.* Leiblein's gland. *ne.r.* nerve ring. *oes.* œsophagus. *rad.s.* radular sac. *re.gl.* rectal gland. *s.gl.* salivary gland. *st.* stomach.

FIG. 33.—*Trophon longstaffi.* Nerve ring and related ganglia. × 10. *b.g.l.* left buccal ganglion. *c.comm.* cerebral commissure. *c.g.l.* left cerebral ganglion. *i.int.g.* sub-intestinal ganglion. *p.g.l.* left pedal ganglion. *pl.g.l.* left pleural ganglion. *pl.g.r.* right pleural ganglion. *s.int.g.* supra-intestinal ganglion.

together that the gland appears solid, and is similar in appearance to the digestive gland, a similarity enhanced by the lobulate nature of the coils; the free terminal portion consists of a narrow, colourless tube shaped like the human appendix. The stomach (*st.*) is a swelling of the gut and is provided with an anterior pouch or cæcum; it receives a large bile duct (*b.d.*); its walls are glandular and are internally ridged. The rectum is thick walled, and is surrounded by a mass of dark-brown glandular matter which appears to be of the nature of a rectal gland (*re.gl.*).

The testis consists of distinct tubules which are much branched. The *vas* *deferens* has thick walls secreting mucus. In the female the oviduct is thick walled and opens behind the rectum. The kidney has well-developed lamellæ and a slit-like aperture.

The nerve ring (fig. 33) shows a distinct separation of the ganglia. The cerebral ganglia are connected by a broad commissure; the pedal ganglia are elongate; the supra-intestinal ganglion (*s.int.g.*) is not far from the right pleural ganglion (*pl.g.r.*). Eight pedal nerves arise from the right pedal ganglion, but only five from the left.

Volutidæ.

Volutharpa charcoti (Lamy). (II, p. 72.)

Station 194. Off Oates Land; 180–200 fathoms.

A single specimen, badly damaged. The shell and the whole of the visceral hump are missing; the mantle is slit open and the organs of the pallial complex are

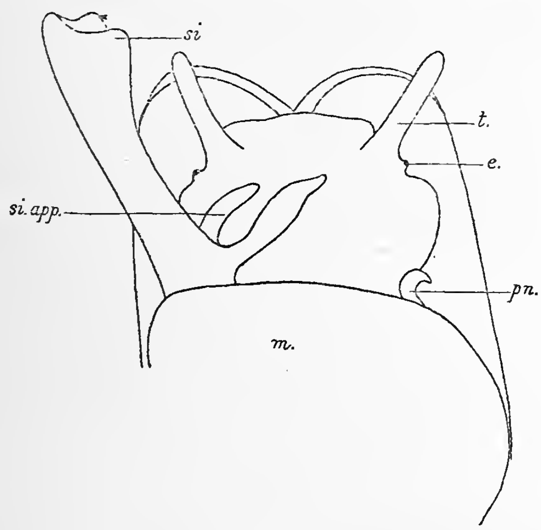


FIG. 34.

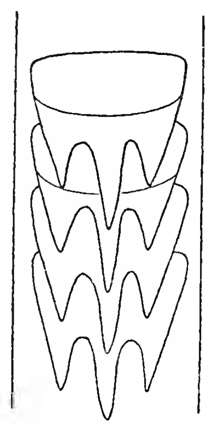


FIG. 35.

FIG. 34.—*Volutharpa charcoti.* Head from dorsal side. × 3. *e.* eye. *m.* mantle. *pn.* penis. *si.* siphon. *si.app.* siphonal appendage. *t.* tentacle.

FIG. 35.—*Volutharpa charcoti.* Radula. × 60.

disturbed. As a result of the opening up of the soft parts the internal organs are well preserved, especially the nervous system.

The head (fig. 34) and tentacles are very much flattened dorso-ventrally, so that the tentacles are strap-like. The intertentacular portion of the head projects over the "mouth" as a thin roof or buccal veil. The eyes are prominent, and lie on ocular papillæ situated at the base of the tentacles on the outer side. Postero-lateral to the eyes the flattened body-wall tapers away and merges into the foot in front of the reproductive aperture.

The siphon (*si.*) is long and projects beyond the tentacles; like these it is flattened. The siphon is rolled to form a tube open along one side, and is wider at the apex than at the base ; close to the base it bears a pair of almost equal, strap-like appendages (*si.app.*) projecting at right angles to its long axis.

The foot is large, symmetrical, deeply cleft anteriorly, and pointed behind. No operculum is present in the specimen examined. A well-developed pedal groove is present along the anterior margin of the foot, but no trace of a pedal pore is visible.

The mantle is very well developed. Vayssière (1917) describes in *Harpovoluta* a reflection of the mantle lobes over the shell, so as to cover it almost completely, except where a central hole, bounded by tentacle-like projections, is left by the fused mantle lobes. In the specimen of *Volutharpa charcoti* now described the shell is absent, but the pallial expansion, with central aperture and tentacles similar to those described by Vayssière, is present.

Ctenidium and osphradium resemble those of other Rachiglossa. The mantle between the ctenidium and the rectum is stained purple by the secretion of the pallial hypobranchial gland.

The penis (fig. 34, *pn.*) projects from the right side of the mantle cavity immediately posterior to the flattened fold of the body-wall that involves the tentacles and buccal veil; it is extremely small, and is nothing more than the free end of the sperm duct, being apparently devoid of the complex musculature that occurs, for example, in the Buccinidæ ; its tip is recurved, but is not folded back within the mantle cavity as in those forms which have a more highly developed penis. Posterior to the penis there runs along the body-wall a groove with open lips, presumably connecting the external genital orifice within the pallial cavity with the base of the penis ; this orifice, however, as well as the internal portion of the duct and the gonad, are absent from the specimen. The genital groove on the floor of the mantle cavity runs into the base of the penis, which closes round it to form a tube or true duct, opening on the surface again at the tip of that organ. In the absence of the gonad it is impossible to say whether the specimen is actually a male or whether the small penis is similar to that described by Pace (1903) in the female *Pontiothauma.*

Internally the only organs requiring comment are the alimentary canal and the nervous system.

The digestive organs somewhat resemble those described by Pace (1902) in *Voluta musica.* The buccal mass (fig. 36, *b.m.*) is large, but is not very powerful. There are no jaws. The radular sac (*rad.s.*) projects backwards from the buccal mass and is slightly recurved at its free end. The radula (fig. 35) has lost all trace of a triserial arrangement and consists of a single series of teeth only, without any indication of laterals, although Pace (1902) found minute laterals, readily soluble in potash, in *Voluta musica.*

The central tooth resembles that of some other Volutidæ; it is set on a dark-coloured curved base, and from its free edge project three simple cusps of a lighter degree of chitinization ; the middle cusp is one and a half times as long as the others.

The œsophagus (fig. 36, *oes.*) leaves the buccal mass on its dorsal side, but at once curves downwards and to the right (not to the left as in many Rachiglossa). Wrapped

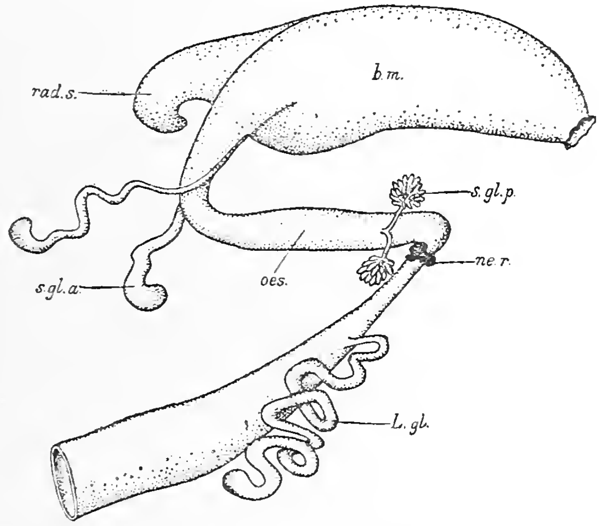


FIG. 36.—*Volutharpa charcoti.* Anterior portion of the gut. × 8. *b.m.* buccal mass. *L.gl.* Leiblein's gland. *ne.r.* nerve ring. *oes.* œsophagus. *rad.s.* radular sac. *s.gl.a.* anterior salivary gland. *s.gl.p.* posterior salivary gland.

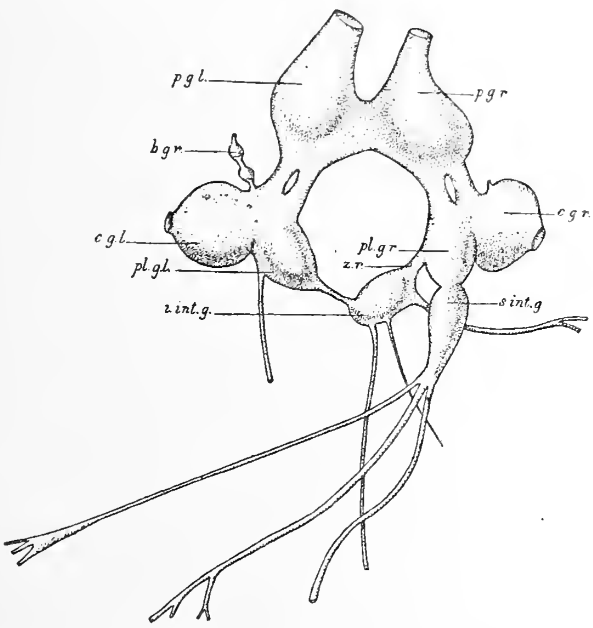


FIG. 37.—*Volutharpa charcoti.* Nerve ring and related ganglia. The cerebral commissure and cerebro-buccal connective have been cut so as to spread out the ganglia. × 12. *b.g.r.* right buccal ganglion. *c.g.l.* left cerebral ganglion. *c.g.r.* right cerebral ganglion. *i.int.g.* sub-intestinal ganglion. *p.g.l.* left pedal ganglion. *p.g.r.* right pedal ganglion. *pl.g.l.* left pleural ganglion. *pl.g.r.* right pleural ganglion. *s.int.g.* supra-intestinal ganglion. *z.r.* dextral zygoneurous connective.

round it are the first pair of salivary glands (*s.gl.a.*), each of which is a tubular gland with the free end dilated, but without a distinct reservoir such as has been described in certain other members of the family. As the buccal mass is approached the salivary ducts become narrower and narrower, and finally unite to form a common median duct, which is so slender that its entrance into the buccal cavity could not be traced. Posterior to the first pair of salivary glands the œsophagus bends sharply forwards, runs parallel to the proboscis, and then bends sharply back again; at the second bend occurs the nerve ring. The second pair of salivary glands (*s.gl.p.*) lie just in front of the nerve ring. They differ from the first pair, and are so small and brittle that they may easily be removed without their presence being noted; each resembles the mushroom-shaped gland of the male Cockroach, i. e. it consists of innumerable acini packed closely together; the two ducts, like those of the anterior salivary glands, unite, but immediately after joining open into the œsophagus. Beyond the nerve ring, which is described below, occurs a voluminous tubular gland of Leiblein (*L.gl.*); the convolutions of this gland form a compact, coiled mass overlying the œsophagus; the free end of the gland is almost globose; at the other end the walls fuse for part of their length with the œsophagus so that it is difficult to say where the opening, if any, occurs. The remainder of the gut is missing from the specimen.

The nervous system (fig. 37) shows a more specialized condition than that described by Bouvier (1887, p. 301) in *Voluta neptuni*, and more closely resembles that of *Voluta* (*Cymbiola*) *ancilla*, as described by Woodward (1903).

The supra-intestinal ganglion (*s.int.g.*) is closely adherent to the right pallial ganglion, although in *Voluta neptuni* they are separate; from the supra-intestinal ganglion three large nerves run to the pallial complex, the mantle roof, and the visceral region respectively.

Marginellidæ.

Marginella hyalina, Thiele. (II, p. 74.)

Stations 331, 339, 340. Ross Sea; 140–250 fathoms.

Three specimens. Length 1–1·3 cms.

The shell is extremely thin and opaline in appearance, and the tissues of the animal are of corresponding delicacy. The mantle has a much-thickened rim, but is elsewhere so transparent that the organs of the pallial complex are plainly visible through it. On the side of the mantle nearest the shell, a band of pigment runs at a short distance from the edge and parallel to it (fig. 38); inside this is an opaque strip; the remainder of the mantle, though transparent, has scattered granules of pigment all over it. The under side of the mantle (i. e. the portion forming the roof of the pallial cavity) is strongly papillate along the edge; when the animal is completely retracted so that the sides of the mantle meet, the papillæ form a dense mass, and, owing to their blunt, rounded apices, have the appearance of eggs; on turning up the edge of the mantle, however, the papillæ are seen to be short, blunt tentacles (fig. 38, *m.t.*).

The foot is large, broad anteriorly, and tapering to a point posteriorly (fig. 39).

The whole of the anterior border is traversed by the pedal groove, which is extraordinarily deep; laterally the pedal groove curves round the edges of the anterior border of the foot and gradually disappears; at this point the edges of the foot are slightly recurved, so that the foot becomes narrower posteriorly.

In two of the three specimens the head is completely retracted. The tentacles (fig. 38, *t.*) are long, blunt at the tips, and bear the eyes on short stalks on their outer sides near the bases; they are confluent at the base, so that there is no inter-tentacular portion of the head. The siphon (*si.*) resembles that of the Volutidæ in shape, but is devoid of siphonal appendages (cf. *Volutharpa*, p. 33); in the single expanded specimen the siphon bends to the right so as to take up a median position between the tentacles.

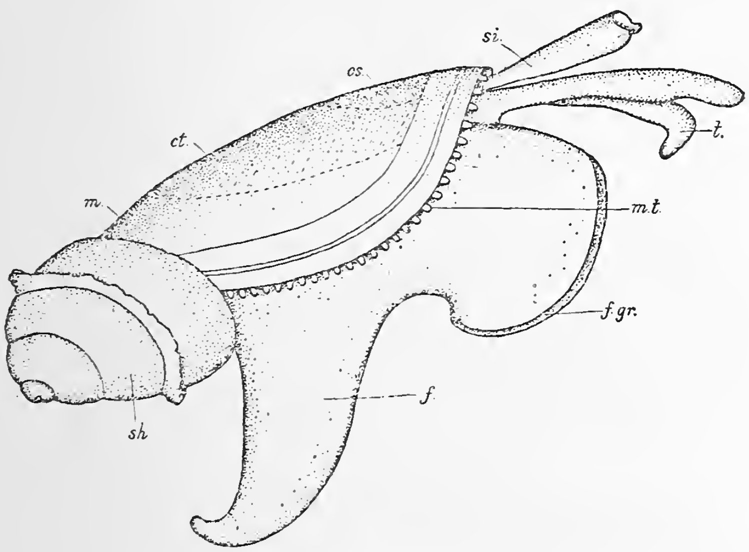


FIG. 38.

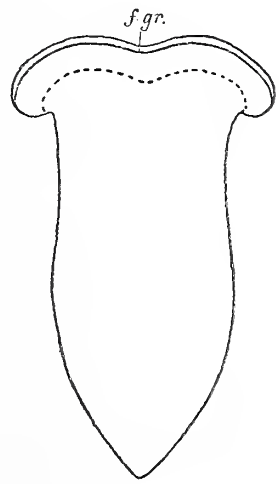


FIG. 39.

FIG. 38.—*Marginella hyalina.* Whole animal viewed from the right side. The mantle whorl of the shell has been removed to expose the mantle. × 8. *ct.* ctenidium. *f.* foot. *f.gr.* pedal groove. *m.* mantle. *m.t.* pallial tentacle. *os.* osphradium. *sh.* shell. *si.* siphon. *t.* tentacle.

FIG. 39.—*Marginella hyalina.* The foot seen from the ventral side. The dotted line indicates the depth of the pedal groove. × 6. *f.gr.* pedal groove.

When the mantle cavity was opened up the chamber was found to be filled with coagulated mucus, though the mucous gland itself is thin. The ctenidium and osphradium are white in colour; they are very delicate and much flattened. The osphradium, owing to the breadth of its rachis, is wider than the ctenidium, which is remarkably small.

Two of the specimens are males. The penis is large and spatulate and has no external seminal groove; the *vas deferens* is only slightly coiled within it, and opens near the tip.

Each whorl of the shell overlaps the preceding whorl, and the organs project into this overlapping portion. Thus the kidney is wrapped round the visceral whorl preceding that in which it lies; hence it is band-like in shape, instead of being compact and triangular as in other Rachiglossa.

The proboscis is small and is but feebly developed. No trace of jaws or of a radula could be found, even in serial sections. A pair of tubular salivary glands are present. Leiblein's gland is very large, and is much coiled; it opens into the œsophagus by a duct of the same width as its glandular portion. There is no "siphon," formed by fusion of the walls of œsophagus and gland, as described by Bouvier (1889) in *Marginella cingulata.*

The ganglia of the nerve ring are relatively large. The cerebral ganglia are flattened, but the remaining ganglia are fused and indistinct; the specimens are too small for their correct interpretation.

TECTIBRANCHIA.

Aceratidæ (?).

Toledonia major (Hedley).

Station 340. Ross Sea; 160 fathoms.

Two specimens, the larger 6·5 mm. long, and 4 mm. wide.

The shell, which is wholly external, is white and is covered with a thin, transparent, horny layer; it consists of from three and a half to five whorls. The foot is small, rounded, and without operculum; in the larger specimen it is 2 mm. long. The mantle is well developed, and there is an inferior mantle lobe as in *Actæon.* The ctenidium is very delicate, and is flattened. The penis is invaginable. The eyes are prominent. The cephalic hood is large, bifid anteriorly, and posteriorly continuous with the neck as in the Aceratidæ. On the right side of the body, beneath the hood, is a widely open seminal groove.

The buccal mass is well developed. A pair of compact salivary glands is present. The œsophagus is short, and has a short cæcum on its right side; it expands into a globular stomach whose inner surface is thrown into folds, but appears to be devoid of the stomachal plates met with in other Bullomorphs. The radula (cf. Thiele, 1913, p. 218) is small and consists of about twenty rows of teeth, with only one distinct tooth in each row; thick, chitinous bands form the edges of the ribbon. The central tooth is set on a quadrangular base, which is broader than long; the central portion of the broad cusp is long and pointed, with four denticles on each side.

The nervous system comprises widely spaced cerebral ganglia connected with pleural, pedal, and stomato-gastric ganglia, a supra-intestinal ganglion, and fused sub-intestinal and abdominal ganglia. The visceral cords are uncrossed.

Toledonia brevior, Smith.

Station 220. Off Cape Adare; 45–50 fathoms.

Three specimens. 2·5 mm. long, and 1·5 mm. wide.

The anatomy of this species, so far as it could be seen in such extremely small specimens, is similar to that of *T. major*. The radula is very small and the teeth have deeply incised denticles.

BASOMMATOPHORA.

Ancylidæ.

Latia neritoides, Gray.

Freshwater stream near Mangomu, New Zealand.

Nine specimens, averaging 10 mm. long, 7 mm. broad, and 4 mm. high.

The shell is very deeply pigmented and shows ridged lines of growth; it is slightly sinistral, having a conical apex pointing towards the left-hand side, but without spiral coiling. The interior of the shell is nacreous, and possesses a posterior internal septum which is not present in the allied genus *Ancylus*; this septum, while occupying the same position and having the same relations to the body of the animal as that of a *Crepidula*, differs in its strong asymmetry and in the fact that on the right side there is a free projection, twisted, and with a spatulate apex that fits in between the visceral hump and the foot and holds the visceral hump in place; on the left the septum is flat and horizontal as in *Crepidula*. There are two muscle impressions on the shell, placed almost symmetrically.

The skin covering the body is strongly pigmented. The tentacles are short and rather blunt, with eyes at their bases. The anterior portion of the head forms a veil overhanging the mouth. The penis occupies its usual position close to the right tentacle, and is completely invaginable. The mantle has a thickened rim and forms a small, thin-roofed pulmonary chamber opening on the right side. The anus and the female genital aperture lie on the right side of the body beneath a fold of the mantle.

The buccal mass is well developed. There are no jaws. The œsophagus arises far forwards on the dorsal side of the buccal mass; the two buccal ganglia are separated by a broad commissure, so that they lie one on each side of the œsophagus (fig. 40); between the ganglion and the œsophagus on each side runs the duct of a salivary gland (*s.gl.*). The salivary glands are elongate, and have a compact racemose structure; they pass through the nerve ring. The radula (fig. 41) consists of about thirty rows of teeth; the formula is approximately 40.1.40. The central is very small, with a saddle-shaped base, and with two or three denticles on each of its paired cusps; there is no median cusp. The laterals are narrow with elongated cusps; they are asymmetrical; on the inner side of the cusp (the side nearer the central) is a broad, flat plate; on the outer side are two short, sharp denticles, pointing backwards; some of the outer laterals have three or even four such denticles, but in these teeth the plate is smaller. The œsophagus passes backwards without coils and without great enlargement of its diameter, trending towards the left side of the body; ventral and just posterior to the heart, the œsophagus ends in a large bi-convex gizzard (fig. 40, *giz.*), which it enters in the centre of the convex ventral surface. The gizzard is tendinous exteriorly; it is not very thick walled; it contains loose stones. The intestine makes its exit from the centre of the dorsal surface of the gizzard, opposite the entrance of the œsophagus; just at this point a duct (*b.d.*) brings in the secretion of the digestive gland. A short distance beyond this is a small, finger-shaped cæcum (*caec.*), whose free end is directed posteriorly (cf. André,

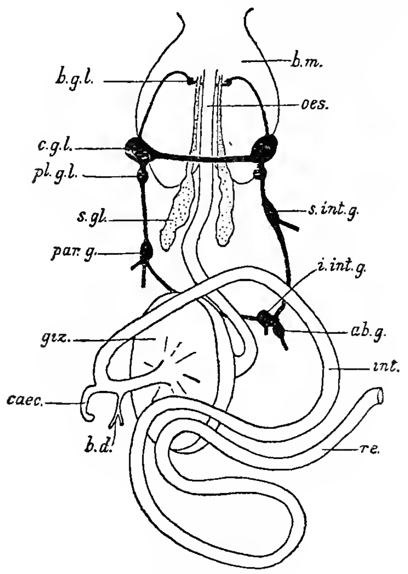


FIG. 40.

FIG. 41.

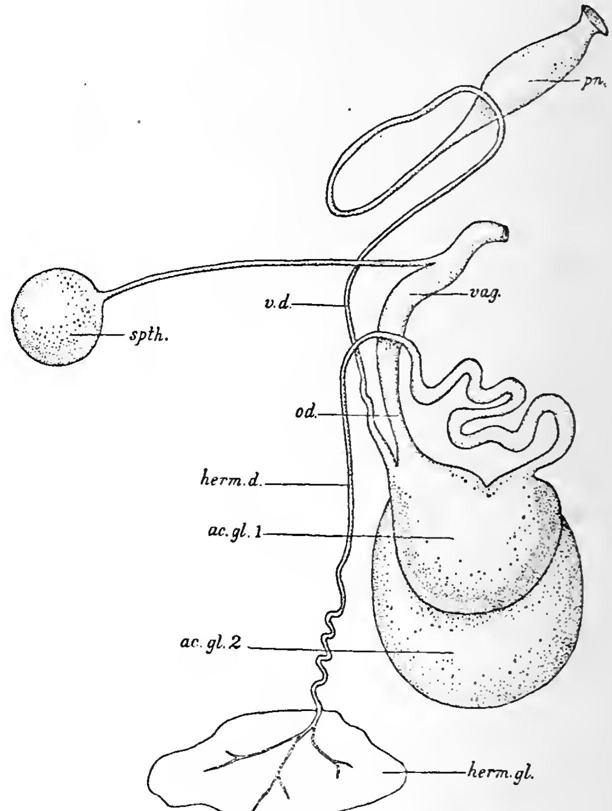


FIG. 42.

FIG. 40.—*Latia neritoides.* Alimentary canal and part of the nervous system viewed from the dorsal side. The pedal ganglia are not shown. × 8. *ab.g.* abdominal ganglion. *b.d.* bile duct. *b.g.l.* left buccal ganglion. *b.m.* buccal mass. *c.g.l.* left cerebral ganglion. *caec.* cæcum. *giz.* gizzard. *int.* intestine. *i.int.g.* sub-intestinal ganglion. *oes.* œsophagus. *par.g.* parietal ganglion. *pl.g.l.* left pleural ganglion. *s.gl.* salivary gland. *s.int.g.* supra-intestinal ganglion. *re.* rectum.

FIG. 41.—*Latia neritoides.* Seven teeth from the radula. × 250.

FIG. 42.—*Latia neritoides.* Semi-diagrammatic scheme of the reproductive system as seen from the dorsal side. The accessory genital glands have been separated to show their relationship to the genital ducts. × 14. *ac.gl.* 1. first accessory genital gland. *ac.gl. 2.* second accessory genital gland. *herm.d.* hermaphrodite duct. *herm.gl.* hermaphrodite gland. *o.d.* oviduct. *pn.* penis. *spth.* spermatheca. *vag.* vagina. *v.d.* vas deferens.

1893). The intestine is long; it passes forwards dorsal to the gizzard and towards the right, then comes up to the surface of the visceral mass, passes backwards along the right side of the body, forms a double C-shaped loop, and terminates in a rectum that discharges on the right side of the body beneath a fold of the mantle; the rectum is filled with amorphous excrement. *Latia* is hermaphrodite. The ovotestis (fig. 42, *herm.gl.*) is embedded in the visceral mass; its duct—the hermaphrodite duct—comprises a narrow, sinuous, proximal portion, running forwards, and a wider coiled distal portion, with glandular walls, running towards the right and ending in a mucous gland (*ac.gl. 1*), into the right side of which it opens. The male and female ducts arise from the left side of this mucous gland, which receives, near their origin, the secretion of a second gland (*ac.gl. 2*), also apparently mucous. These two glands and the coiled glandular part of the hermaphrodite duct together constitute the accessory genital mass. The genital elements leave the accessory genital mass by one of two ducts, either by the spermatic duct (*v.d.*) or by the oviduct (*o.d.*), the two being completely separated (diaulic condition). The spermatic duct is on the left; it is narrow and sinuous; it runs forward through the neck and head, thence backwards and again forwards to the base of the invaginable penis, through the centre of which it passes; the duct lies within the body throughout its course, there being no external seminal groove. The oviduct is much wider and more muscular; its large orifice is close to the anus. The spermatheca (*spth*), or Swammerdam's vesicle, is situated ventral to the pericardium; it is swollen and globular; its long duct joins the oviduct not far from the external opening. *Latia* differs from *Ancylus*, its European relative, in the absence of cæca on the hermaphrodite duct, and in the absence of a flagellum (cf. Lacaze-Duthiers, 1899, and Stephanoff, 1866).

The nervous system has been figured by Pelseneer (1906, p. 114, fig. 96). It is an interesting example of the unconcentrated Euthyneurous type. The visceral commissures are long and the ganglia are distinct, as in the more archaic Pulmonates; but, unlike *Auricula* and *Chilina*, the nerve ring is not anterior to the buccal mass.

In contrast to the primitive condition of the nervous system certain features of specialization may be noted; for example, the structure of the gizzard and the complete separation of the sexual ducts.

IV.—SUMMARY.

1. Rhipidoglossa.

As representatives of the Rhipidoglossa there are only three species of *Margarites* and one of *Margarella*, all belonging to the family Trochidæ.

The three species of *Margarites* show progressive complexity in the epipodial tentacles; these are simplest in *M. dulcis*, more elaborate in *M. iris*, and most finely divided in *M. gemma*. The radula of these three species exemplifies one of those not infrequent anomalies that occurs also within the genus *Trochus* (Randles, 1901 and 1904), as two types are found. In *M. dulcis* the central and laterals have short, stout cusps and are obviously functional, and the marginals are all stick-like; this type resembles the radula of *Trochus turbinatus*. In *M. iris* and *M. gemma* the central and laterals are delicate and foliaceous, useless for rasping, breaking off as soon as the portion of the ribbon where they occur comes into use; in these species, to make up for the deficiency of the eleven central teeth, the first and second marginals become strengthened to take on the rasping function, losing their stick-like form and becoming short, stout, and claw-like.

2. Tænioglossa.

The most interesting genera examined are the three whose affinities are uncertain, namely *Neoconcha*, *Trichoconcha*, and *Sublacuna*.

Neoconcha is in many respects like a Capulid. The grooved lower lip, which can be retracted into a pocket between the snout and the foot, resembles that of the Capulidæ. Certain features of the radula, of the genital organs, and of the nervous system, especially its dextral zygoneury, are as in *Capulus*. On the other hand, the pronounced spiral coiling of the shell and the presence of a small concentric operculum are not characters of the Capulidæ.

Trichoconcha resembles *Neoconcha* in the nature of the shell, the operculum, the long lower lip, the radula, the alimentary canal generally, the nervous and the genital systems. It is evidently more nearly related to *Neoconcha* than that genus is to the Capulids.

Sublacuna, whose name suggests that it is related to *Lacuna*, a Littorinid, is certainly not a member of that family; apart from a resemblance in the shell, it possesses scarcely a feature in common with *Lacuna*. In many characters it shows affinities with the Naticidæ, notably in the operculum, the jaws, the radula, and the anterior portion of the alimentary canal. The similarity of the operculum, the jaws, and the radula of *Sublacuna* to those of *Amauropsis* is most striking.

The anatomy of the Lamellariidæ has been so fully described by Bergh that it did not seem necessary to do more than to note differences and to supplement his account. Unfortunately, this family was represented in the "Terra Nova" collection only by the genus *Marseniopsis*. Two unnamed species have a rough mantle, but in other characters they agree so closely with the named species of *Marseniopsis* that it was not considered advisable to place them in the genus *Lamellariopsis*, Vayssière.

3. Rachiglossa.

None of the Rachiglossate forms belongs to new genera and none is from very deep water, the depth ranging only from 10 to 250 fathoms. Therefore, remarkable modifications associated with extreme conditions of life are not to be expected, but some of the species (e.g. *Marginella hyalina*) exhibit the delicacy of shell, mantle, and ctenidium which are characteristic of deep-sea Mollusca.

All the species possess functional eyes. As a rule, the radula is well developed, but it shows reduction of the whole ribbon in the two species of *Trophon*, and of the lateral teeth in *Volutharpa*. In *Marginella hyalina* the radula has disappeared altogether, although Gwatkin found a reduced and feeble central tooth in the radular ribbon of certain other species of this genus.

The gland of Leiblein reaches its greatest size and complexity in *Trophon* (Muricidæ).

The arrangement of the ganglia of the nerve ring shows great similarity in the members of the order. The most variable portion of the nervous system is the supra-intestinal ganglion, which in the more primitive forms (Buccinidæ) occupies a position remote from the nerve ring, at the posterior end of a long pallial cord. In the more specialized forms like *Volutharpa* the pallial cord is shortened and the supra-intestinal ganglion becomes adherent to the right pallial ganglion.

The anatomy of the forms studied leaves little doubt as to their family relationships. *Neobuccinum* and *Cominella* are typical members of the Buccinidæ, and *Trophon* of the Muricidæ. *Volutharpa* is classed by Pilsbry with the Buccinidæ on purely conchological grounds; but its anatomy indicates a close relationship to the Volutidæ, the chief resemblances being the wide, flattened head and tentacles, the siphonal appendages, the radular pattern, the presence of an additional pair of acinose salivary glands, and the arrangement of the ganglia. The species of *Marginella* examined differs from Pelseneer's diagnosis of the Marginellidæ in that the mantle is not reflected over the shell,* and also in the absence of a pedal pore.

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* All three specimens of *Marginella hyalina* were much contracted, so that it is not impossible that the reflection of the mantle over the shell occurs in the living animal, but if this be so, the reflection is of a temporary nature only, and is quite unlike the permanent covering met with in the Volutidæ. (See *Volutharpa*, above.)

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Printed in England at the Oxford University Press by Frederick Hall

BRITISH MUSEUM (NATURAL HISTORY).

BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910

NATURAL HISTORY REPORT.

ZOOLOGY. VOL. VII, No. 2 Pp. 47–182.

POLYCHAETA.

BY

WILLIAM B. BENHAM, D.Sc., F.R.S.
(Professor of Biology, University of Otago, New Zealand.)

WITH SIX PLATES.

LONDON:
PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM
SOLD BY
B. QUARITCH, LTD., 11 GRAFTON STREET, NEW BOND STREET, W.1; DULAU & CO., LTD., 32 OLD BOND STREET, LONDON, W.1; OXFORD UNIVERSITY PRESS, WARWICK SQUARE, LONDON, E.C.4
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OLIVER & BOYD, TWEEDDALE COURT, EDINBURGH
AND AT
THE BRITISH MUSEUM (NATURAL HISTORY), CROMWELL ROAD, S.W.7
1927

Price Twelve Shillings and Sixpence.

[*Issued 22nd October, 1927.*]

British Museum (Natural History).

This is No. 3 *of 25 copies of "Terra Nova" Zoology, Vol. VII., Polychaeta, printed on Special paper.*

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PREFACE.

I WISH to acknowledge the compliment paid me by the Director of the British Museum by his request that I should undertake the examination of these Polychaetes; my consent to do so entailed for the worms a journey of some 12,000 miles across the sea, almost back to their home; and it was not till after the Great War was ended, when the ships were free from the danger of submarine attacks, that it was possible for them to start on that journey.

When the cases arrived I was engaged in writing the Report on the annelids collected by the "Aurora" and it was not till 1921, when that MS. was in the hands of the publishers, that I was free to begin work on the "Terra Nova" collection.

In justice to myself and to the Editor it is desirable to explain the delay in completing the present Report. Owing to my duties as Professor of Biology and Curator of the University Museum, it has been possible to do systematic work only during vacations and at such other brief periods as might be seized upon. Moreover, much of the matter was in MS. some years ago, and new memoirs have arrived which have necessitated the recasting and rewriting of considerable parts of this Report. Even after the MS. had been finally typed out I received Augener's memoir on the Sedentary Polychaetes of New Zealand (1926), so that I had again to revise this part of the work.

I am greatly indebted to the Trustees of the Australian Museum for the loan, by the kind offices of the late Professor Haswell and of the courteous Director, Dr. C. Anderson, of Ehlers' "Valdivia" Report on the Polychaetes; and for permission to retain the book for a long period.

Since writing the Report of 1921 I have been able to obtain certain memoirs to which at that time I had not access; several of them I owe to the kindness of the authors—*e.g.* Augener's Polychaetes of S.W. Australia; and Hessle's "Terrebellomorphen"—to whom my sincere thanks are due, for in this isolated part of the world there is little likelihood of finding such books in any of the college libraries. In other ways, too, I have been able to fill gaps in my library, so that some of the errors in the previous Report may now be corrected.

INTRODUCTION.

The successive expeditions to the Antarctic Seas have made us acquainted with a considerable number of species of Polychaeta living in depths from the surface to some 500 fathoms, about 130 species having been described from stations extending round half the circumference of the Antarctic ice and land. Many of these species are met with all over this extensive area, or at least closely allied species are met with, which seems to indicate the former great extension of land, as indeed various other lines of evidence make probable.

The distribution of such species is aided, no doubt, by the Westwind Drift which carries the larvae for short distances along the coast line. There are reasons for believing, however, that these pelagic larvae of the Polychaeta, as of Echinoderms and other groups, have but a short life and therefore cannot travel far.

When I was investigating the littoral fauna of the Kermadec Islands I pointed out that in these two groups, at any rate, the fauna was quite different from that of New Zealand. Yet we know that currents set in from New Zealand towards the Kermadecs, for logs of kauri have been found on these islands which have been carried thither by such currents; if Echinoderm larvae live sufficiently long to travel by these currents, why is the littoral Echinoderm fauna so entirely different from that of the Dominion? The distance is not nearly so great as that separating Graham's Land from McMurdo Sound, yet the difference in the fauna is very considerable, only widely distributed species being common to the two islands. So that to understand the resemblance of the fauna in the far distant regions of the Antarctic it seems necessary to assume the former extension of land here, by which the larvae might pass slowly from one part to another.

Other species occurring in the Antarctic have a still wider distribution extending as they do northwards to the sub-antarctic lands ; and still others—especially amongst the Terebellids—are identical with northern species, or at most are varieties of these northern forms. Fauvel and others who have had the opportunity of examining specimens from both these regions have established their identity in several instances.

Thus in the present collection there occur *Amphitrite cirrata* O. F. Müll., *Thelepus cincinnatus* Fabr., *Leaena abranchiata* Malmgren, and *Hauchiella tribullata* McInt., all of which are northern forms, although each of the Antarctic worms has at one time or another received a distinct specific name ; further, Gravier has recorded *Pista cristata* O. F. Müll., and Ehlers *Trichobranchus glacialis* Malmgren, from the Antarctic, so that in this family at least six of the Antarctic species are common to the northern seas.

Fauvel (*Livre du Cinqantenaire de l'Université Catholique d'Angers*, 1925) emphasises the importance of temperature as the main, if not the only, factor which determines the geographical distribution of the group. The species have wandered along the sea floor, where at abyssal depths the temperature is very low, and in this medium of constant temperature they may pass across the Temperate and Equatorial regions and so reach the shallower waters in the cold areas at either pole.

SUMMARY.

The number of species in the present collection is 88 ; of these 54 species occur in the Ross Sea and McMurdo Sound, 33 in the waters round New Zealand (one of which, *Phyllodoce madeirensis*, is common to both areas), and 3 on the shore of South Trinidad in the Atlantic.

There remain to be examined the representatives of the two families Tomopteridae and Alciopidae ; of these pelagic worms a large number were collected, especially of the former. They are chiefly from the neighbourhood of Nelson, only a few individual Alciopids having been included in the Antarctic gatherings.

I hope to give an account of these pelagic forms in a separate Report.

It will be convenient to consider the Antarctic and the New Zealand species separately ; in the following list the species from these two areas are distinguished by the letters *A.* and *N.Z.* respectively.

LIST OF SPECIES OBTAINED BY THE "TERRA NOVA."

FAMILY SYLLIDAE.

Syllis brachycola Ehlers. *A.* and *N.Z.*
,, *brachychaeta* Schmarda. *A.*
Trypanosyllis gigantea (McIntosh). *A.*
Eurysyllis ehlersi, n.sp. *A.*
Pionosyllis comosa Gravier. *A.*
Autolytus charcoti Gravier. *A.*
,, *maclearanus* McIntosh. *A.*
,, *monoceros* (Ehlers). *N.Z.*
Exogone heterosetosa McIntosh. *A.*
,, *anomalochaeta* Benham. *A.*

FAMILY APHRODITIDAE.

Laetmonice producta Grube. *A.*
Lepidonotus jacksoni Kinberg. *N.Z.*
Enipo rhombigera Ehlers. *A.*
Lepidasthenia antipathicola, n.sp. *N.Z.*
Nemidia regalis, n.sp. *N.Z.*
Harmothoe spinosa Kinberg. *A.*
,, *tuberosa* Ehlers. *A.*
,, *abyssorum* (McIntosh). *A.*
Hermadion rouchi Gravier. *A.*

FAMILY PHYLLODOCIDAE.

SUB-FAMILY PHYLLODOCINAE.

Eulalia charcoti Gravier. *A.*
Pterocirrus hunteri Benham. *A.*
,, *macleani* Benham. *A.*
Phyllodoce madeirensis Langerhans. *A.* and *N.Z.*
,, *ovalifera* Augener. *N.Z.*
,, *adarensis*, n.sp. *A.*
,, *bowersi*, n.sp. *A.*

SUB-FAMILY LOPADORHYNCHINAE.

Maupasia coeca Viguier. *A.*
Pelagobia viguieri Gravier. *A.*

FAMILY TYPHLOSCOLECIDAE.

Sagitella kowalewskii Wagner. *A.*

FAMILY ALCIOPIDAE.

(These have not yet been identified.)

FAMILY TOMOPTERIDAE.

(These have not yet been identified.)

FAMILY NEREIDAE.

Nereis loxechini Kinberg. *A.*
,, *falcaria* Willey. *N.Z.*
Cheilonereis peristomialis Benham. *N.Z.*

FAMILY NEPHTHYDIDAE.

Nephthys macrura Schmarda. *A.*

FAMILY AMPHINOMIDAE.

Chloeia inermis Quatrefages. *N.Z.*

FAMILY EUNICIDAE.

SUB-FAMILY EUNICINAE.

Eunice australis Quatrefages. *N.Z.*
,, *tentaculata* Quatrefages. *N.Z.*
,, *aphroditois* (Pallas). *N.Z.*
Paramarphysa parvipes, n.sp. *N.Z.*
Hyalinoecia tubicola (O. F. Müller). *N.Z.*

SUB-FAMILY AOTEARINAE, nov.

Aotearia sulcaticeps, n. gen. et sp. *N.Z.*

SUB-FAMILY LUMBRICONEREINAE.

Lumbriconereis brevicirra (Schmarda). *N.Z.*
Notocirrus, sp. indet. *N.Z.*

FAMILY GLYCERIDAE.

Glycera capitata Oersted. *A.*

FAMILY ARICIIDAE.

Aricia marginata var. *macleani* Benham. *A.*

FAMILY SPIONIDAE.

Nerinopsis hystricosa Ehlers. *A.*

FAMILY TEREBELLIDAE.

Pista symbranchiata (Ehlers). *A.*
,, *mirabilis* McIntosh. *A.*
,, *godfroyi* (Gravier). *A.*
Lanicides vayssierei (Gravier). *A.*
Lanice flabellum (Baird). *N.Z.*
Amphitrite cirrata O. F. Müller. *A.*
,, *kerguelensis* McIntosh. *A.*
Terebella ehlersi Gravier. *A.*
Lepraea haplochaeta Ehlers. *N.Z.*
Leaena abranchiata var. *antarctica* McIntosh. *A.*
,, *wandelensis* Gravier. *A.*
Thelepus cincinnatus (Fabricius). *A.*
Hauchiella tribullata (McIntosh). *A.*

FAMILY AMPHARETIDAE.

Melinnoides nelsoni, n. gen. et sp. *A.*
Neosabellides elongatus (Ehlers). *A.*
Anobothrus patagonica (Kinberg). *A*
Amage sculpta Ehlers. *A.*

FAMILY OPHELIIDAE.

Travisia olens var. *novae zealandiae*, n. var. *N.Z.*

FAMILY MALDANIDAE.

Isocirrus yungi Gravier. *A.*

FAMILY CHLORHAEMIDAE.

Flabelligera mundata Gravier. *A.*

FAMILY SABELLIDAE.

Oridia limbata Ehlers. *A.*
Jasmineira scotti, n.sp. *A.*
Sabella aberrans Augener. *N.Z.*
,, *oatesiana*, n.sp. *A.*
Dasychone cingulata var. *curta* Ehlers. *N.Z.*
Euchone pallida Ehlers. *A.*
Potamilla antarctica (Kinberg). *A.*

FAMILY SERPULIDAE.

Serpula vermicularis var. *narconensis* Baird. *A.*
,, sp. A. *N.Z.*
,, sp. B. *N.Z.*
Vermilia sphaeropomatus, n.sp. *N.Z.*
,, *producta*, n.sp. *N.Z.*
Pomatoceros coeruleus (Schmarda). *N.Z.*
,, *terrae-novae*, n.sp. *South Trinidad.*
Zopyrus maoricus, n.sp. *N.Z.*
Spirobranchus tricornis Mörch. *South Trinidad.*
Chitinopomoides wilsoni, n. gen. et sp. *A.*
Spirorbis, sp. A. *N.Z.*
,, sp. B. *A.*
,, sp. C. *South Trinidad.*
Filograna implexa Berkeley. *N.Z.*
Protula bispiralis (Savigny). *N.Z.*
Apomatus lilliei, n.sp. *N.Z.*

LIST OF STATIONS AT WHICH POLYCHAETA WERE OBTAINED.

SOUTH ATLANTIC.

Station 36. South Trinidad Island; shore.
,, 38. 52° 23′ S.; 63° 50′ W.; depth 125 fathoms.

NEW ZEALAND WATERS.

Station 89. Off the Three Kings Islands; surface. July 25, 1911.
,, 90. From the summit of Great King, Three Kings Islands, S. 14° W., 8 miles; depth 100 fathoms; rock. July 25, 1911.

NEW ZEALAND WATERS—*continued.*

Station 91. From summit of Great King, Three Kings Islands, S. 10° W., 24 miles; depth 300 fathoms; rock. July 26, 1911.
,, 96. Seven miles E. of North Cape; depth 70 fathoms; sand and rock. August 3, 1911.
,, 127. Off Three Kings Islands; surface. August 25, 1911.
,, 134. Spirits Bay, near North Cape; depth 11–20 fathoms; shelly bottom. August 31, 1911.
,, 144. From Cape Maria van Diemen, W. by S. 7 miles; depth 35–40 fathoms; rock. September 13, 1911.

ANTARCTIC WATERS.

Station 191. Bay of Whales, Great Ice Barrier; depth 194–250 fathoms; mud and stones.
,, 194. Off Oates Land, 69° 43′ S., 163° 24′ E.; depth 180–200 fathoms; undecomposed animal debris.
,, 220. Off Cape Adare; mouth of Robertson's Bay; depth 45–50 fathoms; shingle.
,, 275. Ross Sea; 71° 29′ S., 166° 0′ W.; depth 160 metres; plankton.
,, 288. Ross Sea; 71° 59′ S., 168° 43′ W.; depth 60 metres; plankton.
,, 294. Ross Sea; 74° 25′ S., 179° 3′ E.; depth 158 fathoms.
,, 295. Ross Sea; 73° 51′ S., 172° 57′ E.; depth 190 fathoms.
,, 314. McMurdo Sound; 5 miles north of Inaccessible Island; depth 222–241 fathoms; mud.
,, 316. McMurdo Sound, off Glacier tongue, about 8 miles north of Hut Point; depth 190–250 fathoms; mud and undecomposed animal remains.
,, 318. McMurdo Sound; hole in ice between Cape Evans and Inaccessible Island; depth 175 metres.
,, 321. McMurdo Sound, in contraction crack between Inaccessible Island and Barne Glacier; depth 180–250 metres.
,, 326. McMurdo Sound; Cape Evans and immediate neighbourhood; various cracks and holes through the ice; depth 4–40 metres.
,, 331. Entrance to McMurdo Sound, off Cape Bird Peninsula; depth 250 fathoms; mud.
,, 338. McMurdo Sound, near entrance; 77° 13′ S., 164° 18′ E.; depth 207 fathoms; mud.
,, 339. Entrance to McMurdo Sound, 77° 5′ S., 164° 17′ E.; depth 140 fathoms; mud.
,, 340. Ross Sea, opposite Granite Harbour; 76° 56′ S., 164° 12′ E.; depth 160 fathoms; mud.
,, 342. McMurdo Sound, off Cape Royds; depth 0–350 metres; plankton.
,, 343. McMurdo Sound, off Cape Royds; depth 0–600 metres; plankton.
,, 348. McMurdo Sound, off Barne Glacier; depth 200 fathoms; mud.
,, 349. McMurdo Sound, off Butter Point; depth 80 fathoms; mud.
,, 351. McMurdo Sound, hole in ice between Cape Evans and Inaccessible Island; depth 205 metres; plankton.
,, 354. McMurdo Sound; 77° 46′ S., 166° 8′ E.; depth 12 metres.
,, 355. McMurdo Sound, close to the edge of Barrier ice; 77° 46′ S., 166° 8′ E.; depth 300 fathoms.
,, 356. Ross Sea, entrance to McMurdo Sound, off Granite Harbour; depth 50 fathoms; mud.

(1) ANTARCTIC SPECIES.

In my Report of 1921 I have listed the species gathered by the previous expeditions to this region and have estimated the total number at 128; though it has been shown in recent memoirs that some of the worms described as "new species" are synonymous with those of earlier writers.

I have there pointed out also that the families represented by the more numerous species are the Terebellidae (25 species), Syllidae (21), Phyllodocidae (18), Aphroditidae (14), Sabellidae (9), and Ampharetidae (7). In the present collection these families occur in the same numerical proportion, viz.: 11, 9, 8, 6, 5, and 4 respectively.

Of the 54 species collected in the Ross Sea and McMurdo Sound the majority are, as one would expect, already known from other parts of the Antarctic, but eight worms appear to be sufficiently different from the accounts previously published to warrant the naming of new species ; it is unfortunate that most of these are represented by single individuals. Additional material may show that some of these new species are connected by intermediates with already known forms.

One of the new species is a Syllid, a family, as we have seen, well represented in this region ; the genus *Eurysyllis* has not hitherto been recorded, and the new species *E. ehlersi* has been established on an anterior fragment of a sexually mature worm.

Of the Phyllodocidae, two new species of *Phyllodoce* are added—*P. adarensis,* and *P. bowersi ;* the latter is a very well-marked form. It is well known to students of this family how difficult it is to define the species or even the genera, so that it is with a good deal of hesitation that I have added to the number of species.

Of the four species of Ampharetidae, representing four genera, one is the type of a new genus, *Melinnoides*, which, though resembling the common *Melinna* in many respects, has only two pairs of gills, arranged in a transverse line across the body.

Two new Sabellids have to be added, viz. *Jasmineira scotti*, a genus already occurring in the area, and *Sabella oatesiana*, with various peculiarities.

Finally, a new genus of Serpulid—*Chitinopomoides wilsoni*—presents an interesting mixture of features which occur in various genera.*

Included amongst the Polychaeta is a phial containing three specimens of the Archiannelid *Dinophilus*, which I am unable to refer to any species. They were taken at Station 220. Some Trochosperes were also taken, but I am unable to identify the genus to which they belong.

Special attention was directed by Sir Sidney F. Harmer to a tube from Station 321 which contained worms from which Protozoan parasites had been obtained. Examination of these worms shows that two different families are represented in the tube—a Sabellid, *Potamilla antarctica* and a Terebellid, *Lanicides vayssierei* ; the label bears the inscription "August 13, 1911. coll. Nelson," which was the date on which Station 321 was worked. In Dr. Woodcock's account of these Parasitic Protozoa (vol. vi. No. 1, 1921) he gives a description of a Gregarine which was found in specimens of Polychaete "dredged in 150 fathoms, off Inaccessible Island" which corresponds to Station 320. I have no Polychaetes from the latter Station, but this is not material, for the two Stations are quite close together.

(2) New Zealand Species.

The reason that the collection includes a number of worms from these waters is that during the winter season of 1911 and 1912 the "Terra Nova" was engaged in

* It will be observed that in naming these new species I have incorporated the names of four of "the gallant, noble gentlemen" (as Scott wrote of three of them)—Captain R. F. Scott, R.N., Captain L. E. G. Oates, Lieut. H. R. Bowers, R.I.M., and Dr. E. A. Wilson, artist and zoologist—whose death on their return journey from the South Pole, within a few miles of a food depôt, rendered the expedition so tragically epic.

survey work for the Government of the Dominion off the northern coast of the North Island. The zoological work was in the hands of Mr. D. G. Lillie, who was thus able to collect a large quantity of material of different groups of animals. His collecting ground coincided to some extent with that worked by Mortensen in 1914. The Polychaeta collected by Mortensen have been described by Augener and several of the worms collected by the "Terra Nova" belong to species already named by him.

Thirty-three species were obtained in this area by the "Terra Nova" and of these eight are new, while two Serpulids are undetermined, because they are either too imperfect or are immature; a species of *Spirorbis* is probably one of those already known, but as it is represented only by the tube it is unwise to give it a name; a species of *Notocirrus* is included which may be *N. lorum* Ehlers, but I give reasons for my uncertainty.

Of the family Aphroditidae I have to record two new forms of some interest: *Lepidasthenia antipathicola*, which builds a tunnel along the stem of a coral; and *Nemidia regalis*, which adds some new facts to our knowledge of this puzzling genus. In the family Eunicidae, a new species of *Paramarphysa* has been formed for *P. parvipes*. I have found it necessary to establish a new sub-family, intermediate between the Eunicinae and the Lumbriconereinae, for a worm to which I have given the name *Aotearia sulcaticeps*, "Aotea" being the name originally used for land of New Zealand by the early Maori migrants from Polynesia. It is a fact of some interest that the only Lumbriconereids obtained by the "Terra Nova" in this region were collected in the same haul, viz. *Notocirrus* sp., *L. brevicirra*, together with the *Aotearia*.

The Serpulids are well represented by 10 species, four of which are new—*Vermilia sphaeropomatus*, with its large globular transparent membranous operculum; *V. producta*, from the same locality, differing from it in various details; *Zopyrus maoricus* tentatively included in this old genus on account of the form of the operculum and the short club-like "pair" to its peduncle; and *Apomatus lilliei*, from the same Station, which is, like the last, somewhat imperfect.

Reference may also be made to the account here given for the first time of the tube of *Protula bispiralis*, a Serpulid that is peculiar to these waters and not uncommon in the region of Stewart Island in the south.

(3) South Trinidad.

Two Serpulids and a *Spirorbis* were collected on the shore of this island. The last appears closely related to *S. corrugatus*, if it be not that species. One of the Serpulids is described as a new species, *Pomatoceros terrae novae*, while the other is a South American type.

SYSTEMATIC ACCOUNT.

FAMILY SYLLIDAE.

SUB-FAMILY SYLLINAE.

GENUS SYLLIS Savigny.

SUB-GENUS TYPOSYLLIS Langerhans.

Syllis brachycola Ehlers.

Ehlers, 1897, p. 38, pl. II, figs. 46, 47 ; Benham, 1921, p. 22, pl. V, fig. 3 (for other references) ; Augener, 1923, p. 47, and 1924, p. 362.

Augener gives details of a number of individuals obtained from the Auckland Islands and from the northern coast of New Zealand. Only five specimens were included in the present collection, from the region of the Three Kings Islands, and one from near Cape Adare in the Antarctic.

The better-preserved specimens are well extended, and one attains the length of 20 mm., with a diameter of 0·75 mm. at a little distance from the head. The colour is pale brown and yellowish.

In some of the parapods the bristles, which are from nine to twelve in number, are expanded at the articular cup so that in side view they are " hastate " in outline. In some cases the appendix may be so worn that the terminal teeth are indistinct and the edge very irregular, yet in the same group are normal bidentate appendices.

In my former report I figured the acicula as enlarged into a knob-like tip ; but in the present specimens I fail to detect this. The three acicula are pointed.

Localities.—New Zealand, off Three Kings Islands, Stations 89 (one) ; 90 (one) ; 96 (two). Cape Adare, Station 220.

Distribution.—Circum-antarctic ; Sub-antarctic ; Auckland Islands.

Syllis brachychaeta Schmarda.

Schmarda, 1861, p. 70 ; *S. closterobranchia* Schmarda, Ehlers, 1904, p. 19, pl. III, figs. 1–4 ; Augener, 1913, p. 200 ; Haswell, 1920B, p. 96 ; Benham, 1921, p. 20 (for other references) ; *S. brachychaeta* Schmarda, Augener, 1923, p. 42, and 1924, p. 358.

Of this species, which has in recent years been studied intensively by Augener in collections made from the seas around New Zealand, only atokous individuals were met with by the " Terra Nova " naturalists.

Some are colourless, others are pale yellow with darker lines crossing the dorsum of the anterior segments, as has been already noted by Ehlers and Augener.

That the species is very difficult to differentiate is evident from the stages through which Augener has passed in arriving at the conclusion that the two species described by Schmarda are synonymous, and, moreover, synonymous with worms that have been described from other parts of the world. He has had the opportunity of studying a good series from New Zealand and of comparing them with other species from elsewhere. It is, perhaps, not without interest to indicate the stages in his conversion to the view.

In 1913, when reporting on the polychaetes from South-West Australia, he accepted as valid the title of *S. closterobranchia,* as Ehlers had done; but he suggested that probably *S. monilaris* Savigny is identical, as well as *S. capensis* McInt., and *S. corruscans* Haswell.

After studying the syllids from the Auckland Islands (1923) he substituted *S. brachychaeta* for *S. closterobranchia;* and from the actual comparison of Grube's specimens, as well as of others from the Red Sea and of individuals from Zanzibar, he is now convinced that *S. monilaris* is a synonym. When he had examined the worms from the northern coasts of New Zealand, he further contended that *S. hyalina* Grube comes into it; further, he finds that the larger individuals of "*closterobranchia*" agree with *S. corruscans* Haswell; the smaller with *S. kinbergiana* Haswell; so that now we have a distribution as follows:

S. brachychaeta Schm. is southern and Antarctic; and corresponds to the northern and Arctic species *S. armillaris* O. F. Müller. It is true that Schmarda describes *S. brachychaeta* as being very dark, while *S. closterobranchia* is yellowish; but later authors have found that cross-bars of dark pigment may be present to a varying extent on the latter. It is by a very close examination of the bristles and other features of the anatomy that Augener has arrived at the above conclusions. I am not in possession of sufficient material or time to do other than accept his conclusions.

Locality.—Cape Adare, Station 220, depth 45–50 fathoms.

GENUS TRYPANOSYLLIS Claparede.

Trypanosyllis gigantea (McIntosh).

Syllis gigantea McIntosh, 1885, p. 193, pl. XXX, figs. 1–3, pl. XXXIII, fig. 4, pl. XA, fig. 10, pl. XXXIVA, fig. 7; *Trypanosyllis gigantea* Ehlers, 1897, p. 35 (for other references see Benham, 1921, p. 23; Augener, 1924, p. 371).

Atokous stage.

This species, which seems to be very characteristic of these Antarctic seas, was apparently not so abundant in McMurdo Sound as in Commonwealth Bay: at any rate, not so many specimens were obtained from the six stations as in the former Expedition; and most of them are fragmentary.

Localities.—McMurdo Sound, Stations 314 (five); 316 (three); 321; 340 (two); 355; 356 (two). Depths, from 50–300 fathoms.

Distribution.—Kerguelen; South Georgia; Magellan Strait; Juan Fernandez; Kaiser Wilhelm II Land; South Victoria Land; Adelie Land; South American Antarctic (Gravier); New Zealand (Augener).

"*Tetraglene*" *stage.* (Pl. A, fig. 1.)

A single specimen in the epigamous condition, captured "Off Cape Evans January 5, 1911," * proves to be the sexual state of this large common band-like syllid, which has not previously been recorded.

* This is probably Station 326.

The worm is of a dark red-brown colour, which, however, may be due to its having been in a phial containing a Comatulid from which the pigment had been extracted by the alcohol. I have had such "dyed" worms from elsewhere in such an association.

The worm is 25 mm. long, and consists of the prostomium and 29 or 30 segments. The first chaetigerous segment is 1 mm. across, and is rather wider than the prostomium, but at the 5th segment the maximum width of 4 mm. is attained, and this is retained till near the hinder end, where it abruptly diminishes. The body is flattened, being 2 mm. in height, but not to so great a degree as in the atokous condition, so that the worm has not that distinct band-like appearance; this is due to the fact that the worm is distended with eggs and the thin body wall is easily ruptured.

The anterior end bears a pair of nearly spherical lobes directed forwards and downwards, on each side of which is an eye dorsally, and a second and larger one ventrally. But they are not very distinct owing to the "dyed" character.

I see no trace of any tentacle, nor can I detect a mouth on the ventral aspect.

Following the prostomium is a segment with a short parapod on each side, carrying a bundle of gomphotrichs and a long dorsal cirrus, which, like that of the remaining segments, is moniliform; below is a short nonmoniliform ventral cirrus. Traversing this segment and the next segment is a median dorsal ridge or "carina."

In the rest of the segments there are, in addition to the ventral gomphotrichs, great fan-shaped bundles of many long yellow, somewhat flattened, capilliform bristles, which are directed outwards and backwards, and measure 3 mm. in length.

On the dorsal surface of each segment there is on each side a transversely depressed rounded "hump" extending from near the middle line outwards above the parapod, and from its outer margin about half-way along arises the dorsal cirrus, deep down in the furrow between two such humps. Some of these cirri are white, whilst others present bands of pigment, and these two differently coloured cirri alternate pretty regularly. I see no difference in length, but, as they are readily broken, I cannot be certain of this.

The median dorsal surface is naturally depressed between the paired humps.

The parapod consists of a low rounded notopod, carrying the long natatory bristles, and a longer neuropod, in form like a truncated cone, which extends considerably beyond the former, and bears about half a dozen gomphotrichs. These have the same form as those figured by McIntosh for *T. gigantea*, the shaft dilated terminally bears a simple hooked appendix articulated far down the side of the enlargement.

Hitherto the only information about the sexual change is a remark by Ehlers (1912, p. 17) that in February and March specimens bearing natatory bristles were met with; but he does not appear to have found any separated stolons such as is the present worm.

Remarks.—Fauvel (1917, p. 200) states that he found a small fragment of a worm collected in the Gulf of St. Vincent, South Australia, which he regards as belonging to this species, which, however, he believes to be synonymous with *T. taeniaeformis* Haswell and with *T. richardi* Gravier.* In that fragment he found that the chaetae in one and the same parapod vary in form, and figures some of these variations with bidentate appendices.

But from the detailed account given by Augener (1913, p. 230) of *T. taeniaeformis*, I think that Fauvel is mistaken in his identification.

In the first place, *T. gigantea* grows to a much greater size than does that species. A complete individual is said by Augener to be only 20–30 mm. in length, with 165 segments to 23 mm., whereas *T. gigantea* attains commonly a length of 60 mm., and I have recorded one of 130 mm. *T. gigantea* is self-coloured, according to McIntosh, Ehlers, and my own observations on a very large series. Neither of us find any transverse pigment bands across the dorsum, such as are described in Haswell's original account and confirmed by Augener. The latter and Fauvel state that the dorsal cirri are alternately longer and shorter, having eighty and forty joints respectively. Neither McIntosh nor Ehlers nor myself finds this to be the case for *T. gigantea*, but they are alternately uncoloured and banded with pigment of purplish brown. And neither of us has noted any variation in the form of the appendix of the gomphotrich.

On the evidence, therefore, I am unable to agree with Fauvel in his identifications.†

Genus EURYSYLLIS Ehlers.

Eurysyllis ehlersi, sp. n.‡ (Pl. A, figs. 2–8.)

A small worm, with the posterior region sexually modified, but imperfect, measures 4 mm. in length, with 12–14 anterior segments bearing only ventral chaetae, and 12 segments with additional dorsal swimming bristles. This region contains eggs.

The anterior region is grey ; there are no skin tubercles. The prostomium is twice as broad as its length ; its anterior margin is feebly notched on each side, forming small oculiferous lobes ; the two eyes of each side are nearly in the same transverse line, a larger one anteriorly and externally and at a slightly lower level than the other : each of them possesses a lens.

The tentacles are represented by very small rounded structures, of which the median is clearly visible in the mounted specimen, while the laterals, owing to the position on which the worm lies, are less easily recognisable as they are smaller and lie a little further back than the median, and so do not project.

The palps are separate right down to the base, as large sub-quadrate lobes, which are widely divergent in the specimen and project but slightly beyond the prostomium ; but in mounting they were disturbed from their position, and are quite conspicuous.

The peristomium carries no cirri ; the second segment is provided with a small parapod which carries a dorsal and a ventral rounded cirrus, but is without bristles.

* Which latter Haswell (1920B) identifies with *T. zebra*.

† This was written before I had read Augener (1924), whose views I find tally with those expressed above by me.

‡ Professor Ernst Ehlers, the distinguished German student of the Polychaeta.

The following parapods are long cylindrical outgrowths bearing a bunch of very long, delicate, colourless bristles, twelve or more in number, their lengths equalling about half the diameter of the body. The appendix is long, two-toothed, and fringed marginally. It is longer in the upper than in the lower bristles of a bundle.

The dorsal cirri are small, nearly spherical lobes situated far back on the parapod; the ventral cirrus is longer and ovoid. The posterior segments have dorsal bristles reaching outwards to a distance equal to the breadth of the body: they are of the usual type, flexible and simple. The bristles of the first few segments are shorter and slenderer than those of later segments.

There is no trace of "head" or eyes at the commencement of this sexual region, so that the worm is a "heterosyllis" rather than a "budding" form.

The pharynx is short and tub-shaped, as broad as it is long, and occupies about six segments. At the commencement it is surrounded by a dark ring, which seems to be the edge of the anterior wall, perforated in its centre by a hole surrounded by a thick circular ring. There are no teeth. The brown ring is perhaps due to a distortion of the wall owing to compression, though it looks quite definite.

At the hinder end of this region is another small aperture bordered by cuticle, where the pharynx passes into the proventriculus, which extends from the 6th to the 14th segment; lying alongside the proventriculus is a long gland which commences by the side of the pharynx, extending from the 4th to the 9th segment.

Locality.—The label reads: "Sept. 2nd, 1911, No. 28, depth 10 metres. Position A. Nelson."

I assume that this is Station 326, where the naturalists were at work during some unspecified dates in 1911, and the only station at which so shallow a depth was recorded in the List of Stations. This was near Cape Evans, in cracks and holes in the ice.

Remarks.—This little worm has been the cause to me of much difficulty in deciding its generic place.

Augener met with the same difficulty in deciding on the relationships of his genus *Rhopalosyllis*, which in some respects agrees with the above worm; but the cirri are beset with papillae and the foot carries "Eunicid" type of hooks. The former character might be regarded as specific, but the latter at once marks the difference from the present worm.

Malaquin's (1893, p. 73) diagnosis of the genus *Eurysyllis* contains the statement that the pharynx is armed with a tooth, but according to Marion and Bobretzky (1875) this does not exist in *E. tuberculata* Ehlers, the type of the genus. The existence of "tubercles" on the surface of the body to which the specific name alludes and which are also found in *E. paradoxa* Claparède, now regarded by Augener as a synonym, may be only a specific character. In its general characters it seems to me to fall more naturally into the genus *Eurysyllis* than into any other genus, though I confess to some doubt on the matter. With but a single individual which was stained and cleared before all the external features had been exhaustively studied by reflected light, there are some matters which remain uncertain. I have been unable to detect the frontal eyes mentioned by Augener, which again may be specific for the type species. Marion and Bobretzky state that the palps are united along the lower edge to form a sort of lip, but Ehlers shows them to be quite separated.

Genus PIONOSYLLIS Malmgren.

Pionosyllis comosa Gravier.

Gravier, 1906, p. 15, pl. II, figs. 12, 13, and 1911, p. 49 ; Benham, 1921, p. 22.

A few fragments were obtained off Cape Adare. One anterior piece consisting of head and 25 segments, much contracted, measures 3 mm. in length and 1 mm. across.

In a parapod mounted there are 20 bristles in a double series.

Locality.—Cape Adare, Station 220, depth 45–50 fathoms.

Distribution.—South American Antarctic (Gravier) ; Kaiser Wilhelm I Land (Ehlers) ; Adelie Land (Benham).

Sub-family AUTOLYTINAE.

Genus AUTOLYTUS Grube.

Autolytus charcoti Gravier.

Gravier, 1906, p. 7, pl. I, figs. 1, 2 ; Benham, 1921, p. 27, pl. V, figs. 7–10.

Two individuals are in the present collection, both immature, which is in contrast with the great numbers found at Commonwealth Bay, where not only were atokous stages obtained, but both the "polybostrichous" and "sacconereis" stage.

Locality.—Cape Adare, at Station 220, depth 45–50 fathoms.

Distribution.—South American Antarctic, Adelie Land.

Autolytus maclearanus McIntosh.

McIntosh, 1885, p. 207, pl. XXIX, fig. 6 ; pl. XXXIII, fig. 5 ; pl. XVA, fig. 15 ; Ehlers, 1913, p. 488, pl. XXXIII, figs. 9–11 ; epitokous, p. 490 ; Augener, 1923, p. 60.

A specimen in the "polybostrichous" condition was gathered in a hole in the ice at Cape Evans by Mr. Nelson.

The species is easily distinguishable from *A. charcoti* by the absence of epaulettes.

It measures about 22 mm. in length ; there are 12–13 anterior unmodified segments, followed by 35 segments bearing natatory bristles, and this region is succeeded by 20 unmodified segments. In the modified region each segment presents a ridge on the dorsal surface which extends laterally from near the median line to the end of the parapod.

The cirri are not pigmented as they are in Ehlers' figure, but he notes that this is not invariably the case.

Locality.—McMurdo Sound, Station 326, depth 10 metres. "August 11, 1911, Hole A, No. 10."

Distribution.—Kerguelen (McIntosh); Kaiser Wilhelm II Land (Ehlers); S. Victoria Land (Ehlers); Auckland Islands (Augener).

Autolytus monoceros (Ehlers).

Pterautolytus monoceros Ehlers, 1907, p. 8, figs. 1–3; *Autolytus m.* Augener, 1923, p. 60; and 1924, p. 396.

Augener gives details of one individual collected at Auckland Island and of several from various localities off the North Island of New Zealand.

The single specimen obtained during this expedition was found in the stomach of a Barracouta caught off the North Cape.

It measures 15 mm. in length for about 150 segments. Like myself, Augener was unable to find the structure described and figured by Ehlers as an unpaired "occipital" or "nacken Höcker" standing up in the angle formed by the anterior ends of the two epaulettes; but at this point I detect a fairly deep depression, bounded posteriorly by a convex margin which presents a few fine lines or furrows. Is this, perhaps, capable of becoming erect under certain conditions?

The location and extent of the pharynx and proventriculus differ somewhat from that given by Ehlers and by Augener. When the animal was cleared the facts are readily seen. The pharynx extends back to the 9th chaetigerous segment, then bends forwards across the 9th into the 6th, and here turns back again abruptly to enter the proventriculus, which commences in the 10th. This is a barrel-shaped organ occupying 8 segments, and presents as many as 65 muscular rings as opposed to 35–45 mentioned by Augener. Then follows a very short gizzard, which projects into the anterior end of the intestine; but as this region has thicker walls than the following, it may perhaps be termed a "stomach." A pair of small glands open into the gizzard immediately behind the proventriculus. This "stomach" occupies 5 or 6 segments. The intestine is not segmentally constructed, nor is the "stomach," for the constrictions occur at intervals of 3 or 4 segments.

Ehlers and Augener give the length of the proventriculus as 4 or 5 segments, and neither of these refers to the "stomach."

Distribution.—New Zealand, Auckland Islands.

Sub-family EXOGONINAE.

Genus EXOGONE Oersted.

Exogone heterosetosa McIntosh.

McIntosh, 1885, p. 295, pl. XXXIII, figs. 15, 16; pl. XXXIV*a*, fig. 11; Ehlers, 1897, p. 51, pl. III, figs. 61–65 (also 1901, 1908); Gravier, 1911, p. 45, pl. VIII, fig. 3; Augener, 1913, p. 247, as "*heterochaeta*"; Fauvel, 1916, p. 428, and 1919, p. 256; Haswell, 1920A, p. 221, pl. XVII, figs. 11–17; Augener, 1923, p. 59, and 1924, p. 395, as "*heterochaeta*."

A single individual of this common species was obtained in the Ross Sea: it is 5 mm. in length with 50 segments. The eyes are reddish brown; the pharynx is everted and the tooth well seen; a brown chitinous ring surrounds the entrance; the proventriculus extends through four segments.

Augener (1924) has suggested that the species established by me as *E. anomalochaeta* is synonymous with this. I have examined the preparations afresh, and as there are other specimens in the present collection I am able to say that the characteristic gomphotrich, with the sub-quadrate denticulate articular cup is different from that figured by McIntosh and more recently by Haswell. It is quite easily seen in most of the segments of the mounted specimens, even under a low power.

Locality.—Ross Sea, Station 340, depth 160 fathoms.

Distribution.—All round the Antarctic, Marion Islands, S. Georgia, Auckland Islands, and north of New Zealand (Augener); Madagascar (Fauvel).

Exogone anomalochaeta Benham. (Pl. A, figs. 9, 10.)

Benham, 1921, p. 24, pl. V, figs. 11–13.

A few specimens of this were obtained off Cape Adare. A complete worm measures 3 mm. for 32 segments. There are 5–6 bristles in each foot, the most dorsal being capilliform. The uppermost gomphotrich, when studied in glycerine, is seen to have the upper margin of the sub-quadrate articular cup finely denticulate, as shown in my figure (pl. V, fig. 13*b*); but the notches are not always so regular nor are the teeth so blunt as shown there, so I give a figure of another bristle where the denticulations are finely pointed and of irregular lengths. The corresponding bristle of the previous species has, according to Haswell's illustrations, a smooth margin. It is true also of the other gomphotrichs of the species, though the feature is not recognisable when the worm is mounted in canada balsam. The appendix of the uppermost gomphotrich has the bifid form already figured.

In some of the posterior feet, beginning at the 23rd, or perhaps even earlier, I noted in the lower part of the bundle a simple bristle with a bifid tip resembling the above.

Locality.—Cape Adare, Station 220, depth 45–50 fathoms.

Distribution.—Commonwealth Bay, Adelie Land.

Family APHRODITIDAE.

Sub-family APHRODITINAE.

Genus LAETMONICE Kinberg.

Laetmonice producta Grube.

Grube, 1877, p. 512; McIntosh, 1885, p. 39, pl. VI, figs. 1, 2, pl. IVA, figs. 1–8; Benham, 1921, p. 31 (for other references).

A single individual, measuring 32 mm. by 9 mm. over the elytra, the belly of which is covered with densely set spherical villi, such as McIntosh described, was obtained on February 22, 1911, which is probably Station 194, off Oates Land, in 120–200 fathoms.

Distribution.—Sub-antarctic and Antarctic; Japan (Moore).

Sub-family POLYNOINAE.

Genus LEPIDONOTUS Leach.

Lepidonotus jacksoni Kinberg.

Kinberg, 1855, p. 383 (Annulata nova), and 1857, p. 11, pl. III, fig. 11; Augener, 1922A, p. 2, fig. 1, and 1922B, p. 11; Seidler, 1924, p. 74; Augener, 1924, p. 279; *L. carinulatus* Willey, 1905, p. 248, pl. I, figs. 7–11; *L. willeyi* Benham, 1915A, p. 183, pl. XXXVIII, figs. 8–15.

Two worms trawled in 10–70 fathoms off the North Cape of New Zealand prove to belong to this species,

One of them measures 10 mm. by 2 mm. across the parapods, the other is the anterior fragment of a larger individual.

But on looking through the stock of worms that have been gathered on the shores of Otago Harbour during several years I found that I had confused the species with the common or shore form *L. polychromus* Schmarda, to which it bears some superficial resemblance. This species is rarer on shore than is Schmarda's, which is widely distributed from Auckland to Stewart Island.

L. jacksoni appears to prefer deeper water, for although it does occur at Portobello at low tides along the shore, I have specimens trawled from depths of 10–50 fathoms some miles eastward of the Otago Heads. (Thanks to Mr. Maxwell Young, Biologist to the Marine Fish Hatchery at Portobello.)

It was only later that I received Augener's papers in which he records it also from off the North Island in the neighbourhood of the North Cape.

I have compared preparations of elytra and parapods and chaetae of these worms with those which I described as *L. willeyi* from Tasmania (1915A) and find that Augener's suggestion as to the identity is confirmed.

When I was studying the latter worm I relied, of course, on the figures and description given by Kinberg, in which the ventral bristles are stated to have a single tooth at the apex.

Augener has been able to investigate Kinberg's type and finds that it has in reality a sub-terminal tooth as well. The elytron of the type, only one of which remains in the phial, has no fringe, although Kinberg figured one, and Augener suggests that prolonged immersion in spirit might have led to its maceration. But later Augener was able to study other specimens, one of which was from New Zealand, and was thus able to clear up some doubtful points. He finds that in these the elytra are indeed fringed. This is the first record of this species on the coast of the Dominion. Later, during Mortensen's expedition, other individuals were taken off the north of the country, and the description in this later paper agrees well with what I had already written from the study of the local worms, so that with the figures given by me in 1915 there is no need for further remarks.

As to the identity of *L. carinulatus* of Willey and of Potts, I have already suggested that this worm is not the same as that described by Grube under this title; and Augener adopts this same view.

Localities.—New Zealand, Station 96, depth 70 fathoms; Station 134, depth 11–20 fathoms.

Distribution.—Australia (Kinberg); Tasmania (Benham); Malay Archipelago (? Grube); Ceylon (Willey); Indo-Pacific.

Genus ENIPO Malmgren.

Enipo rhombigera Ehlers.

Ehlers, 1908, p. 47, pl. IV, figs. 1–12, and 1912, p. 13, and 1913, p. 449; Gravier, 1911, p. 81; Benham, 1921, p. 32.

About seven dozen of this characteristically marked Antarctic species were obtained at seven stations in McMurdo Sound, in depths of 160–300 fathoms.

Many of them are typically marked with the transverse rhomboidal patches of violet pigment, with and without the median longitudinal line of colour.

In others, only this median line is present.

Many of the specimens are more or less fragmentary, and from most of them the elytra and often the dorsal cirri have fallen away. They are not so well preserved in these respects as were those described in my previous report.

Particularly interesting from an oecological point of view is a portion of a colony of an Isid, with the stem composed of alternate segments of white and black. On this colony are two or three individuals of *Enipo*, killed in the act of creeping amongst the branches of the Anthozoan (Station 340). This is closely allied to, if not identical with, *Primnoisis antarctica* Studer ("Chall." Rep. Vol. XXXI, p. 35, pl. VIII, fig. 2).

Another individual from the same station is clinging to the branches of a gorgonian, which appears to be *Rhopalonella pendula* Roule (Exped. Antarc. Franc. 1903–1905; (1908), p. 4, pl. I, figs. 5–8), the polyps being covered with heavy calcareous plates.

Localities.—McMurdo Sound, Stations 314 (thirty), 316 (one), 348 (two dozen). 355 (two dozen), 356. Also two lots without a station number.

(*a*) Is labelled "No. 39. 1910, depth 100 fathoms, between Inaccessible Island and Barne's Glacier."

(*b*) On the label is written "Feb. 22, 1911. Off new land S. of Balleny Island. Coll. D. E. Lillie."

This appears to be Station 194 according to the date. That is, it is off Oates Land, Ross Sea; Ross Sea, Station 340 (six).

Distribution.—South Victoria Land; Bouvet Island; Kaiser Wilhelm II Land; Graham Land; Adelie Land.

Genus LEPIDASTHENIA Malmgren.

Lepidasthenia antipathicola, n. sp.* (Pl. A, figs. 11–13.)

This worm was submitted to Professor McIntosh by Professor J. Arthur Thomson for description, but when I undertook to report on the group of Polychaeta, Sir S. F.

* So named from its peculiar association with an Antipatharian.

Harmer communicated with McIntosh, who most generously forwarded to him the worm, and the description that he had drawn up ; and this account was transmitted to me.

When the phial reached me there were two portions or portions of two worms, of which only one has a head. Of the appendages only the palp of the right side remains, the tentacles, peristomial, and most of the dorsal cirri having fallen off. On the foot I see only one yellow aciculum in the neuropod, though McIntosh's drawing shows three.

The beautiful pencil drawings of McIntosh are not suitable for reproduction in ink, and I have drawn others, from my own observation, using his drawings to supplement mine—*e.g.* in the head I have added from his drawing the tentacles, and in the foot the dorsal cirrus.

The account of the habitat and the worm's " run " amongst the branches of the antipatharian is transcribed from Thomson's notes contained in a letter to me from the Director of the British Museum.

Professor McIntosh writes :

" The animal was securely fixed in the latticed tunnel formed by the serrated branchlets of the antipatharian, and it was no easy task to remove it from its tough barbed entanglement, especially as the middle region of the body was so decayed that the precise number of segments could not be determined, and the tail was absent. There seemed to be at least 200 segments, probably more.

" The head is prominent and smoothly rounded, with two distinct eyes situated on each side on the outer border, the anterior pair being near a line drawn transversely through the middle of the head. Each eye has a cuticular lens, most distinct in the slightly larger anterior pair. The median tentacle is absent, and the laterals spring at a lower level, that remaining on the left having a somewhat globular base and a filiform tip. The right palpus (the only one present) is smooth, and likewise has an abruptly filiform tip of considerable length.

" The flattened body probably reaches 4–5 inches in length, is nearly uniform in diameter throughout the greater part of its extent, tapering, however, anteriorly and still more posteriorly.

" The dorsal surface is marked by a continuous median pigment-band stretching from a short distance behind the head to the posterior extremity. The band is paler in front, darker posteriorly where a dusky hue pervades the region between it and the bases of the feet on each side. Ventrally, again, a dusky line commences in front, passes along each side internal to the base of the feet and slightly increases in intensity as it goes backward.

" The scales are small, more or less circular with a smooth border, and marked by a bold band of blackish-brown pigment. They leave much of the dorsum bare, indeed the majority only occupy the space between the median pigment stripe and the bases of the feet. They appear to have been somewhat larger in front, but all in that region have been lost. The smooth edge occasionally shows a parasitic Infusorian, whilst the surface near the outer edge presents a row of minute papillae, and a few are also sparingly scattered over the surface. The ovoid scar for attachment is small, and no venation from nerves occurs in any examined.

"The feet are very similar throughout, the only noteworthy change being the somewhat smaller anterior and longer posterior. The setigerous process is bifid, and the dorsal division is only represented by a small papilla to which a spine goes, but its tip does not reach the surface. In the first foot only the tips of the few and small ventral bristles appear on the surface; in the second the tips are not fully extruded, but in the third they project more fully. The typical foot presents dorsally the papilla to which the spine goes and either a scale-papilla or a subulate dorsal cirrus, with its basal process, the cirrus increasing in length posteriorly. The setigerous process is vertically split, and in an antero-posterior view the ventral slope from above downward and inward is the more pronounced. The ventral cirrus is dilated (more or less fusiform) and has a subulate tip.

"The tips of the bristles at first sight (under a low power) appear to be smooth, but more minute examination shows a series of very fine rows of spikes along each side, rudiments of the larger processes so common in the genus. There are about ten bristles in each foot, though some have fewer. The shaft is stout and nearly straight, with a differentiated central axis which is striated in the dilated region at the tip, and ends in a point leaving a considerable part beyond it continuous with the solid and hard chitinous external layer of the bristle. The tip has a slight inclination backward at its commencement, then curves forward so as to make a slightly hooked and sharp extremity, which with the anterior or concave edge of the tip looks upward *in situ*.

"In this form the long, tapering, and boldly spinous bristles so characteristic of the ordinary species of *Lepidasthenia* are absent. Moreover, most species have bristles with spinous and often bifid tips, though in some cases the tip is simple, as in *L. microlepis* Potts.* The structure of the bristles undergoes little change in the terminal feet, but they are fewer in the caudal region.

"The larger and more complete annelid had its tunnel coated by a peculiar sponge, which also invaded the branches projecting beyond it, thus giving the whole the appearance of a tube secreted by *Lepidasthenia*. In the other and smaller example, the sponge had apparently only recently settled on the site, forming minute, scattered patches here and there, and no capsules were present, whereas in the first-mentioned the development had reached so active a stage that the gelatinous coating of the tube may well have passed for the ova of the annelid in their investment; yet the varying size of the capsules showed that they pertained to another type. The capsules were thick and translucent, and may represent investments of the blastulae amidst the general cellular and granular tissues of the sponge.

"In the tissue of the sponge itself were groups of minute bodies like spicules, but differing much from such as occur in ordinary types or in *Halisarca* from Naples; at first sight resembling groups of minute gregarines of a spindle-shaped outline.

* Trans. Linn. Soc., 2nd ser. Zool., Vol. XIII, part 2, 1910, p. 343, pl. 21, fig. 52.

"There is thus no secretion of a tube by the annelid, which belongs to a group which only shares the tube secreted by another Polychaet. For example, *Lepidasthenia argus* Hodgson, lives in the tubes of *Amphitrite edwardsi.* So far as known, Polynoids do not seem to secrete a special tube. *L. antipathicola* has, however, found the remarkable adaptability of *Parantipathes tenuispina* just suited for its needs, the coral surrounding its body with a spiny latticed investment of an impenetrable kind by the interlacing and fusion of the spiked branches. Mr. Brook,* who first noticed this peculiar condition, observes that the verticillate branchlets give the coral a bottle-brush form, and that the presence of the annelid compels the coral to form an abnormal growth of that shape. Two of his specimens, however, were destitute of the annelid and of the tube produced by it, and their branches were more spinous though the general shape remained the same." (These two species are *P. tenuispina* and *Tylopathes crispa* (pl. III, p. 135).)

Professor Thomson supplies the following information :

"Polychaets, which came out of the tunnels made by *Parantipathes tenuispina* (Silberfeld). The tunnel is about 10 cm. long and fits the worm loosely. It is formed to one side of the polyparium by a fusion of numerous small branching twigs, the result being an intricate meshwork. The main axis is included on one side as part of the wall of the otherwise basket-work tube. Of course the peculiar growth is due to the Polychaet. No fusions of branches occur apart from the worm-tunnel."

The Antipatharian is described by Knyvett Totton in the reports of the present Expedition.† The text-fig. 9 (p. 107) shows the structure above described by Thomson.

Locality.—New Zealand, near North Cape, Station 96, depth 70 fathoms, sand and rock.

Genus NEMIDIA Malmgren.

Nemidia regalis, sp. nov.‡ (Pl. A, figs. 14–20.)

To this new species I attribute certain long, narrow polymeric Polynoids with fifteen pairs of elytra limited to the anterior region of the body. The ventral chaetae, which are more slender than the dorsals, have a simple apex and a long smooth area between it and the frills.

Of the seven individuals all but one has the pharynx everted, and all are somewhat curved. One, which is a mature female, is apparently entire ; it measures 32 mm. in length for 63 segments ; its breadth across the elytra is 4 mm., and over the ventral bristles 6 mm., the widest part of the body is near the anterior end, whence it tapers till it is 3·3 mm. over the last pair of elytra.

The largest, however, which is imperfect posteriorly, is 35 mm. with 54 segments ; the smallest complete individual with 52 segments is a female measuring 22 mm.

* Rep. "Challenger," Zool., Vol. XXXII, p. 145.

† "Antipatharia," Vol. V, No. 3, 1923.

‡ In reference to its (Three) Kingly origin.

This specimen of 22 mm. has 20 postelytral segments; one of 30 mm. has 28 postelytral segments; in other words, as the worm increases in length the uncovered region naturally increases in extent.

There is no pigment in the body wall or on the appendages, but the pharynx is deeply coloured.

The elytra are white, fairly thick, translucent, and covered with small, closely set papillae, fairly regularly arranged all over its surface. Microscopically, these are low cones: they reflect the light, and so give the appearance of opacity when seen *in situ*. The elytra are very firmly attached, for most of them are present (and in this the worm forms a marked contrast to *Enipo rhombigera*, where they are readily detached).

The attachment is near the outer margin; the anterior elytra are nearly circular, further back becoming oval, and being extended longitudinally, they become thinner. They meet one another over the dorsum and overlap anteroposteriorly. They are borne by the usual segments, namely, 2, 4, 5, 7–21, 23, 26, 29, 32; the elytrophores are almost as far out on the parapods as are the cirrophores.

The parapods have a length equal to half the width of the body; and the ventral chaetae are as long as the parapods.

The prostomium is broader than its length, with two large eyes at each side, each with a distinct lens; the anterior is just in front of the lateral bulge of the prostomium and the posterior close to the hinder margin.

The peaks are well marked, and are widely divergent: the median tentacle arises from the deep incision between them; its base is directed somewhat upwards as in *Enipo rhombigera*. The bases of the lateral tentacles are below the median. The tentacles are smooth, without cilia, and taper to the tip without any subterminal enlargement. The median is about thrice the length of the laterals. The palps, which are very pale brown, are three-quarters the length of the median tentacle, and are smooth.

The dorsal cirri are particularly long, extending far beyond the ventral chaetae; the ventral cirri are likewise long, especially those of the anterior dozen segments which extend beyond the ventral chaetae. I see no anal cirri, which are probably broken off. All the cirri are smooth, without cilia.

The long parapods are composed almost wholly of the neuropods, for the notopods are but small upgrowths from them. The notopod bears a small bundle of thick bristles arranged in a radiate fashion horizontally. The bristle has numerous small but distinct frills along it, and terminates in a blunt point. In the longer ones there are some twenty-five of these pectinated frills, which take an oblique course from the back downwards to the front edge so as to encircle the shaft for nearly three-quarters of its circumference.

The neuropod is produced to a point, the posterior lip being longer than the anterior. The ventral chaetae are yellow, longer and slenderer than the dorsals; they form a vertical series in a single row: the upper are longer than the lower and rather stouter, but do not differ in form; the shaft presents a slight dilatation towards the free end on which the frills are set, beyond which is a long tapering smooth region that terminates in a simple sharp apex. I can find no evidence of the existence of a sub-apical tooth such as exists in the genus *Polynoe.*

On the upper chaetae there are about 10–12 frills, the distal of which is represented by a few large spines; the rest have very delicate pectinations, appearing as usual as spines at the edge when the bristle is examined under a low magnification. Each frill encircles the shaft in a somewhat spiral fashion.

The entrance to the pharynx is provided with eighteen papillae, nine above and nine below; each is like an isosceles triangle with rounded angles and constricted base; the bases touch except at each side, where there is a gap equal in width to the base of a papilla.

The brown jaws have each a flange on the medial margin.

Locality.—Off the Three Kings Islands, New Zealand, Station 91, depth 300 fathoms.

Remarks.—The three genera, *Polynoe* (Sav.), *Enipo* (Malmgren), and *Nemidia* (Malmgren), are evidently very closely related. The first was stated to differ from the others in the presence of bi-dentate ventral bristles; but according to Ehlers these are present in *Enipo rhombigera* (Ehl.), and in *E.* (*Polynoe*) *antarctica* (Kinb.); I have examined preparations of the former species, but confess that I have been unable to detect a sub-apical tooth even on the smaller less worn bristles, though there is a sort of indistinct "step" in some of them which may be interpreted as the base of a worn-down tooth. But apart from this feature, the form of the chaeta in these two differs from that in *Nemidia,* in which there is a long naked region beyond the frills. Here again there seems to be some discrepancy between different accounts. Ehlers figures the ventral chaetae of *E. antarctica* where the naked region is quite short; but Gravier states that in the specimens he studied these bristles are more like those figured by McIntosh for *Polyeunoa laevis,* which according to Ehlers is identical with *E. antarctica,* in spite of the fact that McIntosh represents a slight swelling of the shaft above the frilled region, which corresponds to the position of the "worn tooth" in the drawing given by Ehlers. Apart from this, the bristles of the new species have a much shorter frilled region with fewer pectinated frills—twelve instead of twenty-four.

These chaetae are rather more like those of *E. rhombigera,* which are slenderer and have a narrower frilled region than have those of *E. antarctica.*

There are also differences in the details of the dorsal chaetae as given by the different authors; for in *Enipo* the original diagnosis states that these are "sublaevis," and no frills are shown in Malmgren's figure; in *E. rhombigera* Ehlers shows none, but in my own preparations they are clearly present, but very delicate, in some, though not in all instances.

In *Polynoe* these dorsals are finely denticulate or, as McIntosh writes, they have "well-marked spinous rows" as in *P. scolopendrina.* In the new worm they are very distinct.

The prostomium is used in distinguishing the three genera. In both *Polynoe* and

Enipo the peaks are very ill-defined, and are close to the median tentaculophore. But in *E. antarctica* Ehlers shows them to be thoroughly " harmothoine " in their arrangements, and Kinberg states that the head of this species is quite similar to that of "*Antinoe pulchella*," Taf. VI, 29B, which thus agrees with Ehlers' figure ; that is, the peaks are on the outer edge of the anterior margin, well above the bases of the lateral tentacles ; so that in this respect *E. antarctica* resembles *Nemidia*.

The position is difficult, for if we take the prostomium as a guide we find in the original diagnosis certain differences were apparent, which do not seem to be borne out by the recent additions to the genera. If we accept the bi-dentate character of the ventral bristles as diagnostic, where is the difference between *Polynoe* and *Enipo* ? And if the dorsals are considered in the light of the nature of those in *E. rhombigera*, this feature fails us. Ehlers has transferred Kinberg's species from *Polynoe* to *Enipo*, thereby implying that the cwo genera are identical, and states that *E. antarctica* differs but little from *E. kinbergi* (McInt.). De Saint Joseph writes (Ann. Sci. Nat. Zool., ser. 7, Vol. V, p. 150) that *Nemidia* is synonymous, at any rate in part, with *Enipo*. Malmgren takes as his type of *Polynoe*, *P. scolopendrina ;* Kinberg in defining his genus *Polynoe* includes both this species and his *P. antarctica*, which Ehlers has removed to *Enipo*.

So far as the literature available to me enables me to say, only three species have been added to the genus *Nemidia* since the original account of *N. torelli* (Malmgren). McIntosh (1874, pp. 265, 266) ascribes, though with a " query," to *Nemidia*, the two species *N. canadensis* and *N. lawrencii* ; both of them have eyes, though Malmgren's *N. torelli* is described as being blind, and this character was included by him in his generic diagnosis. The ventral bristles of the two species are unlike one another, and that of the *N. lawrencii* resembles that of the New Zealand worm the more closely, though there are many more pectinated frills than I find. McIntosh notes that these two species " agree in certain respects both with *Enipo* and *Nemidia* (Malmgren)."

A third species was described more fully by Moore (1910, p. 362) from Monterey Bay ; *N. microlepidota* has a prostomium like that of *Enipo*, in that the peaks are close to the bases of the median tentacle. The dorsal chaetae are very slender with close serrations for nearly the entire length, and very different from those described for the new species and recall those of *Enipo*. The ventrals are different from those in the new worm in having the frills extending almost to the tip.

So that if the prostomium is regarded as important, and Moore is correct in attributing the worm to *Nemidia*, some of the differences in the original diagnoses disappear.

Even if we compare with one another the two species of "*Nemidia* ? " of McIntosh it will be found that the ventral bristles differ as much as they do in several of the oligomeric genera in the number of the frills and the extent of the naked region beyond. The whole matter depends on the weight to be given to minute differences exhibited by the chaetae, which again depends on the care with which they were studied and drawn by different zoologists.

The elytra of *P. scolopendrina*, of *Enipo* and of *Nemidia torelli*, are smooth ; in the new species they are roughened by numerous small tubercles.

In the definite absence of the sub-apical tooth in the ventral bristles I attribute the new species to the genus *Nemidia*. At any rate, the present worm differs from the other worms included in the genus *Nemidia*.

It is evident that the distinctions between the three genera are so slight now that additional extra-European species have been described that a re-examination of the types of the European species and of all the available material should be made by some one zoologist, for much of the discrepancy between the accounts may then be cleared up.

It may be that the differences are merely specific, and that the three genera should be merged.

Genus HARMOTHOE Kinberg, s. l.

Harmothoe spinosa Kinberg.

Kinberg, 1855, p. 286 ; Fauvel, 1916, p. 421, pl. VIII, figs. 8, 9 ; Benham, 1921 (for further references), p. 35 ; Augener, 1924, p. 282.

More than a hundred specimens of this handsome, variably-coloured worm were obtained at nine stations in McMurdo Sound, in depths from 50–300 fathoms ; another seventeen from Ross Sea, from five stations, in 45–190 fathoms ; and a couple of small individuals from the Falkland Islands, from 125 fathoms.

I find the same range of variation in colour pattern that I described amongst the specimens from Commonwealth Bay, and, as there, without any apparent correlation between the tint and the depth at which they lived.

As illustrating the absence of any such correlation I find that from Station 321 two small individuals were received ; of these one has the dorsum pigmented with a " chess-board " pattern, the other is without pigment. The elytra, too, differ : in the former there are a few large cones and no marginal fringe ; they agree with Willey's figure of " *var. lagiscoides*." The other individual has elytra of the "*forma typica*."

Another instance may be quoted from the notes on this matter. From Station 356 there were obtained eight specimens ; two of them have the dorsum of very dark blue, and the elytra are feebly pigmented ; a third possesses beautiful violet-brown splashes on the elytra with a post-areolar patch of violet; the outer region is uncoloured. In four which have lost the elytra the dorsum is unpigmented ; in the eighth, where the body-wall is uncoloured, the elytra have feebly pigmented streaks running longitudinally.

