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VOL. V.

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PREFACE TO VOL. V.

This, the fifth volume of the Report of the Natural History Results of the Voyage of the S.S. 'Discovery' sent in 1901 to the Antarctic Regions under Captain R. F. Scott, R.N., contains five reports on Animals and one on the Lichens collected by the Officers of the Expedition, and has been edited by Mr. Jeffrey Bell.

It is hoped that another volume, treating of the Polyzoa, Polychæta, Radiolaria, Fresh Water Algæ and, possibly, some isolated specimens, will conclude these Reports, which, taking everything into consideration, may be said to have been produced more rapidly than such Reports generally are.

Sidney F. Harmer,
Keeper of Zoology.

British Museum (Natural History).
January 17th, 1910.

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SUMMARY OF THE

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CONTAINING THE REPORTS ON ZOOLOGY AND BOTANY SO FAR AS PUBLISHED.

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CONTENTS OF VOL. V.

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MAMMALIA.

I[A]. SEAL-EMBRYOS.

REPORT ON A COLLECTION OF SEAL-EMBRYOS (*LEPTONYCHOTES WEDDELLI*) MADE DURING THE VOYAGE OF THE 'DISCOVERY' IN THE ANTARCTIC SEAS, 1901–1904.

By H. W. Marett Tims, M.A. (Cantab.), M.D. (Edin.),

Professor of Biology, Royal Veterinary College, and of Zoology and Comparative Anatomy, Bedford College (University of London).

(2 Plates.)

Introduction.

Through the kindness of Professor Jeffrey Bell of the British Museum (Natural History) a collection of seal embryos was placed in my hands for examination. The collection was made during the voyage of the 'Discovery' in the Antarctic polar seas during the years 1901 to 1904. The bulk of the material was fairly well preserved, though some was useless for histological purposes, while the larger specimens were so brittle that it was scarcely possible even to dissect them. This, coupled with the fact that the collection is rather deficient in early embryos, rendered it impossible to trace out in detail the embryological history of these interesting animals. I have therefore contented myself with giving a general account of the material, and of what appeared to me to be the more salient points of interest, more particularly those connected with structural adaptive modifications, or such as may have some bearing upon the phylogeny of the sub-order.

The embryos are all labelled as those of Weddell's Seal (*Leptonychotes weddelli*). The material is the more interesting since a similar collection was obtained during the voyage of the 'S. Y. Belgica' in 1897–1899. The latter has been placed in the hands of several investigators, and some of their results have now been published.

The Antarctic *Phocidæ* are represented by five genera, *Stenorrhynchus*, *Macrorhinus*, *Lobodon*, *Ommatophoca* and *Leptonychotes** (syn.: *Leptonyx*, *Pœcilophoca*), of which the three last mentioned only are to be found within the Antarctic circle.

Dr. Wilson (13) describes Weddell's Seal as being the most handsome of them all, having a "coat richly marked with black and grey and silvery white; the upper parts are the darkest, but below these shades are blended in a most striking manner." The adult animal measures 9 to 10 feet in length and has a girth of 6 to 7 feet.

* The generic name, *Leptonychotes*, is now generally employed, since Sir William Turner pointed out that the name *Leptonyx* had been pre-occupied, having been given to other vertebrates as well as to a gastropod mollusc: see this Report, vol. ii., p. 10.

Material.

The present collection consisted of twenty-nine embryos together with some portions of the reproductive organs, presumably adult. The youngest specimen had a length of 12 mm., measured in a direct line, and was lying in position "in utero" (Pl. I., fig. 1); the oldest, also a uterine specimen, had a total circumferential length of 795 mm., and weighed 12½ lbs.

Nearly all the material had been preserved in corrosive, but in the larger specimens the uterus had not been opened and thus the preservative had been unable to penetrate sufficiently to act efficiently.

Omitting the very early uterine embryos and one or two of the larger ones that had been sliced, the following Table furnishes a list of the remainder with their measurements and dates and places of capture.

The measurements here tabulated are :—

(*a*) Length of body taken circumferentially from the tip of the snout to the root of the tail.

(*b*) Length of head (circumferentially) from the tip of the snout to a point on a level with the angle of the mouth.

(*c*) Length of the tail.

TABLE I.

Measurements of Free Embryos in Order of Size.

—	Date of Capture.	Place of Capture.	Total length to root of tail.	Head length.	Tail length.
1	Feb. 9, 1903 . . .	Hut Point.	61 mm.	17 mm.	4 mm.
2	Feb. 9, 1903 . . .	,,	63 mm.	17 mm.	4 mm.
3	Feb. 9, 1903 . . .	,,	64 mm.	15 mm.	4 mm.
4	Feb. 25, 1903 . .	,,	66 mm.	19 mm.	4 mm.
5	Feb. 25, 1903 . .	,,	76 mm.	26 mm.	4 mm.
6	Feb. 25, 1903 . .	,,	98 mm.	30 mm.	4 mm.
7	Feb. 25, 1903 . .	,,	100 mm.	34 mm.	6 mm.
8	Mar. 1–20, 1903 . .	Not stated.	105 mm.	30 mm.	8 mm.
9	Mar. 1–20, 1903 . .	,, ,,	107 mm.	25 mm.	7 mm.
10	Mar. 9, 1903 . . .	Cape Armitage.	110 mm.	33 mm.	8 mm.
11	Feb. 25, 1903 . .	Hut Point.	114 mm.	36 mm.	6 mm.
12	Mar. 1–20, 1903 . .	Not stated.	127 mm.	32 mm.	9 mm.
13	Mar. 9, 1903 . .	Cape Armitage.	126 mm.	36 mm.	9 mm.
14	Feb. 25, 1903 . .	Hut Point.	137 mm.	37 mm.	10 mm.
15	Mar. 9, 1903 . .	Cape Armitage.	139 mm.	36 mm.	10 mm.
16	Mar. 1–20, 1903 . .	Not stated.	144 mm.	40 mm.	15 mm.
17	Mar. 1–20, 1903 . .	,, ,,	147 mm.	42 mm.	12 mm.
18	Mar. 1–20, 1903 . .	,, ,,	152 mm.	40 mm.	7 mm.
19	Mar. 1–20, 1903 . .	,, ,,	153 mm.	40 mm.	13 mm.
20	Mar. 9, 1903 . .	Cape Armitage.	158 mm.	36 mm.	10 mm.
21	Mar. 1–20, 1903 . .	Not stated.	160 mm.	42 mm.	10 mm.
22	Feb. 25, 1903 . .	Hut Point.	161 mm.	47 mm.	10 mm.
23	Mar. 1–20, 1903 . .	Not stated.	190 mm.	50 mm.	12 mm.
24	Not stated.	,, ,,	560 mm.	155 mm.	52 mm.
25	Not stated.	,, ,,	795 mm.	230 mm.	70 mm.

It will be seen that all these embryos, the place of capture of which is stated, were obtained either at Cape Armitage or Hut Point. It is difficult from the above Table to deduce any definite facts relative to the rate of growth, as, from the same locality and on precisely the same date, specimens were obtained with extreme total lengths of 66 mm. and 161 mm., a difference of 95 mm. The mean date of capture may be taken as March, and the mean length of the embryos included in the above Table (excluding Nos. 24 and 25, the dates of capture of which are not given) is 155 mm., or, including the tail, 127·5 mm. The average length of those obtained during February (9th to 25th) is 99 mm., while that of the thirteen taken in March (1st to 20th) is 149·6 mm. Taking the mean dates in these two months as February 17th and March 10th, we arrive approximately at a rate of growth of 50 mm. in 21 days. Supposing this to represent the rate of growth from the commencement, it follows that the date of sexual pairing would be in the early part of January. From these figures one may also estimate the period of mating as being not less than six weeks.

Major Barrett-Hamilton states (2) that the young of Weddell's Seal are born on the ice in September. Dr. Wilson, in his appendix to Capt. Scott's "Voyage of the 'Discovery,'" however, says that they were able to observe the breeding habits and that the young were born "during the last week of October and the beginning of November." This difference of two months may possibly be accounted for by the difference in latitude. The young specimen (three months old) described by Major Barrett-Hamilton was found by the 'Belgica' Expedition in 70° 18″ S. Lat., whereas those observed and collected by the 'Discovery' were obtained about 78° S. Lat.

It may therefore safely be concluded that the period of gestation in the seals is not less than nine months, probably rather longer. Nine months is the time given by Sir William Turner, though he does not mention the data upon which he based the statement.

It is evident that the rate of growth as estimated above for the earlier period of intra-uterine life must be increased during the later periods, otherwise a young animal born in the early part of November would measure but just over 600 mm., which is considerably exceeded in my oldest uterine specimen. The development of the hair, the descent of the testes, and other factors, lead to the conclusion that this largest fœtus could not have been far from completing its uterine existence.