In my report (1921) I stated that this species is readily distinguished from *H. tuberosa* by the fact that, amongst other features, the tips of the parapodial lobes are deeply pigmented ; this is certainly very general, but in some of the specimens examined in the present collection, notably from Station 316, I observe that the tips are not pigmented. This seems exceptional.

Localities.—Falkland Islands, Station 38 (two small) ; Ross Sea, Station 194, "Off new land south of Balleny Island, Feb. 22, 1911, Coll. D. E. Lillie," probably off Oates Land (four, one of them large blue-black); Stations 220, Off Cape Adare (six); 294 (four); 295 (two); McMurdo Sound, Stations 314 (twenty-seven); 316 (nine); 321 (two small, Coll. Nelson); 331 (twenty-three); 339 (twenty-four); 340 (eleven); 348 (three); 355 (eight); 356 (eight).

Distribution.—Antarctic and Sub-Antarctic; extends as far north as South Australia and New Zealand (Augener); Falkland Islands (Fauvel); Queen Charlotte Sound (Augener).

Harmothoe tuberosa Ehlers.

Ehlers, 1912, p. 11, pl. I, figs. 1–7; Benham, 1921, p. 39, pl. VI, figs. 22–29 (for other references).

As I noted in the report on the "Aurora" worms, this species is much less common than *H. spinosa*, with which it usually occurs; only fourteen individuals are present in the "Terra Nova" collection, obtained from six stations in McMurdo Sound.

Localities.—Stations 314 (two); 338 (four); 339 (one); 340 (six); 355 (one); 356 (three).

Distribution.—South Victoria Land; Bouvet Island; Adelie Land.

Harmothoe abyssorum (McIntosh).

Eunoa abyssorum McIntosh, 1885, p. 73, pl. XIA, figs. 14–16; *Harmothoe abyssorum* Benham, 1921, p. 42, pl. VI, figs. 30–35.

A single specimen of this rare Polynoid was obtained at the mouth of Robertson's Bay. It is of small size, measuring 5 mm. in length with diameter of 1 mm. over the feet; it consists of 25–26 segments. All the elytra and cirri are lacking. Like McIntosh, I see no eyes on the dorsal surface, but I think I can detect them in a side view.

Each segment is crossed on the dorsum by a transverse row of whitish papillae; the form of the foot and bristles agree precisely with those I described in 1921.

Locality.—Station 220, off Cape Adare, 45–50 fathoms.

Distribution.—South of Australia (McIntosh); Commonwealth Bay, Adelie Land (Benham).

GENUS HERMADION Kinberg.

Hermadion rouchi Gravier.

Gravier, 1911, p. 82, pl. III, figs. 33, 34, pl. IV, figs. 45–51, pl. VII, fig. 74; *Harmothoe crossetensis* Ehlers, 1913, p. 442; *H. rouchi* Benham, 1921, p. 46, pl. VII, figs. 43–47.

The "Terra Nova" obtained as many as thirty-two individuals, which I refer to this species, as contrasted with the ten found by the previous expedition. They were all found at the same stations as *Harmothoe spinosa*.

In my previous report I discussed fully this species, and have given reasons for the belief that Ehlers' "*Harmothoe crossetensis*" is not *Lagisca crossetensis* McIntosh, but belongs to Gravier's later described species.

Localities.—McMurdo Sound, Stations 314 (seven); 316 (two); 331 (one); 338 (three); 339 (nine); 340 (nine); 355 (one).

Distribution.—Marguerite Bay, Adelaide Island; Kaiser Wilhelm II Land; Adelie Land.

Family PHYLLODOCIDAE.

Sub-family PHYLLODOCINAE.

Genus EULALIA Savigny.

Eulalia charcoti Gravier.

Gravier, 1911, p. 57, pl. I, figs. 14–16, pl. II, figs. 17, 18; Benham, 1921, p. 52.

This strikingly coloured species, steel-blue and iridescent, with sometimes a bronzy sheen, is readily recognised by its characteristically arranged pharyngeal papillae. It is represented by three individuals, none of them entire, and one of which seems to be without eyes, from Station 314.

Localities.—McMurdo Bay, Stations 314, depth 222–241 fathoms; 340, depth 160 fathoms; 348, depth 300 fathoms.

Distribution.—South Shetlands; Commonwealth Bay, Adelie Land.

Genus PTEROCIRRUS Claparède.

Pterocirrus hunteri Benham. (Pl. A, figs. 21, 22.)

Benham, 1921, p. 53, pl. VII, figs. 48–52

From Commonwealth Bay only one individual was obtained, but the "Terra Nova" collected four, of which one is a male, the others female. One of the latter attains a length of 250 mm. with about 800 segments; and a rather longer worm of 280 mm. contains only 560 segments. The colour of both sexes is similar, purplish or purplish-brown with brown cirri; the dorsal surface of the body presents the paired quadrate patches of dark pigments as in the type.

There is, however, a feature that I did not observe when describing the type; in the posterior feet in addition to the peculiar stout bristles with the hook-like prolongation of one side of the articular cup, there are in the upper part of the bundle more or less numerous slender bristles.

By the kindness of Dr. Anderson, of the Australian Museum, who complied with my request to allow me to re-examine the type, I am now able to state that it, too, presents these slender bristles in feet behind the middle of the body.

In these hinder feet the supra-acicular bristles are more delicate than the sub-acicular except the very lowest of them. Moreover, these slender supra-acicular chaetae lack the hook; there is a gradual reduction in the size of this projection as one approaches the upper region of the bundle, through a stage in which one lip of the articular cup has one much longer and stouter but straight lip, to the uppermost where the lips of the cup are nearly of a size. Further. the lower lip is now striated and marginally denticulate.

In one of the present worms, with 450 segments, I find the supra-acicular chaetae in the 75th parapod and posteriorly, but I have no note as to the segment in which the phenomenon commences. At any rate in the anterior segments the slender ones are lacking.

Localities.—McMurdo Sound, Stations 314, depth 222–241 fathoms; 339, depth 140 fathoms. Ross Sea, Station 340, depth 160 fathoms.

Distribution.—Adelie Land.

Pterocirrus macleani Benham.

Benham, 1921, p. 55, pl. VII, figs. 52–57.

Two small individuals were collected, of which one is larger than the type, being 65 mm. long, with a diameter of 4·5 mm. It is rather poorly preserved which may account for the increased dimensions. There is nothing to add to my former account.

Locality.—McMurdo Sound, Stations 316, depth 190–250 fathoms; 339, depth 140 fathoms.

Distribution.—Adelie Land.

Remarks.—According to Augener (1924, p. 308) this and presumably the previous species should be included in Bergström's genus *Steggoa*, because the dorsal region of the first segment is well developed. But see Fauvel (1919A) on the value of this character, upon which Bergström has laid much stress in defining genera. I have not seen Bergström's memoir.

GENUS PHYLLODOCE Savigny.*

Phyllodoce madeirensis Langerhans.

Langerhans, 1879, p. 307, pl. XVII, fig. 44; Benham, 1921, p. 51 (for other references); Fauvel, 1919A, p. 361 (for synonyms).

Colour pinkish brown to pale grey; there are no markings. Dorsal cirri pale brown near the upper part.

A single individual, measuring 100 mm. for about 250 segments, having a diameter of 3 mm, over the parapods, was obtained in McMurdo Sound.

In the individual from McMurdo Sound the pre-pharyngeal region of the gut was found on dissection to extend back as far as the 15/16th segment, where the long pharynx commences. This pre-pharyngeal or buccal region presents an anterior papillose portion, with compressed papillae, which occupies 10 segments; and a posterior rugose portion of 5 segments in length, where the wall is composed of 5 or 6 longitudinal muscular ridges.

* Fauvel (1919, p. 257) criticises Bergström's procedure in subdividing afresh the genus on the basis of the presence or absence of acicula on the 2nd segment, for, as he remarks, it is in preserved material impossible to ascertain the fact without injuring the specimen which, in the case of exotic species, is often unique. Hence I have not attempted to follow Bergström, nor does it advance our knowledge of the older known species in which it is impossible to decide the matter.

In addition to the above Antarctic individual, a worm was collected off the north coast of New Zealand which I at first attributed to the species *P. sancti-josephi* of Gravier as the median row of pharyngeal papillae is lacking.

It is well preserved, fully extended and very slender, measuring 25 mm. with a diameter of 9·5 mm. over the body ; the pharynx is completely everted and occupies another 3 mm. The entrance is guarded by 17–18 papillae and near the base there are two lateral patches of papillae of about four rows on each side. They commence at the junction of the 2nd and 3rd thirds but do not reach the actual base. The dorsal and ventral areas are free from papillae.

The colour is a very pale brownish, with indications of slightly darker cross-bars on the anterior segments. The appendages are white.

Fauvel (1919A, p. 361), as a result of the study of specimens from Djibouti and the Persian Gulf with those collected at the Azores, came to the conclusion that both McIntosh's *P. sancti-vincentis* and Gravier's *P. sancti-josephi* are synonymous with Langerhans' species. He notes, as did Ehlers (1897, p. 25), the variability as to the median dorsal papillae on the pharynx, even in specimens from the Azores, so that the absence of this median row has no importance as a differential character ; he similarly discounts the relative length of the peristomial cirri, the shape of the dorsal cirri, and so on.

He suggests further, though with a " ? ", that Augener's *P. salicifolia* from South-West Australia is synonymous. Augener (1924, p. 302) records *P. sancti-josephi* from the north coast of New Zealand, but makes no mention of Fauvel's opinion given above.

The suggestion of Bergström (referred to by Fauvel) that the Antarctic worms listed by Ehlers and by Willey under the title " *P. madeirensis* " are not that species is in direct contradiction to Ehlers' positive statement that he had himself examined some of Langerhans' material and had no doubt that the worms from South Georgia are identical with those from the Azores. Bergström would refer them to *P. patagonica* Kinberg. If he has actually compared the Antarctic specimens with the type and if Ehlers is correct then it would seem that the species' name should be that of Kinberg rather than that of Langerhans. As I have not seen Bergström's reasons for his suggestion I prefer to leave the worm under the latter title.

Localities.—McMurdo Sound, Station 316, depth 190–250 fathoms ; New Zealand, Station 96, 70 fathoms.

Distribution.—Madeira, Juan Fernandez, South Georgia (Ehlers) ; Persian Gulf, Red Sea, Mediterranean, K. Wilhelm II Land, Cape Adare (Willey) ; Adelie Land (Benham) ; New Zealand (Augener).

Phyllodoce ovalifera Augener.

Augener, 1913, p. 127, pl. II, fig. 13 ; text-fig. 7 ; 1923, p. 16 ; 1924, p. 301.

A single small specimen of this species was obtained near the Three Kings Islands not far from the place at which Augener's specimens were obtained. It measures 45 mm.

in length with a diameter of 1 mm. over all; though this is longer than the individuals measured by Augener, it is to be noted that the present specimen is very soft and somewhat macerated; hence the above figures are not true for the living worm.

It is pale yellowish with indications on the anterior segments of pale brown transverse bands; but I see no sign of the longitudinal lines noted by Augener on those from the Auckland Islands and in one from Cape Maria van Diemen.

The form of the head, the feet and dorsal cirri, as well as the bristles, agree with the description given by Augener; I may add, however, the following note as to the pharyngeal papillae. In the stained and cleared worm the pre-pharyngeal papillate region extends from the 7th or 8th segment to the 14th or 15th; here there are 4 or 5 longitudinal series of 25–30 papillae in each series; they are closely set and appear to be rounded, but owing to the softness of the worm and the fact that they are under compression it is impossible to tell the real shape.

Locality.—New Zealand, near the Three Kings Islands, Station 90, depth 100 fathoms.

Distribution.—South-West Australia; Sub-Antarctic Islands; New Zealand, north coast.

Phyllodoce adarensis, n. sp. (Pl. A, figs. 23–26.)

This new species is founded on a single individual, which is pale brownish with a faint olive hue, and without any definite pigment markings; the parapods are yellow and the dorsal cirri white. It is much twisted and measures about 25 mm. in length with breadth of body 1 mm., and diameter over the feet 2 mm., so that these are relatively long. The widest part of the body is some distance behind the head. The body is flattened and composed of 103 segments. Most of the dorsal cirri were lacking and the others readily dropped off on handling; they are broadly foliaceous.

The prostomium is longer than its breadth, it is indeed triangular; the hinder margin is slightly excavated, and here is a small "knob" or papilla. The small eyes are far back; the four tentacles are short, being little more than one-third the length of the prostomium; the right and left are separated by a space equal to their length.

Of the peristomial cirri only one remains, that of the 3rd segment, which is long and reaches to about the 14th segment.

The pharynx is partly everted and exhibits close to the base paired lateral groups of papillae, of which there are six rows on either side with 6–10 papillae in a row; the lateral papillate groups are separated dorsally by a bare area of about half the width of the group, and the ventral area, also bare, is as wide as the papillate area. These papillae are relatively large, columnar with rounded tops. In front the pharynx is marked by eight narrow longitudinal furrows separating as many wider areas traversed by ridges apparently muscular.

Of the peristomial cirri, the first segment carries one, the second two, and the third has one long one with a bundle of chaetae and a normal ventral cirrus; the first two segments seem to be fused, as I cannot distinguish them dorsally in the cleared specimen, the third is, however, quite distinct.

The foot, which has a length equal to about half the width of the body, carries a large broadly foliaceous dorsal cirrus, whose breadth is equal to its height; it ends in a blunt point and has the usual leaf-like veining. It has no definite base or cirrophore, but is sessile on the upper surface of the foot. The ventral cirrus has a nearly straight upper and a rounded lower margin, terminating in a sharp point which reaches just beyond the end of the cylindrical chaetigerous lobe. This carries 12–14 bristles, of which the appendix is long, and the articular cup has denticulated margins.

Locality.—Cape Adare, Station 220, depth 45–50 fathoms.

Remarks.—I have been unable to associate this little worm with the accounts of any species known to me. Though the arrangement of the pharyngeal papillae recalls strongly that in *P. madeirensis* Langerh., yet the shape of the dorsal cirrus is quite different and resembles that in *P. castanea* Marenz., where, however, the pharyngeal papillae extend along the whole length of the organ and the chaetae have short appendices. The latter are similar to those in *P. pseudopatagonica* Augener, but in that the dorsal cirri are long and narrow. The length of the foot reminds one of *P. longipes* Ehlers, where, however, the cirrus has a definite cirrophore.

Phyllodoce bowersi, n. sp. (Pl. A, figs. 27–31.)

This new species may be briefly diagnosed as follows: colour almost white, though apparently pale pink in life; prostomium without eyes, dorsal cirri creamy white, very adherent, elliptical in form with broad base; chaetae with long appendix, and articular cup with one side produced into finger-shaped process; pharyngeal papillae uniformly disposed along whole length of the pre-pharyngeal region.

The animal, owing to its white colour and adherent cirri and compact body, is conspicuously different from the other members of this genus collected during the expedition.

The well-preserved worm measures 60 mm. in length for 120 segments; the greatest diameter over the body is 2·5 mm., and over the cirri 5 mm., this greatest width is at about the 20th segment. The breadth of a segment is equal to the length of 5 segments.

The prostomium is without eyes; its breadth is equal to its length and its outline is a semi-circle; the two pairs of short tentacles are widely separated; the length of each is about half the width of the prostomium. The posterior border is slightly excavated, and in the deep but narrow notch is a small rounded knob.

The first segment is large at the sides but narrow dorsally where it is quite distinct, but encroached upon by the hinder margin of the prostomium. The peristomial cirrus is about as long as the width of the segment. The second carries two similar cirri of which the dorsal is somewhat longer than the ventral and about twice the length of the first. The third segment bears a much longer dorsal which reaches to about the 8th segment; below it bears chaetae and a normal ventral cirrus.

The following dorsal cirri are all in position, large, rounded above, transversely elliptical. They overlap one another and do not overlap the dorsum, being directed outwards. Each springs from a short wide base or cirrophore, the upper or dorsal region of which is extended upwards along the base of the cirrus, while the lower margin is swollen and glandular. The cirrus has not the usual " veining and midrib," and there is not the slightest " peak " on the outer edge, which is a continuous curve.

The chaetigerous lobe presents no peculiarity. The ventral cirrus is also large, oval, and reaches nearly to the end of the lobe. The bristles, of which there are about 36, are long. The appendix is long, and minutely serrated. I see no hairs along the edge. The articular cup is markedly heterogomph. One side is prolonged as a nearly straight narrow process in line with the shaft, terminating in a blunt point; the other is nearly transverse and has the usual denticulations.

The pharynx being introverted, the body-wall was slit up along the venter in order to ascertain the arrangement of the buccal papillae. The buccal region extends to the 12th segment, the pharynx reaches to the 30th. The former is lined by some 6–7 longitudinal rows of large irregular papillae, quadrate in section and with rounded tops; they are closely packed and occupy the entire surface and extend up to the entrance to the pharynx.

Locality.—Ross Sea, Station 294, depth 158 fathoms.

SUB-FAMILY LOPADORHYNCHINAE.

GENUS PELAGOBIA Greef.

Pelagobia viguieri Gravier.

Gravier, 1911, p. 62, pl. II, figs. 22–25; Benham, 1921, p. 57, pl. VII, figs. 59–60.

In contrast to the numerous specimens gathered by the " Aurora " in Commonwealth Bay, only about a dozen individuals were contained in the present collection. One lot was preserved in osmic acid, the others in alcohol.

They are of medium size for the species, the ones measured giving the figures 8–10 mm. for the length, with diameter of 1·25 mm. across the body near the anterior end, whence it tapers backwards; the width over the long yellow bristles is 4 mm. The body contains 20 or 21 segments.

The parapods are distinct cones whose length is equal to about one-quarter the width of the body; they carry both dorsal and ventral cirri.

The pharynx is everted in one specimen; it is short, terminating in a circle of papillae, but I see no teeth.

Localities.—Ross Sea, plankton, Stations 275 (eight); 288 (two); McMurdo Sound, Station 343.

Distribution.—Lat. 69° 15′ South, Long. 108° 5′ West (Gravier); Commonwealth Bay, Adelie Land.

Genus MAUPASIA Viguier.

Maupasia caeca Viguier.

Viguier, 1886, p. 382, pl. XXI, figs. 14–20; Ehlers, 1912, p. 15, and 1913, p. 462; Southern, 1909, p. 4, var. *atlantica*.

There are in the collection two small worms attributable to this species. An examination of Southern's account led me to this conclusion and later, through the kindness of Dr. Anderson, the Director of the Australian Museum, I received in reply to my request a photograph of the plate illustrating Viguier's article on the worm and a typed copy of the explanation of the figures. His drawings were made from living specimens, and there are one or two features that appear in the preserved worms that are not shown in his figures.

The longer of the two individuals measures 7 mm. for 19 segments; the greatest breadth is nearly in the middle of the length, in the region of segments 8–12, where it measures 3 mm.

The peristomium is deeply excavated in the middle of its dorsal surface to receive a tongue-like process of the prostomium; the sides of the segment curve forwards and are swollen so that it presents a crescentic form. On the ventral surface it is traversed by a furrow, the anterior portion thus delimited forming the lower lip, the posterior bearing the first parapod. This consists on each side of a short chaetigerous lobe with a few bristles, a long dorsal and a long ventral cirrus, circular in section and attenuated distally.

The third and following segments are bi-annulate; the large annulus is posterior, and extends across from parapod to parapod as a broad ridge widening as the feet are approached, but roundly excavated anteriorly, where it is occupied by a smaller annulus which does not reach the lateral margins of the body.

The parapods are in Viguier's figure much longer and more pointed than in these specimens; the dorsal cirri are relatively longer and the cirrophores are not so well marked.

These slight differences are no doubt due to the preservation and consequent shrinkage of these worms.

Locality.—Probably Station 326. The label accompanying the specimens reads: "June 28, 1911, 20 metres, off Cape Evans, McMurdo Sound, Nelson, A.11."

In the list of stations provided the provisional number "A.11" is placed opposite the date "Dec. 15, 1910," Station 178, which is at the entrance to Ross Sea (67° 23′ S., 177° 59′ W.).

But as the label definitely states that the worms were collected off Cape Evans they could not have come from this station. The naturalists were working in the region of Cape Evans from June 7 to October 14, 1911, and on other not specified dates in that year. The only station for which "20 metres" is mentioned is 322, and the date September 3rd and 4th. During the period June 7 to October 14, the depths are given as 175 metres at Stations 317, 318. But at some unspecified date in 1911 the naturalists were collecting off Cape Evans from depths of 4–40 metres with a "fish trap." This was at Station 326, from which I assume that the present worms were gathered.

Distribution.—Bay of Algiers (Viguier); South Victoria Land, off Kaiser Wilhelm II Land (Ehlers); off the coast of Ireland (Southern).

FAMILY TYPHLOSCOLECIDAE.

GENUS SAGITELLA Wagner.

Sagitella kowalewskii Wagner. (Pl. II, figs. 33, 34.)

Wagner, 1872, p. 344 (which is translated in the following work); Uljanin, 1878, pl. I–IV; Reibisch, 1895, p. 56; Southern, 1911, p. 33, pl. II, figs. 12, 13; Gravier, 1911, p. 74, pl. III, figs. 30–32; Ehlers, 1913, p. 526, pl. XXXIX, fig. 15. (For most of the above I rely on Gravier as I have not access to the earlier works.)

A single specimen of a worm, which seems to be of this species, was obtained at Station 275 in Ross Sea. It had been preserved in osmic acid, an unfavourable reagent for the study of these worms.

Its length, including the anal cirri, is 10 mm., and it consists of the "head" and 23–24 segments.

The "head" consists of the prostomium, which is produced forwards into a "palpode," short conical and slightly upturned, followed by three short narrow segments fused together, each bearing only one cirrus on each side, while all the other segments of the body have two pairs of large foliaceous cirri. The fourth segment is short, but rather wider than the preceding, from which it is separated by a distinct intersegmental furrow. Then follow 23 segments, broader and longer than the fourth; the anterior are twice as broad as the length.

The large cirri, of which the dorsal is slightly larger than the ventral, are pressed backwards against the body and appear to be about equal to its width. The paired anal cirri are a good deal larger than the body cirri, and those immediately preceding the anal are successively larger than the body cirri. Each of the anal cirri, which are directed backwards to form a sort of tail-fan, has a kind of mid-rib along its axis.

Commencing at the 11th segment there are chaetae between the cirri, two or three on each segment; they are straight (not curved as Gravier represents them), pointed, colourless. I am unable to detect any chaetae anterior to this segment.

The prostomium bears upon its dorsal surface a pair of rounded lobes, and between these a large median rounded cushion-like "boss," and from the hinder margin of this there stretch backwards and obliquely outwards a pair of rounded straight ridges which reach the lateral margin of the head, ceasing above the cirri of the second segment.

They resemble the structures figured by Gravier, and their anterior ends commence in the median line, and do not project forwards alongside the central cushion in the manner shown by Southern.

The pharynx is everted; it is a short truncated cone.

As I have not access to the literature I refer it to this Atlantic species though, like Gravier, I do so "with reserve." From the comparison of the dimensions tabulated, it seems that the two specimens obtained from the Antarctic Sea are more consistent in number of segments and approximately in length than the northern form.

Author.	*Segments.*	*Length.*
Reibisch	50	15 mm.
Greef	26–29	5–9 ,,
Uljanin	21–28	5 ,,
Southern	42–47	10–17 ,,
Gravier	25	17 ,,
Benham	23–24	10 ,,

The above are, for the earlier authorities, quoted from Southern. Either the Atlantic forms were much contracted or those from the Antarctica are a different species.

I give figures of the worm as those published by Ehlers, by Gravier, and by Southern are of more or less imperfect specimens, having lost most of the cirri; that by Ehlers indeed is little more than an impressionist sketch, though it shows the anal cirri which were absent in Southern's specimen.

Locality.—Ross Sea, Station 275, plankton, depth 160 metres.

Distribution.—Lat. 69° 15′ S., Long. 108° 5′ W., depth 950 metres. South Victoria Land (Ehlers); both these are to the south of the Pacific Ocean, and the latter close to Capt. Cook's southern limit, 1774.

The species has been met with in various parts of the Atlantic, though not apparently in the Antarctic.

One of Ehlers' specimens was obtained near the Antarctic Circle at 61° 58′ S., 95° 1′ E., which is near Knox Land, but north of the Antarctic Circle.

Family NEREIDAE.

Genus NEREIS Cuvier.*

Nereis loxechini Kinberg.

Kinberg, 1865, No. 2, p. 178 (not seen); Ehlers, 1908, p. 73, and 1913, p. 497; Benham, 1921, p. 65, pl. VIII, figs. 67–75.

I have been unable to consult the above reference to Kinberg for the part containing the Nereidae is lacking in my copy of the *Annulata nova.*

About a dozen individuals were sent to me, collected at four stations in McMurdo Sound; most of them are more or less imperfect posteriorly, the only entire specimen, with a pair of long anal cirri, measuring 50 mm. for 104 segments; but this is shorter than some of the fragments.

* The Nereids had been sent to the late Mr. L. N. G. Ramsay for identification. His unfortunate death during the war prevented the completion of this work, and when Sir Sidney Harmer forwarded the material to me he was unable to obtain any notes made by him. I find that the specimens had been examined, for the pharynx had been removed, but the original preparations are not forthcoming.

There is a point which I did not mention in 1921, viz. all the lobes of the parapods have well-developed glands on their surface.

Localities.—Ross Sea (off Oates Land), Station 194, depth 180–200 fathoms; McMurdo Sound, Stations 314, depth 222–241; 316, depth 190–250 fathoms; 355, depth 300 fathoms.

Nereis falcaria Willey.

Willey, 1905, p. 272; Benham, 1916, p. 136, pl. XLVI, figs. 4–10; *N. mortenseni* Augener, 1923, p. 21, figs. 7–14, and 1924, p. 319, fig. 4.

Two small Nereids were collected off Cape Maria van Diemen, which agree with the worm from South Australia I so identified, but unfortunately the pharynx had been removed. The feet, however, and the chaetae and general structure allow me to identify it as Willey's species.

Since making this examination I have by the kindness of Dr. Augener received his various memoirs and I find that he bestows the name *N. mortenseni* on certain worms collected in the New Zealand area.

In 1923 Augener described as a new species *N. mortenseni,* a worm which he states stands very close to *N. falcaria* in the structure of the head and bristles, but with paragnaths in the oral region VII, but none in VIII.

He writes: "Die Ähnlichkeit mit dieser ist so gross, dass ich die Möglichkeit ins Auge fasse, dass die ceylonische Nereis eine *Nereis mortenseni* ist, bei der aus individuellen oder sonstigen Gründen die oralen Paragnathen nicht entwickelt sind."

In 1924 he places *Ceratonereis falcaria* Willey as a synonym of his species. He describes the condition of the pharynx in a number of individuals and finds that in some the oral paragnaths are absent; in others those of VII are present, and others again have them both in VII and VIII.

In summing up the resemblances, and differences, he arrives at the conclusion that "*N. mortenseni*" is the typical "*Nereis*" form with denticles in VII, VIII; but when these are absent it is represented by the "ceratonereid" or "*N. falcaria,*" which is thus a variation of the normal form. This absence or presence is according to him not a matter of size or of age or of sex.

Surely by the rules of nomenclature Willey's title should be retained.

Locality.—Cape Maria van Diemen, New Zealand, Station 144, depth 35–50 fathoms.

Distribution.—Ceylon; South Australia.

Genus CHEILONEREIS Benham.

Cheilonereis peristomialis Benham.

Benham, 1916A, p. 392; 1916B, p. 138, pl. XLVI, figs. 11–18; pl. XLVII, figs. 19–22.

In 1916 (1916A) I wrote of this worm: "The striking feature of the genus is the great development of the peristomium, the ventral and lateral regions of which are much pleated and form, when fully expanded, a large hood or collar which reaches nearly to the tip of the palps, and hides the base of the everted pharynx." Further, this feature is accompanied by peculiarities in the form of the parapods and by the possession of rather exceptional homogomph falciger bristles in the notopodial bundle of the posterior feet,* as has been pointed out by L. N. G. Ramsay for *Nereis cyclurus* Harrington (Ramsay, P.Z.S. 1914, p. 237); the latter zoologist also compared this species with *Nereis fucata*.

There is no doubt, as I pointed out in my paper (1916B), that *C. cyclurus* and *C. shishidoi* are so closely related that with Ramsay I would include them under one name. I suggested that the trinomial system was here applicable; that each of the three was a local form. Thus:

C. cyclurus cyclurus from American waters;
C. cyclurus shishidoi from Japanese waters;
C. cyclurus peristomialis from Australasian waters.

For references to the literature of the other species, see my article in 1916B.

An epigamous male individual of this species was obtained off the northern portion of New Zealand, thus extending its range, for hitherto it has been recorded from more southerly regions only.

There is little to add to my former account of a specimen in the epitokous phase, which was a female, but the proportions of the worm are somewhat different.

The body is pale-purplish brown, and the modified parapods are white. The animal is 67 mm. long, of which the anterior unmodified region occupies 20 mm. The diameter of body is 6 mm. at the 10th segment, and 9 mm. over the parapods in this, the widest region. This anterior region contains 23 segments and the posterior epitokous region 80 segments, the hindmost being very short.

The anus is surrounded by a circular funnel-shaped lip, traversed by a series of radiating furrows separating low ridges, each such ridge bearing peripherally a short cirriform process.

There is a pair of long ventral cirri on this segment.

Locality.—New Zealand, Station 134, Spirits Bay, depth 11–20 fathoms.

Distribution.—Great Australian Bight.

Family NEPHTHYDIDAE.

Genus NEPHTHYS Cuvier.

Nephthys macrura Schmarda.

Schmarda, 1861, p. 91; Benham, 1921, p. 68 (for other references and synonyms); Augener, 1924, p. 295.

Sufficient has been written about this species by previous writers; and I have no matter of any importance to add.

The species is represented by about a dozen individuals, the largest of which is 135 mm. in length, and was obtained off Cape Adare.

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* In my former article in 1916A, p. 393, I made a slip of the pen in writing that these bristles occur in the " ventral " instead of " dorsal " bundles of the posterior feet.

Localities.—Cape Adare, Station 220, 45–50 fathoms (one); Ross Sea, Station 294, 158 fathoms (two); McMurdo Sound, Stations 338, depth 207 fathoms (two); 339, depth 140 fathoms (one); 340, depth 160 fathoms (five).

Distribution.—Sub-Antarctic, Tasmania, Australia, New Zealand, Antarctic (Gravier).

Family AMPHINOMIDAE.

Genus CHLOEIA Savigny.

Chloeia inermis Quatrefages.

Quatrefages, 1865, vol. I, p. 389; *C. spectabilis* Baird, 1868, p. 234; Benham, 1916a, p. 390, text-figs. 6–11; Augener, 1924, p. 258.

In 1916 I wrote a fairly full account of this worm founded on a number of specimens in the collection in the Otago University Museum. It is not at all a rare species, as I have specimens collected from Wellington and Cook Strait to Stewart Island, and Augener has described the species from Colville Channel.

Only a single individual was obtained by the "Terra Nova" from Spirits Bay in the north, so that it occurs all round the east coasts of New Zealand as well as at Chatham Island.

In that article I stated that it is probably identical with the worm described by Baird as *C. spectabilis;* and Augener is of the same opinion. The only noticeable difference in Baird's brief account from that given by Quatrefages refers to the coloration of the body, which is stated to be "dotted all over below with numerous small white round spots varying in size." All the specimens I have studied are without these spots, as also are those examined by Augener; the body is uniformly pale yellowish with a slightly marked median dorsal band.

The difference in coloration, due perhaps to post-mortem changes, is certainly not worth making into a specific distinction; and though Baird states that all the bristles are smooth, it is possible that he may have overlooked the existence of a small sub-apical tooth found both in dorsal and ventral bristles, but often worn away, as I figured in the above article.

It may be useful to give the measurements of a series of specimens as well as those of Quatrefages and Augener.

Locality.	*Length.*	*Diameter.*	*No. of Segments.*
Wellington (*a*)	55 mm.	12	33 (both of these
Wellington (*b*)	45 ,,	9	30 are soft)
D'Urville Island	20 ,,	8	31
Chatham Island	57 ,,	12	34
Off Otago	14 ,,	4	24
Stewart Island	40 ,,	11	33
Orepuki	31 ,,	9·5	30
Tasmania	42 ,,	10	29
Quatrefages	40 ,,	10	30
C. spectabilis	62 ,,	—	34
Augener (*a*)	29 ,,	7·5	30 (31)
Augener (*b*)	16 ,,	—	29

It may be noted that the dark-purple colour of the gills is retained by specimens that have been in alcohol for at least twenty years.

Locality.—New Zealand, Spirits Bay, Station 134, depth 11–30 fathoms.

Distribution.—New Zealand, Tasmania (Benham, 1915).

Family EUNICIDAE.

Sub-Family EUNICINAE.

Genus EUNICE Cuvier.*

Eunice australis Quatrefages.

Quatrefages, 1865, vol. I, p. 321; *E. australis* Ehlers, 1904, p. 30, and 1908, p. 85; Benham, 1909B, p. 74; Fauvel, 1917, p. 228, fig. XXI. (also for reference and synonyms); Augener, 1923, p. 63, and 1924, p. 399.†

This species has already been recorded from New Zealand seas where it is perhaps the commonest Eunicid from the North Cape to Stewart Island, and even as far south as Auckland Island.

Those described in considerable detail by Augener came from the same district as these obtained by the "Terra Nova."

Localities.—New Zealand, near the Three Kings Islands, Stations 89, surface; and 90, depth 100 fathoms; near Cape Maria van Diemen, Station 144, depth 35–40 fathoms (collected by D. E. Lillie).

Distribution.—Indo-Pacific; Indo-Malay tropical region southwards; Australia; Ceylon; Cape of Good Hope; Zanzibar.

Eunice tentaculata Quatrefages.

Quatrefages, 1865, vol. I, p. 317; *E. pycnobranchiata* McIntosh, 1885, p. 294, pl. XXXIX, figs. 13–15; pl. XXIA, figs. 4 and 5; *E. pycnobranchiata* Benham 1915A, p. 213, pl. XLII, figs. 79, 80, and 1916A, p. 386; *E. antennata* Ehlers, 1907, p. 12; *E. tentaculata* Fauvel, 1917, p. 209 (for further references); *E. tentaculata* Augener, 1924, p. 404.

No doubt it was owing to the imperfect description given by Quatrefages that his species, when again met with in the "Challenger" collection, received a new name at the hands of McIntosh; by the detailed study of a series of specimens Fauvel was able to revive the original title which has been accepted by those who have followed him.

The present worms were captured by Mr. D. E. Lillie in the same region as the previous species, and it was from here too that Augener obtained his material. As I have recorded it from various parts of the coast of the South Island, at any rate on the east side, from Nelson to Foveaux Strait, it is evidently a common worm.

* I am unwilling to follow Treadwell's lead to revive "Leodice" for this well-known genus although the name "Eunice" is preoccupied: no real service to zoology is attained by discarding the latter name.

† Apparently McIntosh (1924, p. 26) does not accept the identification of this species with his *E. murrayi* which Augener suggests.

Locality.—New Zealand, Stations 90, 91, 96, in depths from 70–300 fathoms.
Distribution.—Australia ; Tasmania ; New Zealand.

Eunice aphroditois (Pallas).

Nereis aphroditois Pallas, 1788 ; *Eunice aphroditois* Ehlers, 1868, p. 306 ; *E. gigantea* Savigny, Quatrefages, 1865, p. 311 ; *E. aphroditois* McIntosh, 1904, p. 42, pl. II, figs. 14, 15 ; *E. aphroditois* Augener, 1913, p. 267 ; *E. aphroditois* Fauvel, 1917, p. 215 (for further references).

This worm has been recorded from New Zealand waters by Ehlers, who merely quotes my MS. description of the coloration of the specimen I sent to him; and by myself (1909B).

In the present collection there is one cephalic fragment measuring 85 mm. for 140 segments with a diameter of 5 mm. It is thus only a portion of a young worm.

The non-moniliform tentacles and dorsal cirri ; the relatively large size of the gills, which commence on the 7th chaetiger and attain the maximum number of 15 rami on the 45th segment ; the black acicula and acicular chaetae, appearing at any rate before the 45th, differentiate it from the other two common New Zealand species of Eunice, and lead me to regard it as a juvenile stage of *E. aphroditois*.

The synonymy of this giant Eunicid has been discussed by De Saint-Joseph (1898, p. 261) and more recently by Augener and by Fauvel. Its close resemblance to *E. roussaei* Quat. (=*E. kinbergi* Ehl.) has attracted the attention of all those who have studied the worm critically, and the difficulty of distinguishing the two species from one another has become the greater the more intently the subject has been examined. There is therefore no need to reopen the question. I will merely summarise the conclusions arrived at by the two last zoologists.

The close similarity between the two species is emphasised by the fact that Augener, after examining two specimens collected at Sydney, and described by Ehlers as *E. aphroditois*, finds that one of them, judged by the chaetae, is *E. kinbergi*, the other *E. aphroditois*.

Fauvel taking each of the structures relied upon for differentiating the species, the chaetae, gills, presence of collar and so on, comes to the conclusion : "Il est même fort possible qu'il ne s'agisse, en effet, que d'une seule et même espèce ; c'est la conclusion que j' aurais même adoptée sans la raison suivante ; De Saint-Joseph a demontré que la forme jeune de l' *Eunice roussaei* (*E. kinbergi*) est l' *Eunice purpurea* Grube ; or, cette forme me paraît différente de l' *Eunice tentaculata* que je soupçonne fort d'être la forme jeune de l' *E. aphroditois* " (p. 219).

The juvenile form mentioned above with its smooth tentacles seems to settle the question raised by Fauvel as to the possibility of *E. tentaculata* being the young of *E. aphroditois*, for the size of this specimen is no bigger than many individuals of the former and yet has the characteristics of the latter.

On p. 224, after describing *E. roussaei*, he writes to the following effect : In conclusion one is tempted to regard *E. aphroditois* and *E. roussaei* (=*E. kinbergi*) as two geographical forms belonging to same species : the first to the Indo-Pacific, the second to the Atlantic. The two forms meet at the Cape of Good Hope and apparently at Sydney.

Augener comes to the same conclusion and compares with *E. aphroditois* various other species. So difficult is it to establish a satisfactory distinction between the two forms that thus even the most accomplished systematists of the day are unable to formulate the difference.

Consequently, I shall assume that the specimens before me belong to Pallas' species.

Locality.—New Zealand, off Cape Maria van Diemen, Station 144, depth 25–40 fathoms.

Distribution.—Red Sea, East Africa, Cape of Good Hope, Madagascar, Australia, Samoa, Japan, Philippines, Borneo, Ceylon, Fiji, Kermadec Islands (Benham, 1915B).

I may take this opportunity of placing on record certain details about some large eunicids which have been in this Museum for twenty-five years and more, and which I regard as belonging to the species. The notes on the first three were written in 1900.

A. From Golden Bay, Nelson, dredged by s.s. " Doto," in 1900, at a depth of 8–17 fathoms.

It measures 225 mm., but is imperfect. The colour,* in formalin, was noted as being reddish-brown, highly iridescent; the hinder border of each segment dorsally has a row of dark purplish-brown dots, which are also numerous all over the peristomium. The 4th chaetigerous segment is paler than the rest. The tentacles and dorsal cirri are not moniliform, but the brownish tentacles are ringed with white at intervals. Gills commence on the 8th chaetigerous segment; simple at first, the 4th has 3 rami; the maximum number is 16 on the 40th segment; the majority in the fragment have 15.

B. Was found on the Ocean Beach, Dunedin, in 1899, evidently washed ashore. It is a fragment consisting of a head and only 88 segments, measuring 212·5 mm. Colour in alcohol is dull brown, each segment showing a darker tint near its hinder margin; there are no definite dots; possibly the pigment had been dissolved and diffused by the alcohol after a year or so. Segments 6, 7, 8 are rather paler. Peristomium is dark below, and the ventral surface of the body anteriorly has a dark band across each segment.

Gills commence on 10th on the right, but on 16th on the left side; maximum in the fragment—10 rami on 40th segment, beyond which the worm was decomposed.

C. Also from Ocean Beach, found in 1898, and when received by me was dead and the hinder part decomposed.

Incomplete; when fresh was 750 mm., but in alcohol shrank to 600 mm. Colour reddish brown, with transverse rows of very dark dots near the posterior margin of the segments. After preservation these naturally become a good deal less conspicuous.

No pale segment was noted at the time of receipt. Gills commence on 10th as

* Izuka (1912) describes the coloration of the living worms as being " black with strong metallic iridescence and usually the 6th and 7th segments are lighter coloured."

single tubercles; maximum number of rami 17 on the 37th segment; posteriorly damaged.

D. A specimen complete, but unfortunately very badly preserved in alcohol, was captured on the piles of the wharf at Port Chalmers, Otago Harbour, in 1919. It is now (1925) very soft. It measures 1·67 metres with greatest diameter of 17·5 mm. There are about 800 segments: estimated from the fact that about 12 segments go to the inch.

The coloration is now dull brown and iridescent. The peristomium and the anterior four segments are very dark, nearly black, both dorsally and ventrally, a great contrast to the frequently recorded pallor hereabouts.

The dorsal surface of the anterior half of the body has the hinder half of each segment very deeply pigmented; further back, after about the middle of the length, it becomes bronzy, still with darker pigment posteriorly. Still further back, this pigment resolves itself into a number of distinct patches or irregular spots, extending all over the surfaces of the segments.

The tentacles still exhibit the white rings on the brown ground.

The anal segment is cylindrical, minutely annulated (? regenerated), quite distinctly marked off from the last chaetigerous segment though not much narrower than it; it terminates in a thickened margin which bears ventrally a couple of short cirri, one of which is bifurcated close to the base. Izuka states that there are four anal cirri.

The first gill appears on the left side on the 17th segment. It has but a single filament; the second gill has already 6 rami, that on the 40th segment has 17, and that on the 80th 26 rami. This, the maximum, is continued for at least half-way along the body. The longest gills extend more than half-way across the dorsum. They are continued to the end of the body, and even a few segments before they cease, that is an inch before the end, the number of rami is 10.

On the right side the gills commence on the 15th chaetigerous segment.

Black acicular chaetae occur after the 110th segment.

E. The specimen obtained off Whale Island, North Island of New Zealand, during the "Nora Niven" trawling expedition in 1907–8 at Station 95, was preserved in formalin and still (1925) retains its coloration. The cephalic fragment of 120 segments measures 183 mm. with diameter of 17·5 mm. There are 17 segments to one inch of length. The ground tint is pale-pinkish brown, with numerous dark-brown spots of irregular form, size and distribution over the body as well as over the dorsal surface of the peristomium. Ventrally the surface is pale. The dorsal cirri are pinkish.

The first gill is on the 12th chaetigerous segment on the right side, and on the 15th on the left side; on the 50th segment the gill has 23 rami—the maximum.

Black acicular-chaetae occur at about the 90th segment.

It will be noted that in the last two specimens the first gill is further back than usually stated for the species. Fauvel has tabulated the main characters of all the specimens recorded, hence I have added the facts about those in my possession.

Augener (1913, p. 268) notes that in general the gills in *E. kinbergi* commence a few segments further back than in *E. aphroditois;* and he gives a table of the eleven specimens he examined from this point of view.

The study of the two individuals D and E above, renders this point doubtful and the differentiation of the two species still more difficult.

I may here note a curious fact about the segmentation of the worm D. On the right side each of the chaetigerous segments 6, 7, 8, and 9, has two parapods, well developed, though one of them is small in the 7th and 8th, so that if the parapods are counted the first gill arises on the 20th parapod, and belongs to the 15th segment. There is no sign of any "duplication" of the segment to be seen either dorsally or ventrally; there is no annulus or furrow to suggest fusion or splitting of a segment, such as has been described and figured by Buchanan (1893) * and by Cori (1892).† Nor do I find any "rectification" of this feature on the left side; nothing to suggest the "spiral" intercalation of segments as described by these authors.

It seems that we have here merely a duplication of the parapods without any corresponding duplication of the segments.

Genus PARAMARPHYSA Ehlers.

Paramarphysa parvipes, n. sp. (Pl. II, figs. 35–41.)

This genus differs from *Marphysa* only in the absence of the nuchal cirri.

There are two very slender, well-extended worms that have evidently been carefully preserved. The longer measures 28 mm. with a diameter over the parapods of 0·75 mm.; it contains about 115 segments. The colour is pale brown with a reddish tinge. The prostomium has a scarcely distinguishable notch on its anterior margin; it has one eye on each side near the base and carries five tentacles, which are smooth, short, relatively broad and round-tipped; the median is only slightly longer than the others, the shortest, external, is about two-thirds its length; the tentacles project slightly beyond the anterior margin of the prostomium, which the three middle ones exceed in length.

The eyes are situated in a line with the space between the lateral and admedian tentacles of each side. On the under surface are great rounded palps. The peristomium is feebly bi-annulate, the second ring rather more than half the length of the first.

The parapods are very little prominent, indeed in their proportions they recall those of *Nicidion*, which, however, has nuchal cirri. So insignificant are they posteriorly that at first they were overlooked. The dorsal cirrus is a short rounded cone, while the ventral cirrus is scarcely recognisable, and appears absent posteriorly.

The parapod is supported by a yellow aciculum and in the hinder feet there is a subacicular spine which, like the aciculum, is brown at the base paling to yellow at the tip.

* Buchanan, 1893: "Peculiarities in the Segmentation of certain Polychaetes," *Q. J. Microsc. Sci.*, London, vol. XXXIV, p. 529–544, pl. XLII.

† Cori, 1892: "Über Anomalien d. Segmentierung b. Anneliden," *Zeit. f. Wiss, Zool.*, vol. LIV, pp. 569–578, pl. XXV.

In most of the feet the bristles are broken; rarely in the preparations can I see all the chaetae in the one foot, but from study of various feet it appears that there are 2–3 capilliforms in the upper region, 3 jointed hooks in a vertical series, and 1–2 combs below.

The capilliforms are slender, curved, pointed, and have a narrow wing. The hook has a bent shaft, dilated at the articulation, and the appendix is short, stout, and bifid, the terminal tooth being finer than the proximal.

Usually the combs have the marginal teeth of the same length as the rest; in some a marginal tooth is prolonged.

The subacicular hooded hook makes its appearance in about the 50th parapod; these posterior feet scarcely project beyond the body. There are no capilliforms and the supra-acicular bundle consists only of 3–4 combs, in the upper of which one of the marginal teeth is longer than the rest; in the lower the teeth are all of the same length; the marginal are, of course, the stouter.

The jaws are so transparent and colourless that it is difficult to determine their outlines. The toothed edge is very pale brown and across the "fulcrum," at the origin of the "forceps," is a transverse brown line. The great jaw-plates are four-toothed; the anterior plates have 6–8 rounded teeth. The lower jaw-plates are even more delicate; brown at the tip, they have the usual form. In fact, the jaws agree so far as I can determine with those of *P. obtusa.*

Locality.—New Zealand, Station 96, depth 70 fathoms.

Remarks.—The species is evidently different from the three species, accounts of which I have been able to study. It is a good deal smaller than *P. longula* Ehlers (1887), or *P. teres* Treadwell (1922, p. 153), but is of about the same size as *P. obtusa* Verrill (Treadwell, 1921); but in each of these the parapods are more conspicuous and the dorsal and ventral cirri longer, while in *P. teres,* the prostomium is deeply notched. From the species that I recorded, without describing, from the Kermadecs, I find it differs in these same directions; there the bristles in the anterior feet, for example, are much more numerous.

Sub-Family ONUPHIDINAE.

Genus HYALINOECIA Malmgren.

Hyalinoecia tubicola (O. F. Müller).

Nereis tubicola O. F. Müller, 1766; *Hyalinoecia tubicola* Malmgren, 1867, p. 67, pl. VIII, fig. 49; *Hyalinoecia tubicola* McIntosh, 1885, p. 335, pl. XL, fig. 1; *Onuphis tubicola* Ehlers, 1907, p. 11; *Onuphis tubicola* Benham, 1909A, p. 245; *H. tubicola* McIntosh, 1910, p. 420 (for earlier references); *H. tubicola* Izuka, 1912, p. 97, pl. XI, figs. 1–4; *H. tubicola* Benham, 1915A, p. 225; *H. tubicola* McIntosh, 1924, p. 35; *H. tubicola* Augener, 1924, p. 422.

During the expedition of the "Terra Nova" a number of the tubes of this worm were obtained between Cape Maria van Diemen and the Three Kings. The tubes ranged from 45 mm. to 90 mm. in length; many of them contained the animals and in at least two instances the head was directed towards the lower end of the tube as is figured by McIntosh (1885).

Localities.—New Zealand, Stations 90, depth 100 fathoms, and 96, depth 70 fathoms.

Distribution.—Ranges over the North Sea and shores of Norway southward to the Mediterranean; it is not uncommon in the Atlantic south of Cape of Good Hope and westward on the American shores. New Zealand (McIntosh); Tasmania; Japan.

Sub-Family AOTEARINAE, nov.

Genus AOTEARIA, nov.*

This new genus may be defined as follows: Worms with the general facies of *Lumbriconereis*, in form of body, of the parapods, and of the chaetae; the prostomium is marked by paired longitudinal furrows as in *Ninoe*; the upper jaw-plates are of unequal number on the two sides as in *Eunice*, but the anterior series of plates are arranged in line as in *Lumbriconereis*.

Aotearia sulcaticeps, n. sp. (Pl. II, figs. 42–52.)

The anterior ends of two individuals: the longer fragment contains about 90 segments, but is much twisted; the shorter contains 60 segments and measures 20 mm. in length with a diameter of 1·0 mm. The body is of uniform diameter and the segments are much shorter than their breadth.

A third fragment comes from the mid-body, and no doubt belongs to one of the above.

The colour is a pale brown, with a conspicuous iridescence, more noticeable on the anterior region; on the prostomium it results in a blue-violet sheen, and on the body segments in a greenish sheen.

One of the specimens is less deeply pigmented than the other and is somewhat less iridescent.

The prostomium is conical, its length is about twice its basal breadth and is equal to the distance from the mouth to the middle of the third segment. It is slightly constricted at the base, the apex is truncated and at a short distance from the tip there is a faintly impressed but quite distinct circular groove separating the tip from the rest of the head. Four definite furrows run along the entire length from this circular groove to the base, at approximately equal distances apart—two on the dorsal and two on the ventral surface. They are slightly more deeply pigmented than the general surface of the prostomium.

There are two non-chaetigerous segments; the first, or true peristomium, which is

* "Aotea," White Cloud; the original name bestowed on New Zealand by the first Maori arrivals from overseas. Elsdon Best explains it thus: "The first sign of land is said to have been a white cloud that overhung it."

perforated by the mouth, is nearly twice as long as the second, which in its turn is shorter than the next, the first chaetigerous segment.

The ventral region of the " head " presents a pair of swellings or " buccal cushions " (or perhaps " palps "), separated by a deep median fissure.

The second of these oral segments has a median ventral region marked off from its lateral as the " oral process," which is traversed by five very distinct furrows extending nearly to its hinder margin. The oral process is, however, distinguishable rather by a difference in texture than by any line between it and the lateral region of the segment.

The five anterior chaetigerous segments are longer than those that follow: here the length of three segments is contained in the breadth; whereas in the rest of the body this is equal to the length of five segments. These anterior segments carry small parapods, which are low down at the sides. Their parapods have a very low rounded chaetigerous lobe supported, as are the rest of the feet, by a couple of dark brown or even black acicula. The posterior lip is nearly as long as in the hinder feet. The bristles of the first parapod are five—two winged capilliforms, and three yellow hooded hooks. In the 4th there are three capilliforms and three hooks; in the 6th three and two respectively. In the rest of the body there are usually two capilliforms and one hooded hook.

The capilliforms are slightly upturned where the wing commences, and here the shaft swells out somewhat and presents oblique striations. From another aspect the wing is seen to be double and the striations are continued on to it.

The hooks in the five or more anterior feet differ from those occurring further back, the shaft being bent and somewhat swollen above the bend; it terminates in two teeth, a smaller proximal and a larger distal, and between them there are three or four short spines. The hood is about three times as long as its breadth, and the " back " and " front " borders are almost parallel along the bent region of the shaft. In the anterior hooks the hood arises from the " front " at a much lower level than it does at the " back " of the shaft: it begins well below the point of bending, whereas at the back it arises only a little below the commencement of the hook. There are no " compound " or articulated hooks in any of the feet, which were examined very carefully.

In the feet of the 10th segment, as well as in the most posterior segment of the fragment, capilliforms still exist; the hooks are stouter than in the five anterior feet and the shaft is nearly straight; the hood is here nearly circular, springing from the shaft at almost the same level on each side. The proximal tooth is connected with the shaft by a " bridle," which is absent in the anterior hooks.

The jaws:

I. The "forceps" (Zangen) are stout, and broad at the basal region which is notched. The pair of " carriers " are long and narrow—as long as the forceps themselves; they are wider behind and are constricted at about two-thirds of their length.

II. The great dental plate is pale brown, has four and five teeth of approximately equal sizes. The tooth margin is upturned.

III. A pair of nearly black jawlets, each produced into three teeth.

IV. On the right side is an unpaired plate bearing three teeth.

V. In front is a pair of large "rasping plates," black and with 8–10 denticulations on the inner upturned margin. That on the left side seems to be curled over at its anterior end, but in attempting to separate the various plates for more detailed study, they were displaced.

The series of jaw-plates form a line on each side; the anterior ones are not in a curve. In addition to the above there are the usual paired granulated rasping plates outside the great dental plates.

The lower jaw-plates are white, with brown curved concentric lines of the usual sort. The elongated base was broken in dissecting the plates out so that the full length is not shown in the drawing.

Locality.—New Zealand, near Cape Maria van Diemen, Station 144, depth 35–40 fathoms.

Remarks.—The worm is so similar to a *Lumbriconereis* in its form, its slenderness, its simple parapods and the fewness of its bristles, that I naturally suspected that it might be *L. neozelandiae* McIntosh, which was dredged from near the north-west of New Zealand; but after comparing the account given in the "Challenger Report" I came to the conclusion that the two are different. McIntosh says of the prostomium (1885, p. 248): that it is "rather pointed and elongated with one or two longitudinal depressions dorsally which are, however, omitted from the figure, and an evident median groove ventrally." This at once recalls the condition above described except that I find two quite definite furrows on both surfaces. But the shape as seen in the figure (Pl. XXXVI, fig. 18) shows it to be much rounder at the tip than in the present worm, whilst a glance at the figure of the foot and of the chaetae show them to be quite different.

There are, even on the 33rd foot as figured (Pl. XXXVI, fig. 19), four winged capilliforms and three hooded hooks; the latter with very long hoods and very different from those of the present worm (Pl. XVIIIA, figs. 5–9). Moreover, he states that in the 16th foot and more posteriorly some of the capilliforms are extremely long, there is nothing of the kind in *Aotearia.*

The acicula are black as in the new species, but the bristles are "deeply tinted" also.

The text-figure of the jaws is insufficient in detail for any comparison to be made; but it is apparently different from the present worm.

By the asymmetry of the jaw-plates, *Aotearia* is clearly distinguished from the genus *Lumbriconereis.* The additional unpaired plate on the right side might of itself suggest *Eunice,* till the arrangement of the anterior plates is noted. Grube pointed out in 1877 that these are in *Lumbriconereis* arranged in line, whereas in *Eunice* they form an arch in front of the posterior plates. A further fact that attracts attention is the form of these anterior plates, which, both in *Eunice* and *Lumbriconereis*, are more or less curved and denticulated, whereas in *Ninoe* they have the form of broad plates, roughened on the surface by numerous small knobs, and with the mesial edge finely denticulated: in *Ninoe*, again, the jawlets are equal in number on the two sides.

Hence the new worm cannot be placed in this genus, apart from the fact that in the majority of the species the posterior lip of the parapods, at some distance from the anterior end, is produced into a number of finger-shaped processes which function as gills. It is true that in *Ninoe fusca* Moore these gills are reduced to a single process, formed from the upturned tip of the lip.

The enlargement of the five anterior segments is found also in *Ninoe leptognatha*, where the gills commence on the fifth foot.

The arrangement of the bristles, both capilliforms and hooks, even on the first chaetigerous segment, is more common in *Lumbriconereis* than in *Ninoe*, where the anterior bristles are simply winged.

The Eunicidae are by all authors divided into two large groups, the Eunicidea and the Lumbriconeridea of Grube (1877, 1878); in the former the jaw-plates are asymmetrical and in the latter symmetrical; in the former the anterior plates curve round the ends of the posterior, whereas in the latter they form a linear series in front.

As the present worm combines these characters it cannot be placed in either group, hence a new sub-family is needed.

Sub-Family LUMBRICONEREINAE.

Genus LUMBRICONEREIS Blainville.

Lumbriconereis brevicirra (Schmarda). (Pl. II, fig. 53.)

Notocirrus brevicirra Schmarda, 1851, p. 116; *L. brevicirra* Ehlers 1904, p. 35, pl. IV, figs. 13–20, pl. V, figs. 1, 2; Augener, 1913, p. 288, and 1924, p. 426 (syn. *L. jacksoni* Kbg.).

A single complete specimen and a fragment from the mid-body were obtained at the same time as a fragment of *Notocirrus* sp. and two specimens of *Aotearia sulcaticeps*, off Cape Maria van Diemen. It is remarkable that the only members of the sub-family collected by the expedition were all gathered in one spot, and that the five specimens then found belong to three groups.

This worm is a very pale-brown colour, with a yellowish prostomium. It measures 78 mm. in length and about 1 mm. in breadth, and contains about 130 segments.

There is a feature that Ehlers does not mention. Each segment presents a low ridge round its middle both dorsally and ventrally. Dorsally this ridge ceases just above the parapod in a slight prominence so that the foot appears to lie in a depression; in a side view the series of parapods seem to lie in a continuous lateral groove.

The shape of the parapod agrees closely with that figured by Ehlers, though the posterior lip is directed somewhat upwards instead of downwards as he stated to be the case.

The acicula are yellow: unfortunately all the bristles are broken, and only the bases are present; of these there are three in each foot—two above and one below the acicula.

Locality.—New Zealand, Station 144, depth 35–40 fathoms.

Distribution.—S.W. Australia; Lyttelton, N.Z.

Genus NOTOCIRRUS Schmarda.

Notocirrus, sp. indet. (Pl. II, figs. 54–58.)

Two fragments of a cylindrical Lumbriconereid containing only the middle part of the body is referred to this genus with some hesitation.

The colour of the worm is a pale-greenish brown, without iridescence. One of the fragments measures 40 mm. in length, with a diameter of 1 mm., and consists of about 200 segments. These are not annulated, and carry the parapods slightly below the equator of a transverse section; the belly, like the back, is convex. The length of a segment is about one-fifth of its breadth.

The parapod is small; the posterior lip is horizontal and about twice the length of the chaetigerous lobe; its upper and lower margins are nearly parallel, and the tip bluntly rounded. Springing from the root of the chaetigerous lobe is a small "dorsal cirrus," usually a simple rounded or ovate process, though in some of the feet it is divided into two or three lobules: it is entered by a delicate aciculum and by blood vessels; it represents, therefore, the notopod of a typical foot as in *Eunice*.

I see no trace of a ventral cirrus.

The acicula are yellow and their attenuated tips project freely from the lobe. The chaetae are apparently very brittle, and easily broken when the preparation is being mounted, for it is difficult to find all the bristles complete in any one foot, but a comparison of several feet shows that the foot carries three supra-acicular winged bristles, and one sub-acicular stout spine of peculiar structure.

Of the three upper bristles the uppermost is the longest: it is curved, finely pointed, and the shaft is striated; the wing is not very broad, about half the width of the shaft, and shows no striations. The middle bristle has the usual structure found in the genus, *i.e.* the shaft is bent and appears concave on the winged side, the wing is very narrow, and below it is a broad semicircular expansion or lower wing. This is distinctly ribbed, each of the 5–6 ribs projects beyond the membrane as a little tooth; a curved line, concave proximally, passes across the shaft from the upper margin of the lower wing, suggesting a cup-like excavation opening distally. The lowest chaeta is like the uppermost and without the expansion.

The stout sub-acicular chaeta, of which I find only one in each foot, appears to be somewhat variable in its mode of termination, which may be due to breakage.

When complete, the thick shaft presents a blunt rounded apex, below which is a short rudimentary hood developed on one side. Projecting from between the hood and the apex is a long slender pointed style, terminating in a refringent tip. This seems to be flexible, as in some cases it is bent near its origin, in others it lies at an angle to the shaft. In the general structure of the chaetae it seems to resemble *N. lorum* Ehlers (1897, p. 78, pl. V, figs. 125–128), which is stated to have been captured at Station 49° 35′ S., 64° 43′ W., that is, in the neighbourhood of the Falkland Islands. In this species the acicula are described as being brown; this might be due to the age of the animal or to the position of the feet studied; but the lower winglet of the middle bristle has only three denticulations on its margin. The low number of the bristles, however, is in agreement with the present worm.

Ehlers does not describe the sub-acicular bristles; but the figure of the foot below the aciculum shows a simple blunt spine without a hood and without such a process as I have described. As there is some uncertainty I refrain from giving our worm a specific name.

It is not *N. capensis* McIntosh, nor *N. chilensis* Schmarda, for in the latter the author figures a ventral cirrus as well as a dorsal. He figures also a winged bristle in the lower part of the bundle and a blunt spine, enlarged at "b," which recalls that described above when the "style" is broken away. Nor does the New Zealand worm agree with *N. zonata* Moore (1903) from Japan, the colour of which is yellow with an orange zone in the middle of each segment.

Locality.—New Zealand, near Cape Maria van Diemen, Station 144, depth 35–40 fathoms. (With *Aotearia sulcaticeps* and *L. brevicirra.*)

Family GLYCERIDAE.

Genus GLYCERA Savigny.

Glycera capitata Oersted.

Oersted, 1843, p. 44, pl. VII, figs. 87, 88, 90–94, 99; Benham, 1921, p. 74 (for other references).

Four individuals of this worm were included in the collection submitted to me.

There is nothing to add to the accounts given by previous authors.

Localities.—Ross Sea, Station 294, depth 158 fathoms; McMurdo Sound, Stations 314, in 222–241 fathoms; 331, depth 250 fathoms.

Distribution.—Antarctic; Sub-Antarctic; Atlantic; Pacific (to Japan and Alaska).

Family ARICIIDAE.

Genus ARICIA Savigny.

Aricia marginata, var. *macleani* Benham.

Benham, 1921, p. 78, pl. VIII, fig. 90.

I established this variety of Ehlers' species for a form which, while agreeing in general with that species in the number, 13–14, of anterior spiniferous segments, in the position of the first gill (5th or 6th chaetigerous segment), in the absence of papillae and in the presence of three vertical rows of spines, yet has in addition a curved row of 3–6 spines below and behind the lower end of the third row.*

At Station 331 eight individuals were captured; of these the longest measures 48 mm. with a breadth of 3 mm. Six have 14 anterior spiniferous segments with gills commencing on the 6th; two have only 13 spiniferous segments with the gill on 5th.

From Station 314 two were obtained, both of them having 13 anterior segments with gill on 6th.

The structure of the posterior segments agrees with Ehlers' figures of *A. marginata*.

Localities.—McMurdo Sound, Stations 314, 331, in depth of 222–250 fathoms.

Distribution.—Adelie Land.

Family SPIONIDAE.

Genus NERINOPSIS Ehlers.

Nerinopsis hystricosa Ehlers.

Ehlers, 1912, p. 22, and 1923, p. 512, pl. XXXVI, figs. 7–13.

A number of short darkly-tinted worms (which had been in osmic acid), coiled and shrunken. Their average approximate length is 5 mm. with a diameter of 1 mm. and about 25 segments.

The prostomium bears a pair of thick curved tentacles somewhat like a goat's horns, which spring laterally and near the dorsal surface. From the anterior region there arises a short conical process and I think I detect a shorter one on either side. The prostomium is broad, and overlapped posteriorly by a rounded lobe from the next segment.

The hinder end of the body carries a pair of large rounded lobes or anal cirri (?).

The parapods, which are long, arise high up on the side of the body, really from the margin of the dorsum.

On each segment there are small leaf-shaped processes representing the dorsal cirri and a short conical process on the ventral side of the bristles. But whether these are the homologues of "lips" or "cirri" seems uncertain. Two bundles of delicate chaetae spring from in front of them; the ventrals are fewer and more delicate than the dorsals, which do not extend throughout the length of the body. The worm is fully described in the second article by Ehlers.

Locality.—McMurdo Sound, Station 326, depth 20 fathoms. "June 28, 1911, No. 11, position A, coll. Nelson."

Distribution.—South Victoria Land; Kaiser Wilhelm II Land.

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* On p. 78 of that Report, in line 4, there is a misprint: instead of "10–20" read "19–20" of these spine-bearing segments.

Family TEREBELLIDAE.*

Sub-Family AMPHITRITINAE.

Genus PISTA Malmgren.

Pista symbranchiata (Ehlers).

Nicolea symbranchiata Ehlers, 1913, p. 556, pl. XLIV, figs. 1–6; *Pista symbranchiata* Fauvel, 1923, p. 46, fig. 6.

This worm is readily recognised by the structure of the head, by the two pairs of long-stemmed gills directed forward, and by the enormous "flap" with rounded margins springing from the first segment. This forms a huge lateral lip which extends so far forward as to reach the anterior edge of the prostomium, and is followed by a smaller "flap" with everted margin, arising from the next segment.

I need add nothing to the previous accounts of the anatomy of the worm, but will describe the structure of the tubes.

The tube presents at least two very distinct forms owing to the material of which it may be constructed and the manner in which this may be arranged; so distinct are they that until the contained animal has been examined one would suppose that they had been constructed by two different species.

One form of tube has closely-set heavy pebbles of various sizes and colours, but mostly black; they are all relatively large and more or less spaced so that the underlying membrane is in some cases seen between them; usually, however, the pebbles are more closely set, irregularly arranged, projecting from the surface which is thus rough. Such a tube is very heavy in appearance.

Other tubes, however, have the surface covered with fragments of shell, and other foreign bodies, embedded in a matrix of mud or of fine sand grains, with here and there a pebble. One tube from Station 314 combines both forms, being pebbly in its upper part and sandy below.

Localities.—Cape Adare, Station 220, depth 45–50 fathoms, bottom shingle; McMurdo Sound, Station 314, depth 222–241 fathoms, bottom mud; Station 316, depth 190–250 fathoms, mud; Station 340, depth 100 fathoms, mud; Station 355, depth 300 fathoms.

Distribution.—K. Wilhelm II Land, where it is very common; Ile Gambier (Fauvel).

Ehlers attributed the species to the genus *Nicolea* "nur mit Vorbehalt"; but the uncertainty that obtains in the limitation of the various genera in the family made him hesitate to found a new genus from this two-gilled form. Fauvel (1919B), having examined specimens from Ile Gambier, definitely allots it to the genus Pista; and gives a more detailed account of it in his memoir of 1923. Hessle (1917, p. 164) had arrived at the same conclusion though with some hesitation.

* The genera in this family are arranged in the order in which Hessle (1917) takes them.

Pista mirabilis McIntosh.

McIntosh, 1885, p. 454, pl. LI, figs. 1, 2; pl. XXVIIA, fig. 34; *Scione mirabilis* Ehlers, 1913, p. 562; *Scione spinifera* Ehlers, 1908, p. 162, pl. LXX, figs. 10–14; *S. mirabilis* Benham, 1921, p. 85, pl. IX, figs. 97–100 (other references); *Pista mirabilis* Hessle, 1917, pp. 163, 164.

The collection gathered by the "Aurora" contained only seven individuals, including two in their tubes, from the study of which I came to the conclusion that Ehlers' species is synonymous with that described by McIntosh.

The present collection yields about forty specimens, most of them still in their tubes, though fortunately the naturalists had removed some of the worms before preservation so that they are in a very good condition.

That they occur in abundance in the area explored by the "Terra Nova" is shown by the fact that from one Station, 338, as many as thirty tubes were dredged up, or rather were preserved.

The longest tube in the collection, though of course it is imperfect at its lower end, measures 500 mm. in length, and has a diameter of 8 mm. at the upper end.

Of the total of 35 tubes all but five or six are cylindrical throughout their length; but the minority are quadrangular for a greater or less distance at the lower end; thus a tube of 255 mm. has four longitudinal ridges in the lower 75 mm.

In my previous report I noted that in the upper region of the tube the characteristic processes are irregularly scattered over the surface, and that they become arranged in linear rows in the lower region; that in the quadrangular region the bases of these processes coalesce to form the ridges, while these become shorter in the lowest parts.

As to the worm, the longest in the collection attains a length of 125 mm., which exceeds the previous record.

I may add to my former account of the external features a brief note on the nephridial papillae. In the male there is a small papilla above the first "flap" and short cylindrical papillae behind and above each of the notopods 3, 4, and 5; they project upwards from about the level of the upper margin of the notopod. They are represented in the figure illustrating the worm in my report, but I made no mention of them in the text.

In the female, as is usual in the family, the papillae are very glandular or rather the area of the body wall around them is so, and this glandular area extends over the segment anteriorly both dorsally and ventrally around the notopod so that the actual papillae are embedded in this tissue and are quite inconspicuous.

McIntosh (p. 455) states that the "dorsal processes" occur behind the 3rd, 4th, and 5th hook rows, and are less developed than in *Pista*; probably he had a female specimen before him.

Localities.—Cape Adare, Station 220, depth 45–50 fathoms (one); Ross Sea, Station 294, depth 158 fathoms (one); McMurdo Sound, Stations 316, depth 190–250 fathoms (one, coll. D. E. Lillie); 331, depth 250 fathoms (three, coll. D. E. Lillie); 338, depth 207 fathoms (thirty-four); 340, depth 160 fathoms (two).

Distribution.—Off Valparaiso, off Rio de la Plata (McIntosh); Bouvet Island, Kaiser Wilhelm II Land (Ehlers); Graham Land (Gravier); Adelie Land (Benham).

Pista godfroyi (Gravier). (Pl. II, figs. 59, 60; pl. VI, fig. 193.)

Scione godfroyi Gravier, 1911, p. 135, pl. X, figs. 124–126.

The two tubes from Station 314 vary somewhat in appearance, but what seems to be a characteristic form is as follows: the tube is more or less undulating or twisted as if it had been twined around some vertical support; this may be due to its being crowded into a phial of too small a size; but as several have this spiral twist the former seems to be the more likely explanation. It is too twisted to make a measurement useful; it tapers from 4 mm. at the upper end to 1·5 mm. at the lower. The wall consists of fine brownish sand with a number of black particles intermixed, giving it a dark appearance; the surface is produced at fairly regular intervals into thorn-like processes, which are arranged in a somewhat spiral fashion (fig. 193). These thorns have a length of from $\frac{1}{2}$—$\frac{3}{4}$ the diameter of the tube itself. Each process is supported by sponge spicules and its base covered by sand grains; at its apex it frequently carries some foreign object. When the wall is viewed under a microscope the sand grains are found to be underlaid by regularly and closely arranged pieces of sponge spicules, for the most part horizontally. Attached to some of the processes are curious branched while calcareous structures with tufts of spicules at the ends of the branches: (a sponge of some kind ?).

Other tubes do not present these processes so distinctly, and among the sand grains are a few small pebbles and some Polyzoa. The sand grains are rather regularly arranged in transverse lines and the surface is smooth to the eye.

I removed the worm from tubes from Stations 314 and 355, and in each case it was incomplete posteriorly. The former is a female filled with eggs.

It agrees well with Gravier's account and figures, but there is one sentence in that description which I do not understand, and which does not seem applicable to these worms.

After describing the thickened anterior margin of the buccal segment, which extends across the ventral surface and forms the anterior end of the ventral surface of the body and the lower margin of the mouth, he writes: "En arrière de ce rebord saillant une incision médiane assez profonde divise en deux le reste du premier segment." Whereas I find the following condition: the first or buccal segment has a thick rounded border commencing at about the level of the gill and extending down the side to the ventral surface, but as it passes below the mouth it becomes much thinner from side to side to form a thin transverse and nearly straight lower lip. In one specimen this thin lip was folded over and curved backwards giving the appearance of a broad shallow excavation, but in any case this excavation is not behind the thickened border, but is continuous with it. In front of this thin lip is a shorter cushion-like pad, within the limits of the mouth, which is traversed by a furrow from side to side ; in another individual, owing to contraction, this pad is invisible, being entirely hidden by the lip.

The prostomial platform bearing the tentacles is circular, with a raised edge which extends along the dorsal, lateral, and ventral margins. I do not find, as did Gravier, that it is interrupted on the ventral margins. It forms an arch above the mouth. But in these small worms it is not always easy, especially if the preservation is not good, to trace out these matters satisfactorily. Behind this raised margin there is a row of eye-spots, which are not mentioned by Gravier : they extend up to the level of the gill. The second segment bears a single pair of gills, each of which has a fairly long stout stem bearing only three stout branches, by dichotomous division, and these severally give rise to a number of quite short terminal branchlets, but in each group there is one longer undivided branchlet.

As Gravier shows, a glandular ridge starts from the gill and traverses the segment obliquely towards the ventral surface. It is better developed in the present specimens ; its anterior margin is prominent and reflected. This, I suggest, represents a "flap" such as occurs in other species of the genus. The third segment is compressed, and on it is a small nephridial papilla at about the same level of the notopods as in the subsequent segments. There are 16 notopods and around the 3rd, 4th, and 5th the body wall is much swollen and glandular ; each carries a pore under the anterior margin, no doubt corresponding to the enlarged genital papillae of the female noted in other and larger Terebellids. These are very conspicuous and of considerable extent. Each extends round and above the notopod, as far above as below, and across the entire length of the segment, with a sharply defined upper border.

The first torus is below the 2nd notopod ; the tori are short, leaving a good space between themselves and the ventral gland, equal to about half the width of a gland. There are 13 ventral glands, rectangular, with well-defined margins and limited to the ventral surface.

Gravier states that the uncini are uniserial in all the tori he examined, but the state of preservation of his specimen, he mentions, was not good. I find that the tori under the last 3–4 notopods are biserial, but the uncini face one another and interdigitate so as to appear uniserial under a dissecting lens. Here there are 18–20 pairs of uncini, but posteriorly they are truly uniserial, and the torus contains only 16 uncini.

The formula for the denticles is 1, —2 (2, 2) —3, 3, 3, —4, 4, 4, 4, 4 and still smaller ones above these.

As Gravier did not figure a bristle it seems worth while to do so.

Localities.—McMurdo Sound, Stations 314, depth 222–241 fathoms ; 339, depth 140 fathoms ; 348, depth 200 fathoms ; 355, depth 300 fathoms.

Distribution.—Admiralty Bay, King George Islands, 75 metres.

Genus LANICIDES Hessle.

Lanicides vayssierei (Gravier).

Phyzelia vayssierei Gravier, 1911, p. 130, pl. X, figs. 121–123; pl. XI, figs. 134, 135; *Terebella vayssierei* Benham, 1921, p. 83; *Lanicides vayssierei* Hessle, 1917, p. 166.

This Terebellid is easily distinguished from the other large common Antarctic species by the two pairs of arborescent gills, by the vertical flap below the 2nd gill, and by a smaller flap which lies below and in front of the larger and is overlapped by it.

In the mature male there are two long narrow curved nephridio-genital papillae below the 3rd and 4th notopods, and in the female these become large depressed glandular areas extending over nearly the whole width of the two segments, reaching up to the notopods.

Gravier states that in his specimen there were no papillae: which, I think, means that it was a female.

The character of the tube varies within limits, but it usually consists of sand grains with more or fewer relatively large pebbles loosely held together and forming a very irregular surface. In some of the tubes from Station 220, for instance, these pebbles are black and measure as much as 8–10 mm. across. In others from this station, algae and white arborescent Polyzoa with *Spirorbis* amongst its branches, give the tube a lighter tint.

In tubes from Station 331, again, one of which is 180 mm. in length, with a diameter of 10 mm., only a few pebbles are found, but the surface is covered with fragments of shells, numerous white Foraminifera, some sponge spicules, etc. It contained a male worm. Other tubes from this station are composed of grey mud, and at a first glance resemble those of *Amphitrite kerguelensis*, but they have a much thinner wall.

Localities.—Cape Adare, Station 220, depth 45–50 fathoms, shingle (three dozen); McMurdo Sound, Stations 314, depth 222–241 fathoms; 321, depth 98–136 fathoms;* 331, depth 350 fathoms (two dozen).

Distribution.—South American Antarctic; Adelie Land; South Georgia (Hessle).

Genus LANICE Malmgren.

Lanice flabellum (Baird).

Terebella flabellum Baird, 1864, p. 157, pl. V, figs. 1, 2; *T.* (*Lanice*) *flabellum* McIntosh, 1885, p. 446, pl. XLIX, fig. 3; pl. L, fig. 1; pl. XXVIIa, fig. 22; *T.* (*Lanice*) *seticornis* McIntosh, 1885, p. 448, pl. XLIV, fig. 4; *Thelepus flabellum* Ehlers, 1901, p. 212, and 1908, p. 146, pl. XX, fig. 15; *Terebella* (*Lanice*) *flabellum* Treadwell, 1906, p. 1176.

It is not clear to me on what grounds Ehlers includes this species in the genus *Thelepus*, for the only zoologist who has studied the worm itself is McIntosh, whose figure shows three pairs of arborescent gills, which distinguish it from *Thelepus*. He states that there are 17 pairs of notopods, which distinguish it from *Terebella*. He

* The depth at this and some other stations is given in metres; I have adopted Bell's figures of 1 fathom equals 1·829 metres.

figures the uncinus, which agrees with that of *Lanice conchilega*, except in the presence of the sub-dental process (" lateral process " of Saint Joseph).

Of this species about half a dozen empty tubes of small size were obtained in the neighbourhood of the Three Kings Island, off the coast of New Zealand.

The long, thin, chitinoid membrane is covered, as usual, with small fragments of shells, foraminifera, pieces of calcareous polyzoa and of coral mixed with sand grains: all these are irregularly arranged.

The margin of the aperture is slightly everted and is of uniform height all round: there is no sign of the dorsal and ventral lips described and figured by Baird.

The pillar of the " fan " springs, not from the edge of the lip, but from the inside of the tube-wall at a distance of 2 mm. from the margin. The chitinoid axis soon divides into ten slender radiating arms spreading outwards in a plane to form the " fan." Some of these are undivided, but in others the arms branch twice or thrice. The axis or pillar and the branches are supported by sponge spicules embedded in the chitinoid material and arranged lengthwise: in some specimens a few bits of shell adhere also. The spread of the fan attains a width of 20 mm. in one specimen. The tube measures at least 50 mm. in length: the upper diameter is 2 mm., but it increases away from the mouth till at the lower end it is 3 mm., excluding the foreign objects adhering or embedded.

These New Zealand tubes in form and proportions of the fan resemble that of *L. seticornis* rather than that of *L. flabellum*, as figured by McIntosh; but the tube of the former seems to be of coarser materials. In *L. seticornis*, the base of the pillar is represented as being covered with small fragments of shells, as are also the branches of the fan. The present specimens resemble the more typical form, for the pillar and branches are usually naked.

Ehlers' figure (1908) shows that the branches are flexible, and he states that they are connected by a nucleated tissue (?) of foreign origin.

Judging by the remarks of Baird and McIntosh as to the size of the tubes studied, the present specimens appear to be those of young individuals.

Localities.—Off Three Kings Island, New Zealand, Stations 90, depth 100 fathoms; 91, depth 300 fathoms.

Distribution.—Narcon Island (Baird); Marion Island, Prince Edward Island, Twofold Bay, Australia (McIntosh); Rio de la Plata (*L. seticornis* McIntosh); off Achill Island, Ireland (Buchanan); South Chili (Ehlers); Hawaii (Treadwell); East Coast of Africa (Ehlers); Gulf of Aden.

Genus AMPHITRITE O. F. Müller.

Amphitrite cirrata O. F. Müller.

O. F. Müller, 1776; Malmgren, 1865, p. 265, pl. XXI, fig. 53; McIntosh, 1922, p. 107, gives full literature; Hessle, 1917, p. 155.

A single specimen of this northern worm agrees precisely with the figures given by Malmgren and with Von Marenzeller's description (1884, p. 170).

It was received without a tube and measures 38 mm. in length with diameter of 4 mm.

The 1st segment is narrow dorsally and laterally, but is produced forwards on the ventral surface to form a wide lower lip. Similarly the 2nd and 3rd segments widen ventrally and form a longitudinally folded membrane, but dorsally are represented by a narrow ridge.

Each of the three pairs of gills on segments 2, 3, and 4 consists of a group of four short filaments arising from a very short, thick base.

There are 17 notopods, the first being on the 4th segment. Each carries a vertical row of bristles which have a broad wing on one side and a very narrow one on the other side: both wings cease at some distance from the tip, the point of which is finely denticulated or "ciliate": but these denticulations are very difficult to detect unless particles of mud are caught on them. All the bristles are alike in form, but the upper ones are longer than the lower of each bundle.

The anterior neuropods are long, but after the 17th notopod they are suddenly reduced to about half their previous length. The uncini are biserial anteriorly, with the points facing, but uniserial posteriorly. The uncinus has a short base not much curved; the main tooth carries two or three denticles when seen from the side: when viewed from above the formula appears to be 1–222–3333–44444–555555—, these last being very small.

There are no eye-spots on the prostomium. The genito-nephridial papillae are represented by low rounded prominences just below the notopods 5–10. The specimen is therefore probably a female, for Von Marenzeller states that there are six papillae on segments 6–11 (*i.e.* the 5th to 10th chaetigerous segments) as well as a larger one under the 2nd gill. This seems to indicate that he had a male before him. I did not look for the sub-branchial papilla.

I have given these facts rather fully, as this species has not been recorded south of the Mediterranean and Adriatic so far as I am aware.

Locality.—McMurdo Sound, Station 314, depth 222–241 fathoms.

Distribution.—Northern Seas; Mediterranean; Adriatic.

Amphitrite kerguelensis McIntosh.

McIntosh, 1885, p. 321; Hessle, 1917, p. 186; Benham, 1921, p. 82 (for other references).

This worm is well characterised among the larger Terebellids from these Antarctic Seas by the great development of the flaps on the anterior segments: of these there are four, the last being the largest and extending high up the side so as to reach the base of the 3rd gill. These "flaps" are extensions of the anterior margin of the segments: on the buccal segment the flap is much developed ventrally, forms the lower lip and extends only a little way up each side; on the 2nd segment, which carries the first gill, there is a short flap latero-ventral in position with its free edges rounded; the 3rd segment, carrying the 2nd gill, has also a latero-ventral flap which is at a higher level than its predecessor. On the 4th segment the flap is quite lateral, and commencing at the level of the lower end of the neuropod extends upwards to the base of the 3rd gill, in approaching which it sends forward a rounded lobe beyond the general margin of the flap. The great length of the neuropods also distinguishes the species.

Only two individuals were included in the collection, one male, the other female, both well preserved and from Station 294.

There are in the male seven papillae of similar form and size ; the first is below the 2nd gill, the rest on the succeeding segments ; the foremost papilla is concealed by the large lateral flap when this is pressed forwards. In the female the four hinder papillae are large, rounded, glandular areas over-arching the neuropodia. The three anterior papillae are nephridial, the others genital.

The tube is remarkably thick-walled and consists of fine gray mud, and has been figured by Gravier. One such tube has a diameter of 18 mm., which is broader than any in the collection made by the "Aurora," and the thickness of the wall is 4 mm.

Localities.—Ross Sea, Station 294, depth 158 fathoms (one male and one female) ; McMurdo Sound, Station 316, depth 190–250 fathoms.

Distribution.—Kerguelen ; South Shetlands ; Tierra del Fuego ; Bouvet Island ; Adelie Land ; South Georgia.

Genus TEREBELLA Linnaeus.

Terebella ehlersi Gravier.

Gravier, 1906, p. 47, pl. V, figs. 45, 46 ; Hessle, 1917, p. 190 ; Benham, p. 82 (for other references).

This species, common in Commonwealth Bay, where fifty individuals were obtained near shore, does not seem to occur in such numbers in McMurdo Sound, for only one specimen was collected at each of six stations. The tube, of grey mud or very fine sand grains, is untidy looking, not very thick-walled and with sponge spicules, spines of Echinoids, foraminifera, fragments of shell, etc. worked into the surface.

It is sufficiently unlike the tubes of the other large species of the family to be readily recognised, and the contained worm with its short anterior neuropods, with the lack of flaps on its anterior segments, and with the presence of a large stout, conical papilla just in front of the 2nd gill, can at once be assigned to its proper species.

Localities.—Cape Adare, Robertson's Bay, Station 220, depth 45–50 fathoms ; Ross Sea, Station 340, depth 160 fathoms ; McMurdo Sound, Stations 314, depth 222–241 fathoms ; 316, depth 190–250 fathoms ; 331, depth 250 fathoms ; 338, depth 207 fathoms ; 339, depth 140 fathoms.

Distribution.—South American Antarctic ; Kaiser Wilhelm II Land ; Adelie Land ; South Georgia.

Genus LEPRAEA Malmgren.

Lepraea haplochaeta Ehlers.

Ehlers, 1904, p. 59, pl. VIII, figs. 13–18; Benham, 1909, p. 248; Augener, 1914, p. 87, and 1923, p. 95.

Of this worm a single specimen was found in the stomach of a Barracouta captured at the North Cape, New Zealand. It measures 50 mm. in length plus another 10 mm. for the tentacles; its diameter is 3 mm. and it contains 70 segments. The body-wall is distended and translucent, owing, no doubt, to its stay in the stomach, so that the eggs which fill the body cavity are visible through the wall. The anus is surrounded by 4–6 rounded lobes of different sizes. Of the three pairs of arborescent gills, the 3rd is far the largest and the 2nd the smallest. Augener found that occasionally the 1st is as large as the 3rd.

The nephridio-genital papillae are represented by large glandular areas on the 3rd, 4th, 5th, 6th, 7th, and 8th segments, chiefly below the notopod, but also surrounding it dorsally; in the male Augener finds the papillae on the 3rd to the 6th only.

The figures given by Ehlers in illustration of the bristles do not seem to me to be quite true to life. I find, as he did, that there are two kinds of them, each in a distinct group: (*a*) a longer bristle with a transparent end, thin and in some examples bent so that it is nearly sickle-shaped, and in others straight: it may have a fringe of hairs along the shaft and terminal region, but I do not see them in all cases. The shaft has a very narrow wing on either side. (*b*) Shorter ones with the terminal region quite transparent; it is here dilated into a curved plate, one side of which is prolonged much further than the other; the edges are thicker than the plate so that the bristle looks as if it were forked—as indeed Ehlers represents it.

The neuropods are elongated in the anterior region of the body, and here extend low down on the sides, the lower ends reaching nearly to the mid-ventral line. The uncini of the anterior 6 or 7 segments are uniserial, in the rest biserial.

Locality.—North Cape, New Zealand.

Distribution.—Auckland Island, Campbell Island, Chatham Island, Otago Harbour, S.W. Australia (Augener).

Remarks.—Willey's *L. inversa* from Ceylon (1905, p. 297) may be synonymous; he finds the 3rd gill the longest and the bristles and uncini are similar.

Hessle (1917, p. 191) suggests that probably Ehlers' species should be placed in the genus *Terebella*.

Genus LEAENA Malmgren.

Leaena abranchiata, var. *antarctica* McIntosh.

L. antarctica McIntosh, 1885, p. 462, pl. XLVIII, figs. 9, 10; pl. XXVIIIa, figs. 10, 11; *L. abranchiata* Ehlers, 1913, p. 563; *L. abranchiata*, var. *antarctica* Hessle, 1917, p. 197.

Amongst the mud-tubes of *Sabellides elongatus* from Station 314 is one tube, also of mud, containing this species. The animal, which is a good deal twisted in the abdominal region, is ruptured at some distance from the anterior end, and measures about 30 mm. by 2 mm. It differs from *L. wandelensis* in the absence of prostomial eyes, and of the pronounced lateral flaps, as the anterior margin of the segments 2 and 3 only slightly overlaps the preceding segments; in the presence of a dorsal glandular development of these two segments, as well as in other details.

The 3rd segment carries a small nephridial papilla, which is at a higher level than the notopods of the succeeding segments. The first neuropod is on the 5th segment, quite low down on the side of the body, and the following are almost on the ventral surface.

There are 11 notopods and 8 distinct rectangular ventral glands.

The uncini of the neuropods are biserial in the 11th to the 14th segments, where each torus contains 30–45 uncini; posteriorly they are uniserial and only 16 in a torus. The uncini have a crown of 4 or 5 denticles when seen sideways, but when viewed from above present at least six transverse rows of numerous small denticles.

The hinder end of the worm is broadly open as in the figure given by McIntosh; the margin is provided with paired cirri on the dorsal and ventral surfaces, the dorsal being the longer.

Ehlers maintains that *L. antarctica* is identical with Malmgren's species, but McIntosh figures paddle-shaped bristles in addition to the long-winged ones in the dorsal bundles. Ehlers makes no mention of these, nor do I find them in the present worm.

The bristles, indeed, appear to differ somewhat from those described by previous authors; I find that the longer ones have wings that are more nearly equal in width than those figured by Malmgren; they are very long, tapering to a fine point and are more like that figured by McIntosh for *Euthelepus chilensis*.

Hessle points out that the chief difference between the southern variety and the northern form seems to be that the dorsal surface of the 3rd segment is not so prominent in the southern variety, and that the worm is of smaller size.

It is interesting to find that two Terebellids, *Amphitrite cirrata* and the present species occur both in the Arctic and in the Antarctic area.

Locality.—McMurdo Sound, Station 314, depth 222–341 fathoms.

Distribution.—Arctic Seas, Magellan Strait, Kaiser Wilhelm II Land (Ehlers); Graham's Land, South Georgia (Hessle).

Leaena wandelensis Gravier. (Pl. II, figs. 61–69; pl. VI, 189, 190.)

Gravier, 1906, p. 50, text-figs. 32, 33, 34, pl. V, figs. 47, 48, and 1911, p. 137; *L. arenilega* Ehlers *, 1913, p. 564, pl. XLIV, figs. 8–13; *L. arenilega* Benham, 1921, p. 89, pl. IX, figs. 95, 96.

In the collection from Adelie Land I had only two specimens of this species, but in the present collection the worms are much more numerous, and from the results

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* According to Hessle (1917, p. 236) *Leaena arenilega*, as described by Ehlers, does not fit into any of the genera hitherto established.

obtained in the dredge at certain stations the species is evidently very abundant in McMurdo Sound.

The usual aspect of the worm is so like the figure given by Ehlers that I without any hesitation identified it with his species, but on coming across an individual in which the second postoral "flap" was very evident and which thus recalled Gravier's figure and account, I proceeded to examine the worms with more attention; and as the examination of some six or seven individuals from three different stations exhibited some variation in the particulars that serve to differentiate the two species, I was led to tabulate the description given by Gravier and that by Ehlers and to compare the two accounts critically. I think I am able to show that the two names are synonymous, though the worm has more commonly the form and structure represented by Ehlers.

The two species are said to differ in the following features:

(*a*) Gravier states that in the two specimens studied by him the prostomium is without eye-spots; whereas Ehlers, who had abundant material, describes these eye-spots as forming an irregular double row on each side, interrupted by a slight dorsal gap.

(*b*) Gravier's specimens had two freely projecting "flaps" carried by the two postoral segments; the anterior, better developed than the posterior and extending further downwards towards the ventral surface, is only of moderate size. Ehlers, on the other hand, describes and figures only one such "flap," which attains a very large size and extends forwards as far as the edge of the prostomial platform. It thus seems to form a marked contrast to Gravier's species.

(*c*) There are some slight differences in the accounts of the bristles; Gravier finds that in each bundle there are two kinds, both somewhat curved or bent; the shorter ones have a greater flexure and have one of the wings broader than the other; the longer bristle has two equal wings: Ehlers mentions only one sort of bristle and figures it as straight and with two equal wings.

(*d*) The uncinus of Gravier's worm is figured as having four denticles in a vertical series above the large hook; Ehlers shows but three in the side view.

(*e*) There is a slight discrepancy between the two accounts of the arrangement of the uncini in the anterior neuropods. Gravier finds this: Three of the anterior neuropods are uniserial, retrogressive; the 5th and 6th have them "*engrenant*"; in the 7th to 15th they are definitely biserial; the anterior row progressive, the posterior retrogressive.

On the other hand, Ehlers states that the six anterior neuropodial unicini are uniserial; that the 7th to 13th are alternating (which I take to mean the same thing as "*engrenant*").

In the "Terra Nova" specimens I find that variations in each of the above characters render the difference between the two species so inconsiderable as to be negligible. I will take the points in order:

(*a*) *The prostomial eyes* are, as Ehlers noted, chiefly at the sides; but, as I have already (1921) stated and figured, in some instances there is no dorsal gap; there may be but a single row of spots passing across the dorsum. In two individuals, at least, I find that at the side there may be a single row, and that the eyes occupy a much more limited area than usual. (It may be noted that in one of these two worms a second flap is quite distinct; but in the other it is a mere thickened ridge only slightly prominent at its upper end.)

(*b*) *Postoral Flaps.*—In the first specimen studied the condition agrees with that described by Ehlers, so far as the great development of the flap is concerned, and the second segment is raised up into a rounded glandular ridge as described in my report on the "Aurora" collection. But in another individual, of rather larger dimensions, there is quite a distinct flap on this segment at the level of the notopods, though it is much smaller in all its dimensions than the first, which has the shape and size shown by Ehlers. Eye-spots are present in this specimen (from Station 338) which thus combines two of the chief differences in the two accounts. On examining other specimens I find that in some instances the second flap is represented by a low ridge not readily noticeable from the side, but from above it is seen to present a free margin overlapping to a variable degree the base of the large anterior flap, against which it is usually closely pressed.

Of the six individuals studied for this feature I found that No. 1 shows a distinct flap on the 2nd segment; in No. 2 the second flap is easily recognisable from above; No. 3 has this flap slightly developed and only at the upper end; the remaining three have the glandular swollen ridge without any evident overlap of the first flap.

(*c*) *The Notopodial Bristles.*—The difference between the two accounts seems to depend on the aspect from which the bundle is viewed. In one example I had cut off a portion of the body-wall and mounted the notopod in such a way that the whole of its vertical extent was visible; the bundle was lying on its side. It exhibited two kinds of bristles, the upper ones long and nearly straight, the lower ones curved and with one wing rather broader than the other, as figured by Gravier.

In other examples, I had mounted the half of the body and the bundles were seen obliquely or from below, as they were more or less flattened by the pressure of the cover slips. The difference between the length of the bristles was no longer recognisable; nor could I see any difference in the width of the two wings. However, I noted that in one such preparation all the bristles in one bundle were curved, whilst in another bundle they were straight. This seemed to depend on whether the cover slip had been shifted or on the manner in which the pressure had been imposed.

(*d*) *The Uncini.*—I have examined these from both the anterior and posterior segments in three or four individuals, and I find them all to agree with the description and figure given by Ehlers; that is, they have three denticles above the hook and not four as Gravier found. The uppermost denticles are, however, very small and numerous and extend down the side of the uncinus, so that unless it be seen precisely from the side, additional denticles come into view.

The formula for the abdominal uncini seems to vary, but usually it is 1–2–333333–444444. Ehlers shows only three in the first row of small denticles, and omits the uppermost row of smallest ones.