Description of the External Characters.

Colour.—With the exception of the two oldest specimens, all the embryos are destitute of hairy covering and are of an ivory-white colour, due no doubt in part to the action of the preservative fluid. The only pigment visible gives rise to a narrow black line along the margin of each eyelid, where it makes its appearance at a very early age. The two largest specimens showed considerable colouration; in the younger

(No. 24) the pigment was confined to the cutis, the hair but just showing through the skin on the body, though it was rather more evident on the head. In the older specimen (No. 25) the body was covered with hair, the limbs alone being naked. The dorsal aspect of the trunk is of a uniform dark olive-green colour, the ventral surface being paler, more particularly in the region of the throat where the colour tends to yellow. Along the sides of the body are numerous elongated "splashes" of a yellowish-grey colour. Similar splashes, though less numerous, are also present on the ventral surface. The limbs are very dark in colour, the plantar surfaces of the toes being almost black. Both manus and pes are destitute of hair. Even in this specimen the pigment is largely present in the cutis, from which it seems to travel up into the hairs.*

At what age the colouration makes its appearance is uncertain, as there is a very considerable difference in size and age between the oldest uncoloured specimen (No. 23) and the two under consideration.

These animals appear to undergo considerable alteration in colour shortly after birth. Major Barrett-Hamilton (*loc. cit.*) describes the skin of a young male (? three months) as being slatey-grey above and dirty white on the under surface of both body and flippers. The "splashes" mentioned above seem to be of a more permanent character, for the same author speaks of a "series of dirty white spots running obliquely forwards, arranged almost in rows and give the impression that they are discontinuous streaks." This impression is not confirmed by these specimens. The post-natal alteration in colour is probably due to a shedding of the hair.

Hair.—As already mentioned the hair is just emerging through the skin of the trunk in fœtus No. 24. In the oldest specimen (No. 25) the hair on the body was 5 mm. in length and about half as long again on the head. The hairs are straight, with a slight tendency to curl, soft and smooth; they are closely apposed to the surface and firmly adherent to the skin by their roots. Over the body the general direction is backwards, but on the limbs the hair slopes towards the borders and away from the median line of the limb itself.

Seen under a lens the hair is of uniform diameter throughout the greater part of its length, but towards the free extremity it tapers somewhat abruptly to a point. Pigment is visible in the central axis of the tapering portion but is absent from the remainder of the hair.

The different genera of the Phocidæ exhibit differences in the nature of the early hairy covering and also as to the period of shedding. Wright, quoted by Turner (11), describes the hair in *Phoca vitulina* as long, whitish, curly or woolly, and shed "in utero" in the early part of June; the hairs of the newly-born being of the same colour and quality as those of the mother. This, Wright thinks, is consistent with the fact

* At a meeting of the British Association for the Advancement of Science at Leicester, in 1907, Professor Simroth drew attention to a similar fact in *Cricetus frumentarius*, in which the black pigment in the young animal is found only in the cutis, but later on in the hair.

that the young pass at once into the water. In another animal of the same species, born in the Zoological Gardens in London, the hair was got rid of immediately after birth, and with it the young animal formed a sort of nest upon which it lay for some hours.

The fœtal hair of *Leptonychotes* seems to approach in quality more nearly to that of *Halichœrus*, as described by Turner, rather than to that of *Phoca*. The young of *Halichœrus* do not change their first hair until about three weeks after birth, and then, but not till then, do they take to the water. Dr. Wilson (*loc. cit.*) gives some interesting particulars in this connection with regard to the habits of the young of Weddell's Seal. He says that after birth the young "lay on the ice at the mouth of the blow-holes which the parents kept open for the purpose of procuring food. The young were born in a thick and woolly coat of dull ochre-grey and black showing something of the markings which would appear later on in the adult. The coat began to drop off at the end of fourteen days, and by the end of a month the moult had finished. The young seal, attired now in a very handsome coat of glossy black and silver hair, could for the first time enter the water and take a share in finding its own food. It is suckled for a variable time on the ice. It takes about two years to arrive at maturity and the size increases considerably for many years."

Wright has suggested that the character of the fœtal hair on those seals which take to the water immediately after birth may present certain differences from the hair of those animals which enter the water only after some interval of time. The facts just stated appear to confirm the truth of this suggestion. And further, *Leptonychotes*, both in habit and in the quality of the first developed hair, more closely resembles *Halichœrus* than *Phoca*.