(*e*) *The Condition of the Anterior Tori.*—This cannot be accurately determined from an inspection of the worm even under a high-powered dissecting lens (such as Leitz No. 20), so that I bisected two individuals and mounted the half bodies in Canada balsam. In one (from Station 348) the first five tori are uniserial and as usual retrogressive, that is with the points directed forwards. In the 6th, 7th, and 8th the uncini alternate; they are closely packed together in a single row, but are not biserial. The 9th has also alternating uncini in its upper half, but becomes uniserial in its lower half; the 10th and following are uniserial.

In the second specimen (from the same station) the five anterior tori are uniserial; the 6th has alternating uncini; in the 7th to 14th they are also alternating, but the two rows are further apart so that the torus is almost biserial; the anterior row is progressive; the posterior retrogressive. Thus the first specimen differs from Ehlers' account only in the limited number of tori in which alternation occurs; whereas the second specimen agrees almost precisely with Gravier's account. I am therefore of the opinion that the two species are identical.

I need to add nothing to the previous accounts except to describe the arrangement of the nephridial papillae in the two sexes.

In the mature female, and this sex seems to be the more numerous in the present collection, there are no papillae in the true sense, but there are three very conspicuous, white, glandular swellings or depressed papillae on the 3rd, 4th, and 5th notopodial segments; each area extends round the notopod dorsally and laterally and comes in contact with its neighbours; ventrally it meets the neuropod.

In the male worm, which was filled with sperm morulae, there are three papillae on the same segments as in the female; very small, ill-marked and only visible under a high magnification; they are situated just above and behind the notopods and have the aperture directed dorsally.

The tubes in which the worm lives are frequently more or less undulating or coiled. One tube measures 180 mm. in a straight line, with a diameter of 2–3 mm. Shorter or longer ridges of fine sand grains running obliquely and parallel with one another at fairly regular distances apart seem to be characteristic of the surface of the sandy tube, though they are not invariably present. The ridges are relatively high and narrow; sometimes those on opposite sides go in different directions and at first seem to form part of an interrupted spiral, but they are really independent (fig. 66). The grains of sand composing them are not larger than those elsewhere. The ridges are not always distinct in all regions of the same tube, and they are scarcely noticeable in some, as in those from Stations 339 and 348.

Though usually the wall of the tube is composed of only fine grains of sand, yet some have larger grains embedded, as in tubes from Stations 316 and 339. In other tubes various foreign bodies, bits of Polyzoa, spines of Echinoids, and very commonly spicules of sponges occur in varying proportions; no doubt the exact composition depends on the nature of the bottom.

The tube from Station 355 resembles that of *Pista godfroyi* in having a number of projections from its surface-supporting spicules, and as such I regarded it until I had extracted and examined the inhabitant.

The species is fairly widely distributed in McMurdo Sound as will be seen from the list of stations and the number of individuals captured.

Localities.—Ross Sea, Station 340, depth 160 fathoms (six). McMurdo Sound, Stations 314, depth 222–241 fathoms (dozen); 316, depth 190–250 fathoms (dozen); 338, depth 207 fathoms (six); 339, depth 140 fathoms (six); 348, depth 200 fathoms (eight); 355, depth 300 fathoms (three).

Distribution.—South America; Antarctic (Gravier); K. Wilhelm II Land (Ehlers); Adelie Land.

Sub-Family THELEPINAE.

Genus THELEPUS Leuckart.

Thelepus cincinnatus (Fabricius).

Amphitrite cincinnatus Fabricius, 1780; *Thelepus c.* Malmgren, 1865, p. 387; *T. antarcticus* Willey, 1902, p. 278, pl. XLV, fig. 6 (nec Kinberg); *T. antarcticus* Benham, 1921, p. 91; *T. cincinnatus* Hessle, 1917, p. 212 (with full literature).

In the account of that species of *Thelepus* with two pairs of gills, which occurred in great numbers in the "Aurora" collection from Commonwealth Bay, I referred it to *T. antarcticus* to which Kinberg ascribed only two pairs of gills. Hessle has since examined the type of that species and finds that it possesses a third pair, which Kinberg seems to have overlooked. Consequently this antarctic worm is not that species. As I indicated in my report on the "Aurora" worm, this antarctic species is very similar to the northern *T. cincinnatus* Fabr., as Willey has pointed out, but there seem to be a few differences judging by the recent account given by McIntosh.

Hessle has had the opportunity of studying a large series of this form both from the Arctic Seas and from Graham's Land, and he writes: "Trotz sorgfältiger Bemühungen habe ich keinen einzigen konstanten Unterschied zwischen den arktischen und antarktischen Exemplaren gefunden."

As I noted, I was unable to find any specimen with three pairs of gills, such as Fauvel had suggested might occur as a variation; and in the present lot there is in every case only two pairs of gills, so that we may regard the possibility of such a variation as excluded.

In striking contrast to the very great abundance of this worm in Adelie Land is the paucity of specimens gathered during the expedition to McMurdo Sound, from which only some dozen tubes—some of them empty—were collected; these are all of small size and the only large one comes from Cape Adare in the same region as that recorded by Willey. This large individual reached me without its tube. It is not nearly of the size commonly attained by those at Commonwealth Bay.

As I had not paid attention to the nephridial papillae when making that report, I take this opportunity of supplementing that account. Hessle, who has investigated the distribution of the nephridia in the various genera of Terebellids, does not describe the position of the papillae in all cases. This individual is a male, filled with sperm morulae; there are four papillae on each side in the usual position on the chaetigerous segments 2, 3, 4, and 5, but the last is scarcely noticeable. These papillae are relatively smaller than one would expect for a worm of this size, but this is explained, I think, by the highly glandular character of the skin, by reason of which the papillae do not project as far as in worms in which this thickening is absent. I am able, also, to give the facts about the female for, owing to the kindness of the Trustees of the Australian Museum, I have some specimens at hand from the former expedition. In a female the papillae are depressed, glandular and very difficult to see, so closely do they resemble the surrounding tissue; unless searched for, they would be overlooked. However, on the segments 3, 4, and 5 the region between notopod and neuropodial torus is of a paler hue and smoother than the surrounding body-wall; the papillae have the same position and appearance as in other genera.

The worm attains sexual maturity while still of small size, for, in one measuring 55 mm. in length, excluding the tentacles, I find the body cavity filled with eggs.

In this and other smaller worms the glandular dorsal surface differs in appearance from that noted in the larger individuals. Each segment is marked by a transverse row of large circular translucent spots, with smaller ones interspersed amongst them; this glandular dorsal region is very distinctly marked off at the sides, and stands up as a sort of cushion extending from side to side, but not reaching the notopods. It lacks the roughness of the larger forms. I notice that Hessle has a statement to the same effect. In the tubes of this species, the basal membrane which supports the sand grains is often seen when the worm is within; for the wall of the tube is stretched and the sand grains appear arranged in transverse or circular lines round the tube.

Some of the tubes have, as usual, foreign bodies of various sorts attached. In the specimen from Station 348 portions of the calcareous Polyzoan *Salicornaria* are attached, mostly horizontally and projecting beyond the edge of the tube.

Localities.—Cape Adare, Station 220, depth 45–50 fathoms. McMurdo Sound, Stations 314, 316, 348, 355, in depths of 200–300 fathoms.

Distribution.—In the Antarctic and Arctic Seas; Mediterranean; warmer and colder parts of the Atlantic; Japan.

Sub-Family POLYCIRRINAE.

Genus HAUCHIELLA Levinsen.

Hauchiella tribullata (McIntosh).

Polycirrus tribullata McIntosh, 1869, p. 424; *Hauchiella tribullata* Hessle, 1917, p. 233; *Hauchiella tribullata* McIntosh, 1922, p. 201, pl. CXXXIII, fig. 13; *Lysilla inermis* Ehlers, 1913, p. 557, pl. XLIV, figs. 14–16.

Two specimens were obtained in the neighbourhood of Cape Evans; the one more particularly studied is that labelled "A" below. It is without a tube; the colour is a pale reddish-purple; its length 16 mm. and greatest breadth 2·5 mm. It consists of about 70 segments, the hinder ones being very small and difficult to count. It is thus of about the same dimensions as that described by Ehlers.

The body is irregular in diameter, swollen here, contracted there, especially near the anterior end where the body-wall is much distended dorsally, but the irregularities in outline are not so pronounced as in that figured by Ehlers; and, moreover, in the individual "B," which has been preserved in osmic acid, the body shows no such sudden dilatations and is evenly tapering. Hence the figure given by Ehlers is not that of its normal form. Each segment is biannulate, the smaller annulus being anterior and about half the length of the posterior annulus. The dorsal surface is much arched and on the ventral there is a deep, narrow, median furrow, the boundary of which is a rounded ridge. In "B" this furrow is not so pronounced as in "A."

Along the whole length of the body is a series of short rectangular ventral gland-shields, at least 38 in number, the hindermost being so narrow that it is impossible to see their limits. Each gland is divided by a shallow median furrow into right and left halves. McIntosh states that "no ventral plates are present, only a raised central line"; Ehlers, however, figures the glands.

Running along the side of the body rather less than half-way up, is a well-defined groove, which is also present in "B"; this is therefore apparently a normal feature.

The skin is marked out into closely set squarish areas by longitudinal and transverse linear furrows, producing an effect similar to that seen in *Arenicola* and in *Lysilla loveni;* Ehlers describes his specimens as having warty skins.

The intersegmental grooves are deep.

The prostomium is a much-folded membrane ; its edge is thickened and here arise the tentacles, beyond which the extreme margin is raised up into a thin ribbon-like flange. This prostomial membrane projects considerably beyond the sides of the buccal segment, and extends down to the ventral surface where it is interrupted. Here it becomes thinner, and close to the mouth it bends backwards on either side to become continuous with the thickened collar-like base which passes across the dorsum as a rounded ridge, forming the anterior extremity of the body, behind the folded prostomial membrane. Its ventral region overlaps the mouth to such an extent that it is impossible to make out the relations till it has been turned aside.

Only a few of the tentacles remain, for, as Ehlers states, they are very deciduous ; they are short and grooved, all alike in their form which is cylindrical rather than "keulenförmig," as Ehlers describes them, a statement, however, which his figure does not bear out.

The buccal segment is narrow dorsally and laterally, but ventrally it becomes thickened to form a rounded collar which is interrupted in the median line where the segment projects forwards into the mouth as a distinct tongue-shaped lower lip with a rounded anterior end ; it has the same width as the following ventral glands.

There are neither parapodia nor bristles, of which I satisfied myself by mounting a portion of the body-wall in glycerine. There are, however, six small, rounded, nearly hemispherical papillae, situated on the segments 3–8, each of which carries a pore at its tip ; those of the 5th, 6th, and 7th are somewhat larger than the others. I interpret these as nephridial or genital pores.

McIntosh, in his account of the species (1922), refers to certain "Disc-like processes" carrying the nephridial pores on segments 6, 7, and 8. I take them as indicating that the specimen he had before him was a female.

Locality.—Cape Evans, McMurdo Sound, depth 100 metres (coll. E. W. Nelson), presumably Station 317.*

Distribution.—British Isles ; Norway ; K. Wilhelm II Land (Ehlers notes that the hinder end was enclosed in a thin transparent tube) ; South Georgia ; Falkland Is.

Remarks.—Hessle, as a result of his comparison of specimens of *H. tribullata* from Bergensfjord in Norway, with worms from the Falkland Islands collected by the Swedish South Polar Expedition, finds no constant difference between the northern and southern forms and therefore concludes that *Lysilla inermis* Ehlers is identical with the northern species.

* I can find no station in the list to fit the details recorded on the labels of the two specimens ; that accompanying "A" reads : "May 21, 1911 ; Cape Evans, McMurdo Sound ; 100 metres. Nelson 64B." The second—"B"—has this label : "June 28, 1911. 11B. Nelson."

Gravier (1906, p. 56) had described *L. macintoshi* from Graham's Land, and Ehlers found the same species at K. Wilhelm II Land, together with *L. inermis*, the latter differing from the former in having no bristles projecting from the parapodia, which are described as being very low. Augener (1923, p. 102) refers certain small worms from the Auckland Islands to Gravier's species, but is in doubt as to whether it really differs from *L. inermis*, since both occur together in two widely distant localities and at the same depth at the Auckland Islands. Gravier describes very fine bristles in his species, but Augener was unable to detect them with certainty, though in a cleared and compressed example he saw structures which he interprets as possibly bristles, but confesses that they are very difficult to detect as they are enclosed in the parapodial lobes and do not project.

Hessle (1917, p. 231), to whose memoir Augener does not refer, had before him examples of *L. macintoshi* from South Georgia; he regards it as a variety of the northern species *L. loveni*. He states that bristles do occur in *L. macintoshi* as Gravier found. Some of them project from the parapodial lobes and some, at least, are enlarged at the tip to a more or less irregular spatula-like lump of chitin, which he figures; he holds that the "hastate" dilatation shown in Gravier's figure is much too regular in outline, and that the shape is not constant.

We are thus left in doubt as to which of the species was found by Augener in Carnley Harbour at Auckland Island.

Family AMPHARETIDAE.

Genus MELINNOIDES, n.g.

Melinnoides nelsoni, sp. nov.* (Pl. III, figs. 73–81.)

This new genus has all the appearance of *Melinna*, but has only two pairs of gills, which are in a transverse row; there are neither dorsal crest nor postbranchial hooks.

The single individual on which the new genus is established was found inhabiting a tube of fine white sand, in which small fragments of shell and a few foraminifera were embedded; this tube, which measures 30 mm. by 3 mm., was invested by a thick mass of siliceous sponge spicules, which radiate outwards for a distance of as much as 4 mm. The whole bears a great resemblance to the tube of *Euthelepus setubalensis* McInt. (1885, pl. L, fig. 4).

The worm is 14 mm. in length, with an additional 3·5 mm. for the tentacles; its diameter is 1 mm. at the anterior end, whence the body tapers backwards. It consists of a head and 26 segments, and terminates in a long cylindrical pygidium, similar to that of *Melinna*.

In extracting the worm from its tube a number of the head appendages remained adherent to its wall; these were at once carefully gathered and mounted on a slide.

* Mr. Edward Nelson, the biologist of the shore party.

The body was bent and somewhat coiled, and in order to mount it satisfactorily for study it had to be cut across; it was later stained and cleared.

The prostomium has a quadrate outline when seen from above and is posteriorly bounded by a transverse ridge; the sides are folded downwards so that the under surface is deeply and widely grooved; in short, the prostomium is a half-cylinder. There are no eye-spots.

The tentacles, some of which are broken off, and some still projecting from the mouth, are spindle-shaped, being wider in the middle, and ending in a blunt point; a deep groove traverses the whole length, and the margins are perfectly smooth.

The buccal segment, distinct ventrally, is overlapped dorsally and almost concealed by the 2nd segment. Ventrally it forms a large under-lip, which is grooved transversely.

The 2nd, or branchiferous segment, bears at its anterior margin four gills, arranged in a close transverse row, two gills on either side. The specimen retains only one of the gills in position—the inner one of the right side; but the bases of the other three are visible and were studied both when the worm was viewed as an opaque object and later when cleared. Amongst the head appendages alluded to as having remained inside the tube I find seven tentacles and three gills.

The gill is nearly cylindrical with a rounded tip; it is slightly longer than the prostomium and is marked with closely set low transverse ridges and furrows, which cease some way below the apex.

The existence of so small a number of gills is so unusual in the family that I searched repeatedly for the bases of any others, but was quite unable to detect the slightest indication of their presence, whether in the opaque or in the cleared specimen.

Immediately outside the gills is a small sunken bundle of short bristles, but whether it really belongs to the branchial segment appears to me doubtful, for the side of the body here is so marked that it suggests the 3rd segment. The ventral region of the 2nd is long and biannulate, but this is cut off from its dorsal region by the forward growth, as I see it, of the 1st chaetigerous segment. In so small a worm the interpretation of this contracted portion is difficult.

There are 14 notopodial bundles of bristles: the first, as stated, has no definite parapodium; the second has a distinct cylindrical parapodium, and the following are rather longer.

The bristles are simple and slightly curved with two nearly equal wings.

The neuropods commence under the 3rd notopod; they are long, low ridges, which project but slightly in the anterior region of the body, but after the last notopod become short, compressed outgrowths, bearing a cirrus above the unicinal row. In the hinder region they become quite prominent truncated cones projecting backwards. They are all lateral in position.

The uncini are uniserial and, as usual, retrogressive. The uncinus has four denticles above the main tooth, which is not larger than the others. The plate is low and has a curved base with a small protuberance at about its middle, and a rounded knob at the end of the plate. When viewed from above or obliquely from the side, the 2nd and 3rd denticles are seen to be paired, while the last is single and smaller than they. The formula therefore is: 1–22–33–4. There is sometimes an additional solitary denticle as a fifth row.

The posterior uncini have only three transverse rows of three denticles, then a pair, then a single much smaller one. Thus: 1–222–333–444–55–6.

The terminal segment is cylindrical and the anus is surrounded by a small number of short round lobes; at the base of this segment is a small rounded papilla in line with the preceding neuropods but bearing, so far as I am able to see, no uncini.

Locality.—McMurdo Sound, Station 338, depth 200 fathoms.

Remarks.—The general appearance is that of *Melinna,* especially as regards the hinder end of the body; it seems, however, to be near *Melinnopsis* McIntosh (1885, p. 441), where "the branchiae are four in number and arranged somewhat as in *Mellina,* a slight ridge apparently running backwards from the posterior pair." Whether this really means four gills on each side, or two on each side, is not quite clear. The present worm agrees with this and differs from *Melinna* in the absence of dorsal postbranchial hooks and of the fimbriated crest on the 4th chaetigerous segment.

It might be suggested that the ad-branchial bristles in the present worm are the "hooks," but they are slender bristles like those of the following notopods.

The worm differs from *Melinnopsis* in the form of the uncinus, (the only figure referring to the species given by McIntosh (pl. XXVIIA, fig. 18)) in which the subdental knob is not so rounded and the whole form different. Owing to the fragmentary and soft condition of the worm McIntosh was unable to give more than a very sketchy account of it.

Genus NEOSABELLIDES Hessle.*

Neosabellides elongatus (Ehlers). (Pl. III, figs. 82–86.)

Sabellides elongatus Ehlers, 1913, p. 551, pl. XLII, figs. 1–6; *Neosabellides e.* Hessle, 1917, p. 104.

About eighteen specimens of this worm were obtained from three stations on McMurdo Sound from depths of 200–300 fathoms.

The slender straight tubes of grey mud, thin-walled and with perfectly smooth surface, are very neat and characteristic. The longest measures 50 mm. in length.

Well-preserved worms, removed from the tubes before preservation, enable me to

* Hessle separates this from *Sabellides* on the grounds, amongst others, that the tentacular membrane is indistinctly lobed, and there are three pairs of gills.

add something to the rather indistinct figure drawn by Ehlers' artist, C. Peters, from an ill-preserved specimen.

The best specimen in the collection measures 18 mm. by 1·5 mm. at its anterior end ; it consists of head and 33 segments.

A second individual measured gives 22 mm. in length, for 31 segments ; it is 3 mm. across its anterior end and tapers rather suddenly after the 16th segment to a diameter of 1 mm.

There are one or two points about which Ehlers was uncertain. These I think I can settle.

The prostomium is squarish, with rounded corners, and the lateral borders are bent down so as to form a sort of hood. I see no eye-spots, but I did not clear a specimen.

The buccal segment appears in front of the gills on the dorsum, and on the ventral surface widens out to form a conspicuous lower lip, produced forwards in the middle line and transversely grooved. The upper part of this segment is concealed by the forward overlap of the branchiferous segment.

The branchiferous segment is raised up above the buccal ; in some cases where the worm is contracted the median region stands up as a ridge between the gills, but in well-extended individuals this is a flat region, roundly excavated in front.

On each side of the middle line it bears three gills in an oblique line one behind the other, the two groups widely separated. The gills are tapering, long, translucent structures of about the same length, extending considerably beyond the prostomium. The lateral portion of this segment is intimately fused with the next so that it is difficult to see its limits.

The 3rd segment carries the first notopod, which is situated immediately behind the middle gill ; the first neuropod is on the 3rd chaetigerous, that is the 5th segment of the body.

The tentacles are, in the specimen studied, all but one withdrawn within the buccal cavity, which shows the peculiar fringe of processes figured by Ehlers.

In the individuals in which the buccal region was slit open the tentacles are seen to have the attachment usual in the family, namely, to the sides of the posterior portion of the cavity.

The uncinus is not quite in agreement with Ehlers' figure, so I give my own interpretation of it. The denticles are in double series except the most distal ; four on one side, five on the other, in an alternating fashion.

There is no need for me to give further details as the worms agree with Ehlers' account.

Localities.—McMurdo Sound, Stations 314, depth 222–241 fathoms ; 316, depth 190–250 fathoms ; 355, depth 300 fathoms.

Distribution.—Kaiser Wilhelm II Land ; Graham's Land (Hessle).

Genus ANOBOTHRUS Levinsen.

Anobothrus patagonica (Kinberg). (Pl. III, figs. 87–93.)

Ampharete patagonica Kinberg, 1866, p. 343; *Ampharete patagonica* Ehlers, 1897, p. 129; 1901, p. 208; 1913, p. 551; *Anobothrus patagonica* Hessle, 1917, p. 107; *Sosane patagonica* Augener, 1926, p. 224.

Kinberg's account of this little worm is brief: Ehlers, who had the privilege of comparing the type with specimens collected at Tierra del Fuego and elsewhere in that region, missed the opportunity of giving more details as to its structure and of providing figures of the species.

According to Hessle the genus *Anobothrus* differs from *Ampharete* in that the notopod of the 13th segment is shifted somewhat dorsally. I did not observe this when studying the worm, and I had not at that time Hessle's memoir; the worm agrees with the species described by Ehlers and I merely follow Hessle in assigning it to Levinsen's genus.

The collection made by the "Terra Nova" contains a single individual which inhabits a tube similar to that formed by *Amage sculpta* Ehl., but of smaller dimensions.

The worm, of about 31 segments, measures in all 9 mm. in length, with a diameter anteriorly of 1 mm., and posteriorly of 0·5 mm. The hinder region of the body, of about 15 segments, is abruptly narrowed to about one-third the diameter of the thorax, and is turned forwards alongside the body, pressed close against its right side. As this bending of the abdomen on the thorax has not been noted either by Kinberg or by Ehlers, I take it for an accidental bend, the more so as I see a tentacle clasped between the two regions.

The thorax or anterior region, then, consists of the head and 16 chaetigerous segments, measuring 5·5 mm. in length; and the abdomen contains 15 segments and with the anal segment measures 3·5 mm.

The prostomium is somewhat pentagonal in outline with a straight base and rounded anterior and lateral angles; its breadth is greater than its length. The sides are curved downwards and a median dorsal quadrate area is marked out by a transverse basal and a pair of lateral furrows; this area, which is longer than broad, is slightly raised above the lateral areas. Each of the latter bears near its base a rather large patch of dark pigment-spots, forming a transverse triangular group. The buccal segment, narrow across the dorsum, widens out laterally as it passes down to form the large lower lip which, when seen from below, is triannulate; its anterior margin presents a wide, shallow excavation. Tentacles, long, cylindrical and smooth, issue from the mouth.

The second or branchial segment bears laterally a rather prominent parapodium, from which issues a large bundle of long bristles—the paleolae—projecting forwards as a spreading fan: they reach about midway along the sides of the prostomium. Dorsally this segment carries the gills: its anterior margin is raised well above the buccal segment, and its upper surface is marked into six rectangular areas by shallow notches and grooves. Each of these areas carries a gill, though in this individual they are broken away and only their bases of attachment remain. I had some difficulty in satisfying myself as to the precise arrangement of the gill bases, but after prolonged study under varying conditions of illumination and varying aspects of this worm, I have no doubt that there are six gills ranged close together across the segment near its anterior margin; and two others lie immediately behind this row, near the middle line: the small area separating the bases of the two hinder gills is marked out as a small platform.

This arrangement agrees with that given by Kinberg and confirmed by Ehlers. It differs from the condition found in *Ampharete grubei* in that the anterior row of three gills on each side is separated by a distinct dorsal gap of some width.

The paleolae are succeeded by three bundles of shorter bristles, few in number, carried on very slight parapodia arising from the body at the same level as the paleolar parapodium; the fifth and subsequent bundles lie at a lower level, down the sides of the thorax, and their parapodia are scarcely at all prominent. The chaetae in the second bundle are only 3–4, and shorter than those that follow; the third and fourth bundles contain 6–8, but from the fifth onwards the number is increased and the bristles longer. The paleolae and dorsal bristles have essentially the same form, long capilliforms with a narrow wing on either side.

The uncini commence below the fifth notopod, and continue throughout the body, carried on small wing-like neuropods. The attachment of the uncini to the neuropod is as described by Fauvel for *A. grubei*, that is they are not on the free outer edge but on the posterior face just within the edge, and the muscles are so attached that on contraction the torus is withdrawn into a small pit. The uncini are uniserial, and about thirty in a thoracic torus. Each uncinus has a double row of denticles, not paired, but alternate; there are three in one row and four in the other, so that when viewed from the side four denticles are seen. The last few segments are very short so that the neuropods almost touch one another.

The anal segment carries no lobes or processes: it seems to be a very short cone, but it is possible that the real tip of the body has been injured.

Locality.—Ross Sea, opposite Granite Harbour, Station 340, depth 160 fathoms.

Distribution.—Cape Virginia, Patagonia (Kinberg); Tierra del Fuego; Magellan St.; Kaiser Wilhelm II Land (Ehlers); South Georgia (Hessle).

Remarks.—Gravier (1907, p. 47), describes a specimen under Kinberg's specific title, but mentions that the tentacles are "pennés," whereas Kinberg expressly states that in his species they are "nudi." McIntosh's *Ampharete kerguelensis* appears to differ from the present species not only in having all the eight gills in a transverse row, but also in the form of the prostomium, the greater length of the notopods and the more numerous denticles on the uncinus.

GENUS AMAGE Malmgren.

Amage sculpta Ehlers. (Pl. III, figs. 94–99.)

Ehlers, 1908, p. 141, pl. XX, figs. 1–9 ; Hessle, 1917, p. 121.

Although the form of the body of the two individuals at my disposal differs considerably from the figures given by Ehlers, yet I think that this is a matter of preservation. There is evidence that the specimen figured by him is much contracted ; for instance, the shortness of the segments, the very marked excess in size of the thorax over the abdomen, the relative shortness of the latter region, the fact that the prostomium is almost completely concealed by the following segments and the apparently distorted arrangement of the gill-bases, all seem to be explicable as a result of contraction.

There are, it is true, one or two other slight differences ; for example. Ehlers found that the parapodia extend right to the posterior end of the body, and that the anus bears on its margin two low cones : whereas in the specimens before me there is a pair of very long anal cirri, and the anus is carried at the end of a short region consisting of six segments without neuropods, which suggests that his specimen had been injured at this end.

It will, therefore, be advisable to give a description of an extended individual so far as this differs from Ehlers' account. The worm, which had been removed from its tube before preservation, measured 23 mm. in length, with the greatest diameter of 3·75 mm. at about the 5th–12th segments, where its height is 3·25 mm. Thence the body tapers forwards and backwards, to 3 mm. at the anterior end and 2·75 at the commencement of the abdomen. The last segment of the body is 2 mm. in diameter. Thus the worm has the shape usual in the family ; the tapering posteriorly is quite gradual and the difference in size between thorax and abdomen is much less than in Ehlers' type.

The colour is reddish-brown, iridescent : and the bristles are bronze coloured.

The length of the thorax (with head) is 12 mm. and of the abdomen 11 mm. The body contains 31 segments, of which 16 constitute the thorax. The hinder end of the body is somewhat dilated to form a thin-walled cup-shaped depression, from the edge of which arise two long filamentous cirri, which are as long as the last five chaetigerous segments, and there also appears to be a circle of minute cirri or papillae round the anus.

The prostomium is quadrate with rounded corners ; it slopes, as usual, downwards and forwards so that its anterior margin nearly touches the lower lip. On its upper face a raised rectangular area is marked out by a wide posterior groove and a pair of lateral furrows, which cut the anterior margin so as to divide it into a larger median and a pair of smaller lateral lobes. The regions outside the furrows both basal and lateral are swollen.

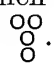
A small group of pigment spots lies at the angle formed by the junction of the lateral with the transverse basal furrow.

The tips of a few tentacles issue from between the prostomium and the lower lip.

The buccal segment is narrow dorsally but, as usual, widens out to form a thick ventral lip, which is furrowed lengthwise. This segment dorsally overlaps the base of the prostomium, whose full extent is only seen when viewed from the front or by pressing back the buccal and branchial segments.

The second or branchial segment presents in the median dorsal region a large quadrate shield or plate which is longitudinally furrowed and lined and occupying the space between the right and left couple of anterior gills projects over the buccal segment and the base of the prostomium.

On either side of this platform a pair of gills arise, beyond the outer one of which is a small parapodium with a small bunch of short bristles; below this the anterior margin of the segment is notched, and shows a low papilla (? nephridiopore). The lateral and ventral portions of the segment are glandular, forming a prominent ridge round the base of the preceding segment.

The third segment is biannulate dorsally and carries on each side a second pair of gills, of which one is situated just behind the interval between the anterior pair, and the second is immediately behind this. The posterior gill is the longest of the four and reaches back as far as the 10th notopod. Hence, instead of the four gills on each side forming, as Ehlers interprets, an oblique line, they form a clump, in which the anterior two are transversely and the posterior longitudinally placed. Thus .

In one of the two specimens, which was still within its tube, all eight gills are present; in the other, three are in position on the left side, and only one remains on the right.

Of the fifteen notopods, the anterior three borne by the 2nd, 3rd, and 4th segments are small, after which they become larger and project as short cylinders, and the bristles are longer and more numerous.

In the abdominal region, after the cessation of the bristle-bearing notopods, there is above the neuropod of each segment a small cylindrical papilla, without chaetae, which is no doubt a vestigial representative of a notopod. It is absent only in the last six segments of the body, which are also without neuropods.

The neuropods commence on the 5th segment below the 4th notopod; the first three are longer than the rest, and the first is the longest. At the 15th segment the torus is only half the height of the first, while in the abdomen they are still further reduced in length.

The notopodial bristles are of two lengths, but all are alike in form; straight, with finely striated narrow wings, of which one is about twice the width of the other. There is a small rounded knob or lip behind the bundle.

The uncini are uniserial and as many as 70 occur on the 13th neuropod, and about 24 in the posterior tori. The form of the uncini seems to differ slightly from that described by Ehlers, for I find, below the first or anterior denticles, a short pointed process apparently part of the manubrium, which he does not figure, and at the other end a fifth denticle, which is not always apparent or may be duplicated. As in other members of the family these denticles form more than one row. I find generally the formula 1–22–3–4–5 (5). Ehlers gives the formula 1–2–3·3–4, which, moreover, does not agree with his figure which shows 1–2·2–3–4. But, as Fauvel has pointed out, the exact number and disposition of these denticles are liable to variation.

The tube is of grey mud with abundant sponge spicules embedded and foreign bodies adherent. This tube measures 35 mm. by 4 mm. at its upper end. The contained worm is 15 mm. in length.

Locality.—Ross Sea, opposite Granite Harbour, Station 340, depth 160 fathoms.

Distribution.—Bouvet Island (Ehlers); Graham's Land (Hessle).

Family OPHELIIDAE.

Genus TRAVISIA Johnston.

Travisia olens var. *novae zealandiae* nov. (Pl. II, figs. 70–72.)

T. olens Ehlers, 1897, p. 98, pl. VI, figs. 162, 163; 1907, p. 20; 1912, p. 23; ? *T. forbesi* Ehlers, 1904, p. 46.

The species was originally described from the Magellan Region, the type being much larger than those recorded later from New Zealand. The present collection contains a single specimen obtained "from the stomach of a Schnapper, August, 1911."

No doubt this fish was captured off the northern coast of New Zealand where the "Terra Nova" was working at that time. The species is common all along the shores of the west coast of the Dominion.

Characters of the Variety: similar to *T. olens*, but with 38–40 segments, of which 20–24 form the abdomen.

The specimen measures 39 mm. in length by 7 mm. in breadth at the 8–10th segments; it contains 40 chaetigerous segments. It is somewhat contracted; the middle segment of the body is 4·5 mm. across; there are 23 enlarged posterior parapods constituting the abdomen.

The worm shows evidence of having been partly digested.

Comparison of *T. olens* with *T. kerguelensis*.

Augener has recently (1922A, p. 35) examined specimens of both *T. olens* Ehlers and *T. kerguelensis* McIntosh and comes to the conclusion that they are synonymous, because the material from the Magellan Region studied by him agrees in the number of segments, which is 29–30, though occasionally less.

The examination of a fairly large series of individuals from the shores of New Zealand leads me to differ from him. My material consists of 33 specimens, in addition to the one from the "Terra Nova": one from Waiheke, in the Hauraki

Gulf, North Island ; one from Lyttelton ; two from New Brighton, both in Canterbury ; and 29 from Moeraki, a few miles north of Dunedin.

I have tabulated various measurements of 20 well-preserved worms : their length, greatest breadth, the width of the middle segment of the body, the total number of segments and the number of enlarged parapodia constituting the abdomen. From this table I have extracted the following figures :

The shortest specimen (which is ill-preserved) is only 20 mm. in length, but has 38 segments. The size of the well-preserved individuals varies from a maximum of 60 mm. to a minimum of 28 mm., but the majority are between 40 and 55 mm. With one exception the number of segments is from 38–40 : only two out of the twenty have the lowest number, ten have 39, and eight have 40 segments. The exception is a worm collected at Lyttelton which was part of the material forwarded by the late Henry Suter to Ehlers who identified it as *T. forbesi*.*

This measures only 15 mm. and has 26–27 well-developed, podiferous segments, and five non-podiferous segments preceding the anal cylinder, *i.e.* a total of only 33 segments. There are only twelve abdominal segments. I cannot detect any other difference from those obtained elsewhere in New Zealand ; yet this specimen contains sperm morulae in the coelomic fluid, and is therefore presumably fully grown.

Apart from this one specimen none of the 32 worms have so few segments as that assigned to the species by Ehlers : his type, though measuring 72 mm., has only 32 segments, whilst other worms from the Magellan Region examined by Augener have 29–30 segments and body lengths of 25–36 mm.

Now, since some of the worms before me are even smaller than those of Augener and have as many as 38–39 segments, it appears to me that either the New Zealand worm is distinct from *T. olens* or that the conditions of life are so unfavourable on New Zealand shores as to allow it to increase the number of segments without increasing the length.

This difference entitles them to at least a varietal name ; perhaps if we relied mainly, as Augener does, on numerical data, the worm would deserve a new specific name. But apart from the greater number of segments in these New Zealand forms there is marked difference in the form of the body between *T. olens* as figured by Ehlers, and that of *T. kerguelensis* as figured both by Ehlers (1897) and by Willey (1902). The New Zealand specimens agree fairly well with the figure of the former species, that is, they are spindle-shaped ; but in distinction from the Magellan form the greatest diameter does not occur at the middle of the length but in front of it. It occupies five or six segments beginning at the 8th, that is segments 8–12 or 13 are broadest. In other worms, that had been preserved in formalin in an extended condition, the widest region is more extensive and is rather further back, so that it may extend from 7–16, or 10–15, or even from 12–17. These latter worms bear, therefore, a closer

* Both Ehlers and Augener write the word with one "i" but Johnston wrote it "*forbesii.*"

resemblance to Ehlers' figure of *T. olens* than do the majority. He shows a uniform tapering from the middle towards each end. I find the diameter of the middle segment of the body to be almost uniformly 4 mm., whatever the size of the worm; and this diameter continues nearly to the hinder end of the body. An exception must be made for the large specimen from Waiheke, where the mid-segment is 7 mm. in width.

But this spindle-shape of *T. olens* is very different from the figures given of *T. kerguelensis*, which is represented as much shorter and broader in comparison with its length, giving it somewhat the outline of a chrysalis. Augener states that *T. olens*, examined by him, varied in form; he writes, "die Köperform kann gestreckt spindelförmig, aber auch gedrungen, mehr madenartig sein."

None of the specimens from New Zealand, some of which are poorly preserved and shrunken, others well preserved, has this short swollen form.

The numerical data about *T. kerguelensis* are insufficient to enable one to compare it with the New Zealand worms. McIntosh does not give any measurements of the type, which has only 23 segments. Willey's specimen from Cape Adare measured 20 mm. in length and his drawing shows 23 segments, of which eight belong to the abdomen. Ehlers' figure also presents 23 segments, though the hinder ones are not very distinct. Augener's material consisted of two specimens from the Magellan and Chilian regions; one measures 42 mm. with 29 segments, the other 26 mm. for 29 (?) segments.

The chief feature in my opinion that serves to distinguish the two species is the condition of the hinder segments. In *T. kerguelensis*, according both to Ehlers and to Willey, there are on the last five segments definite short rounded papillae or "Knopfe" which project freely backwards from the hinder margin of the segments. Willey even indicated a constriction at the base.

Ehlers states that though there may be individual differences yet their general disposition is constant. They are arranged thus: on the 5th segment from the end there are two papillae on each side just above the notopod; the next has three on each side and the last three segments have a close row of seven papillae extending across the dorsum. On the ventral surface of these segments they are fewer in number.

In none of my specimens do these preanal papillae exist; nor is there any trace of them; but in all my specimens, whether well-preserved and extended, or ill-preserved and shrunken, the segments at this end are marked with longitudinal furrows which cut the hinder margin and extending over the surface divide it up into a number of small rectangular areas which do not project beyond the margin. These furrows commence at about the 12th segment from the end, where there are three furrows on each side close above the notopod: further back the number increases to five and in the last 2–3 segments additional furrows exist, so that they reach right across the dorsum. They are confined to the dorsal surface.

While there can be no doubt that the papillae may be derived from the furrowings and the areas delimited by them, yet their actual form and arrangement are so different that I do not understand how it would be possible for the "areas" to swell into "papillae" as a result of difference in preservation or contraction. There is not the slightest evidence amongst my material of this possibility.

A nice point arises as to whether the worm described by McIntosh was provided with papillae or with flattened areas. His figure of the hinder end (1885, pl. XLIII, fig. 10) is so indefinite that it might as well represent *T. olens* as *T. kerguelensis.* It is not possible from his brief account of the worm to pick out any diagnostic characters. He states that it measures 20 mm.×7 mm. and has 23 segments, and resembles *T. forbesii* very closely, but "the rings of the segments differ, and posteriorly the last two have a crenated margin dorsally, while the segment anterior to these also shows a few lateral pectinations" (p. 358).

His figure which represents only the hinder segments does not indicate any surface furrows, nor definite papillae; its appearance differs entirely from the pictures of *T. kerguelensis* given by Willey and Ehlers, so far as one can judge; but from the description the form of the body recalls that of the latter in its shortness and stoutness.

It is possible that McIntosh had before him the worm that at a later date was named by Ehlers *T. olens.* If so, then the *T. kerguelensis* of Ehlers will have to receive a new specific name.

As to Gravier's worm from the South Shetlands, which he records under the name *T. olens,* its smaller number of segments (20), its great width (8·5) in comparison with its length (30 mm.), makes it difficult to associate it with the accounts of *T. olens.* He states that the segments at the hinder end have the posterior margins "decoupé en festons." This may be due to furrows such as those occurring in *T. olens,* or it may refer to papillae of the other species. Indeed, the figure given by McIntosh might be described by Gravier's expression.

The upshot of this comparison of the various accounts leaves me assured, firstly, that *T. olens* is really different from *T. kerguelensis*; and, secondly, that the New Zealand worms differ from both, though not sufficiently from the former to warrant a new specific name. Thirdly, that we are not sure to which species McIntosh's account refers, nor that of Gravier. If a renewed examination of the "Challenger" specimen shows it to be Ehlers' species *T. olens* and not the *T. kerguelensis* of Willey and Ehlers, we shall have a pretty confusion.*

There is a point of anatomical nomenclature in which I think Augener (1922A) has fallen into error. On p. 33, in describing *T. lithophila* Kbg., reference is made to "einen grossen Segmentalporus" lying between the two bundles of bristles in every segment of the body, and also to certain pores behind and below the neuropodial bundles from segment 3–14, as "genital pores." He refers to them by these names in discussing

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* Since writing the above I have received from Dr. Augener his memoir on the Auckland Islands Polychaeta (1923), wherein he identifies (p. 76) the Ophelid occurring there, with 29–30 parapods, as *T. kerquelensis.*

the other species. Willey calls the former "lateral sense organs," the latter "nephridio-pores," and I think he is correct. I dissected a specimen and the nephridia, which no doubt act also as genital ducts, are clearly seen as large sacs lying below the level of the parapodia and opening by the lower pores, whilst the upper "pore" is not an opening, but merely a dermal structure.

As has been pointed out by Ehlers, Saint Joseph, and McIntosh, a distinct odour is associated with the species of *Travisia*, and I shall here quote from notes made at the time when I first came across the worms at Moeraki in 1899. They live in clean sand near low-water mark. "Pink ophelid worms $1\frac{1}{2}$ inches long, form a U-shaped burrow about 2–3 inches down in the sand. When covered by water a pink head protrudes about $1\frac{1}{2}$ inches from the burrow. As the tide went out I found them crawling slowly along the sand, usually in a groove or shallow channel with loose sand above them. The worm is invested by a thin mucous coat. It has a very objectionable odour of sulphuretted hydrogen, and secretes a slimy mucous."

So noticeable is this odour that in 1901, when I again visited Moeraki, I made this note: "In the sand a few 'stink-worms,' pink anteriorly, greyish posteriorily; red filamentous gills."

Augener seems inclined to suggest that the odour was due to the character of the sand swallowed. I think that this is not the case. The sand seemed clean; other worms did not smell: but the slimy secretion is, I think, responsible for it. The odour persisted for some time after preservation in alcohol, but it has long since disappeared from the bottles.

The Surface of the Body.

The general character of the external surface of the body is quite in agreement with that described by Ehlers, but there are a few details that may be added to his account. The anterior segments are tri-annulate. The three annuli are equal in length: the intersegmental furrows are no deeper than the interannular, each being encircled by three bands of closely set glands, which in a specimen that had been preserved in chromic acid have a brownish tint, darker than the neighbouring skin. In those preserved in alcohol or formalin this brownish tint is absent.

The middle annulus widens out laterally in front of the notopodial bundle of bristles and sends forward a prolongation below it and below the first annulus which ceases abruptly, and this enlarged portion is continuous with the middle annulus on the ventral surface (fig. 70). The notopodial bundle and the gill arise just behind this enlargement; the lateral sense organ is carried by its hinder margin; the nephridio-pore, lying below and in front of the chaetae, is situated in the middle annulus from the 2nd postoral segment to the 13th postoral. After about the 17th–18th segment this lateral enlargement of the middle glandular band becomes gradually more extensive, till in the 20th and posterior segments it forms a conspicuous swelling or pad of some-what quadrate form above the parapod and comes to occupy the whole length of the segment; the third annulus coalesces with or is absorbed into it, so that the 24th and subsequent segments are biannulate. This glandular swelling continues to increase in size till in the last dozen segments it extends across the dorsal surface.

In these posterior segments this glandular pad presents those longitudinal furrowings figured by Ehlers; at first only in its lateral region, later over the whole of it; so that it becomes marked out into a series of small rectangular areas.

It is in connection with the increase in glandularity that the parapodial lobes become so prominent in these hinder segments. Anteriorly, there is no perceptible lip to the chaetal sac, though there is a small glandular lobe just below and in front of the ventral bundle, and above and in front of the dorsal; in the most anterior segments even these are not recognisable.

At about the 16th segment these lobes commence to enlarge, and from about the 20th become greatly developed into round, flattened glandular lobes overlapping the next segment. It is the presence of these conspicuous parapodial lobes that may be said to constitute an "abdominal region," which in these New Zealand worms contains 20–24 segments.

On the ventral surface the three annuli are all equally visible except in the most posterior segments, where the two hinder annuli coalesce, forming a large transverse glandular pad and leaving the first annulus as a small narrow area surrounded by it. The sides of this glandular region are enlarged in connection with the neuropods, as are the dorsal glands.

The anus is carried at the end of a cylindrical periproct, marked with longitudinal furrows which, when they reach the opening, delimit nine lobes; there is one large ventral lobe and two pairs of rather smaller ones, one lateral pair on each side and one pair dorsally. Between the ventral and laterals, and between the laterals and dorsals is a smaller lobe which is absent medio-dorsally.

Family MALDANIDAE.

Genus ISOCIRRUS Arwidson.

Isocirrus yungi Gravier.

Gravier, 1911, p. 122, pl. IX, fig. 109; pl. X, figs. 115–120; Benham, 1921, p. 106,

A complete worm from Station 294, measuring 180 mm. by 6 mm., is larger than any previously recorded. It is unnecessary to add any anatomical facts to those given by Gravier.

But in addition to this and various fragments of the worm, parts of the tube inhabited by it are in the collection, and as the tube has not received any attention hitherto I append a few notes thereon. The tube belonging to the above-mentioned specimen was in four pieces, the longest of which measures 40 mm. with an external diameter of 10 mm., and internal 4·25 mm., hence the thickness of its wall is as much as 2·25 mm.; the other pieces measure respectively

35, 30, and 20 mm., so that the total length of what is merely a fragment of the tube of this individual is 125 mm.

The longest piece is bifurcated at one end. The wall is mainly composed of clear grains of sand of various sizes, with a few dark grains; all the grains are small and are so arranged as to give a smooth surface to the tube. Scattered amongst the small sand grains are some larger pebbles—as they almost deserve to be called in comparison with the rest—some of them white, others black; they are embedded in the grains from which they project.

A smaller tube from Station 316, only 5 mm. in diameter, consists of loose sand grains forming a contrast to the compactness of the wall already described; there are a few foreign bodies, such as sponge spicules, projecting from the surface. It is so similar to the tube commonly associated with *Terebella ehlersi* that I had sorted it out under that species, but when the worm was extracted it proved to be *Isocirrus*. The question occurs to me: Has the Maldanid built this tube or has it entered the tube of the Terebellid as a means of escape or concealment? I do not know of any facts that would support the latter hypothesis; yet a tube of a particular character is usually associated with a particular species of worm.

Localities.—Ross Sea, Station 294, 158 fathoms (complete worm with tube); McMurdo Sd., Stations 214, depth 222–241 fathoms (one); 316, depth 190–250 fathoms (fragments of worm and the small tube); 340, depth 160 fathoms (fragments of worm and portion of tube like that from 294).

Distribution.—South American Antarctic; Adelie Land.

Family CHLORHAEMIDAE.

Genus FLABELLIGERA Sars.

Flabelligera mundata Gravier.

Gravier, 1906, p. 37, pl. IV, figs. 31, 32, and 1911, p. 110, pl. VIII, fig. 87; Ehlers, 1913, p. 535, pl. XLI, figs. 1–12; Benham, 1921, p. 108.

Of the seven specimens in the collection the largest measures 65 mm. with width of 16 mm. over the gelatinous "tunic," which is a translucent bluish-grey and has no trace of the yellow or brown tint represented in Ehlers' figure. This has 26 segments, and the smallest of the lot with a length of 38 mm. has 24 segments. There is nothing to add to the previous descriptions.

Localities.—McMurdo Souud, Stations 314 (two); 331 (two); 338 (two); 348 (one); depths from 200–250 fathoms.

Distribution.—South Shetlands; Kaiser Wilhelm II Land; South Victoria Land; Adelie Land.

Family SABELLIDAE.

Nomenclature of the Gills.

In describing the constituents of the gill plume in these two families of Sabellids and Serpulids the earlier writers, such as Quatrefages, Claparède, Grube, as well as some of the more recent French authors, use the term " branchial filaments " (or its French or Latin equivalent) to refer to the filamentous unit of the plume. Whilst Malmgren, and some recent zoologists—Saint Joseph, Bush, Fauvel, Pixell—use the word " branchia " or " branchies " in the same sense.

For the small internally attached processes the word " barbule " is employed by the French authors from Claparède onwards.

The modern English authors, following McIntosh (1885), have used the word " pinna," or even " pinnules " in some instances, for those small processes which Malmgren and Grube have termed " radioli."

Unfortunately McIntosh (1885) transferred this last word to what is spoken of above as the " filament " and has been followed by Willey, Moore (1904), and myself (1916). Nevertheless, McIntosh himself has in recent years (1916, 1918) reverted to the word " filament " in the sense above defined. Having looked into this matter and tabulated the various terms used by the different authors, I have come to the conclusion that it is advisable to revert to the word " branchial filament " or gill filament for the filamentous units, and to use the word " barbules " for the small internal processes carried by them.

It might have been desirable to revert also to the more ancient term " radioli " for these latter, but in consequence of the employment of the word by McIntosh in a sense different from its original, it appears better to drop the term altogether and so avoid confusion. " Barbules " has the authority of the older writers, and even Grube, who wrote generally " radioli," used " barbules " in some instances (1877, p. 550).

As I understand these earlier authors, they mean by the word " filament " not merely the axis of " rachis " of the unit but include also these " barbules " : hence we have some kind of analogy with the terminology of a feather and had it been advisable the word " barb " would have been a fitting term for filament.

The " gill plume " then of Sabellid or Serpulid, consists of a right and a left circle or series of " branchial filaments," each of which consists of an axis or " rachis," carrying on its inner face one, or usually two, series of small ciliated " barbules."

Genus ORIDIA Rioja.

Oridia limbata (Ehlers).

Oria limbata Ehlers, 1897, p. 137, pl. IX, figs. 211–216, and 1913, p. 579 ; *Oria limbata* Fauvel, 1916, p. 476.

Rioja (1923, p. 52) states that the name *Oria* is preoccupied for a genus of insects, and he suggested in 1917 that de Quatrefages' generic name must be replaced now by the above. It appears that Chamberlin in 1919, unaware of Rioja's emendation, proposed the name *Oriades* for the same reason.

A number of these small free-living Sabellids were obtained off Cape Adere ; some of them had been preserved in osmic acid, others in alcohol. They are rather longer than the type, the total length being 5 mm.

I find that the gill filaments carry ten pairs of barbules, all of which reach up to, or even extend beyond, the tip of the filament.

I do not detect the ovate ciliated processes inside the gill-base which are described by Ehlers, owing perhaps to the way in which the mounted specimens are lying, but I see the two larger processes at the base of the dorsally situated filaments.

The characteristic membrane along the gill filaments is even better developed here than it appears to be from Ehlers' figure 214; I find it broader and longer than he shows; it has in my specimens a well-defined edge and in spite of its tenuity the membrane is rendered very evident by the attachment to its surface of a number of Protozoa, apparently some form of Vorticellid.

In the collar of the type a triangular lobe is represented as projecting forwards on the ventral region; this I do not detect in cleared specimens, where the collar appears to be of uniform height right across this region.

Like Fauvel, I am unable to detect either the otocysts in the 1st segment or the eyes at either end of the worm; and Ehlers himself (1908) states that the former are difficult to see in preserved specimens. I treated one individual with potash and mounted it in glycerine. Failing to see the above organs, I stained and mounted the worm in Canada balsam in order to make it more transparent; but was unsuccessful even then. But in spite of these slight discrepancies I have no doubt it is the same species as that described by Ehlers.

Locality.—Off Cape Adere, Station 220, depth 45–50 fathoms.

Distribution.—Tierra del Fuego; Kerguelen; Kaiser Wilhelm II Land (Ehlers); Falkland Is. (Fauvel).

Genus JASMINEIRA Langerhans.

Jasmineira scotti, n. sp. (Pl. III, figs. 100–107.)

A single specimen, inhabiting a tube of fine grey mud, was obtained in McMurdo Sound at a depth of 140 fathoms. The tube is curved and measures about 30 mm. in length with an external diameter of 4 mm. The worm, which is much contracted and may have dried up at some time before it reached me, has a total length of 29 mm., of which the body occupies 18 mm., and the gill-plume 11 mm.

The animal is a female filled with eggs.

The thorax contains 8 segments, the abdomen 20. The thorax is much shrunken so that a dorso-lateral and a ventro-lateral ridge run continuously above and below the parapodia, and the sides of the body are depressed so as to form a furrow, which is probably an artifact and due to having been dried. The notopodial chaetae are inserted in short conical papillae. Of the collar bundle, most of the bristles are broken short, but those that remain are long capilliforms with a narrow wing on each side.

The bristles of the rest of the thorax are of two sorts in each bundle; an upper group of long two-winged bristles like those of the collar; and a lower group, more numerous, of paddle-shaped bristles, of which the axis is prolonged beyond the wings to a very fine point. These paddles are in about 8 vertical rows with 3–5 in each horizontal row.

The neuropod contains a short series of 16 long-handled avicular uncini with a crown of denticles above the fang, in 4 transverse rows of 5–6 in a row. They are, indeed, much like those figured by Ehlers for *Potamilla perlonga* (1913, p. 156, pl. XXIII, figs. 1–6). There are no pickaxe chaetae in this genus.

The abdominal uncini are more numerous, forming rows of 25–30, and differ from the thoracic in having a very much shorter handle and a crown of very large denticles above the fang. In this crown they are in 6–7 transverse rows of 6–8 in a row; and they cover the sides as well as the top of the tooth.

The ventral bristles are 15–20 in number in each bundle; they are very long, simple capilliforms without a wing.

On the thorax the ventral gland-shields are extremely well defined by very deep intersegmental furrows and laterally by the narrow continuous ridges above mentioned. Those on the abdomen are likewise well defined and are traversed by a feebly indicated faecal furrow.

The collar presents an extensive dorsal lobe on each side, which arises far back on the 3rd segment. The dorsal margin of one lobe overlaps that of the other; though it is now pressed down against the dorsum, it is in life probably of a fair height. When it reaches the buccal segment the lobe bends downwards and is continued across the ventral surface as a thickened ridge or fold from side to side without any medium or lateral incision. The ventral glands of this segment and of the next are divided transversely into two or three plots.

In front of the collar are two pairs of rounded structures at the base of the gill, but I cannot make out their exact relations: it may be that they represent the two ventral lips figured for *J. elegans* by de Saint Joseph (1894, p. 316, pl. XII, fig. 338).

The gill filaments, which are adherent, are 25–30 on each side, inserted into a low base which is concealed by the collar; they are apparently connected by a membrane, as it is very difficult to separate the individual filaments though this too may be the result of drying.

The barbules are very slender and rather short, but their condition does not allow any accurate account of them to be given.

Locality.—McMurdo Sound, Station 339, depth 140 fathoms.

Remarks.—According to the tabular diagnosis given by de Saint Joseph the worm falls into the genus *Jasmineira,* as there is only one kind of uncinus and this has a long manubrium in the thorax, while that in the abdomen is short-handled; the thoracic bristles are of two kinds. It differs from *J. elegans* in several features and from *J. caducibranchiata* Willey (1905, p. 312), which has only 12 gill filaments and has a total length of 22 mm. It is also a good deal longer than the species described by Langerhans and by Ehlers.

Genus SABELLA Linn. emend. Sars.

Sabella aberrans Augener. (Pl. III, figs. 108–115.)

Augener, 1926, p. 245.

After having written a detailed description of this peculiar species to which I had given a name I received Augener's memoir on the "Sedentary Polychaets" of New Zealand, and I find that he had a single specimen of the same worm to which he gives the above title, and which is illustrated by figures. His specimen was collected by Mortensen off the Little Barrier Island on our northern coast.

There are one or two differences, and as the worm is rare they may as well be recorded.

The example before me is somewhat larger than Augener's. A single complete individual without its tube, and also an isolated gill plume, were obtained off the North Cape of New Zealand.

The animal is curved and measures 23 mm. for the body with 12·5 mm. for the length of gill plume, giving a total length 35·5 mm. The thorax is 4 mm. in length, with transverse diameter of 4 mm. and a height of 2 mm. The abdomen, which is nearly cylindrical, has a breadth of 2·5 mm. and is not much tapered.

The colour is uniform dingy brown, with irregular and irregularly scattered spots of a very pale reddish-brown, and on every segment there is a conspicuous, though small, dark brown spot between the torus and the capilliform bundle of chaetae, which I take to be an eye. In the thoracic segments a short line of pigment passes downwards from it behind the neuropod.

The thorax consists of 8 segments ; its dorsal surface is depressed ; the faecal groove, after coming up from the right side, crosses to the mid-line as a narrow but well-defined furrow.

On each side of the 3rd chaetigerous segment a rather high fold commences, stiff and cartilaginoid in texture, extends forwards above the chaetae of the 3rd, 2nd, and 1st segments, passes between the dorsal lobes of the collar, then swells out to form a conspicuous rounded mass reaching as far as the gill base, with which it seems to be merged. The base of this curious fold is thick, the upper margin thin and nearly straight when seen from the side ; it curves inwards arching over the dorsum and encloses a canal which is closed anteriorly by the fusion of the bases of the right and left folds ; the upper margins, however, remain free to form the boundaries of a shallow, narrow groove leading forwards to the interbranchial gap, where a short process projects still further forwards between the gill bases, is truncated anteriorly, and bears a pair of eye-like spots.

The collar arises outside and independently of these folds ; it is low, with only a slightly reflected edge ; it passes uninterruptedly from the dorsal to the ventral surface, and is without lateral incisions. At the ventral surface there is a pair of small triangular lobes separated by a narrow median incision.

The gill plume, which is about half the length of the body, consists of 14 branchial filaments on each side; they separate from one another close to the base, there being no "inter-filamentary" membrane; the filaments spread outwards in the specimen so as to form an elegant circular fan, like that figured, for instance, by Schmarda for his *S. ceratodaula*. Each filament is prolonged beyond the "barbules" to a tapering point; they are not marked by any bands of colour, nor do they bear eyes.

The collar chaetae, which do not differ essentially from those that follow, form a small bundle of about nine bristles arranged in a nearly vertical row; they are long, straight, feebly winged on each side.

In the thoracic bundles the bristles are not in prominent parapodia, but, as in the collar, form a vertical series of about a dozen in each bundle, of which 3–6 are apparently capilliform, and 3–4 are lanceolate rather than paddle-shaped. In the latter, the paired wings are well developed, and the appearance is as if the shaft was here dilated (as is represented by v. Marenzeller for *S. aulaconota*); the striations are longitudinal and diverted slightly obliquely outwards as the wing is reached.

The capilliforms are slightly bent with only one wing, which is narrow. It may be that this is merely one aspect of the above bristle with two wings.

In the thoracic neuropods there are both uncini and "pickaxe" or "pennon" bristles; about 60 of each in each torus. The uncini are aviculiform with a short stout base and one large tooth or "fang" capped by numerous long slender denticles in transverse rows.

The pre-uncinal pickaxes seem rather different from those usually figured and recall those of *S. aulaconota*. The stem terminates in a rounded head marked by numerous curving lines, which, when seen from above, give the impression of a series of dots. In this head is a short shallow groove in which the base of the extremely delicate transparent "pick" is inserted at right angles to the axis. It is in many cases broken away, and even when it is present it is almost impossible to detect it until the bristle is freed from the surrounding tissues.

The abdominal uncini are similar to the thoracic, but have a shorter base; there are about 24 in a vertical row.

The neuropodial capilliforms are about 12 in number in a bundle; in one view they appear straight with two wings, while in the other aspect they are slightly bent with one long narrow wing extending down as far as the body wall. They are very brittle and are readily broken.

Locality.—New Zealand, Station 96, depth 70 fathoms.

According to Bush (1905, pp. 191 and 199) the species should be placed in the genus *Parasabella*, as the branchial filaments are connected "by a very slightly developed posterior interbranchial membranous web." The collar has no lateral incisions, and the dorsal ends are widely separated. But the points on which she subdivides the various genera do not commend themselves to me as "natural," nor are they ones that can always be examined.

As to the species of this worm, there is a general resemblance to Schmarda's *Laonome ceratodaula*. Ehlers, however, who has re-examined the type, does not refer to any lateral eye-spots which were also not mentioned by Schmarda, nor is there any reference to the conspicuous post-branchial cave-like structure.

But there is much more reason to think that it may possibly be the *S. aulaconota* of v. Marenzeller (1884, p. 14, pl. II, fig. 8) from Japan. It is true that he does not make any reference to the dorsal post-branchial structure, though the specific name seems to imply that the dorsal surface is furrowed. The uncinus, however, is not closely like that of the present form ; the base is longer and narrower, but the pickaxe bristle and the two-winged capilliforms are similar, though the author does not represent clearly the insertion of the pick into the head ; the type is of larger dimensions, measuring as much as 70 mm., though we are not told whether this includes the gills or not, but as he uses the term "length of the body" it may exclude them. The gill plume is 20 mm. in length, having 20 filaments on each side, a figure perhaps due to the greater size of the worm.

Sabella oatesiana, sp. nov. (Pl. IV, figs. 116–122.)

Specific Characters.—Gills nearly as long as the body ; dorsal lobes of the collar widely separated ; a distinct lateral incision ; rounded ventral lobes. Body segments eyed ; thoracic bristles of two sizes ; uncini accompanied by pickaxes with terminal plate-like appendix.

This worm inhabits a tube coated with fine grey mud on a basis of thin parchment-like membrane, which projects beyond the mud at its upper end. This coating of mud is smooth, but exhibits at intervals very narrow circular rings, indicating, apparently, zones of growth. The wall is friable, and to the lower end, where it presumably issued from the muddy sea floor, fragments of a calcareous Polyzoan are attached. The length of the longest of the three tubes is 70 mm., and its diameter 4 mm. Two of the tubes contained inhabitants, which were extracted with difficulty, owing to the adherence of the worms to the membranous lining of the tube.

Such a worm measures 13 mm. for the body and 12 mm. for the gill plume, so that the gill is nearly as long as the body.

The colour is uniform, pale pinkish-brown, without pigment spots, except that between the dorsal and ventral bundles of chaetae, in all but a few anterior segments, is a very small black spot, and two larger ones on the pygidium.

The body is somewhat flattened on its dorsal surface.

The thorax, which contains 8 segments, measures 3 mm. in width and 2·25 mm. in height.

The abdomen tapers very gradually backwards and consists of 35 distinct segments, the last few being very short and crowded together, though there is no evidence of regeneration here.

The faecal groove is distinct along the abdomen and leaves the ventral mid-line behind the first segment, curves to the animal's right as usual, but is not continued along the thorax.

The gill plume is of considerable length; its base is infolded ventrally so as to suggest a spiral of one-and-a-half turns, but this may be due merely to a state of contraction. There are 12 filaments on each side, each supported by a double series of skeletal cells. The tip is very fine and does not project beyond the barbules, which are long and slender, but the state of preservation does not permit of any very precise details.

The tentacles are short, measuring about 3 mm. in length, narrow, and as usual grooved ventrally.

The collar commences on each side at the level of the dorsal chaetae; the dorsal lobe is thus of short extent, and of small length. The ventral lobe is separated by a lateral incision from the dorsal; it is thickened, recurved and rounded.

The thoracic chaetae are short, bronze in tint, in considerable numbers in each bundle. Those in the upper part of the bundle are rather longer than the others, nearly straight, much attenuated, with a narrow striated wing on each side, but when seen from another aspect only one such wing is visible.

The shorter ones are rather stouter with two broad wings. When a bundle is viewed in glycerine while still embedded in the body the majority of the bristles exhibit only one wing, though those in the lowermost rows exhibit two wings of approximately equal width. On my first examination I saw these two wings quite distinctly, but on a later re-examination I was able to see only one wing in the majority. It occurred to me, therefore, that this discrepancy might be due to the aspect from which the bristles were viewed, so I proceeded to test the matter in the following way: one such bundle in which I could detect two-winged bristles was cut off the body and isolated on a slide; the chaetae were separated from one another by needles. Now I was able to see more of the two-winged forms, though others still appeared to have but one wing, and still others to have one broader and one very narrow wing. When the cover-slip was lifted and then let fall in such a way as to cause the chaetae to roll over, the number showing the two wings was diminished, and indeed when the preparation was examined some days later, after and when the coverslip had pressed down upon the bristles, and these had settled on their "sides," I was unable to find any of them exhibiting two wings. I conclude, therefore, that the majority of the chaetae as seen in a bundle, or when separated, are so lying that one of the wings is concealed. The two wings are not in the same plane; they form an angle with one another. By very slow and careful focussing and repeated examination I believe that even so I can detect two superposed series of striations, that is, two wings.

When seen in side view the bristle is more or less curved, with a rather long and comparatively broad wing on one side and a narrower one on the other; the apex is prolonged for some distance beyond the wings.

The thoracic uncini are of the usual avicular form, about 40–50 in each torus; each has a rather prolonged base, the sub-dental margin of which seems to be produced into a rounded plate, thinner than the rest of the base, and producing the appearance of a breast of a bird. There are about seven denticles above the main tooth.

Each uncinus has in front of it a "pennon" or "pickaxe" bristle; the terminal plate of which is very thin, quite transparent and colourless, and when seen obliquely shows a process from the stem entering its base. But from the side the junction is not visible. The abdominal chaetae are carried on distinct dorso-ventrally elongated parapodia; the uncini are smaller than those on the thorax, but of the same form; there are about 12 in each torus.

The capilliforms are few in a bundle, and all being of the same size and form resemble the longer thoracic ones.

Locality.—Off Oates Land, Station 194, depth 180-200 fathoms.

Genus DASYCHONE Sars.*

Dasychone cingulata Grube, var. *curta* Ehlers. (Pl. IV, figs. 124, 125.)

D. cingulata Grube, 1878, p. 259; *D. curta* Ehlers, 1901, p. 216, pl. XLV, figs. 10–13, and 1907, p. 28; *D. cingulata* var. *curta* Augener, 1922, p. 211.

One small specimen, lacking its tube, was obtained at Spirits Bay, New Zealand.

It measures 10 mm. in total length, of which the gill plume occupies 3 mm. It was mounted in Canada balsam before making these measurements.

The body is pale brown, sparsely spotted with red-brown pigment throughout. The gill filaments are feebly pigmented at the level of each eye, so that the gills are faintly banded.

The gill filaments number 10 on each side. They are short, thick, and end in a free narrow process which is rather longer than the distance separating the two distal stylodes. Externally each filament carries 6 pairs of reddish eyes, the uppermost being less pigmented than the rest. The lowest eyes are just at the level of the interfilamentar membrane.

The stylodes are cylindrical and have no terminal enlargement; they arise about midway between the successive eyes and are shorter than the interocular spaces. The

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* Johansson (1926, p. 9) writes that the generic title *Dasychone* cannot be used for the animal to which Sars gave this name. The species for which he established the genus, *Dasychone argus*, had been described by Dalyell in 1853 as *Sabella argus*; Kölliker in 1858 referred to it as *Branchiomma argus*. The generic name *Branchiomma* must therefore be used for this species. Claparède in 1869 established the genus *Brachiomma* for the species *B. kölliкeri*—a name which is thus preoccupied. Johansson suggests that *Megalomma* be used in place of *Branchiomma* for the latter species. Thus, if the law of priority be applied strictly in this case a very great deal of confusion will arise, since the generic names *Branchiomma* and *Dasychone* are so well established in the sense commonly employed by such authorities as McIntosh, Ehlers, Fauvel, Augener, as well as by older zoologists in systematic works, in various text-books, and so forth. It seems quite unnecessary to make the change now.

lowest stylode is solitary and not median, but is situated asymmetrically on the dorsal margin. It is about twice the length of the others, which are nearly equally spaced, except the most distal, which is about half the usual distance from the penultimate.

To this account of the Spirits Bay specimen I may add some notes on those collected some years ago in the Otago Harbour. Of these I have seven, of which one still remains in its tube of fine grey mud.

The largest of the other six measures 18 mm., of which the gill plume occupies 6 mm., the breadth of the body is 2·5 mm., its height 2 mm. The thorax, which is 1·5 mm. in length, contains only 4 segments, though in other individuals I find 5, and in one there are 4 on one side and 5 on the opposite side.

The abdomen contains 17 well-formed segments followed by a slender pale region (3 mm. in length) consisting of about 20 regenerated segments. In all the six individuals there is a greater or less amount of regeneration, as indeed Augener has noted in the numerous specimens from Juan Fernandez (1922). I opened the largest of my specimens and teased up some of the contents of the body in the hope of seeing genital cells, but they are not yet developed so that presumably the animal is still immature.

The colour varies somewhat: they are all more or less spotted with red-brown to purplish pigment, but the ground colour differs.

A, is ochre-brown with purplish spots and the usual dark segmental "eyes"; the gills are barred with purple;

B, is dark brown, nearly chocolate;

C, is quite pale, nearly white, with fine specks of purplish pigment scattered over the entire surface, but the gill filaments are banded with much darker colour than in the other specimens, of a chocolate tint;

D, is brown with spots;

E, is dark chocolate, gills pale, for they are regenerating.

The specimen E is a short worm with 30 distinct segments; the posterior end is pale and yellowish; the general hue of the body is chocolate-brown peppered with darker spots; there is a pale band down the back. The worm is without a thorax; but in front of the first segment are three very short colourless segments with a distinct ventral bilobed collar and about 12 gill filaments (fig. 124). It is evident that the worm has lost the whole of its pre-abdominal region and was at the time of capture regenerating the gills and thorax.

This last fact, that regeneration affects the anterior end of the worm, is of interest, for though Augener, in his first account of the species (1914) suggested that the shortness of *D. curta* might be due to such a phenomenon, he was unable to find amongst the large number he received from Juan Fernandez (1922) any evidence of this, though like Ehlers and myself he found that the hinder end of the abdomen exhibits the phenomenon.

For ready comparison with Augener's account I append a tabular statement of the dimensions of these New Zealand specimens:

Length in mm.		Number of Segments in			
Of Body.	Of Gill.	Thorax.		Abdomen.	
		Right.	Left.	Formed.	Regenerating.
A 13	5	4	4	17	20 *circa*
B 10	4	5	4	21	15
C 10	3·5	4	4	17	imperfect
D 9	3	5	5	24	10
T.N. 7	3	6	6	40	imperfect

The worm E is not included ; the letters " T.N. " refer to the specimen collected by the " Terra Nova."

It is evident that these specimens are all smaller than those recorded by Augener and are presumably young.

Locality.—Spirits Bay, New Zealand, Station 134, depth 20 fathoms.

Distribution.—Juan Fernandez ; Stewart Island (Ehlers) ; Otago Harbour, littoral.

Note on the Lateral Eyes (fig. 125).—In every segment of the body, with the exception of the first, there is a deeply pigmented spot placed between the dorsal and ventral bundles of chaetae, *i.e.* just below the notopod. Sections of this spot, made parallel to the surface, show that it contains an eye.

The spot itself is oval and the dark brownish-purple pigment is in irregular clumps ; but towards the posterior end of the spot is a circular ring of some breadth in which the pigment is of a lighter tone ; uniformly distributed it attracts attention by the difference in colour, which is brown. In the centre of this brown patch is a pale pink translucent area, which has all the appearance of a cup-shaped depression; in this is a highly refringent body, which I take to be a lens. This cup is directed obliquely backwards, so that the eye is affected by light coming from behind.

Owing to poor preservation it is not possible to give a detailed account of the structure.

This suggests that the worm can and does leave its tube from time to time and move through the water backwards as does *Myxicola*.

Augener notes the absence of tubes in the material he studied and assumes that the tubes had been destroyed when the corallines, amongst which the worms were found, were crushed in order to extract the worms.

Genus EUCHONE Malmgren.

Euchone pallida Ehlers. (Pl. IV, figs. 126–130.)

Ehlers, 1908, p. 158, pl. XXI, figs. 10–15 ; pl. XXII, figs. 1–4 ; Ehlers, 1913, p. 574.

As Ehlers has remarked, the discovery of a representative of this distinctly Arctic and Northern genus in these Antarctic Seas is noteworthy ; and though the species appears to be distinct it is more nearly related to *E. rubrocincta* Sars than to other species, especially in the absence of definite spatulate chaetae from the dorsal bundles in the thorax. Southern, however (1914, p. 144), states that the resemblance between the shorter and longer bristles is exaggerated by Malmgren; the shorter ones have wider wings.

Several specimens were obtained by the "Terra Nova," and, except in a few details, they agree with the original description. The points of apparent difference are either matters of interpretation or may be due to the larger size or to better preservation of the material at my disposal.

The worm is at once recognised by the naked eye from the other Sabellids of the region by these four features: (*a*) the shortness and relative stoutness of the body; (*b*) the length of the gill plume in relation to that of the body; (*c*) the high collar; and (*d*) above all by the curious "caudal membranes" forming the lateral boundaries to the ventral pre-anal groove.

(*a*) The largest individual measures 55 mm., of which 35 mm. account for the body and 20 mm. for the gill plume; the thorax is 8 mm. and the abdomen 27 mm. in length; the breadth of the former is 6 mm. and of the latter 4 mm.

This individual had been removed from its tube before preservation so that it is well hardened and the gills are loosely spread outwards.

The thorax contains 8 segments; the abdomen 26. I find this number to be constant in each of the specimens examined, whereas Ehlers found 32 segments in a smaller worm.

(*b*) The length of the gill plume is more than half that of the body, indeed in one specimen the body only just exceeds the gills, as the following figures show:

	Length in mm. Body.	Gill.
A	35	20
B	27	22
C	25	15
Ehlers	22	14

The worm B had also been removed from its tube before preservation, the gills are extended and the body perhaps somewhat contracted. The number of gill filaments is 17 or 18 on each side, whereas Ehlers counted only 14. The gill filament is supported by a single series of skeletal cells, and each barbule has likewise its skeleton of long narrow cells, each of which has at its end a short tubular outgrowth on one side.

Of the five pairs of intra-branchial filaments, which Ehlers regards as vestigial gill filaments, I find that two pairs spring from the base of the gill near the ventral region, of which the more ventral is two-thirds the length of a gill filament and the other about half the length of a filament; the more ventral is connected with the interfilamentar membrane, but I do not see, even under a microscope, the serrations along its edge that Ehlers figures. The other three pairs lie dorsal of the hood-like tentacles, and are stouter and much shorter than the ventrally-placed structures, being about the same length as the tentacles.

(*c*) The delicate collar arises from the 1st and 2nd segments and reaches the same level all round its circumference; it is directed forwards and is not reflected; its height laterally is 3·5 mm. in the largest individual.

There are two points on which I think that emendations to Ehlers' account must be made. The collar is divided by dorsal and ventral clefts into a right and left lateral lobe. On the dorsal surface there is a deep but narrow cleft; at its posterior end the dorsal convex margin of the lobe, where it passes on to the surface of the body, becomes thickened and continuous with the outer edge of an elongated gland, the "Nuchal Gland," occupying the dorsal surface of the first two segments of the thorax; it is traversed by the faecal groove. The gland itself extends forwards to the base of the gill support and ends at about the level of the anterior margin of the collar.

In another individual the right and left lobes of the collar overlap in the middle line so that the greater part of the gland is concealed from view, and only its anterior end is seen between the gill bases. This is what is shown in Ehlers' figure (pl. XXI, fig. 11), and he seems to have misinterpreted this anterior end of the nuchal gland as representing the "Kopflappen."

Although the anterior margin of the collar keeps the same level all the way round, yet, owing to the forward extension of the first segment on the ventral surface, the collar is here only half the height of its lateral region; and whereas Ehlers finds only a slight notch in the median line on its anterior border, I find that there is a deep cleft extending down to the base and reaching to the first ventral gland-shield.

(*d*) The description and figure given by Ehlers of the pre-anal groove and its neighbourhood scarcely do justice to this structure, which is more accurately shown in Malmgren's figure of *Euchone analis* Kroycr (pl. XXVII, fig. 88 f.).

The pre-anal groove is bounded by a relatively high and thick membrane, the "caudal membrane" as Moore terms it, which commences posteriorly on each side of the anus and extends forwards along the ventral surface of the animal for 10–12 segments. It increases in height towards its anterior limit where it curves towards the mid-line to meet its fellow; just before they mect, each lateral membrane bends rather sharply backwards so as to form with its fellow a "spout" which is continuous in front with the faecal groove. Posteriorly the caudal membrane extends behind the anus to end in the supra-anal portion of the last segment of the body—the periproct. On the floor of the groove there is only the very slightest indication of the segmentation of the body, and the nerve cord is visible through the thin body-wall. In the first specimen studied the two caudal membranes stand upright so as to be nearly parallel to one another, but in the other individuals they are spread outwards so as to be nearly flat and the whole structure then resembles the "head" of some Maldanid.

It is evident that these membranes are mobile and perhaps muscular in nature. What is the function of this peculiar structure?

The worm agrees, except for the above details, completely with the account given by Ehlers; but the tube inhabited by it differs from that described by him.

At Kaiser Wilhelm II Land the species inhabits a thick-walled tube of mud; for Ehlers found some of the animals within their tubes. In his original account, though there was such a tube in the same phial as the worm he had no certainty that it belonged to it; but in 1913 he writes: "Eines dieser Tiere wurde aus einer sehr dickwandigen Schlammröhre herausgelöst; damit ist die Beschaffenheit der Wohnröhre dieser Art sichergestellt."

The worm, however, from McMurdo Sound inhabits a tube which is not unlike that of *Potamilla antarctica* in that it is horny-yellow in colour with its upper region sometimes covered with grains of mud or of sand, but not to such a degree as to hide the horny membrane. The tube is thinner than that of *Potamilla* and more brittle. Some of the specimens were still within their tubes, others had been extracted. This difference in the nature of the tube is not sufficient to demand the formation of a new species, although, so far as I am aware, such differences in the nature of the tube inhabited by different individuals has not been recorded for any other species of Sabellid. The European species forms a tube of mud; but *Euchone alicaudata*, from Japan, forms a stiff horny tube (Moore and Bush, 1904, p. 165), similar to that from McMurdo Sound. I cannot think that *Euchone pallida* in the latter region would leave its own mud tube and enter one formed by *Potamilla*, for against such a supposition is the fact that the worm fits its tube precisely, and a tube of this diameter would, if it belonged to *Potamilla*, be much longer than are those of *Euchone*. Nor do I know of any record of a Sabellid migrating in such a way from one tube to another.

Localities.—McMurdo Sound, Stations 314, depth 222–241 fathoms; 316, depth 190–250 fathoms (4); 321, depth 180–250 fathoms (2, coll. Nelson); 355, depth 300 fathoms (three); Ross Sea, Bay of Whales, Station 191, depth 194–250 fathoms (one, coll. Lillie).

Distribution.—Kerguelen, in 88 metres; Kaiser Wilhelm II Land, in depth of 385 metres.

Genus POTAMILLA Malmgren.

Potamilla antarctica (Kinberg).

Laonome antarctica Kinberg, 1866, p. 354; *Potamilla antarctica* Gravier, 1906, p. 59; *Potamilla antarctica* Benham, 1921, p. 109; *Laonome antarctica* Johansson, 1926, p. 22.

The last author, though placing the species in the genus *Laonome*, writes "Die Art, die eine echte *Potamilla* ist." This very characteristic Antarctic Sabellid, with its long tough brown parchmenty tube, occurs in great numbers over the sea bottom of the area explored by the "Terra Nova," as it did in the region traversed by the "Aurora." More than two hundred individuals were included in the material submitted to me, obtained from twelve stations in McMurdo Sound and the adjacent areas of the Ross Sea, from depths varying from 50 to 250 fathoms.

In several instances a dozen or more tubes, in one case more than fifty, were dredged at one station, and the biologist had with foresight removed one or more worms from the tubes of each station before preserving them, so that well-preserved material is available for study. The worm is, however, so well known in its external anatomy that little need be added here. The size of these tubes varies from quite small to very large, as I noted in my previous report. The smallest worms were found at Stations 314 and 340, one of which measured only 37 mm. in length with a diameter of 2 mm., so that it is as small as those described by me from Macquarie Island.

The largest tube in this collection from Station 220 exceeds 500 mm. in length with a diameter of 10 mm.

The largest worm measured attains the length of 280 mm., including the gill plume which occupies 45 mm. The diameter of the body is 8 mm.

Though the tubes usually occur isolated from one another there are instances in which three or even more are tightly pressed together or even intertwined to form a cluster. Many of the tubes are more or less covered by foreign growths of a very varied nature. I note Polyzoa, and creeping and arborescent Hydroids; some tubes support an Antipatharian (as I supposed, though in the report on this group it is stated that all the material came from Station 96, which is in the New Zealand area), others support sessile Alcyonarians; and even tubes of Terebellids, such as *T. ehlersi*. One specimen seemed to be without any tube of its own, but was wrapped around by a colonial Ascidian, but on closer examination a very thin, very pale transparent tube is found to invest those parts of the worm, the head and the tail, which protrude beyond the tunicate.

It is unnecessary to enter into further details as the worm has been studied by several zoologists, and I discussed certain features of it in 1921 at some length.

Localities.—Off Cape Adare, Station 220, depth 45–50 fathoms (one very large specimen).* Off Oates Land, Station 194, depth 180–200 fathoms (8). Off Granite Harbour, Stations 340, depth 160 fathoms (20); 356, depth 50 fathoms (12). Off Bird Peninsula, Station 331, depth 250 fathoms (37, coll. D. E. Lillie). McMurdo Sound, Stations 314, depth 222–241 fathoms (60, coll. Lillie); 316, depth 190–250 fathoms (30); 321, depth 180–250 fathoms (7, coll. E. W. Nelson); 338, depth 207 fathoms (19); 339, depth 140 fathoms (6); 348, depth 200 fathoms (6); 349, depth 80 fathoms (2).

Distribution.—All round the Antarctic region.

Family SERPULIDAE.

Owing to the fact that McIntosh (1885) does not in many instances give sufficient detail as to the characters of the thoracic bristles it is difficult to allocate all the species described in the "Challenger" Report to the genera as at present defined. On the other hand, Miss Pixell, while paying close attention to the bristles, is less concerned with the general appearance of some of the species described by her (1913).

Some of the finest drawings of modern times of the Sabelliform and Serpuliform worms are to be found in a work of a Spanish zoologist, Rioja (1923), which are much more instructive than the photographs illustrating Miss Bush's memoir (1905); but, of course, they do not compare for beauty with the coloured illustrations to McIntosh's classical monograph published by the Ray Society.

It is well known to all students of the Serpulids how difficult it is in many cases to distinguish the genera. Very similar forms in general appearance may show important differences in the form and arrangement of the chaetae.

Thus, from Station 96, off the coast of New Zealand, I received a phial containing two worms which had been removed from their respective tubes; neither was complete. One was wholly debranchiate, the other had but one gill plume remaining. Superficially, and under a hand-lens, the bodies of these two were closely alike in size, proportions, number of thoracic segments, and so on, that I supposed them to belong to one and the same species, and drew up my account of the external features from the more complete individual, and of the chaetae from the less complete one. But, fortunately, I had also mounted a thoracic segment of the former, and I then noted differences in the shape of the uncini in the two specimens, and was therefore led to make a more detailed comparison of the chaetae of the two worms, with the result that I find that each is a representative of a separate genus—the one belongs to the genus *Apomatus*, the other to *Vermilia*.

Miss Bush, in a very exhaustive survey of the species of the Sabelliformia of the Pacific, relies to a great extent on the form of the collar as the foundation for her characterisation of the genera in the analytical table that precedes the account of the

* The numerals in brackets indicate the number of individuals obtained at each station.

species. But bearing in mind the readiness with which this delicate structure is torn, and that the earlier, and even recent writers, provide little or no information about this organ, and, further, that she herself gives no satisfactory figures of it for the species that she describes (for the photographs that illustrate the work are in many cases not at all distinct), it is very doubtful whether this method of characterisation is as useful as she would suppose. Even the footnotes to the table of generic characters emphasise the gaps in our knowledge of the condition of the collar in several genera.

It is true, as she remarks, that reliance on the chaetae does entail a considerable amount of labour ; but as one has ultimately to get the facts about them, even on her system, it does not seem to matter whether one commences or ends the study with their examination. Some authors rely almost entirely on the details of the chaetae, but I think that on the whole de Saint Joseph's scheme, being a combination of others, is as useful as any yet proposed.

Genus SERPULA Linnaeus s. str. Philippi.

Serpula vermicularis var. *narconensis* Baird.

Serpula narconensis Baird (1864), p. 21, pl. II, figs. 7, 8 ; *S. vermicularis* var. *narconensis* Ehlers (1912), p. 13; *S. vermicularis* Augener (1913), p. 133 (for synonymy and for other references) ; *S. v.* var. *narconensis* Benham (1921), p. 112.

Augener gives a somewhat detailed account of the tubes he received from S.W. Australia, but notes that he did not find any with the pronounced funnel-like mouth, which Ehlers states as characteristic of the variety, while confessing that intermediate conditions occur. It seems at any rate quite the most common condition in these Antarctic forms, and may well be indicated by retaining the varietal name. Excellent figures of the European form are given by Rioja (1923, p. 73).

A considerable number of this common Serpulid were obtained at various stations, but most of the tubes are empty. The younger tubes are twisted in a close coil or loose spiral, and in some stations are wrapped round branches of an Antipatharian (?). As they grow older the tube becomes free and then nearly straight. These young tubes do not show the everted lip so characteristic of the southern variety, and indeed I supposed at first that they might have been constructed by some other species till a study of the chaetae, of the contained worms, showed them to belong to this species.

Perhaps the most interesting position in which the tubes were found is that noted by Mr. R. E. Priestly, who collected a number of them, broken into fragments of 1–2 inches in length, some 30 feet above sea-level on the Drygalski glacier at Evans Cove, Victoria Land. This is not, however, listed in the collecting stations.

Localities.—Ross Sea, Stations 194, depth 180–200 fathoms ; 220, depth 45–50 fathoms ; 294, depth 158 fathoms ; 331, depth 250 fathoms ; 340, depth 160 fathoms ; 356, depth 50 fathoms. McMurdo Sound, Stations 314, depth 222–241 fathoms ; 316, depth 190–250 fathoms; 338, depth 207 fathoms; 339, depth 140 fathoms; 340, depth 160 fathoms; 348, depth 200 fathoms; 354, depth 30 fathoms; 355, depth 300 fathoms; 321, depth 180–250 metres (coll. Nelson).

Distribution of variety.—All round the Antarctic region.

Serpula, sp. A. (Pl. IV, figs. 131–136.)

On an old broken volute shell (*Scaphella pacifica*) inhabited by a hermit-crab, is a small white tube circular in section, coiled in an irregular heap.

The worm was removed from its tube, and mounted in glycerine. It is colourless; its total length but 9 mm. with a breadth of 0·75 mm.; the gill plume is 2·25 mm., so that it is about one-third the length of the body.

The gill filaments are relatively broad without an axial skeleton, and each is prolonged terminally into a fine thread about as long as a barbule and as thick. There appear to be about 10–12 filaments on each side, but as the two series are spirally twisted round each other it is difficult to be certain of the number.

On the dorsal region of the gill base there arise two cylindrical processes, one shorter than the other, which are evidently modified branchial filaments. The longer one, situated on the animal's left side, terminates in an oval swelling, the apex of which reaches about half-way along the plume. There is no sign of any rupture here, though it is possible that a conical operculum has fallen away or/and that it is undergoing regeneration.

The shorter stem is also somewhat enlarged at its extremity. Unfortunately minute fragments of lime due to the fracture of the shell, on its removal of the worm from the tube, conceal much of the collar, but at any rate the ventral lobe is seen to be quite low, and appears to be divided from the dorsal by a deep incision, unless this upper part is part of the thoracic membrane.

The collar chaetae are of two sorts: (*a*) the upper three or four are long and stout, with two or three short, blunt knobs below the denticulated blade; (*b*) three or four shorter, paler, simpler capilliforms.

The thoracic bristles are shorter and less stout than those (*b*) of the collar; each bundle contains also two kinds: (*a*) three or four upper ones are slender simple capilliforms; and (*b*) the three or four lower ones are shorter and broader, with one very narrow wing, or in another aspect, two narrow wings.

The abdominal bristles are "en cornet" with one end slightly produced; there are five or six in each bundle in the anterior segments; they are apparently absent in the middle region, but reappear posteriorly, where they are in couples.

The uncinigerous tori are short in the thorax, longer in the abdomen; the uncinus is of the usual "serpulid" type, with 5–6 teeth above the proximal fang. The base is long and has a broad rounded subdental process.

Locality.—New Zealand, Station 96, depth 70 fathoms.

Remarks.—This seems to be a juvenile form, but to what species it belongs I am unable to determine. There are some resemblances to the *Zopyrus maoricus*, notably in the paired opercular stems, but the uncinus has but one series of denticles.

Serpula, sp. B. (Pl. IV, figs. 137–141.)

On a stone covered with various growths, including empty tubes of serpulids and *Spirorbis*, is one serpulid tube of rather striking appearance. It is coiled in a close ascending spire, one whorl almost directly above the other and leaving a central area; there are three successive coils, each of about the same diameter; the coils are united by lime and the "area" surrounded by them is filled up with lime.

The largest coil is 12 mm. across, and the tube has a diameter of 2 mm. It looks indeed like a large *Spirorbis*. The upper whorl is 10·25 mm. across; the lower is 12 mm. Width of tube is 3 mm. The central platform of lime 5 mm. across; height of upper surface from the stone is 7 mm.

The tube contained a worm, which unfortunately is very soft, has lost both gill plumes and the operculum, so that it is impossible for me to give details except of the chaetae. There are seven thoracic segments. The collar bundle contains about 20 bristles; the more anterior of which are very long with the blade finely striated and denticulated; at its base the shaft is swollen and carries two rounded knobs ("moignons"), characteristic of the genus. The rest of the bristles are simpler and finer. The remaining six bundles of the thorax contain only simple, rather thick capilliforms, feebly winged on each side.

The uncini had macerated away from the body-wall and are lying isolated in groups of 15–20. Each uncinus has a short base with six teeth above the fang.

The hinder part of the abdomen shows that the notopod contains 70–80 uncini of the same general form as the above, and the neuropodial bundles 10–15 bristles "en cornet." There is a slight difference in detail between the uppermost and the lower, in that those nearest the uncini have a less definite "claw" at the end of the main axis while in those further away it is very strikingly marked. This may be a matter of wear.

Locality.—New Zealand, Station 92, depth 300 fathoms.

Genus VERMILIA Lamarck s. str. Saint Joseph.

Vermilia sphaeropomatus, n. sp. (Pl. IV, figs. 142–146.)

The striking feature about this species is the large globular, transparent, membranous operculum of a tough consistency, which recalls that of *Apomatus geniculata* Moore (1908), but is without calcareous or other thickening over its free surface, or any markings on it that are perceptible under a hand-lens.

In one individual it is beautifully iridescent with blue and green, shading off to violet on the one hand and to yellow on the other as the globe is turned about.

It is supported on a long narrow cylindrical, transparent, firm, membranous peduncle which springs from the left side of the body immediately behind the gill base. This peduncle is naked, smooth, and has no wings or other outgrowths but passes suddenly, without any enlargement, into the under-surface of the lobe.

The largest of the five specimens measures about 20 mm. in length, allowing for its curvature. It may be taken as the type and is here figured. The gills, curled and coiled and outspread, are 6 mm. in length; the peduncle of the operculum is bent; the diameter of the globe is 3 mm.

The thorax measures 4 mm., breadth 5 mm. or including the membrane 6 mm., while the abdomen is but 3 mm. across its anterior end.

The gill filaments are thick and fleshy; on the right side about 20 in number, on the left 25; they are quite free above the base which is curved inwards ventrally. The barbules are numerous and slender. At its distal end the filament after the cessation of the barbules suddenly decreases in size to form a short finger-shaped free terminal. There are no eyes.

The thorax consists of 7 segments; the collar is extensive: it arises dorsally in connection with the thoracic membrane and is separated from its fellow by a wide dorsal gap. The lateral lobe is separated from the ventral by a distinct cleft at about the level of the lower end of the thoracic tori; but the thin, ventral lobe is continuous right across the ventral surface where it is reflected over the first segment.

The collar chaetae do not differ from the thoracic chaetae: they form a small bundle directed outwards and forwards, of larger and stouter bristles than those in the following segments, but are all of one kind, fairly stout, tapering to a fine point with a narrow striated wing on one side, which does not reach the apex.

In the following bundles the wing is somewhat narrower, indeed it is often scarcely visible, while the bristles lie *in situ*.

The six uncinigerous tori (neuropods) are long and low ridges reaching about half-way to the ventral mid-line. Each contains a considerable number of uncini, 80 or more. Each uncinus is comparatively short, somewhat triangular with one large pointed tooth succeeded by 6–7 narrow, sharp, and successively shorter denticles. It differs a good deal from the uncini described for other species of the genus. The base is nearly straight, the posterior edge is as long as the base and slightly excavated, while the anterior edge projects slightly as a convex lobe below and beyond the main tooth from which it is separated by a deep, narrow bay.

The abdominal uncini are similar but smaller and less numerous. They are carried on short quadrangular parapodial lobes.

The abdominal capilliforms are in couples at any rate at the hinder end; each is very delicate, colourless, and sharply geniculate near the tip which forms nearly a right-angle with the shaft and is produced into a long and fine point. The free edge of this bent region is distinctly denticulate nearly to the tip.

The ventral surface of the thorax and abdomen is provided with glands in the form of narrow transverse ridges; those in the thorax occupying segments 4–7; those of the abdomen every segment.

The worms had been removed from their tubes, and no tubes accompanied the animals.

Localities.—New Zealand, Stations 90, depth 100 fathoms (one); 96, depth 70 fathoms (four).

Remarks.—The globular operculum recalls that of *Apomatus philippi*, but in that genus the peduncle has barbules on it, and also certain of the thoracic chaetae are characteristic. It recalls also *Cystopomatus* Gravier, in which the upper hemisphere is tesselated with a mosaic; here, again, the thoracic chaetae contain "*Salmacina*" bristles, and the uncini are different. *Hyalopmatus* with its globular operculum has no thoracic membrane and there are capilliforms in all the abdominal segments, while there are special "*Apomatus*" chaetae in the collar. So far as the chaetae are concerned it agrees with Saint Joseph's diagnosis of *Vermilia* s. str. (1894, p. 262) as represented by *V. annulata* Schmarda and *V. infundibulum* Gm. (Clap.), but in that genus the globular operculum has one or more transverse "planches" across and around its circumference, of which there are no traces here. Moore and Bush describe *V. ctenophora* and *V. pluriannulata* (1904, pp. 169, 171) in which these "planches" are shown, and in these two species the chaetae differ from those of the New Zealand worms.

I am thus in doubt whether to establish a new genus or to place the worm in the genus *Vermilia* as defined by de Saint Joseph, and to modify the definition in regard to the operculum. I prefer the latter course, for Ehlers has described (1901, p. 219) a species from the Magellan Strait, *V. nigropileata,* in which there are no superposed discs on the operculum which is biconical, and the distal region is deeply pigmented; in it, as in *V. annulata* Ehlers (1887, p. 308), the uncinus is less triangular and has more numerous denticles than in the present species.

Vermilia producta, n. sp.* (Pl. IV, figs. 147–151.)

Fragments of old and worn bivalve shells have creeping over their surface a number of white serpulid tubes, most of which are empty; but from two of them there projects the anterior end of the worm: it is nearly black, though whether this is due to the mode of preservation or not I cannot say. Unfortunately, in both these worms the gill plume is lacking. The tube, which has a diameter of 2 mm., is thick-walled and its surface is rough with rings of growth at irregular intervals; it is traversed lengthwise by four ill-defined ridges at nearly equal distances apart on its upper face. It bears some resemblance to the tube of *Protula antennata* Ehlers (1887, p. 39, fig. 9), from which, however, the worm differs in the character of the bristles.

The contained worms are ill-preserved and the skin partly macerated. The length of the body is 19 mm. and its breadth 2 mm.; the thorax is 4 mm. in length. The collar is high; its dorsal lobe of about equal height with the ventral arises as far back as the level of the second bundle of dorsal chaetae: this lobe is rounded and reflected and is separated from its fellow by a fairly wide gap. From the ventral

* In reference to the prolongation of the axis of the bristle far beyond the wings.

lobe it is marked off by a deep lateral incision, while the ventral lobe itself is continuous from side to side and its margin is nearly straight.

There seems to be a thoracic membrane, but it is so much torn that what I take for it may be merely a portion of the macerated skin, as I am unable to detect it in the second individual.

The thorax contains seven chaetigerous segments.

The thoracic neuropods are vertically extended, somewhat quadrate lobes of comparatively small height and occupy the sides only. The abdominal uncinigerous tori are short and flush with the surface. There are about 100 segments in the abdomen which tapers very slowly.

The collar chaetae are simple capilliforms without a wing; the rest of the bundles contain one kind of bristle, which is long, slightly bent and when seen from one aspect shows one wing, but in another two wings are apparent; the wings are short and narrow and the axis is prolonged considerably beyond them. Those in the upper part of a bundle are longer than the lower ones though even here the wing is only about half the width of the axis.

The thoracic uncinus has a broad triangular base, which is nearly straight; its posterior margin is slightly excavated and its anterior rounded edge is prolonged in front of the base of the tooth. The main tooth is rather small and above it are about twelve denticles.

The abdominal uncini are some 30 to each notopod and of similar form. The abdominal bristles are three in a bundle; most are broken, but when entire they are geniculate and denticulate.

Locality.—New Zealand, Station 96, depth 70 fathoms.

Remarks.—The species comes from the same locality as *V. sphaeropomatus*, but its uncini and its bristles differ; the former in having more denticles, the latter in the prolongation of the axis beyond the short wings.

The tube agrees to some degree with that of *Omphalopomopsis* v. Marenzeller (1884, p. 23) which, however, has "*Apomatus*" bristles in the thorax. These are quite lacking in the New Zealand worm. I looked for them carefully and repeatedly in isolated bundles and failed to find them, otherwise I should have regarded the worm as assignable to this Japanese species, though it seems to differ in other details.

Genus POMATOCEROS (Philippi) Saint Joseph.

Pomatoceros coeruleus (Schmarda).

Placostegus coeruleus Schmarda, 1861, p. 29, pl. XXI, fig. 178; *Pomatoceros strigiceps* McIntosh, 1885, p. 520, pl. LV, figs. 3, 4; pl. XXXIa, figs. 26–28; *Pomatoceros strigiceps* Ehlers, 1904, p. 67, pl. IX, figs. 11–19; *Pomatoceros coeruleus* Ehlers, 1907, p. 30; *Pomatoceros coeruleus* Fauvel, 1919, p. 464.

Portions of four tubes which have been chipped off a rock were received: the colour of the sides is a pale azure blue, but is partly concealed by deposits of lime; the interior is of a much deeper tone of blue.

The tubes appear to have been solitary; two of the fragments are nearly straight. Another is bent round nearly into a circle. There is a high compressed keel, which, in the two instances in which the anterior end is entire, projects beyond the mouth as a high narrow, tooth-like process.

The sides show irregularly curved ridges of growth, rather coarser at intervals, indicating a resumption of growth; these growth lines are continuous with similar ones on the keel.

In one case the keel broadens out at a little distance from the mouth and here the lines of growth bend forward abruptly at an angle and meet at some distance in front of the point at which they pass up from the sides. Further back this keel is represented by a flattened ridge with oblique lines.

The longest fragment is 22 mm. in length by 3·5 mm. across, and 5 mm. in height. The diameter of the mouth is 2·5, and the overhanging "tooth" is 1·5 mm. long.

The contained worms have a brownish body with dark-blue gills; the operculum is blue with a pair of short white wings on the peduncle. The body of the animal is 22 mm. long, and the gills add another 5 mm. I have nothing to add to Ehlers' illustrated account of this common littoral serpulid of the coasts of New Zealand.

Locality.—New Zealand, Bay of Islands, rock-pool, September, 1912. (There is no station number given by the collector, nor is there any station in the list corresponding to the shore gathering in this locality.)

Distribution.—Cape of Good Hope (Schmarda); Madagascar (Fauvel); New Zealand (Ehlers).

It is curious that this species was not included in the South African polychaetes studied by McIntosh. Had it not been for the precise statement by Ehlers that he had compared the worms I sent him from New Zealand with Schmarda's type I should have doubted whether the two are identical, for Schmarda's drawing of the tube is light blue; and the colour of the worm is very unlike the appearance presented by this serpulid in life. The tube is white; the gills are deep, nearly indigo, blue rather than azure tinted as Schmarda gives.

Pomatoceros terrae novae, n. sp. (Pl. V, figs. 174–180.)

Specific Characters.—Operculum with thin convex calcareous plate on the end of a winged peduncle; uncini with 8–10 denticles above the stout bifid tooth; thoracic chaetae simply winged, the striations at the bend rather stronger than elsewhere; abdominal chaetae in hinder segments only, "en cornet" in couples; tube with keel undulating or toothed with a violet stripe along each side, circular in section, lip thin, not everted.

From the littoral zone of the Island of South Trinidad were gathered a number of slender calcareous tubes containing worms provided with a very simple operculum. This is a membranous inverted cone with rounded sides, bearing on its flat top a thin white, circular, convex, calcareous plate, which is irregularly calcified, for it exhibits thinner areas of irregular shape over its entire surface.

The peduncle is cylindrical, smooth, membranous, and transparent; at its upper end it is slightly dilated and wing-like and each wing is produced into the usual filamentous thread. The peduncle is as long as the gill plume and the operculum itself projects beyond it when the gill filaments are pressed together as in specimens removed from the tube.

The body of the worm is 6 mm. in length, of which the thorax measures 1·5 mm.; the gill plume is 3 mm. and the operculum 4 mm. in length.

The thorax contains seven segments. The collar chaetae are about a dozen in number and of two sizes, but all are alike in form; six are short, very pale and delicate; and six are longer, stouter, and yellowish. The chaetae are slightly curved and winged on one side and the wing is very long and striated with, I think, feeble denticulations. At about the point where the curve commences the striations are rather more pronounced than above or below, but there is no separate winglet here. The chaetae of the following segments are similar, but the wing is somewhat narrower.

The uncini are long, have 8 to 10 denticles, and the fang or cephalic tooth is stout, blunter than the others, and bifid. The body of the uncinus is narrow, its base parallel with the free edge and produced only slightly beyond the fang at a sharp angle.

The anterior abdominal segments have no chaetae for a length of at least 2·75 mm., but the hinder 30 segments possess capilliforms in couples. These are "en cornet" with a delicate shaft which widens out at the distal end, one margin of which is prolonged to a fine point. The edge of the wide portion is provided with close set delicate hairs or spinules.

The gill filaments are not united by a membrane. Owing to the poor state of preservation it is impossible to trace the outline of the collar with any accuracy, but it does not appear to be developed in the ventral region to anything like the extent that it is in *P. coeruleus*. It is, too, equally difficult to say anything of the thoracic membrane.

The tube seems to grow upright. The specimens are a good deal broken and show no supporting substratum. They are mostly nearly straight, slightly curved or undulating; they run more or less parallel in bundles of two, three, or more and some are twisted together in a plane. This circular tube has a narrow, compressed keel along one surface and on each side, at some little distance away from it, is a narrow lilac or pale-violet stripe which is absent from some of the larger, older tubes.

In some, the keel is notched at more or less regular intervals so as to present a series of teeth; in others it is simply undulating. The mouth of the tube is circular and the lip is not everted. Where the tubes are pressed together there is a sort of ledge uniting them, the under-surface of which is cancellated with quadrate spaces in series.

Locality.—South Trinidad, Station 36, between tide marks.

Genus ZOPYRUS Kinberg.

Zopyrus maoricus, n. sp. (Pl. V, figs. 156–161.)

With some hesitation I refer this worm to Kinberg's genus, which is only very sketchily diagnosed (1910, p. 71): but in the possession of a funnel-shaped operculum with a number of radiating lines on its sides, and, as a pair to it, of a short club-shaped process on the opposite side of the body, it agrees with that author's description.

A stone covered with various growths, including Spirorbis and serpulid tubes of various sizes and modes of growth, has one tube which contained this worm.

The long tube, which is circular in section, commences in a few loose spiral convolutions and then becomes nearly straight for a certain course, then bends round in a wide loop to become parallel to this early portion. It is attached for its whole length to the stone.

The diameter of the tube is 1·25 mm. and the length of each portion of the wide loop is about 17 mm.; the diameter of the coiled region is 5 mm.

At intervals along its course old mouths are indicated by more or less undulating ridges passing round the tube. In the older regions the upper surface is flattened, and is bounded by slight ridges on either side; on the sloping surface outside these is a series of small nodules which stand out obliquely; in the more recent portions this flat, ribbon-like, upper region is absent; the tube becomes rounded, and the lines of growth are more prominent at the sides, especially as the region of attachment is approached.

The contained worm is darkly coloured, whether naturally or not I cannot say; it measures 8 mm. in total length. The gills consist of about six stout filaments on each side with short barbules and terminating in a rather thick thread of some length.

The operculum is funnel-shaped with about 12 petal-like lobes, the divisions or lines between which pass down the sides for about half its length; it is constricted from the wingless, cylindrical peduncle, which arises from the animal's left side; on the right, in a corresponding position, is a short cylindrical process slightly enlarged at its apex, about half as long as the peduncle of the operculum.

The collar is low, and in the mounted specimen I cannot see any incisions; it is high ventrally, and slopes gradually towards the dorsal surface where it passes behind into the thoracic membrane.

The collar chaetae form a small bundle directed forwards in which there are, as usual, two kinds of bristles: (*a*) three stout golden "serpulid" bristles, with 2–3 rounded knobs ("moignons") at the base of the blade; and (*b*) four or five more delicate, pale, simple capilliforms.

In the following thoracic segments, the usual two-winged bristles are present.

The uncinus is of peculiar type: it is long and narrow with a rounded anterior process beyond the teeth. The main tooth is relatively small, and above it are 8–9 denticles; when viewed from above it is seen that these are in two transverse rows near the main tooth and in three rows at the other end. After a preliminary study of these uncini, and making sketches while the worm was in glycerine, I had to postpone further work on it and therefore stained it and mounted it in Canada balsam; the chaetae are now difficult to see; at any rate they are not sufficiently clear for me to draw them under the camera lucida.

In the anterior abdominal segments there are "cupped" chaetae ("en cornet") up to six in a bundle, they are placed on a slight eminence which shows in profile as the worm lies on its side; the pectinated edge of the bristle is vertical and directed forwards, while the finer, narrower end of the cup is turned towards the body. They occur in the last twenty segments at any rate, perhaps more. In the middle region there is a couple of long very delicate simple capilliforms together with 2–3 extremely delicate transparent cupped chaetae. I cannot detect any of them in the last dozen segments.

Locality.—New Zealand, Station 91, depth 300 fathoms.

Remarks.—It will be seen that the worm agrees with *Serpula* except for the duplicated or triplicated denticles on the uncinus. It differs, however, from such species as *S. vermicularis* and *S. vasifera* in various ways, such as in details about the operculum and the presence of a second rudimentary operculum. It has some resemblance to *Zopyrus loveni* Kinberg, from the Magellan Strait, but in that the number of petals and lines on the operculum is much greater (this may perhaps be a matter of age or size): it differs also in the number of filaments to each gill plume.

The tube recalls that of *Serpula philippensis* McIntosh.

Genus SPIROBRANCHUS Blainville.

Spirobranchus tricornis Mörch. (Pl. V, figs. 185–188.)

S. tricornis Ehlers, 1887, p. 292, pl. LVII, figs. 8–15.

There are one or two apparent differences between Ehlers' account of the species and the present specimen. Thus, his figure 8 shows the collar as continuous with the anterior region of the thoracic membrane, but he says nothing in the text about it; in the specimen before me I find them distinctly separated, but the thoracic membrane overlaps the dorsal lobe of the collar which is thus almost concealed; and it is in this anterior portion of the membrane that the small bundle of collar bristles is inserted. When the thoracic membrane is turned aside the collar lobe is seen.

The ventral lobe is characteristically prolonged into a very long triangular point; but in the present specimen the point is not so acute as Ehlers figures it; it is here nearly a right angle. On the opercular plate his figure 15 shows certain short radial lines around the margin; these I do not see, and the median "horn" is shorter than in his specimen.

But these are but individual differences and the worm agrees in all essentials with Ehlers' account, so that only a few notes need be added here.

The tube is not described by him. The single specimen in this collection was on a piece of rock and only a small portion remains, as it had been broken in order to extract the worm. The tube appears to be nearly straight and adherent throughout its length by a broad base. The posterior end is entire and the lumen is blocked by a deposit of lime. Along its upper surface there is a low rounded ridge which slopes down to the vertical sides and the base being horizontal the outline in transverse section is a pentagon. The wall is very thick and in its thickness, below the level of the lumen, is a canal on each side. When broken, the wall has a violet colour.

The worm measures 32 mm. in total length, the gills occupy 6 mm., the width of the thorax at its anterior end is 4·5 mm. and of the abdomen 2·5 mm.

The gills are spirally rolled in three whorls at their ventral portion ; the filaments are connected by a membrane for nearly half their length but the base is hidden by the high collar.

The collar, which is pressed against the gills, is especially high in its ventral region where its forward prolongation reaches to the level of the gill membrane. It is evidently much shrunken, for there are lines as of foldings here.

Dorsally the collar is widely interrupted and the lobes hidden by the expanded anterior portion of the thoracic membrane ; but on turning this aside, its attachment to the body-wall is exposed, below and behind the dorsal region of the collar. This dorsal region can scarcely be termed a " lobe," for it is quite continuous with the rest of the collar as there is no lateral incision separating it from the ventral region. As to the chaetae, there is nothing that I need add to the account by Ehlers ; but in the abdomen there is a structure which he seems to have overlooked and which seems to have some importance in relation to the peculiar plugging of the hinder end of the tube.

The diameter of the abdomen is uniform till quite close to the posterior end when its sides rather rapidly approach ; the dorsal surface is here smooth and without any sign of intersegmental furrows and the ventral is traversed by segmental glands in the form of narrow transverse ridges. At the point where the lateral contraction occurs the dorsum suddenly and abruptly bends downwards to form a spoon-shaped depression, the sides of which are also glandular and continuous with the ventral glands. The ventral surface curves upward, but not so abruptly as the dorsum, which it meets at the end of the " spoon " in a distinct point.

The ventral glands, as well as those at the sides of the " spoon," are distinctly whitish suggesting the secretion of lime ; at one point almost at the hindermost point there is a partially detached mass of white material, which is no doubt calcareous. I suggest that this curious structure secretes the material by which the tube is sealed posteriorly.

Locality.—South Trinidad Island, Station 36, shore between tide marks, July 26, 1912.

Distribution.—Florida Keys, Tortugas.

Genus CHITINOPOMOIDES, n. gen.

Chitinopomoides wilsoni, n. sp. (Pl. V, figs. 162–173.)

Generic Characters.—Without thoracic membrane; operculum with dark, horny, concave plate, collar chaetae with one large knob below the blade; thoracic chaetae with "*Salmacina*" bristles; abdominal chaetae "en cornet" with one angle produced; uncini with more than a dozen denticles above the large blunt fang.

A single specimen contained within its tube was found on the outer surface of the theca of a simple coral (? *Flabellum*), around which it coiled, close to the upper margin, with the free end of the tube projecting freely at right angles to its main course. The tube measures 1·5 mm. in diameter, has a compressed keel running along its middle line and one or two low rounded, indistinct and ill-defined ridges along the sides; the wall is thick and the mouth circular with its margin somewhat everted. I did not draw it before crushing it to remove the animal.

The operculum of the worm was projecting beyond the mouth of the tube; in attempting to extract the animal by pricking away the tube-wall with needles the peduncle was broken off at its origin; the gills which adhered closely to the wall were also broken, as was the body behind the thorax.

The total length of the worm was 25 mm. of which the gills accounted for 5 mm. and the thorax for 3 mm.; the diameter was 1·5 mm.

The gill plume appears to consist of about 14 filaments on each side, though as they are broken it is impossible to be sure of the exact number. The filament is broad and contains no skeleton; the barbules are long, but do not project beyond the end of the filament, which is here relatively short, thick, and slightly swollen at its apex.

The operculum is brown, horny, and concave with a black line round its edge. It is borne upon a subconical enlargement of the peduncle, which is partly constricted at two places by deep grooves which, however, extend only for about three-quarters of the circumference, and may be artifacts. The peduncle is smooth throughout and bears no processes of any kind; I am unable to determine where it springs from the gill base, but on the right side of the animal there is a loose fleshy process which may be the lower end of the peduncle.

The collar is flattened forward against the gills; it is a continuous membrane except for a deep incision in the dorsal mid-line; the ventral region is not incised but is here thin and pleated, forming as it were a flexible lower lip. There is no thoracic membrane; the thorax contains seven chaetigerous segments, including the collar. The collar chaetae form a greyish bundle which misled me, for under a dissecting microscope of low magnification I supposed at first that they were linear groups of eye-spots. The collar chaetae are of two kinds: (*a*) long, curved, and delicate with two narrow wings, of which the broader is coarsely toothed on the convex margin; and (*b*) about half a dozen long, stout bristles in the upper part of the bundle, each of which has a large blunt knob some distance below the point or commencement of the wing.*

In the other thoracic segments the bristles are yellow and are arranged in horizontal bundles without being in definite projecting parapodia. In these groups there are also two kinds of chaetae: (*a*) the majority are long, straight, two-winged, though only one wing is visible in a certain aspect; and (*b*) in the lower part of each bundle a few bristles "en faucille," but the denticulated margin is on the convex side so that it is scarcely a true "sickle." The blade, broader at its commencement where it is finely striated, tapers to a delicate point. It seems to be what de Saint Joseph terms a "*Salmacina*" bristle. The six uncinigerous neuropods are separated ventrally by the gland shields, paired and quadrate: on the first segment the gland shield is transversely divided into two so that there are four narrow elongated pads, an anterior and a posterior on each side.

The tori are flush with the surface of the body. The uncinus has a high basal plate, truncated below, with nearly vertical sides, one much higher than the other; it is transparent, colourless, finely striated, and bears 13–15 denticles above the large stout blunt tooth or process, which may be grooved on its under-face, but of this I am not sure.

When the uncinus is viewed from above there are seen to be two rows of denticles near the large tooth, increasing to four transverse rows at the opposite end.

The abdominal uncini, of which there are about thirty in a notopod, agree with this except that there are four to five transverse rows of denticles.

The neuropodial bristles are two per bundle, pale and almost colourless; the end is widened out to one side and terminates in a point. It seems to be "cupped" or a bristle "en cornet," one margin of which is prolonged to a fine point, the free edge being very finely denticulate or rather "frayed out."

Locality.—McMurdo Sound, Station 348, depth 200 fathoms.

Remarks.—In the absence of a thoracic membrane this worm agrees with the genera *Chitinopoma* and *Hyalopomatus*; from the latter it differs in having other than capilliform bristles in the thorax and abdomen, and from *Chitinopoma* in the form of the collar chaetae. The collar chaetae agree with those found in *Serpula*, *Hydroides*, and *Crucigera*, but from each of these it differs in possessing chaetae "en faucille" as in *Filograna*, from which, on the other hand, it differs in the form of the collar chaetae. The abdominal bristles being "en cornet" with one margin prolonged resemble those in the group *Pomatoceros*, *Spirobranchus*, etc., whereas in *Serpula* they are not so produced.

From these, however, it departs in the form of the collar bristles.

The uncini are quite unlike those of *Serpula* and others, but in the form of the large tooth it recalls *Pomatoceros*, though I do not feel sure that the tooth is here grooved.

* Unfortunately in attempting to isolate individual bristles for the purpose of drawing them under the camera, the collar bundle was torn away and swept off the slide, but I had already made a sketch of the characteristic features.

In short, the worm seems to combine the characters of two or more of the known genera and I have to make a new one.

In the form of the operculum it agrees, as I have noted above, with *Spirobranchus* and *Chitinopoma* and differs from some of the genera to which in its chaetal characters it approaches.

GENUS SPIRORBIS Daudin. sensu lato.

Amongst the material gathered by the "Terra Nova" from various localities I find a number of representatives of this genus which appear to belong to three or four species, but I find myself unable to identify them, owing partly to insufficient preservation of the worms, partly to the fact that some of the tubes do not contain any animal, and partly to the inherent difficulties presented by these small worms in spite of the work of Caullery and Mesnil, of Pixell and others in their diagnoses of the numerous species. I therefore report the facts about them so far as I can, and will refer to them merely by the letters A, B, C.

Spirorbis A. (Pl. VI, fig. 194.)

The tube is sinistral with greatest diameter of 1·5 and least 1·25 mm. It is a lowly ascending helicoidal spiral with the mouth directed upwards; the inner lip spreads out on the surface of the body whorl. The lower whorls are almost entirely hidden by the last or body whorl. There are two very distinct keels running along its upper surface, one near the inner margin, the other along the outer. There is no outward spreading of the shell substance at its attachment; the outer edge of the tube is slightly excavated and nearly vertically inclined to the stone to which it is attached. The lines of growth are very feebly indicated.

Locality.—New Zealand, Station 90, depth 100 fathoms.

Two species have been recorded from New Zealand, viz. *S. zelandica* (Dieffenbach, vol. 2, p. 295) and *S. perrieri* Caullery and Mesnil; this is highly variable and I am inclined to regard "A" as being their variety "*a*" of the latter species.

Spirorbis B. (Fig. 195.)

On the small thin valve of a Pecten of a dark-reddish colour. Dredged off Granite Harbour, there are a number of small tubes which may be sorted out into two varieties. Both are sinistral, but as they are all empty I cannot of course say whether there are any specific differences between them.

(*a*) One variety has flattened whorls with a depressed centre and as there is no umbilicus the whole course of the spire can be seen. The coil measures 2 mm. across. The surface is rather roughened, angular, with a keel along the middle. The margin of attachment spreads out over the substratum like a flange. The outer lip is produced.

(*b*) The second form is of about the same size, but the whorls are rounded and smooth except for the growth-lines which are well marked. The tube stands higher than does the form (*a*) and the centre is more depressed. The inner convexities of the successive whorls overlap one another to a greater extent: there is a less pronounced marginal flange of attachment: the outer lip is produced but to a less degree than in the other variety.

Since the character of the tube is known, in well-investigated species, to vary a good deal it is likely that these are merely two growth-forms of one species; but it seems rather remarkable that both should be fixed on one shell from which one may deduce that the nature of the substratum is of itself insufficient to account for such differences.

Locality.—McMurdo Sound, Station 356, depth 50 fathoms.

Three species have been described from the Antarctic and this may be *S. nordenskjoldi* Ehlers.

Spirorbis C. (Figs. 196–200.)

A piece of stone collected in a rock pool on the Island of South Trinidad presents several tubes which measure 1·5 mm., or even less, in diameter.

Some are dextral, others sinistral, but otherwise they agree in externals. The tube has two well-defined keels running along the upper surface of the outermost whorl, the inner margin of which has a sharply-defined edge. The fixing flange is obliquely striated and its edge denticulated. Only the outer whorl is visible, and there is a large umbilicus.

The tubes, or some of them, contained the worms, two of which were removed for examination. The form of the operculum is similar to that of *S. pusilla* Saint Joseph; there is a calcareous plate on the flattened top, with a thin calcareous rod passing down from it on one side nearly to the peduncle; the interior is filled with granules which may be the embryos broken down; and below the brood chamber is a space which seems to correspond with the "basilar plate," described by Caullery and Mesnil.

The collar is fairly high and is directed upwards. The thorax consists of three segments with two uncinigerous neuropods. The collar chaetae appear to be geniculate or perhaps "en cornet," with one angle produced. The other thoracic bristles are simple, slightly bent and winged.

The thoracic uncini are numerous, very delicate plates, but I regret that I am unable to give details. In the abdomen I do not see any chaetae till in the last few segments where there are "sickles" below a row of uncini.

The species agrees fairly well with that described as *S. corrugatus* by Caullery and Mesnil (p. 200), but Bush (p. 248) states that the dextral form described by them is distinct from the Irish species studied by her, which has a smooth tube and she suggests the name *pseudocorrugatus* for it.

I am unable to decide its specific name from the few observations I have been able to make.

Locality.—South Trinidad Island, Rock Pools, July 26, 1912.

Genus FILOGRANA Oken.

Filograna implexa Berkeley. (Pl. V, figs. 181–184.)

Protula dysteri Huxley, 1855, p. 113, pl. I, figs. 1–11; *Salmacina incrustans* Claparède, 1868, p. 176; *S. aedificatrix* Claparède, 1868, p. 519, pl. XIII, fig. 1; *S. australis* Haswell, 1884, p. 669, pl. XXXIII, figs. 7–11; *Filigrana huxleyi* Ehlers, 1887, p. 314, pl. LVI, figs. 4–9; ? *S. setosa* Langerhans, 1884, p. 276, pl. XVI, fig. 40; *S. dysteri* Pixell, 1913, p. 250; *S. dysteri* Rioja, 1923, p. 111; *S. australis* Augener, 1923, p. 106; *Filograna implexa* McIntosh, 1919, p. 125.

As far back as 1887 Ehlers (p. 320) in his account of *Filigrana* (*sic*) *huxleyi* suggested that the species for which Claparède had established the genus *Salmacina* should be transferred to Berkeley's genus and that therefore Claparède's would have to be suppressed. Nevertheless de Saint Joseph still (1894, p. 335) relied upon the presence of an operculum to differentiate the two. In 1919 Professor McIntosh gave a summary of all the records of the species included in these two genera and as a result of an examination of specimens from various parts of the world showed that the presence or absence of an operculum is not sufficiently constant, even in the same cluster of worms, to separate the species into two genera.

He points out (p. 151) that "on the same ground, as in Shetland, Moray Firth, and St. Andrews, some (worms) in the masses have and others do not have opercula." And later on in his paper he writes: "The difference in the various races of *Filograna* do not appear to be so great as to warrant specific separation and this is the more noteworthy in a species so widely distributed and so plastic" (p. 160).

Amongst foreign material he was able to examine Haswell's *S. australis* and failed to find sufficient evidence for its differentiation from the European form. In 1914 Augener (p. 160) likewise included the Australian worm under Huxley's title, but in a more recent memoir on the Auckland Island worms (1923, p. 106) he resuscitates Haswell's specific name for these southern forms, on the grounds of certain differences exhibited by the collar chaetae. His drawing of this bristle agrees precisely with my own observation which was made a couple of years before I received a copy of his paper. No doubt the number of teeth and their relative size do differ, but is it enough to separate the two forms as distinct species? I prefer to follow McIntosh whose experience is so wide and who has made the comparative studies referred to, and I accept his view as to the identity of the southern and northern forms.

The occurrence of the species on the coast of New Zealand is not unexpected, for Ehlers has recorded the presence of a "*Filigrana sp.*" from Foveaux Strait (1904, p. 72).

The material collected by the "Terra Nova" illustrates the two main characters of the "vermidom," as Huxley so aptly named the clusters of tubes; viz. that recorded from deeper water as described by Claparède under the title *S. aedificatrix* and that from shallow water which led him to form the species *S. incrustans*.

The material collected off the North Cape of New Zealand in depths of 70, 100, and

300 fathoms, consists of clusters and masses of these delicate white tubes. In one such vermidom the slightly undulating tubes run parallel with one another, but more usually they are intertwined to form clusters of irregular shape and of considerable size; the mouths of the tubes often diverge in groups and some of the tubes converge again and perhaps coalesce with other groups giving the appearance of a mass of branching and anastomosing tubes. Thus they form a network around objects such as calcareous Polyzoa, or sponges.

In the vermidom from Station 91, from a depth of 300 fathoms, the tubes are of rather greater diameter than usual, being as much as 1 mm. instead of 0·75 mm.; the mouth of the tube has a distinctly thickened and rounded margin which is slightly everted and the mouths form definite rings at intervals recalling the much more prominent rings of *Serpula vermicularis* var. *narconensis*. So different, indeed, do these tubes appear from those usually met with that it was not until I had examined the chaetae that I was assured of their identity. Moreover, this vermidom presents an unusual method of branching which I looked for in vain amongst other masses of tubes. I find that a tube gives rise to a new tube at the mouth. I give some sketches of this feature. In one instance a single tube comes away from an older tube at one of the former mouths; in another part I see two smaller tubes issuing from the end of one older tube.

On the other hand, the material from Spirits Bay, obtained from a depth of 11–20 fathoms, consists of a large number of old bivalve shells, *Glycimeris*, *Mesodesma*, etc., the interior of which is covered with slender tubes usually in a single plane. Sometimes these radiate from a common centre near the umbo of the valve, sometimes they run parallel for a short distance and then diverge, crossing one another in various directions. Only rarely are these tubes heaped in more than one plane or layer. They thus form a marked contrast to the free growing massive vermidoms from the deeper water. Nevertheless, even from 100 fathoms there are one or two small stones over which a few small tubes are creeping, so that the difference in habit is not really a matter of depth only, but of opportunity.

The worm was removed from some of the tubes either by crushing or by decalcification and they agree in their chaetigerous characters with the European species with one slight exception to be mentioned later.

The animal occupies but a very short portion of a tube in which it probably can move up and down. In a cluster I find the bodies lying in different directions, *i.e.* the heads are not all directed in the same way, though when the tubes are parallel and lying side by side the gills of all are directed similarly.

In most cases I find buds at various stages in the hinder end of the body.

I note that the gills of one lot are dark reddish-brown, another colourless. The gill filaments vary from 5 in number to 8, usually the latter. I examined some 20–30 individuals from different lots and could detect no sign of an operculum; but the terminal swellings with their two rows of gland cells enclosing a pit, so well figured and described by Ehlers (1887, pl. LVI, fig. 5) and by de Saint Joseph (1894, pl. XIII, fig. 376) are easily seen in specimens well preserved in alcohol when slightly compressed.

In some individuals from Station 90 I noted eye-spots on the 1st segment; four groups of 3 or 4 spots in each group, or two groups of 6–8 spots. But in those from Station 134 I was unable to detect any. Ehlers was likewise unable to find them in his *F. huxleyi* from Tortugas.

As to the thoracic chaetae, it is well known that in certain segments the dorsal bundle contains one or two special bristles termed "sickle-shaped," but in the present specimens this term seems scarcely applicable to their form. The bristle is bent just below the winged region, but this very delicate, transparent, and finely denticulated wing is on the convex side instead of on the concave. It is, in fact, bent in the reverse direction and in this respect recalled that figured by Ehlers (1887, pl. LVI, fig. 7) except that the teeth are not square as he shows them but have the usual fine points.

On examination of some specimens collected at Warrington, a few miles north of Dunedin, I find that these bristles are slightly curved in the more usual direction and that the teeth are on the concave side, but in none do I find so pronounced a curve as to entitle them to be termed "sickle-shaped." I can only suppose that the backward pressure exerted by the tubes from which the worm was withdrawn may have caused this difference in appearance. No doubt those figured for the European worm were from fresh material, whereas these are from worms which had been preserved while still within their tubes and the bundles of bristles are directed backwards and pressed against the tube-membrane, which remains after the solution of the lime by acid, when the bristles can be seen through the membrane.

Localities.—New Zealand, Stations 90, Off Three Kings Island, depth 100 fathoms; 91, ditto, depth 300 fathoms; 96, East of North Cape, depth 70 fathoms; 134, Spirits Bay, depth 11–20 fathoms.

Distribution.—North Sea; English Channel; Mediterranean; Red Sea; Madras Harbour; Tortugas; Indian Ocean; Gulf of St. Vincent; Gough Island; Auckland Island.

Genus PROTULA Risso.

Protula bispiralis (Savigny). (Pl. VI, figs. 191, 192.)

Serpula bispiralis Savigny, 1822, p. 75; *Protula bispiralis* Quartrefages, 1865), tome ii, p. 467; *Protula bispiralis* Ehlers, 1907, p. 31; *Protula bispiralis* Fauvel, 1922, p. 498, fig. 2.

In a recent paper on the Polychaetes collected at Abrolhos, Fauvel records the occurrence and gives an account of this species; he notes that since Savigny's account, which was amplified by de Quatrefages by examination of the same specimen, it has only been recorded once, and that by Ehlers, who studied a specimen collected in the sea round New Zealand and sent to him by me; and, further, that no one has yet described the tube of the worm.

Amongst the "Terra Nova" material a tube was dredged off the shores of New Zealand; so that I am able to fill this gap in our knowledge.

It is evidently an old tube, long deprived of its inhabitant, for on its inner surface are the tubes of small serpulids. The outer surface is waterworn where it has been exposed, but for the most part it is concealed by adherent organisms, such as encrusting Polyzoa, calcareous Algae, small Serpulids, Spirorbis, and other things.

It is broken at both ends; it is curved in a long S-shape and the curve near one end is very pronounced, so as to form almost an angle. Measured along the curve it is 200 mm. in length; or in a straight line 142 mm.; its external diameter is 12 mm., the thickness of the wall 2 mm. It is practically cylindrical, there being no tapering perceptible in such a short piece.

In addition to this fragment there is another, either of the same or of another tube; it has a much thinner wall but the obliquely broken ends do not fit either end of the long portion. It is oval in section, one diameter being 15 mm., the other 13 mm. Its length is 45 mm. It is probably part of the first piece though not a direct continuation of it.

Locality.—New Zealand, Station 90, depth 100 fathoms.

Distribution.—" Mer des Indes " (Savigny); Abrolhos (Fauvel).

Remarks.—As I have other examples, not only of the tube, but also of the worm, I may take this opportunity of giving a series of measurements, and in order to make this note as complete as possible I will refer to the previously recorded specimens.

The only reference to the colour of the worm is that by Savigny who states that when preserved it is " Gris blanchâtre, avec une teinte d' incarnat." But I am able to give its colour as it lives, for I was fortunate to be present when a specimen was dredged up in Port Pegasus, Stewart Island, and I made a note: " The gills are yellow with reddish base; the thoracic membrane is yellow; the body white."

Savigny's account of the external features suffices; de Quatrefages added nothing of importance to that account; Ehlers adds nothing to our knowledge beyond recording for the first time its occurrence in the sea round New Zealand; but Fauvel has given us figures of the chaetae.

Before I sent to Professor Ehlers a collection of New Zealand polychaetes which enabled him to issue the second part of his memoir on these annelids, I had written out a description of each of the worms as they came into my possession and drew figures of most of them, with the intention of publishing articles on the worms; but when Ehlers wrote asking me to send him samples of our polychaete fauna for comparison with those he was then working at, collected in the Antarctic Seas, I sent him examples of each species that I then had and refrained from writing them up myself. Amongst the material which I had in this way written up was a specimen of *P. bispiralis*, and in my notebook I find a MS. account of a much larger individual than any that has been recorded. It had been obtained in 40 fathoms of water off Timaru, in the South Island, and has been preserved since then in the museum of the University of Otago: it was withdrawn from its tube, which is mounted alongside; this specimen I will refer to as " A."

"B": A second specimen, was dredged in Port Pegasus, as above noted, during the expedition to the Sub-Antarctic islands of New Zealand in 1907. Its tube was not preserved. By some unaccountable oversight I omitted to refer to it in my report on the Polychaeta of the expedition.

"C": A third specimen was dredged off Stewart Island by the Hon. G. N. Thomson, F.L.S., in 1915; it is accompanied by its tube.

I have then three worms of this rare species. It appears that the gill plume is readily detachable, for in two of these it is lying in the phial beside the worm.*

MEASUREMENTS IN MM. OF THE FIVE KNOWN SPECIMENS OF *PROTULA BISPIRALIS.*

	Total Length.	Length of Thorax.	Length of Gills.	Breadth of Thorax.	Breadth of Abdomen.	No. of turns of Gill.
Savigny	125	—	37	20	—	8–9
Fauvel	60	—	12	10	—	6
A.	153	48	25	11	9	9
B.	135	40	32	13	9	7–8
C.	62	20	17	6·5	5	5

The breadth of the last three was taken at the collar and at the commencement of the abdomen respectively.

Savigny states that his specimen measured "$3\frac{1}{2}$ pouces" and the gills "$1\frac{1}{2}$ pouces," that is, the total would be "5 pouces." Taking a "pouce" to be 1 inch or 25 mm., I get the above numbers. Quatrefages, measuring the same specimen, gives the length as "8 centimetres" but does not say whether this includes the gills or not; but judging from his measurements of other worms that he gives, I believe that it is length of body exclusive of the gills; if this is so, there is a difference of 8 mm. in the two measurements, *i.e.* 80 mm. as against 88 mm., and no doubt de Quatrefages' would be the more accurate numbers.

Fauvel's measurement of the breadth includes the chaetae, which mine does not.

It thus appears that in Savigny's worm the gills are one-third of the total length; Fauvel's one-fifth; in A they are one-sixth; in B less than one-fourth; and in C more than one-fourth.

There is no need for me to say more than that my study of the bristles, made so long ago, agrees with what Fauvel has described.

The Tube.—In addition to the tube collected by the "Terra Nova" I have four others in this Museum, one of which may serve for the description of its general characters.

This tube D was obtained in Port Pegasus by Captain Bollons, Master of the Government steamer "Hinemoa," and it is from this tube that the animal forwarded by me to Ehlers was extracted.

The surface is fairly free from adherent foreign organisms and is very nearly

* Quite recently a small specimen in its tube was dredged in Foveaux Strait by Mr. Maxwell Young, Biologist to the Portobello Marine Fish Hatchery (July, 1926).

complete at its upper end. It tapers from a diameter of 11 mm. at this end, to 6·5 mm. at its lower end, which is broken, and we are ignorant as to the total length. It is more or less undulating, curved in various directions and in some regions abruptly curved. There is no evidence of coiling or of attachment, but probably, as in most other serpulids, it commences as a coil. The length measured along the curve is 280 mm., or in a straight line from end to end 240 mm.

The section is circular ; the surface smooth, but exhibits numerous closely set lines of growth. The animal has evidently great powers of repair, for at irregular intervals there are thick, irregular, and interrupted lines running round it, marking a break, beyond which the regular lines of growth are resumed.

Usually these " breaks " occur at a bend or commencement of a new curve, but occasionally no such curves are recognisable at these " breaks." The undulations and the curves do not lie in one plane, but there is no evidence of a regular spiral twist. Thus in the outline of the tube the region from O to A can be laid flat on the table, but the neighbouring regions will be above that plane.

So, too, the region A–C lies in a plane ; B–C in another ; so with D–E and E–F.

At the spot marked A there is a sign of a break in the original tube, an irregular line or low ridge encircles it, showing a prominent edge ; this repair has originated a new curve resulting in a distinct bend or sharp elbow. At B there is another such break, indicated by an angulated ridge crossing the tube. At C there is a slight ridge, which would be readily overlooked were it not for a change in the direction of the tube ; it was apparently a slight break and was soon repaired. At D is a sharp, almost an angular, bend ; yet no break is visible, for hereabouts there is a good deal of foreign matter which commences just above D and is continued downwards, chiefly a reddish calcareous Alga spreading over the surface. But at E, again, I can detect between these growths a slight ridge. It is, of course, not surprising that these breaks in the older parts of the tube should not be so distinct as those in the younger, as from the evidence of other tubes it is clear that the surface suffers a good deal of corrosion, so that even the normal lines of growth are wiped out.

But from the study of this and other tubes of *Protula* it seems that each new curve indicates a temporary cessation of growth due to the fracture of the tube and the need of using material for its repair. But what causes the tube to be fractured ? Embedded as they are in the sea floor, perhaps fish, attracted by the protruding yellow gill plume, attempt to devour the worm and merely break off a part of the tube.

The upper end is thinner than the lower where the wall is as much as 1 mm. in thickness ; the upper margin is, however, very thin and readily broken, even while it is being handled ; and I do not feel sure that the true margin of the mouth is present in any of the tubes ; but they all, like this one, have an irregular undulating thin edge.

The four tubes in our collection are as follows, some of them contained the worms already enumerated, others were obtained without the animal :

A. This belongs to the Timaru worm ; it is broken at each end so that it is quite short and shows only slight curvatures; but the natural "breaks" have been numerous and are close together and well marked. It is part of a very large tube as its diameter is 14 mm. with a thickness of wall of 2 mm.

B. This, which was collected off Stewart Island, has been on exhibition in this museum for more than twenty-seven years. It is the longest of our series, but is still very imperfect. It is somewhat bow-shaped, with a length along its outer curve of 305 mm. The lip is thin and apparently entire. It had recently been added to, for it projects slightly from a rough edge of the thicker wall, as if a considerable piece had been fractured, and the animal had had a very narrow escape from capture.

C. Belongs to the worm obtained by Mr. Thomson and still encloses the animal. It is nearly straight, bending a little near its lower end. In spite of its "youth" the surface is much corroded and does not show the fine growth-lines as well as longer tubes do. Its upper end shows an irregular, undulating, thin margin which appears to be the true mouth.

D. Is the tube that has already been described.

MEASUREMENTS OF TUBES OF *PROTULA BISPIRALIS*.

Specimen.	Length.	Diameter of Upper end.	Diameter of Lower end.	Thickness of wall at lower end.
"Terra Nova"	200	12	12	2
A (Timaru)	130	14	14	2
B (Stewart Island)	305	12	11	1·5
C (Thomson)	105	8·5	5	0·75
D (Bollons)	240	11	6·5	1

GENUS APOMATUS (Philippi) Mörch.

Apomatus lilliei, sp. n.* (Pl. IV, figs. 152–155.)

One specimen without gills and unaccompanied by any tube was contained in the same phial as *V. sphaeropomatus*.

The colourless body measures 20 mm. in length, of which the thorax occupies 5 mm. and has a breadth of 4 mm., and a height of 2 mm. The abdomen has, at its commencement, a width of 3 mm. and thence gradually tapers to the hinder end.

The collar, which is much torn, is stiff and upstanding round the absent base of the gill plume; it is undivided in the ventral mid-line while dorsally it spreads out into a huge lobe, but it is too imperfect for me to give details as to its shape. It is, however, continuous with a thoracic membrane behind the last thoracic segment.

The thorax contains seven chaetigerous segments; the bristles are carried by parapodia whose length is about equal to one-half of the diameter of the body here; and they project straight outwards.

The collar bristles form a small bundle and are directed backwards.

The notopodial bristles, including those of the collar, are long, yellow, slightly

* Mr. Dennis Lillie, the biologist on the ship.

curved with a feeble wing, very faintly striated. In the lower part of each bundle from the 3rd to the 7th inclusive, there are a few "sabre-shaped" or "*Apomatus*" bristles; these are shorter, broader, and less refringent than the others; colourless and more sharply curved, each presents a broad striated wing below the point of curvature, beyond which is a broad wing without any striations and often thrown into undulations.

The uncini are extremely thin plates of considerable height; the edge has numerous (at least 20) fine denticles in addition to the cephalic tooth or fang, which is nearly straight with its tip slightly upturned; the plate has a rounded base rather shorter than the length of the toothed edge, so that a bay is formed posteriorly by the backward prolongation of the upper margin; vertical striae originating at each of the denticles traverse the whole plate.

I am unable to state the length of the thoracic neuropod or the number of uncini contained in it, owing to the maceration of the ventral epidermis.

In the abdomen the notopod is a short quadrate lobe standing out obliquely from the side; the uncini have the same form as in the thorax but, as usual, are smaller and there is a great number of these thin plates.

The neuropodial chaetae differ in the anterior and posterior segments. In the anterior the two or three of each bundle are short, distinctly though but slightly bent, and with a striated and denticulated wing, which is colourless and transparent. Those of the posterior segments are long, simple capilliforms only slightly curved distally. I see no markings on them.

Locality.—New Zealand, Station 96, off the North Cape, depth 70 fathoms.

Remarks.—De Saint Joseph refers two species to this genus, namely, *A. enosimae* von Marenzeller (1884, p. 24) and "*Protula ampulliferum*" (?=*A. marioni* v. Mar.). The latter I know only from Philippi's brief diagnosis and it is evident that the present worm differs from it, as it does too from *A. enosimae*, whose proportions are different, as well as the various chaetae. It bears some resemblance to *A. similis* Marion and Bobretzy (1875), but there are differences in the bristles.

De Saint Joseph defines the genus (s. str.) (p. 363) as having in the abdomen chaetae "en faucille," and these are illustrated by Rioja (p. 114), but I do not find any curvature such as is implied by that term; at the same time the angle formed is not so marked as in typical "geniculate" bristles such as occur in the sub-genus *Apomatopsis*.

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EXPLANATION OF PLATES.

PLATE I.

N.B.—The chaetae are in the majority of instances drawn with camera lucida.

FIG. 1.—*Trypanosyllis gigantea;* the "Tetraglene" or epitokous phase. Anterior end, dorsal surface; (× 30 about). The cephalic lobes are represented as too circular; the dorsal bristles are more numerous than in the figure; the dorsal cirri are omitted from some of the segments for the sake of clearness.

FIGS. 2–8.—*Eurysyllis ehlersi.*

FIG. 2.—The entire fragment; camera outline (× 9).
FIG. 3.—Anterior end, drawn from a stained and cleared specimen (camera, × 20), showing some of the regions of the gut.
FIG. 4.—The head from the same preparation (× 80); the left palp is seen in its true position; the right one has been displaced while the worm was being mounted.
FIG. 5.—Ventral view of the head (× 80); showing the two palps widely separated at their bases.
FIG. 6.—One of the parapods from the genital region.
FIG. 7.—A ventral chaeta (× 520).
FIG. 8.—Ventral chaetae seen from the edge; (*a*) from the upper part of a bundle, (*b*) from the lower part (× 520).

FIGS. 9, 10.—*Exogone anomalochaeta.*

FIG. 9.—The 23rd foot (× 520); to show the arrangement of the chaetae.
FIG. 10.—The uppermost gomphotrich from the above foot (× 1000).

FIGS. 11–13.—*Lepidasthenia antipathicola.*

FIG. 11.—The head (× 20). The tentacles and some other features are copied from Professor McIntosh's pencil drawing.
FIG. 12.—A parapod (× 25); the dorsal cirrus is inserted from McIntosh's drawing.
FIG. 13.—The tip of a chaeta mounted in glycerine (× 180; camera).

FIGS. 14–20.—*Nemidia regalis.*

FIG. 14.—The head (× 20), the appendages on the left side are only partially indicated.
FIG. 15.—The 13th parapod; anterior face (× 20).
FIG. 16.—A dorsal chaeta (× 90).
FIG. 17.—A ventral chaeta (× 20).
FIG. 18.—Distal extremity of a dorsal chaeta (× 180): and (*a*) a portion much enlarged to show two "frills" partially encircling the shaft.
FIG 19.—One of the shorter ventral chaetae (× 180).
FIG. 20.—One of the longer ventral chaetae (× 180).

FIGS. 21, 22.—*Pterocirrus hunteri.*

FIG. 21.—Two bristles from the type (see Benham, 1921); taken from a posterior foot, to illustrate the biform nature of the chaetae in the species: (*a*) the uppermost is slenderer than (*b*) the subacicular chaetae (× 260).
FIG. 22.—The topmost bristle from a posterior foot; another aspect, showing the nearly equal lips of the articular cup.

FIGS. 23–26.—*Phyllodoce adarensis.*

FIG. 23.—The anterior end of the worm ; the peristomial cirri were lacking (enlarged).
FIG. 24.—A parapod (× 360).
FIG. 25.—The articular cup of a bristle ; one aspect (× 360).
FIG. 26.—The same from the opposite side (× 360).

FIGS. 27–31.—*Phyllodoce bowersi.*

FIG. 27.—The anterior end of the worm (enlarged).
FIG. 28.—A parapod (× 20).
FIG. 29.—A bristle (× 360).
FIG. 30.—The articular cup of a bristle showing the finger-shaped process on one side of it (× 360).
FIG. 31.—The other side of the same articulation seen by deeper focussing (× 360).

NOTE.—The author has omitted numbers 32 and 123 in the serial arrangement of his figures.

PLATE II.

FIGS. 33, 34.—*Sagitella kowalewskii.*

FIG. 33.—Side view of the anterior region (× 30, *circa*). The pharynx is everted ; four of the ventral cirri are detached and the cirrophores exposed. On the head, the structure marked (*a*) is the base of the palpode ; (*b*) the round median cushion on the hinder part of the prostomium ; (*c*) the oblique ridge.
FIG. 34.—Dorsal view of the same (× 35, camera outline). The prostomium is pressed forwards and downwards. Letters as above.

FIGS. 35–41.—*Paramarphysa parvipes.*

FIG. 35.—Prostomium and tentacles (camera, × 40).
FIG. 36.—An anterior parapod (× 80).
FIG. 37.—A posterior parapod (× 80).
FIG. 38.—A subacicular hooded hook from about the 100th segment (× 520).
FIG. 39.—A capilliform bristle from an anterior foot (× 520).
FIG. 40.—A gomphotrich or jointed hook, from an anterior foot (× 520).
FIG. 41.—A comb from the upper region of a posterior foot (× 520).

FIGS. 42–52.—*Aotearia sulcaticeps.*

FIG. 42.—Ventral view of the anterior region of the body (× 10).
FIG. 43.—Dorsal view of the head end (× 10).
FIG. 44.—The second parapod (× 80). The anterior lip is scarcely developed ; the posterior lip well marked.
FIG. 45.—The parapod from about the 10th segment (× 80), anterior face.
FIG. 46.—The parapod from the 60th segment, from the posterior face (× 80).
FIG. 47.—One of the winged bristles from a posterior foot (× 520).
FIG. 48.—A winged bristle from another aspect showing that there is a wing on each side of the shaft (× 520).
FIG. 49.—A hooded hook from the second foot ; note the extent of the hood on one side (× 520).
FIG. 50.—A hooded hook from the 10th and subsequent feet. The hood is symmetrically developed on the two sides (× 520).
FIG. 51.—Series of upper jawlets ; the left forceps being omitted (× 80).
FIG. 52.—Lower jawplates (× 80).
FIG. 53.—*Lumbriconereis brevicirra ;* view of the left side of two segments in mid-body showing the lateral groove in which the parapodia are situated (enlarged).

FIGS. 54–58.—*Notocirrus*, sp. indet.

FIG. 54.—A parapod, posterior face ; acicula omitted (× 90).
FIG. 55.—A parapod with bifurcated gill ; the acicula are shown, one entering the base of the gill (× 90).
FIG. 56.—The uppermost bristle, drawn *in situ* (× 260).
FIG. 57.—The subacicular chaeta (× 260). The one marked (*b*) was drawn while still attached to a foot ; but the others were loose in the preparation. The refringent "point" is sometimes longer than that shown at *b* ; it may be in line with the shaft, or at an angle ; in one case it formed a right angle ; it may even be bent as at (*d*).
FIG. 58.—The middle chaeta (× 260).

FIGS. 59, 60.—*Pista godfroyi.*

FIG. 59.—Ventral view of anterior extremity (× 10). The buccal segment is interrupted mesially ; and a great "tongue" is seen lying in the buccal cavity.
FIG. 60.—An uncinus (× 520).

FIGS. 61–69.—*Leaena wandelensis.*

FIG. 61.—A tube from Station 348, of the natural size, with the contained worm protruding from each end ; the sand wall carries characteristic tufts of sponge spicules at intervals (see pl. VI, figs. 189, 190).
FIG. 62.—Side view of a female worm from Station 348, showing the large size of the buccal "flap" (*a*) ; that of the enlarged glandular 2nd segment projects but little. The three patches of glandular (dotted) tissue are the walls of the genital pores.
FIG. 63.—Side view of another female (from Station 338) showing the "flap" of the 2nd segment more prominent and resembling the condition seen in Gravier's figure of the species, while the buccal flap is less developed than in Ehlers' figure.
FIG. 64.—Dorsal view of the worm. The 2nd segment is but little prominent.
FIG. 65.—Side view of the genital segments of a male. In this species the papillae are long slender tubes in the male.
FIG. 66.—Portion of a tube (see pl. VI, figs. 189, 190) in which the sand grains form definite ridges, looking as if they were spirally continuous ; but in reality as here, they are oblique and independent.
FIG. 67.—An uncinus from a posterior segment, in side view (× 1040).
FIG. 68.—The same from above.
FIG. 69.—Top view of an uncinus from an anterior segment (× 1040).

FIGS. 70–72.—*Travisia olens* var. *novae-zealandiae.*

FIG. 70.—The right side of the 10th segment (× 8) ; showing the gill (*g*) ; the two bundles of bristles ; the sense organ (*s.o.*) the nephridiopore (*n.p.*) behind and below the ventral bundle.
FIG. 71.—The 23rd segment (× 8). The glandular region has invaded the entire length of the segment, obliterating the annuli, and concealing the nephridiopore ; the glands project beyond the hinder margin of the segment as a couple of lobules.
FIG. 72.—The 30th segment (× 8). The glandular lobes now conceal the bristles ; the hinder margin of the gland is longitudinally furrowed producing the characteristic feature of the posterior extremity of the species.

PLATE III.

FIGS. 73–81.—*Melinnoides nelsoni.*

FIG. 73.—Dorsal, but rather oblique, view of the anterior region (camera, × 25) of a stained, cleared, and mounted individual. The single persisting gill is shown and the bases of attachment of the three others. The prostomium is compressed and somewhat distorted.
FIG. 74.—View of the left side of the specimen in alcohol ; that is while opaque (× 25 about freehand).
FIG. 75.—Ventral, but oblique, view of the stained specimen (× 25), (camera). The uncinigerous tori are seen on the left of the figure, but not on the right owing to the obliquity ; some of the tentacles are seen projecting from the mouth.

FIG. 76.—The posterior end (enlarged).
FIG. 77.—A tentacle (enlarged).
FIG. 78.—Uncinus (× 520).
FIG. 79.—Uncinus (freehand) seen obliquely from above and so showing the double series of denticles.
FIG. 80.—Uncinus from an anterior segment, from above (freehand).
FIG. 81.—Uncinus from a posterior segment, from above (freehand).

FIGS 82–86.—*Neosabellides elongatus.*

FIG. 82.—Dorsal view of the anterior end; gills on the right side are represented as having been cut away (× 5).
FIG. 83.—Ventral view of the same (× 5), a tentacle issues from the mouth.
FIG. 84.—Side view of the same (× 5).
FIG. 85.—A notopodial bristle (× 260).
FIG. 86.—An uncinus, side and top aspects (× 520).

FIGS. 87–93.—*Anobothrus patagonica.*

FIG. 87.—The entire animal (× 5). The gills were lacking; the posterior end is upturned and clasped between it and the body is a tentacle.
FIG. 88.—The anterior end; from above (× 20). The tentacles are omitted.
FIG. 89.—The anterior end, ventral aspect (× 20). Four tentacles project from the mouth.
FIG. 90.—Side view of the same (× 20). The base of the nearest gill is seen.
FIG. 91.—An uncinus, side view, from the 12th thoracic torus (× 520).
FIG. 92.—The same from above (freehand).
FIG. 93.—An uncinus from the last abdominal torus (× *circa* 600, freehand).

FIGS. 94–99.—*Amage sculpta.*

FIG. 94.—Anterior end, side view (× 8). The sub-quadrangular plate (*a*) of the prostomium and the swollen lateral margin (*b*) are pressed down against the buccal segment (*c*); the branchial segment (*d*) is longitudinally ridged.
FIG. 95.—Dorsal view; the prostomium is fully exposed by pressing backward the branchial segment (× 8). Letters as above.
FIG. 96.—Posterior end of the worm (× 4).
FIG. 97.—Dorsal aspect of the anterior end (× 8). Letters as above.
FIG. 98.—Uncinus in side view (× 260).
FIG. 99.—The same from above (× 520).

FIGS. 100–107.—*Jasmineira scotti.*

FIG. 100.—Anterior end, side view (× 8). The gills are represented as having been cut short.
FIG. 101.—Dorsal view (× 8).
FIG. 102.—A thoracic parapod with capilliform and paddle chaetae (× 260).
FIG. 103.—A paddle chaeta (× 260).
FIG. 104.—A thoracic uncinus (× 260).
FIG. 105.—The free end of the same (× 520).
FIG. 106.—Abdominal uncinus, side view (× 520).
FIG. 107.—The same from above (× 520).

FIGS. 108–115.—*Sabella aberrans.*

FIG. 108.—Side view of the anterior end (× 8).
FIG. 109.—Dorsal view of the same (× 8). The great dorsal lobes meet above and form a deep recess or cavern closed at its anterior end by the union of the base of these folds; from in front of them there projects a process with eye-like spots.
FIG. 110.—A collar chaeta (× 260).

FIG. 111.—A thoracic chaeta ($\times$ 260).
FIG. 112.—The same from another aspect showing that the wing is double ($\times$ 260).
FIG. 113.—An abdominal chaeta ($\times$ 260)
FIG. 114.—Uncinus with its accompanying "pickaxe" bristle (freehand).
FIG. 115.—Two views of a "pickaxe" chaeta. The "head" is marked by fine parallel ridges and the "pick" is inserted in a deep notch (freehand).

PLATE IV.

FIGS. 116–122.—*Sabella oatesiana.*

FIG. 116.—One of the longer thoracic bristles ($\times$ 260).
FIG. 117.—One of the shorter thoracic bristles from the lower part of the bundle ($\times$ 260).
FIG. 118.—An abdominal bristle ($\times$ 260).
FIG. 119.—A "pickaxe" chaeta in side view ($\times$ 520).
FIG. 120.—The same seen obliquely to show the mode of articulation of the terminal plate ($\times$ 520).
FIG. 121.—A thoracic uncinus ($\times$ 260).
FIG. 122.—An abdominal uncinus ($\times$ 260).

FIGS. 124, 125.—*Dasychone cingulata* var. *curta.*

FIG. 124.—Anterior end from the ventral aspect of a specimen collected in Otago Harbour showing regeneration of the gill plume and of the thorax; the latter being represented by the three short (and in the specimen) uncoloured segments without chaetae, in front of the deeply pigmented abdominal region (enlarged).
FIG. 125.—One of the segmental eyes, the lens is directed posteriorly in the animal and is surrounded by uniform pale brown pigment, the rest of the eye-spot being of dark purplish dots.

FIGS. 126–130.—*Euchone pallida.*

FIG. 126.—Dorsal aspect of the anterior end, the gills being shown as if cut short; the margins of the dorsal region of the collar are separated so as to expose the greater part of the large "Nuchal gland" ($\times$ 4).
FIG. 127.—Ventral view of the same ($\times$ 4). In front of the large ventral gland shields the edges of the collar overlap one another.
FIG. 128.—Hinder end dorsal surface ($\times$ 5), showing the extent of groove bounded by the paired "caudal membranes."
FIG. 129.—Side view of a specimen in which the membranes are nearly vertical, closed over the groove ($\times$ 5).
FIG. 130.—Dorsal view of the same in an individual in which the membranes are spread outwards; the segments being contracted ($\times$ 4).

FIGS. 131–136.—*Serpula,* species A.

FIG. 131.—The gill plume and 1st segment, seen dorso-laterally (camera).
FIG. 132.—A collar chaeta ($\times$ 520).
FIG. 133.—Another collar chaeta (freehand).
FIG. 134.—An abdominal bristle.
FIG. 135.—A chaeta from lower portion of a thoracic bundle, from two aspects (much enlarged).
FIG. 136.—An uncinus (freehand).

FIGS. 137–141.—*Serpula,* species B.

FIG. 137.—The tube from the side ($\times$ 2).
FIG. 138.—The tube from above ($\times$ 2).
FIG. 139.—A collar bristle ($\times$ 180).
FIG. 140.—Uncinus (freehand).
FIG. 141.—Abdominal chaeta "en cornet" ($\times$ 520).

FIGS. 142–146.—*Vermilia sphaeropomatus.*

FIG. 142.—Side view of the entire worm ($\times$ 4).
FIG. 143.—Dorsal aspect of the anterior end ; the gills are represented as if truncated ($\times$ 4).
FIG. 144.—Ventral aspect of the same ($\times$ 4).
FIG. 145.—A thoracic uncinus ($\times$ 520).
FIG. 146.—An abdominal chaeta ($\times$ 520).

FIGS. 147–151.—*Vermilia producta.*

FIG. 147.—Portion of the tube ($\times$ 4).
FIG. 148.—An abdominal chaeta.
FIG. 149.—Anterior end of the fragment seen obliquely from the dorsal aspect ($\times$ 8).
FIG. 150.—An uncinus ($\times$ 520).
FIG. 151.—A thoracic bristle from two aspects.

FIGS. 152–155.—*Apomatus lilliei.*

FIG. 152.—A thoracic bristle ($\times$ 520).
FIG. 153.—An anterior abdominal bristle ($\times$ 520).
FIG. 154.—Abdominal uncinus ($\times$ 520).
FIG. 155.—An " Apomatus " bristle from the 3rd bundle ($\times$ 520).

PLATE V.

FIGS. 156–161.—*Zopyrus maoricus.*

FIG. 156.—The tube fixed to a stone along its entire length ($\times 3\frac{1}{2}$).
FIG. 157.—Portion of the tube showing on the right an older region with a flat surface and to the left a younger region rounded above (enlarged).
FIG. 158.—The anterior end of the worm ($\times$ 30).
FIG. 159.—An abdominal " cupped " chaeta ($\times$ 520).
FIG. 160.—Abdominal uncinus, side and top views (freehand).
FIG. 161.—A collar chaeta ($\times$ 360).

FIGS. 162–173.—*Chitinopomoides wilsoni.*

FIG. 162.—The operculum ($\times$ 16).
FIG. 163.—Side view of the thorax, gill plume omitted ($\times$ 8).
FIG. 164.—Ventral view of anterior thoracic segments ($\times$ 8).
FIG. 165.—A gill filament.
FIG. 166.—One of the longer collar bristles ($\times$ 520), with a front view of the " moignon " at (*a*).
FIG. 167.—A thoracic bundle showing the winged bristles and the " soies en faucille " ($\times$ 40).
FIG. 168.—One of the " soies en faucille " ($\times$ 520).
FIG. 169.—One of the upper, longer thoracic bristles ($\times$ 520).
FIG. 170.—A thoracic uncinus ($\times$ 520).
FIG. 171.—The same from above (freehand).
FIG. 172.—Abdominal uncinus from above (freehand).
FIG. 173.—An abdominal " cupped " chaeta ($\times$ 520).

FIGS. 174–180.—*Pomatoceros terrae-novae.*

FIG. 174.—A portion of a group of tubes ; the purple line is indicated by the row of short oblique lines on each side of the keel ($\times$ 4).
FIG. 175.—Transverse section as seen from in front, with keel and the basal flanges ($\times$ 8).
FIG. 176.—Portion of the upper surface of the tube showing the undulating keel and the two lines of purple spots (enlarged).

FIG. 177.—The operculum ($\times$ 8).
FIG. 178.—An uncinus from above and from the side ($\times$ 520).
FIG. 179.—Abdominal chaeta ($\times$ 520).
FIG. 180.—A thoracic chaeta ($\times$ 520).

FIGS. 181–184.—*Filograna implexa.*

FIG. 181.—The end of a tube showing budding at the mouth; from two aspects ($\times$ 4).
FIG. 182.—A similar tube in which the two budded tubes have grown longer ($\times$ 4).
FIG. 183.—A collar bristle (much enlarged).
FIG. 184.—A "sickle" bristle from the thorax (much enlarged).

FIGS. 185–188.—*Spirobranchus tricornis.*

FIG. 185.—Transverse section of the tube ($\times$ 2).
FIG. 186.—Dorsal view of the anterior end; the base of the thick opercular peduncle is seen between the gill bases; the thoracic membrane is on the left turned aside and shows the independence of the collar ($\times$ 5).
FIG. 187.—Hinder extremity from the dorsal aspect. The spoon-shaped depression at the hinder end is bounded on either side by glands, in front of which are seen the uncinigerous tori ($\times$ 8).
FIG. 188.—Side view of the same region; the ventral gland shields reach up to the tori, but when these cease they reach to the margin of the dorsal "spoon" ($\times$ 8).

PLATE VI.

FIG. 189.—*Leaena wandelensis.* Portion of a tube from Station 348 (figured on pl. III, fig. 61). The wall of sand grains is traversed by ridges of sand assuming a spiral course, from which tufts of sponge spicules project. The sandy wall is thin between these ridges and allows the underlying membrane to be seen when stretched by the contained worm ($\times$ 6).
FIG. 190.—Tube of another individual of *L. wandelensis*, from Station 339, in which the ridges are less developed. A portion of a similar tube is figured on pl. III, fig. 62) ($\times$ 2).
FIG. 191.—Tube of *Protula bispiralis* ($\times \frac{1}{2}$). This is tube "D" referred to in the text, from Port Pegasus, Stewart Island. At each of the points lettered there has been a break and the newly formed portion takes a new direction, so that the consecutive regions lie in different planes.
FIG. 192.—*P. bispiralis*, tube obtained by the "Terra Nova" (nat. size). L, lower end; U, upper end of fragment.
FIG. 193.—*Pista godfroyi.* Portion of a tube showing the sandy cones supporting sponge spicules (enlarged).
FIG. 194.—*Spirorbis* from New Zealand, Station 90 ($\times$ 16).
FIG. 195.—*Spirorbis* from McMurdo Sound ($\times$ 16).
FIG. 196.—*Spirorbis* from South Trinidad Island ($\times$ 13).
FIG. 197.—The operculum of the same.
FIG. 198.—A collar bristle from the same.
FIG. 199.—A thoracic bristle.
FIG. 200.—An abdominal bristle.

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PLATE I.

N.B.—The chaetae are in the majority of instances drawn with camera lucida.

FIG. 1.—*Trypanosyllis gigantea;* the "Tetraglene" or epitokous phase. Anterior end, dorsal surface; (× 30 about). The cephalic lobes are represented as too circular; the dorsal bristles are more numerous than in the figure; the dorsal cirri are omitted from some of the segments for the sake of clearness.

Eurysyllis ehlersi.

FIG. 2.—The entire fragment; camera outline (× 9).
FIG. 3.—Anterior end, drawn from a stained and cleared specimen (camera, × 20), showing some of the regions of the gut.
FIG. 4.—The head from the same preparation (× 80); the left palp is seen in its true position; the right one has been displaced while the worm was being mounted.
FIG. 5.—Ventral view of the head (× 80); showing the two palps widely separated at their bases.
FIG. 6.—One of the parapods from the genital region.
FIG. 7.—A ventral chaeta (× 520).
FIG. 8.—Ventral chaetae seen from the edge; (*a*) from the upper part of a bundle, (*b*) from the lower part (× 520).

Exogone anomalochaeta.

FIG. 9.—The 23rd foot (× 520); to show the arrangement of the chaetae.
FIG. 10.—The uppermost gomphotrich from the above foot (× 1000).

Lepidasthenia antipathicola.

FIG. 11.—The head (× 20). The tentacles and some other features are copied from Professor McIntosh's pencil drawing.
FIG. 12.—A parapod (× 25); the dorsal cirrus is inserted from McIntosh's drawing.
FIG. 13.—The tip of a chaeta mounted in glycerine (× 180; camera).

Nemidia regalis.

FIG. 14.—The head (× 20), the appendages on the left side are only partially indicated.
FIG. 15.—The 13th parapod; anterior face (× 20).
FIG. 16.—A dorsal chaeta (× 90).
FIG. 17.—A ventral chaeta (× 20).
FIG. 18.—Distal extremity of a dorsal chaeta (× 180): and (*a*) a portion much enlarged to show two "frills" partially encircling the shaft.
FIG 19.—One of the shorter ventral chaetae (× 180).
FIG. 20.—One of the longer ventral chaetae (× 180).

Pterocirrus hunteri.

FIG. 21.—Two bristles from the type (see Benham, 1921); taken from a posterior foot, to illustrate the biform nature of the chaetae in the species: (*a*) the uppermost is slenderer than (*b*) the sub-acicular chaetae (× 260).
FIG. 22.—The topmost bristle from a posterior foot; another aspect, showing the nearly equal lips of the articular cup.

Phyllodoce adarensis.

FIG. 23.—The anterior end of the worm; the peristomial cirri were lacking (enlarged).
FIG. 24.—A parapod (× 360).
FIG. 25.—The articular cup of a bristle; one aspect (× 360).
FIG. 26.—The same from the opposite side (× 360).

Phyllodoce bowersi.

FIG. 27.—The anterior end of the worm (enlarged).
FIG. 28.—A parapod (× 20).
FIG. 29.—A bristle (× 360).
FIG. 30.—The articular cup of a bristle showing the finger-shaped process on one side of it (× 360).
FIG. 31.—The other side of the same articulation seen by deeper focussing (× 360).

NOTE.—The author has omitted numbers 32 and 123 in the serial arrangement of his figures.

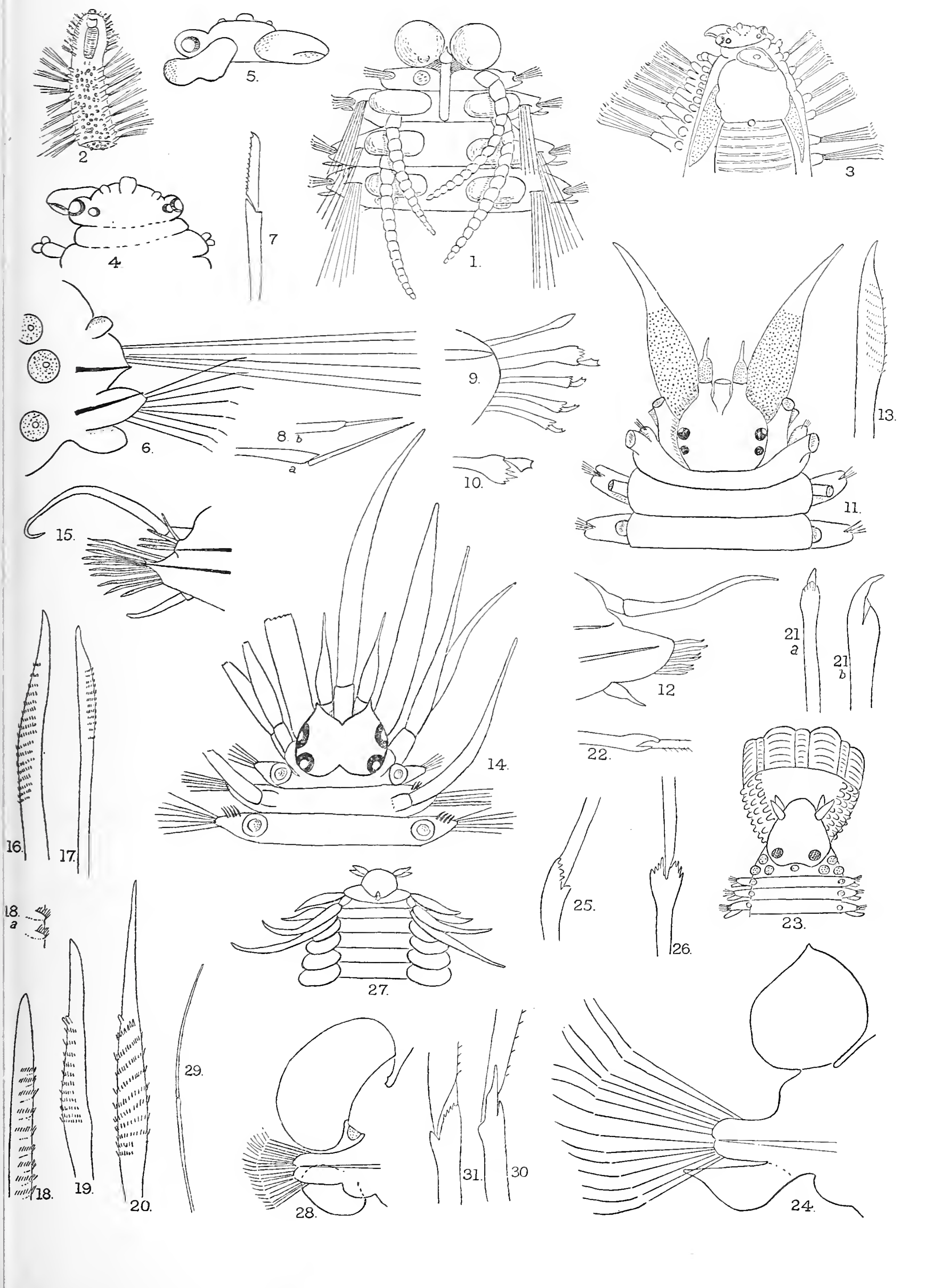

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FIG. 66.—Portion of a tube (see pl. VI, figs. 189, 190) in which the sand grains form definite ridges, looking as if they were spirally continuous; but in reality as here, they are oblique and independent.
FIG. 67.—An uncinus from a posterior segment, in side view (× 1040).
FIG. 68.—The same from above.
FIG. 69.—Top view of an uncinus from an anterior segment (× 1040).

Travisia olens var. *novae-zealandiae.*

FIG. 70.—The right side of the 10th segment (× 8); showing the gill (*g*); the two bundles of bristles; the sense organ (*s.o.*) the nephridiopore (*n.p.*) behind and below the ventral bundle.
FIG. 71.—The 23rd segment (× 8). The glandular region has invaded the entire length of the segment, obliterating the annuli, and concealing the nephridiopore; the glands project beyond the hinder margin of the segment as a couple of lobules.
FIG. 72.—The 30th segment (× 8). The glandular lobes now conceal the bristles; the hinder margin of the gland is longitudinally furrowed producing the characteristic feature of the posterior extremity of the species.

PLATE II.

Sagitella kowalewskii.

FIG. 33.—Side view of the anterior region (× 30, *circa*). The pharynx is everted; four of the ventral cirri are detached and the cirrophores exposed. On the head, the structure marked (*a*) is the base of the palpode; (*b*) the round median cushion on the hinder part of the prostomium; (*c*) the oblique ridge.

FIG. 34.—Dorsal view of the same (× 35, camera outline). The prostomium is pressed forwards and downwards. Letters as above.

Paramarphysa parvipes.

FIG. 35.—Prostomium and tentacles (camera, × 40).

FIG. 36.—An anterior parapod (× 80).

FIG. 37.—A posterior parapod (× 80).

FIG. 38.—A subacicular hooded hook from about the 100th segment (× 520).

FIG. 39.—A capilliform bristle from an anterior foot (× 520).

FIG. 40.—A gomphotrich or jointed hook, from an anterior foot (× 520).

FIG. 41.—A comb from the upper region of a posterior foot (× 520).

Aotearia sulcaticeps.

FIG. 42.—Ventral view of the anterior region of the body (× 10).

FIG. 43.—Dorsal view of the head end (× 10).

FIG. 44.—The second parapod (× 80). The anterior lip is scarcely developed; the posterior lip well marked.

FIG. 45.—The parapod from about the 10th segment (× 80), anterior face.

FIG. 46.—The parapod from the 60th segment, from the posterior face (× 80).

FIG. 47.—One of the winged bristles from a posterior foot (× 520).

FIG. 48.—A winged bristle from another aspect showing that there is a wing on each side of the shaft (× 520).

FIG. 49.—A hooded hook from the second foot; note the extent of the hood on one side (× 520).

FIG. 50.—A hooded hook from the 10th and subsequent feet. The hood is symmetrically developed on the two sides (× 520).

FIG. 51.—Series of upper jawlets; the left forceps being omitted (× 80).

FIG. 52.—Lower jawplates (× 80).

FIG. 53.—*Lumbriconereis brevicirra;* view of the left side of two segments in mid-body showing the lateral groove in which the parapodia are situated (enlarged).

Notocirrus, sp. indet.

FIG. 54.—A parapod, posterior face; acicula omitted (× 90).

FIG. 55.—A parapod with bifurcated gill; the acicula are shown, one entering the base of the gill (× 90).

FIG. 56.—The uppermost bristle, drawn *in situ* (× 260).

FIG. 57.—The subacicular chaeta (× 260). The one marked (*b*) was drawn while still attached to a foot; but the others were loose in the preparation. The refringent " point " is sometimes longer than that shown at *b*; it may be in line with the shaft, or at an angle; in one case it formed a right angle; it may even be bent as at (*d*).

FIG. 58.—The middle chaeta (× 260).

Pista godfroyi.

FIG. 59.—Ventral view of anterior extremity (× 10). The buccal segment is interrupted mesially; and a great " tongue " is seen lying in the buccal cavity.

FIG. 60.—An uncinus (× 520).

Leaena wandelensis.

FIG. 61.—A tube from Station 348, of the natural size, with the contained worm protruding from each end; the sand wall carries characteristic tufts of sponge spicules at intervals (see pl. VI, figs. 189, 190).

FIG. 62.—Side view of a female worm from Station 348, showing the large size of the buccal " flap " (*a*); that of the enlarged glandular 2nd segment projects but little. The three patches of glandular (dotted) tissue are the walls of the genital pores.

FIG. 63.—Side view of another female (from Station 338) showing the " flap " of the 2nd segment more prominent and resembling the condition seen in Gravier's figure of the species, while the buccal flap is less developed than in Ehlers' figure.

FIG. 64.—Dorsal view of the worm. The 2nd segment is but little prominent.

FIG. 65.—Side view of the genital segments of a male. In this species the papillae are long slender tubes in the male.

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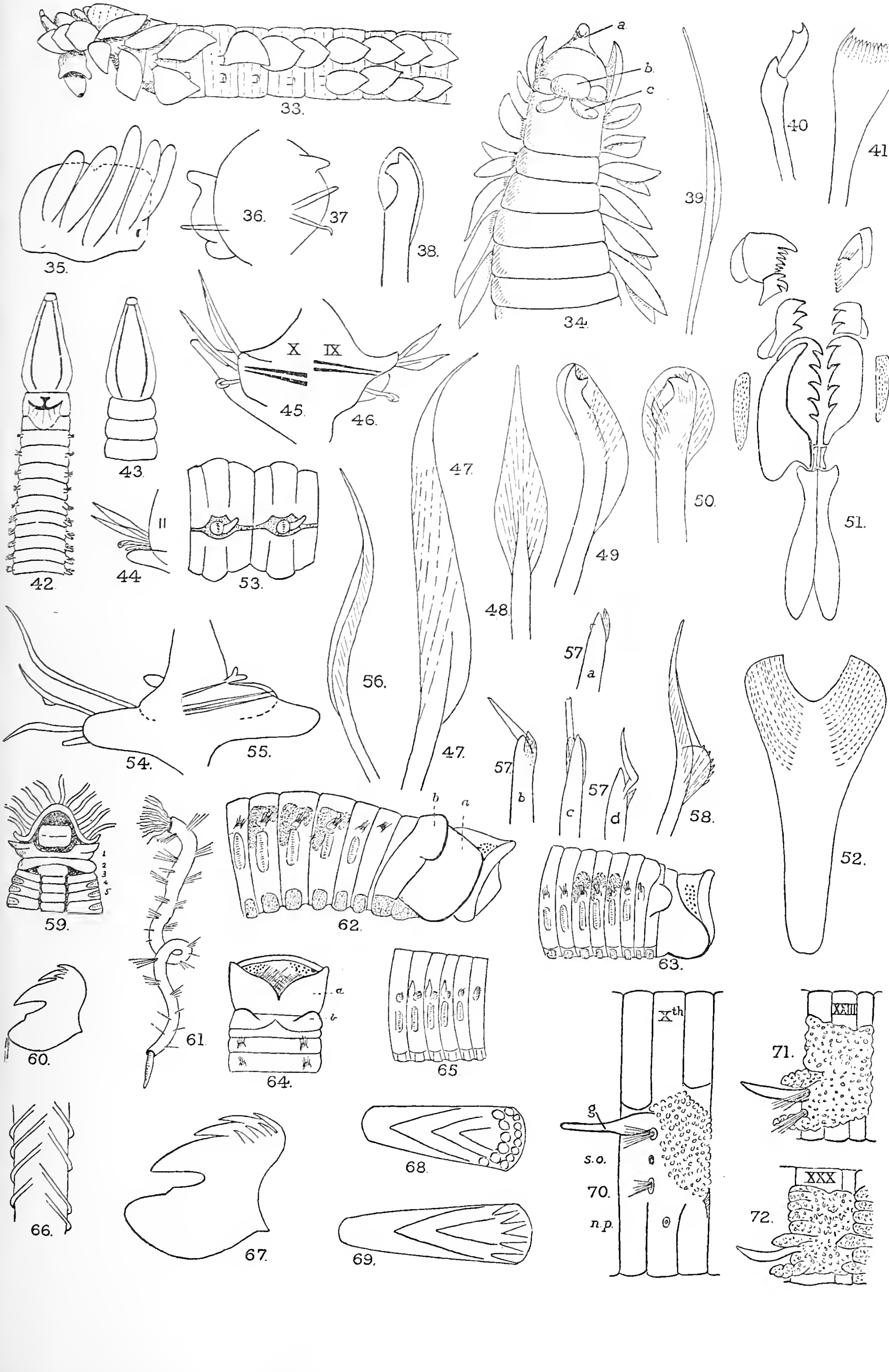
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PLATE III.

Melinnoides nelsoni.

FIG. 73.—Dorsal, but rather oblique, view of the anterior region (camera, × 25) of a stained, cleared, and mounted individual. The single persisting gill is shown and the bases of attachment of the three others. The prostomium is compressed and somewhat distorted.

FIG. 74.—View of the left side of the specimen in alcohol; that is while opaque (× 25 about freehand).

FIG. 75.—Ventral, but oblique, view of the stained specimen (× 25), (camera). The uncinigerous tori are seen on the left of the figure, but not on the right owing to the obliquity; some of the tentacles are seen projecting from the mouth.

FIG. 76.—The posterior end (enlarged).

FIG. 77.—A tentacle (enlarged).

FIG. 78.—Uncinus (× 520).

FIG. 79.—Uncinus (freehand) seen obliquely from above and so showing the double series of denticles.

FIG. 80.—Uncinus from an anterior segment, from above (freehand).

FIG. 81.—Uncinus from a posterior segment, from above (freehand).

Neosabellides elongatus.

FIG. 82.—Dorsal view of the anterior end; gills on the right side are represented as having been cut away (× 5).

FIG. 83.—Ventral view of the same (× 5), a tentacle issues from the mouth.

FIG. 84.—Side view of the same (× 5).

FIG. 85.—A notopodial bristle (× 260).

FIG. 86.—An uncinus, side and top aspects (× 520).

Anobothrus patagonica.

FIG. 87.—The entire animal (× 5). The gills were lacking; the posterior end is upturned and clasped between it and the body is a tentacle.

FIG. 88.—The anterior end; from above (× 20). The tentacles are omitted.

FIG. 89.—The anterior end, ventral aspect (× 20). Four tentacles project from the mouth.

FIG. 90.—Side view of the same (× 20). The base of the nearest gill is seen.

FIG. 91.—An uncinus, side view, from the 12th thoracic torus (× 520).

FIG. 92.—The same from above (freehand).

FIG. 93.—An uncinus from the last abdominal torus (× *circa* 600, freehand).

Amage sculpta.

FIG. 94.—Anterior end, side view (× 8). The sub-quadrangular plate (*a*) of the prostomium and the swollen lateral margin (*b*) are pressed down against the buccal segment (*c*); the branchial segment (*d*) is longitudinally ridged.

FIG. 95.—Dorsal view; the prostomium is fully exposed by pressing backward the branchial segment (× 8). Letters as above.

FIG. 96.—Posterior end of the worm (× 4).

FIG. 97.—Dorsal aspect of the anterior end (× 8). Letters as above.

FIG. 98.—Uncinus in side view (× 260).

FIG. 99.—The same from above (× 520).

Jasmineira scotti.

FIG. 100.—Anterior end, side view (× 8). The gills are represented as having been cut short.

FIG. 101.—Dorsal view (× 8).

FIG. 102.—A thoracic parapod with capilliform and paddle chaetae (× 260).

FIG. 103.—A paddle chaeta (× 260).

FIG. 104.—A thoracic uncinus (× 260).

FIG. 105.—The free end of the same (× 520).

FIG. 106.—Abdominal uncinus, side view (× 520).

FIG. 107.—The same from above (× 520).

Sabella aberrans.

FIG. 108.—Side view of the anterior end (× 8).

FIG. 109.—Dorsal view of the same (× 8). The great dorsal lobes meet above and form a deep recess or cavern closed at its anterior end by the union of the base of these folds; from in front of them there projects a process with eye-like spots.

FIG. 110.—A collar chaeta (× 260).

FIG. 111.—A thoracic chaeta (× 260).

FIG. 112.—The same from another aspect showing that the wing is double (× 260).

FIG. 113.—An abdominal chaeta (× 260)

FIG. 114.—Uncinus with its accompanying "pickaxe" bristle (freehand).

FIG. 115.—Two views of a "pickaxe" chaeta. The "head" is marked by fine parallel ridges and the "pick" is inserted in a deep notch (freehand).


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PLATE IV.

Sabella oatesiana.

Fig. 116.—One of the longer thoracic bristles (× 260).
Fig. 117.—One of the shorter thoracic bristles from the lower part of the bundle (× 260).
Fig. 118.—An abdominal bristle (× 260).
Fig. 119.—A "pickaxe" chaeta in side view (× 520).
Fig. 120.—The same seen obliquely to show the mode of articulation of the terminal plate (× 520).
Fig. 121.—A thoracic uncinus (× 260).
Fig. 122.—An abdominal uncinus (× 260).

Dasychone cingulata var. *curta.*

Fig. 124.—Anterior end from the ventral aspect of a specimen collected in Otago Harbour showing regeneration of the gill plume and of the thorax; the latter being represented by the three short (and in the specimen) uncoloured segments without chaetae, in front of the deeply pigmented abdominal region (enlarged).

Fig. 125.—One of the segmental eyes, the lens is directed posteriorly in the animal and is surrounded by uniform pale brown pigment, the rest of the eye-spot being of dark purplish dots.

Euchone pallida.

Fig. 126.—Dorsal aspect of the anterior end, the gills being shown as if cut short; the margins of the dorsal region of the collar are separated so as to expose the greater part of the large "Nuchal gland" (× 4).

Fig. 127.—Ventral view of the same (× 4). In front of the large ventral gland shields the edges of the collar overlap one another.

Fig. 128.—Hinder end dorsal surface (× 5), showing the extent of groove bounded by the paired "caudal membranes."

Fig. 129.—Side view of a specimen in which the membranes are nearly vertical, closed over the groove (× 5).

Fig. 130.—Dorsal view of the same in an individual in which the membranes are spread outwards; the segments being contracted (× 4).

Serpula, species A.

Fig. 131.—The gill plume and 1st segment, seen dorso-laterally (camera).
Fig. 132.—A collar chaeta (× 520).
Fig. 133.—Another collar chaeta (freehand).
Fig. 134.—An abdominal bristle.
Fig. 135.—A chaeta from lower portion of a thoracic bundle, from two aspects (much enlarged).
Fig. 136.—An uncinus (freehand).

Serpula, species B.

Fig. 137.—The tube from the side (× 2).
Fig. 138.—The tube from above (× 2).
Fig. 139.—A collar bristle (× 180).
Fig. 140.—Uncinus (freehand).
Fig. 141.—Abdominal chaeta "en cornet" (× 520).

Vermilia sphaeropomatus.

Fig. 142.—Side view of the entire worm (× 4).
Fig. 143.—Dorsal aspect of the anterior end; the gills are represented as if truncated (× 4).
Fig. 144.—Ventral aspect of the same (× 4).
Fig. 145.—A thoracic uncinus (× 520).
Fig. 146.—An abdominal chaeta (× 520).

Vermilia producta.

Fig. 147.—Portion of the tube (× 4).
Fig. 148.—An abdominal chaeta.
Fig. 149.—Anterior end of the fragment seen obliquely from the dorsal aspect (× 8).
Fig. 150.—An uncinus (× 520).
Fig. 151.—A thoracic bristle from two aspects.

Apomatus lilliei.

Fig. 152.—A thoracic bristle (× 520).
Fig. 153.—An anterior abdominal bristle (× 520).
Fig. 154.—Abdominal uncinus (× 520).
Fig. 155.—An "Apomatus" bristle from the 3rd bundle (× 520).

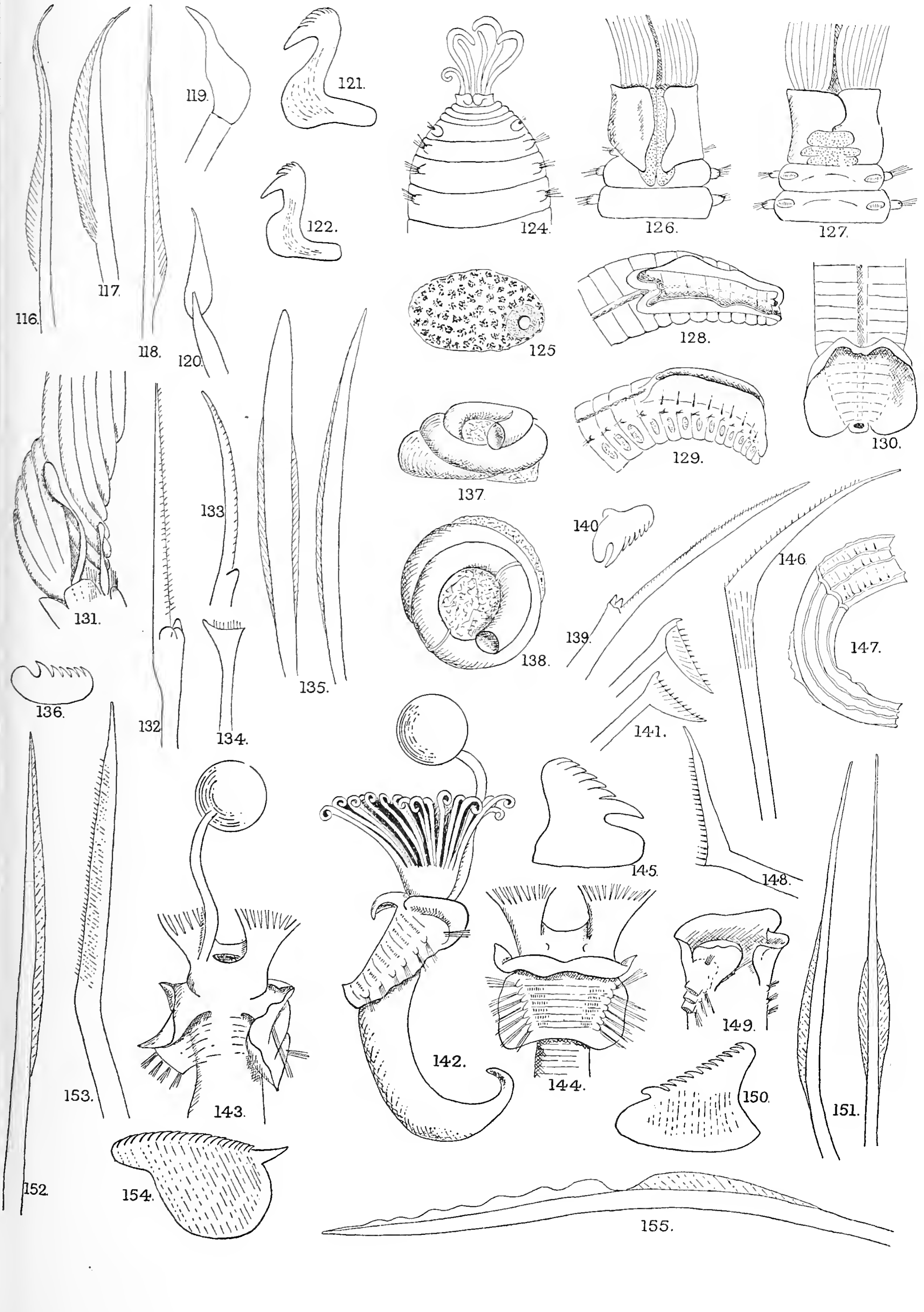
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PLATE V.

Zopyrus maoricus.

FIG. 156.—The tube fixed to a stone along its entire length ($\times 3\frac{1}{2}$).
FIG. 157.—Portion of the tube showing on the right an older region with a flat surface and to the left a younger region rounded above (enlarged).
FIG. 158.—The anterior end of the worm ($\times$ 30).
FIG. 159.—An abdominal "cupped" chaeta ($\times$ 520).
FIG. 160.—Abdominal uncinus, side and top views (freehand).
FIG. 161.—A collar chaeta ($\times$ 360).

Chitinopomoides wilsoni.

FIG. 162.—The operculum ($\times$ 16).
FIG. 163.—Side view of the thorax, gill plume omitted ($\times$ 8).
FIG. 164.—Ventral view of anterior thoracic segments ($\times$ 8).
FIG. 165.—A gill filament.
FIG. 166.—One of the longer collar bristles ($\times$ 520), with a front view of the "moignon" at (*a*).
FIG. 167.—A thoracic bundle showing the winged bristles and the "soies en faucille" ($\times$ 40).
FIG. 168.—One of the "soies en faucille" ($\times$ 520).
FIG. 169.—One of the upper, longer thoracic bristles ($\times$ 520).
FIG. 170.—A thoracic uncinus ($\times$ 520).
FIG. 171.—The same from above (freehand).
FIG. 172.—Abdominal uncinus from above (freehand).
FIG. 173.—An abdominal "cupped" chaeta ($\times$ 520).

Pomatoceros terrae-novae.

FIG. 174.—A portion of a group of tubes; the purple line is indicated by the row of short oblique lines on each side of the keel ($\times$ 4).
FIG. 175.—Transverse section as seen from in front, with keel and the basal flanges ($\times$ 8).
FIG. 176.—Portion of the upper surface of the tube showing the undulating keel and the two lines of purple spots (enlarged).
FIG. 177.—The operculum ($\times$ 8).
FIG. 178.—An uncinus from above and from the side ($\times$ 520).
FIG. 179.—Abdominal chaeta ($\times$ 520).
FIG. 180.—A thoracic chaeta ($\times$ 520).

Filograna implexa.

FIG. 181.—The end of a tube showing budding at the mouth; from two aspects ($\times$ 4).
FIG. 182.—A similar tube in which the two budded tubes have grown longer ($\times$ 4).
FIG. 183.—A collar bristle (much enlarged).
FIG. 184.—A "sickle" bristle from the thorax (much enlarged).

Spirobranchus tricornis.

FIG. 185.—Transverse section of the tube ($\times$ 2).
FIG. 186.—Dorsal view of the anterior end; the base of the thick opercular peduncle is seen between the gill bases; the thoracic membrane is on the left turned aside and shows the independence of the collar ($\times$ 5).
FIG. 187.—Hinder extremity from the dorsal aspect. The spoon-shaped depression at the hinder end is bounded on either side by glands, in front of which are seen the uncinigerous tori ($\times$ 8).
FIG. 188.—Side view of the same region; the ventral gland shields reach up to the tori, but when these cease they reach to the margin of the dorsal "spoon" ($\times$ 8).