The vibrissæ on the upper lip are arranged in four rows. They are distinctly visible in embryos of 98 mm. in length (No. 6), so that by the time the body hairs begin to appear the animal has whiskers of considerable length. The tufts of long hairs which are attached a little distance above the inner angle of the eye do not make their appearance until later, when the animal has attained a size of 158 mm. (No. 20).

Eyes, nose, and ears.—The eyelids were firmly adherent to one another along their edges even in the oldest fœtus. Whether they remain closed until the time of birth, or even after, as in some other carnivores, I am unable to say. In the fœtus of a Grey Seal (*Halichœrus grypus*), "about three months from the completion of its term of intra-uterine life," described by Turner, the palpebral fissure was not closed. As already stated, there is a narrow line of dark pigment along the margin of either lid from quite an early age. The pupils are circular.

The external nares are, throughout the series, in the form of crescentic slits, the concave margin being directed outwards, and are covered by a valvular fold of skin. The nares are placed upon the anterior surface of the snout, and look forwards. Not even in the oldest specimen have they assumed the dorsal position characteristic of the *Phocidæ*. In the latest stage the nose is covered with short hairs, and there is no

naked, darkly pigmented skin area, such as Mr. Beddard has figured and described (3) as present, and of systematic importance, in the *Otariidæ*.

Perhaps one of the most interesting points in the external features is what I think must be regarded as a vestige of an external ear. In a very early embryo, situated just behind the eye is a somewhat circular depression (Pl. I., figs. 2 and 3), the upper and posterior margin of which is sharply defined. Arising from the bottom of this depression, rather towards the posterior part, is a minute, filiform, forwardly directed, elevation with a small dark speck at its apex. Whether it is an aperture or not I cannot say, but I was unable to insert a bristle into it. This structure was bi-lateral, though more distinct on the right side.

It corresponds so closely to the description given by Howes (4) of the vestiges of the external ear in two of the *Cetacea* that I cannot refrain from quoting his words. In a fœtal porpoise 22 inches in length was found the external auditory aperture an inch and a quarter behind the eye, into which a fine bristle could be passed. "Overhanging this aperture was a filamentous process of the integument which measured a quarter of an inch in length, its pointed extremity being turned forwards, while behind it became somewhat broadened, fading off into that covering the head."

Still more similar is the description given of the external ear in a fœtal *Beluga*, 13 inches in length. Howes says (p. 468) that "The external ear opens, in this creature, a little above and three-quarters of an inch behind the eye by a minute slit-like aperture, somewhat crescentic in shape, and having its concavity turned forwards. There projects out of this aperture a delicate filamentous process, having the same general appearance as that observed in the porpoise, save that it is more slender and appears to spring from the integument forming the posterior lip of the aperture rather than altogether behind it." I think there can be no doubt that the structure present in this fœtal seal is the vestige of an external ear, and it is interesting to note the close agreement which exists in the last traces of this organ in animals of different classes, which have undergone so many similar structural alterations in adaptation to their aquatic habit.

Limbs.—The development of the limbs naturally invites attention on account of their adaptive modifications, and it has already been examined to some extent in this connection by Professor Leboucq (7). He, however, had a smaller amount of material at his disposal, and I think it is possible to add some additional points of interest to his published account. The first thing that strikes the observer is the precocious development of the hind limb. In fig. 1 the hind limb is as long, if not slightly longer, than the fore limb. With the growth of the embryo the total length of the latter soon exceeds that of the former, as is seen by a reference to figs. 4, 5, 6. This increase is due to an elongation of the femoral and crural segments, since it is not until the embryo reaches a body length of about 144 mm. (No. 16) that the length of the pes begins to exceed that of the manus, and even then there are individual instances in which this is not the case.

Leboucq (*loc. cit.*) has given the actual measurements of the hand and foot of four specimens of *Leptonychotes*, together with the ratio that each bears to the body length. The measurements are taken from the radio-carpal and tibio-tarsal articulations respectively to the distal extremity of the first digit. For purposes of comparison I have adopted the same points, and the measurements of the material in hand are set forth in the following Table, together with the ratios of the hand and foot to body length.

TABLE II.

SHOWING LENGTH OF HAND AND FOOT AND RATIO OF EACH TO BODY LENGTH.