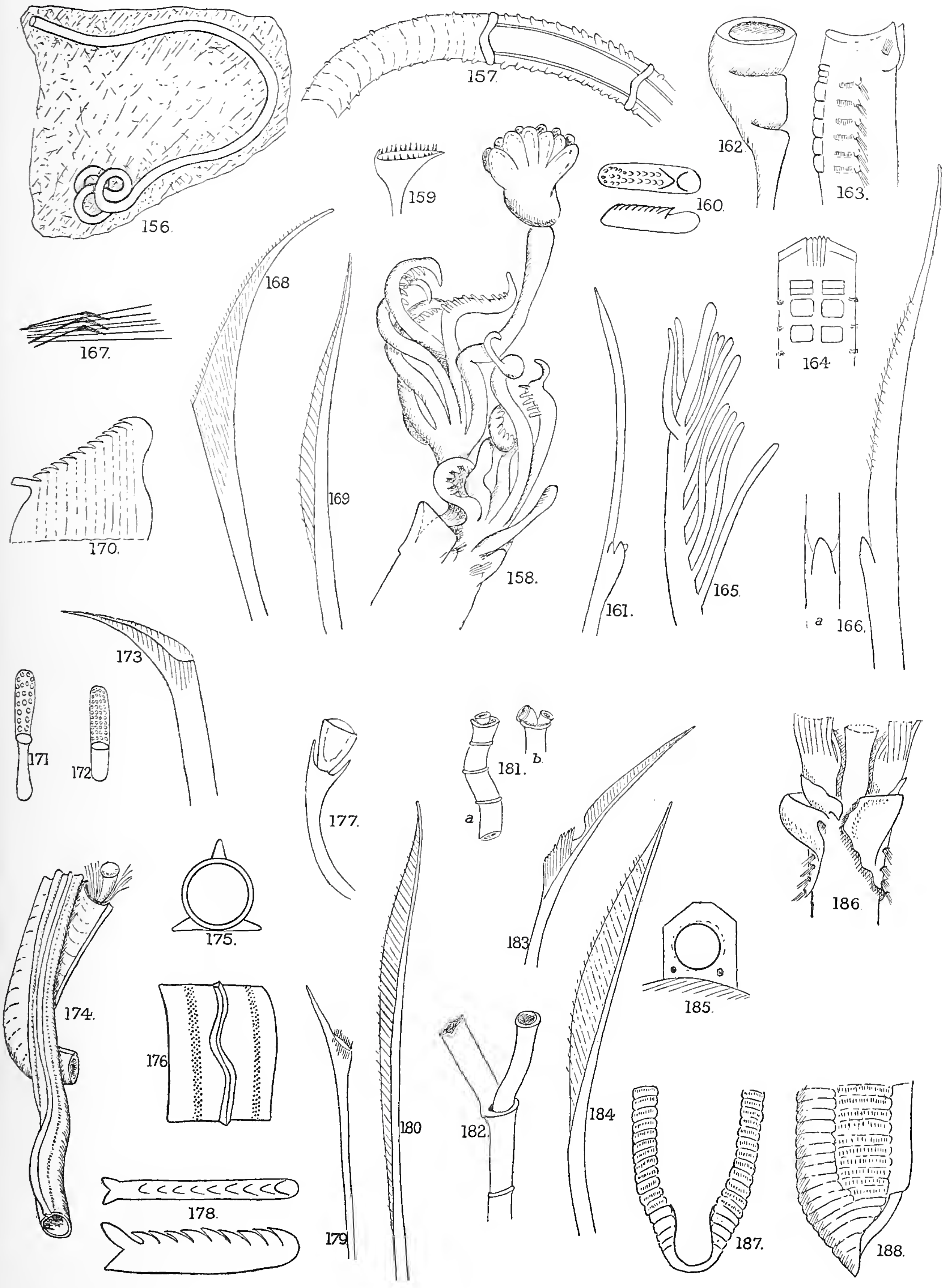
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PLATE VI.

FIG. 189.—*Leaena wandelensis*. Portion of a tube from Station 348 (figured on pl. III, fig. 61). The wall of sand grains is traversed by ridges of sand assuming a spiral course, from which tufts of sponge spicules project. The sandy wall is thin between these ridges and allows the underlying membrane to be seen when stretched by the contained worm (× 6).

FIG. 190.—Tube of another individual of *L. wandelensis*, from Station 339, in which the ridges are less developed. A portion of a similar tube is figured on pl. III, fig. 62) (× 2).

FIG. 191.—Tube of *Protula bispiralis* (× $\frac{1}{2}$). This is tube "D" referred to in the text, from Port Pegasus, Stewart Island. At each of the points lettered there has been a break and the newly formed portion takes a new direction, so that the consecutive regions lie in different planes.

FIG. 192.—*P. bispiralis*, tube obtained by the "Terra Nova" (nat. size). L, lower end; U, upper end of fragment.

FIG. 193.—*Pista godfroyi*. Portion of a tube showing the sandy cones supporting sponge spicules (enlarged).

FIG. 194.—*Spirorbis* from New Zealand, Station 90 (× 16).

FIG. 195.—*Spirorbis* from McMurdo Sound (× 16).

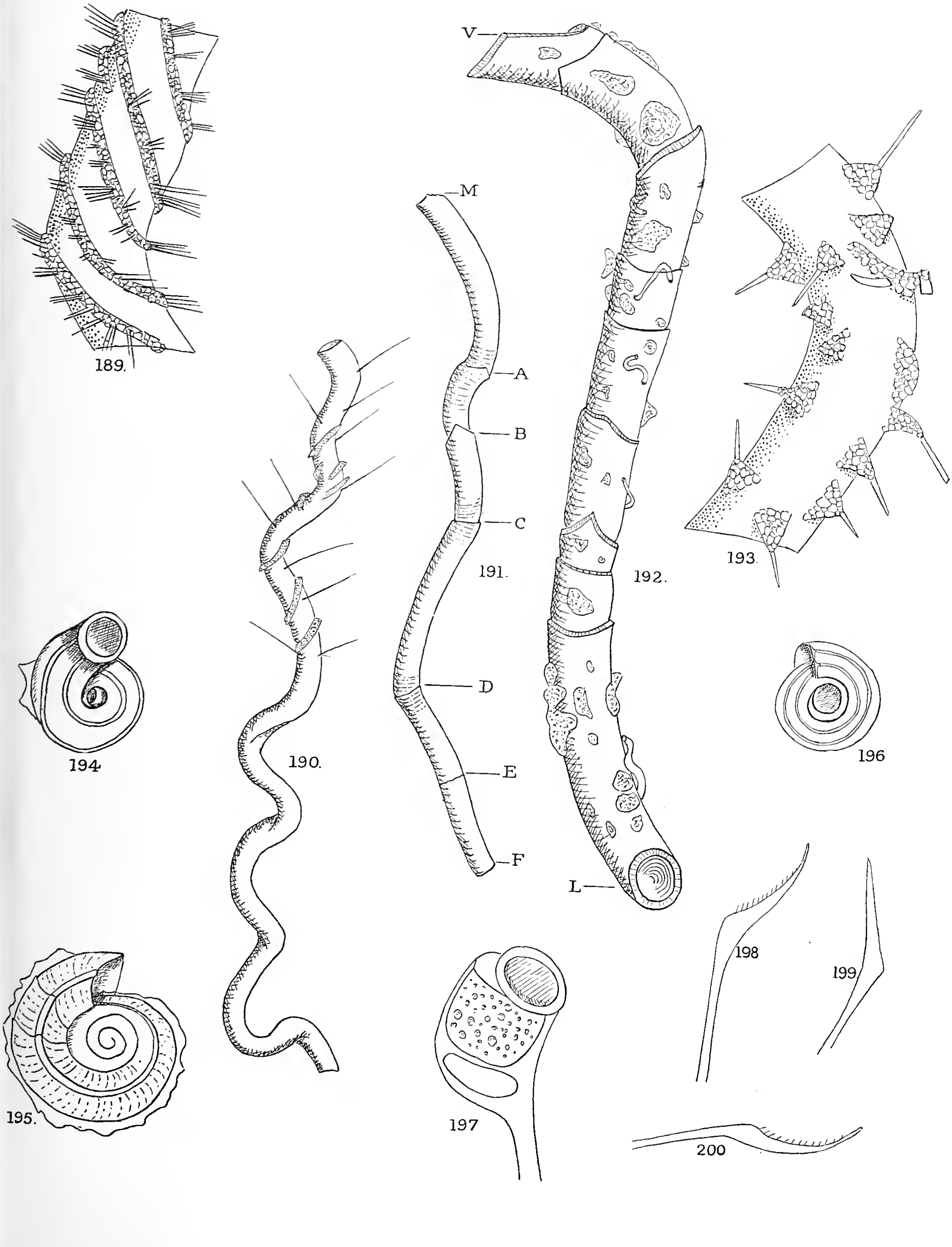
FIG. 196.—*Spirorbis* from South Trinidad Island (× 13).

FIG. 197.—The operculum of the same.

FIG. 198.—A collar bristle from the same.

FIG. 199.—A thoracic bristle.

FIG. 200.—An abdominal bristle.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BRITISH MUSEUM (NATURAL HISTORY).

BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910

NATURAL HISTORY REPORT.

ZOOLOGY. VOL. VII, No. 3. Pp. 183-201.

THE PELAGIC POLYCHAETA.

BY

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(Professor of Biology, University of Otago, New Zealand).

WITH TWO PLATES.

LONDON:

PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM

SOLD BY

B. Quaritch, Ltd., 11 Grafton Street, New Bond Street, W.1; Dulau & Co., Ltd., 32 Old Bond Street, London, W.1; Oxford University Press, Warwick Square, London, E.C.4

Oliver & Boyd, Tweeddale Court, Edinburgh

and at

The British Museum (Natural History), Cromwell Road, S.W.7

1929

Price Two Shillings and Sixpence.

[*Issued 27th July, 1929*]

British Museum (Natural History).

This is No. 3 *of 25 copies of "Terra Nova" Zoology, Vol. VII., No. 3. The Pelagic Polychaeta, printed on Special paper.*

THE PELAGIC POLYCHAETA.

BY WILLIAM B. BENHAM, D.Sc., F.R.S.

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WITH TWO PLATES.

I. INTRODUCTION.

In my previous report on the Polychaeta of the "Terra Nova" Expedition (Benham, 1927, p. 49), I wrote of the pelagic families here studied—"They are chiefly from the neighbourhood of Nelson." This was an error. In originally sorting out the tubes I had seen the name Nelson on a number of labels and I concluded that it referred to the New Zealand town of Nelson, forgetting that the late E. W. Nelson, to whom in fact the labels referred, was one of the naturalists on the expedition. Actually the only collecting done near Nelson was some littoral and land collecting near Admiralty Bay.

I wish to thank the Trustees of the Australian Museum for the loan of Apstein's valuable monograph on the Polychaeta of the Plankton Expedition.

II. LIST OF SPECIES AND NOTES ON GEOGRAPHICAL DISTRIBUTION.

FAMILY PHYLLODOCIDAE.

Sub-Family Alciopinae.

Alciopa cantrainii (Delle Chiaje)	Atl.	N.Z.
Torrea candida (Delle Chiaje)	Atl.	N.Z.
Vanadis augeneri, n. sp.	N.Z.	

Greeffia oahuensis McIntosh	N.Z.	
Callizona bongraini Gravier	A.	
Callizona gravieri, n. sp.	N.Z.	

FAMILY TYPHLOSCOLECIDAE.

Sagitella kowalewskii Wagner	A.	N.Z.

FAMILY TOMOPTERIDAE.

Tomopteris (*Tomopteris*) *carpenteri* Quatrefages . .	A.	N.Z.
T. septentrionalis Quatrefages	A.	N.Z.
T. elegans Chun	Atl.	N.Z.
T. cavallii Rosa	A.	

(In the above the abbreviations Atl. indicates Atlantic stations; A. Antarctic, and N.Z. Stations off New Zealand.)

From the above list it will be noted that the widely distributed species *Alciopa cantrainii* and *Torrea candida* occur in the waters around New Zealand; at any rate off the northern coasts, for it is quite likely that they would not be found along our eastern coast. Though the occurrence is not surprising, yet it is of interest as no Alciopines have hitherto been recorded from these waters, for all the collecting by Schmarda, Schauinsland, Mortensen, myself and others has been done along the shore; the "Challenger" made some gatherings in the open sea in the southern and eastern areas off the North Island.

The occurrence of *Greeffia oahuensis* is not unexpected since it is a Pacific worm; and I find it necessary to form two new species though I do so with some hesitation.

Of the Tomopterids, *T. carpenteri* is characteristically antarctic and sub-antarctic; while the abundance of *T. septentrionalis* in the Ross Sea was not altogether unexpected as it had been recorded already by Gravier and myself and perhaps by Ehlers from isolated examples; it is apparently cosmopolitan and is evidently indifferent to temperature.

The rather rare *T. cavallii*, hitherto found in warm seas, is now reported from the Antarctic also; and *T. elegans* is added to the New Zealand fauna.

III. LIST OF STATIONS AT WHICH ALCIOPINES, TOMOPTERIDS AND TYPHLOSCOLECIDS WERE OBTAINED.

South Atlantic.

Station	57.	4° 30′ S.,	270° 16′ W.;	surface.
,,	59.	0°,	25° 15′ W.;	surface.
,,	63.	6° 10′ N.,	24° 5′ W.;	surface.
,,	64.	23° 28′ N.,	34° 45′ W.;	surface.
,,	68.	27° 22′ N.,	33° 40′ W.;	surface.

New Zealand Waters.

Station	80.	From summit of Great King, Three Kings Islands, N. 87° W., 11 miles; depth 0–100 metres.
,,	84.	From Cape Maria van Diemen Light, S.W. by W., 15 miles, depth 2 metres.
,,	92.	From summit of Great King, S. by W., 24 miles; surface.
,,	103.	From West Island, Three Kings group, S.W., 5 miles; surface.
,,	109.	34° 15′ S., 172° 0′ E.; surface.
,,	110.	34° 4′ S., 171° 55′ E.; surface.
,,	122.	From Cape Maria van Diemen, S. 80° W., 21 miles; surface.
,,	123.	Between North Cape and Doubtless Bay; surface.
,,	127.	Off Three Kings; surface.
,,	129.	Off Three Kings; surface.
,,	130.	Off Three Kings; surface.
,,	131.	Off Three Kings; surface.
,,	141.	34° 37′ S., 171° 19′ E.; surface.

Sub-antarctic waters, near Campbell Island.

Station	251.	54° 2′ S., 177° 0′ W.;	surface.
,,	256.	54° 38′ S., 176° 24′ W.;	depth 20 metres.
,,	259.	55° 34′ S., 174° 35′ W.;	depth 20 metres.

Antarctic Waters.

South Pacific, north of Ross Sea.

Station	178.	67° 23′ S., 177° 59′ W.;	depth 0–500 metres.
,,	180.	68° 26′ S., 179° 08′ W.;	depth 100 metres.
,,	217.	66° 46′ S., 177° 48′ W.;	depth 10 metres.
,,	264.	64° 33′ S., 166° 30′ W.;	depth 20 metres.
,,	267.	66° 30′ S., 166° 8′ W.;	surface.
,,	269.	68° 37′ S., 166° 14′ W.;	surface.
,,	270.	69° 51′ S., 166° 17′ W.;	depth 0–600 metres.

Cape Adare.

Station	224.	60 miles east of Cape Adare; depth 1 metre.

Ross Sea.

Station	271.	71° 23′ S., 166° 3′ W.;	surface.
,,	274.	71° 29′ S., 166° 0′ W.;	depth 80 metres.
,,	275.	ditto	depth 160 metres.
,,	276.	71° 40′ S., 166° 47′ W.;	depth 0–1750 metres.
,,	281.	70° 41′ S., 166° 47′ W.;	depth 80 metres.
,,	282.	70° 41′ S., 166° 47′ W.;	depth 0–1000 metres.
,,	283.	71° 39′ S., 166° 47′ W.;	depth 80 metres.

Station 284.	71° 49′ S., 167° 32′ W. ;	depth 80 metres.
,, 285.	ditto	depth 0–600 metres.
,, 287.	71° 44′ S., 167° 57′ W. ;	depth 60 metres.
,, 288.	71° 59′ S., 168° 43′ W. ;	depth 60 metres.
,, 289.	72° 0′ S., 168° 17′ W. ;	depth 24 metres.
,, 290.	ditto	depth 60 metres.

McMurdo Sound.

Station 317. Hole in ice between Cape Evans and Inaccessible Island ; depth 175 metres.

,, 319. In contraction crack between Inaccessible Island and Barne Glacier.

IV. SYSTEMATIC ACCOUNT.

Family PHYLLODOCIDAE.

Sub-family ALCIOPINAE.

Southern (1911) has pointed out quite justly that the Alciopines really form a sub-family of the Phyllodocidae, rather than an independent family as hitherto regarded. The differences between the Phyllodocines and the Alciopines are of the same kind as those between the Heteronereids and Nereids—namely, modifications related to a pelagic mode of life ; the eyes are much enlarged, and the bristles are greatly elongated as natatory organs, while the head and general characters are those of the Phyllodocines ; but in place of the brilliant coloration of these, the body is uncoloured and transparent.

Genus ALCIOPA Aud. & M. Edw.

Alciopa cantrainii (Delle Chiaje).

Izuka, 1914, p. 2, with synonymy. Greef, 1876, p. 57, pl. I, figs. 1–4 ; pl. II, figs. 14–18.

Specimens of this world-wide and much described species were obtained at four Stations off the northern coast of New Zealand, and at two Stations in the Atlantic ; the former being a new locality for the species.

None were gathered in the Antarctic or Sub-antarctic seas.

Localities.—Atlantic ; Stations 63 (one), and 64 (one). New Zealand, off the Three Kings ; Stations 84 (one), 129 (two), and 131 (three examples).

Distribution.—Mediterranean, Atlantic ; Pacific (coast of Chili) ; Japanese Coast.

Genus TORREA Quatrefages [1850].

[*Asterope* Claparède (1870).]

Torrea candida (Delle Chiaje).

Asterope candida Izuka, 1914, p. 3, with synonymy.

This worm is also widely distributed and frequently recorded ; the "Terra Nova" collected it at two Stations in the Atlantic and at five Stations off New Zealand, where it is recorded for the first time.

Localities.—Atlantic; Stations 57 (two), and 59 (two). New Zealand; off Cape Maria van Diemen and the Three Kings, Stations 84 (one), 92 (two), 122 (two), 127 (one) 129 (one), 141 (one).

Distribution.—Mediterranean; Atlantic; Indian Ocean; Japanese Coast.

GENUS VANADIS Claparède.

Vanadis augeneri, sp. nov.* (Pl. I, figs. 1–7.)

Three fragments from three Stations off the north of New Zealand in the neighbourhood of the Three Kings Islands.

The worm is a pale pinkish brown in the preserved state translucent, and in two examples uncoloured; in the third (Station 131) there are bands of dark, nearly black, pigment at intervals—a double band encircling the body at the 4th and 5th segments; another at the 32nd and 33rd; and a couple of bars which do not quite surround the body at the 18th and 19th segments.

The segmental "cushions," though prominent, are not pigmented or only very slightly in some regions of the body.

The eyes are not conspicuously large, and their diameter does not greatly exceed that of the anterior segments. They are widely separated from each other (fig. 3).

The longest fragment is 15 mm. in length for 50 segments; its diameter is 1·5 mm. anteriorly, increasing to 2 mm. at the end of the fragment.

There are 5 prostomial tentacles; and 3 pairs of peristomial cirri borne on three segments; they are all similar in size and form, and as usual are directed forwards below the eyes.

The lower lip is formed by the 2nd segment which projects forwards in the mid-line as a rounded lobe and thus separates the 1st segment on the ventral surface into a right and left portion.

There is a slight difference in the appearance presented by the arrangement of the peristomial cirri in the two specimens, the one from Station 131 and that from Station 123. In the latter (fig. 2) the peristomium is traceable as a transverse band on each side of the mouth behind the eye, ending in an oblique margin or lateral lip on each side of the mouth; its cirrus springs from it at a point behind the eye and rather to the side of the segment. But in the former worm (fig. 1) the lateral portion of the segment is not visible; all that is seen of the peristomium is a triangular area on the inner side of the eye, from which the cirrus arises.

This difference is, I suggest, due to the strong contraction of the worm, the 2nd segment thrusting the peristomium forwards.

Following these peristomial segments are 7 or 8 segments with quite small parapods, each consisting of a lobe with dorsal and ventral cirri; I noted in one instance that a bundle of bristles is carried by the first of the series; and other feet carry a

* Named after H. Augener, who has added so much to our knowledge of New Zealand Polychaeta.

few. In another worm they are absent from the four anterior feet and present later. Probably they have dropped out or were broken off. They were not recognised when the worm was studied under a dissecting lens × 20, but are visible under a low power of a compound microscope; so that they are easily overlooked.

After this series of small parapods the normal ones commence and increase in size till about the 20th segment when they remain of similar size throughout the fragment. They are close together in two of the specimens, but in the one that has the coloured bands they are spaced; which therefore may be a matter of degree of contraction on preservation.

The dorsal and ventral cirri are broadly foliaceous (fig. 4), though in the one narrow banded worm they are relatively smaller and less extended (fig. 5); this may be due to youth or to the strong contraction of the worm.

The terminal process of the chaetigerous lobe is filamentous, as long as, or even longer than, the length of the protruding portion of the aciculum.

The bristles are long, delicate, articulate and all alike. In one of the worms (Station **129**) the pharynx was fully protruded: this fragment measures 11 mm. for 22 segments and the pharynx is 13 mm. in length (figs. 6, 7). It carries at the entrance to its lumen a pair of long horn-like processes 3 mm. long, situated rather nearer the ventral than the dorsal mid-line. The dorsal margin of the entrance is formed of a frilled membrane, but the ventral is quite smooth. In this worm the parapods were macerated and even the terminal process unrecognisable; but the character of the pharynx, the absence of denticles from the interior (which exist in *Torrea*), the reduced anterior feet, render it certain that the worm is identical with the better preserved example above described. Moreover I slit open the anterior end of the latter, removed and mounted the pharynx, which is identical with the protruded organ of the softer specimens.

The species approaches *V. crystallina* Greef (pl. II, fig. 29) which, however, has but 5 small anterior parapods; but whether there is a range of variability in this matter is unknown; there are, however, other details which serve to separate the two.

Localities.—North of New Zealand, off the Three Kings; Stations **123, 129, 131.**

Genus GREEFFIA McIntosh.

Greeffia oahuensis McIntosh. (Pl. I, figs. 8, 9, 10.)

McIntosh, 1885, p. 182, pl. XXVIII, figs. 5, 6, 7; pl. XXXII, fig. 11; pl. XV A, fig. 4.

Four individuals of a short, rather broad and flattened worm, with long parapods bearing large reniform cirri.

One measures 10 mm. in length with diameter of 4 mm. over the parapods and 2 mm. over the body alone; it has 40 segments. The body is apparently a good deal contracted as the feet are close together and the segments therefore short; as McIntosh points out, the large cirri overlap as in some of the true Phyllodocids. The colour is a pale pinkish ; the segmental " cushions " are deeply pigmented ; and in one case there is in addition a series of short pigmented lines along the ventral mid-line.

There is but little to add to the original account but the pharynx is protruded in the present specimens which was not the case in the type. It is quite short and carries a pair of horn-like processes which McIntosh shows in his figure issuing from the mouth. In form it recalls that of *Vanadis* but in strong contrast to the previous species it is here quite short (fig. 10) ; and since it was protruding in two individuals it may be concluded that this is its normal and total length.

There are three pairs of peristomial cirri—one carried by the true peristomium, and two pairs on the 2nd segment—a dorsal and a ventral ; the first pair is the longest of the three. These are followed by one small non-chaetigerous (?) segment with small foliaceous cirri, the ventral being small. In the normal feet the cirri are relatively enormous (fig. 9), and the two terminal processes of the chaetigerous lobe which characterises the genus are short. In fact, except for its shorter and more compact form of the body, which may be due to method of preservation, the worm agrees with McIntosh's account.

Localities.—New Zealand ; Stations 110, 129.

Distribution.—Near Honolulu (and ? South Pacific).

Genus CALLIZONA Greeff.

Callizona bongraini Gravier. (Pl. I, figs. 11, 12.)

Gravier, 1911, p. 70, pl. IV, figs. 39–43.

Specimens of this purely Antarctic worm were obtained at three Stations ; they are all fragmentary, consisting of head and a variable number of segments.

The species is small, slender and apparently uncoloured, except for the brown eyes and the segmental cushions, which are, however, only feebly pigmented.

One of the larger worms measures 11 mm., for 35 segments, with a diameter of 1 mm. over the cylindrical body which does not taper. Another individual measures 18 mm., but I did not count the segments. Gravier does not give figures of the head, for his specimen was but poorly preserved, so I add to his account. The median prostomial tentacle is stumpy, and the two pairs of anterior tentacles are fairly long, swollen basally and pointed distally ; they project forward of the eyes. There appear to be five peristomial cirri on each side, carried by 3 segments : thus—

Segment I.—Carries one long cirrus.
,, II.—A long dorsal and a small ventral.
,, III.—A long dorsal and, I believe, a very small ventral. The order of size is III, II, I.

As to the existence of the ventral cirrus on Segment III, I found it difficult to detect ; in one instance, however, as I rolled the worm over I got a clear view of it ; but in other cases in spite of much study I was unable to satisfy myself of its presence ;

yet the long cirrus occupies the position of a dorsal so that one may presume the existence of a ventral cirrus.

The parapods and the curious distribution of the "spines" in the anterior feet are sufficiently described by Gravier. The segmental "cushions" which Gravier states commence in the 10th segment vary somewhat, for in one of the present examples they do not appear till the 16th and in another even later.

The pharynx is short and the margin of the entrance is produced into low triangular or semicircular papillae.

Localities.—Entrance to Ross Sea ; Stations 178 (three), 180 (six), 217 (three).

Distribution.—South American Quadrant, lat. 69° 15′ S. ; long. 108° 5′ W.

Callizona gravieri, sp. nov. (Pl. I, figs. 13–17.)

A single specimen (unfortunately preserved in osmic acid) of a long slender worm of 1 mm. in diameter ; it is imperfect posteriorly and contains, in addition to the head, 56–60 segments and measures 25 mm. in length.

The most striking feature is the presence of white, glistening conical papillae on the ventral surface below each parapod (fig. 16) commencing at about the 10th segment. They are, of course, in addition to the usual "cushions" which are deeply pigmented.

These "sub-pedal cones" are covered with a thick cuticle, and exhibit neither cavity nor terminal pore ; so far at least as one can judge from a study in optical section, for I did not sectionise them. Immediately below the cuticle there is an irregular network of polygonal meshes outlined by granules, but not recognisable everywhere. Towards the base of the cone some of these meshes appear to be the ends of strands of refringent tissue which enter the cone from the body wall and radiate outwards (fig. 17). Deeper down, and forming the substance of the cone, these strands are arranged circularly or transversely. These strands of tissue do not take a deep stain in haematoxylin, and so do not seem to be glandular in character ; they are much stouter and more highly refringent than the muscle tissue in the body wall. I cannot suggest their function.

The head has the usual five tentacles, which are all short (fig. 13) ; the eyes are not noticeably large and are separated from one another dorsally by a considerable space, at least equal to the diameter of an eye, in marked contrast to the preceding species. There is a "bridge" joining them leaving the anterior region of the prostomium depressed ; and it is on this area that the median tentacle rises. The anterior tentacles are also widely separated.

The peristomial cirri are arranged thus : segment I bears one cirrus on each side ; segment II has two cirri ; a dorsal and a ventral : all are filamentous in form and of similar size (fig. 14).

The parapods have in the anterior part of the fragment the usual horizontal disposition, but after about the 30th segment they assume an obliquely upright poise (fig. 16). The chaetigerous lobe terminates in a small rounded process or "languette" which in the anterior feet is very small but increases in length further back; the anterior feet themselves are not of less size than the following. The aciculum is brownish in tint, particularly long and stout, and projects far beyond the tip of the lobe—indeed this portion is as long as the width of the body.

The cirri are for the most part lacking; they are very deciduous, falling away on handling the worm, but when first examined they were seen to be long and cylindrical, and the ventrals longer than the dorsals.

The bristles are of course articulated, the appendage being plain and flagelliform; some are stouter than others but otherwise all the bristles are alike; below the fan-shaped bundle is a single stout "spine" with a simple point. I see none of the articulated spines which occur in the previous species, nor is there more than one in any of the feet examined.

The pharyngeal papillae have a form quite different from that in *C. bongraini*; instead of the low triangular papillae, they are here long, lingulate and pointed, with a thinner membranous flange along each side. There are about one dozen of these papillae at the entrance to the pharynx (fig. 15). It seems to me that, just as amongst the true Phyllodocids, the form and arrangement of these papillae are regarded as "good" specific characters, so in this sub-family more emphasis should be put upon them than has hitherto been the case.

Locality.—New Zealand; Station 92.

Family TYPHLOSCOLECIDAE.

Genus SAGITELLA Wagner.

Sagitella kowalewskii Wagner.

See Benham, 1927, p. 80, pl. II, figs. 33, 34.

When writing the Report I had but one specimen of this pelagic worm which was obtained in the Ross Sea; but in examining the Alciopines I found others, and have now to record its occurrence from New Zealand waters as well as from another Station in the Antarctic sea.

I need add nothing to my previous account.

Localities.—New Zealand, off the Three Kings; Stations 92 and 130. Ross Sea; Station 282.

Family TOMOPTERIDAE.

Genus TOMOPTERIS Eschscholtz.

Sub-genus *Tomopteris* Eschscholtz.

Tomopteris carpenteri Quatrefages. (Pl. II, figs. 18–23.)

Quatrefages, 1865, Vol. II, p. 227, pl. XX, figs. 1, 2; Benham, 1921, p. 61, pl. VIII, figs. 64–66; McIntosh, 1925, p. 29, pl. III, figs. 1, 2, 3.

Nine examples were obtained from four Stations and a doubtfully identified imperfect one from a fifth Station (319).

Most of them are in a good state of preservation, with well extended parapods, and apart from measurements I have but little to add to the account published in 1921.

MEASUREMENTS OF THE "TERRA NOVA" SPECIMENS.

Station number.	Length in mm.	No. of Parapods.	Notes.
269 (*a*)	30	29	
(*b*)	20	24 or 25	
(*c*)	15	24	Has small chr. gl. on 4th.
289 (*a*)	33	34	Has small chr. gl. on 4th.
(*b*)	30	30	
(*c*)	28	30	
(*d*)	25	29	Last 7 segments seem to have been regenerated, being paler in tint, and feet very minute; but typical.
290	35	28	Last feet very small.
317	20	26	

The hinder end of the body tapers very gradually to a blunt anal segment and the parapods naturally diminish in size as this point is reached, the last 4 or 5 being often so crowded together that it needs manipulation with needles under a dissecting lens in order to count them accurately. The disposition of the parapods is of no specific importance, for I find a note that in a specimen from Station 289 the 12 anterior feet are directed outwards, the rest backwards; and in 269 (*a*) the feet 1 to 4 are inclined forwards, 5 to 9 outwards and the rest backwards; and in 290, the 3 anterior feet are forwardly directed, the following backwardly.

Having re-read Quatrefages' account I note that he refers to the presence of eyes, which are shown in his figure, and to the possibility of the type having possessed a "tail," for he supposed that this was the normal condition of the adult of all species of *Tomopteris;* I therefore wrote to Professor Charles Gravier and asked him to be so kind as to examine the type for these two features. He wrote on 19th March, 1928, as follows: "J'ai examiné le type de *Tomopteris carpenteri* qui existe dans les collections du Museum. *On n'y voit pas d'appendice postérieur ni d'yeux.* (Gravier's underlining.) Malheureusement l'état de conservation du specimen laisse a désirer, de sorte qu'il est difficile d'être absolument affirmatif. *Il n'y a plus trace d'yeux* (Gravier's underlining), mais les yeux figurés par Quatrefages sont petits et il n'est pas impossible que le pigment ait disparu dans l'alcool; rien actuellement n'autorise à le croire."

The absence of a tail and of external evidence of eyes in the specimens I have had before me thus agrees with what at any rate is the present state of the type of this species. But as a fact a pair of small eyes comes into view when the head is cleared in Oil of Cloves and mounted in Canada Balsam (fig. 18).

As to the "tail," surely if it exists in this species some at least of the larger individuals would have shown a trace of it, but the end is rounded and shows no evidence of any rupture. Since the publication of my report on the "Aurora" polychaetes in 1921, in which I gave a detailed account of a tomopterid which I identified as *T. carpenteri*, Professor McIntosh has (1925) published a number of notes on the genus and on pp. 29, 30 gives an account of a worm from the South African waters under the title of "*T. carpenteri*"; which appears to me to differ from the Antarctic examples more widely than a mere variety would do.

His specimen, which measured 55 mm. in length, includes a "tail" of 13 mm. bearing 8–9 rudimentary feet. There is, too, a difference upon which systematists seem to place some importance in the character of the anterior end. The African worm is described and figured (pl. III, fig. 1) as having a wide gap separating the cornual membrane (or frontal tentacles) into two distinct parts, whereas in all the Antarctic worms that I have studied this membrane is continuous from side to side, as I figured (pl. VIII, fig. 64); though it may in some specimens be slightly folded in the middle line when the cornua have been preserved in a forwardly directed pose instead of in the normal transverse position, there is no gap.

There is again a very considerable difference in the shape of the cirrus base in the two forms, for in all the Antarctic worms, which are well preserved, it is much swollen to form a sub-globular mass, sharply marked off from the slender cirrus itself, which of course tapers slowly from this point. (See Benham, pl. VIII, fig. 64.) But in the South African form (or species) McIntosh figures the base as being quite narrow and gradually passing into the cirrus (pl. III, fig. 1). I add here a camera drawing of a cleared head (pl. II, fig. 18).

Although of the same length the South African form has only 29 pairs of parapods whereas this length of 55 mm. for the Antarctic form has 33 pairs.

The position of the chromophil gland on the membrane differs in the two forms; in the Antarctic worms it has the position shown in my figure (1927, pl. VIII, fig. 66); it lies ventral to the ramus, a little further towards the apex than the mid-length, whereas McIntosh represents it (pl. III, fig. 3) as of enormous dimensions, hiding the distal part of the ramus and opening outwards beyond the tip of this.

I add some camera outlines of feet in the present collection to show this point, in which the gland is shown in greater detail than in my former figure (pl. II, figs. 19–21).

In the African form the chromophil gland commences at the 4th parapod but in the Antarctic form, as I stated in 1921, it appears first on the 5th foot. I have examined eight individuals of the present collection and in only two of them is there a small gland on the 4th foot; but as compared with the large gland of the 5th and following feet it is minute. In the other six individuals the gland commences on the 5th. The presence of a small chromophil gland on the 4th parapod is independent of length of worm, for the two instances occur in the shortest and in one of the longest examples in this collection.

I have added drawings showing the feeble development of the chromophil gland of the 4th foot, in those cases in which I have been able to detect it, as compared with the normal size in following feet. In the 4th parapod the gland consists of only a few—as few as four—gland cells, which take the haematoxylin in the same way as the cells of the typical gland. It is quite inconspicuous and I overlooked it till I had compared my statements with those of McIntosh; indeed it is not recognisable till treated with haematoxylin (pl. II, figs. 22–23).

No great stress can be laid on the proportion and form of the rami, or of the angle formed by them; these must be affected by the state of contraction on preservation. It is true that in my report I referred to the angle formed by the rami as being approximately a right angle, but in view of the better preserved and more abundant material before me I recognise that that statement has no importance: as a matter of fact, as the drawings show, the rami may be long and pointed and the angle formed by them acute (cf. figs. 19, 20, 21).

I have been unable to detect genital papillae in any of the specimens.

On p. 33 McIntosh adds notes on the "Challenger" specimens in the British Museum which he has re-examined; these were collected between Kerguelen and Macdonald Islands. He states: "This form is recognised by the absence of a tail" . . . "by the slightly nodulated condition of the frontal tentacles" (cornua).

These two statements seem to be in accord with the Antarctic forms studied and described. But then follows, a few lines further on, what appears to be a contradictory statement: "The tail, again, terminates in a small tip (anus), the whole tail, however, forming a broad process of diminishing feet."

It is evident that McIntosh is here using the word "tail" in a sense different from that used by him on a previous page when describing the South African form; or as used by Rosa for a part of the body with spaced rudimentary feet.

Quatrefages, too, says that the parapods on the "tail" spring more ventrally from the body which loses its cylindrical form, and becomes flattened. Rosa states that the feet here differ from those on the trunk. In the case of these "Challenger" worms it seems that the "tail" is merely the posterior end of the body with the naturally diminishing series of normal feet. If so, they agree with the other Antarctic representatives of the species.

I summarise in tabular form some of the differences between the South African and the Antarctic worms—so far as the facts given by McIntosh permit. Are they distinct species? Certainly some of these differences are such as are used by Rosa and others for specific purposes, but we do not know much of the range of variability in the genus or indeed in the Class of Polychaetes.

Localities.—Ross Sea; Stations 269, 289, 290. McMurdo Sound; Stations 317, hole in ice; 319, in contraction crack, collected by Nelson.

Distribution.—Antarctic Ocean (Quatr). Between Kerguelen and Macdonald Islands (McIntosh); Commonwealth Bay, Adelie Land (Benham).

	Antarctic form.	South African form.
Cornual membrane.	Continuous.	Interrupted.
Cirrus base.	Globular.	Tapering, cylindrical
Tail.	Absent.	Present.
Chromophil gland.	5th foot ; below ramus.	4th foot ; terminal.
Genital papillae.	Unknown.	4th foot.
Size.	55 mm.	55 mm.
Number of feet.	33.	29

Tomopteris septentrionalis Quatrefages.

Quatrefages, 1865, Vol. II, p. 229.

Of this widely distributed species nearly 600 examples reached me, gathered from twenty-four Stations ; with the exception of two gatherings off the coast of the north island of New Zealand, made in August (Stations 103, 109) and four hauls between Campbell Island and the Antarctic circle (Stations 251, 256, 259, 264) they were captured within the Arctic circle in or near the Ross Sea during the months of December and January, though one haul was made in March (Station 224) off Cape Adare.

I tried, by tabulation of the data given for depth, duration of haul, time of day and size of mesh used, to ascertain whether there might be any correlation between the number gathered at any haul and any of these factors, but I can find none ; moreover, I have no assurance that I received all the specimens obtained at each or any haul.

The largest individuals attain a length of 12–15 mm., with 19–20 pairs of parapods ; the smaller ones measure about 5 mm. with 15-16 pairs.

The determination of so large a number of specimens entailed, of course, a prolonged and tedious examination of samples of each gathering, because in many cases the hyaline gland, the presence of which in this species serves as one of the distinguishing marks between it and *T. eschscholtzii*, was not pigmented and so was not visible under a dissecting miscroscope, consequently the compound microscope had to be employed on the entire worm as well as on parapods cut off, mounted and often stained in haematoxylin. Southern (1911, p. 20) has already pointed out this difficulty of detecting the gland and its variability in degree of development The chromophil gland is also frequently of small size. Further, the fact that in certain specimens from various Stations a pair of genital papillae exists on the base of the 4th parapod—a feature that has not, I believe, hitherto been observed in this species—led me to think that *T. eschscholtzii* might be present with *T. septentrionalis*. But a renewed and exhaustive examination of samples from these gatherings convinces me that this is not so : they are all of the latter species.

These genital papillae occur in the larger individuals—from 9 mm. upwards, but not even in all of this size. I failed to detect them in some males attaining a length of 12 mm. The papillae are on the margin of the body close to the base of the parapods. I found them in specimens from the Stations 290, 269 and 270, and no doubt they occur in other gatherings.

There is no need for me to add any further details to the useful, concise and sufficient account given by Rosa (1908, p. 297).

The zoologists had thoughtfully placed a few of the larger gatherings in osmic acid, but this reagent is not suitable for systematic work, as the specimens preserved therein are not merely blackened and therefore opaque, but are much contracted, distorted often, the feet curved and the membranes partially macerated.

Included amongst the phials was one with the label: "National Antarctic Expedition, 1901–04 ('Discovery'), 19.10.10." It contained a number of worms which had at some time dried up and are now in the form of a firm entangled mass. The worms measure about 12 mm., but are so shrunken and stiff that it is impossible to identify them, but from their general aspect and proportions there is little doubt that they are of this species.

Ehlers (1912, p. 31) states that a number of "*Tomopteris*" were collected at several stations, but does not describe them or attempt to identify them. There is little doubt, in the light of the present Report that they, or at least some of them, belong to this species.

Localities.—Off New Zealand; Stations 103 (two), 109 (four dozen). S.E. of Campbell Island; Stations 251 (four), 256 (one), 259 (one), 264 (one); Cape Adare, Station 224 (one); Ross Sea, Stations 178 (seven), 180 (six), 217 (three), 267 (fifty); 269 (forty), 270 (two), 271 (twenty-four), 274 (thirty), 275 (twenty), 276 (six), 281 (one hundred and ten), 282 (eighteen), 283 (eighteen), 284 (sixty-five), 287 (ten), 288 (twenty-two), 290 (seventy-six).

Distribution.—N. Atlantic; Azores; Pacific, meridional; Baltic; North Sea; Irish Sea; Japanese Coast (Izuka); Antarctic seas.

Tomopteris elegans Chun. (Pl. II, figs. 24–26.)

Chun, 1887, p. 18; *T. kefersteini* Apstein, 1900, p. 37, pl. IX, fig. 15. Rosa, 1908, p. 294, for other references.

About one dozen examples were obtained in the Atlantic and three others off the north coast of New Zealand. The Atlantic specimens are well extended, pale coloured with widely spaced parapods; those from New Zealand having been preserved in osmic acid are shrunken and distorted.

None of them exceeds 5 mm. in length, with a maximum of 14 parapods. Some are mature males and females.

There is a wide cornual gap which is partly concealed dorsally by a rounded anterior projection of the prostomium (fig. 24). The eyes are not deeply pigmented. The epaulettes or ciliated organs project conspicuously in front and on the dorsum extend back to about halfway along the brain. The first cirrus is short and slender and nearly as long as the cornu of its side. The second cirrus, the base of which is not much enlarged, exceeds the length of the body, and in one specimen from New

Zealand is about twice this length, possibly owing to the great contraction of the worm in osmic acid.

On one sample studied from the Antarctic with only 11 pairs of parapods there is a short foliaceous anal cirriform process on each side ; it is transparent and contrasts in appearance with the cellular character of the pinnal membrane of the preceding feet (fig. 25). It may be a young developing foot.

The chromophil gland, commencing as usual on the 4th foot, has the position and proportions typical of the species (cf. Rosa, pl. XII, fig. 16). It is somewhat mammiform, situated below the ramus and its base extends beyond the apex ; the pore is at a point about midway along the ventral margin of the membrane (fig. 26). As to the hyaline gland, which in this species occurs on the dorsal pinnal membrane of the 3rd and 4th parapods and only here, I found it very difficult to detect it owing to its lack of pigment and to the fact that these worms are covered with rhomboidal crystals so that the essential characters of the organ, as a group of vacuolated cells converging to a point or pore, can only with difficulty be seen : though in two specimens examined in glycerine I was able to assure myself of its presence. It occupies a position rather above a line continuing the axis of the ramus to the free edge of the membrane.

Localities.—Station 68, Atlantic ; surface. Station 80, New Zealand, depth, 9–100 metres.

Distribution.—Mediterranean ; Atlantic, temperate regions ; Pacific ; Indian Ocean ; Japanese Coast (Izuka).

Tomopteris cavallii Rosa. (Pl. II, figs. 27, 28.)

Rosa, 1908, p. 304, pl. XII, fig. 20. Southern, 1911, p. 29. McIntosh, 1925, p. 27, pl. II, fig. 5.

This species has been previously obtained from the Atlantic, Pacific and Indian Oceans ; and amongst other places between New Caledonia and New Zealand. In spite of this wide distribution it appears to be a rare form and in the present expedition was collected at only one Station at the entrance to Ross Sea, the first recorded occurrence within the Antarctic circle.

The four examples, which had unfortunately been fixed in osmic acid, are nearly black, contorted and the pinnal membranes much shrunken ; but the great size of the chromophil gland and its position agree precisely with that described and figured by Rosa, where it is shown as lying entirely below the ventral ramus, its base extending along almost the entire length of this, and reaching to the apex. This, the only pinnal gland, commences on the 4th parapod and is readily visible up to the 9th, after which it gets smaller.

The largest of these three examples is but 5 mm. in length with 14 pairs of parapods.

The second cirrus is well preserved, the envelope of the seta being present along its entire length. The seta is not axial but nearer the posterior margin except towards the free end. On the anterior side the envelope exhibits three or four rows of nuclei and a series of regularly spaced, fine, straight, colourless rods, which extend from below the most superficial nuclei in a somewhat oblique direction to the margin, from which they project slightly, though perhaps this is due to strong contraction of the membrane (fig. 28).

The membranous fringes of the cornua are separated by a wide gap which is partly obscured by the rounded projection of the prostomium. This agrees with the account given by Rosa, who speaks of " una larga insenatura frontale."

I found it rather difficult to recognise this wide gap in specimens mounted in Canada balsam, as the membrane is so tenuous that it is scarcely visible ; and in my notes I wrote " gap absent," but further examination of another in glycerine enabled me to detect it. McIntosh's figure does not indicate this membrane at all and it may be that he overlooked it.

In the specimens from the Irish Sea, examined by McIntosh, this wide gap is absent and he shows a mere notch in the median line. He therefore suggests that the Irish form should be regarded as a variety—*var. southerni.*

Locality.—Ross Sea, Station 285, depth 0–600 metres.

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The Pelagic Polychaeta, Pl. I.

PLATE I.

Vanadis augeneri.

FIG. 1. Anterior end of a specimen from Station 131, seen obliquely from below (enlarged). Note the four anterior non-chaetigerous parapods, and the triangular lateral lip with cirrus, representing all that is seen of the peristomium.

„ 2. The anterior end of a specimen from Station 123; the peristomium occupies the normal position (enlarged).

„ 3. The prostomium from above, of the same specimen.

„ 4. A parapod of a specimen from Station 123 (× 25). The bristles are not completely drawn in.

„ 5. A parapod from a specimen from Station 131, which is similar to that from Station 129 (× 40).

„ 6. The fragment from Station 129 (× 4), with the pharynx completely protruded, and seen from the dorsal aspect.

„ 7. Ventral view of the end of the same pharynx (× 4).

Greefia oahuensis.

FIG. 8. The entire worm (× 8). The parapods and their cirri are not filled in along the whole length, though they exist in the worm.

„ 9. A parapod (× 25).

„ 10. The anterior end of the worm from the side (enlarged). One of the pharyngeal tentacles was broken off but has been indicated in dotted outline.

Callizona bongraini.

FIG. 11. Side view of the anterior end with protruded pharynx (enlarged). Note the low triangular papillae round the margin.

„ 12. Dorsal view of the head; the eyes are very close together.

Callizona gravieri.

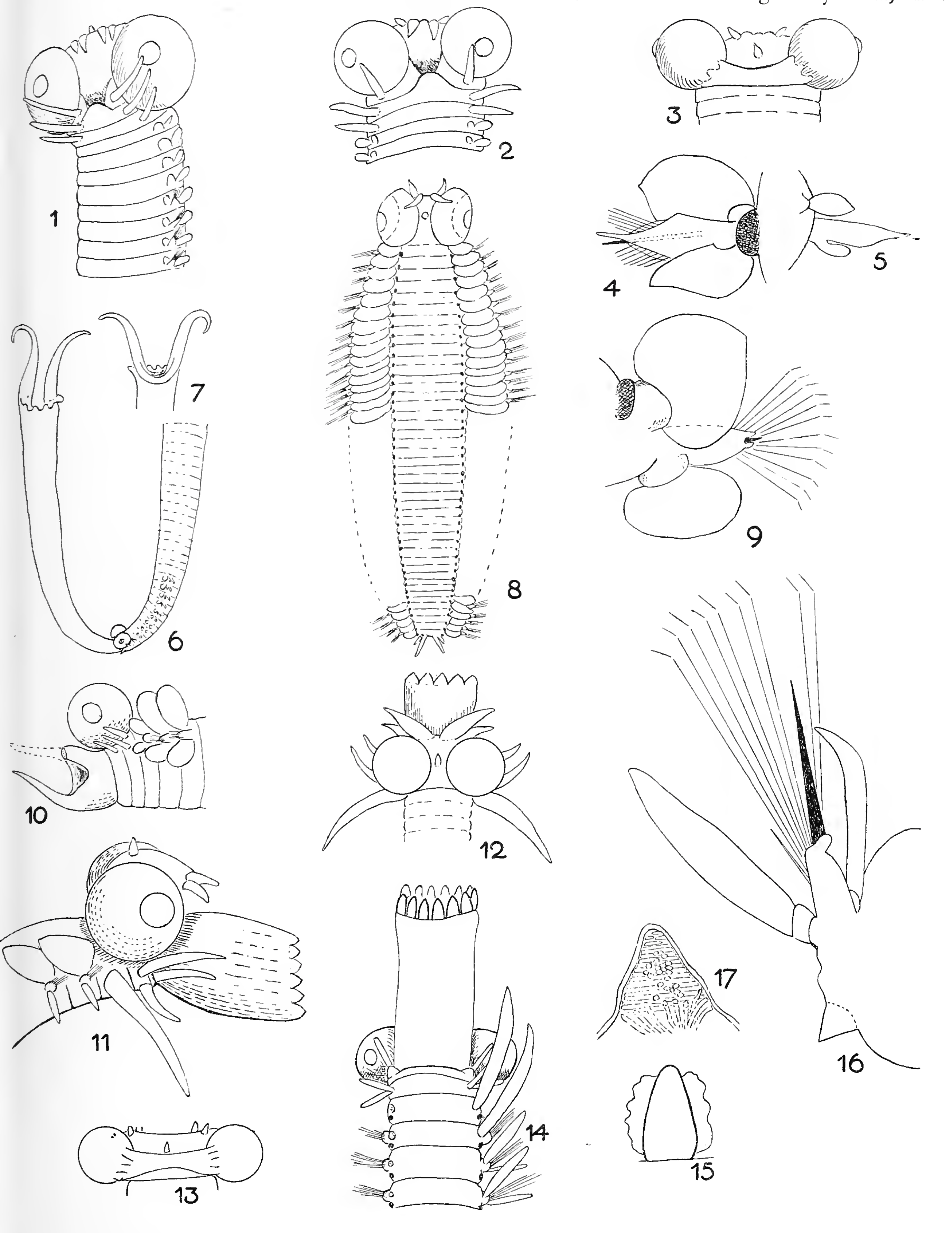
FIG. 13. The prostomium (enlarged). The eyes are widely separated.

„ 14. The anterior end from below with fully protruded pharynx (enlarged). The cirri have been omitted from the left side of the drawing.

„ 15. One of the circle of marginal pharyngeal papillae (enlarged), showing the characteristic membrane along its edges.

„ 16. A parapod from the hinder end of the fragment (× 50) the sub-pedal cone is conspicuous; the parapods in this region of the body are directed dorsally.

„ 17. A sub-pedal cone (× 180).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The Pelagic Polychaeta, Pl. II.

PLATE II.

Tomopteris carpenteri.

FIG. 18. The head cleared in Canada Balsam drawn with camera lucida (× 15). The small eyes become visible: the cornual membrane, though slightly folded, is continuous across the mid line; the base of the second cirrus is sharply marked off from the distal region.

„ 19. A parapod from a male, about mid-body (× 15); from Station 289.

„ 20. Another parapod from Station 289 (× 15). These two figures illustrate the valuelessness of using form of ramus or angle formed by them for specific characterisation.

„ 21. The 7th parapod of a specimen (*c*) from Station 269 (× 15).

„ 22. The 5th parapod of 269*a* with normal chromophil gland (× 15 camera). The dorsal ramus with its pinnal membrane was curved under the ventral.

„ 23. The 4th parapod of the same individual, showing the rudimentary chromophil gland (× 15).

Tomopteris elegans.

FIG. 24. The head (× 15). The cornual membrane is interrupted in the mid line and the prostomial prominence fills the gap: the base of the second cirrus is cut short in the drawing.

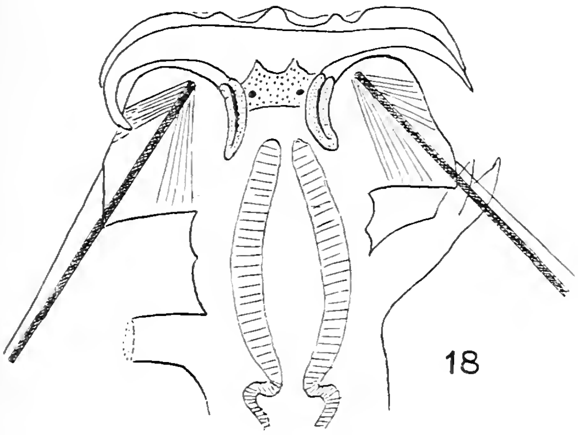
„ 25. The posterior end of the body with its rounded, opaque, anal cirri (enlarged).

„ 26. A parapod (× 50).

Tomopteris cavalii.

FIG. 27. A parapod (× 50).

„ 28. A portion of the envelope of the seta in the second cirrus showing the peculiar rods in the membrane. The seta is cross hatched in the drawing.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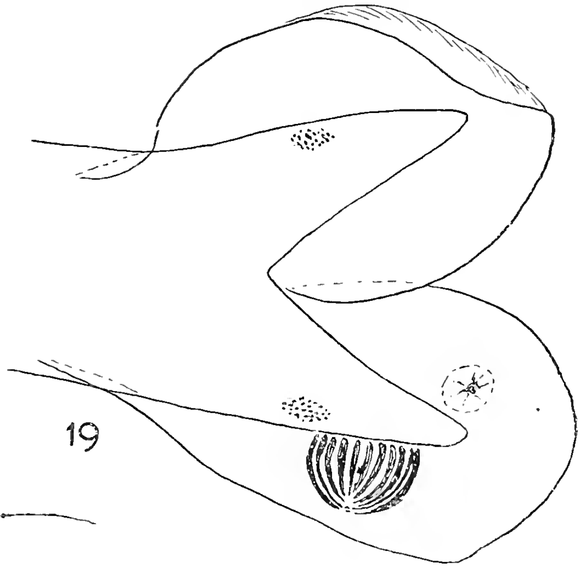
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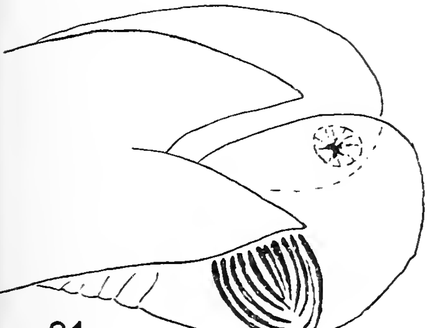
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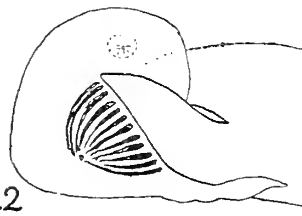
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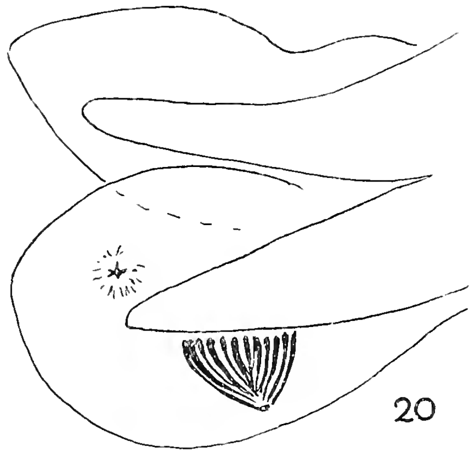
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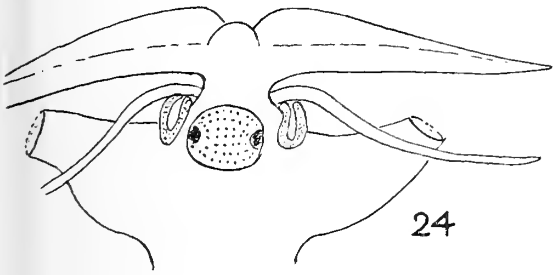
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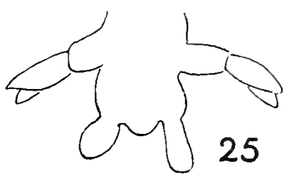
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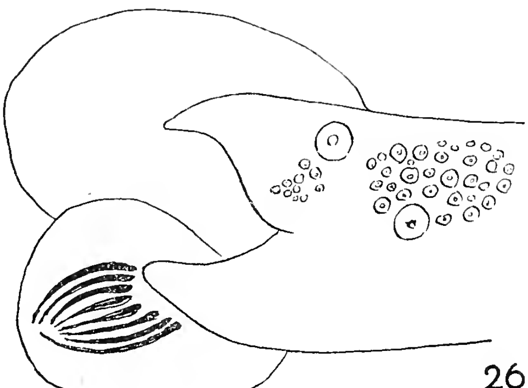
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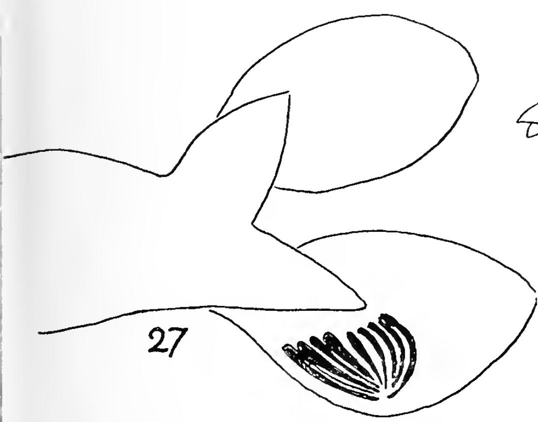
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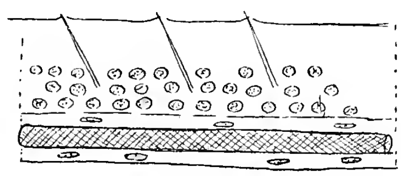
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BRITISH MUSEUM (NATURAL HISTORY)

BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910

NATURAL HISTORY REPORT.

ZOOLOGY. VOL. VII, No. 4. Pp. 203-228.

CHAETOGNATHA.

BY

S. T. BURFIELD, M.A., M.Sc.
(Lecturer in Zoology, Liverpool University.)

WITH THREE MAPS.

LONDON:
PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM
SOLD BY
B. QUARITCH, LTD., 11 GRAFTON STREET, NEW BOND STREET, W.1; DULAU & CO., LTD., 32 OLD BOND STREET, LONDON, W.1; OXFORD UNIVERSITY PRESS, WARWICK SQUARE, LONDON, E.C.4
AND AT
THE BRITISH MUSEUM (NATURAL HISTORY), CROMWELL ROAD, S.W.7
1930

Price Two Shillings and Sixpence

Issued 25 October, 1930.]

British Museum (Natural History).

This is No. 3. *of* 25 *copies of* "*Terra Nova*" *Zoology, Vol. VII., No.* 4, *Chaetognatha, printed on Special paper.*

CHAETOGNATHA.

BY S. T. BURFIELD, M.A., M.Sc.

(*Lecturer in Zoology, Liverpool University.*)

WITH THREE MAPS.

I. INTRODUCTION.

THE collection of Chaetognatha obtained by the "Terra Nova" is a large one, consisting of upwards of 17,000 specimens obtained in 133 different catches. The collection includes specimens belonging to four different genera and thirteen species. The plankton of this expedition was obtained by the use of various nets, a bucket, and on occasions by a young fish trawl. The majority of the specimens of Chaetognatha were taken at or near the surface, or by drawing up an open net from somewhat greater depths to the surface. There are practically no data therefore from which to draw any conclusions as to distribution in depths of the various species. On the other hand, a considerable number of night hauls were made, in some cases at the same station as day hauls, and the data thus obtained have been considered. The specimens were all preserved in formalin, the best preservative for Chaetognatha, and were in good condition apart from damaged fins, a trouble which it is practically impossible to avoid.

In a number of the samples in this collection the animals were of a very distinct pink colour. This occurred in catches taken in all four geographical regions into which the collection is divided. There is therefore no correlation between station and colour, and on examination it was also found that any species might be pink coloured. With some of these catches a number of small crustacea were present, similarly coloured. The Chaetognatha often feed on small crustacea, and it is suggested that the pigment in the prey may tint the feeder. This would account for the sporadic occurrence of the colour in any Chaetognathan.

The present collection is the sixth in which any considerable number of Chaetognatha have been taken in Antarctic and Sub-Antarctic waters, and reported upon. The earlier collections have been worked out by Steinhaus (1900), Fowler (1907), Ritter-Záhony (1911A), Jameson (1914), and Johnston and Taylor (1921). I am indebted to all of these, and especially to the extensive work of Ritter-Záhony.

The Chaetognatha to be found in the surface waters of the Antarctic are reasonably well known as a result of the above collections, and no new species has been discovered in the present collection.

I have to thank the authorities of the British Museum for entrusting me with this collection for examination and report, and my thanks are also due to Dr. von Ritter-Záhony for a copy of one of his papers.

II. LIST OF SPECIES.

The arrangement of species followed in this report is that given by Ritter-Záhony in Das Tierreich (1911c).

Gen. SAGITTA, Quoy and Gaimard.

1. *Sagitta hexaptera*, d'Orb.
2. ,, *lyra*, Krohn.
3. ,, *gazellae*, Ritt-Z.
4. ,, *maxima*, (Conant).
5. ,, *enflata*, Grassi.
6. ,, *bipunctata*, Quoy and Gaimard.
7. ,, *robusta*, Doncaster.
8. ,, *bedoti*, Béraneck.
9. ,, *serratodentata*, Krohn.
10. ,, *planctonis*, Steinhaus.

Gen. PTEROSAGITTA, A. Costa.

11. *Pterosagitta draco*, (Krohn).

Gen. EUKROHNIA, Ritt-Z.

12. *Eukrohnia hamata*, (Möb).

Gen. KROHNITTA, Ritt-Z.

13. *Krohnitta subtilis*, (Grassi).

III. LIST OF STATIONS AT WHICH CHAETOGNATHA WERE OBTAINED.

It should be noted that the separately numbered "Stations" do not indicate in every case a different *locality*. In some cases several hauls of plankton were made at different times at the same place. These hauls each receive a separate "station" number.

Tropical and Sub-Tropical Atlantic.

Station	12.	June 27th, 1910.	30° 21′ N. 18° 14′ W. Surface, 3.45–4.15 p.m.
,,	27.	July 6th, ,,	17° 8′ N. 25° 41′ W. Surface, 2.30–4.30 p.m.
,,	29.	,, 7th, ,,	15° 38′ N. 25° 24′ W. 10 metres, 2–3.30 p.m.
,,	30.	,, 8th, ,,	13° 56′ N. 25° 8′ W. 2 metres, 1.10–3.15 p.m.
,,	39.	April 27th, 1913.	Six miles off mouth of Rio de Janeiro Harbour, 2 metres, 11 p.m.–1.30 a.m.
,,	40.	,, ,, ,,	Six miles off mouth of Rio de Janeiro Harbour, 2 metres, 2.30–5 a.m.
,,	43.	May 3rd, ,,	22° 6′ S. 39° 40′ W. Surface, 12.30–1 a.m.
,,	45.	,, 4th, ,,	21° S. 37° 50′ W. Surface, 12.50–1.30 a.m.
,,	46.	,, ,, ,,	20° 30′ S. 36° 30′ W. Surface, 10.30–11 p.m.
,,	47.	,, ,, ,,	20° 30′ S. 36° 30′ W. Surface, 10.30–11 p.m.
,,	49.	,, 6th, ,,	18° 51′ S. 33° 40′ W. Surface, 4.30–5 a.m.
,,	50.	,, 7th, ,,	18° S. 31° 45′ W. Surface, 12.35–1.15 a.m.
,,	51	,, 12th, ,,	5° S. 27° 15′ W. Surface, 3–3.30 p.m.
,,	52.	,, ,, ,,	5° S. 27° 15′ W. 2 metres, 4–6 p.m.
,,	53.	,, ,, ,,	5° S. 27° 15′ W. 2 metres, 6–7 p. m.
,,	55.	,, 13th, ,,	4° 30′ S. 27° 16′ W. 2 metres, 1–3 a.m.
,,	57.	,, ,, ,,	4° 30′ S. 27° 16′ W. 2 metres, 1.15–3 p.m.
,,	58.	,, 16th, ,,	0°. 25° 15′ W. Surface, 1–1.30 a.m.
,,	59.	,, ,, ,,	0°. 25° 15′ W. Surface, 1–1.30 a.m.
,,	60.	,, 17th, ,,	2° N. 24° 45′ W. Surface, 1–1.30 a.m.
,,	61.	,, ,, ,,	2° N. 24° 45′ W. Surface, 1–1.30 a.m.
,,	62.	,, 18th, ,,	4° 50′ N. 24° W. Surface, 1–1.30 a.m.
,,	63.	,, 19th, ,,	6° 10′ N. 24° 5′ W. Surface, 2–2.30 a.m.
,,	64.	,, 26th, ,,	23° 28′ N. 34° 45′ W. Surface, 1.30–2 a.m.
,,	65.	,, ,, ,,	23° 28′ N. 34° 45′ W. Surface, 1.30–2 a.m.

Station	66.	May 27th, 1913.	25° 35′ N. 34° 10′ W. Surface, 1–30–2 a.m.
,,	67.	,, ,, ,,	25° 35′ N. 34° 10′ W. Surface, 1.30–2 a.m.
,,	68.	,, 28th, ,,	27° 22′ N. 33° 40′ W. Surface, 1.30–2 a.m.
,,	69.	,, 29th, ,,	29° 10′ N. 33° 36′ W. Surface, 1.30–2 a.m.
,,	70.	June 2nd–3rd, 1913.	Off Horta Harbour, Fayal, Azores, 12 metres, 6 p.m.–8 a.m.
,,	310.	April 21st, 1913.	36° 57′ S. 51° 21′ W. Surface, 3.30–3.50 p.m.
,,	311.	,, 22nd, ,,	35° 29′ S. 50° 26′ W. 2 metres, 8–10 a.m.

North of New Zealand and neighbouring waters.

(Approximately 33°–35° S., and 171°–174° E.)

Station	75.	July 17th, 1911.	From summit, Gt. King, W., 8 miles. Surface, 3–3.30 p.m.
,,	76.	,, ,, ,,	From summit, Gt. King, W., 8 miles. Surface, 3–3.30 p.m.
,,	80.	,, 22nd, ,,	From summit, Gt. King. N. 87° W., 11 miles, 0–100 metres, 5 p.m.
,,	84.	,, 23rd, ,,	From C. Maria van Diemen Light, S.W. by W., 15 miles. 2 metres, 8–9 p.m.
,,	85.	,, 24th ,,	From C. Maria van Diemen Light, W.N.W., 24 miles. 2 metres, 1–5 a.m.
,,	86.	,, 24th–25th, 1911.	Off Three Kings Islands, 3 metres, 8 p.m.–5 a.m.
,,	87.	,, 25th, 1911.	From summit, Gt. King, S. ½° W., 10 miles. 30 metres, noon.
,,	92.	,, 26th–27th, 1911.	From summit, Gt. King. S. by W., 24 miles. Surface, 9 p.m.–4 a.m.
,,	93.	,, 27th–28th, ,,	From summit, Gt. King. S.E. by S., 13 miles. Surface, 9 p.m.–4 a.m.
,,	94.	,, 30th, 1911.	Off Morgonui, Doubtless Bay. 18 metres, 2–4 p.m.
,,	97.	Aug. 2nd–3rd, 1911.	Anchorage, North Cape. 20 metres, 9 p.m.–8 a.m.
,,	100.	,, 4th, ,,	From West Island, Three Kings Islands, S.W., 5 miles. Surface, 1–2 p.m.
,,	101.	,, ,, ,,	From West Island, Three Kings Islands, S.W., 5 miles. Surface, 4–5 p.m.
,,	102.	,, ,, ,,	From West Island, Three Kings Islands, S.W., 5 miles. Surface, 3–4 p.m.

Station 103.	August 4th, 1911.	From West Island, Three Kings Islands, S.W., 5 miles. Surface, 5–6 p.m.
,, 106.	,, ,, ,,	From West Island, Three Kings Islands, S.W., 5 miles. Surface, 7–8 p.m.
,, 107.	,, 4th–5th, ,,	From West Island, Three Kings Islands, S.W., 5 miles. Surface, 8 p.m.–5.30 a.m.
,, 108.	,, 5th, ,,	34° 15′ S. 172° 0′ E. Surface, noon, 4 p.m., at intervals.
,, 109.	,, 5th–6th ,,	34° 15′ S. 172° 0′ E. 3 metres, 8 p.m.–8 a.m.
,, 111.	,, 7th, ,,	Off Three Kings Islands. Surface, 10 a.m.–1 p.m.
,, 112.	,, 8th, ,,	33° 37′ S. 171° 30′ E. 3 metres, noon–4 p.m.
,, 113.	,, 9th, ,,	33° 12′ S. 171° 05′ E. 3 metres, 9 a.m.–noon.
,, 118.	,, 16th–17th ,,	34° 32′ S. 172° 20′ E. Surface, 9 p.m.–5 a.m.
,, 120.	,, 17th–18th ,,	34° 26′ S. 172° 14′ E. Surface, 9 p.m.–5 a.m.
,, 122.	,, 18th–19th ,,	From C. Maria van Diemen. S. 80° W., 21 miles. Surface, 9 p.m.–5 a.m.
,, 125.	,, 23rd, ,,	Between North Cape and Doubtless Bay. Surface, 2–4 p.m.
,, 126.	,, 24th, ,,	34° 13′ S. 172° 15′ E. Surface, 9 a.m.–noon.
,, 127.	,, 24th–25th, ,,	Off Three Kings Islands. Surface, 9 p.m.–5 a.m.
,, 129.	,, 25th–26th, ,,	Off Three Kings Islands. Surface, 6 p.m.–6 a.m.
,, 130.	,, 26th–27th, ,,	Off Three Kings Islands. Surface, 8 p.m.–6.30 a.m.
,, 131.	,, 27th, ,,	Off Three Kings Islands. Surface, 9 a.m.–5 p.m.
,, 132.	,, 29th, ,,	Spirits Bay, near North Cape. 10 metres, 9 a.m.–noon.
,, 133.	,, 30th–31st, ,,	Spirits Bay, near North Cape. 20 metres, 8 p.m.–6 a.m.
,, 135.	,, 31st–Sept. 1st, 1911.	Spirits Bay, near North Cape. 3 metres, 9 p.m.–6.30 a.m.
,, 136.	Sept. 1st–2nd, 1911.	Spirits Bay, near North Cape. Surface, 6 p.m.–6.30 a.m.
,, 137.	,, 4th, ,,	34° 2′ S. 172° 40′ E. Surface, 9 a.m.–noon.

Station 139. Sept. 5th–6th, 1911. 34° 30′ S. 171° 53′ E. Surface, 9 p.m.–5.30 a.m.

,, 140. ,, 6th, ,, 34° 30′ S. 171° 53′ E. Surface, 10 a.m.–4 p.m.

,, 141. ,, 6th–7th, ,, 34° 37′ S. 171° 19′ E. Surface, 11 a.m.–9 a.m.

,, 142. ,, 7th–8th, ,, 34° 45′ S. 170° 45′ E. 2 metres, 9 a.m.–9 a.m.

,, 143. ,, 8th–9th, ,, 34° 58′ S. 170° 12′ E. Surface, 4 p.m.–9 a.m.

,, 145. ,, 15th, ,, Anchorage, North Cape. 24 metres, 1.30–3.30 p.m.

,, 146. ,, 18th, ,, Anchorage, North Cape. 5 metres, 11.30 a.m.–1 p.m.

Sub-Antarctic Zone.

(Approximately between 40° S. and 60° S.)

Station 232. March 24th, 1912 55° 51′ S. 165° 49′ E. Surface, 10–11 a.m.

,, 235. ,, 26th, ,, 52° 41′ S. 168° 15′ E. 10 metres, 7–10 p.m.

,, 236. ,, 27th, ,, 52° 11′ S. 167° 25′ E. 80 metres, 6–8 p.m.

,, 237. ,, 27th–28th, 1912. 52° 11′ S. 167° 25′ E. 10 metres, midnight–8 a.m.

,, 238. ,, 27th, 1912. 52° 11′ S. 167° 25′ E. 30 metres, 10–10.30 a.m.

,, 241. ,, 27th–28th, 1912. 51° 57′ S. 167° 38′ E. Surface, 9 p.m.–4 a.m.

,, 248. Dec. 18th, 1912. 51° 22′ S. 179° 18′ E. Surface, 7 p.m.

,, 250. ,, 20th, ,, 54° 2′ S. 177° 0′ W. Surface, noon–1 p.m.

,, 251. ,, ,, ,, 54° 2′ S. 177° 0′ W. Surface, 8–8.30 p.m.

,, 252. ,, 21st, ,, 54° 33′ S. 176° 55′ W. Surface, 4–5 p.m.

,, 256. ,, ,, ,, 54° 38′ S. 176° 24′ W. 20 metres, 10 p.m.

,, 259. ,, 22nd, ,, 55° 34′ S. 174° 35′ W. 20 metres, 9 p.m.

,, 302. Feb. 3rd, 1913. 58° 21′ S. 158° 5′ E. 20 metres, 8.30 p.m.

,, 305. March 21st, 1913. 56° 41′ S. 162° 05′ W. Surface, 9–9.30 p.m.

,, 307. April 1st, 1913. 55° 16′ S. 120° 3′ W. 6 metres, 6.15–8.45 p.m.

,, 308. ,, 9th, ,, 55° 29′ S. 78° 54′ W. 4 metres, 9.30–11 a.m.

Antarctic Ocean (Ross Sea Area).

Station 178. Dec. 15th, 1910. 67° 23′ S. 177° 59′ W. 0–500 metres, 9 p.m.

,, 180. ,, 22nd, ,, 68° 26′ S. 179° 08′ W. 100 metres, 5 p.m.

Station 224.	March 9th, 1912.	60 miles E. of Cape Adare. 1 metre, 7–9 p.m.
,, 228.	,, 17th–18th, 1912.	64° 3′ S. 160° 12′ E. Surface, 9 p.m.–4 a.m.
,, 229.	,, 18th, 1912.	64° 3′ S. 160° 12′ E. 80 metres, 8.30–9 a.m.
,, 230.	,, ,, ,,	64° 3′ S. 160° 12′ E. 80 metres, 11 a.m.–12.30 p.m.
,, 267.	Dec. 27th, 1912.	66° 30′ S. 166° 8′ W. Surface, 8–8.30 p.m.
,, 269.	,, 28th, ,,	68° 37′ S. 166° 14′ W. Surface, 6–8 p.m.
,, 270.	,, 29th, ,,	69° 51′ S. 166° 17′ W. 0–600 metres, 8 p.m.
,, 272.	Jan. 1st, 1913.	71° 35′ S. 166° 01′ W. 80 metres, 4 p.m.
,, 273.	,, 2nd, ,,	71° 35′ S. 166° 01′ W. 20 metres, 10–11.30 p.m.
,, 274.	,, 3rd, ,,	71° 29′ S. 166° 0′ W. 80 metres, 9 a.m.–noon.
,, 275.	,, ,, ,,	71° 29′ S. 166° 0′ W. 160 metres, 1–5 p.m.
,, 276.	,, 5th, ,,	71° 41′ S. 166° 47′ W. 0·1750 metre, 10.30–11.30 p.m.
,, 281.	,, 6th, ,,	71° 41′ S. 166° 47′ W. 80 metres, 5.30–8 p.m.
,, 282.	,, 6th–7th, 1913.	71° 41′ S. 166° 47′ W. 0–1000 metres, 8 p.m.–8 a.m.
,, 283.	,, 7th, 1913.	71° 39′ S. 166° 47′ W. 80 metres, 1–3 p.m.
,, 284.	,, 8th, ,,	71° 49′ S. 167° 32′ W. 80 metres, 5.15–7.30 p.m.
,, 285.	,, 8th, ,,	71° 49′ S. 167° 32′ W. 0–600 metres, 8–10 p.m.
,, 287.	,, 9th, ,,	71° 44′ S. 167° 57′ W. 80 metres, 9 a.m.–7 p.m.
,, 288.	,, 10th–11th, 1913.	71° 59′ S. 168° W. 60 metres, 8 p.m.–9 a.m.
,, 289.	,, 11th–12th, ,,	72° S. 168° 17′ W. 24 metres, 8 p.m.–9 a.m.
,, 290.	,, 12th, 1913.	72° S. 168° 17′ W. 60 metres, 9 a.m.–3 p.m.
,, 293.	,, 15th, ,,	73° 41′ S. 177° W. 0–370 metres, 10 a.m.
,, 300.	Feb. 2nd, ,,	61° 18′ S. 157° 33′ E. 0–140 metres, 10 p.m.
,, 332.	Jan. 16th, 1912.	77° 15′ S. 166° 0′ E. 0–550 metres, 2 a.m.
,, 342.	,, 31st, ,,	Off Cape Royds, 0–350 metres, 4 p.m.
,, 344.	Feb. 1st, ,,	Off Cape Royds. 0–400 metres, 3 p.m.
,, 345.	,, 2nd, ,,	McMurdo Sound, 0–500 metres, 8.30–9.30 a.m.
,, 346.	,, 3rd, ,,	McMurdo Sound, 0–450 metres, 9 a.m.–5 p.m.

Station 350. March 4th, 1912. Off Glacier Tongue, McMurdo Sound, 250 metres, 2–4 p.m.

In addition to these there are eleven Antarctic catches made by Nelson in the neighbourhood of Cape Evans in 1911 and 1912.

IV. DESCRIPTION OF SPECIES.

Gen. SAGITTA, Quoy and Gaimard, 1827.

1. *Sagitta hexaptera*, d'Orbigny, 1836.

Fowler, 1906; Ritter-Záhony, 1908, 1909B, 1911A, 1911B, and 1911C; Michael, 1911 and 1919; Jameson, 1914; Germain and Joubin, 1916; Johnston and Taylor, 1921; Burfield and Harvey, 1926.

Over three hundred specimens of this species were collected in thirty-three hauls. The examples agree with the latest descriptions of the species. The long pointed anterior teeth are very characteristic. There is a good deal of variation in the number of both anterior and posterior teeth, and in a few cases all the teeth appear to have been torn out. This feature has been noted by Fowler (1906) and Michael (1919).

Formulae *:—	40–43	20–16	7–4	3–0	3–0
	25–39	23–16	9–5	3	3–4
	16–24	25–17	10–8	3	3–4

2. *Sagitta lyra*, Krohn, 1853.

Ritter-Záhony, 1908, 1911A, 1911C; Michael, 1911, 1919; Johnston and Taylor, 1921; Burfield and Harvey, 1926. *S. furcata*, Fowler, 1905.

This species was taken in six hauls, yielding 186 specimens. In spite of the extended descriptions of this species and of *S. gazellae* by Ritter-Záhony, I still find it difficult to separate them (*see also* Johnston and Taylor, 1921). In tail length expressed as a percentage of total length there is overlapping as shown by the series of measurements given by Ritter-Záhony himself and by other authors. Michael (1919) in a key to the species of Sagitta says that in *lyra* the tail *usually* exceeds 15 per cent. of the total length, and that this measurement is *usually* less than 15 per cent. in *gazellae*. This appears to be a fair statement of the situation, and serves to differentiate the average size individuals. The rayless regions of the fins are very similar in both cases, but the rayless portions are, on the whole, less extensive in *gazellae* than in *lyra*. There is, however, some variation in this character. The junction between anterior and posterior

* The tables of formulae given for each species follow the arrangement adopted by recent writers on the group. The first column gives the length of specimens in millimetres (without tail fin): the second the proportional length of the tail expressed as a percentage of the total length; the remaining three columns give the number of jaws, the number of anterior teeth, and the number of posterior teeth respectively.

fins offers a feature which I have found useful. In *gazellae* this junction is very narrow and has indications of rays, whereas in *lyra* the junction is much broader and is rayless. The claw-like form of the youngest jaws in *lyra* seems to be a good feature (*see* Ritter-Záhony, 1911A), and the anterior fin begins distinctly nearer the ventral ganglion in *lyra* than in *gazellae*, in the former species beginning immediately behind the ventral ganglion.

Formulae :—25–36	17–14	8–5	7–4	11– 5
20–24	19–16	9–8	5–7	10–12
14–18	19–16	9–8	5–6	9–10

3. *Sagitta gazellae*, Ritter-Záhony, 1909B.

Ritter-Záhony, 1911A, 1911c ; Jameson, 1914 ; Michael, 1919. ? *S. lyra*, Johnston and Taylor, 1921.

This species was very well represented in the collection, over 300 specimens being taken. The likeness of this form to *S. lyra* is discussed above. Taking all the facts into consideration I have retained *S. gazellae* as a valid species. The present species grows to a large size for a Chaetognathan, and several catches were taken in Sub-Antarctic and Antarctic waters consisting of several hundreds of *S. gazellae* 50 m.m. long and upwards. The longest specimen in this collection measured 75 m.m., taken at station No. 288. Jameson records a specimen 90 m.m. long. With the possible exception of *S. maxima*, the present species contains the largest known Chaetognatha.

Formulae :—60–75	13–12·5	7	6–7	9–10
50–59	14–12	7	6–7	8–10
40–49	14–13	8	6–8	7–10
25–38	16–13	8	4–6	5– 8
17–24	17–15	10–9	4–5	4– 5

4. *Sagitta maxima* (Conant, 1896).

Ritter-Záhony, 1910B ; Jameson, 1914. *S. gigantea*, Broch, 1906.

Our knowledge of this species we owe almost entirely to Ritter-Záhony. In general appearance it is very similar to *S. lyra* and *S. gazellae*. Michael (1919) finds it impossible to distinguish this species from *S. lyra*, although he allows *S. gazellae* as a valid species. Ritter-Záhony describes *S. maxima* as a large deep-sea form. The principal distinguishing features of this species appear to be as follows. Tail length of over 20 per cent., *i.e.* longer than for *S. lyra* or *S. gazellae*. The posterior teeth do not exceed 8 in number on each side, whereas there may be as many as 12 in *S. lyra* and 10 in *S. gazellae*. In *S. lyra* and *S. gazellae* there is no ridge-like vestibular organ, but only a row of conical papillae. *S. maxima*, according to Ritter-Záhony, has a ridge set with papillae. The anus lies in front of and well separated from the trunk-tail septum, and in this feature *S. maxima* is comparable with both *S. lyra* and *S. gazellae*.

Only one specimen in this collection could be referred to this species. This was obtained from a haul described as from 0–600 metres, so the specimen may have come from any depth down to about 300 fathoms. The formulae for this specimen is as follows :—

45	22	6	5	6

5. *Sagitta enflata*, Grassi, 1883.

Fowler, 1906 ; Ritter-Záhony, 1909B, 1911A, 1911B, 1911C ; Michael, 1911 ; Jameson, 1914 ; Germain and Joubin, 1916 ; Michael, 1919 ; Burfield and Harvey, 1926. *S. australis*, Johnston, 1909.

This species was well represented in the catches obtained from warmer waters. The specimens conform to previous descriptions of this characteristic species, and call for no special remarks.

Formulae :—	25–28	18–16	9	8–10	15–16
	15–24	18–16	9	9	15–16
	10–15	20–16	9	7–10	10–16

6. *Sagitta bipunctata*, Quoy and Gaimard, 1827.

Ritter-Záhony, 1908, 1910B, 1910C, 1911A, 1911B, 1911C ; Jameson, 1914 ; Burfield and Harvey, 1926.

This is perhaps the best known of all the Chaetognatha, though it is very easily confused with several other species, especially *S. elegans*. We owe to Ritter-Záhony a careful sorting out of several similar forms. If the animals be sufficiently mature the shape and position of the seminal vesicles forms a useful character. The presence or absence of alimentary diverticula serves to differentiate this species from *S. elegans*, but I have often found it somewhat difficult to see these structures in the whole animal. The position of the front end of the anterior lateral fin relative to the ventral ganglion is a good distinguishing feature if the fin be well preserved. The tail length and head armature are very similar in the two species when the limits of variation are noted, and are not by themselves sufficiently characteristic to serve as a distinguishing feature.

Formulae :—	12–15	26–22	9	6–7	13–15
	9–11	26–22	9	6–7	14–15
	6– 8	27–22	8	5–6	11–13

7. *Sagitta robusta*, Doncaster, 1902.

Fowler, 1906 ; Ritter-Záhony, 1909A, 1909B, 1910C, 1911A, 1911B, 1911C ; Jameson, 1914 ; Burfield and Harvey, 1926. *S. ferox*, Michael, 1919.

I have already discussed this species at some length (1926), particularly in relation to *S. ferox* and *S. hispida*. This is a species which is easily confused with *S. planctonis* as regards general external appearance. Both are moderately opaque with rather large head and well-developed collarette. The tail length and head armature are very similar, though *S. planctonis* has rather more numerous posterior teeth. The corona differs in the two species. The young forms of *S. robusta* are very similar to *S. bipunctata*.

Formulae :—11–15	29–23	8–7	8–9	13–14
8–10	29–24	8–7	6–8	13

8. *Sagitta bedoti*, Béraneck, 1895.

Fowler, 1906 ; Ritter-Záhony, 1910A, 1911A, 1911C ; Michael, 1919 ; Burfield and Harvey, 1926. *S. polyodon*, Doncaster, 1902.

This is a small species found in the surface waters of the warmer parts of the Indian and Pacific Oceans. The characteristics of this form are fully given by Ritter-Záhony, 1911A, and by Michael, 1919. The specimens obtained on the present expedition conform to these descriptions. The short but distinct collarette is easily seen. This species of Sagitta is easily confused with several others, perhaps more especially when young. There are many points in common to be found in *decipiens*, *pulchra*, and *neglecta*, and in the present species. A feature which is useful in the identification is the considerable amount of the anterior parts of both lateral fins which are rayless. In this feature *bedoti* is more like *pulchra* and approaches the condition found in *minima*.

Formulae :—9–12	28–25	6–7	9–13	16–28
7– 8	30–25	6–7	8–11	15–22

9. *Sagitta serratodentata*, Krohn, 1853.

Fowler, 1905 and 1906 ; Ritter-Záhony, 1908, 1909A, 1909B, 1911A, 1911B, 1911C ; Michael, 1911 and 1919 ; Jameson, 1914 ; Germain and Joubin, 1916 ; Johnston and Taylor, 1921 ; Burfield and Harvey, 1926.

This well-known species was caught in considerable numbers on the present expedition. It is easily recognisable, apart from its serrated jaws, by the pin-like shape of the whole body. Many of the specimens are mature, and the distinctive seminal vesicles were well shown. The way in which these vesicles stand out from the sides of the tail, and the presence of a membrane connecting the vesicles with the posterior fins are features which make this species easily distinguishable.

There is considerable variation in this species in the number of anterior and posterior teeth, when the numbers given for various observers are examined. The very low numbers are all given by Fowler from Biscayan and Siboga material, and later collections tend to show higher numbers and somewhat less variation. The numbers for specimens in the present collection are much the same as those given by the author for Sealark material.

Formulae :—10–13	25–23	6	9–10	19–21
7–10	27–25	6	7–9	15–19

10. *Sagitta planctonis*, **Steinhaus, 1896.**

Ritter-Záhony, 1909B, 1911A, 1911C; Michael, 1911, 1919; Germain and Joubin, 1916; Johnston and Taylor, 1921; Burfield and Harvey, 1926. *S. zetesios*, Fowler, 1905, 1906.

A considerable number of specimens of this stout, opaque species were captured. Young individuals are somewhat like *S. robusta*. The loss of rays in the front portion of the anterior fin in older specimens is characteristic. The anterior teeth also provide a good distinguishing character. They are slightly curved, pointed, and the outer members of each row considerably shorter than the inner.

Formulae :—	25–28	24	9	9–11	15–18
	20–24	26–25	9	8–11	15–18
	16–19	29–24	8–9	7–10	16–19
	13–16	30–24	8–9	7–10	16–19

Gen. PTEROSAGITTA, Costa, 1869.

Syn. Spadella, Langerhans, 1880 (part); Hertwig, 1880 (part); Grassi, 1883 (part); Strodtmann, 1892 (part).

11. *Pterosagitta draco* **(Krohn, 1853).**

Sagitta draco, Krohn, 1853. *Pterosagitta mediterranea*, Costa, 1869. *Spadella draco*, Fowler, 1906; Michael, 1911. *Pterosagitta draco*, Ritter-Záhony, 1911A, 1911B, 1911C; Michael, 1919; Jameson, 1914; Germain and Joubin, 1916; Burfield and Harvey, 1926.

The specimens of this well-known species conformed to the published descriptions. The collarette is often entirely rubbed off, but in spite of some superficial resemblance in this condition to young specimens of several other species, the relatively long tail segment makes this form easily recognisable.

Formulae :—	7–10	46–40	8–9	8–10	13–17
	5–7	46–41	9	6–9	11–16

Gen. EUKROHNIA, Ritter-Záhony, 1909B.

Syn. Krohnia, Langerhans, 1880 (part). *Spadella*, Hertwig, 1880 (part).

12. *Eukrohnia hamata* **(Möbius, 1875).**

Ritter-Záhony, 1909B, 1910B, 1911A, 1911B, 1911C; Michael, 1911, 1919; Jameson, 1914; Germain and Joubin, 1916; Johnston and Taylor, 1921; Burfield and Harvey, 1926.

This species was captured in considerable numbers and conformed to the descriptions given by several authors. The youngest jaws in the smallest specimens were saginate, and this confirms the observations of Krumbach (1903) and Ritter-Záhony (1911A, 1911C), and is contrary to Michael (1911), and Johnston and Taylor (1921). From the detailed records of several reporters it is evident that in this species there is a good deal of variation in the number of teeth, and in general the number increased with age (*i.e.* total length). Apart from this variation Ritter-Záhony, Michael, and

Burfield and Harvey have noted that there appear to be some other variations which are possibly characteristic of different regions in which the species occurs. The particular features are length of tail segment, number of jaws, and number of teeth. This species is bipolar and Ritter-Záhony (1911A, 1911C) suggests that there may be a constant difference between arctic and antarctic forms in length of tail and number of jaws. Data on these points have been collected from various descriptions of this species as given in the reports on different expeditions and are tabulated below.

Region.	Reporter.	Total Lengths of Specimens.	Length of Tail.	Number of Jaws.	Number of Teeth.
		mm.	per cent.		
Arctic	Ritter-Záhony 1910B ..	8–43	22–31	8–10	0–28
Irish Sea	,, ,, ..	11–25	20–32	8–9	5–22
Atlantic	Germain and Joubin, 1916	20–45	22–30	8–11	12–25
Atlantic and Pacific ..	Fowler, 1906	8–26	22–34	8–12	9–23
San Diego	Michael, 1911	13–17·5	28–32	8–11	10–13
Chagos and Seychelles ..	Burfield and Harvey, 1926	8–22	22–31	9–12	10–23
Antarctic	Fowler, 1907	9–31	18–30	6–9	4–23
,, ...	,, ,, ...	10–17	20–30	6–9	3–13
,, ...	Ritter-Záhony, 1911A ..	11–29	19–24	7–9	4–23
,, ...	Present Coll.	8·5–25	22–25	7–8	10–18

An examination of these figures shows that there is little constant difference between the individuals taken from the various regions. The tail length of Arctic forms is identical with that of individuals taken at Chagos and differs little from that of Antarctic specimens measured by Fowler and those of the present collection. The minimum number of jaws is smaller by one or two in Antarctic as compared with Arctic, but these structures are known to be variable in number, and the variation is very small. The number of teeth is extremely variable, and no recognisably constant difference is to be seen between Arctic and Antarctic forms. From the data so far collected there does not appear to be any reason for the creation of distinct Arctic and Antarctic varieties of this species.

No variety such as that described by Johnston and Taylor (1921) appeared in the present collection.

Gen. KROHNITTA, Ritter-Záhony, 1910c.

Syn. Spadella, Grassi, 1883 (part). *Krohnia*, Strodtmann, 1892 (part).

13. *Krohnitta subtilis* (Grassi, 1883).

Ritter-Záhony, 1910c, 1911A, 1911B, 1911c; Jameson, 1914; Germain and Joubin, 1916; Michael, 1919; Burfield and Harvey, 1926. *Krohnia subtilis*, Fowler, 1905, 1906. *Krohnia pacifica*, Fowler, 1906; Ritter-Záhony, 1909A. *Eukrohnia subtilis*, Michael, 1911.

The examples of this form agreed with the most recent descriptions, and call for no special comment. The single pair of lateral fins extending far back on the tail segment, the " bayonet-shaped " teeth in a single row on each side, and the characteristically bent and needle-pointed jaws, are features which serve to distinguish this from all other Chaetognatha. An examination of the specimens in this collection confirms the conclusion that the species *pacifica* must be considered as synonymous with *subtilis*. The former are only small individuals of the latter species.

Formulae :—11–13	31–38	7–9	10–12
9–11	33–38	7–8	10–12

V. DISTRIBUTION.

A. Whole Collection.

The number of hauls of Plankton made by this expedition was 294, to which may be added 11 catches made by Nelson in the Antarctic. This gives a total of 305 hauls. Of these Chaetognatha were present in 133 catches, *i.e.* 43·6 per cent. of the whole. As indicated in the list of stations, the hauls may be considered as forming four groups. The first of these includes 32 hauls made in Tropical and Sub-Tropical Atlantic waters (47·7 per cent. of plankton hauls made in this region). These stations extend from approximately 38° N. (Azores), to 23° S. (Rio de Janeiro). The following are represented in these catches :—

Sagitta hexaptera.	*Sagitta robusta.*
,, *lyra.*	,, *serratodentata.*
,, *gazellae.*	*Pterosagitta draco.*
,, *enflata.*	*Eukrohnia hamata.*
,, *bipunctata.*	*Krohnitta subtilis.*

Some of these were only sparsely represented in numbers of specimens. Only one specimen each of *Eukrohnia hamata* and *Krohnitta subtilis* were recorded. Including these, however, ten of the thirteen different species found in this collection were found in this area. All of these catches were made at the surface, or at a depth of not more than 12 metres.

The total number of specimens captured in this group of hauls was approximately 8188, and the hauls occupied in all 46 hours, giving an average surface capture of 178 specimens per hour haul over day and night.

The second group of catches were made in waters around the north of New Zealand, the approximate limits being Lat. 33° to 35° S., and Long. 171° to 174° E. In this area 43 hauls containing Chaetognatha were made (59·7 per cent. of total plankton hauls in this region), and the following are represented :—

Sagitta hexaptera.	*Sagitta bedoti.*
,, *lyra.*	,, *serratodentata.*
,, *gazellae.*	,, *planctonis.*
,, *enflata.*	*Pterosagitta draco.*
,, *bipunctata.*	*Eukrohnia hamata.*
,, *robusta.*	*Krohnitta subtilis.*

These are the same ten species as found in the previous area with the addition of *S. bedoti* and *S. planctonis*, but in the New Zealand waters *S. enflata*, *S. robusta*, and *Eukrohnia hamata* were sparsely represented by four, ten, and three specimens respectively. These hauls were all made at the surface or at a depth not greater than 30 metres, except one catch which is recorded as 0–100 metres. The total number of specimens in these hauls was 2899, and the time occupied was 267 hours, giving an average capture of 11 specimens per hour haul over day and night.

Further south the third group of hauls are designated as Sub-Antarctic, and extend from Lat. 40° S. to 60° S. Within this area 16 hauls containing Chaetognatha were made (30·2 per cent. of plankton hauls made in this region), and the following species are represented :—

Sagitta gazellae.	*Eukrohnia hamata.*
,, *serratodentata.*	

The hauls in this area are likewise surface collections. One station was at 80 metres, and the remainder vary from 30 metres to the surface. A total of 4242 specimens were taken, and these were almost entirely of the first and last species, only 29 specimens of *S. serratodentata* being captured. These hauls occupied a total of approximately 30 hours, giving an average capture of 141 specimens per hour over day and night. The sudden absence of many species in stations south of Lat. 40° S. is very noticeable in spite of the small number of hauls in this area. This absence is confirmed when the larger number of hauls made still further south are examined.

Finally, a series of hauls were made in the Antarctic waters of the Ross Sea area. The furthest south station from which Chaetognatha were taken was Station 350, Lat. 77° 44′ S.

In this area 42 hauls contained Chaetognatha (42·1 per cent. of total plankton hauls in this region), and the following species were present :—

Sagitta gazellae.	*Eukrohnia hamata.*
,, *maxima.*	
,, *serratodentata.*	
,, *planctonis.*	

In this series of hauls *S. maxima* and *S. serratodentata* were represented by only one specimen of each. Of the three remaining species *Eukrohnia hamata* was present in considerable excess, *S. gazellae* and *S. planctonis* following in that order. The total number of specimens captured in this series was 2295, and the total time occupied was a minimum of 120 hours, but as a number of hauls were made in this area for which no length of time was recorded, a reliable figure for average catch of specimens per hour haul cannot be given.

The main facts which are brought out by this general consideration of the horizontal distribution of the catches made on this expedition is that both the Atlantic and New

Zealand surface waters as far south as about Lat. 40° S. are rich both in species and individuals, and that in the Sub-Antarctic and Antarctic regions a few species are still well represented. There is a very noticeable falling off in the number of species present in surface waters further south. A further examination of the details given above shows that south of Lat. 40° S., *i.e.* south of the *average* limit of floating ice, *Eukrohnia hamata* and *Sagitta gazellae* are the characteristic surface forms, and whatever may be the species population at greater depths, these two are present to the practical exclusion of all others in the upper epiplankton of the far south.

The largest haul in the collection as regards numbers of specimens was at Station 311, Lat. 35° 29′ S., Long. 50° 26′ W., in the South-West Atlantic. Here, in a haul of two hours with a Young fish trawl at a depth of 2 metres, 3028 specimens were taken, the majority of these being *Sagitta serratodentata.* The largest number of species taken in one haul was seven. This number appears in four hauls taken respectively at Stations 93, 107, 112, 133, all in New Zealand waters, and taken from the surface to 10 metres. At all these stations the following were taken together : *Sagitta hexaptera*, *S. serratodentata*, *S. planctonis*, *Krohnitta subtilis*, and *Pterosagitta draco*, and three of these hauls contained also *S. gazellae* and *S. bipunctata.*

Further points of interest in the distribution of the collection will be considered under the headings of the separate species.

B. Separate Species.

Sagitta hexaptera. (Map 1.)

This species appeared only in the Atlantic and New Zealand catches. In all 312 specimens were taken in 33 hauls. The most northerly haul was taken at Station 70, off Horta Harbour, Fayal, Azores, and the most southerly at Station 142, Lat. 34° 45′ S. These catches are within the limits usually given for epiplanktonic catches of this species, viz. from Lat. 40° N. to 40° S. Most of these were captured in night hauls, there being 25 night hauls yielding 279 specimens in a total time of 116 hours. This gives an average catch of 2·4 per hour over both areas. The day hauls were 8 in number, and gave 33 specimens in a total time of 18 hours, or an average of 1·8 per hour haul. So far as the data go they indicate that this species was somewhat more numerous by night than by day at the surface, though a larger number of day hauls would have given more reliable results. The largest number taken in one haul (49) were captured at Station 50. At this station there were also taken *S. lyra* (2) ; *S. enflata* (89) ; *S. bipunctata* (18) ; *S. serratodentata* (33) ; and *Pterosagitta draco* (313).

Stations.—Atlantic : 45, 46, 47, 49, 50, 52, 55, 59, 60, 61, 63, 65, 66, 67, 69, 70.
New Zealand : 80, 85, 86, 92, 93, 100, 107, 112, 113, 120, 122, 129, 130, 131, 133, 135, 142.

Sagitta lyra. (Map 1.)

This species was obtained in only six hauls. Of these two were in the Atlantic and four in New Zealand waters, and none were taken at a greater depth than 12 metres.

In all 86 specimens were captured, and the total time occupied was 38 hours, giving an average catch of 5 per hour. All these hauls were made by night.

The stations extend from Horta Harbour, Fayal, Azores, to Station 85, that is from approximately Lat. 38° N. to Lat. 34° 23′ S. This species is known to have a very wide distribution, and the catches in this collection fall within the known area within which it has previously been found. Probably this form would have been taken in more catches if these had been made at greater depths. The species is known to be found mainly in the lower epiplankton and upper mesoplankton.

Two successive hauls containing this species were made at the same position, viz. Stations 106 and 107. In the first case an hour's haul was made from 7–8 p.m., and in the second the net was out from 8 p.m. to 5.30 a.m. immediately following the first haul. One specimen was taken in the first haul and six in the second. Both hauls were at night, and there was no significant change in the rate of capture. The largest number taken in one haul (75) was at Station 86, at which there were also taken *S. hexaptera* (10) ; *S. bipunctata* (13) ; *S. serratodentata* (115) ; *S. planctonis* (12) ; and *Pterosagitta draco* (31).

Stations.—ATLANTIC : 50, 70.

NEW ZEALAND : 85, 86, 106, 107.

Sagitta gazellae. (Maps 1, 2, 3.)

Although not the most numerous in individuals this species was taken in more separate hauls than any other in this collection. A total of 3202 specimens were captured in 79 hauls (*i.e.* in 59 per cent. of the hauls in which Chaetognatha were taken). It is notable that this form was taken in a number of New Zealand, Sub-Antarctic, and Antarctic stations, but at only one Atlantic position, viz. : Stations 39 and 40 off Rio de Janeiro Harbour in the South Atlantic. The horizontal range of the stations at which this form was captured extends from Lat. 23° N. to Lat. 77° 38′ S. Of the two hauls in Rio de Janeiro Harbour, the first was taken from 11 p.m. to 1.30 a.m. and gave 686 specimens, or an average of 274 per hour haul. After an interval of an hour a second haul was taken lasting for the same period, viz. from 2.30 a.m. to 5 a.m., and in this case only 18 specimens were obtained. In both cases the same net was used at the same depth. An attempt was made to discover whether there was any noticeable difference in the abundance of this form at the surface by day and by night. The figures may be summarised as follows :—

New Zealand Stations.

Day hauls. 130 specimens captured in 56 hours, or an average of 2·3 per hour.

Night hauls. 271 specimens captured in 142 hours, or an average of 1·8 per hour.

Stations south of Lat. 40° *S.*

Day hauls. 764 specimens captured in 32 hours, or an average of 24 per hour.

Night hauls. 1309 specimens captured in 82 hours, or an average of 16 per hour.

So far as the data go the indication is that this species was more abundant at the surface by day than by night. In a few instances in which a day and a night haul were taken at the same place the captures showed the same tendency.

The great majority of hauls in which this species was captured were taken at or very near the surface. The largest number taken in one haul (686) were captured at the Station 39 mentioned above. At this station was also taken *S. robusta* (449).

Stations.—ATLANTIC : 39, 40.

NEW ZEALAND : 75, 76, 80, 84, 87, 92, 93, 94, 97, 101, 109, 111, 112, 113, 118, 125, 126, 127, 130, 131, 132, 133, 135, 136, 139, 141, 142, 143, 145, 146.

SUB-ANTARCTIC : 232, 235, 236, 237, 238, 241, 250, 251, 256, 259, 302, 305, 307, 308.

ANTARCTIC : 178, 180, 228, 267, 269, 270, 272, 274, 275, 276, 281, 282, 283, 284, 285, 287, 288, 289, 290, 300, 332, 345.

Also from 11 stations in the Ross Sea area by Nelson.

Sagitta maxima. (Map 2.)

The one specimen captured on this expedition referable to this species was taken in the Antarctic at Station 285, Lat. 71° 49′ S., at a depth recorded as 0–600 metres. According to Ritter-Záhony (1911c) this form is cosmopolitan, and is found from a depth of about 200 metres downwards.

Sagitta enflata. (Map 1.)

This species was taken in 21 hauls, the total capture being 424 specimens. All of these hauls were in the Atlantic and New Zealand regions, and extend from Lat. 17° 8′ N. to Lat. 34° 29′ S. The captures in the two regions are, however, very unequal. Only four specimens in three hauls were taken in New Zealand waters. The general distribution of this form is between Lat. 40° N. and Lat. 40° S., so that the captures in this collection fall between these limits. All the hauls were in surface water. In several of the Atlantic stations more than one haul was made at the same position, but no figures of significance appear in these hauls, except in Stations 46 and 47. These hauls were made at the same position, at the same time, and for the same duration (½ hour). The only difference between them was that in No. 46 a net with a wide mesh was used (7 to the linear inch), and in No. 47 a finer net (50 meshes to the linear inch).

In the first case 27 specimens were taken, and in the second, 61. These figures indicate, as might be expected, that the mesh of the net used makes a considerable difference in numbers of individual Chaetognatha captured. It should perhaps be added that the "7-mesh" net was apparently used for only three hauls of plankton on this expedition.

An examination of the day and night catches of this species in the Atlantic gave the following figures :—

Day hauls. 57 specimens in 9 hours, average 6 per hour haul.

Night hauls. 363 specimens in 9·75 hours, average 37 per hour haul.

These figures are derived from a total of 18 hauls, and indicate that this species was more abundant at the surface by night than by day in the Atlantic area. The largest capture of this species in one haul (89) was at Station 50, at which were also taken *S. hexaptera* (49) ; *S. lyra* (2) ; *S. bipunctata* (18) ; *S. serratodentata* (33) ; and *Pterosagitta draco* (313).

Stations.—Atlantic : 27, 29, 30, 40, 43, 46, 47, 49, 50, 51, 52, 53, 55, 58, 60, 61, 62, 63.

New Zealand : 80, 133, 136.

Sagitta bipunctata. (Map 1.)

This species, also, was taken only in hauls made in the Atlantic and New Zealand regions. In all 362 individuals were taken in 28 hauls. As between the two regions 102 specimens were taken in 9 Atlantic hauls totalling 44·25 hours, giving a general average of 2·3 per hour haul. In the New Zealand area 260 specimens were taken in 19 hauls, totalling 112 hours, giving the same average rate of capture. The captures were made from Lat. 38° N. (Azores) to Lat. 34° 45′ S., which fall within the limits assigned to this species by Ritter-Záhony, *i.e.* between Lat. 40° N. and Lat. 40° S. None of the specimens were taken at a greater depth than 12 metres. The captures by day and by night in the New Zealand area show 65 specimens in 12·5 hours by day, an average of 5·2 per hour haul, and 179 specimens in 81·5 hours by night, or 2 per hour haul. This species seems therefore to have been more abundant by day than by night at the surface. The largest capture of this species in a single haul (115) was at Station 109, at which were also taken *S. gazellae* (4) ; and *S. serratodentata* (1).

Stations.—Atlantic : 47, 49, 50, 52, 55, 60, 63, 65, 70.

New Zealand : 75, 84, 85, 86, 92, 93, 101, 103, 107, 109, 111, 112, 113, 122, 136, 139, 141, 142, and a station labelled " Off North Cape."

Sagitta robusta. (Map 1.)

This species was taken only in 10 hauls, of which 7 were in the Atlantic and 3 in the New Zealand area. A total of 827 specimens were captured, but these are very unequally distributed among the hauls. The largest number of individuals taken in 8 of the hauls was 12, but large numbers were found at the Stations 39 and 40, in which 449 and 341 specimens were taken respectively. These two hauls were made at the same place, six miles off the mouth of Rio de Janeiro Harbour, Lat. 22° 58′ S., and were both taken at night. The first extended over $2\frac{1}{2}$ hours from 11 p.m. to 1.30 a.m., and the second for the same length of time with the same net and at the same depth (2 metres) from 2.30 a.m. to 5 a.m.

The catches of this species extend from Lat. 29° 10′ N. in the Atlantic (Station 69) to Lat. 34° 32′ S., in the Pacific New Zealand area (Station 118). Ritter-Záhony gives the limits of this form as between Lat. 35° N. and Lat. 35° S., that is to say, it does not reach so far north nor so far south as several other species, notably the somewhat similar *S. bipunctata.* The catches made in the present collection fall within these limits. The most southerly catch is about as far south as this species has ever been taken. Ritter-Záhony discusses the distribution of *S. robusta* in his "Revision der Chätognathen" (1911A), and believes that in the Atlantic it may extend as far south as about the latitude of the southern point of Africa (*see also* Michael, 1919). The catches made near Rio de Janeiro (Stations 39, 40, and 43) come within this limit, but they seem to be the first captures of any note to be made so far south in the Western Atlantic.

The separate hauls of this species are too few for any comparison between day and night catches to be made. All the hauls were taken at the surface.

Stations.—ATLANTIC: 39, 40, 43, 45, 53, 66, 69.
NEW ZEALAND: 76, 108, 118.

Sagitta bedoti.

This species was taken only in two hauls, both in New Zealand waters, and 26 specimens were captured. Both of these hauls were taken at the surface. The species has been found in the surface waters of the warmer parts of the Indian and Pacific Oceans, in Misaki Harbour, the Maldive and Laccadive Archipelagoes, and other stations, including Sharks Bay, Australia (Ritter-Záhony, 1910A). The latter position is a little further north than the stations of the present expedition, but in these New Zealand waters the temperatures are somewhat high.

Stations.—108, 127.

Sagitta serratodentata. (Maps 1, 2, 3.)

This species was caught in greater numbers than any other in the present collection. A total of 6514 individuals were captured in 66 hauls. The great majority of these hauls were in the Atlantic and New Zealand areas, only two hauls falling within the Sub-Antarctic and one within the Antarctic regions. The Sub-Antarctic positions are Stations 235 and 242, Latitudes 52° 41′ S., and 43° 50′ S. respectively. The Antarctic position is Station 344, Cape Royds, Lat. 77° 30′ S. The distribution of this species is discussed by Fowler (1907) and Ritter-Záhony (1911A), and the conclusion is reached that it is not a truly Antarctic form. Ritter-Záhony puts the southern limits of its range at about Lat. 50° S. in surface waters, and Fowler says that it may be considered Sub-Antarctic and records one specimen taken in Lat. 51° 20′ S. Johnston and Taylor (1921) record one specimen from 2 fathoms at Macquarie Id. in Lat. 54° S. The records of the present collection serve to extend the southern limits of this species. At Station 235 three specimens were captured at night at a depth of 10 metres, and at Station 344 one specimen was taken by day. It is to be noted that in the latter case the net was drawn up from a depth of 400 metres, so the specimen may have come from any depth down to this. This latter catch is therefore the farthest south from which this species has been taken up to the present. Deep-water hauls with closing nets taken in the far south would perhaps yield further information on the distribution of this species.

A comparison of the day and night catches in the Atlantic and New Zealand waters gave some interesting results. In the Atlantic 10 day hauls, lasting for a total of 13·75 hours, yielded 4746 specimens, an average of 345 specimens per hour haul. On the other hand, 15 night hauls, lasting for a total of 14·75 hours, gave 315 individuals, an average catch of 21 per hour haul. In New Zealand waters 15 day hauls, lasting for 39·5 hours, gave 535 specimens or approximately 14 per hour haul. In this area 18 night hauls, lasting for 149 hours, gave 744 specimens, or 5 per hour haul. These hauls were all taken at depths not exceeding 30 metres. From these figures it would appear that this species is considerably more abundant at the surface by day than by night. The figures also show that on the whole the species becomes less abundant in the more southern portion of its range. The largest number taken in one haul (2788) was at Station 311, at which was also taken *Pterosagitta draco* (240).

Stations.—ATLANTIC: 27, 29, 30, 40, 45, 47, 50, 51, 52, 53, 55, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 70, 310, 311.

NEW ZEALAND: 75, 76, 80, 84, 85, 86, 87, 92, 93, 94, 97, 100, 101, 103, 106, 107, 109, 111, 112, 113, 118, 120, 122, 127, 131, 132, 133, 135, 136, 137, 139, 140, 141, 142, 143, 145, 146. Also a station described as North Cape.

SUB-ANTARCTIC: 235, 242.

ANTARCTIC: 344.

Sagitta planctonis. (Maps 1, 2.)

This species when young is easily confused with *S. robusta*, and some of the specimens in the present collection identified as *planctonis* may be *robusta*, more particularly some of the records from the New Zealand area. In all 319 individuals were obtained in 28 hauls, and all were from the Antarctic or New Zealand regions. The largest number obtained in one haul was 33 (Station 275, 160 metres). There has been some discussion as to the vertical distribution of this species (*see* Ritter-Záhony, 1911A, and Michael, 1919), and it is generally said to be mesoplanktonic, though small numbers of small individuals have been taken nearer the surface, especially in the far south. It is noteworthy that in the present collection the species has been found mainly in Antarctic hauls in which the net has been drawn up from depths varying from 1750 to 100 metres. On the other hand, small numbers were taken from New Zealand stations at or near the surface. In at least some of these latter catches the species is undoubtedly *planctonis*. The results of this expedition would therefore tend to confirm the conclusion that the species is typically mesoplanktonic, but that it is, on occasions, to be found in small numbers at the surface. No noticeable difference was observed between catches made by day and by night.

Stations.—NEW ZEALAND: 75, 80, 84, 85, 86, 87, 93, 97, 107, 112, 113, 126, 130, 131, 132, 133, 135, 140, 143.

ANTARCTIC: 178, 180, 270, 275, 276, 282, 283, 285, 293.

Pterosagitta draco. (Maps 1, 2.)

This form was taken in 33 hauls, which yielded 889 specimens. All of these were captured in the Atlantic and New Zealand areas, and none were taken below a depth of 30 metres. Two Atlantic hauls gave large numbers of individuals. At Station 50, 313 specimens were taken in a night haul lasting forty minutes, and a day haul at Station 311 gave 240 specimens in two hours. A comparison of the day and night hauls in the two areas gave the following results. In the Atlantic three day hauls lasting for 6 hours gave 242 specimens, an average of 40 per haul. On the other hand, seven night hauls lasting for 18·75 hours have 382 individuals, an average of 20 specimens per hour haul. In the New Zealand stations seven day hauls lasting 25·5 hours gave 76 specimens, an average of approximately 3 per haul, and thirteen night hauls lasting 105 hours gave 156 specimens, an average of about 1·5 per hour haul. Although the number of separate hauls was not large the figures indicate that this species was more abundant at the surface by day than by night, and that the species is scarcer in individuals at the stations farther south.

The most northerly and most southerly stations at which this species was taken on this expedition were Stations 70, Lat. 38° N., and Station 311, Lat. 35° 29′ S. These are both within the limits given for the range of this form. The number of specimens taken at a position described as "off Three Kings Islands" in three successive hauls with the same net are worth noting. A night haul on August 25th–26th gave 1 specimen in 12 hours. A night haul on August 26th–27th gave 9 specimens in 10·5 hours, and a day haul begun $2\frac{1}{2}$ hours later on August 27th gave 49 specimens in 8 hours. So far as these figures go they confirm what was said above, that this species is more numerous by day than by night at the surface. The largest number taken in one haul (313) were taken at Station 50 mentioned above. With these were taken *S. hexaptera* (49) ; *S. lyra* (2) ; *S. enflata* (89) ; *S. bipunctata* (18) ; and *S. serratodentata* (33).

Stations.—ATLANTIC : 27, 30, 43, 47, 50, 55, 63, 69, 70, 311.

NEW ZEALAND : 84, 85, 86, 87, 92, 93, 107, 111, 112, 113, 122, 127, 129, 130, 131, 132, 133, 135, 136, 142, 143, 145, 146.

Eukrohnia hamata. (Maps 1, 2, 3.)

This species was taken in considerable numbers at many Sub-Antarctic and Antarctic stations. The total number of individuals taken was 4291, and these were captured in 49 hauls. The species appeared in only one haul in New Zealand waters (Station 94), in which 3 specimens were taken, and in one Atlantic haul (Station 62), in which only one immature individual was captured. The fact that this species was not taken more frequently at the more northerly stations on this expedition is accounted for by the lack of deeper water hauls. It is cosmopolitan at mesoplanktonic depths, but no hauls were made in the Atlantic and New Zealand regions at a greater depth than about 100 metres. In Sub-Antarctic and Antarctic regions it becomes epiplanktonic also. The largest single haul of individuals of this species was Station 308, when 1387 specimens were taken at a depth of 4 metres, together with *S. gazellae* (71). A feature of the Antarctic hauls in which this species was present is that many were made by pulling up an open net from greater depths, the lowest being Stations 276 and 282, from 1750 metres and 1000 metres respectively. These two hauls were made at the same position (Lat. 71° 41′ S., 166° 47′ W.), and produced 182 and 12 specimens respectively. Other hauls were made at depths varying from 0–600 metres to 0–250 metres. Two large surface hauls were made at Sub-Antarctic Stations 250 and 307, at which 519 specimens in one hour and 557 specimens in $2\frac{1}{2}$ hours were taken respectively.

The data for day and night surface hauls in the Sub-Antarctic and Antarctic regions are obtainable from only a comparatively small number of hauls because the time for which many such hauls lasted is not given. The figures are as follows: In the Sub-Antarctic 5 day hauls lasting for 5 hours gave 1983 specimens, or an average of 396 per hour haul. The night hauls in the same region are 6, and gave 688 specimens in 16·5 hours, or an average of 42 per hour haul. In the Antarctic 8 day hauls lasting for 29·25 hours gave 488 specimens, an average of 17 per hour haul, whereas 6 night hauls in this region gave 184 specimens in 38·5 hours, or an average of 5 per hour haul. Thus, in both cases the species was more abundant at the surface by day than by night. Moreover, the species is represented by fewer individuals in the more southerly stations. This form was taken farther south than any other on this expedition. The most southerly station was that numbered 350, off Glacier Tongue, McMurdo Sound, Lat. 77° 44′ S., at a depth of 250 metres, where 13 specimens were taken by day in two hours.

Stations.—Atlantic: 62.

New Zealand: 94.

Sub-Antarctic: 232, 235, 236, 237, 238, 250, 251, 252, 259, 302, 305, 307, 308.

Antarctic: 178, 180, 224, 228, 229, 230, 269, 270, 272, 274, 275, 276, 281, 282, 283, 284, 285, 287, 288, 290, 293, 300, 342, 344, 345, 346, 350, and seven hauls made by Nelson.

Krohnitta subtilis. (Map 1.)

This species was taken only in small numbers, and appeared in 11 hauls. The total number of specimens was 22, and these were all taken in New Zealand waters, with the exception of one haul in the Atlantic (Station 68), which gave one specimen. The largest number of individuals taken in one haul was four, and this number occurred on only two occasions. The positions at which this form was captured extend from Lat. 27° 22′ N. to Lat. 34° 37′ S. These are within the range assigned to the species. None of the specimens were taken at a greater depth than 20 metres.

Stations.—Atlantic: 68.

New Zealand: 84, 93, 97, 107, 112, 120, 131, 132, 133, 141.

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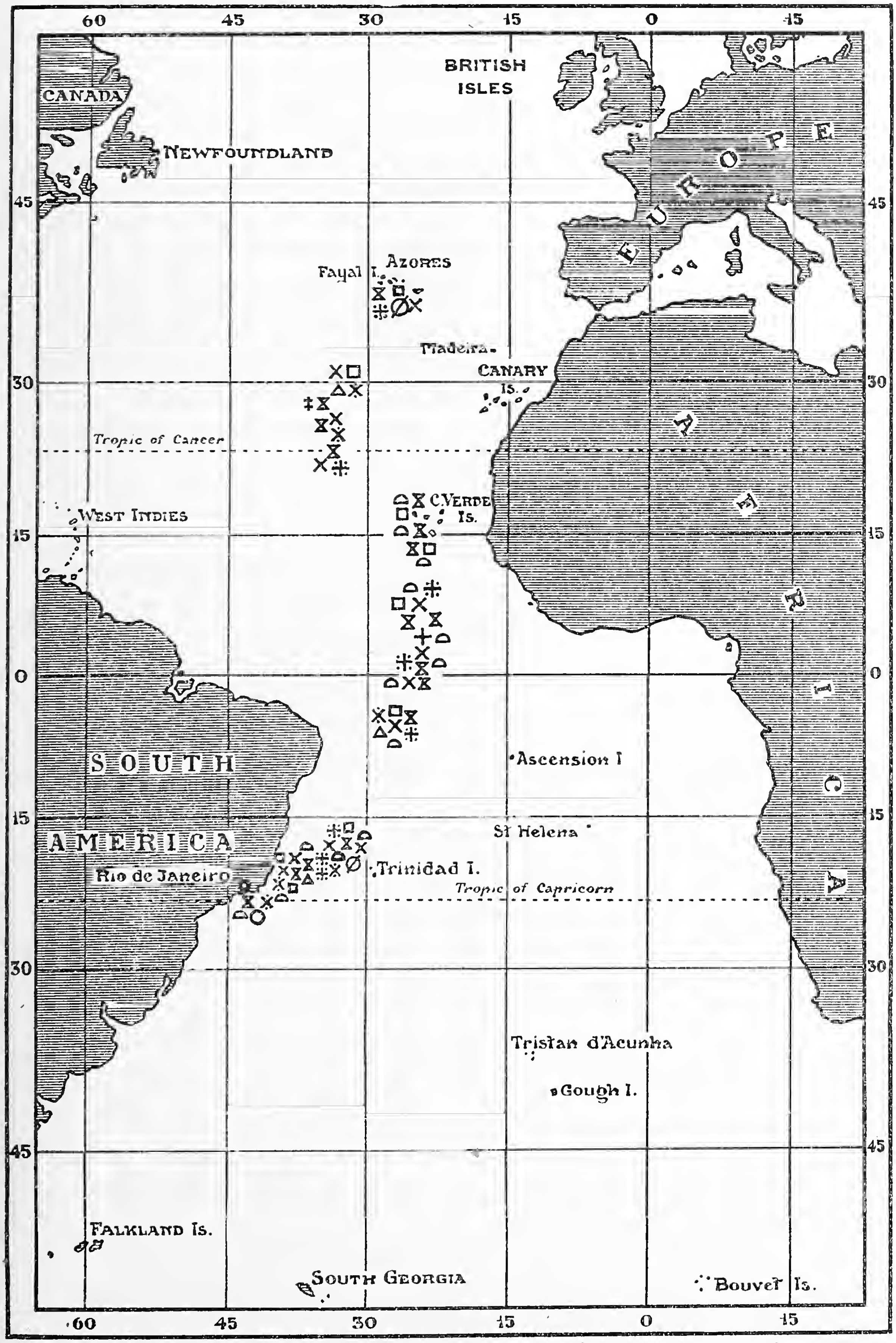
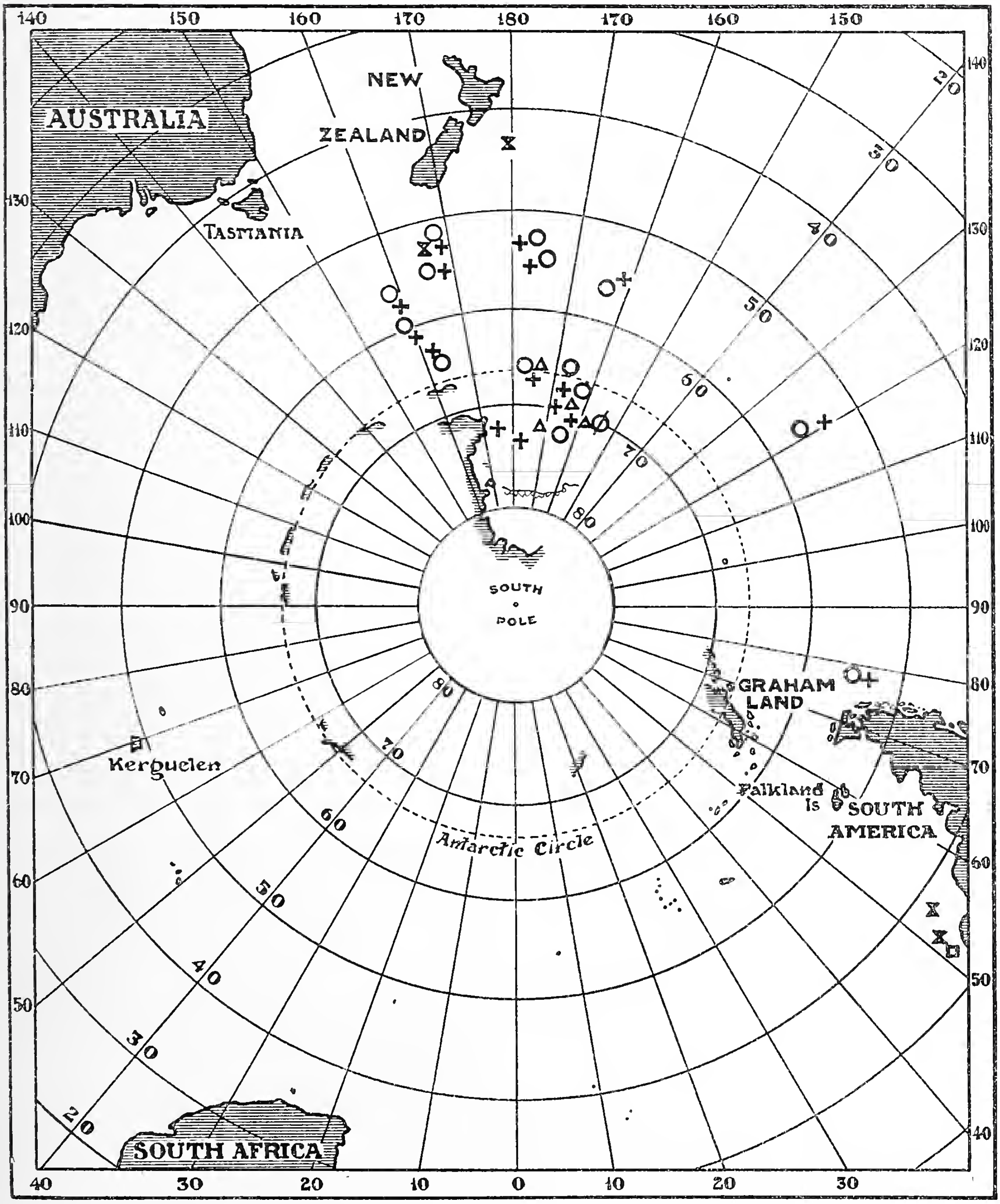
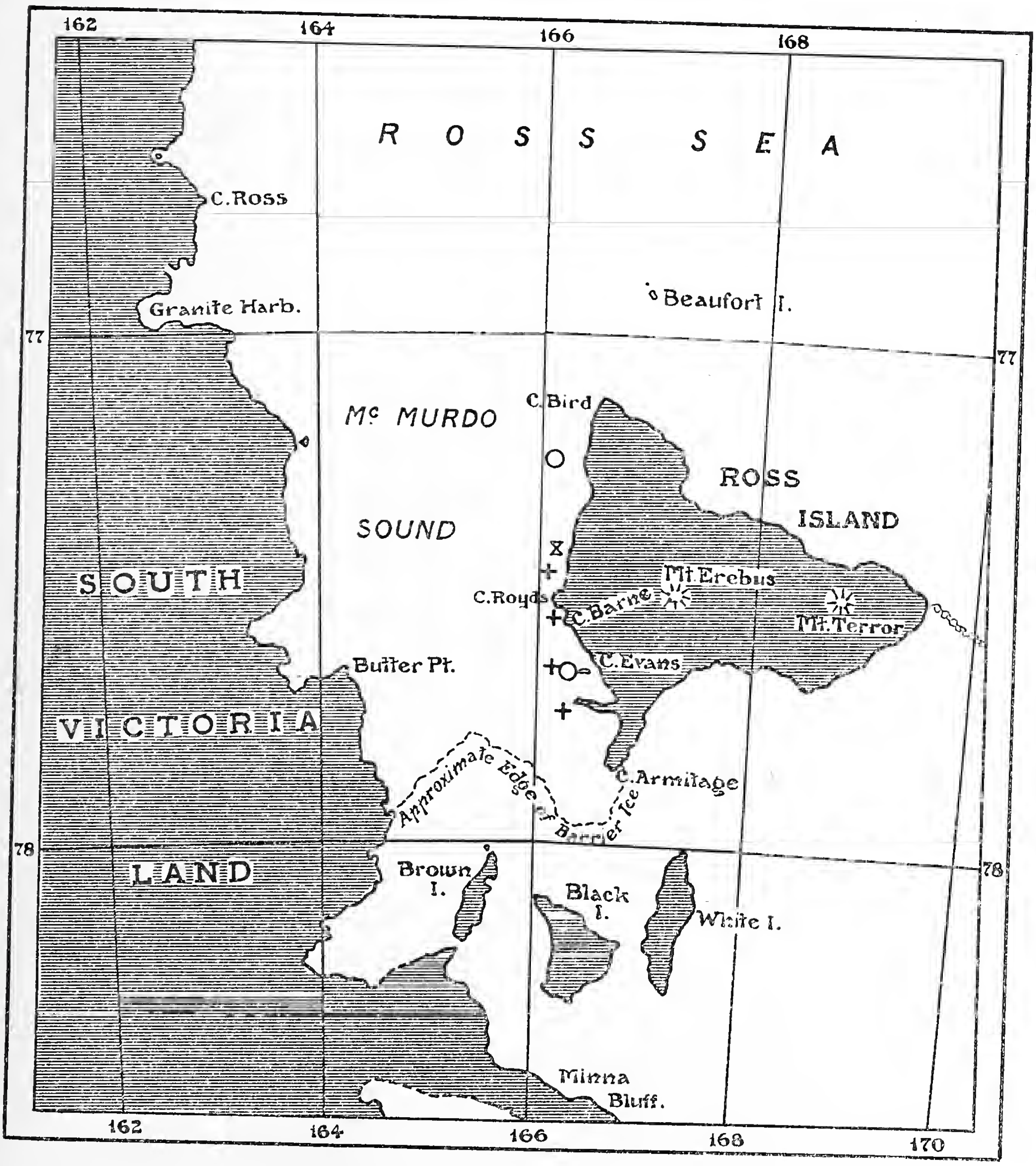


Sagitta serratodentata X	Sagitta gazellae ○	Krohnitta subtilis ‡
,, bipunctata ⁜	,, lyra ∅	Eukrohnia hamata +
,, planctonis △	,, hexaptera ×	Pterosagitta draco □
,, robusta ⁎	,, enflata ⌓	



Sagitta gazellae ○ | Sagitta serratodentata X | Eukrohnia hamata +
„ maxima ∅ | „ planctonis △ | Pterosagitta draco □



Sagitta gazellae ○ | Eukrohnia hamata + | Sagitta serratodentata X

BRITISH MUSEUM (NATURAL HISTORY)

BRITISH ANTARCTIC ("TERRA NOVA") EXPEDITION, 1910.

NATURAL HISTORY REPORT.

ZOOLOGY. VOL. VII, No. 5. Pp. 229-310.

THE NUDIBRANCHIATA.

BY

NILS HJ. ODHNER

(Stockholm).

WITH THREE PLATES AND SEVENTY-FOUR TEXT-FIGURES.

LONDON:
PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM.

SOLD BY

B. QUARITCH, LTD., 11, GRAFTON STREET, NEW BOND STREET, LONDON, W.1; DULAU & CO., LTD., 32, OLD BOND STREET, LONDON, W.1; OXFORD UNIVERSITY PRESS, WARWICK SQUARE, LONDON, E.C.4,

AND AT

THE BRITISH MUSEUM (NATURAL HISTORY), CROMWELL ROAD, LONDON, S.W.7.

1934.

Price Seven Shillings and Sixpence.

Issued July 28, 1934

British Museum (Natural History).

This is No. 3. *of 25 copies of "Terra Nova" Zoology, Vol. VII., No. 5, Report on The Nudibranchiata, printed on Special paper.*

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BY NILS HJ. ODHNER

(*Stockholm*).

WITH 3 PLATES AND 74 TEXT-FIGURES.

INTRODUCTION.

The material dealt with in the present publication was handed over to me by Mr. G. C. Robson, who originally intended to describe it himself. He made dissections, preparations, notes and drawings, all of which he placed at my disposal. Some of these observations have been used here, but in most cases my examination has been made quite independently, an undertaking that was not made easier by the fact that the material had already been investigated for the same purpose. It has been especially difficult to obtain good photographs of the specimens already dissected, and I think it necessary to give good figures of the whole animal, and not of details only in the ancient manner of Bergh. His method of description is followed by later authors with the result that one is often very little informed as to the essential external appearance of a species described, and this is the more to be regretted as external shape and features provide not only an immediate means of recognition, but often also important systematic characters. I have, moreover, tried to avoid another weakness often attaching to works on nudibranchia when their authors depend too much on Bergh's special descriptive method of research, namely extensive descriptions without comparisons with previously known facts or forms. The literature on nudibranchs is full of detailed descriptions but too little of comparisons, which, however, are specially desirable in this group, because of the difficulty of finding representative characters in these soft-bodied animals, which when preserved are often distorted and bleached. The external appearance was, however, well preserved in the present material, and this made it possible for good figures to be made. Descriptions of nudibranchs without habitus figures and comparisons often demand too much of the reader who must do a good deal of the author's work for him, not to speak of those cases in which an author failing to test his own statements by previously known facts merely betrays, by creating too many synonyms, the poverty of his systematic knowledge.

As to the systematic arrangement of the nudibranchia, this is a problem still not satisfactorily solved. Since Bergh published his System of Nudibranchia (1892) many new genera of this group have been described and a lot of facts have been added, so that everybody who studies these Mollusca will feel the urgent need of a revision of its classification. This task cannot be performed without a critical study in several categories (families, genera, and species), and has been made the object of my studies for many years, studies which will be published in another connection. But already here I venture to maintain that the division of the Nudibranchia into Cladohepatica and Holohepatica so generally accepted (though modified by Pelseneer, 1894, and Eliot, 1910) should be abandoned as being too inadequate an expression of their natural relationships. As an example we find that a holohepatic liver is present in Duvauceliidae and in *Goniaeolis*, as well as in Doridacea, and a cladohepatic liver in *Armina*, *Aeolidia* and *Hancockia*, forms of different affinities which can be more naturally classified if other characters are chosen as differential criteria. Thus we find that *Goniaeolis* and *Armina* are more closely related to each other than, *e.g.*, the latter to *Hancockia*, which, on the contrary, is closer to Dendronotidae. The ideas "cladohepatic" and "holohepatic" are not adequate to cover every form of liver differentiation in the nudibranchia. The liver is often a solid mass consisting of crowded lobuli as in the already mentioned *Goniaeolis* (*cf.* Odhner, 1907, 1922). A further development of this internal diffuse extension leads to *Heterodoris* (*cf.* Odhner, 1926b) and *Armina* (*cf.* Bergh, 1866), in which genera its complete ramification has been achieved. On the other hand, the entire liver may become branched (*e.g.* Dendronotidae), while its minute structure remains more compact, the ramification in this case beginning, so to speak, superficially and being restricted to the surface of the liver as a whole. Accordingly, a cladohepatic organization does not imply a uniform or monophyletic development, and consequently, forms no basis for a natural classification.

I have introduced these examples in order to explain the establishment in this publication of a new group of nudibranchs, *Arminacea*, of equal status with *Doridacea*, *Eolidacea* and *Dendronotacea* and comprising the genera and families grouped round *Armina* (and *Dermatobranchus*) and sharing their little-modified external body-form. In this they still keep traces of a primitive nudibranch organization, but in the liver system all the stages mentioned, from a nearly holohepatic liver (in *Heterodoris* and *Goniaeolis*) to a cladohepatic one, are present.

A systematic arrangement of the Nudibranchia must take into account the fact that the Elysioidea (or Elysiacea), which are, externally, very like the nudibranchs and were until lately included among them, have differently shaped rhinophores, liver system, genital organs, nervous system, radula etc. (*cf.* Odhner, 1914, Pruvot-Fol, 1929), and therefore must be considered as belonging to a special branch (*Sacoglossa*) derived from a group of tectibranchs other than that which gave rise to the remaining, or true, nudibranchs. Thus the term "nudibranch," if comprising the *Sacoglossa*, must be considered as merely a collective name, not as a strictly systematic term; or, if this term is to be treated as a systematic category, it must be restricted just as Thiele has done (1931). In their restricted sense the Nudibranchia seem to have had their origin within the Notaspidea, to which Thiele unites them as a suborder of his order Acoela, and comprise the stirpes already mentioned. They may be briefly characterized, and their relationships indicated as follows :—

I. Holohepatic nudibranchs with right liver absent or reduced to a caecal appendix ("gall-bladdder"). Blood-gland and (as a rule) two vesiculae seminales present *Doridacea.*

II. Holohepatic or cladohepatic nudibranchs with right liver smaller than but of similar structure to the left. No blood-gland. Only one vesicula seminalis.

  A. Rhinophores simple, without sheaths, generally not retractile.

    1. Eyes stalked. Mouth with velum, generally without tentacles. Anus lateral (dorsal in *Antiopellidae* only) .. .. *Arminacea.*

    2. Eyes sessile (or with very short stalks). Mouth with tentacles, without velum (except in *Embletonia*). Anus lateral or latero-dorsal, in or behind the interhepatic space .. .. *Eolidacea.*

  B. Rhinophores retractile within sheaths. Anus lateral or latero-dorsal in the interhepatic space .. .. *Dendronotacea.*

I have chosen for these groups names of the simplest derivation, for I prefer to derive the third group from *Eolis* instead of *Aeolidia* in spite of the fact that *Eolis* is not a valid generic name, but replaced by *Aeolidia.*

The present material divided into these sections comprises the following families, genera, and species :—

DORIDACEA.

Fam. BATHYDORIDIDAE.

Bathydoris obliquata n. sp. Antarctic.

Fam. NOTODORIDIDAE.

Aegires (*Anaegires*) *protectus* n. sp. Antarctic.

Fam. CHROMODORIDIDAE.

Lissodoris mollis n. gen. n. sp. New Zealand.
Glossodoris amoena Cheeseman. New Zealand.
Cadlina affinis n. sp. Antarctic.

Fam. DORIDIDAE.

Austrodoris macmurdensis n. sp. Antarctic.
Austrodoris granulatissima Vayssière. Antarctic.
Austrodoris tomentosa n. sp. Antarctic.
Austrodoris nivium n. sp. Antarctic.

Fam. HALGERDIDAE.

Aphelodoris luctuosa Cheeseman. New Zealand.

ARMINACEA.

Fam. CHARCOTIIDAE.

Telarma antarctica n. gen. n. sp. Antarctic.

EOLIDACEA.

Fam. NOTAEOLIDIIDAE.

Notaeolidia robsoni n. sp. Antarctic.

Fam. EUBRANCHIDAE.

Eubranchus adarensis n. sp. Antarctic.

DENDRONOTACEA.

Fam. DUVAUCELIIDAE.

Tritoniella belli Eliot. Antarctic.
Tritoniella sinuata Eliot. Antarctic.
Marionia cucullata Gould. Rio de Janeiro.

Fam. DOTONIDAE.

Doto antarctica Eliot. Antarctic.

DORIDACEA.

This large division of nudibranchs comprises the typical Dorididae and the smaller Polyceridae and their allies, the latter representing a more primitive section with non-retractile gills (*Phanerobranchia*), the former a more specialized one (*Cryptobranchia*), in which the gills are retractile into pockets. The *Cryptobranchia* may be divided into a few families, which have not yet been definitely classified; a preliminary arrangement of the genera and subfamilies was published by me in **1926a**. In the present material there are represented the following families, designated as subfamilies in **1926**: 1. Fam. Chromodorididae, the common character of which is the presence in the radula of a median tooth and pectinate marginals, as well as a hook-bearing lip cuticle; 2. Fam. Dorididae, with lips smooth and radula teeth hook-shaped without denticles; no prostate gland; back tuberculate; 3. Fam. Halgerdidae with smooth lips, marginal teeth pectinate, a well-developed prostate gland, and a smooth or reticulated, not tuberculate, back. To the present division Doridacea a further couple of aberrant genera must be referred on account of the presence of a blood-gland and two vesiculae seminales, viz. *Bathydoris* Bergh, 1884, and *Doridoxa* Bergh, 1900. Though rather different from each other in shape, for *Bathydoris* has small non-retractile dorsal gills round or to the right of the median anus and *Doridoxa* is entirely without gills and has a lateral anus, a primitive character, these two types have one character in common which separates them from all other Doridacea, viz. the possession of very homogeneous mandibles in the pharynx. This is also a primitive character relating these genera to the two other primitive groups Arminacea and Dendronotacea. They deserve to be separated from the remaining Doridacea in a distinct section, for which I propose the name *Gnathodoridacea*, in contradistinction to the *Eudoridacea* which lack mandibles. It is a remarkable zoogeographical fact that, whereas the Eudoridacea have a cosmopolitan distribution, the primitive group Gnathodoridacea has representatives only in the high northern and southern latitudes, and in the depths of the sea (off N.S. Wales).

Fam. BATHYDORIDIDAE.

Bathydoris obliquata n. sp. (Pl. I, figs. 1–3.)

The genus *Bathydoris* comprises a few stenothermic deep-water species, which may be enumerated here, together with their localities: *B. abyssorum* Bergh, 1884 ("Challenger" St. 271, off N.S. Wales, about 4,000 m.), *B. ingolfiana* Bergh, 1899 (Davis Strait, about 3,400 m.), *B. hodgsoni* Eliot, 1907b (Antarctic, Coulman Island, 180 m.); for *B. inflata* Eliot, 1907b ("Discovery" Winter Quarters) and *B. clavigera* Thiele, 1912 (German Gauss Station) no depths were stated; *B. browni* Evans, 1914 (off Coats Land, about 2,540 m.).

By the "Terra Nova" Expedition in 1910 two specimens of a *Bathydoris* were dredged, which have proved to belong to a new species, here named *B. obliquata*. Their locality is St. 348, McMurdo Sound, 366 m., mud. The larger measures in length 28 mm., in breadth 13·5 mm., and in height 14 mm.; and the smaller, length 25, breadth 11, height 10 mm. The distance of the anus from the anterior end of the body is 20 and 17·5 mm. respectively.

The known species of *Bathydoris* may be grouped into two divisions as to their most striking external characters. The one group comprises *B. abyssorum*, *ingolfiana* (both with retractile rhinophores) and *inflata*, all three having a bulbous body, a very narrow foot and a small oral velum with distinct lateral lobes; the other group, with *B. hodgsoni*, *clavigera*, and *browni*, has non-retractile rhinophores, a foot much broader than the body and a very large oral veil with either elongate tentacles (*B. browni*), or short and thick, rather distinct ones (the two remaining species). Also the number and position of the gills provide good specific distinctions. They are, in the first group, placed far back on the hind slope of the back and in a circlet with the anus as a completing point behind, and number either 5–6 or 10; in the second group, the gills are situated either far backwards and in a circlet of 8 plumes wholly in front of the anus (*B. hodgsoni*), or in smaller numbers to the right of the anus (*B. clavigera*), or, reduced to 2 in number, symmetrically rather far in front of the anus (*B. browni*) ; or again there may be 1 in front and 1 to the right of the anus (*D. obliquata*). The anus is, in *D. clavigera* and *obliquata*, situated at $\frac{2}{3}$ of the body-length, in *D. browni* and *hodgsoni* as far back as in the first-named group. Thus we find in the external body-form great variation in directions similar to those followed by the different sections of the Eudoridacea. The differences between the species of *Bathydoris* are, indeed, so wide, that it seems questionable whether certain species are to be included in this genus. Nevertheless, the fact that owing to its primitive organization and radical systematic position it keeps, as specific differentiae, characters which in the more highly organized Eudoridacea are used to delimit larger systematic categories, affords no good ground for its subdivision.

In the shape of the body, the position of the anus and the gills and in the retractility of the rhinophores we find characters which are not only useful for specific discrimination but also indicate the line of development followed by this genus, and, probably, by the ancestors of the Doridacea also. Probably the species of *Bathydoris* which have a symmetrical arrangement of the gills and rhinophores retractile into pockets, represent a higher degree of development (towards the more differentiated Eudoridian type) ; and an asymmetrical arrangement of the gills chiefly to the right of the anus and non-retractile rhinophores are primitive characters. This becomes clear, if we remember that the ancestors of the Doridacea are probably to be sought for in the Pleurobranchidae. This fact also gives some support to the interesting theory of Evans (1914) that the doridid gills are to be considered, not as a neomorphous structure, but as homologous with the ctenidium in the Tectibranchia, modified, as a consequence of the dorsal replacement of the anus, into a dorsal and a ventral branch embracing the anus (resp. a left and a right stem).

The systematic position of this new species thus being established and its validity corroborated by comparisons with the remaining species of the genus, it has to be diagnosed and further described.

Diagnosis.—Body of medium size, thick and clumsy; foot broad, its margins extending beyond the sides of the body. Anus in $\frac{2}{3}$ of the body-length. Gills 2, obliquely placed, the left one in front of the anus, the right one on its right side. Rhinophores non-retractile, laminated. Oral veil wide, with slightly projecting thick lateral corners. Colour white, tinged with yellow. Length 28 mm. Radula 31 × 42.1.1.1.42, median tooth obscurely tricuspidate ; admedian lateral with larger base and smaller hook than the following laterals ; the third and following laterals with one denticle on their external margin ; marginals non-denticulated.

External Morphology.

The body (Pl. I, figs. 1–3) has an elongate wedge-shape and is broadest in front and tapers to a bluntly rounded end behind. The back is high and vaulted. Along each side of the body a faint margin delimits the back from the small furrow-shaped body sides. This dorsal margin, which does not project as a rim, is continuous also in front of the rhinophores across the body. Posteriorly, the back passes into the dorsal surface of the tail. The surface of the back is covered all over with small, shortly conical papillae, most of them having broad bases, but some being clavate and constricted below to a narrow stalk ; the greater part have fallen off, but their places are marked by small rounded scars ; in the posterior and anterior areas, however, a few papillae still adhere to the back.

The rhinophores are strong and large, non-retractile, placed a little within the dorsal margin, widely separated from each other, tapering from broad bases and thus showing no differentiation into stalk and club ; they are laminated throughout by about 50 laminae with smaller ones between them. The largest laminae are all circular and uninterrupted, but the smaller interjacent ones show a gap which forms one band along the antero-external side of the rhinophore and another on its opposite side. There is thus here a rudiment of a rhachis, always, however, less distinct than in the Eudoridacea. In the smaller specimen only a pair of small eyes is distinctly visible as black dots, at the interior base of each rhinophore.

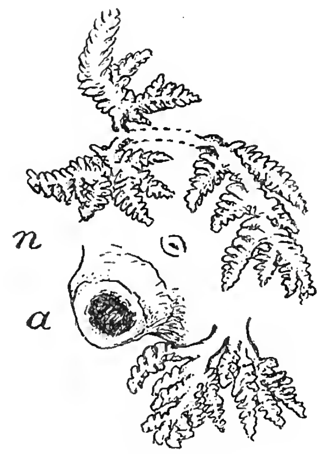

FIG. 1.—*Bathydoris obliquata* : disposition of gills, anus (a) and renal pore (n).

Situated at about $\frac{2}{3}$ of the animal's length, in the median line of the back, the anus has the shape of a wide tube projecting somewhat to the left and backwards (fig. 1, a). Close in front of its base, the renal pore or nephroproct (n) is to be observed as a fine pore on a small projection. Farther in front of the anus, an arborescent gill is situated in the median line, and a similar gill is present close to the right side of the anus. Both gills consist of 2–3 plumes composed in their turn of a few irregular branches with short lateral laminae (*cf.* fig. 1).

In the front of the faint dorsal margin a wide velum extends round the mouth. Its lateral corners project a little as a pair of thick tentacles without any trace of a furrow. The upper thick margin of the veil is quite smooth. In the largest specimen both the right rhinophore and the right velar tentacle were small and thin, as though regenerated after mutilation.

In the middle of the oral veil the bulbus pharyngeus projects beyond the mouth, in a direction half anterior and half central. Next the mouth the velum is bounded by a thick cuticular fold surrounding the base of the pharyngeal bulb. The mouth proper is a vertical fissure in its end. It is surrounded by a thick and smooth but loose, almost spongy, labial cuticle.

At the right side of the animal the genital aperture appears just in the faint dorsal line about half-way between rhinophores and anus.

The foot is broader than the back and projects beyond it at the sides as a thin rim and behind as a large, flattened, broadly rounded lobe. Behind the front margin of the foot a very shallow transverse furrow exists which extends as far back at both sides as to below the genital aperture. The anterior corners of the foot are evenly curved.

The colour of the animal was, according to the notes by Robson, white faintly tinged with yellow, the viscera shining through with a darker hue.

Anatomy.

The alimentary canal.—The buccal mass is short and broad (3 mm. in length, 8 mm. in breadth in the large specimen), with a circular periphery. Its front part is occupied by two mandibles, which form together a broadly conical disc. Each mandible (fig. 2) is (in the small specimen) about 4·5 mm. in height, 2·2 mm. in breadth, of a broadly ovate umbo-shape, convex in the middle, thinning out towards its margin, very faintly striated radially and concentrically. Its masticatory margin is straight, thicker than the other parts of the mandible and of a deep brown colour, whereas the remaining jaw is light yellowish. The masticatory margin projects forward in the middle and passes immediately into the lip cuticle at the sides; there is no armature of the margin itself, and it is continued upwards and downwards into a thin, short flap, the latter representing a rudimentary processus masticatorius. The upper margin of the jaw is gently curved and forms the attachment for the feeble muscle uniting the mandibles. No differentiated ligament is present.

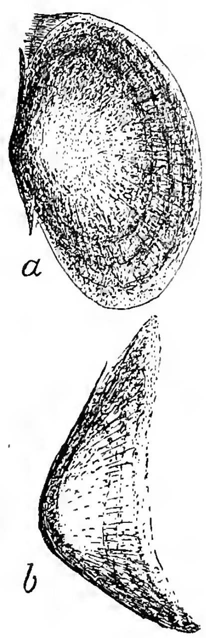

Fig. 2.—*Bathydoris obliquata*, left jaw: *a* from front, *b* from left side. ×10.

The radula is rather broad and contains 31 rows with 42.1.1.1.42 teeth in the large specimen. It is of a bright yellowish colour. The median tooth (fig. 3, *m*) has the shape of an equilateral triangle with an obscurely tricuspidate hook showing irregular denticulations on both its sides; the lateral cusps are smaller than the median one. The first lateral tooth differs in shape from the remaining ones: its basal plate is larger and its spine is smaller. The cusp bears 3–4 small, blunt denticles along its basal margin on each side. The next laterals (fig. 3, 1) have a pointed cusp and an elongated basal plate. This cusp increases in length to a spine, whereas the basal plate decreases, in the following laterals (fig. 3, 2–5) up to number 10 or 16 (fig. 3, 16); then a slight decrease of the length of the spine takes place and grows more rapid in the 5 or 6 extreme teeth. Lateral tooth 3 and the following ones have a small external denticle at the base of the cusp, the external margin of which is thin like an edge and furnished with a small notch close to the denticle; in the marginals (tooth 31 and following) the denticle disappears again but the notch still remains. The extreme marginals (fig. 3, 38–42) are thinner and smaller but of the same general shape as the preceding teeth. Some abnormal teeth with a couple of irregular denticles or indentations along the external edge and also teeth fused together were observed (fig. 3, 26);

the latter phenomenon, occasional on the right side, was located in three adjacent stripes on the left side of the radula (teeth 26+27, 28+29, 38+39) and was repeated on this side in all rows in the longitudinal direction throughout the whole radula.

The difference in size and the denticulation of the admedian tooth as well as the presence of an external denticle on most of the laterals are characters which distinguish the present species from all the hitherto known members of the genus; the radula of *B. clavigera* is, however, unknown.

From the upper posterior side of the pharynx rises the oesophagus (fig. 4). On each side of it a small salivary duct debouches, each forming a small ampulla at its mouth. The ducts pass under the nervous system and widen to the triangular salivary glands which are flattened and separated from each other (fig. 4, *s*), lying one on each side of the oesophagus.

As a consequence of the contraction of the animal, the oesophagus, which is a wide tube, bends first to the right, then to the left and to the bottom of the body cavity in front of the left side of the liver. It has cuticularized walls, plicated longitudinally and in the first part of the oesophagus, wrinkled transversely. The plicae soon take a straighter course in the second part of the oesophagus, and each acquires a median stripe of small black dots (fig. 4, *c*) representing chitinous cones like those described by Evans (1914)

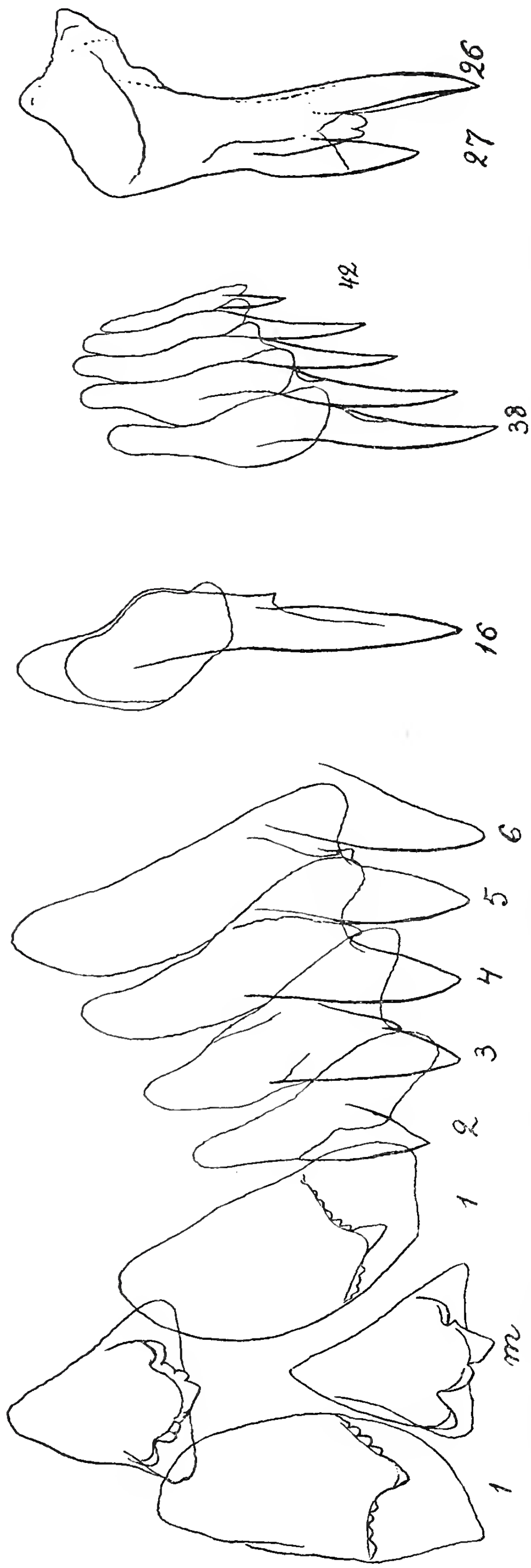

Fig. 3.—*Bathydoris obliquata*, radula: *m* median tooth, inner laterals (1–5), lateral 16, outermost marginals (38 to 42), and left fused laterals 26 and 27. ×210.

in *B. browni*. These cones are in a single row, with or without smaller ones scattered at the sides of the median line. There are 14 or 15 longitudinal plicae in the posterior part of the oesophagus. The foremost part of the oesophagus differs also externally from the second in its colour which is pale bluish-black, while the second portion has a nacreous fawn colour due to the presence of transverse muscular bands in its walls. The posterior portion of the oesophagus ends in a thin-walled sac on the left side of the liver. Here the plicae are obliterated and no armature is present. This portion is the stomach proper. A ventral aperture forms the mouth of the left liver duct (fig. 4, *d*), which has been turned over to the ventral side from its original lateral position; strictly speaking, it still retains a position indicating a slight degree of torsion. From the frontal side of the stomach, close to the left of the pylorus, there rises a short caecum representing the right liver or the gall-bladder (fig. 4, l_1), described by Evans (1914, fig. 5) in *B. browni*. It has plicated walls, and its mouth is flanked by a lappet-like fold; the plicae continue into the intestine. The pylorus again is furnished with a ring of elevated plicae, but these are soft and not armed nor cuticularized; they run as long folds into the intestine, which describes a curve to the right side of the liver. The relative position of these parts of the alimentary canal in life is shown in fig. 5.

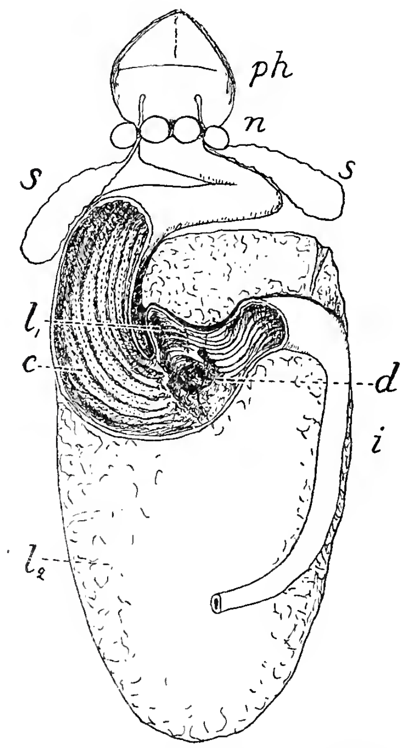

FIG. 4. — *Bathydoris obliquata*, alimentary canal: *c* oesophageal cones, *d* left liver duct, *i* intestine, l_1 right liver (gall-bladder), l_2 left liver, *n* nervous system, *s* salivary glands.

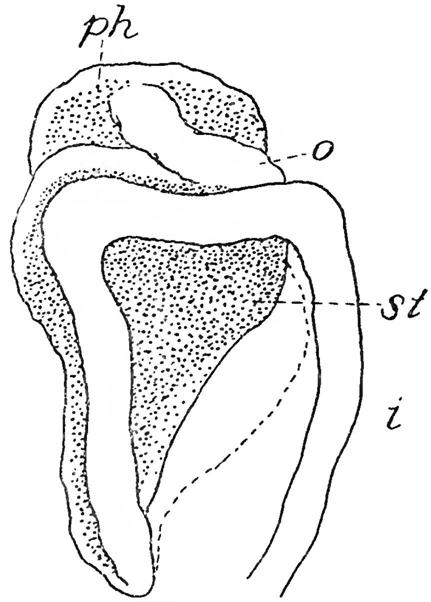

FIG. 5.—*Bathydoris obliquata*, relative position of stomach and intestine in life (Robson del.): *i* intestine, *o* oesophagus, *ph* pharynx, *st* stomach.

The whole alimentary canal, oesophagus as well as stomach and intestine, was filled with a mass of organic matter mingled with fragments of stems of Hydroid colonies, and a few Foraminifera.

The *nervous system* was made the subject of a close examination by Robson, whose figure (fig. 6) and description I use here. Robson gives in his notes the following particulars on the central ganglia :

" In general shape the main ganglia resemble those of the species hitherto described. In the form of the cerebral ganglia, which appear to be the most variable character of this system, this species differs from *ingolfiana, hodgsoni*, and *abyssorum* in not having the ganglion in question divided into two halves by a notch. The cerebro-pedal commissure

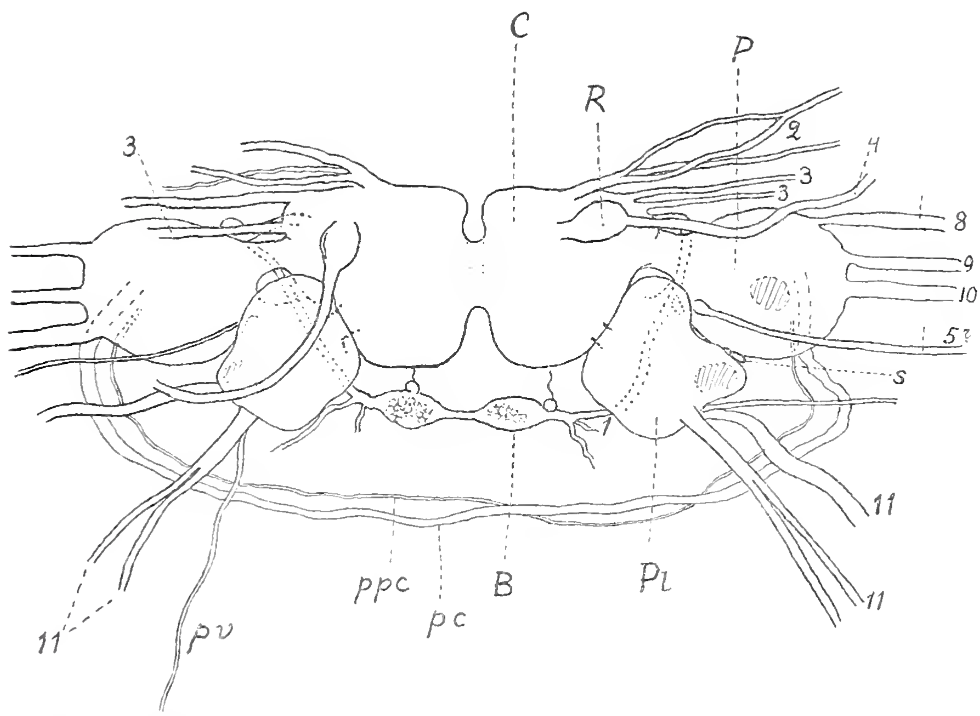

FIG. 6.—*Bathydoris obliquata*, nervous system (Robson del.) : *B* buccal ganglion, *C* cerebral ganglion, *P* pedal ganglion, *Pl* pleural ganglion, *R* rhinophorial ganglion, *pc* pedal commissure, *ppc* parapedal commissure, *pv* pleurovisceral connective, *s* statocyst, *1* buccal nerve, *2* frontal n., *3* lateral n., *4* rhinophorial n., *5* anterior pallial n., *6* optic n., *8* anterior pedal n., *9, 10* posterior pedal n., *11* posterior pallial nerve.

emerges anteriorly and has but a slight expansion of the cerebral ganglion in front of it. In this respect the species comes nearest to *B. browni*. The main commissures are very plainly indicated and there is no fusion of the ganglia. The latter are moderately symmetrical though a certain disparity in size between the two pallials is observed. As in *browni, ingolfiana*, and *abyssorum*, the nerves arise at the outer angles of the cerebral ganglia ; in *hodgsoni* they are distributed along the whole front of the ganglion (Eliot, 1907b, fig. 12). The rhinophorial ganglion occupies a more anterior position than is usual in the genus. The main nerves are fairly symmetrical in their size and distribution, the pedals showing considerable agreement in both respects. The nerve roots on this ganglion are placed all round the outer edge as in *hodgsoni* and *ingolfiana*, and are not, as in the other two species, concentrated towards the posterior end. A nerve arising from a small ganglion at the posterior end of the pedal ganglion towards the inner side supplies the genitalia, and the ganglion is apparently the combined penio-genital ganglion, the penial (pedal) and genital (visceral) centres, as described by Evans (1914, p. 196). The nerve is represented upon the outer side by a nerve similar in point of origin but without a ganglion, smaller in size and of very ambiguous distribution.

"The *buccal commissure* was fairly symmetrical though the left-hand part was slightly shorter than the right (*cf.* Evans, *l.c.*, p. 196). The buccal ganglia are fairly large; they each bear a small gastro-oesophageal ganglion asymmetrically placed, possibly in relation to the slight asymmetry of the oesophageal region generally. It should be noted that these gastro-oesophageal ganglia are not figured for the other species, and Evans for *B. browni* (*l.c.*, p. 197) and Bergh for *B. abyssorum* (1884, p. 111) definitely say they could not find any. The visceral commissure was not discovered. A short pedal commissure accompanied by a parapedal (probably these are actually longer than shown in the figure) * was found arising from the ventral surface of the pedal ganglion. It was disposed in a remarkably horizontal plane as figured.

"*Sense organs.*—In the smaller specimen cutaneous eyes were found in the situation described above. They occupy a very superficial position and were quite plainly visible from the outside. Each eye consists of a shallow circular cup † of pigment with a slightly vacuolated appearance due to the scanty development of the pigment. The cup is open in front and bears no lens; nor was a lens found in the tissue immediately above.‡ No nerve was found connecting the eye with the brain, though it is possible that such a nerve was present but being slender was destroyed when the skin was removed from the brain." The minute statocysts (fig. 6, *s*) were found in the same place as Evans states (1914), on the outside of the pleuro-pedal connectives.

I refer also for the *renal* and *pericardial* systems, which could not be studied in the material after its dissection, to the notes made by Robson: "The pericardium is roughly circular and rather extensive. It measures about 4–5 mm. in diameter. The whole of its centre is occupied by the large ventricle which is elliptical to circular in shape, viz. much flattened, and provided with a wide aperture communicating with the auricle, which is narrow in the antero-posterior axis but extends for some distance upon either side. The reno-pericardial aperture, as in *B. browni*, is at the exterior right-hand posterior corner of the pericardium. The kidney is not the enormously developed structure seen in *B. browni*, nor did it appear to have any portion developed into the 'fern-like' organs described by Eliot for *hodgsoni*. It is practically coterminous with the last limb of the intestine and is irregular in shape. It appears to consist of a main

* In the small specimen examined by me the commissure is much shorter than in the figure; the buccal commissure, on the contrary, is longer (somewhat exceeding the length of one of the buccal ganglia).

† Having a diameter of 0·4 mm.

‡ My observations verify Robson's as to the absence of a lens.

longitudinal renal chamber from which no doubt the renal duct arises, with fairly large lateral diverticula of irregular shape. The blood-glands were not found."

The *genital organs* (fig. 7) were very little developed in both specimens, and their morphology could not be made out in much detail. It was observed that the hermaphrodite gland (*h*) is lodged on the front and right side of the liver between kidney and intestine. A short hermaphrodite duct of uniform breadth and without ampulla runs to the glandular part (mucus and albumen glands, *g*, both parts still undifferentiated and of a pale yellowish colour), which debouches by means of a short vagina. A small bursa copulatrix (*b*) was inserted on the vagina, but no spermatocyst could be found and is certainly absent as in *B. browni*. From the gland a thin winding vas deferens leads to the penis (*p*), which is enclosed in an oval sac (*s*) and forms a hook-shaped cylindrical muscular body doubled up on itself in both specimens; its tip is elongate conical and without any armature, and the vas deferens runs all through its interior.

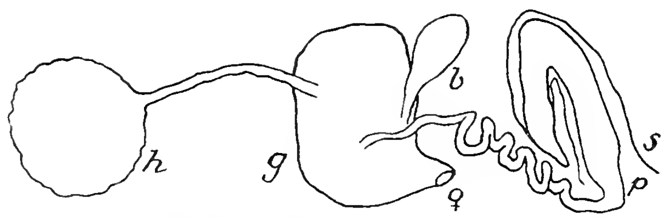

FIG. 7.—*Bathydoris obliquata*, genital organs: *b* bursa copulatrix, *g* albumen and mucus glands, *h* hermaphrodite gland, ♀ female orifice, *p* penis, *s* penis sac.

Remarks.—Evans (1914) has made a very thorough and valuable study of the vascular system in *B. browni*; unfortunately, this could not be examined in the present species: this is the more regrettable, for this system, as Evans emphasizes, is of essential importance for judging the relations of this genus. Only one fact was established, namely, that *B. obliquata* like *B. browni* has not a closed ring of efferent and afferent vessels such as exists in the Dorids with their circumanal branchial circlet, but only a transverse swelling uniting the separate gill tufts. The latter are much branched, but along both their stems and their twigs a series of transverse laminae projects which join the ventral afferent vessels with the dorsal efferent ones in the gill plume. Evans is quite right when he not only compares but even homologizes the gills of *Bathydoris* with the ctenidium of a tectibranchiate mollusc: the doridid ctenidium, however, shows a greater variety of shape and ramification. As mentioned above, the doridid gill circlet thus may be homologous with the ctenidium of a tectibranch, but this homology needs to be supported by evidence derived from comparison with intermediate organisms, and this still remains to be done.

FAM. NOTODORIDIDAE.

Aegires (*Anaegires*) *protectus* n. sp. (Pl. I, figs. 4–6.)

Eliot (1910) constituted a family Notodorididae for the reception of *Notodoris*, *Aegires*, and *Triopella*, which he rightly united on account of their undifferentiated, simple, hook-shaped teeth. Iredale and O'Donoghue (1923) changed the family name to Aegiretidae but without justification, since *Notodoris* may, of course, be kept as the type genus of the family. To *Aegires* a few small, mostly papillate, species, with *Ae. punctilucens* Lovén as type, have been referred; only one species, *Ae. canariensis* Odhner, 1932, is almost smooth. One species, *Ae. albus* Thiele, 1912, differs from all others in having a continuous mantle margin, which is low but distinct all round the back (except behind); it is present not only in front as in all *Aegires* species, but also laterally, where the typical species retain only a series of separate papillae instead of a mantle rim.

The character mentioned is certainly of systematic importance, for which reason I establish the subgenus *Anaegires* with this as its chief characteristic, and I designate *Ae. albus* Thiele as the type. A second species belongs to the "Terra Nova" material. As we shall find, there seem to be other differences also between the new subgenus and the higher genus.

If we compare the present form with *Ae. albus* in order to establish its specific validity, we have first to consider Thiele's description, which is somewhat brief as to the external characters, but sufficient as to the radula. There seem to be some slight differences in the shape of the outermost teeth, which, in *Ae. albus* (*cf.* Thiele, 1912, text-fig. 7), have broad and short, sharply curved hooks and elongate bases, whereas in our new species (fig. 9, *b*) the hooks are more lengthy and erect; the first laterals seem to be abnormal in having suddenly dilated bases. These differences are of not much systematic importance, but there are other distinctions to prove that the two forms are to be considered specifically distinct.

In its external body-form the present specimen shows an interesting character, of which no trace is present in a specimen of *Ae. albus* at my disposal (from the Graham Region, Swedish Antarctic Exp., *cf.* Odhner, 1926 a). First it may be noted that in the new species the 5 gills are placed somewhat obliquely in front of the anus. The arc formed by the gills is somewhat more highly developed on the left side (where 3 gills form a group) than on the right side with a group of 2 gills. It may, however, be questioned whether this is the normal condition in this species, as in *Bathydoris obliquata*, or whether it is due to some abnormality, which expresses itself in an asymmetrical arrangement of the adanal papillae, of which the left is normally large, and the opposite right one very small (*cf.* Pl. I, fig. 4). It is a more remarkable fact, however, that in front of and outside the gills there are two large papillae which differ in size and shape from the largest dorsal ones; and between them there stands a smaller papilla of normal size. The two larger papillae are somewhat flattened or lobulate at their base, and their postero-external margin bears two small knobs between their top and base. Thus these large papillae have been differentiated to form a pair of rudimentary protectory lobes at each group of gills, the right one being more effective than the left, since the left gill group is placed between the median papilla and the left protectory lobe (Pl. I, fig. 4).

In *Ae. albus* these protectory lobes are lacking; in the Graham Region specimen all the adbranchial papillae were of the same size and shape as the general dorsal ones.

Here also another type of papillation was apparent; in front there were 6 papillae in a transverse row outside the rhinophores and a bifid median one behind. Thus we conclude that the present species is a distinct one. The structure of the adbranchial papillae, further, throws an interesting light on the development of the peculiar protectory branchial lobes in Notodorididae, since it does not meet any difficulty to trace the derivation of the lobes characteristic of *Aegires* and *Notodoris* from the simple papillae in *Ae. albus* by way of the rudimentary protectory lobes in *Ae. protectus*.

That there is any difference between the two species in the spicules seems doubtful. In *Ae. albus* they are chiefly cross-shaped, and the same form was found in *Ae. protectus*, though the simple spicules which attain a considerable length seem to be the more frequent.

Diagnosis.—Body elongate, papillate all over, with a continuous narrow dorsal rim. Gills 5, in 2 groups behind a pair of protectory lobes in the shape of large, flattened papillae. Rhinophorial openings with 3 external knobs; between the rhinophores 3 papillae forming a short crest. Colour yellowish-white. Length 23·5 mm. Jaw of semicircular shape, with a short median projection in its under margin. Radula 26 × 21.0.21, all lateral teeth hook-shaped, the external marginals with their cusps more or less curved, and bases generally shorter than cusps (in unworn teeth).

Further description.—Locality: St. 355, McMurdo Sound, 77° 46′ S., 166° 8′ E., 547 m., trawl, 1 specimen. Dimensions: Length 23·5 mm., breadth 7·5 mm., height 8 mm.; anus 17·7 mm. from anterior margin; rhinophores 4 mm. from each other; genital aperture 7 mm. from front margin.

External body-form.—Body elongate, broadly rounded in front, with parallel sides, and a narrower rounded end. Back covered with large and small papillae of conical shape, irregularly scattered, the largest situated in front of and between the rhinophores and in a band between rhinophores and gills; on the dorsal margin and the middle line smaller papillae. Between the rhinophores a longitudinal series or crest of 3 elevated papillae, in front of them 2 symmetrically placed elevated ones, and outside them small low knobs. Rhinophorial openings with thick elevated margins, each protected outwardly by 3 small papillae. Rhinophorial clubs with about 13 laminae. Praebranchial papillae as already described; a large papilla to the left of the anal tube, and a smaller one close to its posterior margin. The narrow but continuous dorsal margin terminates behind the anal tube in a lateral papilla on each side; between them there is a median large papilla, and behind it 2 large median ones on the tail. Sides of body and margins of foot nodulous. Foot with subparallel sides, broadest in front, and here with a simple margin separated from the head by a very deep furrow medially; laterally with almost angular corners connected with the lateral lobes of the broadly triangular oral veil. Oral lateral lobes (tentacles) furnished with a deep and distinct short groove within their external margins. Mouth a rather wide fissure in the middle of the oral veil. Whole oral portion overlapped by and withdrawn under the frontal dorsal margin.

Colour a uniform yellowish-white.

Internal Morphology.

In the *alimentary canal* we find the lip armature and the radula characters in very close agreement with those of the typical *Aegires* forms (*cf.* Bergh, 1881). The median jaw (fig. 8) has about the same shape, is only slightly different, of a semicircular outline, and has a median projection on its edge. In *Ae. albus* this projection was not present, the jaw margin was sinuous all over, and the jaw plate had an upper continuation beyond its semicircular outline thinning out into a square lamina. Whether there is any armature of the lateral lip cuticle, as in *Aegires*, could not be seen in the present specimen, but in *Ae. albus* no such armature of rods was present, the cuticle being quite smooth, although showing a fibrillar structure.

The radula teeth (fig. 9) are yellow and stand in 26 rows of 21 teeth on each side of the naked rhachis, or, to be more exact, there are in the present specimen 21 on the left side and 20 on the right side. This asymmetry is combined with an irregular development of the inner lateral teeth, inasmuch as, on the right side, a fusion has taken place between teeth 1 and 2. All teeth are simply hamate, the ones next the rhachis somewhat narrower and shorter than the others but otherwise similar, except where in some aberrant cases they show a basal enlargement (*cf.* fig. 9). The middle teeth of each half row are the largest, the two to three extreme marginals decreasing rapidly in size. The first lateral tooth on the left side seems to be aberrant in its broad base and narrow hook; the next one on the right side is bifid and irregular in its basal part (evidently through fusion); on the left side no bifid teeth are present. The extreme marginals of the right side (fig. 9, *c*) are reduced to a thin irregular rod; the next one is bifid and has an additional tubercle far down. The same abnormalities are to be observed through all series of the radula.

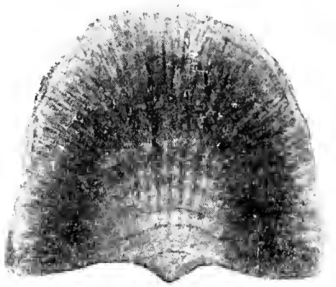

Fig. 8.—*Aegires protectus*, jaw. ×30.

About the remaining alimentary canal no more could be established than that the stomach was, just as in the typical *Aegires*, embedded in the liver, only the pyloric part being free and uncovered, and lying dorsal to the liver in the median line of the body. The gall-bladder was situated at its right side just where the intestine emerges. This runs in a simple curve along the right side of the liver to the anus. The same conditions were reported by me in *Ae. albus*, as well as in *Notodoris gardineri*.

I was not able to study the genital organs, and I quote for them the brief notes made by Robson: "As the albumen gland was extensively developed (probably due to sexual activity) and rather hard, it was necessary to cut a great deal away to reach the other organs. These were unfortunately in a very brittle condition either through bad preservation or the sexual condition the animal was in at death; consequently they were much mutilated. Glans penis rather pointed and armed with very small spines at tip." The preparation shows this armature to be exactly as Bergh has figured it in *Ae. punctilucens* (1881, pl. XII. fig. 10).

Robson also prepared and figured the nervous system, about which he gives some notes ; his figure cannot, unfortunately, be reproduced, because it is, like the dissection, incomplete : thus only a part of his notes are given here : " While the cerebral and pleural ganglia were completely fused, the connectives in this form are distinct and

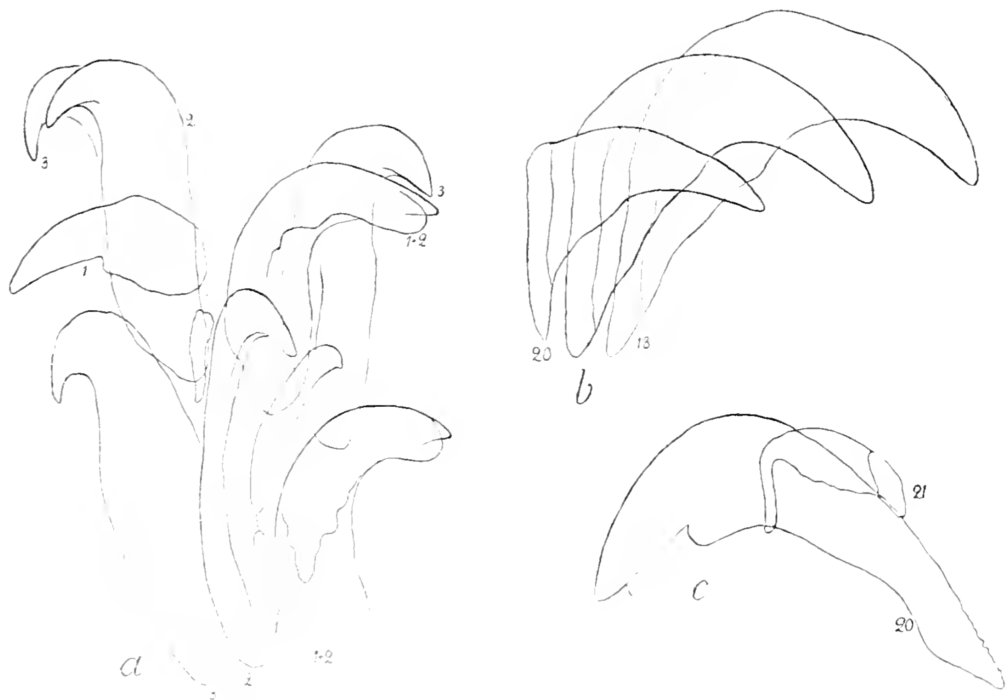

Fig. 9.—*Aegires protectus*, radula : *a* median part, *1*, *2*, *3* lateral teeth, *b* three extreme left marginals, *c* two extreme right marginals. ×240.

unfused. The buccal commissure arises from practically the same point as it does in *Archidoris*. The buccal ganglia are very large and spindle-shaped. On the whole this system agrees very closely with that of *Aegires punctilucens* (Bergh, 1881, pl. XII, fig. 2). The eyes, which are furnished with a lens and capsule, are situated in exactly the same spot as in *punctilucens*." They are sessile.

Fam. CHROMODORIDIDAE.

Lissodoris mollis n. gen. n. sp.

Two very small specimens of a Doridid were dredged at St. 133, Spirits Bay, near North Cape, 20 m., New Zealand (30.8.1911). They proved to represent a new genus and a new species, but were, unfortunately, too juvenile to permit a definite description of their genital organs. Nevertheless, the characters of the external morphology and of the radula are such as to justify the establishment of a new genus, which I name *Lissodoris*.

Diagnosis of the genus.—Mantle distinct all round, scarcely covering, in the living animal, foot sides and posterior end; thick but loose (without spicules), completely smooth on back. Head small, with tentacles reduced to a small prominence in a triangular groove on the cephalic sides, which are connected with the external margin of the foot. Rhinophorial openings pore-like with smooth margins. Branchial pocket with smooth elevated margin. Gills simply pinnate. Foot broad, with a broad, narrow transverse furrow in front and a small free tail tapering to a blunt point and projecting but little beyond mantle when extended. Lips armed with short bifid hooks. Radula multidentate, with a well-developed median tooth having a strong central spine and 3–4 denticles on each side; inner lateral teeth with a strong cusp and 3–4 external denticles, and gradually changing outwards into short marginals having a uniform size of the cusp and the 3 denticles.

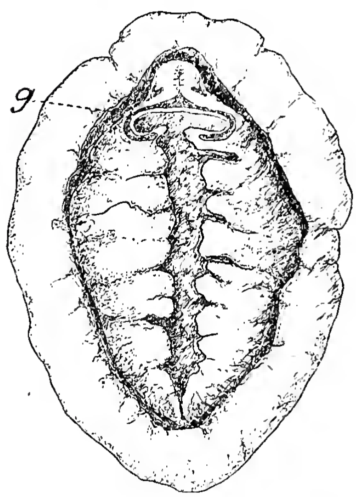

FIG. 10.—*Lissodoris mollis*, animal from below: *g* genital pore. ×20.

Diagnosis of the species.—Colour whitish with a pale rosy hue. Rhinophorial clubs with about 10 leaves; distance of rhinophorial openings from anterior mantle margin somewhat smaller than rhinophorial interspace. Gills 8, round the small anal tube, of subequal size and situated in one-sixth of the body-length from the posterior mantle margin. Radula at least 34 × 25–28.1.25–28. Dimensions of the largest specimen: length 3 mm., breadth 2 mm., height 1·7 mm. (contracted).

Further description.—The external body-form of these small specimens recalls in many respects an *Actinodoris* (*Sphaerodoris*). This is especially the case in the oral parts (fig. 10). On each side of the mouth (which is a narrow transverse fissure), the sides of the head are occupied by an elongate triangular pit with a small projection at its oral side. This structure represents a tentacle of similar form to that in *Actinodoris*, where, however, the pit is replaced by a curved fissure, because the tentacular projection fills up the hole more completely. The tentacle of *Lissodoris*, on account of its open shape, may be more primitive and approach the original stage of the doridid tentacle. The sides of the head are produced laterally as in *Actinodoris* and fused to the external margin of the foot as in that genus. Between the external foot margin and the edge of the foot sole is a narrow, transverse furrow. The sides of the foot are wrinkled transversely owing to contraction; if expanded the ovate foot would project slightly at the sides and at the end beyond the mantle.

The genital aperture is situated towards the front at the right side, about at the point where the transverse pedal furrow ends laterally (fig. 10).

The lip cuticle was armed with dense bifid hooks, feebly curved at their ends and measuring 10μ in length; they are of a light yellow colour (fig. 11, *a*).

Robson has prepared the radula of the larger specimen. It contained about 34 rows of teeth, though it appeared as if this number was not complete. The largest rows comprised 25–28 teeth on each side of the median tooth. This latter (fig. 11, *m*) is well developed and of the same size as the laterals (not about half their length as in *Cadlina*). It bears a sharp elongate cusp and, on each side of it, in the narrow margin, 3–4 small but distinct denticles. The length of the whole median tooth is 24μ. The first lateral is like the median tooth in its cusp; on the outer side of its base are 4 close denticles. In the laterals external to tooth 5 the cusp gradually diminishes in size, while the denticles, on the contrary, grow coarser; their number is only 3. Lastly, in the extreme marginals, the cusp and the denticles are of about uniform size, and the teeth consequently show a pectinate edge (with only 4 pinnulae; fig. 11, 23–25).

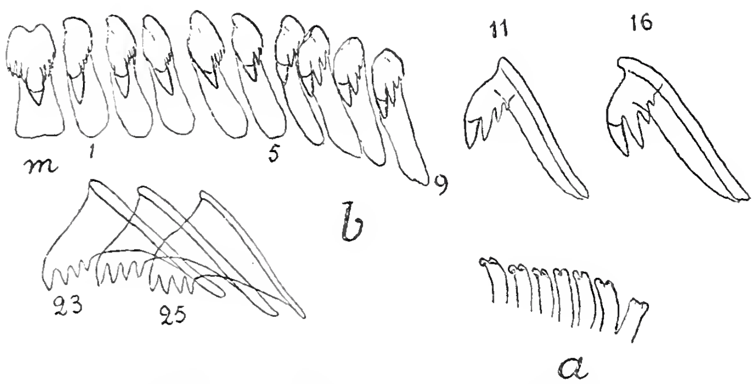

FIG. 11.—*Lissodoris mollis*: *a* lip staves, *b* radula teeth, *m* median tooth. ×620.

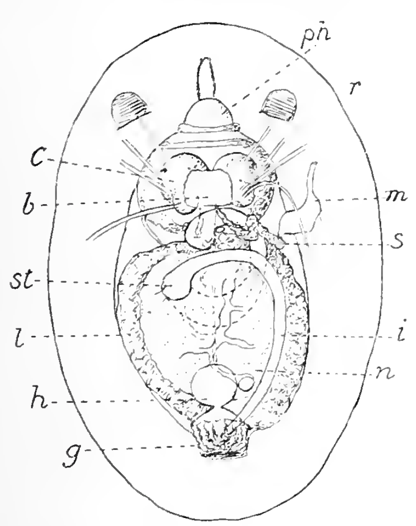

FIG. 12.—*Lissodoris mollis*, situs viscerum: *b* blood-gland, *c* cerebral ganglia, *g* gills, *h* heart, and renal syrinx to the right of it, *i* intestine, *l* liver, *n* nephridium, *m* distal genital organs, *ph* pharynx, *r* rhinophores, *st* stomach with liver duct.

About the further anatomy only a few points can be stated (*cf.* fig. 12). A blood-gland is well developed and situated on the upper side of the central ganglia. Beneath the latter a pair of band-like salivary glands debouch into the oesophagus. The latter describes a coil back and to the right, enters the liver and opens into the scarcely wider stomach. On the upper side of the liver, to the left, the intestine appears, running backwards along the right side. A gall-bladder was not seen. The right side of the liver is covered by the hermaphrodite gland. The distal genital organs were not differentiated; thus no vesiculae and no male organs were to be discerned. The nephridium lay on the upper side of the liver. To the renal chamber there leads an aperture through the bulb in the right side of the pericardium. The heart is situated in the mid-line of the body in front of the branchial circlet.

The nervous system (fig. 13), as far as could be ascertained from the preparation made by Robson, is concentrated much as in *Cadlina* (*cf.* Odhner, 1926a, p. 59). The pedal commissure seems to be somewhat longer, but it is always shorter than in *Austrodoris* (*cf.* Bergh, 1884, pl. I, fig. 13). Also a distinct genital ganglion was attached to the pleural ganglion.

Systematic position.—Though our knowledge of the anatomy of the present genus is incomplete, the establishment of the presence of a median tooth in the radula proves it to belong to the family Chromodorididae. Moreover, it occupies a position of its own in this family, because it differs from all the other genera of the family in having a distinct cusp of the median tooth, which elsewhere in this group is either vestigial (*Chromodoris*) or split up into 4 subequal cusps (*Cadlina*). Only in the genus *Cadlinella* Thiele, 1931, established on *Cadlina ornatissima* Risbec, 1928, from New Caledonia, is a distinct median cusp present in the central tooth; and the radula of *Cadlinella* is in other respects very like that of the present species, but the animal has a different external body-form, with a tuberculated back. *Lissodoris*, thus, is the most primitive of all Chromodorididae, and, in fact, of the proper Doridids also. In external characters, especially in tentacles, mantle, foot, and the simple gills, *Lissodoris* approaches *Actinodoris*, but it retains a radula of much simpler shape, whereas in *Actinodoris* the innermost tooth has its cusp separated by an incision from the lateral edge carrying the denticles; this genus, moreover, has been placed in a different family. *Lissodoris* has much the same shape of its marginal teeth as *Cadlina*, but it retains a primitive character in the smaller number of denticles.

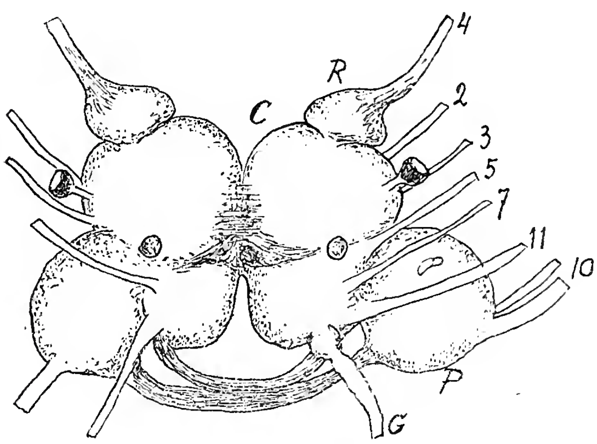

FIG. 13.—*Lissodoris mollis*, nervous system, ×80. Lettering as in fig. 6; *G* genital ganglion and nerve.

I think it is a natural arrangement to group *Cadlinella* and *Lissodoris* together as a distinct subfamily *Cadlinellinae*, characterized by the large and distinct, not reduced, central tooth with a well-developed cusp. In this respect they are clearly distinguished from all other Chromodorididae.

Risbec (1928) has described a further species of Chromodorididae with a distinct median tooth, viz. *Chr. versicolor*, which should be taken out of the genus *Chromodoris* and placed in a genus of its own. To this same genus I refer another form described by Risbec under the wrong name of *Ceratosoma francoisi*. It is no *Ceratosoma*, for it has a quite different appearance and a different radula (with a well-developed median tooth).* Further, according to Risbec, this species has no spermatocyst, and thus only

* Mme. Pruvot-Fol (1933, p. 130) believes that this species and Risbec's figure of it give a good idea of a *Ceratosoma* in life; but for species of the latter genus, which differs in external appearance and in anatomy from Risbec's form, good pictures of living specimens are given already by Bergh (1876 and 1905).

one vesicula seminalis)—a very remarkable fact, if true. Unfortunately, I have not had the opportunity of re-examining this interesting form, for which, nevertheless, I am obliged to establish a new genus on the basis of Risbec's rather insufficient description. I name it *Risbecia* and include in it, not only the type *francoisi* Risbec, 1928 (not *Ceratosoma francoisi* Rochebrune ; *cf.* Rochebrune, 1895), but also, though only provisionally, *Chromodoris versicolor* Risbec, 1928. Furthermore, *Risbecia* may be referred to the same subfam. *Cadlinellinae* as *Lissodoris* and *Cadlinella*, since it shares their distinct median cusp and the denticles on each side of it.

Glossodoris amoena Cheeseman, 1886.

At St. 134 (New Zealand Benthos, 5), Spirits Bay, near North Cape, New Zealand, 20–37 m. (31.8.1911), a Chromodoridid was dredged measuring 16 mm. in length (mantle 12 mm.). Though lacking all colour markings—it had attained a uniform verdigris colour *—I have been able to identify it as *Glossodoris amoena*. It shares the two chief characteristics of that species, viz. a series of small glandular swellings round the mantle margin (at any rate laterally and above all posteriorly), as mentioned by Eliot (1907a, p. 345), and the shape of the radula teeth, which are rather characteristic : the median tooth has a small but distinct cusp, the first lateral tooth has a long cusp, which, in the following laterals, grows still more elongated ; the marginal teeth, on the contrary, have their cusps shortened, while the first denticles grow larger. Thus the radula in the present species is exactly similar to that described and figured by Bergh (1905, p. 72, pl. V, figs. 17–19) in *Chromodoris figurata*, which is identical with *Chr. amoena* according to Eliot (1907a). The gills were 8 or 9, simply pinnate.