Numbers corresponding to numbers in Table I.	Length of Hand and Foot.	Ratios to Body length.	Numbers corresponding to numbers in Table I.	Length of Hand and Foot.	Ratios to Body length.
3	H. 4·0	6·2	15	H. 14·0	10·0
	F. 4·0	6·2		F. 14·0	10·0
4	H. 4·5	6·8	16	H. 15·0	10·4
	F. 5·0	7·5		F. 16·0	11·1
5	H. 5·0	6·5	17	H. 14·0	9·5
	F. 5·0	6·5		F. 17·0	11·5
6	H. 7·0	7·1	18	H. 16·0	10·5
	F. 7·5	7·6		F. 18·0	10·8
7	H. 9·0	9·0	19	H. 15·0	9·8
	F. 8·5	8·5		F. 15·0	9·8
8	H. 11·5	10·9	20	H. 16·0	10·1
	F. 11·5	10·9		F. 18·0	11·3
9	H. 11·0	10·2	21	H. 18·0	11·2
	F. 11·0	10·2		F. 19·0	11·8
10	H. 12·0	10·9	22	H. 18·0	11·1
	F. 12·0	10·9		F. 16·5	10·2
11	H. 9·5	8·3	23	H. 18·5	9·7
	F. 10·0	8·7		F. 21·0	11·0
12	H. 12·5	10·3	24	H. 65·0	11·6
	F. 13·0	10·7		F. 75·0	13·2
13	H. 12·0	9·5	25	H. 113·0	13·0
	F. 12·0	9·5		F. 127·0	14·6
14	H. 13·0	9·9			
	F. 12·0	9·1			

The figures are substantially in agreement with those given by Professor Leboucq, which I quote here for comparison.

TABLE III.

Comparison of Limb Measurements of Specimens in the 'Belgica' and 'Discovery' Collections.

'Belgica' Material.			'Discovery' Material.		
Body length.	Length of Hand and Foot.	Ratios.	Body length.	Length of Hand and Foot.	Ratios.
113	H. 8 F. 9	7·08 7·96	114	H. 9·5 F. 10·0	8·3 8·7
120	H. 10 F. 12	8·33 10·00	121	H. 12·5 F. 13·0	10·3 10·7
172	H. 18 F. 19	10·46 11·04	No specimens of corresponding size.		
190	H. 20 F. 23	10·53 12·10	190	H. 18·5 F. 21·0	9·7 11·0

The following conclusions arrived at by Professor Lebouceq from his four specimens are fully borne out by the study of this additional material, viz. :—

1. The length of the limbs does not remain of constant proportion to that of the body.

2. The proportion per cent. increases from the earlier to the later stages.

3. The increase in the hand and foot does not remain parallel, but is in favour of the foot.

And further the surmise that, in stages younger than those in his possession, the proportions of the two extremities would be equal, is shown to be correct by the younger embryos of the 'Discovery' collection.

The limbs appear as buds, with bulbous extremities, which spring out almost at a right angle to the long axis of the trunk (fig. 1) with the flexor surface apposed to the body, the radial and tibial borders directed anteriorly, and the median axes of the arm and leg directly continuous with those of the manus and pes. This continuity of the axis persists from a short time after the appearance of the digits (fig. 4). Very soon, however, the manus becomes ulnar flexed, so that the median axis of the hand forms an obtuse angle with that of the arm, the radial border of the forearm being in a direct line with the radial border of the pollex (fig. 5). Up to this point the change in position seems to have affected the hand only, but now the whole limb begins to assume a backward direction, the axes of the hand and arm once more become almost continuous (figs. 6, 7). In the case of the hind limb the backward extension is gradual but continuous, the movement affecting the whole extremity simultaneously.

Manus.—In an embryo 64 mm. long the five digits are quite visible and distinctly webbed, the webbing extending to almost the tips of the fingers and, at this stage, being quite as well marked as in the foot. At this stage the second digit is slightly longer than the others, the fifth being the smallest. The nails begin to appear when the animal is rather older. Beyond the change in position of the limb described above, the manus retains these characters throughout fœtal life.