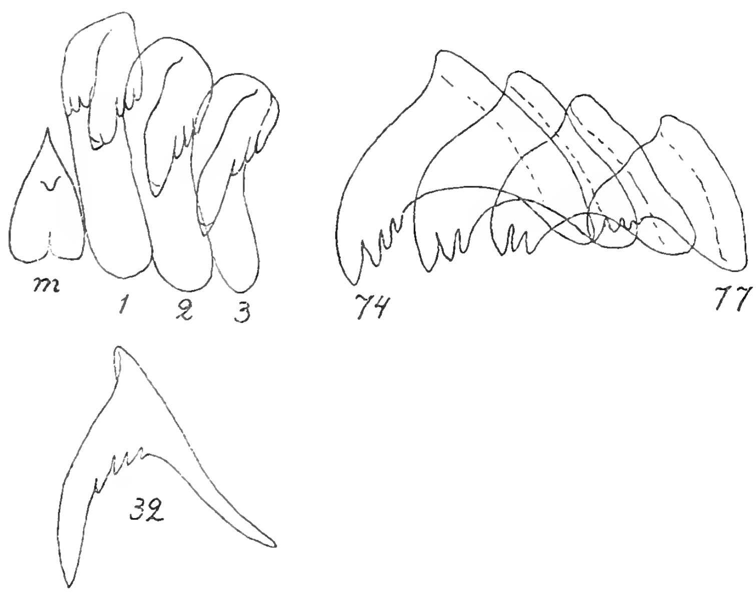

Fig. 14.—*Glossodoris amoena*, radula : *m* median tooth ; innermost laterals (1–3), middle lateral (32) and the 4 extreme marginals (74–77). ×480.

The radula of the present species has the formula 69 × 77.1.77. The median tooth is only half the size of the next laterals and has a very small, simple hook (fig. 14, *m*). The first lateral is denticulated on both margins, the next ones only on the external

* According to a note by Robson, the colour is a very faint yellowish-white.

margin. In the marginal teeth the cusp becomes short and the whole tooth laminar (fig. 14). This radula was exactly like that of a specimen examined for comparison from Great Barrier Island, collected by Mr. A. W. B. Powell and kindly sent me for disposal. The latter specimen measured 20 mm. in length, had 9 gills and a radula such as that just described and of the formula 75 × 80.1.80.

The " Terra Nova " animal had been dissected by Robson, but was still so well preserved that some of the internal organs could be examined. The genital organs (fig. 15) exhibited the general shape of the genus, especially the vesiculae seminales, of

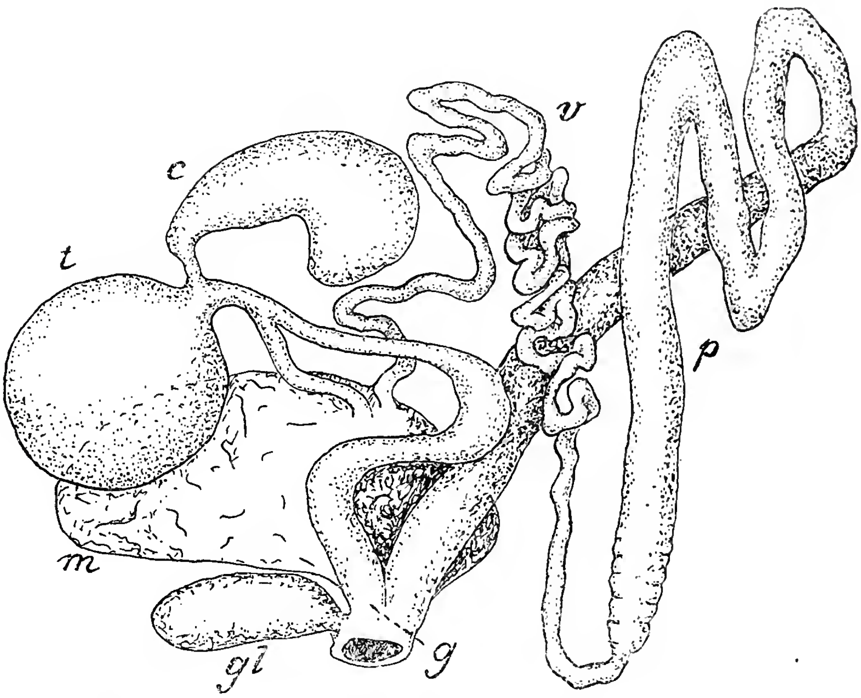

FIG. 15.—*Glossodoris amoena*, distal genital organs: *c* spermatocyst, *g* vagina, *gl* vestibular gland *m* mucus gland, *p* penis, *t* spermatheca, *v* vas deferens.

which the spermatheca (fig. 15, *t*) had, as usual, a spherical and the spermatocyst (*c*) a pyriform shape. Both were attached close to each other at the end of the vagina. The uterine duct comes off somewhat more distally on the common stem of the vagina. At the mouth of the vagina a small vestibular gland (*gl*) was to be seen. A similar gland, somewhat better developed, was found also in the Great Barrier Island specimen, and the latter showed, on the whole, a similar shape of the other parts also. As far as I can find, a vestibular gland has been observed in the genus *Glossodoris* or in *Chromodoris* only in a few cases. Bergh records it doubtfully in *Chr. sannio* (1890, p. 941): " Die Schleim- und Eiweissdrüse fast ganz von einem weissen Drüsenlager mit langgestreckten, wenig verzweigten, gegen den Schleimdrüsengang convergierenden Läppchen eingehüllt (Vestibular-Drüse ?)." The presence in *Chr. sannio* of a large vestibular gland covering most of the mucus and albumen gland, is beyond doubt, since I found it in a specimen from Fiji (Mus. Hamburg). I have found it, likewise, in a specimen of *Chr. valenciennesi* (*elegans*) from the Canary Islands, but in other species it does not exist, as, *e.g.*, in *Glossodoris punctilucens* (Canary Isl.); in that species, however, a small pouch-like widening of the vagina may represent a rudimentary or vestigial vestibular gland.

The nervous system (fig. 16) shows no differences from that of the Doridacea in general (e.g., *Austrodoris*, *cf.* Bergh, 1884, pl. I, fig. 13): cerebral and parietal ganglia are marked off from each other, though broadly fused, and the pedal ganglia are also broadly connected to both; the pedal commissure is rather short. The statocysts were very indistinct.

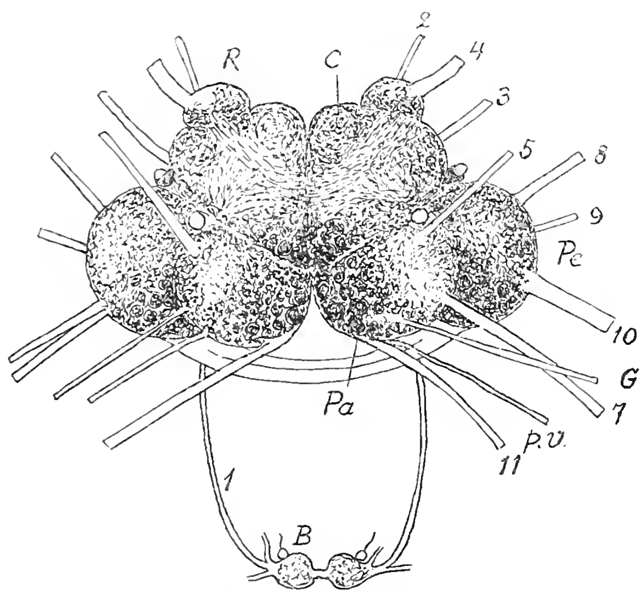

Fig. 16.—*Glossodoris amoena*, nervous system. Lettering as in fig. 6; *G* genital nerve, *7* median pallial nerve.

As to the nomenclature of this genus, I am not willing to follow O'Donoghue in his rejection of the name *Chromodoris* as preoccupied by *Glossodoris*, but think that both these names will be found applicable in the classification of the Chromodorididae. As a preliminary step at least, I have (1932) restricted *Chromodoris* to those forms in which the teeth of the radula are mainly bifid, whereas *Glossodoris* is characterized by hook-shaped teeth more or less denticulated. But it should be remarked that the anatomy of the group has not yet been investigated thoroughly enough to allow us to subdivide it in a natural way by taking account of all characters of classificatory importance. Features such as the structure of the genital organs may also be valuable in this respect. Probably several genera will be necessary for the reception of all species now referred to *Chromodoris* and *Glossodoris*.

Cadlina affinis n. sp. (Pl. I, figs. 7, 8.)

The genus *Cadlina* has a remarkable bipolar distribution; within the northern hemisphere it has its southern limit in California, Gulf of Mexico, and at the Cape Verde Islands; within the southern hemisphere it is represented by several species in the Subantarctic and Antarctic regions (*cf.* Odhner, 1926a). In the latter tracts the genus occurs on both sides of the southern parts of S. America, at the Falkland Islands, and in S. Georgia, and one species, *C. kerguelensis*, was described from Kerguelen Island by Thiele, 1912. From the Antarctic continent 4 specimens belonging to a distinct new species were brought back by the "Terra Nova" Expedition. They were trawled in McMurdo Sound at the following stations:

St. 340 (Antarctic Benthos 9), 76° 56′ S., 164° 12′ E., 293 m., 2 specimens, length 13 mm. (both), the one with 8, the other with 12 gills.

St. 355 (Antarctic Benthos 13), 77° 46′ S., 166° 8′ E., 547 m., 1 specimen, length 19 mm. (gills 8).

St. 356 (Antarctic Benthos 14), off Granite Harbour, entrance to McMurdo Sound, 92 m., 1 specimen, length 15 mm. with 10–12 gills (type, Pl. I, figs. 7, 8).

Diagnosis.—Body elongate ovate, with nearly parallel sides; mantle rim narrow, overlapping head and foot except at the hindmost end; dorsal surface tuberculate with fairly large depressed warts, largest in the middle part of the back, intermingled with smaller ones, all studded with weak spicules; there are about 5 large warts in a transverse line between the rhinophores and about 7 in the median line from branchial opening to hind mantle margin. Margins of branchial and rhinophorial openings beset with small papillae (about 11 round each rhinophore). Gills 8–12, bipinnate, in a complete circlet round the anus situated far back (postbranchial mantle breadth about $\frac{1}{8}$ or $\frac{1}{9}$ of the body-length). Rhinophorial clubs with about 12 laminae. Tentacles represented by broadly triangular lobes at the cephalic sides (fig. 17), with a small pit in the middle of the frontal surface. Mantle rim distinctly narrower than foot, quite smooth beneath. Foot with a transverse, narrow furrow, its upper lip faintly incised in the middle. Colour (in alcohol) yellowish- or brownish-white.

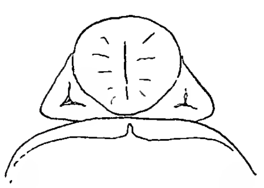

FIG. 17.—*Cadlina affinis*, mouth parts.

Radula 56 × 20.1.20 to 71 × 27.1.27. Median tooth equal to the first lateral in size, with 4–6 denticles; first lateral denticulated on both sides, following laterals only externally; an elongate cusp in the 5 first laterals, then gradually diminishing, the denticles becoming, in the same degree apical and narrower; they number about 8; extreme marginals about 3 or 4 times as long as broad.

Armature of lip cuticle consisting of small rods with bicuspid or tricuspid ends.

Further description.—As regards the genital organs (fig. 18) this species is essentially like other species of *Cadlina;* but the female organs exhibit an important character, probably of specific value, inasmuch as the vagina (fig. 18, *u*) is split distally into two canals, one leading to the mucus gland and serving as uterine duct. This remarkable condition (also observed and sketched by Robson) was found to prevail in 3 dissected specimens. Moreover, the position of the vesiculae seminales was the same in them all. The spermatheca (*t*) is round and twice as large as the pear-shaped spermatocyst (*c*), and both are situated at the upper end of the vagina. The shaft of the spermatocyst is about as long as that of the spermatheca, and no uterine duct is differentiated, since this duct still forms a part of the uterus and vagina. In the male canal a band-like prostatic portion of the vas deferens, running in a couple of loops, passes, after a slight constriction, into the muscular part, which is less than twice the length of the vagina and has no armature in its distal or penial part. There are no accessory glands attached to the atrium genitale.

As to the radulae (fig. 19) all 4 specimens were examined, and some variation was observed. The number of teeth varied to some extent with the size of the specimens : the largest one (length 19 mm.) from St. 355 had the formula 71 × 27.1.27, the next one (length 15 mm., from St. 356) 62 × 23.1.23 ; and the two specimens from St. 340 (both 13 mm. in length) showed the formulas 56 × 20.1.20 and 60 × 22.1.22. Further, it is to be remarked that in one specimen the median tooth, and the remaining teeth in a lesser degree, had a narrower shape than in the normal radulas, though the specimen in question was the largest of all (from St. 355, fig. 19, *d*). This phenomenon of reduction in size of the teeth may perhaps best be interpreted as a consequence of the conditions on the sea-floor in the deep water (547 m.). I have found a corresponding variation in the radula of *Natica clausa* from the Ice Fjord, Spitzbergen (*cf.* Odhner, 1913, p. 22, and 1915, p. 156). In other respects I cannot find any differences separating the last-named specimen from the others ; it has 8 gills only, but this small number also prevails in another specimen (St. 340), which has teeth of normal size (fig. 19, *b*). The latter specimen differs in its turn from the remaining ones in another respect, inasmuch as its median teeth have an asymmetrical cusp, in which the left denticles are somewhat shorter than the right ones, an abnormality observable throughout the radula.

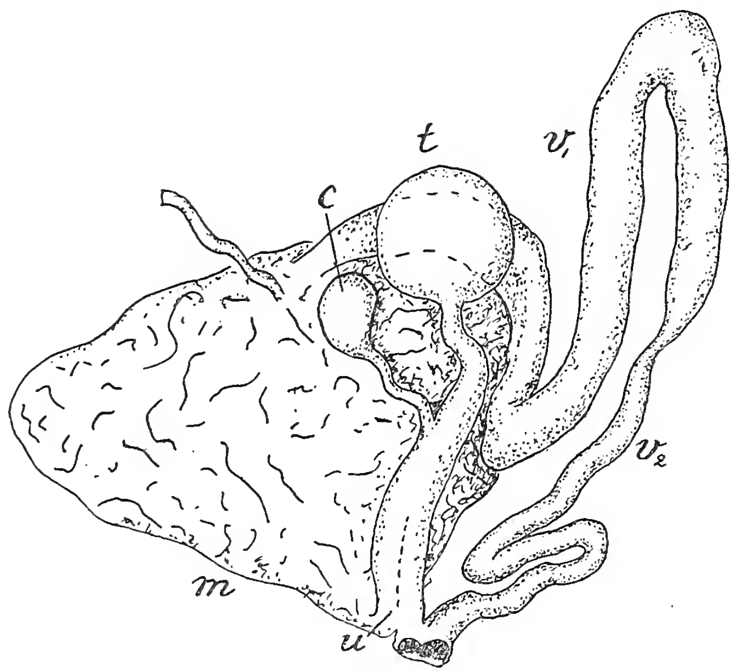

FIG. 18.—*Cadlina affinis*, genital organs: *c* spermatocyst, *m* mucus gland, *t* spermatheca, *u* vagina + uterus, v_1 vas deferens, prostatic portion, v_2 vas deferens, muscular portion.

Remarks.—The main constant characters in which the present form differs from other species of the genus and agrees with species of the southern hemisphere, are, above all, the tentacles, which are small and knob-like, occupying only the posterior part of the side of the head as a triangular lobe with a median depression. In this character it differs from most of the species, in which, on the contrary, the tentacles are extended along the head and have an external marginal furrow. The southern subantarctic species, *C. magellanica*, *falklandica*, and *kerguelensis*, are similar in this respect to *C. affinis*. A further similarity is afforded by the dorsal papillation, which consists of large and small warts (*cf.* Odhner, 1926a, pl. II, figs. 24, 26). The general shape of *affinis*, however, distinguishes it as a distinct species; its body is elongated with parallel sides, and the mantle rim is much narrower than the foot, whereas in the other species the body is ovate and the mantle rim broader. Thus the species is easily distinguishable by its external appearance alone.

More important or essential characters are, however, provided by the genital organs. In their general structure these organs are similar and uniform in the subantarctic species, and *affinis* has, like them, in its male apparatus a prostatic portion about equal in length to the muscular vas deferens and separated from it by a small constriction. The prostatic portion is thickened and band-like in *affinis* just as it is in *magellanica* and *falklandica*. But in *affinis* the vesiculae seminales are vaginal, not semiserial as in the two species mentioned (*cf.* Odhner, 1926a). No separate uterine duct is developed in *affinis*: it still forms a part of the vagina separated from its lumen by a longitudinal distal fold. This condition, observed in 3 specimens and certainly of specific importance, is a more primitive stage of differentiation than that in the other species, and is quite sufficient to separate it from the closely related *C. falklandica* (*cf.* Odhner, 1926a, p. 62, fig. 45).

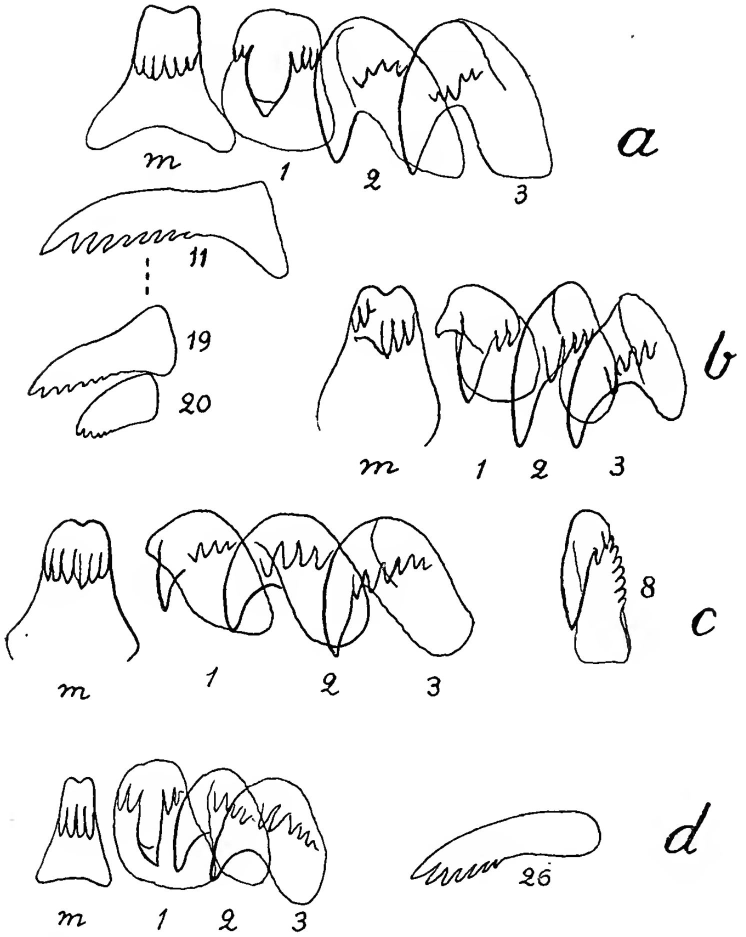

FIG. 19.—*Cadlina affinis*, radula: *m* median tooth, laterals and marginals numbered; *a* specimen from St. 340 with 12 gills, *b* sp. from St. 340 with 8 gills, *c* sp. from St. 356, *d* sp. from St. 355. ×480.

Unfortunately we are not able to identify *C. kerguelensis* Thiele, 1912, though this species may be identical with or closely allied to *C. falklandica*, as I assumed in 1926a. For the same reason we cannot state what are the essential differences between *C. kerguelensis* and *affinis*, but we must await further particulars from the study of well-preserved material of *C. kerguelensis*, which is insufficiently known.

Fam. DORIDIDAE.

AUSTRODORIS Odhner, 1926a.

To the genus *Archidoris* a number of large species of Dorids have been referred chiefly on account of their external similarity to the typical species of this genus, the northern *Archidoris tuberculata* Cuvier. The genus was extended to comprise also forms from the southern hemisphere, when Bergh, in 1884, described *A. kerguelenensis* and *australis* from Kerguelen Island and, in 1898, *A. rubescens* from S. Chile. Several other species of *Archidoris* were reported from southern parts of the world, but in almost every case insufficient characters were given, and nearly all must be excluded from the genus *Archidoris,* which, at present, has outside northern latitudes a few representatives in New Zealand only (*A. wellingtonensis* and *nanula*) and perhaps in East Africa (*A. africana* and *minor*). Other species referred to *Archidoris* must be subjected to a renewed examination to settle their true generic place.

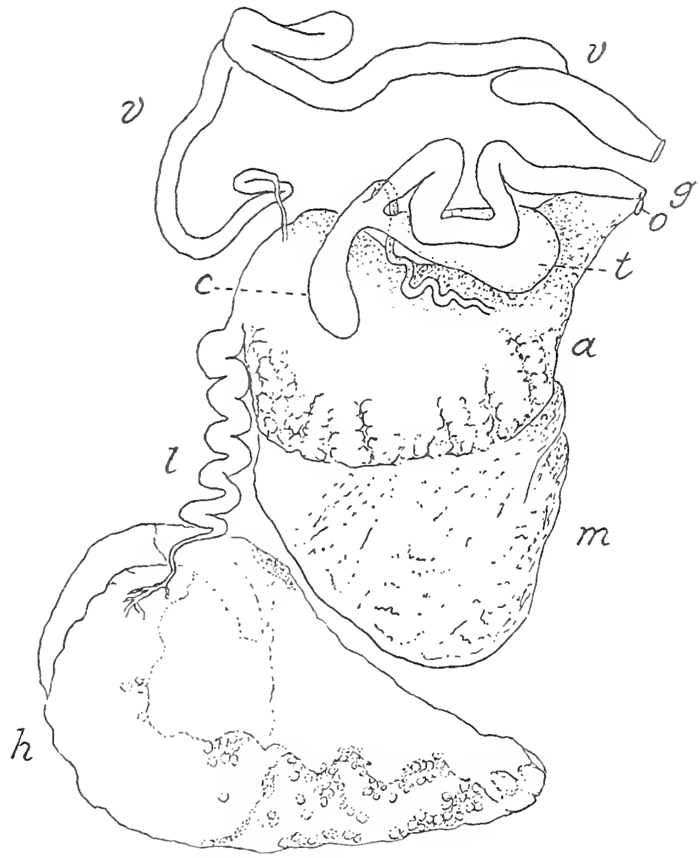

Fig. 20.—*Austrodoris macmurdensis*, type St. 349, genital organs (combined from two sketches drawn by Robson). Lettering as in fig. 15; *a* albumen gland, *l* ampulla, *o* oviduct aperture.

A. rubescens Bergh was made the type of a new genus, *Austrodoris*, by myself in 1926. The chief characteristic of this genus is in the genital organs: the vas deferens has no prostatic part (as in *Doris* and *Archidoris*), nor prostate gland (as in *Anisodoris*) and lies, in its entire length, enclosed and winding in a thick muscular sheath (the upper continuation of the penis sheath). There is no glans penis (contrarily to *Archidoris* and *Anisodoris*). Both spermatheca and spermatocyst are placed at the end of the vagina (the latter vesicle is thus not remote from the vagina and not inserted at the uterine duct as is the typical condition in *Archidoris*). Further, the lip cuticle is smooth, and the salivary glands are, as a rule, short, broad and tongue-shaped (not band-like as in *Archidoris, Doris,* and *Anisodoris*).

These characteristics of the genital organs were observed in the present material independently by Robson, who dissected about half the number of specimens, and he remarks in his notes the disposition of the vesiculae seminales and the shape of the vas deferens. I have reproduced his sketches here (figs. 20–24) in order to show these characters and to bring out how little they vary in the different forms. Consequently, with the possible exception of the relative size of the vesiculae, they are unsuitable for specific discrimination.

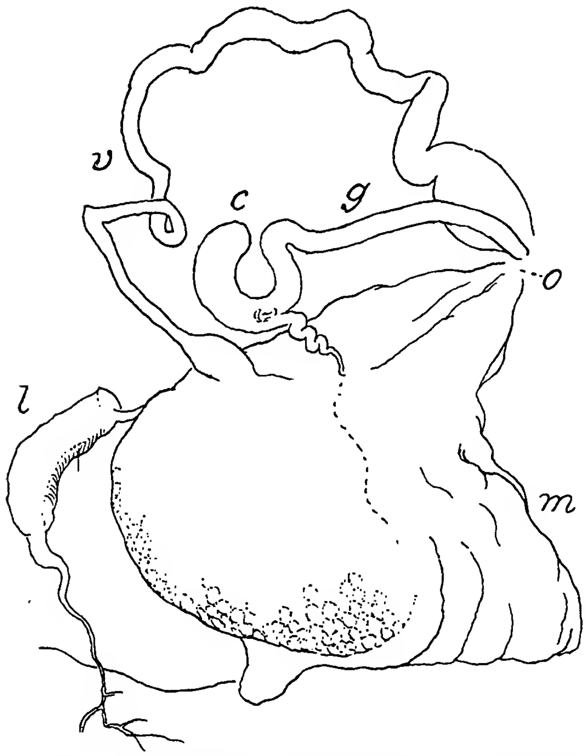

Fig. 21.—*Austrodoris macmurdensis*, St. 340, distal genital organs. Lettering as in fig. 20; spermatheca removed.

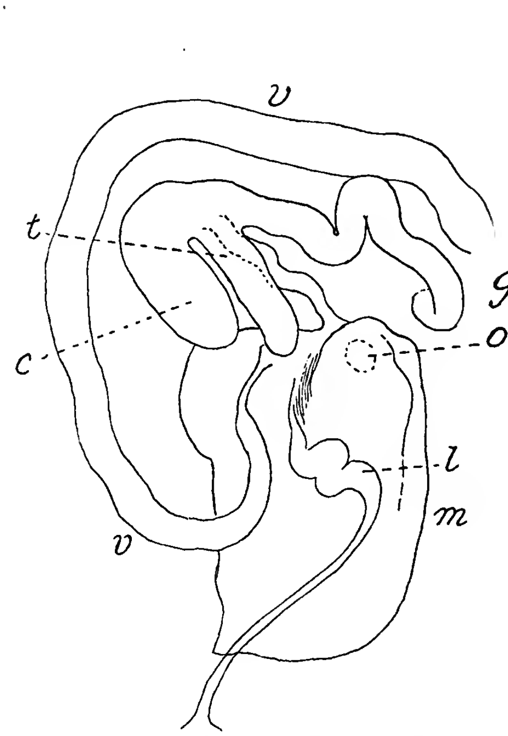

Fig. 22.—*Austrodoris granulatissima*, St. 194, distal genital organs. Lettering as in fig. 20.

A glance at the figures of the radula teeth represented in figs. 25–33 also convinces us that there are only small and unimportant differences in the shape of the teeth. Their differences in number and the mode of their increase and decrease in size represent also only slight changes and form no good basis for establishing and characterizing species.

We have, consequently, for the distinction between species in this genus, only external characters to consider and above all the number of gills and the papillation of the back. In many Dorids the number of gills is fairly constant, though in other genera such as *Cadlina* (*cf.* above) they seem to vary in one and the same species. We still possess too little material to decide whether the number of gills is specifically constant in the present genus. Some variation occurs partly, at least, in relation to the body size. In *Austr. rubescens*, from the Swedish Antarctic Expedition material, I have found the following numbers of gills in relation to the size of specimen :

Length of specimen in mm.	17	15–20	20	20–40	35
Number of gills	8	9	10	11	12

In *A. michaelseni*, however, the number of gills is less variable, being 6–7 in specimens from 8–25 mm. in length. In the latter species a relatively greater difference between the single gills obtains, inasmuch as the largest gill (the anterior median or an admedian) is many times larger than the hindmost gills in the circlet. In the former case, where a larger number of gills is developed, the difference between the single plumes is less striking. A small number of gills may be considered as the primitive condition.

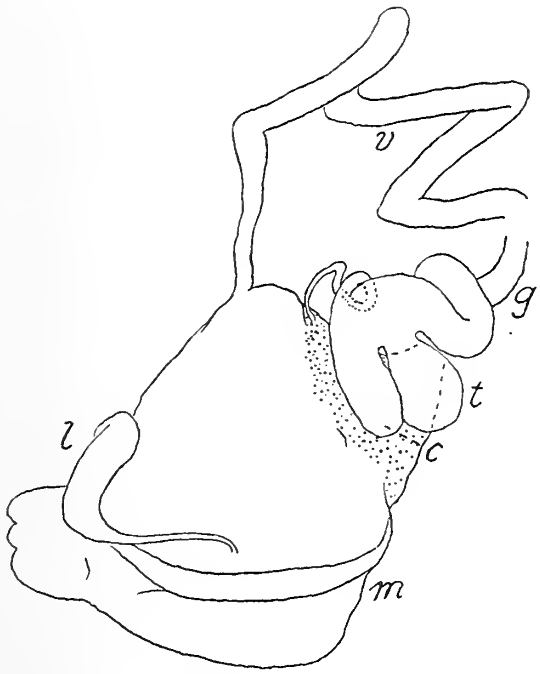

Fig. 23.—*Austrodoris tomentosa*, St. 194, distal genital organs. Lettering as in fig. 20.

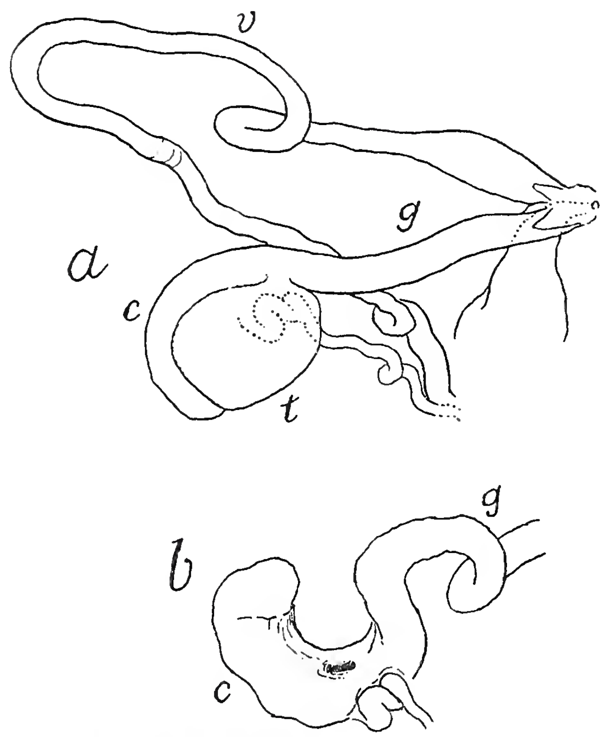

Fig. 24.—*Austrodoris tomentosa*, St. 355, distal genital organs : *a* from above, *b* spermatocyst from hind side.

With increasing body size the number may either be stable, each gill plume only attaining greater size by adding more basal branches and thus growing more and more ramose and extensive, or new gill plumes may bud out from both ends of the branchial arch, in which case each single plume keeps a comparatively simple shape. In different species a different modification of this scheme has taken place, which at least enables us to distinguish certain forms, or probably species. It may be noted, however, that some variation in the number of the gills may occur even when few gill plumes are present, for the separation of posterior branchial leaflets may be less complete, so that a smaller number than usual may be present.

Another external characteristic of *Austrodoris*, which at once distinguishes the typical form, *A. rubescens* from *Archidoris tuberculata*, to which it has a great similarity, is the breadth of the mantle rim. This may be difficult to state exactly, if one measures the lateral rim of the notum, as this may be more or less extended or contracted; but the measurement of the posterior portion of this rim behind the gills yields useful differential characters. The postbranchial mantle rim indicates the position of the gills (whether far back or more advanced). In *Archidoris tuberculata* the postbranchial mantle is about $\frac{1}{6}$ of the body-length, in *Austrodoris rubescens* at most $\frac{1}{7}$. This relation seems to form a fairly good distinguishing character in *Austrodoris*, taxonomically a very difficult genus. Thus in *Austrodoris granulatissima* this relation is $\frac{1}{6}$, and the mantle is, according to Vayssière, large; in all the new species described below, the relation is still smaller than in *A. rubescens*, or $\frac{1}{8}$ to $\frac{1}{9}$, a value which seems to prevail also in *A. antarctica* Hedley (according to his fig. 102, pl. IX).

A further external characteristic common to most species of *Austrodoris* is the papillation of the rhinophorial and branchial margins. In *A. rubescens*, as in other Dorids, the largest of the rhinophorial papillae is situated on the outer hinder side of the aperture; obliquely in front is a somewhat smaller anterior papilla. Often these papillae are somewhat remote from the margin proper, which is, instead, furnished in the same place with smaller papillae. The number of these marginal papillae increases with age. This characteristic papillation is, however, a general feature in many Dorids with papillated rhinophorial openings (e.g., *Doris*). The papillation of the rhinophorial and branchial openings seems, however, to have two or three exceptions in the genus *Austrodoris*, viz. *A. antarctica* Hedley, 1916, and *Doris peculiaris* Abraham, 1877, from Port Lincoln, if this species shall prove to belong to *Austrodoris*. The latter seems probable, since I found in the type specimen, examined on my visit to London (1928), an unarmed vas deferens with a sheath and no prostate, and vaginal (or rather semiserial) vesiculae seminales. The radula is unknown, but might be of the Dorid type, since it was described as a *Doris* by Abraham, who created as separate the genus *Doriopsis*, to which *D. peculiaris* has some resemblance in the under side of the mantle with its veined fibrillae. It may be questioned whether this species is identical or at least closely related to *Doris violacea* Quoy and Gaimard, which Mme. Pruvot-Fol (1934) places with doubt in *Austrodoris*.

The papillation of the back forms, lastly, an important character for the classification of the species of *Austrodoris*. This genus exhibits in that respect a multitude of stages, from forms with comparatively large and depressed pustules (*A. michaelseni*) or smaller semispherical warts (*A. rubescens*) to those with cylindrical papillae or even a tomentose dense papillation. The extreme stages are very different from each other, but the intermediate stages are difficult to keep apart, the more so, as certainly the mode of preservation may influence the shape of the papillae.

Only with caution should the size and density of the back papillae be relied upon in distinguishing species of Dorids. This character may vary even in the same species, and, especially in preserved material, may change its appearance. In *Archidoris tuberculata*, for example, the nodules of the back vary from small and depressed to large and rather high, and even confluent warts may occur. In *Cadlina repanda* there are specimens which are quite smooth, and others again which are distinctly verrucose. In *Austrodoris rubescens* most of the specimens from the Swedish Antarctic Expedition had large rounded warts, but in a few specimens within the same set the warts are cylindrical or slightly clavate, showing that a variation also may take place within this genus. Nevertheless, I have used the papillation as one of the most significant characters for the discrimination of the forms of *Austrodoris*, since it seems to furnish a fairly good basis of classification, if combined with the number of gills.

It may be remarked that the genus *Austrodoris* has a geographical distribution restricted to the southern hemisphere, and especially to high latitudes. A few species are endemic in the Patagonian region, and apparently at least two are found in the southern parts of Australia (*A. fulva* Eliot and *A. peculiaris* Abraham). The remaining species are all antarctic. *A. nivalis* Thiele, 1912, is not identifiable (*cf.* Odhner, 1926a).

Several specimens collected by the "Terra Nova" Expedition have proved to belong to *Austrodoris*. They are wholly typical of this genus in their genital organs, having a long sheath containing the winding vas deferens (which consequently lacks a prostatic portion) and having vaginal vesiculae seminales. From each other they differ to some extent in the size and shape of the back papillation and in the number of gills, thus seemingly representing more than one species. In their radula they are much alike, but one species has strikingly dense teeth; only one of the specimens has the inner laterals abnormal, which may give an impression of false median teeth; this feature is due to an asymmetrical development of the left admedian tooth, whereas the right one is normal, an abnormality developed to a varying degree in various rows of the radula.

The present material has been subjected to a thorough investigation, first by Robson, who dissected half of the specimens and examined especially their radulae and genital organs, and afterwards by myself who have tried to discern the specific differences. This was extremely difficult, since the material was uniform in general shape, all specimens being elongate elliptical, soft and entirely discoloured. Whether the forms here distinguished as species will prove to be valid when more material shall have been studied, is therefore somewhat questionable. At present, however, they seem to be most conveniently defined and related as follows:

I. Gills few, 6–7; dorsal papillae digitiform or columnar; postbranchial mantle about $\frac{1}{7}$ of the body-length. Radula $22 \times 24.0.24$ or $13 \times 32.0.32$ .. .. *A. macmurdensis* n. sp.

II. Gills numerous (10–15); dorsal papillae conical or columnar.

  A. Postbranchial mantle about $\frac{1}{6}$ of body-length. Radula 20–23 $\times$ 39–40.0.39–40 .. .. *A. granulatissima* Vayssière.

  B. Postbranchial mantle $\frac{1}{8}$ or $\frac{1}{9}$ of body-length.

    1. Papillae conical. Radula $20 \times 29.0.29$ to $33 \times 43.0.43$ *A. tomentosa* n. sp.
    2. Papillae columnar. Radula $22 \times 28.0.28$ .. .. *A. nivium* n. sp.

Austrodoris macmurdensis n. sp. (Pl. I, figs. 9, 10; Pl. II, figs. 16–18.)

To this new species I refer the three following specimens: The type, 1 specimen, length 71·5 mm., from St. 349 (Antarctic Benthos 11), off Butter Point, 146 m., sponges (Pl. I, figs. 9, 10); and 2 specimens, length 22·5 mm. and 6 mm., from St. 340 (Antarctic Benthos 9), off Granite Harbour, 293 m., mud (figs. 16–18); both localities in McMurdo Sound.

All three specimens show as a common character 7 (or 6) gill plumes. These are, in the largest specimen, quadripinnate; in the smallest specimen, though it measures only 6 mm., they are 7 in number, small but very distinct and simply pinnate; in the remaining specimen there are 6, all distinct and none showing any basal branch which could represent a 7th leaflet. All have, further, a papillation of conical or columnar, dense papillae. In the shape and number of the gill plumes they resemble *A. kerguelenensis* Bergh, 1884, but in their papillation they are distinct, though this is not a very clear character. Bergh gives in his type of *A. kerguelenensis* (length 45 mm.) the largest papilla as 1·3 mm. in diameter and nearly the same in height, and his fig. 2, pl. I, shows a spherical shape for the papillae, which are of various sizes and stand close together. In the present specimens, on the contrary, the largest papilla in the largest specimen measures scarcely 1 mm. in diameter and is more elongated, nearly columnar, whereas the general shape of the papillae in all the three specimens is columnar or digitiform. I therefore hold them distinct from *A. kerguelenensis* and name the new species after its place of occurrence.

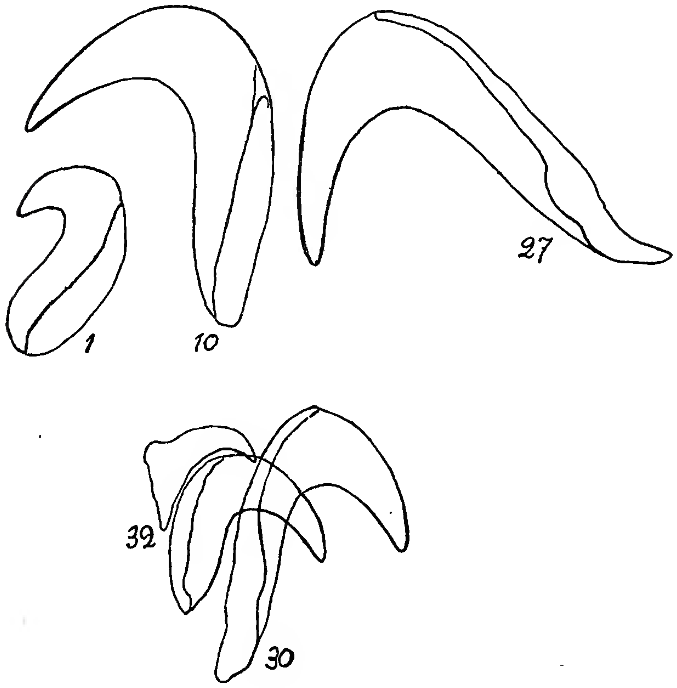

FIG. 25.—*Austrodoris macmurdensis*, type St. 349, radula, 1 inner lateral, different laterals, and outermost margins (30–32). ×80.

The two large specimens were examined for their anatomical characters, and their radulae showed the same features as that in *A. kerguelenensis* in the shape of the external marginals which are strong and stout, with their hooks of about the same length as the basal plates (fig. 25); this is in contrast with *A. australis*, where these teeth are slender, with the hooks much more elongate than the basal plates. These characters may, however, be of little value as differentiae. Both specimens were sexually mature.

Apart from the differences in the number of gills, the specimens show certain slight variations in external form, as shown by the following measurements (in millimetres) :—

Specimen.	Length.	Breadth.	Height.	L. of foot.	Br. of foot.	L. of postbranchial mantle.	Gen. apert. from anterior margin.
St. 349	71·5	34·5	24	67	25	10·5	18
St. 340	22·5	9·5	6	25	4·5	3·5	7
St. 340	6	4	2	5	1·4	1	2·4

The relation of the postbranchial mantle to the body-length is 1 : 7, 1 : 7, and 1 : 6 respectively.

The rhinophores had about 45 laminae in the largest specimen, 30 in the second specimen, and about 12 in the smallest one. The perirhinophorial and peribranchial papillae were, as a matter of fact, fewer in the smaller specimens. The largest peribranchial papillae apparently alternated with the branchial plumes in the smallest specimen, a feature which disappears with age but is of interest as indicating that the valves in certain Doridids (*Platydoris*, e.g.) have taken their origin from this papillation. The largest specimen had about 17 small (and smallest) papillae in a line between the rhinophores.

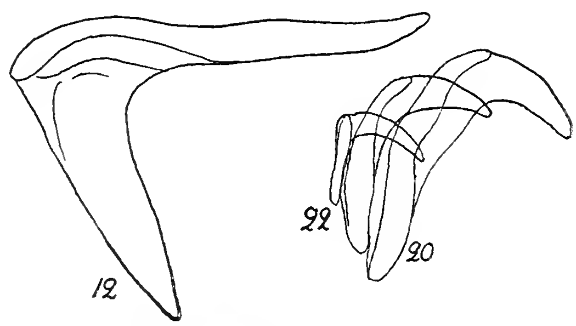

FIG. 26.—*Austrodoris macmurdensis*, St. 340, one lateral and three outermost marginals (20–22). ×125.

As to the shape of the dorsal papillae, it may be remarked that in the smallest specimen they are the most elongate, and in the largest one, broader and shorter, often with a wider upper half and a broadly conical tip. Since, however, columnar papillae generally occur in the largest specimen, the aberrant ones seem to be due to variation or possibly to the state of preservation (they are often flattened, because of having been pressed down on the back).

The radula (figs. 25, 26) was examined in all three specimens. The biggest had only 13 rows of teeth, the largest row having 32.0.32 simply hook-shaped teeth (fig. 25) of the general dorid shape, and is strikingly small for the size of the animal. The smaller specimen had 22 rows of 24 teeth on each side of the bare rhachis (fig. 26). Except for some trifling differences in size and strength, the teeth are alike in both specimens, and the extreme marginals, which generally have short and blunt cusps and show some differences, are not suitable for comparison, since even in the same radula they exhibit variation. In some rows of both specimens the extreme marginals had been reduced to an evenly curved needle. The smallest specimen had 20×19.0.19 teeth. In all three specimens about the 7 innermost teeth increase slowly; the following are about uniform in size or increase slightly to about the 7th from the margin, which seems to be the largest; then a decrease follows which goes on rapidly in the 4 extreme teeth.

The nervous system was prepared and sketched by Robson, and his figure is reproduced here (fig. 27). Compared with the nervous system of *Austrodoris australis* described by Bergh (1884, pl. I, fig. 13), it shows the same degree of concentration of the ganglia, but the suboesophageal commissures are longer. At the cerebral ganglia the rhinophorial nerves rise from almost sessile olfactory ganglia, and the main pairs of nerves radiate to the labial region. Whether eyes are actually absent, as the figure shows, seems most unlikely; they were without doubt omitted from the drawing. Robson notes: "The main roots of the pleural centres are asymmetrical in their origin. On the right side one of the two anterior pallial nerves is bifid, while on the left side it is single (a similar condition is seen in *A. granulatissima*). The right pleural ganglion has a nerve arising from its median area, absent on the left side, while at its posterior corner there is only a single trunk, whereas on the left side there are 3. Similar irregularities are found in the origin of the pedal nerves. The abdominal ganglion is drawn well up towards the pleural centre and a separate ganglion, apparently the isolated genital ganglion, is found close to it." Bergh's figure, just quoted, seems to be less detailed.

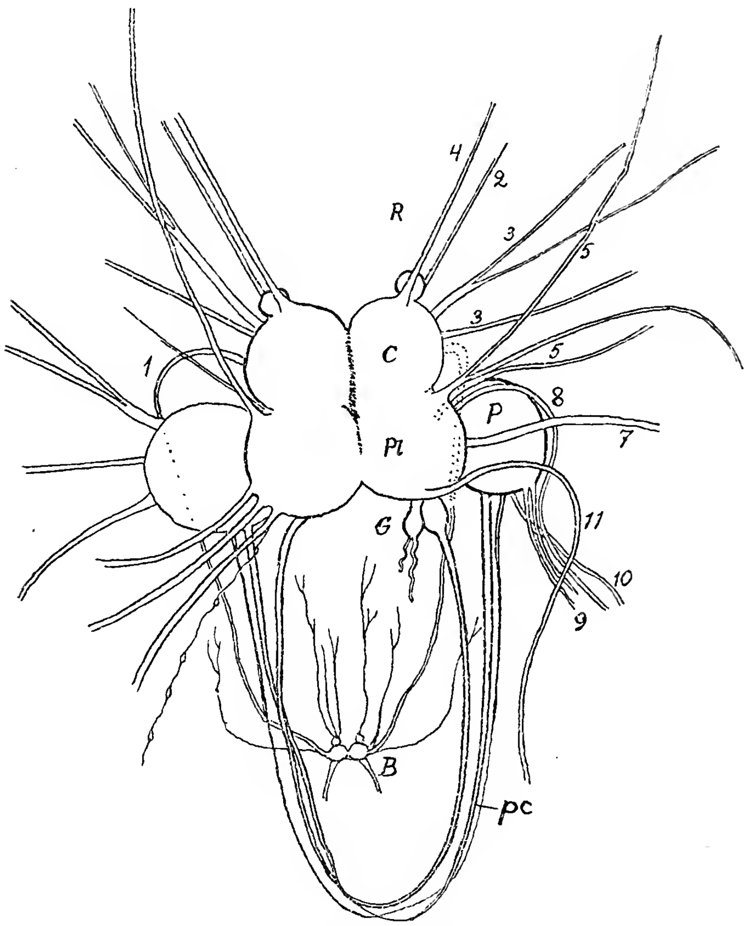

FIG. 27.—*Austrodoris macmurdensis*, type St. 349, nervous system (Robson del.) Lettering as in fig. 6; *G* genital ganglion, to the right of it the abdominal ganglion, *7* median pallial nerve.

The genital organs were examined by Robson (fig. 20). Compared with those of *A. nivium*, described below, they differ in two respects: (1) the hermaphrodite duct enlarges gradually to a much-coiled ampulla; (2) the spermatheca is much larger than the spermatocyst and pear-shaped. Whether these are constant differences or due to individual variation is uncertain; the ampulla, however, may attain a simpler shape (*cf.* fig. 21 of the smaller specimen from St. 340).

Austrodoris granulatissima Vayssière, 1917. (Pl. II, figs. 13–15.)

One specimen from St. 194 (Antarctic Benthos 4), off Oates Land, 69° 43′ S., 163° 24′ E., 329–366 m.), and one specimen from St. 349 (Antarctic Benthos 11), off Butter Point, western shore of McMurdo Sound, 146 m. They differ from the three new species of *Austrodoris* obtained by the "Terra Nova" in their broader mantle which gives rise to a dilated postbranchial mantle-rim, or a more advanced position of the branchial circlet than in the other species. The breadth of the postbranchial mantle in these two specimens occupies about $\frac{1}{6}$ of the body-length just as it does in *A. granulatissima* Vayssière. I identify the specimens in question as *A. granulatissima* on account of this feature as well as by the apparent agreement in the nature of the papillation (*cf.* Vayssière, 1906, pl. IV, fig. 43): this, on the other hand, is somewhat less dense and shows a trifle more rounded papillae than in *A. tomentosa*. There are about 12 papillae in a transverse line between the rhinophores. Also the radula corroborates the identification, though in Vayssière's type it numbers up to 25 rows with up to 34 teeth on each side of the rhachis, in the largest specimens. The present specimen from St. 349 (length 45 mm.) has a rather larger number of teeth (fig. 28), 23 × 39.0.39, and this is the case also with the second specimen (length 33 mm.), which shows a formula of 20 × 39–40.0.39–40 teeth (fig. 29). Vayssière's typical specimens, though measuring 28–61 mm. in length, thus have radulas with a comparatively smaller number of teeth, the single noteworthy difference from the present form. On this ground alone it cannot be separated as a distinct variety, for, as I established in 1926, a similar condition exists in *A. rubescens*, where even a very small specimen may have a greater number of teeth than a very large one. The shape of the radula teeth is in agreement with that of *A. granulatissima*, inasmuch as their base is rather elongated (*cf.* Vayssière, 1917, fig. 44). The increase in size of the teeth, however, proceeds in a different way from that in the typical form, in which the 6th tooth is about twice the first, and the 24th about 4 times; after which the size decreases rapidly. The radula of the largest

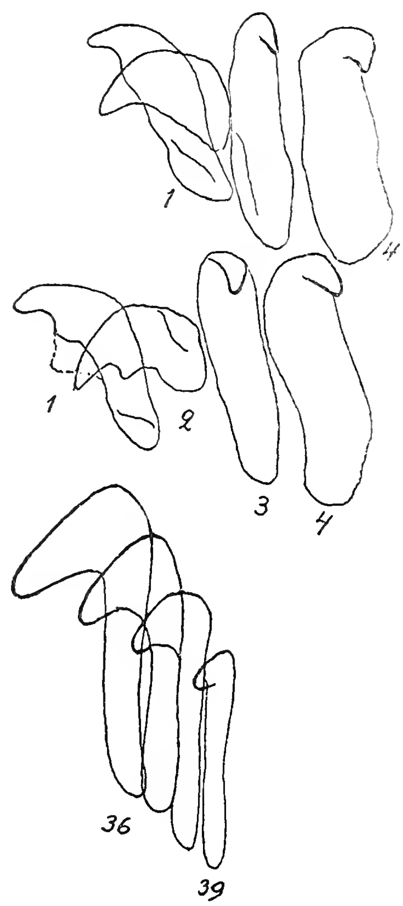

FIG. 28.—*Austrodoris granulatissima*, St. 349, radula, two rows of innermost laterals (1–4) and four outermost marginals (36–39). ×80.

specimen (fig. 28) showed a slow increase in size of about the 12 inner teeth, then a uniform size up to about the 12th tooth from the margin, then a slow decrease, rapid only in the 3 outermost marginals. The two innermost teeth in this specimen are irregular in most rows, showing a tooth-like projection under their cusps. I think this different mode of alteration of tooth size cannot be considered of systematic importance.

Dimensions of the two specimens obtained:

Specimen.	Length.	Breadth.	Height.	Length of foot.	Breadth of foot.	Postbranchial mantle length.
St. 194	33	23	16	28	13	5·5
St. 349	45	24·5	20	40	14·5	7·5

The genital orifice is situated in the larger specimen at 15 mm. distance from the front margin, in the smaller specimen at 11 mm.

I assumed (1926a) that *A. granulatissima* was probably identical with *A. antarctica* Hedley, 1916, for the character of the dorsal surface seems to support that view. It

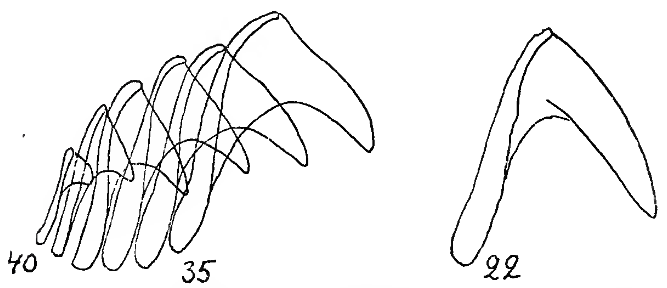

FIG. 29.—*Austrodoris granulatissima*, St. 194, radula, lateral tooth (22) and outermost marginals (35–40). ×80.

FIG. 30. — *Austrodoris granulatissima* from Ross Sea (Wallin coll.), lateral tooth No. 15. ×125.

is described by Hedley in *antarctica* as constituted by "fine grains, among which larger grains are set about 3 mm. or 4 mm. apart," whereas Vayssière says about *granulatissima* (*l.c.* p. 18): "Toute la surface dorsale du manteau, assez bombée, est couverte d'une multitude de petits tubercules arrondis qui donnent un aspect chagriné à sa surface . . . les tubercules varient seulement du simple au double." Whether they are really identical cannot be decided without comparing the respective types.

To this same species I refer a specimen from the Ross Sea dredged by Dr. Sten Wallin in 1924 (10/2), 35′ N. of Discovery Inlet, in 640 m. depth. It has a similar papillation of the back, and measures in length 15, in breadth 9, and in height 6 mm.; the post-branchial mantle measures 3·5 mm., and the gills are 8 in number. The radula (fig. 30) is smaller (3·5 × 3·5 mm.) than in the "Terra Nova" specimens and has more numerous and crowded teeth. The teeth are, further, more strongly curved and the cusp is longer in relation to the base than in the "Terra Nova" specimens. The colour of the teeth is light yellowish. The formula of the radula was: 22 × 41.0.41. A tooth from the radula is figured.

Robson prepared and figured the nervous system of this species also. His sketch, reproduced in fig. 31, shows a general agreement with that of *A. macmurdensis*, though there are some slight differences, either specific or due to individual variability. This is the case, above all, with respect to the genital ganglion. "The visceral commissure bears a single moderate-sized ganglion on the right side lying quite distinct at some distance from the nerve collar. From it a nerve issues sending branches to the vas deferens and the genital organs. . . . There is a short though distinct ocular nerve on each side, at the end of which are found the subcutaneous eyes which are apparently of the usual structure." (Note by Robson.)

In *A. rubescens* Bergh from South Georgia (Swedish Antarctic Expedition) I found the same conditions as to eyes and genital nerve.

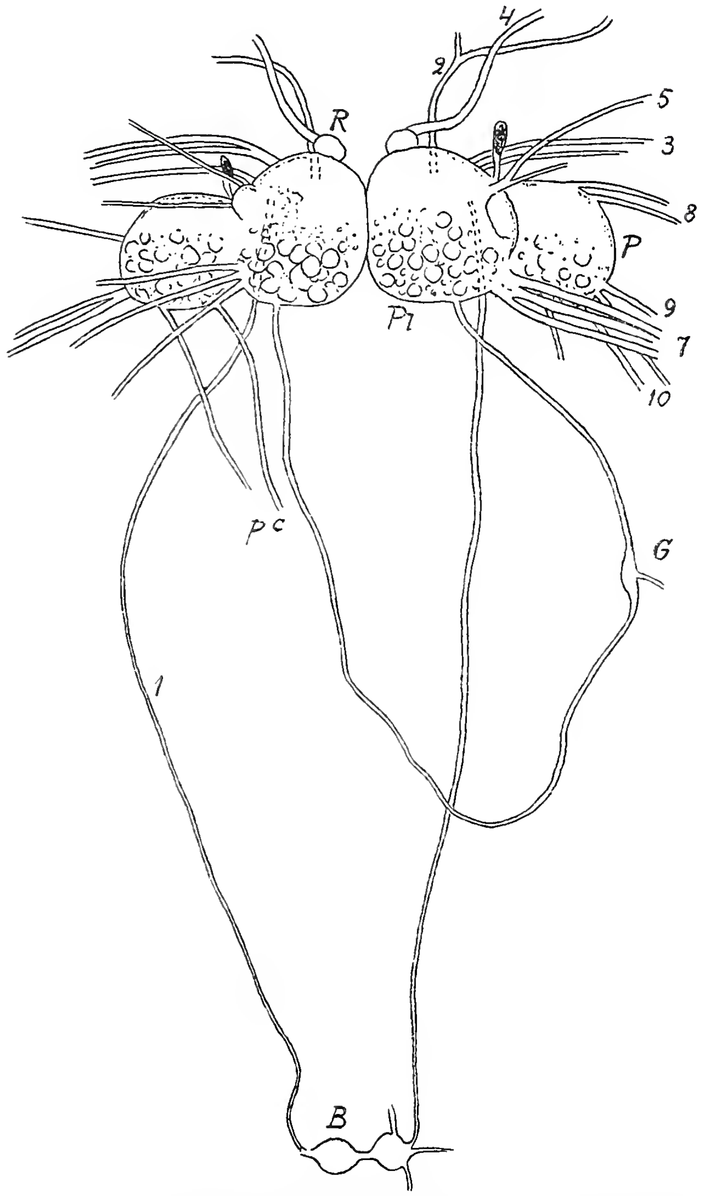

Fig. 31.—*Austrodoris granulatissima*, nervous system (Robson del.) Lettering as in fig. 6; *G* genital ganglion, *7* median pallial nerve.

Austrodoris tomentosa n. sp. (Pl. II, figs. 19, 20.)

To this new species I refer four of the specimens obtained by the "Terra Nova" Expedition in the McMurdo Sound as well as from off Oates Land. They were obtained from the following stations:—St. 194, off Oates Land, 69° 43′ S., 163° 24′ E., 180–200 fms. (1); St. 295, Ross Sea, 73° 51′ S., 172° 57′ E., 190 fms. (1); St. 316, McMurdo Sound, off Glacier tongue, about 8 miles N. of Hut Point, 190–250 fms. (1); St. 355, McMurdo Sound, close to the edge of Barrier ice, 77° 46′ S., 166° 8′ E., 300 fms. (1). They have as a common feature conical papillae most closely resembling those of *A. granulatissima*. These papillae are thus intermediate in shape between the columnar ones of *A. macmurdensis* and the hemispherical ones of *A. rubescens* from the West Antarctic. In *A. rubescens*, moreover, the papillae are somewhat less crowded than in the present specimens of *A. tomentosa* as shown by the figures (*cf.* Odhner, 1926a, pl. II, figs. 33, 34, 36). In *A. tomentosa* there are from 13 to 17 papillae in a transverse line between the rhinophores, and they are often so densely set that the distance between two papillae is smaller than the papilla height, a character which distinguishes *A. tomentosa* from *A. crenulata* Odhner, 1926a, which has more scattered papillae (distance between them larger than papilla height). In *A. antarctica* Hedley, 1916, the back is covered with small grains among which larger grains are set at about 3 or 4 mm. distance. This species thus proves sufficiently distinguished from the present one. The single species which may cause some hesitation is *A. granulatissima* Vayssière, 1917, which seems very similar to *tomentosa*; but in the present species the mantle margin is much narrower than in *A. granulatissima*, as is evident from the following table, which, further, shows that the variation of form is quite as great in this species as in the preceding one :—

Specimen.	Length.	Breadth.	Height.	Length of foot.	Breadth of foot.	Postbranchial mantle, L.	Gen. orifice from front, L.
St. 194	38	18	15	21	9	4	11
St. 295	26	10·5	8	23	6	3	9
St. 316	30	13	11	23	11	3·5	10
St. 355	25	12·5	11	23	9·5	3	8

The radula teeth of this species are very crowded and have long and curved hooks. The innermost teeth are small and increase very slowly up to teeth 15–20; the following

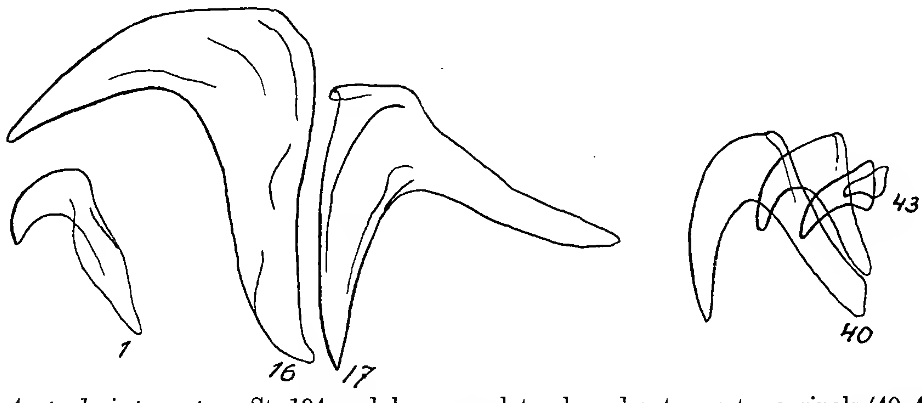

Fig. 32.—*Austrodoris tomentosa*, St. 194, radula: some laterals and outermost marginals (40–43). ×80.

are subequal, and then a slow decrease begins with the 7th tooth from the margin. The radula formulae were as follows: St. 194, 33 × 43.0.43 (fig. 32); St. 295, 20 × 29.0.29; St. 316, 26 × 34.0.34; St. 355, 24 × 28.0.28.

Of the present material the specimen from St. 316 was especially well preserved (and hence photographed, fig. 19). It had the rhinophores well extended; their clubs were beset with about 43 laminae. There are about 13 small (and smallest) papillae in a transverse line between the rhinophores in this specimen.

The anatomy could be fairly well examined. In the alimentary canal the gall-bladder was situated in the left corner of the hepatic mass between liver and stomach wall, where it projected freely from the liver covering. The stomach was on the front side of the liver mass and extended in a transverse direction. The intestine started from its left inferior part and followed its frontal side, then it traversed the back, descended and ran directly at the side of the pericardium to the anus. The walls of the intestine and those of the stomach were simply longitudinally plicate (just as in the other species of this collection), the plicae of the stomach being stronger and denser.

In the nervous system we find the same elements as in *A. macmurdensis*. This also holds for the genital and abdominal ganglia. The eyes are very distinct.

The genitalia, according to a note by Robson, show an uncoiled ampulla and the normal relation of size between the vesiculae seminales, inasmuch as the rounded spermatheca (with thin walls) is the larger and the elongate and thick-walled spermatocyst the smaller of the two.

Austrodoris nivium n. sp. (Pl. II, figs. 21–23.)

Just as in *A. macmurdensis*, the papillation in this new species consists of soft cylindrical papillae at rather distinct intervals occupied by a network of fine lines of spicules radiating from each papilla. There are about 15 papillae in a line between the rhinophores. The single important feature in the external body-form is the number of gills, which amount to 11 and are bipectinate.

The single specimen dredged at St. 314, McMurdo Sound, 5 miles N. of Inaccessible Island, 406–441 m., mud, was somewhat damaged, the mantle being worn away at the margin and on the back. It measures: length 30 mm., breadth 13 mm., height 11 mm.; length of foot 28 mm., breadth of foot 8 mm.; length of postbranchial mantle 3 mm.; distance from front margin to genital aperture 8 mm.

The radula has the formula $22 \times 28.0.28$, thus, on the whole, being of the same type as that of *A. macmurdensis;* its length and breadth is 5×5 mm., and the teeth are dark brown in colour. They have a relatively short and not much curved cusp and narrow, elongate bases, about twice the cusp in length (fig. 33). Teeth 13–15 have the longest cusps.

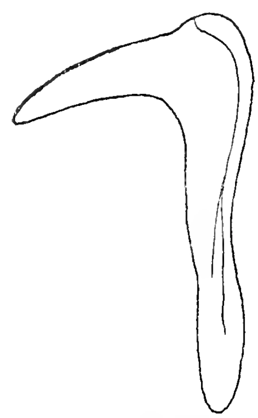

Fig. 33.—*Austrodoris nivium*, lateral tooth No. 16. $\times 125$.

Genital organs (fig. 34). Nearly all the other specimens of the collection having been dissected by Robson, this single example was intact and dissected by me. The genital organs, however, proved to be of the same type in essentials as those of the other species. The gonad occupies a superficial position chiefly on the dorsal and the lateral sides of the liver; it also covers the front side of the liver, and here the ducts from the folliculi unite with the hermaphrodite duct which issues from the left ventral corner of the gonado-hepatic mass. After some short coils, this duct suddenly enlarges to the rather short, sausage-shaped ampulla, which is not so strongly coiled as in *A. macmurdensis* (*cf.* fig. 20). This debouches into the uterine part of the oviduct, and in its immediate vicinity there rises the vas deferens, which, from its very beginning, has a strong muscular sheath round the internal winding canal. Distally this sheath and the canal widen down to the male aperture. No penis proper is formed and no armature

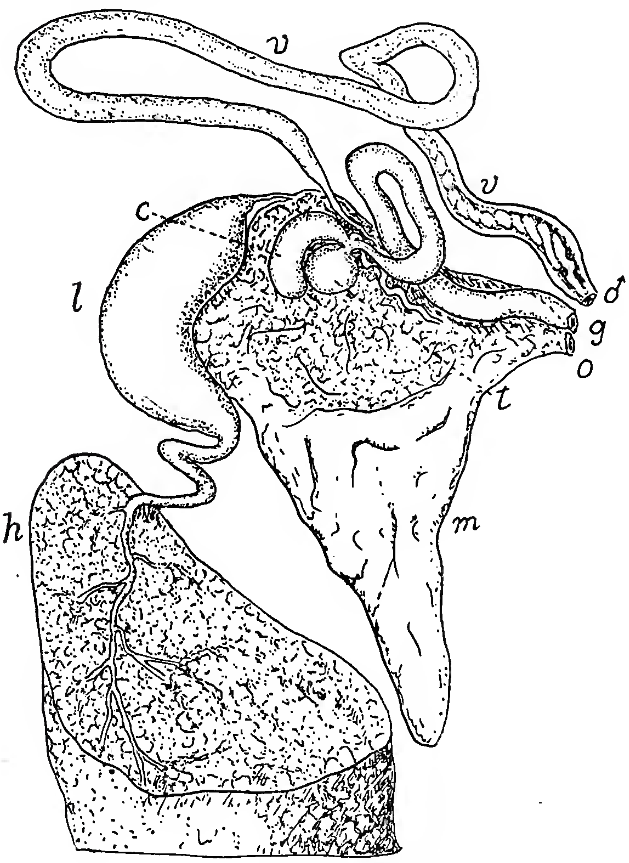

FIG. 34.—*Austrodoris nivium*, genital organs, lettering as in fig. 20.

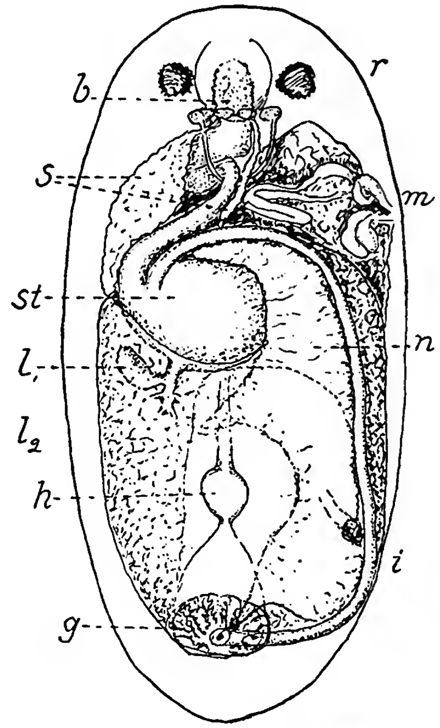

FIG. 35.—*Austrodoris nivium*, situs viscerum, lettering as in fig. 12; l_1 right liver (gall-bladder), l_2 left liver.

is present in the interior of the vas deferens. The distal end of the internal tube, which lies coiled up in the sheath (*cf.* fig. 34), serves as an intromittent organ on being everted.

On the oviduct the albumen and mucus glands are attached as usual; only its distal end narrows somewhat before it opens separately from the vagina. This latter forms a muscular tube about half the male tube in length. At the upper end of the vagina two vesiculae arise side by side; from the same point a thin uterine duct issues to the uterine part of the oviduct. Of these two vesiculae the spermatheca (that with thin walls and a spherical shape) is the smaller and the spermatocyst (with muscular walls and elongate shape) the larger, in contrast to the usual condition in the genus.

This may constitute a specific character. For the rest, the organs are of the same essential type in all species.

The nervous system of *A. nivium* agrees with that described by Bergh in *A. australis* and that figured above for *A. macmurdensis*. The suboesophageal commissure is long, and the genital and abdominal ganglia are placed close to each other at the hinder side of the pallial ganglion. Eyes are distinct and furnished with a lens.

As to the salivary glands, their shape in the genus *Austrodoris* seems to be subject to some variation; in 1926 I pointed out that *Austrodoris* differs from *Archidoris* and *Doris* in the short and broad shape of its salivary glands, which in the two other genera are band-like. The broad shape seemed to be constant in all specimens examined in that respect. Now, however, the present specimen of *A. nivium* proves to be an exception, inasmuch as its left gland is of the broad shape, but the right one completely band-like.

The pericardium (fig. 35) is very asymmetrical, the right half being much more dilated than the left; beneath it lies the nephridium, which extends in front along the intestine to the stomach. The intestine follows the external side of the pericardium and the nephridium and does not, as in *Archidoris*, traverse the back beneath them. The stomach is not covered by the liver. On the side of the posterior liver duct the short gall-bladder (or right liver) opens into the duct: this gall-bladder lies between the liver lobes and the stomach beneath the upper surface of the liver.

Fam. HALGERDIDAE.

Aphelodoris luctuosa Cheeseman, 1882 (=*A. Cheesemani* Eliot, 1907a).

At St. 91 (New Zealand Benthos 2), from Summit, Gt. King, Three Kings Islands, S. 10° W., 25 miles, 549 m., 1 specimen, length 15 mm. contracted, was dredged. Though entirely white and without darker markings, it has been referred by me to *A. luctuosa* on account of its general shape. Like that species the specimen has a quite smooth back wrinkled only by contraction. The rhinophorial openings have slightly prominent, smooth edges; they are rather wide and widely separated from each other, so that their distance apart is about twice their distance from the front margin. The mantle margin is a narrow rim and extends a little beyond the foot end posteriorly. The oral tentacles are furrowed externally and connected to the foot by a cutaneous fold. The gills are 5, tripinnate, and placed in a circlet with the anal tube as the completing piece. The foot is grooved transversely in front, which may not be a constant feature, since, according to Eliot (1907a), the anterior margin is not grooved in specimens examined by him.

There is also a slight difference in the number of the radula teeth from that of Eliot's specimen. The present example has only 20 rows of teeth with 46–50.0.46–50 teeth (in Eliot's specimen the formula was 36 × 50–60.0.50–60). About the inner 20 teeth (fig. 36) are small and crowded with elongated bases and short cusps which increase in size up to about the 30th tooth; the extreme marginal (fig. 36) has a broad elongate cusp and a short base. Unfortunately, Eliot did not figure the teeth; I give some illustrations of those from the present specimen.

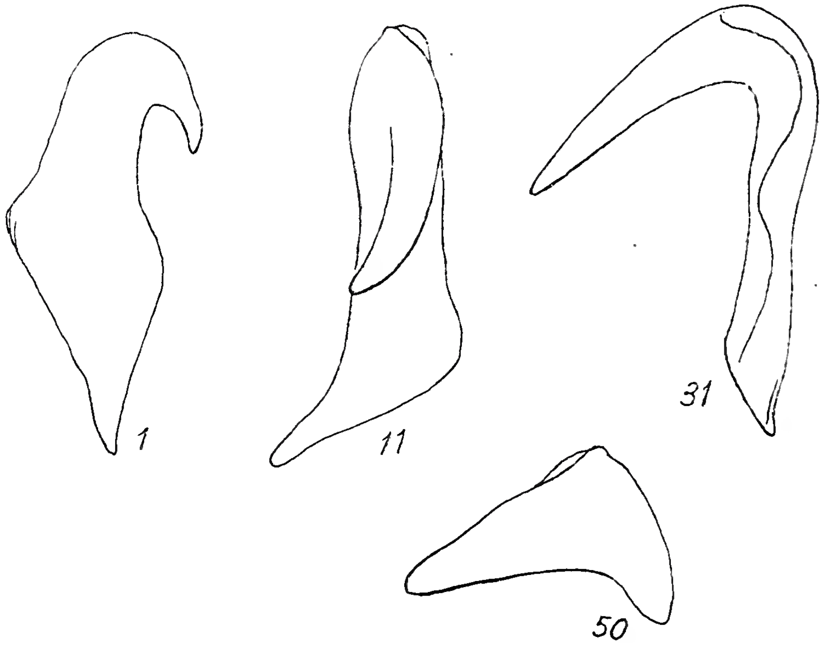

FIG. 36.—*Aphelodoris luctuosa*, radula: lateral teeth, 1, 11, 31, and extreme marginal (50). ×480.

That the present individual is immature is evident also from its genital organs (fig. 37), which were very feebly developed. The vas deferens was, however, strong, its lower part being enclosed in a muscular sheath. A small prostate gland was present, formed by the windings of the vas deferens. The vagina was winding, and the spermatheca, of spherical shape, gave off a short uterine duct separated from the vagina and carrying at its middle point the pear-shaped spermatocyst. It is of interest to remark this *serial* combination within the female ducts, since it shows a rather high stage of evolution compared with that in the Chromodorididae; in *A. varia* Abraham, 1877 (specimen borrowed from the British Museum, collected in Victoria), I found exactly the same serial arrangement.

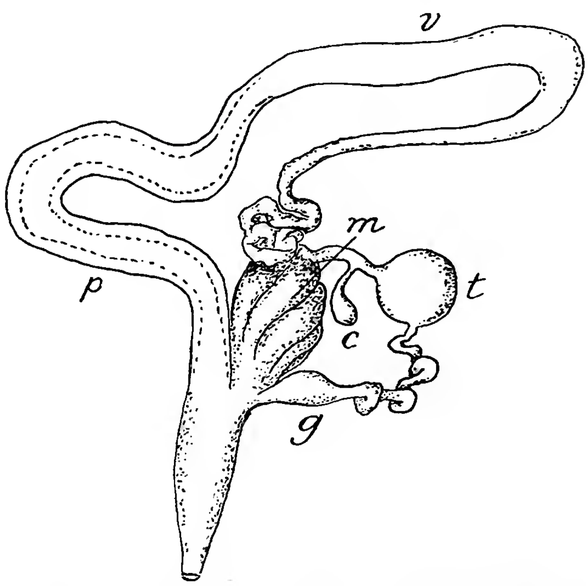

FIG. 37.—*Aphelodoris luctuosa*, genital organs. Lettering as in fig. 15.

According to Eliot (1907 a) the present species, which is not identical with *Aphelodoris luctuosa* Bergh, 1905, has to change its name, and Eliot proposes for it the name *A. cheesemani*, appealing to article 35 in the international rules of nomenclature. It seems to me, however, that it is, on the contrary, Bergh's species that should be renamed, and I have already (1924) done this in proposing for *A. luctuosa* Bergh the name *A. berghi*.

ARMINACEA.

In order to maintain an adequate and consistent system of classification for the Nudibranchs, I have been obliged to create a new major division, the Arminacea. As mentioned in the preface, the Cladophepatic Nudibranchs comprise forms as various as Aeolids and Arminids. Of the Eolids, in general typically cladohepatic, we find as the most primitive the Notaeolidiidae, which still preserve signs of an original stage of development in a liver less differentiated than in the higher forms, and in the radula (*cf.* below). The Arminids, on the other hand, with their highly diffuse liver, show a close relation to forms like *Heterodoris* with an almost holohepatic liver system. Thus this organ, with its gradual stages of differentiation in all branchs of the Nudibranchs, seems less suitable as a differential criterion than the external body-form, which provides a more stable basis for division of the principal groups, as it is without transitional stages such as the liver system shows. Thus we find a velum in the Arminids, which is replaced by oral tentacles in the Eolids. In accepting this character as essential for discriminating between the two groups Arminacea and Eolidacea, their delimitation becomes as exact and natural as possible. Then we find that in the Arminacea, just as in the Eolidacea, we are able to establish a series of forms representing the development from a more or less holohepatic condition to an advanced cladohepatic one. This tendency, in other words, seems to be a general principle of differentiation in different groups of Nudibranchs realizing itself independently in the two sections just mentioned, just as it does, also independently, in the division Dendronotacea.

The presence of a velum as the chief character of the division Arminacea does not exclude tentacles; such exist in *Goniaeolis* and in Antiopellidae (=Janolidae, Zephyrinidae), where the velum is reduced, compared with that in other genera in the group. The latter family, in some other respects, recalls the Eolidacea, but a comparative study shows that it is more nearly related to the families Madrellidae and Dironidae (with a well-developed velum), a relation dependent above all on the enormous jaws which are common to all three families and confined to this group alone among all the Nudibranchs.

We have reason to consider as the most primitive genera among the Arminacea those with a multiseriate radula and perfoliate retractile rhinophores, characters common to the Doridacea as well as to the Dendronotacea. In this section of Arminacea I place the families Heterodorididae, Doridoididae and Arminidae: to the latter I also refer, with Eliot, *Dermatobranchus* (=*Pleuroleura*). In the second section the rhinophores are stiff and the radula reduced, characters recalling those of Eolidacea. In this section three families (Goniaeolididae, Charcotiidae and Heroidae) are to be united.

One of the families constituting the latter section is represented in, or rather characteristic of, the Antarctic Region, viz. Charcotiidae; this family is peculiar in its anatomy, in that the liver sends subcutaneous diverticula towards the surface of the body and into the short dorsal papillae where such are present. This family, which apparently has as its nearest relative the N. Atlantic Goniaeolididae, has differentiated into three genera: *Charcotia* Vayssière, 1906, with a densely papillated dorsal surface and a radula of the formula 1.1.1 (median tooth with 2 side denticles, lam. lat. denticulated in both margins), *Pseudotritonia* Thiele, 1912, with smooth back and radula 2.1.2 (median tooth with a few side denticles, first lam. lat. denticulated in its inner margin, second lateral smooth), and the following new genus, *Telarma*, with smooth back and the large median tooth and the two reduced laterals smooth.

Further characters of *Telarma*, as will be found from the description below, are a ramified liver system giving off a few lateral branches which spread into the dorsal rim from a liver with its major part on the left and a small part on the right, all the ducts of which are lined with compact liver tissue; hermaphrodite gland small and dorsal to the posterior liver duct. It may be added that the liver in this genus represents an intermediate stage between Arminidae, where a very intensive ramification is manifested, and *Goniaeolis*, where the liver is divided into three main portions only (posterior and left masses, which debouch by means of a common duct, and the right liver), a condition very little advanced from the holohepatic type. Vayssière gives some information about the structure of the liver system in *Charcotia* from which it appears that it most nearly resembles the liver of *Goniaeolis* except for its subcutaneous ramification.

Fam. CHARCOTIIDAE.

Telarma antarctica n. gen. n. sp. (Pl. II, figs. 25, 26.)

One specimen of this new genus and species was found at St. 348 (Antarctic Benthos 10), 13.2.1912, 366 m., off Barne Glacier, McMurdo Sound. Dimensions: length 55 mm., breadth about 25 mm., height 15 mm.

Diagnosis of the species.—Body elongated, tapering gradually backwards, quadrangular in section, with flattened back attenuated into expanded margins, everywhere with smooth surface except for extremely minute, irregularly scattered warts. Anterior corners of the back well rounded. Head with a large and wide velum (its reflection backwards in the present individual is certainly due to the strong protraction of the pharynx). Lateral corners of velum well rounded, lobes freely projecting.

Rhinophores stout and clumsy, pillar-like, compressed, wrinkled transversely but not perfoliate, rather apart, placed somewhat behind the foremost ends of the dorsal margins.

Body sides high; the anus is in the middle of the body, half-way up on the right side; the genital aperture is a little behind the external lobe of the velum, beneath the rhinophores. The dorsal margins are expanded and thin out to a smooth, undulating edge without any trace of glandular or cnidosac pores. Here and there on the sides of the body, however, small pores appear on minute warts often set in series along short canals, which communicate with the internal liver ramifications.

Foot elongate, with expanded margins bluntly acuminate at the end where they project a little above the acute dorsal end. Anterior corners rounded. No distinct transverse furrow in front.

Nephroproct at about $\frac{1}{3}$ of the distance from anus to genital aperture and in the same line as these openings.

Colour a light yellow (shading into green, which, however, is certainly due to secondary verdigris from metal in the bottle).

Further description.—The mouth is surrounded by a circular lip disc (fig. 38, *a*) with radiating folds and covered with a thick, greenish, smooth hyaline cuticle (fig. 38, *b*) composed of prismatic, ill-defined elements, the ends of which are plain and do not project as papillae. In the upper inner margin of the labial disc the processus masticatorii project; they are composed of separate prismatic elements and so, when seen from their surface, appear to be finely grained. Their margins are smooth except for the papilliform ends of these elements.

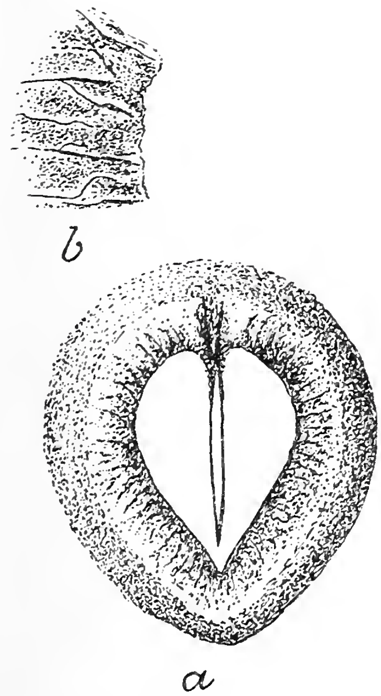

Fig. 38.—*Telarma antarctica*, lip disc (*a*) and lip cuticle (*b*).

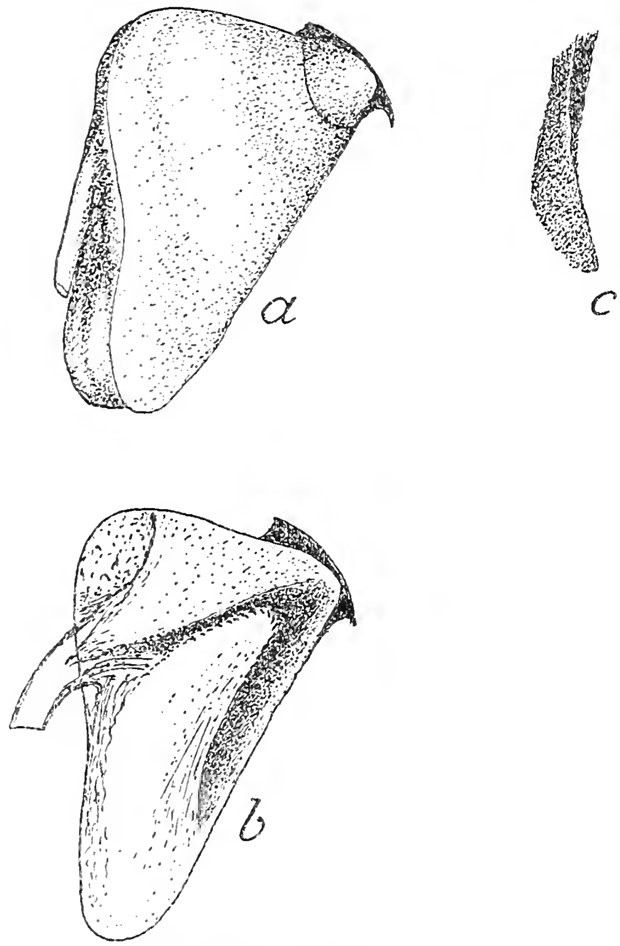

Fig. 39.—*Telarma antarctica*, pharynx with jaws, *a* from the right side, *b* in sagittal section, $\times$ 4·5; *c* masticatory process, $\times$25.

The jaws (fig. 39) are of an elongate triangular shape, the base of the triangle representing the straight connective upper margins; the jaws thus extend ventrally and their height is $1\frac{1}{2}$ times their length. Their colour is a dark greenish-brown, paler towards the thinner lower and posterior margins. Their height is 12 mm., their length 8 mm.; the thickness of the pharynx together with the jaws is 5 mm. About the foremost third of their upper margin is thickened into a connective cartilage of dark brown colour, the outline of which slopes gently forwards into the margin of the processus masticatorius (fig. 39, *c*).

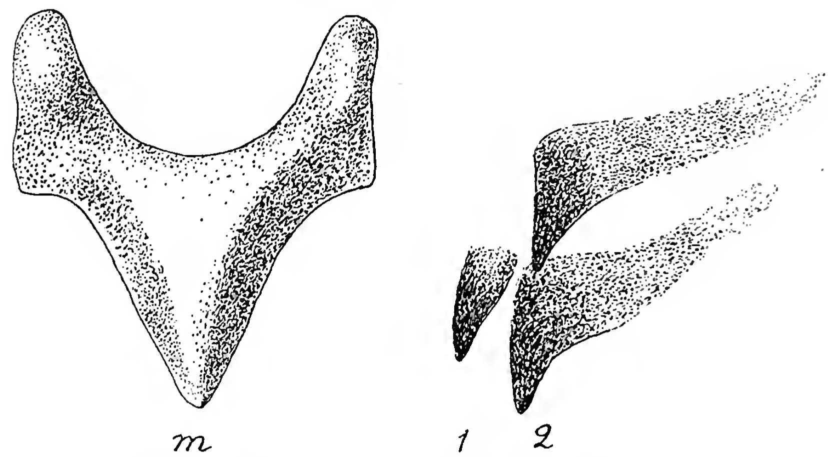

Fig. 40.—*Telarma antarctica*, radula: median tooth (*m*) and two laterals. ×80.

Within the jaws the tongue projects from below as a muscular prominence towards the upper anterior corner of the jaws (fig. 39, *b*). The number of the radula teeth was not ascertained. According to a sketch by Robson, there were 28 teeth in front of the radula sheath, but only 17 rows of teeth still remained. Each series consists of one enormous median tooth (fig. 40, *m*) with a projecting spine and diverging basal legs, and 2 almost obliterated, smooth and conical, lateral teeth on each side (fig. 40). One median tooth measures 0·6 mm. in height and 0·5 mm. in breadth.

The median teeth follow closely after one another in an articulated saw-shaped series (fig. 41). Between the basal legs is a broad, semicircular sinus occupied by the preceding tooth. The ends of the legs are broadly rounded and form a sort of articulatory joint. The chief cusp is about as long as the breadth of the tooth, triangular and thick, bluntly rounded to a cutting edge above and to a blunt tip behind. Its sides are quite smooth, without denticles, only showing a faint and dense superficial striation near the base.

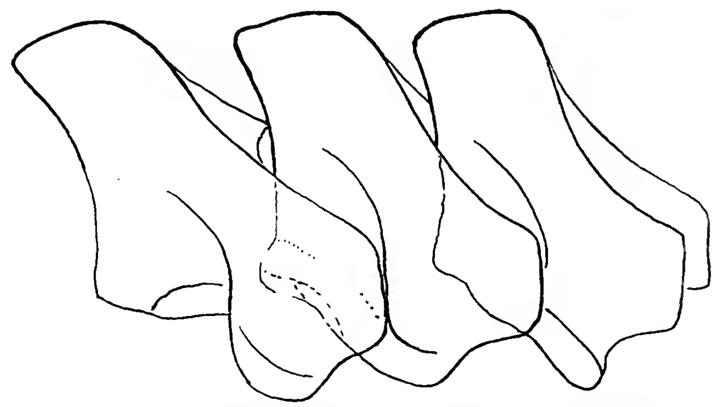

Fig. 41.—*Telarma antarctica*, three median teeth in a series, from the side. ×80.

The first lateral tooth is a short cone, only about $\frac{1}{4}$ of the median tooth in length. It is obliterated in most of the series. The second lateral has its external side extended as a thin lamella narrowing towards the exterior. The basal plates of the lateral teeth in two adjacent rows are not in contact.

A thin, short oesophagus issues from the posterior side of the pharynx at about $\frac{1}{3}$ of its height. It widens into the stomach lying in a third of the body-length to the left of the median line. The stomach forms a simple, sac-like dilatation of the alimentary canal with the walls plicated chiefly in a longitudinal direction. The contents of the stomach were indeterminable animal substance, detritus and planctonic organisms.

The right liver duct (fig. 42, *r*) debouches on the right side of the stomach, and the opposite left duct (*l*) on the left side, ventrally. The two parts of the liver from which these ducts arise are remarkably asymmetrical, the right one being larger than the left and expanded across the middle of the back towards the left part of the liver, with which it is in close contact, without, however, fusing with it at any point. This asymmetry of the front parts of the liver recalls the condition in *Heterodoris robusta* Verrill and Emerton, described by me in 1926 b, from the Trondhjem Fjord of Norway; and the condition in *Telarma* forms a stage in the transition from that in this genus to the symmetrical organization of the same liver parts in Arminidae and Aeolidiidae. It may be remarked that this asymmetry is probably to be interpreted as a vestige of the main torsion which, in the Nudibranchs, has been obliterated by the characteristic detorsion process.

From the left side of the posterior wall of the stomach a second liver duct issues to the left side where a second part of the liver is lodged behind the front one from which it is wholly separated. The ducts of the above-mentioned hepatic parts ramify into smaller branches distally in a somewhat irregular manner.

The remaining or posterior main portion of the liver forms a large, distinct, cylindrical, gradually attenuating, superficially lobate body of liver mass (*p*) extending along the middle of the body and surrounding a wide space, the gastric duct. From each side of this posterior hepatic part small side branches issue, the foremost of them on the upper side of the anus; and further behind, on the right side, there are two small ducts; alternating with these, two ducts issue from the left side, and a single terminal duct opens near the posterior end of this part of the liver. All the distal groups of hepatic branches are distinctly separated from each other.

This ramification of the liver evidently places the animal among the cladohepatic nudibranchs, for the main part of the liver, like that of the Dendronotacea, is still retained, but in this same respect it differs from the bulk of the Aeolids. The finest ends of the liver branches, however, show a peculiarity recalling the last-named group of nudibranchs. In several places on the body very small warts appear, as already mentioned, which are often situated in series along a subepithelial canal; this latter is actually the terminal end of a branching liver duct. Thus there is, in *Telarma*, a rudiment of papillation of the same kind as in the Eolids. This rudimentary papillation is not only dorsal but occurs even on the under side of the mantle rim and on the sides of the body, a condition which evidently implies the possibility of further development into papillate forms such as the Eolids, or into *Armina*-like forms, with prominences on the under side of the mantle rim.

From the upper side of the stomach a wide intestine bends towards the right and ventrally. It runs below the heart and opens, after a short course, into the anus (fig. 42, *a*).

Heart and nephridium.—The heart lies somewhat to the right of the median line, at the side of the stomach, in a spacious pericardium which penetrates deeper on the right side, so that the heart lies obliquely to the horizontal plane. The ventricle (fig. 42, *v*) is an ovoid body in the middle of the pericardium. Its posterior end projects somewhat on the right side of the auricle, with which it communicates on the left side of the ventricle. The auricle extends along the left side of the pericardium and has the shape of a cone narrowing backwards, where it penetrates the pericardium.

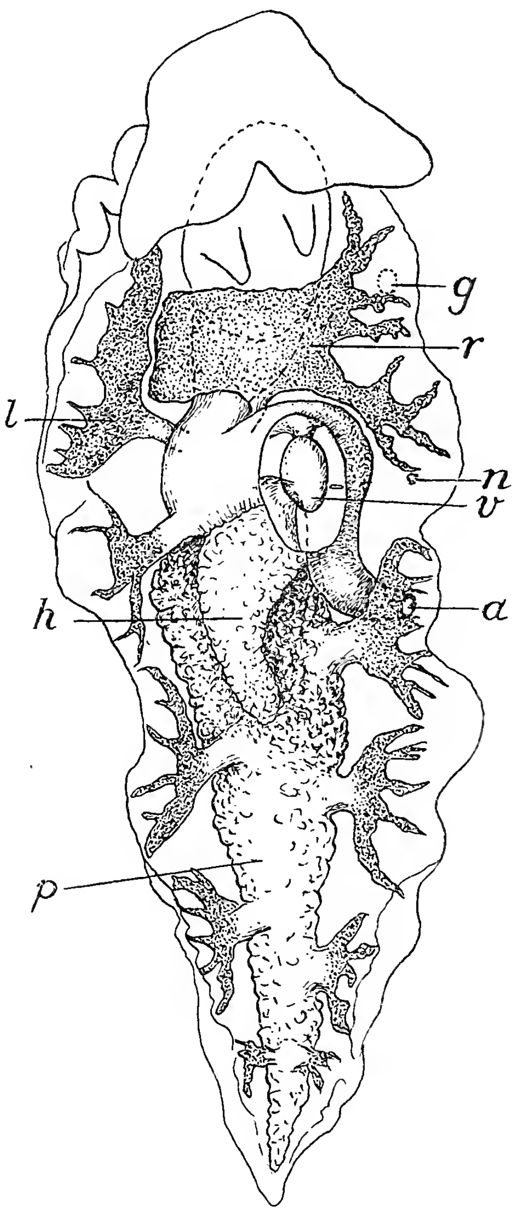

Fig. 42.—*Telarma antarctica*, situs viscerum, *a* anus, *g* genital opening, *h* hermaphrodite gland, *l* left anterior liver, *n* nephroproct, *p* posterior liver mass, *r* right liver, *v* ventricle.

At the front end of the ventricle a wide sinus is seen, which divides into right and left aortic trunks, the former plunging down beneath the intestine as aorta anterior, the latter following, as aorta posterior, the stomach and the gastric duct.

At the right side of the ventricle the nephrostome appears as a fissure in the deepest margin of the pericardium. It leads into the syrinx, which is, however, not sharply marked off externally from the surrounding nephridial mass, but is recognizable by its folded interior. Robson justly remarks of the reno-pericardial canal: "Its walls are slightly plicate, but it cannot be said to constitute the strongly lamellate piriform organ found in the Tritoniomorpha and Eolidomorpha." The nephridial chamber covers the dorsal side of the posterior liver duct throughout the body in the form of a spongy mass of small and short lobuli and ramifying canals. In fig. 42 the nephridium is entirely omitted, only the nephrostome being seen to the right of the ventricle.

Genital organs.—The gonad is separate from the liver and occupies a position on its dorsal side just behind the stomach and at the side of the heart. It is a mass of large, crowded lobes with an even surface, each in its turn consisting of smaller lobuli, the follicles.

As to the distal genital organs, these were evidently not fully developed. Robson, however, made out their chief disposition, and I quote his notes and reproduce his drawing (fig. 43): "The vagina is fairly long and expands distally. The vas deferens is very long and intricately coiled; the penis is short and bulbous. The mucus gland is swollen and with the albumen gland forms a compact mass lying up against the body side. On top of the mucus gland lies the spermatheca, of a roughly triangular form, communicating with the other organs by a very short duct, which is quite invisible from above."

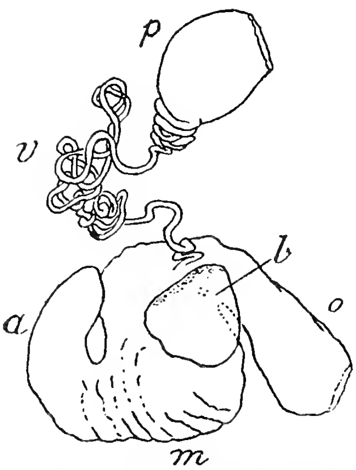

Fig. 43.—*Telarma antarctica*, genital organs (drawn by Robson), *a* albumen gland, *b* bursa copulatrix, *m* mucus gland, *o* oviduct, *p* penis, *v* vas deferens.

Of the nervous system in general, the rather long pedal commissure is a striking feature, as well as the fusion of the cerebral and pleural ganglia to form an undivided ganglionic mass. The optic nerve is rather long, and the eye, submerged under the thick cutis behind the rhinophore, is very small, but shows nevertheless the essential parts: a pigmented cup containing a protruding lens. The statocysts are very small and apparently contain a multitude of statoliths. The buccal ganglia are lodged just beneath the exit of the oesophagus from the pharynx and are closely connected. The distribution of the nerves is shown in fig. 44.