Pes.—At their first appearance the digits are spread out in a fan-shaped manner. They are sub-equal in length and united by a web. The outermost digits on both sides soon commence to elongate, so that the tips of the digits are in a line with each other (figs. 5, 6). This increase continues until the first and fifth digits are longer than the intervening toes (fig. 7), a condition which obtains throughout the life of the animal. A web extends between all the toes. Those portions of the web which pass between the first and second digits and between the fourth and fifth are very short, so that their mobility is considerably restricted. The portions of the membrane on each side of the central digit are much longer. This condition is shown in the text (fig. 8), which is drawn from the foot of the largest fœtus.

Accompanying the elongation of the outermost toes there is a considerable amount of flattening and lateral expansion, each toe having a width of 2·5 cm. The flattening becomes more marked towards the extremity where the digit is almost membranous. The nails are terminal and recurved in the earlier stages, but, owing to the elongation and expansion of the fleshy parts of the toes, more particularly the first and fifth, they come to be on the dorsal surface 1·3 cm. from the distal margin. After the nails have once been formed they increase but very slightly in size; in the specimen here represented the free portion of the nail has only a length of 3 mm. Those on the three central digits are rather longer and are placed somewhat nearer to the extremity.

Visceral arches.—As might be expected, these are only visible in the very earliest stages; the intervening clefts are not perforated (fig. 2).

In the later stages the subcutaneous tissues become laden with fat, the lobules being bound together by very tough connective tissue. The rapid accumulation of fat in the skin as the intra-uterine life is drawing towards its termination, is in preparation for the young animal's independent life in the frozen waters of the Antarctic seas.

Skeletal and Muscular Systems.

I am able to add but little to the accounts already published by Leboucq, Murie, and others, with regard to the anatomy of the skeleton and muscles. There are, however, a few points of interest to which attention may be drawn.

Skeleton. Skull and Vertebral Column.—With the exception of the basis cranii, the process of ossification had not advanced to any great extent even in the oldest fœtus. In general shape the skull has the characteristic adult appearance from quite

an early age. In the specimen No. 24 the bizygomatic breadth measured 64 mm., the bicranial diameter being but 61 mm. It is doubtful whether the relations of these two diameters is of any importance, since in the two skulls of *Stenorrhynchus leptonyx* measured by Turner, the bizygomatic was greater in one, the bicranial in the other. A point to which it is possible greater importance may be attached is that in the fœtal *Leptonychotes* the widest part of the zygomatic arch is at its posterior end, the breadth gradually diminishing as one passes forwards. In this respect they agree with the adult skull of *Stenorrhynchus*, but differ from that of the adult Weddell's Seal, in which the widest part is at the mid-point of the arch. The most interesting point which I have observed is the extraordinary downward curve in the cervical region of the vertebral column (Pl. II., fig. 12). The curvature involves the whole of the cervical and the anterior portion of the dorsal region. The bend is so considerable that the ventral surfaces of the vertebræ are brought so close to the ventral body wall that the trachea and œsophagus are deflected to one side. Dr. Gadow made the suggestion to me that it might possibly be a sexual character present only in the males and caused by the habit of lifting the females when pairing. I therefore made median sections of both sexes and found that the curvature is a constant feature, and further, that it tends to become accentuated with the increasing age of the fœtus. It is evidently caused by the action of the powerful muscles on the dorsum of the neck which, by approximating the head to the mid-dorsal region, have caused a "buckling-up" of the spinal column while in a cartilaginous and plastic condition. The particular mechanical advantage to be derived by this condition is not quite easy to understand, but apparently a short stunted neck is of value to aquatic animals as evidenced by the Cetacea and Sirenia. In these mammals the shortening is brought about by an antero-posterior compression and a partial fusion of the individual vertebral centra. In the seals, however, the same end has been attained by different means. I am not aware of this fact having been noticed before; it certainly is not shown by the mounted skeletons which are to be seen in museums.*

Muscular system.—So detailed and careful a description of the muscles and their attachments in *Otaria* and *Trichechus* having been given by Dr. Murie (9), it is unnecessary for me to do more than note the points in which the muscles of these animals appear to differ from those of the fœtal specimens under consideration. It is necessary, however, to repeat that the material was by no means in good condition for dissection, the muscles being in a very brittle condition, so that, in spite of care, the facts here recorded must be taken with a certain amount of reservation.

Writers on mammalian myology attach considerable importance to the muscles as being of systematic and phylogenetic importance. Bearing this in mind, I have compared the muscles of the embryo seal with the descriptions of the muscles of the

* A mounted, but not exhibited, skeleton of *Phoca vitulina* in the Natural History Museum shows a well-marked curvature in the cervical region.—F. J. B.