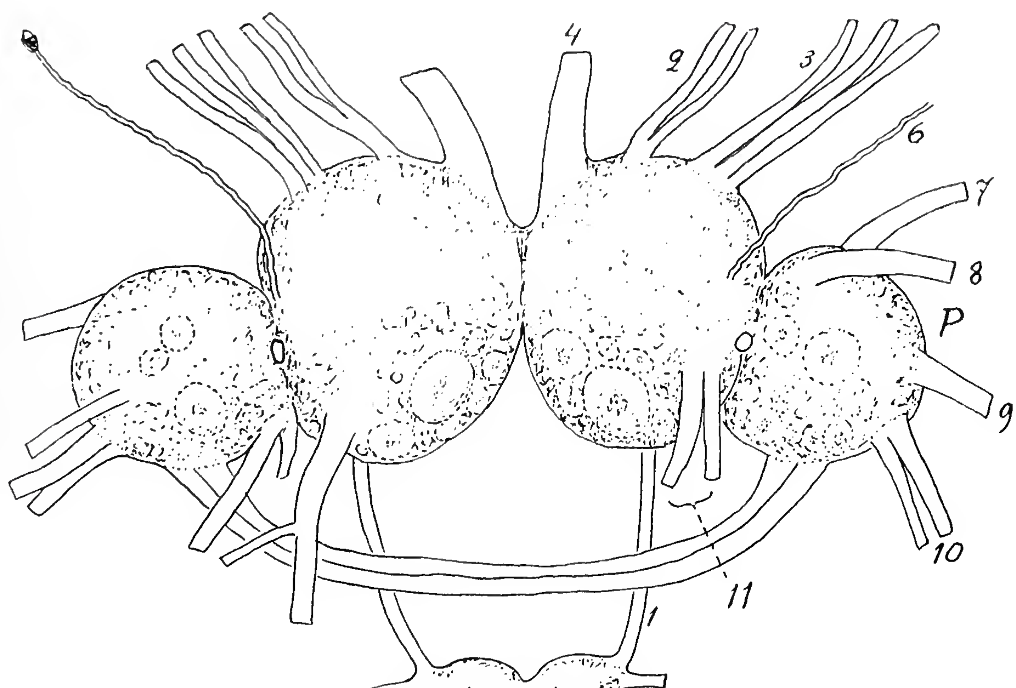

Fig. 44.—*Telarma antarctica*, nervous system, lettering as in fig. 6.

EOLIDACEA.

This division of the Nudibranchiata, characterized by oral tentacles replacing the velum of Arminacea (except in *Embletonia*, where the velum persists, perhaps as a case of neoteny) and by almost sessile eyes, needs a complete systematic revision. To begin with, they may be divided into two sections as to the radula characters. One comprises the single family Notaeolidiidae which still preserves primitive characters in its multiserial radula (at least 2 lateral teeth are present on each side in each row). In all other members of this division the radula is reduced to a triserial or uniserial type, but these may appear independently in separate groups and are, consequently, no indication of natural relationships and no sound basis for major subdivisions. Instead, the position of the anus has proved a better differential criterion. Thus we have to consider the Coryphellidae as the most primitive of the higher Eolidacea, because in this family the position of the anus is still lateral; to this must be added the fact that the liver system is much like that of the Notaeolidiidae. In all other forms the anal position has been secondarily altered. In Eubranchidae and Cuthonidae it has moved up to the dorsal side and is placed between the first and second groups of papillae, just at the side of the pericardium where it is without any connection with the hepatic branches. This I have named (1926a) the acleioproct condition. All other genera of Eolidacea have, as opposed to the just-named families, a so-called cleioproct organization: that is, the rectum is crossed by a branch of the liver system, and the anus is situated among the liver branches and papillae of the group following next behind the pericardium or the interhepatic space. In the Facelinidae we find the anus among the papillae of the second group (next the interhepatic space), in Glaucidae it is situated between groups 2 and 3, and in Aeolidiidae it is still farther back, among the more posterior rows. To these characters may be added also the shape of the radula teeth. Thus we can use the position of the anus in its relation to the branching of the liver system, which is variously modified in the Eolidacea, as a suitable basis of classification, because it indicates the direction and degree of modification and is a sign of the true relationships of the present division of Nudibranchs.

In the Antarctic Region the Eolidacea are represented by three families: Notaeolidiidae, with the single genus *Notaeolidia*, characteristic of and exclusively inhabiting the Antarctic Region; Eubranchidae and Cuthonidae of cosmopolitan distribution. Two of these families are dealt with in the following pages.

Fam. NOTAEOLIDIIDAE.

Notaeolidia robsoni n. sp. (Pl. III, figs. 27, 28.)

Of this exclusively Antarctic genus, one small specimen was obtained at St. 331 (Antarctic Benthos 6), off Cape Bird Peninsula, entrance to McMurdo Sound, 457 m., mud. It measured only 17 mm. in length and showed a flat, not undulating, dorsal margin, with large, flattened liver branches shining through the thin dorsal edges, which bore a single series of variable, large papillae. The present specimen is thus nearest to *N. depressa* Eliot. But even in external body-form it differs from this species in having long tentacles, whereas these are very short and broad in *N. depressa* (their basal breadth nearly equalling their length in the latter species). For this reason as well as on account of differences in the radula, the present specimen, though originating from the same district as *N. depressa*, is to be described as a distinct and new species which I have much pleasure in dedicating to Robson, who himself recognized its distinctness.

Diagnosis.—Body much compressed with thin, expanded, sharp and even (not undulating) dorsal margins carrying numerous papillae of unequal size in a single series. Head small with thick, elongated, smooth oral tentacles (their length about twice the

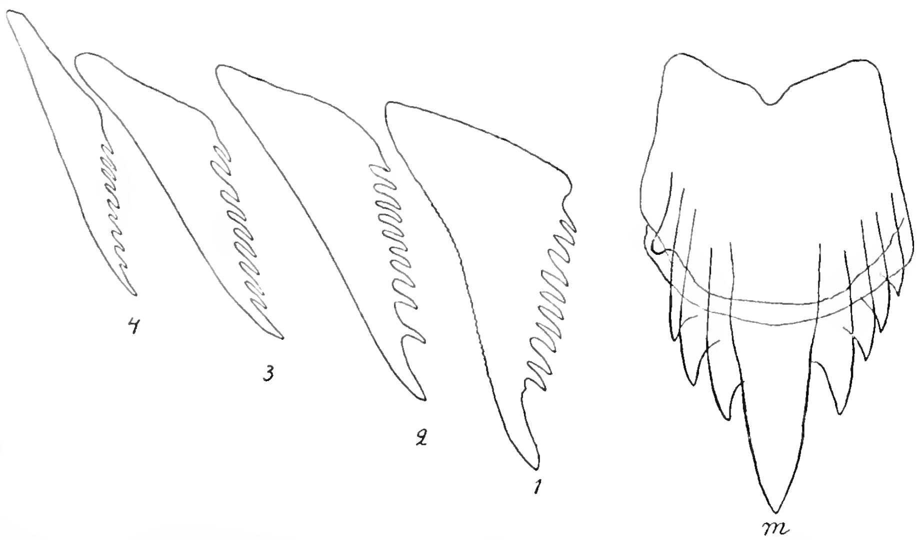

FIG. 45.—*Notaeolidia robsoni*, radula: median tooth (*m*) and 4 lateral teeth. ×320.

breadth of the head). Rhinophores very short, wrinkled by about 12 annuliform rugae and placed rather close to each other. Foot very narrow, rounded in front where it has a trace of a transverse furrow; its lateral edges somewhat prominent, its end tapering, tongue-shaped, not freely projecting but connected to the gradually diminishing dorsal margins up to its tip. Anus in the middle of the body, half-way up on the right side; somewhat in front of it (at about $\frac{1}{3}$ of the distance to the front) the genital aperture; just above, and in front of the latter, the small nephroproct. Colour pale yellowish-white, the brownish liver diverticula shining through the thin dorsal expansions. Dimensions: length 17 mm., breadth 6·5 mm., height 6 mm.; length of tentacles 5 mm., length of rhinophores 2 mm.

Radula (fig. 45) with 17 rows of teeth each having the formula 4.1.4. Median tooth solid, yellowish-brown, elongate, squarish, with a strong, prominent cusp and 4 large denticles (or, exceptionally, 5 or 6) on each side of it, the largest admedian; front end with a narrow emargination. First lateral narrowly triangular in shape, very thin, pale yellow, with an elongate cusp and 10 strong, narrow denticles in its inner margin; outer margin with an extremely fine, scarcely perceptible serration. The remaining laterals of the same appearance but narrower, with their inner margins denticulated, their external margins smooth.

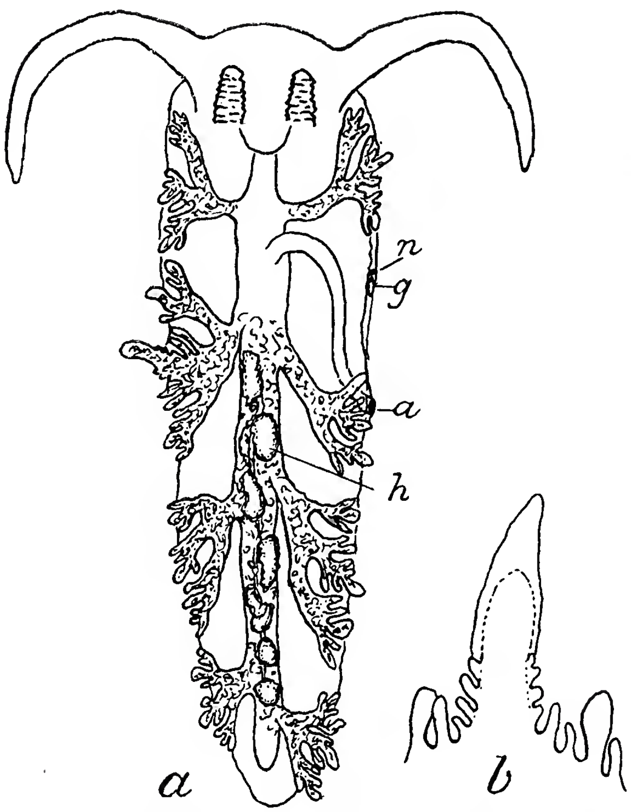

Fig. 46.—*Notaeolidia robsoni*, *a* disposition of alimentary canal: *a* anus, *g* genital pore, *h* hermaphrodite glands, *n* nephroproct, *b* papillae of dorsal margin seen from below.

Further description.—Among the external characters peculiar to this genus we draw attention to the position of the renal pore (fig. 46, *a*, *n*). Whereas this opening is situated in all remaining Nudibranchs either in the vicinity of the anus or farther in front of it between anus and genital aperture, its position in the genus *Notaeolidia* is quite different, for it lies in front of and closely above the genital opening. This situation in *Notaeolidia* may be due, partly at least, to the advanced situation of the pericardium, which lies about in the same transverse plane as the genital opening, and rather far in front of the anus. The remarkable position of the nephroproct is a generic character in *Notaeolidia;* I have found it also in the type of *N. rufipicta* Thiele and in a species akin to *N. gigas*. Nothing is said about this character in previously described species. Otherwise, this position very close to the genital aperture, is only found in some species of *Antiopella*, e.g. *cristata*, for here the renal pore lies above the genital opening, but behind it.

Along the dorsal margin the cerata are arranged apparently without order, but on examining them more closely we find that the largest cerata are often flanked with smaller ones placed symmetrically on both sides (fig. 46, *b*). In one of the largest cerata the dorsal margin ran up as a narrow keel for half the distance towards the tip, and some small papillae were inserted on it above the base of the large papilla.

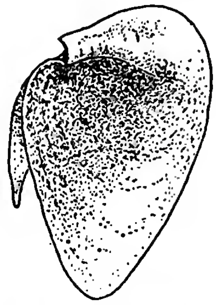

Fig. 47.—*Notaeolidia robsoni*, right jaw. ×20.

The jaws (fig. 47) are thin and membraneous, especially in their inferior corner, rounded triangular, somewhat cordiform, of a pale greenish-brown.

They have a well-marked furrow on their upper external surface, and their upper margin is expanded, both of these being structures for fixing the ligamental muscle. Interiorly, the furrow is marked by a ridge which becomes sharply angular in front and ends in a point. The masticatory process is smooth and has about half the length of the anterior margin of the jaw. The length of the jaws is about 2 mm.

The specimen was dissected by Robson, who made observations chiefly on the alimentary organs. The stomach (still in its place at my examination) is furrowed internally, the plicae having a smooth cuticle, not developed into plates; some of the ridges run right down into the intestine. As usual, the intestine leaves the stomach at the dorso-lateral right-hand corner.

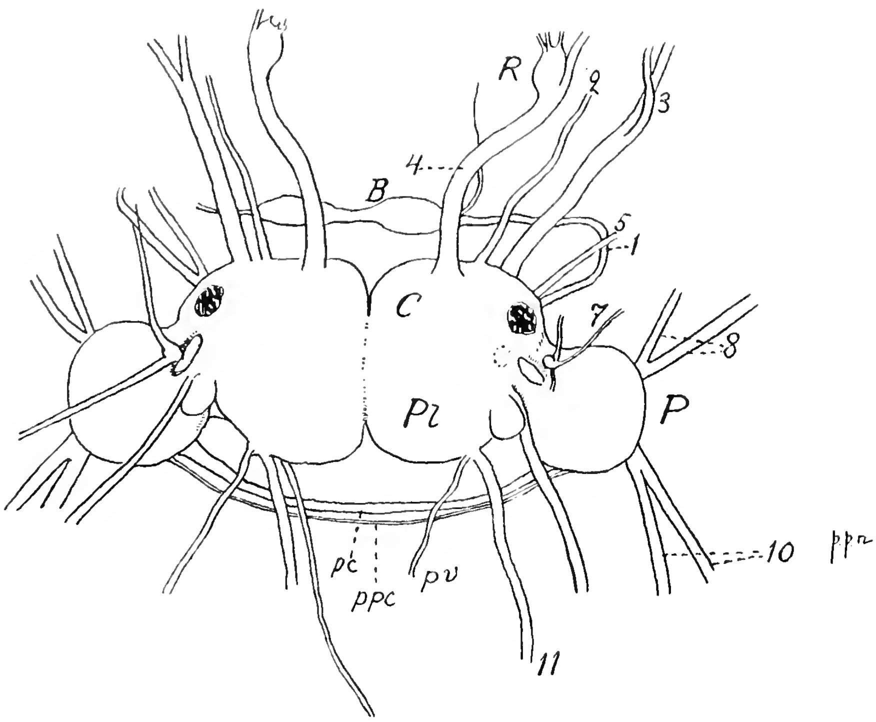

FIG. 48.—*Notaeolidia robsoni*, nervous system (drawn by Robson), lettering as in fig. 6.

In the disposition of the hepatic ducts (fig. 46) and diverticula there is a close agreement with *N. depressa* which I examined in London. From the stomach are given off one right and one left liver duct to the front of the dorsal margin. From the posterior wall of the stomach the main liver canal extends backwards; from its left and right sides, alternating ducts issue to the back of the dorsal margin: 3 ducts on the left and 4 on the right. The hindmost end of the hepatic duct is a small caecum. All lateral ducts as well as the median one are largely lobulated and lined with hepatic tissue. Distally in the dorsal margins the liver ducts acquire a flattened appearance, and from these flattened stems branches extend towards and into the cerata. Each branch has a large median tip and smaller side furcations, the median one always entering into the biggest papilla of each group. In the papilla the liver diverticle extends up to the tip, where a small opening is present, and below it there is a minute sac of whitish colour containing cnidocysts of the two sorts described by Eliot and Vayssière.

Dorsal to the main liver duct we find the lobules of the hermaphrodite gland (fig. 46, *h*) on both sides along their efferent duct. These lobules extend backwards to the hindmost side branch of the liver duct. The distal genital organs were not examined.

The nervous system (fig. 48) agrees in main with that of *Notaeolidia gigas* described by Vayssière (1906, pl. II, fig. 10), but shows perhaps a more intimate fusion of cerebral and pleural ganglia. The buccal ganglia are attenuated and the cerebro-buccal connectives are comparatively short in both species. The posterior pallial nerve seems to be double in both species (fig. 48, 11 and adjacent unmarked nerve corresponding to nerves 7 and 8 in Vayssière's figure).

Fam. EUBRANCHIDAE.

Eubranchus Forbes, 1838.

Fam. Eubranchidae consists of acleioproct eolids with a triserial radula. The following genera belong here: *Eubranchus* (=*Galvina* A. & H.), *Galvinella* Eliot, *Egalvina* Odhner, *Cumanotus* Odhner, and *Capellinia* Trinchese.

The type of *Eubranchus* is *Eolis tricolor* Forbes (=*farrani* A. & H.). The chief characteristics of the genus are, except for the shape of the radula (1.1.1, with lateral teeth broad and smooth-edged), the *simple* branches of the liver ducts and the simple rows of papillae (just as in *Cuthona*). This is opposite to the condition in *Egalvina* Odhner, 1929, which has the liver ducts dichotomously branching distally into smaller rami; these enter the papillae which, as a consequence, increase in number as the rami approach the sides of the back. Further, the jaws have, in *Eubranchus*, only one row of denticles (in *Egalvina* there are several rows; *cf.* Odhner, 1929).

A large number of species of *Eubranchus* have been described, which may be roughly arranged according to the place of the anus among the rows of papillae or the number of rami of the right and left parts of the liver. The small species have a lesser number of rami (in *E. exiguus* and *cingulatus* only 2, in *pictus* and *rupium* 3, in *tricolor* and *fuegiensis* 4 or 5, in *flavus* 6).

In *Eubranchus exiguus* and *rupium* a bifurcation is to be observed in the first post-anal right liver duct, but in the typical species, *E. tricolor*, this duct is, as in the rest, quite simple and recalls the liver system of *Cuthona aurantiaca* (*cf.* Odhner, 1929, p. 19, fig. 15).

The radula provides, in this genus and in its nearest ally, *Galvinella* (which differs from *Eubranchus* in having the anterior corners of the foot produced and the anus medio-dorsal), good distinguishing characters; the antarctic species especially (*E. fuegiensis* Odhner, 1926a, *Galvinella antarctica* Eliot, 1907b, and *G. glacialis* Thiele, 1912) are distinctive in having their lateral teeth much broader than (up to twice as broad as) the median tooth.

From all these previously known species the present form is obviously well separated, since its lateral teeth are of the same breadth as the median tooth, thus recalling more the boreal species. *E. falklandicus* Elliot, 1907a, on the contrary, has lateral teeth which are much less broad than the median tooth.

Eubranchus adarensis n. sp. (Pl. III, fig. 29.)

Only one specimen was found at St. 5, off Cape Adare, mouth of Robertson Bay, 82–92 m., shingle. It is somewhat damaged and measures (stretched out) 11 mm. in length, 2·5 mm. in breadth, and 2·5 mm. in height; longest papilla about 3 mm. The colour is a uniform pale rusty-brown, and the integument is quite transparent, letting the viscera shine through (*cf.* fig. 49).

Body limaciform, narrowing posteriorly into a rather long tail; foot margins slightly projecting at the sides, posterior end narrowly rounded, anterior foot corners rounded. Head small, without lateral dilatation. Tentacles simple, of about the same length as the smooth rhinophores, which, however, are stouter and transversely wrinkled through contraction. Papillae subcylindrical or claviform, often with a basal oviform swelling and a spherical apex (through various degrees of contraction). The liver diverticulum entirely fills up the interior of the papilla and lines even its tip; no special cnidosacs are present here. Papillae arranged in regular rows (fig. 50): 5 in front of the anus (and at the left side), 5–6 on each side of the posterior median liver duct behind the anus;

Fig. 49.—*Eubranchus adarensis*, habitus of animal (chiefly drawn by Robson). ×10.

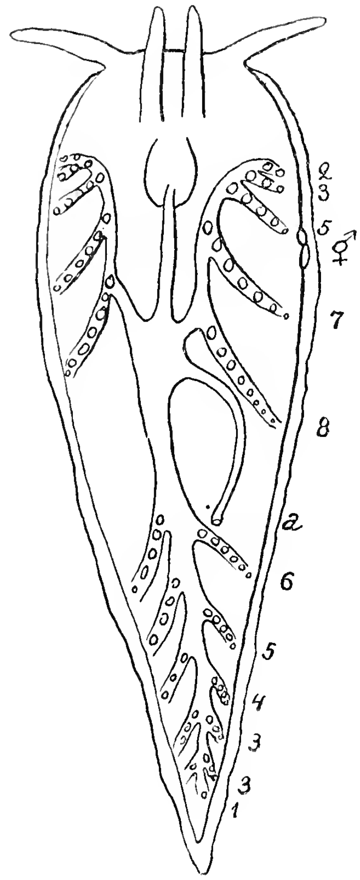

Fig. 50.—*Eubranchus adarensis*, disposition of alimentary canal and papillae: *a* anus.

right and left rows issuing in alternating order from the median duct (hindmost papilla rows, however, indistinct). Number of papillae: 2, 3, 5, 7, 8; 6, 5, 4, 3, 3, 1 in the respective rows on the right side, and about the same number on the left side. Anus behind the middle length of the body, just in front of the innermost papilla of the 6th row. Nephroproct close inside and in front of the anus. Genital opening below the end of the 3rd papilla row. The liver system and the arrangement of the papillae are shown

FIG. 51.—*Eubranchus adarensis*, masticatory process of jaws. ×480.

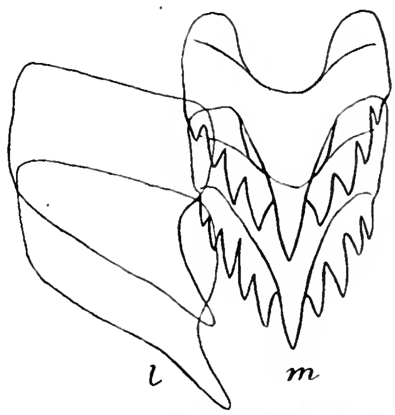

FIG. 52.—*Eubranchus adarensis*, radula: *m* median tooth, *l* lateral tooth. ×320.

in fig. 50, which also gives the position of the heart and the course of the short intestine as it curves at the right side of the body.

In the jaws, the processus masticatorius (fig. 51) shows a single series of 12 strong denticulations. The radula contains 60–62 teeth. The median tooth (fig. 52, *m*) is somewhat longer than broad and bears 4 or 5 denticles on each side of the cusp, which is only a little stronger than the nearest denticles. These are inserted at a somewhat higher level than the cusp. The lateral teeth (fig. 52, *l*) are lamelliform and have a squarish basal plate and a rather broad triangular cusp, acutely produced towards the median line. The length of the lateral tooth a little exceeds its breadth.

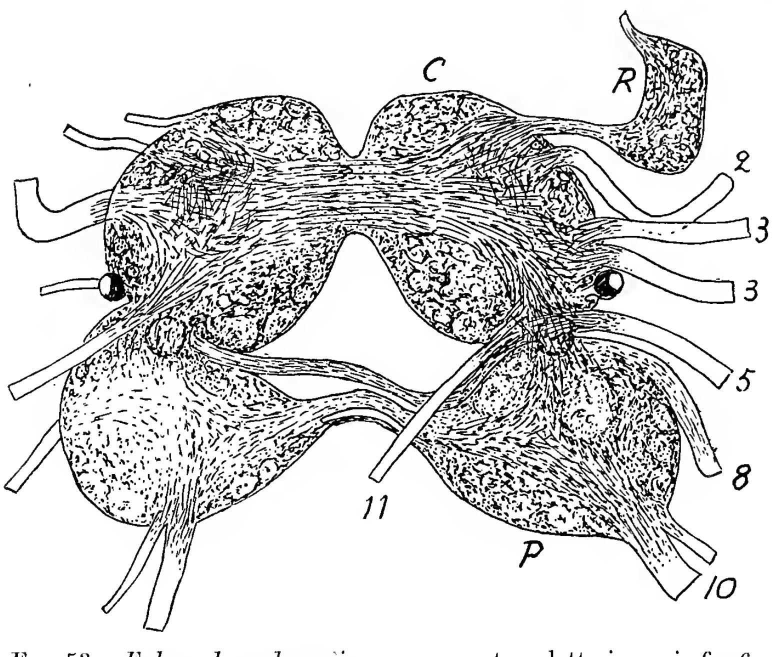

FIG. 53.—*Eubranchus adarensis*, nervous system, lettering as in fig. 6.

At the sides of the pharynx a pair of ptyaline glands are present which debouch by a median duct below the mouth.

The nervous system (fig. 53) agrees with that of other eolids, e.g. *Aeolidiella glauca* A. & H. as figured by Trinchese (1881, pl. VII, fig. 1). The pedal commissure is shorter than in *Notaeolidia* and the cerebro-pleural ganglia more fused.

The position of the anus far behind, the arrangement of the papillae, and the shape of the radula teeth are characters which mark the present form as a distinct and valid species.

DENDRONOTACEA.

This division, the characters of which are given in the introduction, has the same scope as Pelseneer's Tritonioidea, thus comprising both the Duvauceliidae and the Dendronotoidea of Eliot. My studies of forms belonging to this group has convinced me of the inadequacy of keeping the Duvauceliidae as holohepatic apart from the Dendronotoidea as cladohepatic; in reality both types of liver prevail even in one and the same family in that latter group, viz. Scyllaeidae. As this suborder contains a lot of families grouping round Dendronotidae, I think it most convenient to name it after the latter family instead of after the Duvauceliidae, which are less typical. In Antarctic waters two families of the Dendronotacea are endemic, viz. Duvauceliidae and Dotonidae; and also species of Scyllaeidae have been found within this region. These all have a cosmopolitan distribution and occur also in the Northern hemisphere and the tropics.

Fam. DUVAUCELIIDAE.

As I showed in 1926a, this family is represented in Antarctic waters by several species which belong to the genera *Duvaucelia*, *Tritoniella*, and *Tritoniopsis*.* In the present collections there are present only two species of *Tritoniella* and one of *Marionia*, both genera being represented by species already described, the *Marionia* from the east coast of S. America.

The systematic arrangement of the genera of the present family is still an unsettled question. Eliot (1907b) listed among the genera of Tritoniidae *Atthila* and *Heterodoris*, both very different types and *Atthila* probably synonymous with *Heterodoris;* these must be placed elsewhere (*cf.* Odhner, 1926b), namely, in the Arminacea. I have studied the anatomy of several species of the genera of Duvauceliidae and arrived at the following general conclusions as to their mutual relationship and systematic arrangement, which, in this family, must be based exclusively on anatomical characters, since the external body-form is very uniform.

When comparing this family with the most closely related ones, we find that in the Duvauceliidae the liver is compact, and consists either of a single mass with two hepatic ducts (thus showing its composition of two parts), as prevails in three of the genera, or

* In a recent (1933) work, Mme. Pruvot-Fol says that "Odhner n'admet pas ce genre et n'en fait qu'un sous-genre," but this is quite contrary to my own opinion and even statements (*cf.* Odhner, 1926a, p. 31 and following).

of two separated masses, each with its own duct representing the original right and left hepatic divisions; this latter condition prevails only in *Marionia*.

The two liver parts in *Marionia* are not only separated from each other, but are also more symmetrical than in *Duvaucelia* and the other genera, where the right liver duct debouches on the left side of the stomach and the respective liver part is lodged upon the front of the stomach—conditions which together indicate a somewhat higher degree of torsion than in *Marionia*. Thus we infer that the *Duvaucelia* stage of liver development, in which the detorsion has not proceeded so far as in *Marionia*, is more primitive, and the fusion of the two liver parts, also, is reminiscent of a primitive contorted stage of the visceral complex. *Marionia*, on the other hand, where the separation of the two liver parts is achieved, realizes a higher degree of detorsion and thus a higher stage of differentiation than the other genera, and this inference is corroborated by other facts, *e.g.* the existence of stomachal plates. In *Marionia cyanobranchiata* (=*arborescens* Bergh) I found, however, a single liver mass just as in *Duvaucelia*, *Tritoniella*, and *Tritoniopsis elegans* (also examined by me). Since it must be admitted that the liver system affords a much more important standard of subdivision and a more reasonable indication of relationship than the presence or absence of stomachal plates, I infer that the liver bipartition in *Marionia* is the essential characteristic of this genus (it is present not only in the type *M. berghi* Vayssière =*blainvillea* Risso, but also in other species), and that the presence of stomachal plates is of secondary significance. Consequently, the somewhat aberrant *M. cyanobranchiata*, which cannot be referred to *Duvaucelia* on account of its stomachal plates, should at all events be excluded from *Marionia*; and then no other course is open than to make this species the type of a distinct genus, for which I propose the name *Marioniopsis*, a genus forming a transition between *Marionia* and *Duvaucelia*. The latter genus seems to be the most specialized among the three remaining genera, of which *Tritoniopsis* keeps the primitive character of a unicuspid narrow median radula tooth. Owing to our insufficient knowledge of the last-named genus, we cannot yet definitely delimit the genera exactly, but in the light of what has just been said we can draw up the following synopsis of the Duvauceliidae:—

I. Liver fused into one mass, the foremost part of which (right liver) covers the left side of the stomach.
  - A. Spermatheca elongated. No stomachal plates.
    1. Nephroproct in front of the anus. Back keeled. Penis with apical ring. Simple processes in back margin .. *Tritoniella* Eliot, 1907b.
    2. Nephroproct above anus. Back smooth or rugose. Penis simple, conical. Branching processes in dorsal margin.* Median tooth of radula tripartite .. .. *Duvaucelia* Risso, 1826.
  - B. Spermatheca spherical. Branching processes in dorsal margin.
    1. Radula with unicuspidate narrow median tooth. No stomachal plates .. .. *Tritoniopsis* Eliot, 1905.
    2. Radula with tricuspidate broad median tooth. Stomachal plates present .. .. *Marioniopsis* n. gen.

* Only in *Tritonidoxa capensis* is the back quite smooth without branchial processes. This form should be revised in order to decide the validity of Bergh's genus *Tritonidoxa*.

II. Liver in two masses (right and left) each with its own duct; stomach in front of the hinder liver mass, and with strong plates interiorly. Radula as in the preceding genus .. .. *Marionia* Vayssière, 1877.

Tritoniella Eliot, 1907b.

In the preceding synopsis I have placed *Tritoniella* at the beginning of the table to indicate the primitive nature of this genus in the Duvauceliidae. It retains a primitive character in the position of the nephroproct somewhat in front of the anus (*Marionia* and *Marioniopsis*, though differentiated in other respects, still keep this position unchanged), whereas in *Duvaucelia* it is immediately above the anus. This position of the nephroproct in *Tritoniella* brings the genus in close relation to other primitive nudibranchs, such as *Doridoxa* (and thereby also to the primitive Doridacea) and *Heterodoris* (and thus to the primitive Arminacea). Another character, the radula shape, is also a sign of the simple stage of development of *Tritoniella*. Eliot (1907b) has described two species of the present genus: the genotype, *T. belli* has a broad median tooth (its breadth surpassing its length) showing a trace of tripartition, and the first lateral tooth with a broad basal plate and a very short cusp, as in *Duvaucelia* and *Marionia*. In the second species, *T. sinuata*, the median tooth is narrow (its length surpassing the breadth), its median cusp is very small and no trace of tripartition is shown: the first lateral has much the same shape as those that follow. Thus in the genus *Tritoniella* the radula has developed into the same types as we find elsewhere in the different genera of Duvauceliidae, being broad and tripartite in *Duvaucelia* and *Marionia*, and narrow and simple in *Tritoniopsis*, the latter being the same primitive condition as is found also in *Doridoxa* and *Heterodoris*.

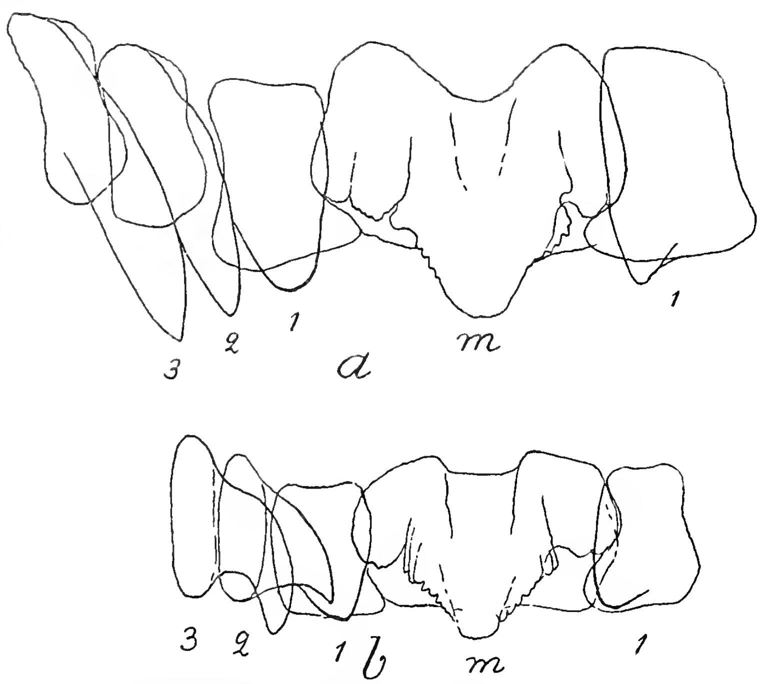

FIG. 54.—*Tritoniella belli*, radula, *a* from St. 356, *b* from St. 355: *m* median tooth; three inner laterals. ×210.

This variation of the radula, consequently, on the one hand shows the primitive nature of the genus and on the other provides us with a means of distinguishing between the species of the genus. We now will try to see whether these differences are verified by other facts. In *T. belli* (fig. 54) the median tooth, besides the character mentioned, is broad, its breadth surpassing its length, and has an anterior broad emargination (about $\frac{1}{3}$ of the breadth of the tooth). In *T. sinuata* (fig. 55) the median tooth is of an elongate, quadrangular outline (its length is greater than its breadth), and has a small and narrow anterior emargination. As Eliot points out, the first marginal tooth is of much the same shape as the following ones in *T. sinuata ;* in *T. belli* the first lateral is relatively broader. Eliot also states that there are differences in the jaws, but he does not describe them as exactly as desirable. A glance at the figures given here (figs. 56, 57) will show these differences better than any description. In *T. sinuata* the jaws, seen from the anterior surface, are more prominent and have a straight masticatory margin ; above, in front of the ligamental wing, the margin slopes vertically down to the front surface, and there is no emargination in the middle of the masticatory margin. In *T. belli* the convexity is less, the surface slopes gently to the ligamental wing, and a distinct emargination occurs in the upper half of the masticatory margin, evidently caused by tearing action of the radula. Another difference is seen in the line of labial insertion on the jaws, which line runs parallel to the margin in *T. sinuata*, whereas it curves away from the margin in *T. belli.* This mode of fixation of the lips is in relation to their shape, the lips being broad and forming a fold inwards in *T. belli*, whereas they are simple and narrow in *T. sinuata.*

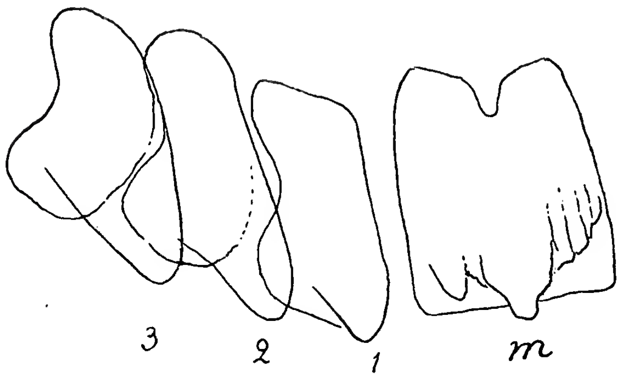

FIG. 55.—*Tritoniella sinuata*, St. 356, radula : median tooth (*m*) and three lateral teeth. ×480.

Thus the present material proves that the radula characters form valid specific differentiae : they are constant in small individuals of both species also. The two species established by Eliot, consequently, are treated as distinct. Just as Eliot remarks, the central tooth is hard to see in *T. sinuata*, being hidden by the laterals which bend over it, a condition opposite to that in *T. belli ;* and this circumstance alone makes it easy to recognize the two species, which are, externally, completely alike. In some other external characters Eliot's description seems to support a distinction ; thus he points out that the penis is furnished with an apical ring in *T. sinuata*, whereas it is said to be small, conical and pointed in *T. belli.* In reality, both species are exactly alike in this respect also, for the ring is present in both.

The " Terra Nova " material thus has contributed considerably to the definition of the characters of these two species, so that we are able now to distinguish them more exactly than before. From this new point of view I have revised the specimens of *Tritoniella* mentioned by me under the name of *T. sinuata* from the Swedish Antarctic Expedition (they were dredged at the Shag Rock Bank and off Graham Land). The descriptions and figures of the jaws and the radula of this species (*l.c.*, 1926a, figs. 24E, 27, 28) now prove that my specimens must be referred to *T. belli* and not to *T. sinuata*.

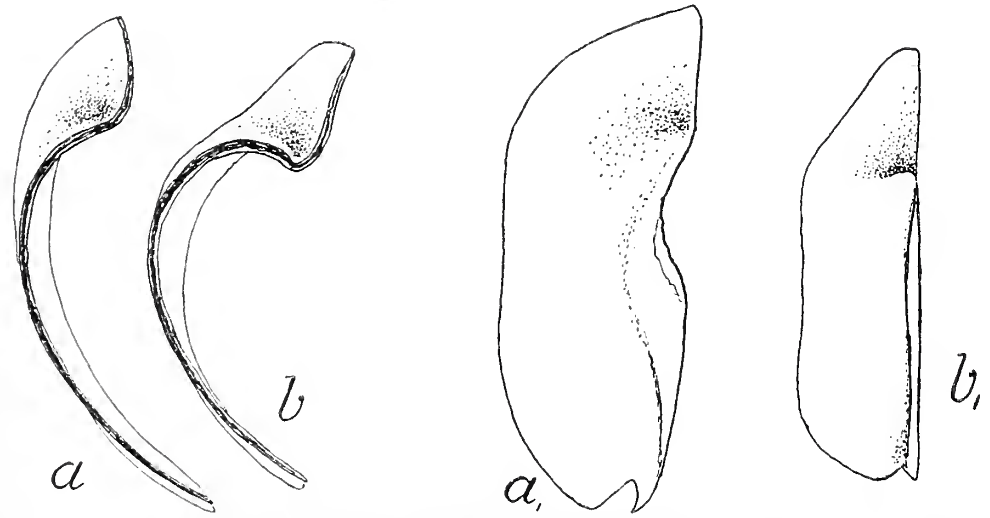

FIG. 56.—*Tritoniella belli* (a, a_1) and *T. sinuata* (b, b_1), jaws seen from masticatory margin (a, b) and from frontal side (a_1, b_1). ×10.

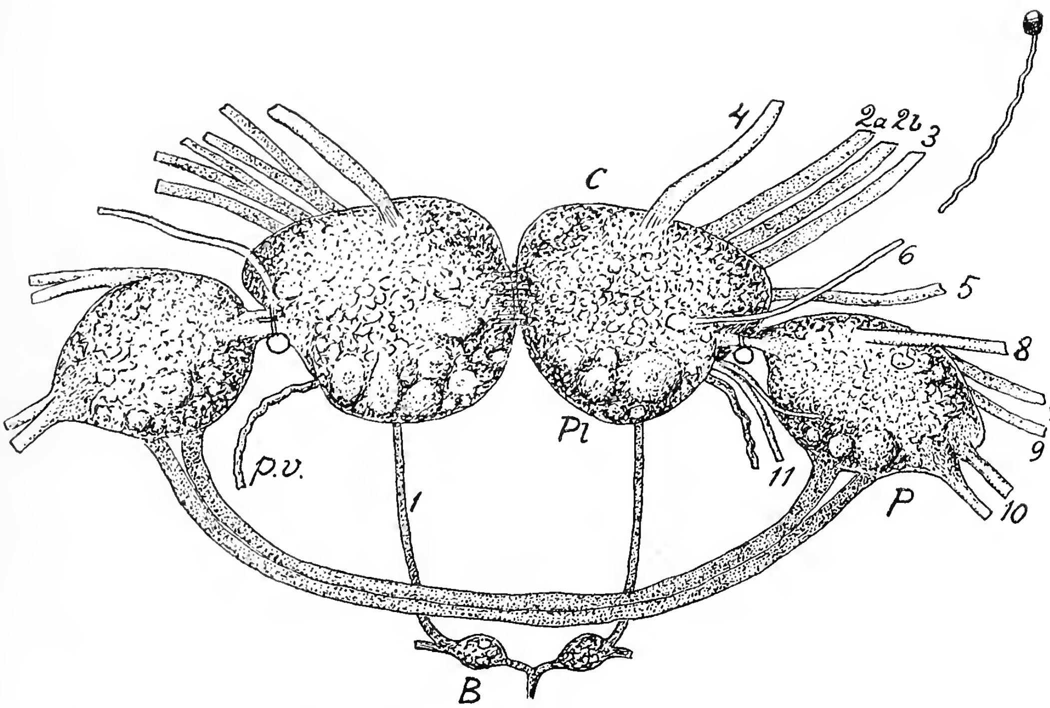

FIG. 57.—*Tritoniella belli*, nervous system. Lettering as in fig. 6.

Only the number of teeth of the radula and the dentition of the median tooth exhibit slight differences from those of the type, not, however, beyond the normal limits of individual variation.

Tritoniella belli Eliot, 1907b. (Pl. III, figs. 30–33.)

The material present was collected at the following localities :—

St. 314 (Antarctic Benthos 1), 5 miles N. of Inaccessible Island, McMurdo Sound, 406–441 m., 1 specimen., length 38 mm.

St. 316 (Antarctic Benthos 3), off Glacier tongue. about 8 miles N. of Hut Point, McMurdo Sound, 348–457 m., mud, 1 specimen, length 30 mm.

St. 355 (Antarctic Benthos 13), 77° 46′ S., 166° 8′ E., 547 m., 4 specimens, max. length 42 mm.; specimens 2 and 3, length 15 mm.; specimen 4, length 14 mm.

St. 356 (Antarctic Benthos 14), off Granite Harbour, entrance to McMurdo Sound, 92 m., mud, 3 specimens, max. length 42 mm.; specimen 2, length 38 mm.; specimen 3, length 25 mm.

The external body-form of this species is so exactly described by Eliot that little need be added, and its more important specific characters have already been discussed in comparing it with *T. sinuata.* The present specimens, however, show some slight differences when compared with a typical *T. belli.* Thus the oral veil is not bilobed and has, in some of the specimens, no distinct tubercles. Further, the rhinophorial sheaths have a somewhat more expanded margin. These small discrepancies may, however, be due to individual variation only or to the mode of preservation. But there seems to be a difference also in the size and the shape of the jaws. In a specimen (from St. 314) of 38 mm. length, the jaws (fig. 56, a, a_1) measure 9·5 mm. in height and 8 mm. in breadth (both lying together), and their sides are straight or even concave, whereas, according to Eliot, a typical specimen of 50 mm. length has the jaws 7·5 mm. in breadth. This same specimen was examined by Robson according to his notes (but the jaw was found to measure only 5·5 × 6·5 mm.); for comparison it may be mentioned that the jaws of the smaller specimen from St. 316 (length 30 mm.) measure 5·5 × 7 mm. (fig. 56). The figures just mentioned thus suggest larger jaws in the present specimens than in the typical ones. However, even this difference in the relative size of the mandibles seems to me to be no stable base for establishing a special variety, since a similar variation may be observed in other species of Duvauceliidae, as shown below in *Marionia gouldi.*

Eliot's description of the anatomy of this species may be completed with some particulars on the nervous system, the alimentary canal, the genital organs, and the nephridium.

The nervous system (fig. 57) shows a complete fusion of the cerebral and the parietal ganglia to one mass which has been attenuated in a lateral direction, evidently a secondary phenomenon. The pedal ganglia are far removed from one another and combined by a long, double commissure. The cerebro-pedal and the pleuro-pedal connectives are indistinctly separated, but surrounded by the same neurilemma. The statocysts are distinct and contain a few statoliths, and their nerves cross the connectives. The optic nerves are very long, the eyes small and subcutaneous behind the rhinophores. The pleuro-visceral commissure is distinct, but no subcerebral commissure could be found. The buccal ganglia are well separated from each other and combined by a short commissure. For details compare fig. 57.

The alimentary canal (fig. 58).—Robson has described in notes the facts observed by him in two specimens dissected, and I have verified them in a smaller specimen. The salivary glands (*s*) debouch by means of short ducts and are band-like, flocculent masses following the sides of the wide oesophagus (*o*). This narrows backwards and passes into the stomach which is entirely enclosed within the liver. Behind the oesophagus the two liver ducts (l_1, l_2) debouch into the stomach, one on the left side, the second and larger about medially. The two parts of the liver are fused into one mass as in *Duvaucelia.* Just to the right of the median liver duct the intestine (*i*) starts being marked off from the stomach by a ring of about 15 longitudinal, rather short, low folds of varying size. These folds are covered on their whole surface (even on the furrow between them) by a rather thin cuticle. The intestine immediately behind the ring of longitudinal folds is lined with a papillate endothelium the papillae of which rise at the points where the longitudinal and transverse folds cross. The internal wall behind this zone shows a short typhlosole in its frontal wall and is lined with narrow, longitudinal bands. The intestine is lodged on the right side of the liver in a deep sinus and describes a short coil forwards and downwards before it passes beneath the heart and debouches in the anus.

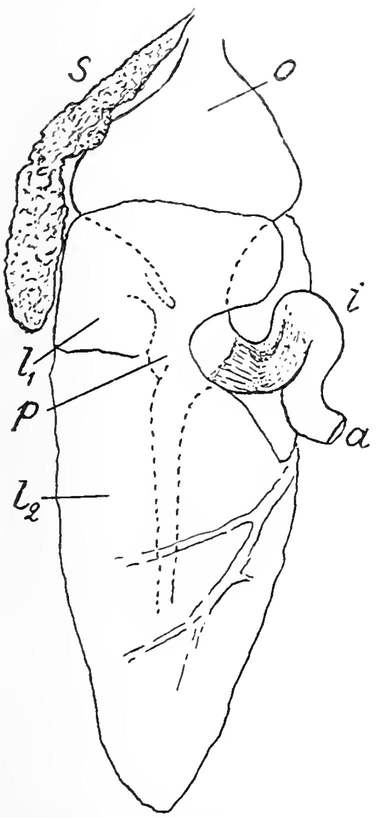

FIG. 58.—*Tritoniella belli*, alimentary canal : *i* intestine, l_1 left liver with duct, l_2 right liver with duct, *o* oesophagus, *s* salivary gland.

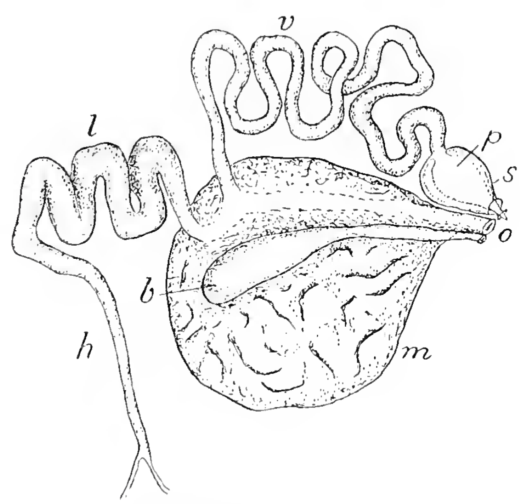

FIG. 59.—*Tritoniella belli*, genital organs : *b* bursa copulatrix, *h* hermaphrodite duct, *l* ampulla, *m* mucus gland, *o* oviduct, *p* penis, *s* penis sac, *v* vas deferens.

The contents of the intestine consisted chiefly of spicules and other parts of Alcyonarians.

The gonad envelops the liver completely except at its front end, which is covered only dorsally. From the right side of the gonad the thin hermaphrodite duct (fig. 59, *h*) runs forwards and soon widens into an elongated ampulla (*l*). This debouches into the indistinct oviduct which carries the mucus (*m*) and albumen (*b*) glandular masses (their size is $\frac{1}{2}$ or $\frac{2}{3}$ of that of the gonad). The oviduct and the glands narrow distally and open by a fissure-like aperture. The bursa copulatrix (*b*) is entirely separate from the oviduct and debouches above it. It is elongate in shape and attains (including its stalk) a size smaller than that of the mucus gland.

Close to the point where the ampulla passes into the oviduct, the vas deferens (*v*) issues. It runs as a yellow canal with thin walls and intricate windings (the length of the canal about equals that of the animal) to the conical penis sac (*s*). This includes a bottle-like penis (*p*) with a swollen and rounded base and a tapering end which carries a ring-like disc just below its apex. It is entirely unarmed. The three genital apertures are shown in their respective places in fig. 60.

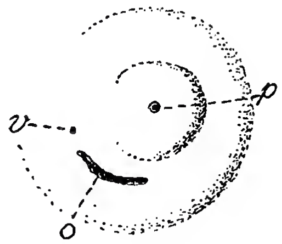

FIG. 60.—*Tritoniella belli*, genital pores: *o* oviduct opening, *p* penial pore, *v* vaginal pore.

The heart and the nephridium are situated at the right side of the body, the heart enclosed in a spacious pericardium just dorsal to the intestine. The heart has a regular symmetrical shape with two auricles of uniform size. On the right side of the pericardium, about in the middle of its ventral wall, the nephrostome opens into the large, bulbous syrinx. Immediately behind the latter the ureter appears, crossing the upper side of the rectum and leading directly to the nephroproct. The urinatory chamber of the nephridium is spread over the gonad as a thin veil of tissue much as in *D. hombergi* (*cf.* Odhner, 1926b). Bergh has, as pointed out by me in 1926a, misinterpreted the urinatory sac, confusing it with the aorta posterior, but Pelseneer has given a more correct explanation of it.

Tritoniella sinuata Eliot, 1907b. (Pl. III, figs. 34–37.)

The present species was collected at the following localities :—

St. 316 (Antarctic Benthos 3), off Glacier tongue, about 8 miles N. of Hut Point, McMurdo Sound, 348–457 m., mud, 3 specimens, max. length 27 mm. (Pl. III, figs. 34, 35) ; specimen 2, 25 mm. ; specimen 3, 23 mm.

St. 356 (Antarctic Benthos 14), off Granite Harbour, entrance to McMurdo Sound, 92 m., mud, 3 specimens, max. length 17 mm. ; specimen 2, 16 mm. ; specimen 3, 14 mm.

Since this species is not so thoroughly described by Eliot as the preceding one, I give here some details of its external characters, which, however, do not differ from those of *T. belli*.

The velum has a thin, somewhat uneven margin and is entire or emarginate in the middle. On its under side it shows a shallow but distinct furrow near the external margin.

The rhinophores are placed about as close to each other as the diameter of the rhinophorial sheaths. These are widely expanded, with even margins, highest externally where they are connected with the dorsal margin. The rhinophorial clubs have about

9 feather-like plumes with rather sparse-set pinnulae on the front, inner and outer sides of the central pillar, which is itself bipectinate behind.

The back has a strong median ridge diverging just behind the rhinophores into a short ridge directed towards each of them. Externally to this ridge there run short marginal ridges, separate from the median ridge. In front of and between the rhinophores stands a distinct depressed tubercle. The nephroproct, the anus and the genital openings are situated exactly as in *T. belli*, the anus in the middle of the body-length, the genital opening half-way between anus and insertion point of velum, and nephroproct close in front of the anus (closer than anal diameter).

The radula of 5 examined specimens had the following formulae: St. 316, specimen 1 (27 mm.) 52 × 77.1.77; specimen 2 (25 mm.) 53 × 73.1.73 (fig. 61), specimen 3 (23 mm.) 86.1.86; the last has a rather high number, a high and distinct cusp to the median tooth and an indistinct emargination in the front of the basal plate; St. 356, specimen 2 (16 mm.) 44 × 62.1.62; specimen 3 (14 mm.) 51 × 69.1.69 (fig. 55). As may be seen, the number of teeth increases with size, but this is not without exceptions.

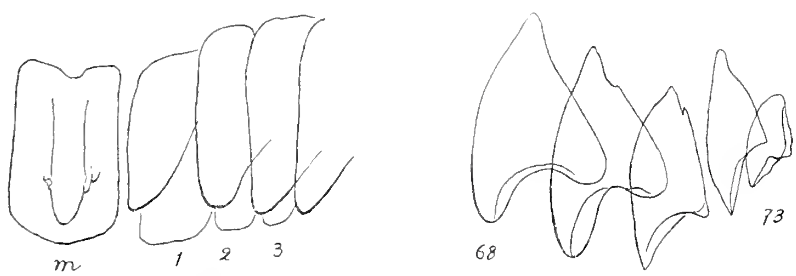

FIG. 61.—*Tritoniella sinuata*, St. 316, radula: median tooth (*m*), three lateral teeth (1–3), and external marginals (68–73). ×320.

The alimentary canal showed no essential differences from that of *T. belli*. A widening marks the beginning of the oesophagus, which is flanked by salivary glands of the same shape as in that species. The oesophagus descends to the ventral side and narrows when passing into the stomach. The liver ducts open in the left and the posterior side of the stomach in front of the pyloric ring of folds, which number about 15 and have a very thin cuticle. Behind them there project 2 or 3 elevated papillae of the same origin as in *T. belli*. A distinct typhlosole follows the ventral wall of the intestine. This bends upwards and forwards, then describes a sharp curve outwards and passes beneath the heart to the anus. The liver forms one simple mass consisting of the right and the left liver which have fused.

Compared with large specimens of *T. belli*, the course of the intestine of *T. sinuata* shows a slight difference inasmuch as it starts more medially and describes a more open curve. But this seems to be due only to the small size of the specimens examined, for in a young *T. belli* of the same size similar conditions prevailed. It is, however, interesting to state that in both species of *Tritoniella* a displacement of the intestine has taken place compared with its position in other Duvauceliidae, where it starts, as a rule, medially. This displacement is probably due to the altered position of the right liver and its fusion with the left one and to some increase of the latter. In this respect *Tritoniella* shows some advance on the following genus and species.

Marionia cucullata Gould, 1852 (=*M. occidentalis* Bergh, 1884). (Pl. III, figs. 36, 37.)

There are numerous specimens—not less than 37—of a *Marionia* dredged by the "Terra Nova" in St. 42, off Rio, 22° 56′ S., 41° 34′ W., 73 m., sandy bottom (2.5.1913), Agassiz trawl. The largest specimen measures 90 mm. in length, 25 mm. in breadth, and 20 mm. in height (figs. 36, 37).

In order to identify this form, it was necessary to arrange the characters of the about 20 known species of the genus according to a scheme which will be published in another connection. It turned out that the character forming the chief criterion of division is to be found in the shape of the mandibulae. Like the jaws of *Duvaucelia* (*cf.* Odhner, 1926a), those of *Marionia* are of two different types, the one having the masticatory margin even, its edge rounded, and the external side beset with 3–6 rows of small denticles, the second having its margin thin and regularly roughened by a single series of coarse serrations, as figured by Bergh, 1905, pl. XIX, fig. 1. To the first group both the present species and the typical *M. blainvillea* (with many colour variations) belong; the latter has, generally, a brown or orange reticulation and the dorsal polygonal areas covered with white spots, 6–8 velar processes on each side and 11–15 branchial tufts on each side of the dorsal margin. *M. cucullata* has the polygonal areas on the back greenish and the body sides reddish or greenish with feebly developed white spots; it has 7–11 velar processes on each side of the front margin (slightly incised in the middle), each composed of 3–5 tubercles in a dorsoventral series, and 12 or 13 to 16 gills on each side of the back.

The colour markings of the present specimens are those of *M. cucullata* Gould (=*M. occidentalis* Bergh). This species has been described in some detail by Bergh, whereas Gould's type is known only from its external body-form; evidently Gould in his description and figure (1856, fig. 403) confounded anus and genital opening. The present specimens agree with Bergh's account and the abundance of material enables me to give a full description below.

External Body-Form.

In the genus *Marionia* no specific value can be attributed to the position of the anus and genital aperture in relation to body-length or to the number of branchial tufts. These characters are, on the whole, uniform and vary in about the same degree in several species. In the present form the anus is situated just behind the middle of the body between gill tufts 4 and 5 or beneath 5. The genital apertures, which are all three separate, lie beneath the 3rd gill tuft or under the space just behind it.

The nephroproct is situated a little in front of the anus, under the next preanal gill tuft. The same position of these openings is found in *M. blainvillea*, where I observed a more considerable variation, inasmuch as the genital aperture may lie beneath the 3rd and 4th and, rarely, 5th gill, whereas the anus appears between gills 4 and 5, or 5 and 6, rarely beneath 6.

The tentacles are short, open furrows. The rhinophorial clubs have 7 or 8 tripinnate, longitudinal crests, as shown in fig. 62, the posterior one terminating in a smooth, elongate papilla.

Foot rounded in front, its edges slightly projecting all round; front margin with a shallow transverse furrow.

ANATOMY.

Alimentary canal (fig. 63).—The pharynx measures 12·5 mm. in length, 10 mm. in breadth, and 7 mm. in height, and has the shape of a biconvex lens the front of which is occupied by the jaws. These are large and strongly curved (fig. 64) and have their masticatory margin (fig. 65) finely denticulated by small cones of which there are about 6 series on the internal surface of the margin; the outermost, longest denticles are in many places worn off. In an animal of 77 mm. length the jaws measure 11 mm. in length and 4 mm. in breadth; their convexity amounts to 3·5 mm.

The radula (fig. 66) consists of about 52 series of teeth with about 58.1.1.1.58 teeth in the largest rows. The median tooth has a strong, pointed cusp projecting beyond the posterior margin of the basal plate in unworn teeth. It shows a peculiar striation on the basal plate, resembling fissures radiating from the incisions at the sides of the cusp. First lateral tooth has a blunt obliterated cusp; the following ones are all sharply pointed. All are simply hamate.

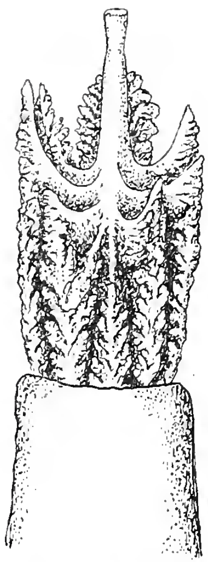

FIG. 62.—*Marionia cucullata*, rhinophorial club from frontal side. ×10.

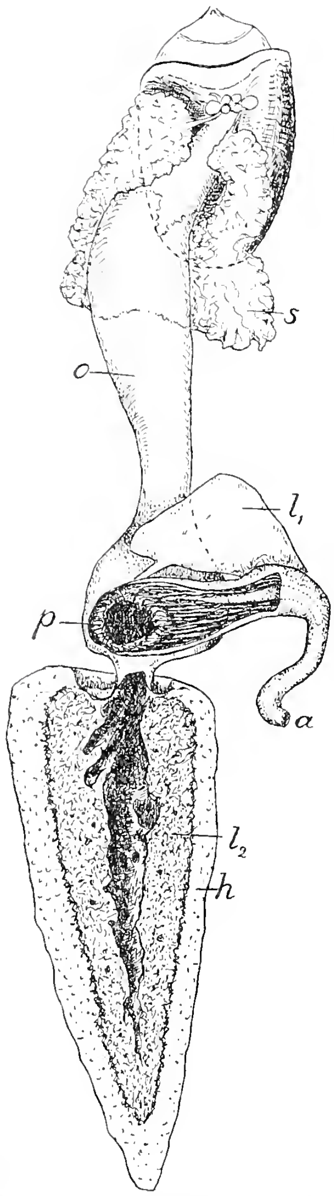

FIG. 63.—*Marionia cucullata*, alimentary canal. Lettering as in fig. 58; *h* hermaphrodite gland.

From the posterior side of the pharynx the oesophagus (fig. 63, *o*) issues as a narrow canal beneath the central nervous ganglia. Within the nerve ring also the ducts from the salivary glands (*s*) run forwards to the basis of the oesophagus. The salivary glands spread like a pair of flocculent laminae of roughly triangular shape over the postero-external side of the pharynx, between it and the sides of the oesophagus, and extend only a little backwards.

They meet beneath the oesophagus and fuse in the middle. In *M. quadrilatera* the salivary glands are considerably longer and extend along the oesophagus.

The oesophagus rapidly widens, but narrows again farther back. For its whole length it is covered dorsally by the large bursa copulatrix (fig. 67, *b*). Its walls are entirely smooth within. Ventrally, it widens to the rounded first stomach, a small sac which is immediately followed by the ascending, second cylindrical part of the stomach, which passes directly into the transverse intestine. The right liver duct debouches at the angle where the first stomach passes into the second. The right liver (fig. 67, *l*) is a rather small compact mass of triangular outline and narrow lumen, and lies in front of and beneath the intestine, quite separate from the left or main liver. The duct from the latter opens in the posterior stomach wall opposite to the right hepatic duct. The left liver is lodged in the median line of the body, has an elongate, conical shape, in front abruptly truncate behind the stomach, and is covered all over by the more or less thick layer of the hermaphrodite gland. Interiorly it has a wide central cavity (fig. 63). The internal walls of the stomach are folded longitudinally, the folds showing through on the outer side also. At the pylorus (behind, or rather above the openings of the liver ducts) a circlet of separate horny plates is developed which project in the direction of the folds as triangular laminae generally with pointed apices directed backwards (fig. 68). The two dorsal median plates are larger than the remaining ones. There are about 30–40 large plates with smaller ones between them. They are usually 2·5 mm. in length and vary in shape, the apex being subcentral and blunt or very excentric and more acute (fig. 68). According to Bergh (1884), the plates amount to 60 in number.

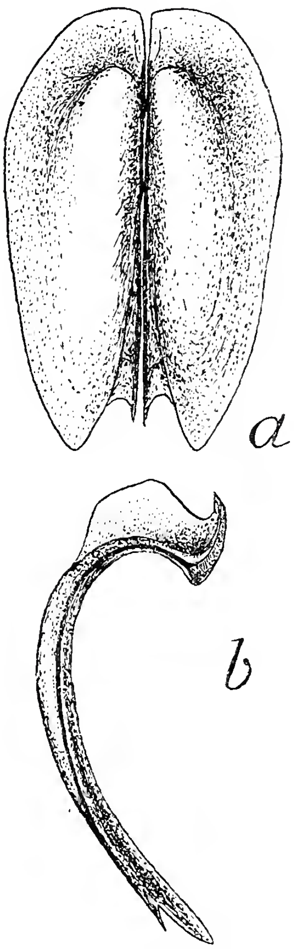

FIG. 64.—*Marionia cucullata*, jaws: *a* from front, *b* from masticatory margin.

Behind the plate ring a thick typhlosole appears in the ventral wall of the intestine; this terminates at the place where the intestine bends backwards and downwards passing into the short rectum.

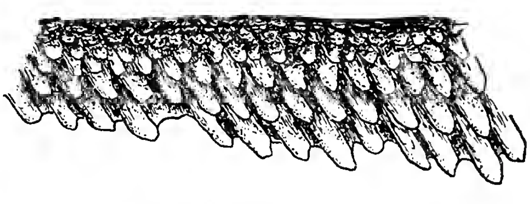

FIG. 65.—*Marionia cucullata*, jaws: masticatory margin. ×125.

Genital organs (fig. 69).—The genital openings are surrounded by a circular rim. There are, as mentioned, 3 separate openings of the genital ducts. The foremost opening is the male one, the median one (somewhat higher up and behind the first) leads into the vagina (*v*), and the third is that of the oviduct: it is marked off from the others by a semicircular lobe projecting beneath as a short, ear-shaped lappet.

The penis (*p*) is elongate, conical and tapering, often bent into a hook, always quite smooth. The vas deferens (*v*) has a winding course, distally with muscular, proximally with thin walls, and forms no prostates before joining the albumen gland (*a*).

At the upper part of the glandular mass of the oviduct the ampulla (*l*) appears as a wide canal bent upon itself in a simple elongate coil. The hermaphrodite duct (*h*) issues at some distance from the anterior rounded end of the ampulla. It divides, just behind the stomach, into a dorsal and a ventral branch coming from the hermaphrodite gland, which surrounds the liver completely.

A difference from *Duvaucelia* is found in the vagina, which opens quite separately from the

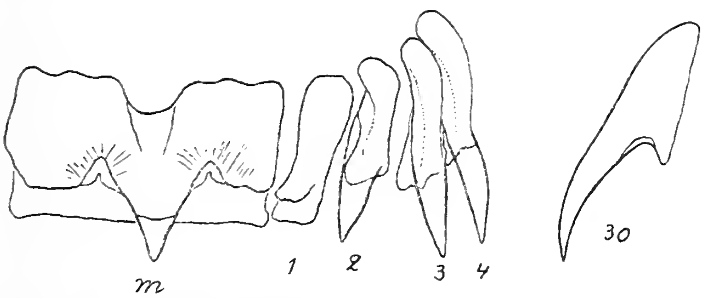

Fig. 66.—*Marionia cucullata*, radula: median tooth (*m*) and laterals (1–4 and 30). ×80.

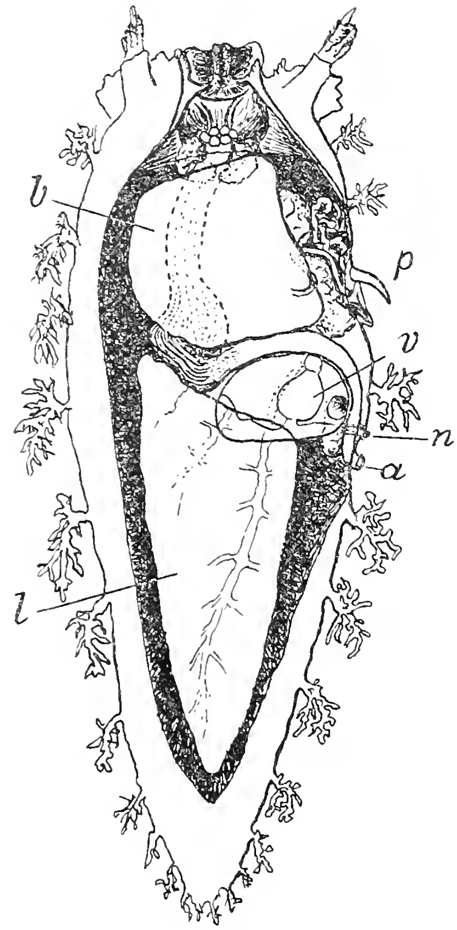

Fig. 67.—*Marionia cucullata*, situs viscerum: *a* anus, *b* bursa copulatrix, *l* left liver, *n* nephrostome, *p* penis, *v* ventricle.

oviduct, whereas in *Duvaucelia* it may either open freely or into the vagina. The latter (*g*) leads internally into the long shaft of the very wide bursa copulatrix (*b*), which lies dorsally to the oesophagus (*cf.* fig. 67). The same position is occupied by the bursa copulatrix in *Marionia quadrilatera*, in contrast to *Duvaucelia* in which the rather small bursa lies at the side of the oesophagus. There is some variation in the proportions of the vaginal organs inasmuch as the bursa is sometimes longer than its shaft, though more often it is shorter (*cf.* Bergh, 1884). The vaginal dilatation of the

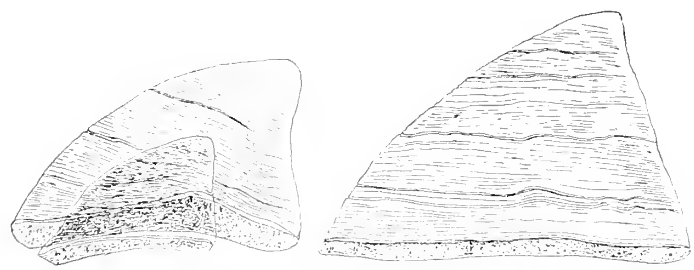

Fig. 68.—*Marionia cucullata*, stomach plates. ×10.

shaft occupies either half of the vagina (*cf.* Bergh, 1884) or only a small terminal part.

Heart and nephridium.—Behind the transverse part of the intestine, the heart is

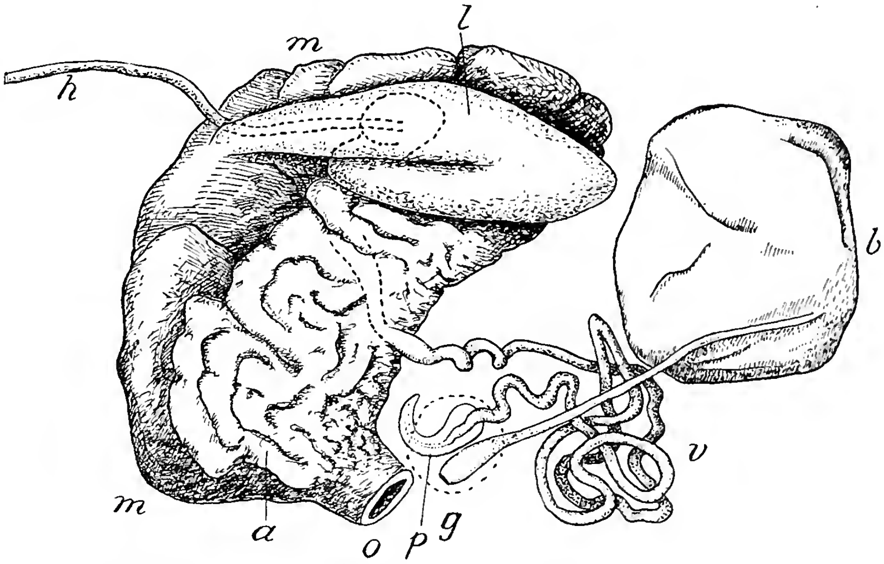

FIG. 69.—*Marionia cucullata*, genital organs. Lettering as in fig. 59; *a* albumen gland, *g* vagina.

situated in a spacious pericardium (fig. 67), wider than long. The ventricle lies somewhat to the right of the median line, and its anterior end is directed slightly obliquely to the right. Here the aorta issues, on the inside separated from the ventricular chamber by an obliquely transverse valve hanging from its dorsal wall. Posteriorly, a dorsal and a ventral valve projecting into the ventricle separate it from the auricle behind (*cf.* fig. 70). The latter extends along the posterior wall of the pericardium, carries a dilatation on both sides, and receives, laterally, two afferent vessels.

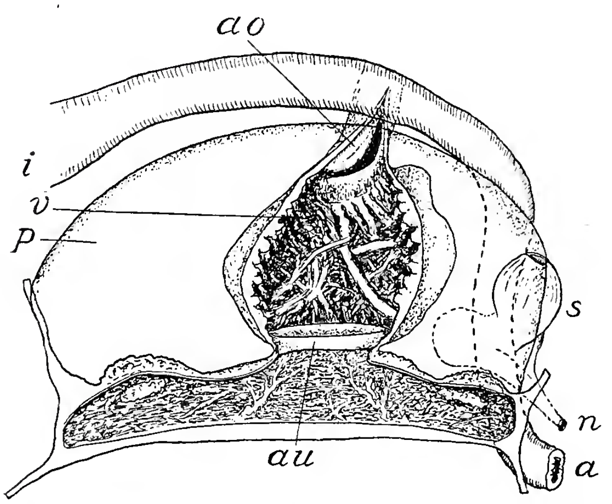

FIG. 70.—*Marionia cucullata*, pericardium, heart and nephridium seen from above: *a* anus, *ao* aorta, *au* auricular valve, *i* intestine, *n* nephroproct, *p* pericardium, *s* syrinx, *v* ventricle.

The internal walls of the ventricle are made up of strong muscle cords (fig. 70) crossing each other in all directions; those of the auricle have much feebler musculature.

The nephridium (fig. 71) lies ventrally to the pericardium and inside the intestine. It communicates with the pericardium by means of a large bulbous syrinx on its right margin. The nephridial chamber is short and thin-walled and opens by a short ureter which crosses the rectum immediately in front of the anus. A branch from the aorta accompanies the left side of the renal chamber.

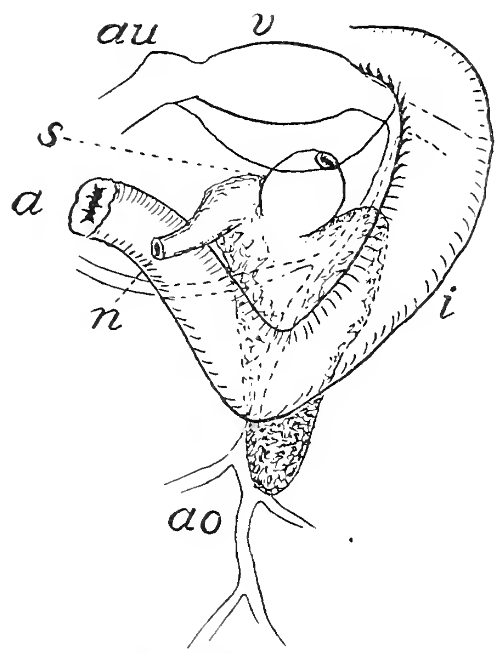

FIG. 71.—*Marionia cucullata*, pericardium, heart, nephridium from the right. Lettering as in fig. 70.

The nervous system (fig. 72) is very similar to that of *Duvaucelia* (*Tritonia*), but the suboesophageal commissures are shorter. No subcerebral commissure could be found. Compared with *Tritoniella* the pleural ganglia are much more distinct and the commissures shorter, but the buccal ganglia are more approximated. In the pleural ganglia some of the cells are strikingly large, especially the hindmost one of the right ganglion. For the nerves rising from the ganglia, see the figure.

A specimen of *M. cucullata* (275 mm. in length) was obtained by the Swedish Antarctic Expedition off the coast of the Argentine (*cf.* Odhner, 1926a, p. 40, pl. I, fig. 16). I have compared its anatomy with that of the present specimens and established some slight differences, which, however, seem to be too unimportant for separating the specimen even as a variety. Above all, the jaws are stronger and less convex in the Argentine specimen. Their length amounts to not less than 17 mm. and their convexity to 5 mm., whereas in the "Terra Nova" specimens the jaws measure 11 mm. in animals of 77 mm. length and their convexity or curvature is 3·5 mm. Further, the masticatory margin of the jaws is smooth in the specimen of the Swedish Expedition.

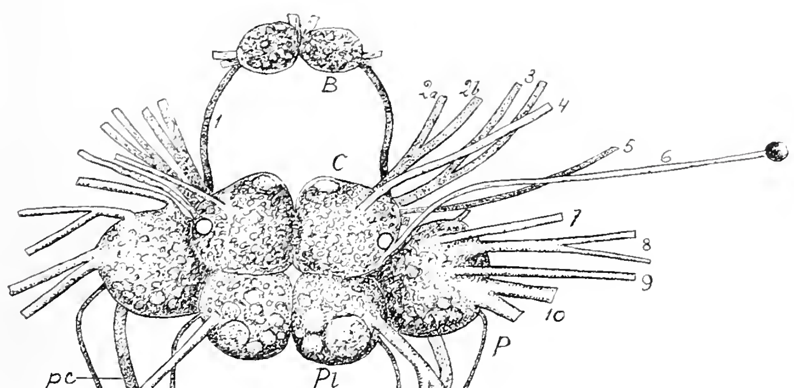

FIG. 72.—*Marionia cucullata*, nervous system. Lettering as in fig. 6.

This latter, however, depends on more intense use, and, indeed, the nutritive matter of this specimen was very coarse, the stomach containing masses of spicules of Alcyonarians, whereas the "Terra Nova" specimens have a homogeneous, soft, animal matter in their stomachs.

Since *M. quadrilatera* also shows some variation in the convexity of the jaws, I see no reason to attribute any systematic value to this variation in the present species. But there are other differences in the alimentary canal, viz. in the shape of the radula teeth and the stomachal plates. The median tooth of the radula is relatively shorter and more extended in breadth and its cusp does not project beyond the posterior margin (seen from above). The stomachal plates are more bluntly rounded dorsally and not so sharply pointed as in the "Terra Nova" specimens; their number is only 36. But these differences in shape seem to be merely a consequence of the coarseness of the food, and the stomachal plates vary even in one and the same specimen (*cf.* Bergh, 1884).

Besides the features mentioned, there are some slight differences in the genital organs, which are worth mentioning. In the specimen from the Argentine the vaginal swelling comprises half the shaft of the bursa copulatrix, and this equals its shaft in diameter. In the Rio specimens, as mentioned above, a short vaginal swelling is usual, as well as a long shaft exceeding the diameter of the bursa, but both characters are variable. In the Argentine specimen, further, the hermaphrodite gland attained only $\frac{1}{3}$ of the body-length and its thickness was only $\frac{1}{4}$ or $\frac{1}{3}$ of the thickness of the liver. These differences, however, are no doubt due to the sexual products being emptied into the efferent ducts, as is shown by the fact that the ampulla of the Argentine specimen was swollen to a width equalling that of the bursa, and filled with sperm.

Thus the differences mentioned are, in my opinion, only due to individual variation and both types belong to the same species. Which of these is the typical form cannot be decided, since Gould's type was not sufficiently described; but it was taken off the shores of Rio de Janeiro, like the "Terra Nova" specimens, which are, therefore, probably closer to the type than the Argentine form.

Fam. DOTONIDAE.

Doto Oken, 1815.

As to the nomenclature of this genus, Iredale and O'Donoghue (1923) maintain that *Doto* Oken, 1815, must be rejected and *Idulia* Leach, 1852, accepted in its place, since *Doto* Oken, 1807, was used in another sense. Mme. A. Pruvot-Fol (1931) has raised some weighty objections to their opinion as to the necessity of this change, showing that *Doto* was not used in a scientific manner nor described until 1815. I agree with Mme. Pruvot-Fol in her argument and consider that *Doto* should be restored and used for this genus. Mme. Pruvot-Fol writes (*l.c.*, p. 314): "Le nom a été en effet prononcé sans diagnose, description ni figure, à propos d'un Annélide qui portait déjà un nom. Ceci ne suffirait pas aux puristes pour le rendre à nouveau libre et disponible, si ce nom avait été en effet donné, même à tort, et d'une façon non valable, à un animal, par un auteur ayant signé son travail. C'est précisément ce qui n'est pas le cas ici : il s'agit en effet d'un compte rendu non signé d'une conférence d'Oken (1807, Göttingische Gelehrte Anzeigen. p. 1067), compte rendu fait par un inconnu, un élève vraisemblablement, qui a pu faire des adjonctions ou intervertir des noms, et qui ne peut être invoqué contre Oken lui-même lorsqu'il désigne plus tard nettement le type de son genre *Doto*."

About 20 species of *Doto* have been described. Few of them are, however, characteristic and well defined. Most of the species have a radula with a small and narrow cusp of the median tooth produced together with the base of the next two adjacent denticles and projecting at a lower level than these (*cf.* Odhner, 1922, fig. 14). In a few species the median tooth has a cusp broader than each one of the side denticles (this is the case in *D. africana* Eliot, 1904, *D. obscura* Eliot, 1906, as appears from the description, *D. indica* Bergh, 1888, and *D.* sp. described by Bergh in 1904). In a single species the cusp of the teeth is produced to a slender spine twice as long as each of the three basal denticles on each side of it ; this is *D. racemosa* Risbec, 1928. For the discrimination between species in this genus, as I remarked in 1922, the colour of the animal is of primary importance. The number and form of the papillae and the shape of the rhinophorial sheaths have also been used as systematic characters. The boreal *D. crassicornis* is well separated from all other species by its thick, short and wide cylindrical sheaths with even margins. *D. pinnatifida* is very characteristic because of its row of small tubercles along each side below the cerata. But another character, to which Eliot has attributed too much importance, viz. the ridge or tubercle in front of the rhinophorial sheaths, seems to be subject to much variation, probably because of the different degree of expansion or contraction of the head. In preserved specimens of *D. coronata* I have observed a well-developed tubercle or none at all, as well as all intermediate stages. In *D. fragilis*, on the contrary, where a distinct ridge is seen in living specimens (*cf.* Alder & Hancock, Plate 5, Fam. 3), this character may be obsolete in preserved specimens. *D. fragilis*, however, is distinct in its great number of cerata and their numerous tubercle rings ; the admedian tubercles near the base of the cerata have a more slender appearance than the remaining ones and are often compound.

From among the species described we must reject *D. ocellifera* Simroth, 1895, referred with doubt to this genus. Certainly it does not belong here, since its radula is different in having quite smooth, spine-like teeth ; further, the rhinophores have no sheaths and the anterior corners of the foot are produced laterally. This small animal (1 mm. in length) from Bermuda seems to be a young Eolid, perhaps belonging to *Favorinus* or an allied genus.

On the other hand we have to add as a synonym or subsection of *Doto* the genus *Bornellopsis* O'Donoghue, 1929, which has nothing to do with *Bornella* (*cf.* Pruvot-Fol, 1933). The peculiar gills at the inner side of the cerata may be observed, though less distinctly, even in *D. coronata*, and no other distinctions of generic importance exist which justify the new genus. I have examined a Japanese species of *Doto* with similar gills to those of *D. kabretiana*, the type of *Bornellopsis*.

Doto antarctica Eliot, 1907b.

Of this species the "Terra Nova" collected about 8 specimens at St. 220, off Cape Adare, mouth of Robertson's Bay, 82–92 m., shingle bottom, the largest one measuring 6 mm. in length and 3 mm. in breadth (it was somewhat contracted): height 3 mm., breadth of foot 2 mm. It showed (fig. 73) marks of 6 pairs of cerata (all fallen off) on the dorsal sides. In a smaller specimen (length 3 mm. contracted) 7 pairs of cerata were present. The cerata (fig. 73, *b*), which had mostly fallen off in every specimen, carry about 4 rows of tubercles equal in size on the inner and outer sides of the cerata; about 7–10 tubercles are present in the largest row. The colour of the animal is a pale yellowish-white or yellowish-brown with no dots; the cerata show the same colour with whiter tips to the tubercles.

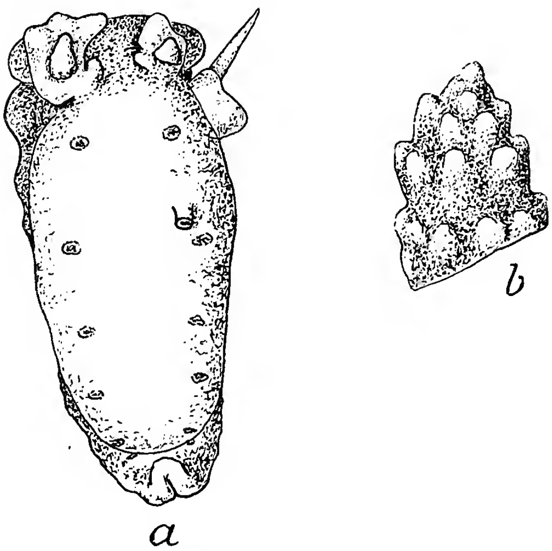

FIG. 73.—*Doto antarctica*: *a* animal from above, ×10; *b* papillae, ×10.

The rhinophorial sheaths (fig. 73) have an expanded margin, the frontal lobe of which is somewhat longer than the three remaining ones. In the small specimens the lobes are ill-defined, but a frontal dilatation of the sheath margin is obvious.

Eliot describes in the type specimen of *D. antarctica*, on each side of the velum, a ridge running to each rhinophorial sheath. In the present specimens there is no such ridge, but a transverse fold may be present in front of each rhinophore: since the head is rather contracted, these transverse folds may have arisen from a ridge like that described by Eliot, a feature which, however, apparently, is of no specific value.

Whereas the other known species of *Doto* are characterized by various coloration, generally brown or red, the present one lacks dark pigment and comes, in this respect, close to *D. formosa* Verrill, 1875, the colour of which is described as being "translucent white, tentacle-sheaths and dorsal papillae covered with flake-white specks." Because this species has the cerata set in 6–7 groups, Eliot remarks that *D. antarctica* is closely allied to *D. fragilis*, which also is uniformly yellowish in colour, but points out the difference in the number of the cerata and their tubercles, a difference which he considers to be subject to variation. The present specimens are in this respect only a little different from the typical ones, as described by Eliot (I have not seen the type); and in view of the constancy of the characters mentioned above, and especially in view of the colour, which seems to be one of the more reliable specific characters in this genus, we note that *D. antarctica* is less akin to *D. fragilis* than to the smaller forms, being apparently closest to *D. formosa*.

The radula presents no very distinctive characters. In the type of *D. antarctica*, Eliot observed 102 clear yellow teeth with 3–4 lateral denticles, "the highest of which are on the sides of the central cusp." This indicates a tooth like that typical of the genus and figured by me in 1922 (fig. 14, p. 36). In the largest present specimen I found about 83 teeth in the radula (fig. 74). The two preparations made by Robson were imperfect and contained only 45 and 21 teeth in each radula. These have a rather broad posterior sinus of a triangular rather than of an oblong shape, thus recalling the teeth of *D. fragilis* more than those of the smaller species; but this character may be variable; Trinchese figures (1881, pl. LIX, fig. 6) the teeth of *D. coronata* with rather broad emarginations.

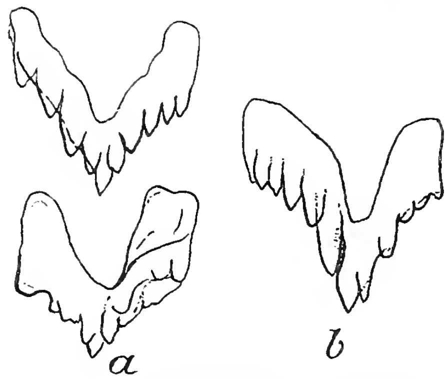

FIG. 74.—*Doto antarctica*, radula teeth: *a* two teeth from the largest specimen, *b* one tooth from another specimen. ×750.

Of the anatomy of *Doto* I gave an account in 1922. The present species agrees with it in essentials. Robson made some observations on the anatomy of this species, based on sections. A few facts may be cited here. The hermaphrodite gland lies above the posterior hepatic duct and is folded down on each side of the latter. It consists of a number of large lobes composed of smaller ones which contain male products, and there are ova in the surrounding female acini. Both male and female genital products were present in all stages of maturity. The thin, whitish hermaphrodite duct runs forward from the anterior and under side of the gonad and swells out into a short, sausage-shaped ampulla (as in my fig. 15 of *D. coronata*, 1922). The penis is unarmed, conical and included in an ovoid atrial sac.

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,, 7, 8.—*Cadlina affinis* n. sp., type, St. 356, ×4·6.
,, 9, 10.—*Austrodoris macmurdensis* n. sp., type, St. 349, ×1·5.
,, 11, 12.— ,, ,, ,, St. 340, ×2·5.

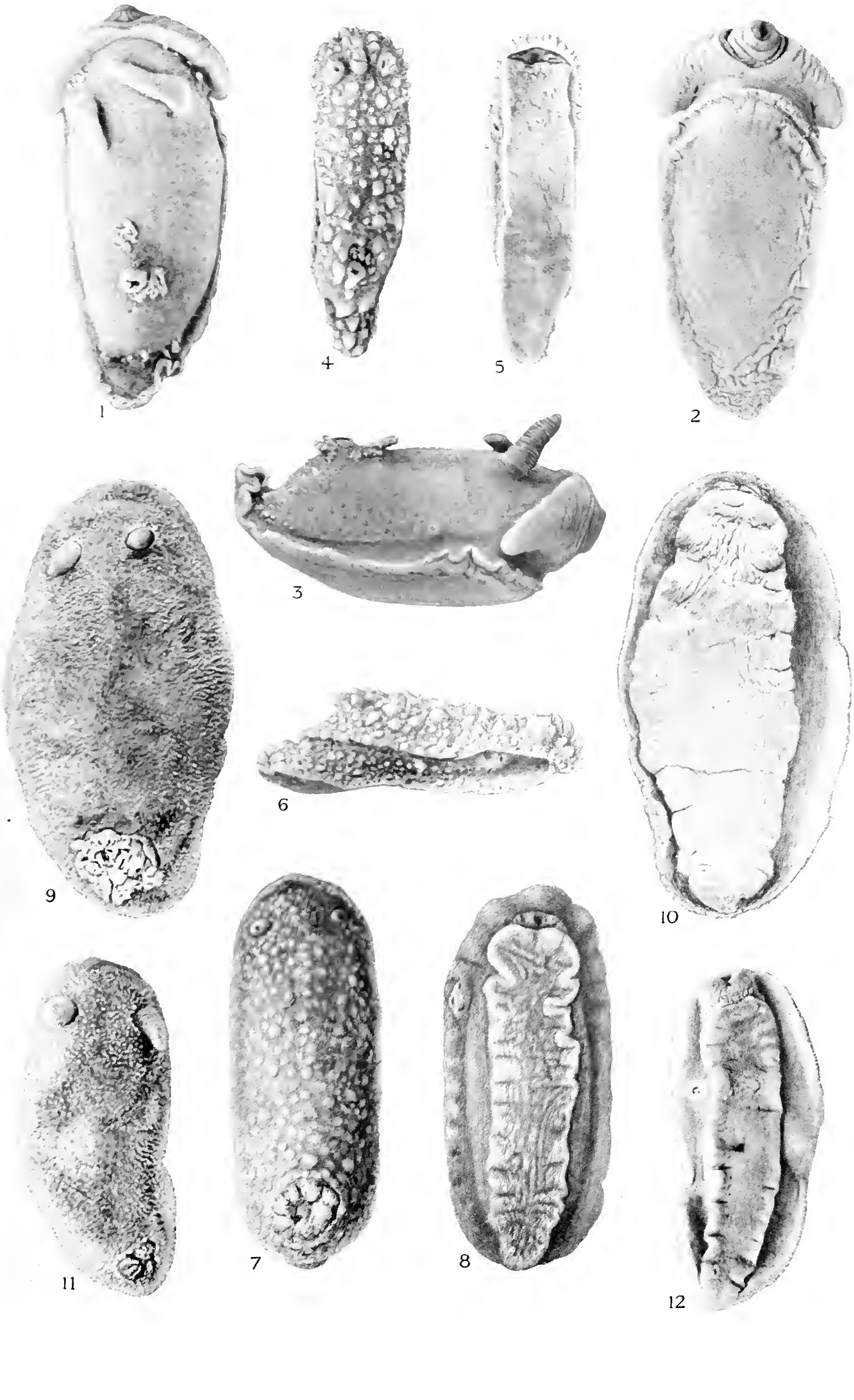
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PLATE II.

FIG. 13.—*Austrodoris granulatissima* Vayssière, St. 194, ×2.
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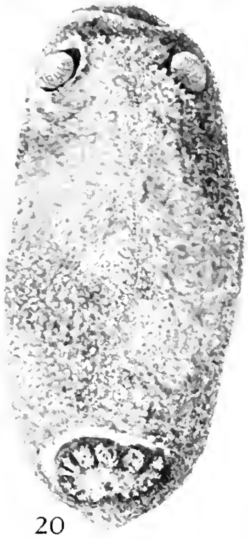
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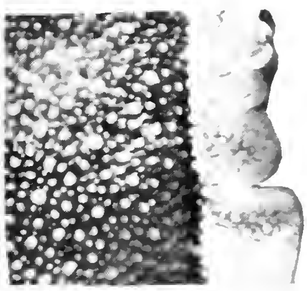
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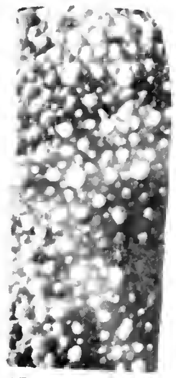
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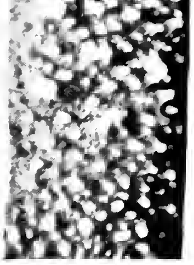
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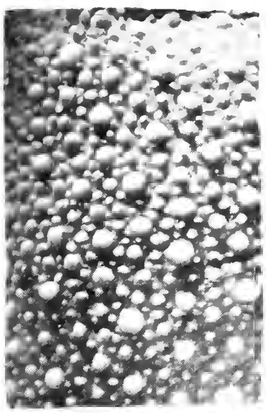
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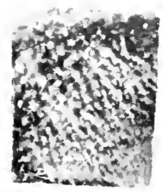
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PLATE III.

FIGS. 27, 28.—*Notaeolidia robsoni* n. sp., type, ×4.
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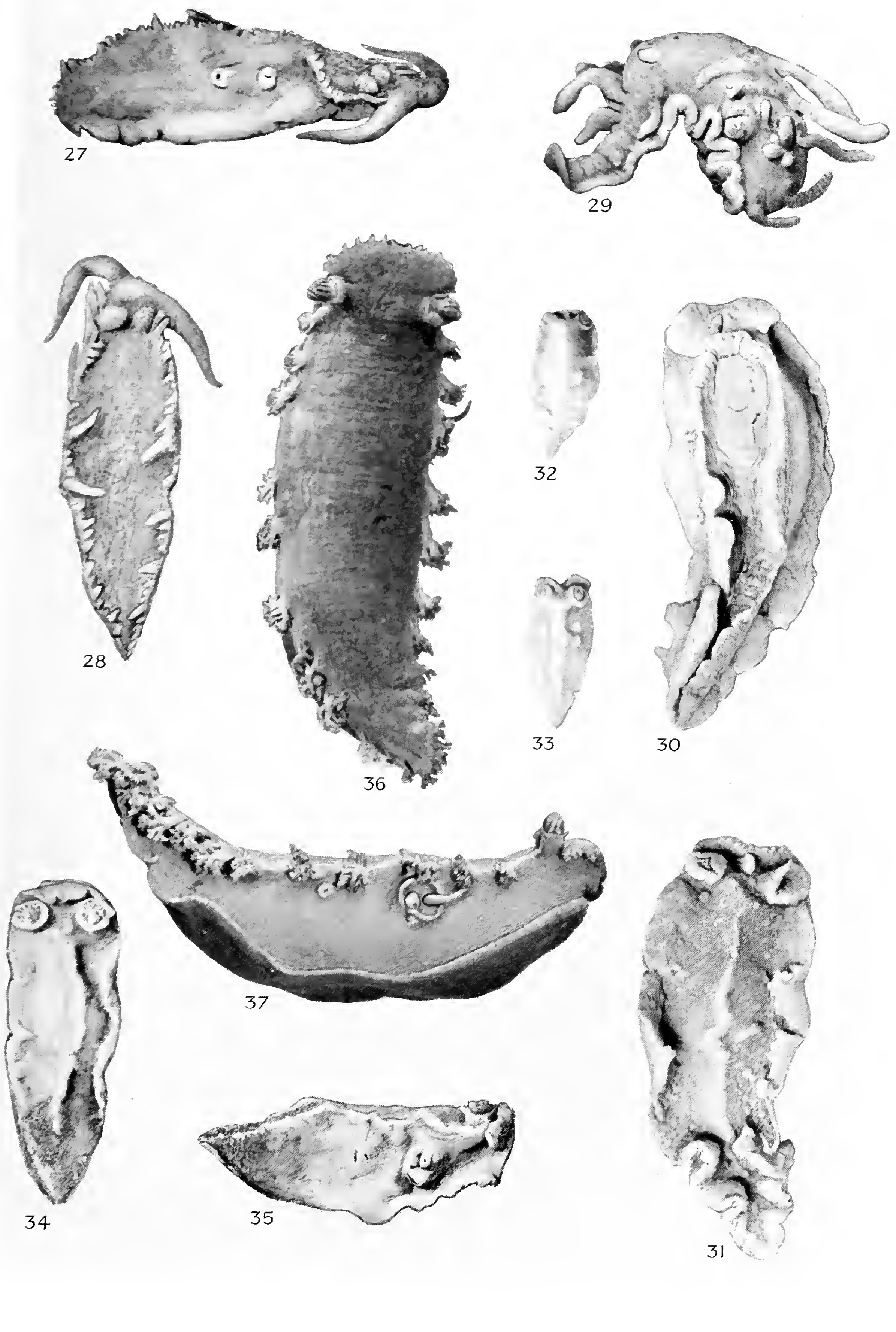
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