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terrestrial Carnivora as given by Drs. Parsons and Windle (14), to see what evidence, if any, could be obtained in support of Mivart's suggestion that the Otaries may have been derived from bear-like ancestors, while the *Phocidæ* had another, possibly Lutrine origin (8).

From the fact that the muscles which show distinctive characters between the *Ursidæ* and the *Mustelidæ* are with one exception (viz. the *Rhomboideus profundus* as a separate muscle) confined to the limbs, the very positions in which adaptive peculiarities would probably be most apparent, it might be inferred that but little evidence would be forthcoming from this source. As a fact, however, the altered position and functions of the limbs seem to have produced, at least in the embryo, comparatively little change in the muscular attachments.

Anterior extremity.—(i.) The *Supinator longus* is a well-marked muscle inserted into the *lower* end of the radius. It arises from high up on the shaft of the humerus close to the tuberosities, there being practically no origin from the supra-condylar ridge. The origin of the muscle agrees closely with that of *Trichechus*, but would appear to correspond only with the second additional belly arising from the deltoid ridge which Dr. Murie described in *Otaria jubata*. The attachments also further correspond with those found in *Lutra*. According to Drs. Parsons and Windle this muscle is constantly present in the *Ursidæ*, *Viverridæ* and in most of the *Felidæ*, but absent in the *Canidæ* and *Hyænidæ*.

(ii.) The *Pronator radii teres* is inserted into quite the lower end of the radius, and I could find no deep head of origin. This attachment agrees with what Drs. Parsons and Windle found throughout the land Carnivores, and they point out that the insertion is "of some interest from a systematic point of view." The insertion found in the seal agrees with that found in the *Ursidæ* and many *Mustelidæ*, including *Lutra vulgaris*. The description given by Dr. Murie in *Otaria* is rather ambiguous, but the attachments would seem to be more extensive, though it must be remembered that he is describing the conditions found in the adult animal, and it is quite possible that in the seals the terrestrial condition found in the fœtus may, when the limb becomes functionally powerful, give place to more extensive bony attachments.

(iii.) *Flexor carpi radialis* is inserted into the bases of the first and second metacarpals, the latter attachment being the smaller, and has disappeared altogether in *Otaria*. The insertion into both metacarpals agrees with the condition found by Meckel in *Ursus arctos*.

(iv.) *Palmaris longus.*—The attachments of this muscle appear to vary considerably in the land Carnivora. Drs. Parsons and Windle describe this muscle as composed of external and internal portions, both of which are present in the *Procyonidæ* alone, the muscle being frequently absent altogether in the *Ursidæ*. They find both portions of the muscle present in *Lutra cinerea*, while in the majority of the *Mustelidæ*, including *L. vulgaris*, the large external one alone was present. Both portions are present in the embryo seal, the external being the larger. The condition approximates

more closely to that of *Trichechus* than of *Otaria*, the Palmaris tertius in the former being much weaker than the other two heads.

(v.) *Flexor sublimis digitorum* gives tendinous slips to all the digits, that to the pollex being the largest and the slip to the fifth digit being very small. This arrangement coincides with that found in *Trichechus*, though in the latter the fifth slip does not appear to be so much reduced. In this respect the condition in the seal is intermediate between *Trichechus* and *Otaria*, in which the slip to the fifth digit is wanting. Tendinous slips of insertion to all the digits seem to be exceptional among the land Carnivores, in which the slip to the fifth digit is usually absent.

(vi.) *Flexor carpi ulnaris.*—Only the olecrano-pisiform portion of the muscle appears to be present; if there be any condylar fibres, they form but an insignificant part in these fœtal animals. Here again this muscle is similar to that of *Trichechus*, in which there is no sharp division between it and the third Palmaris longus. In *Otaria* there is in addition a second strong tendon of insertion into the fifth metacarpal bone.

Drs. Parsons and Windle give no instance of a Fissipede in which the olecrano-pisiform portion of the muscle is alone present, though the condition seems to be approximated in *Procyon lotor*, *Ictonyx* and *Mustela putor*.

(vii.) *Flexor brevis digitorum manus.*—I could find no trace of this muscle, which I believe to be absent. In this respect this Seal agrees with the Otary and not with the Morse, in which this muscle is present.

(viii.) *Extensor communis digitorum* gives tendons of insertion to all the digits with the exception of the first. They spring from a broad tendinous expansion lying over the dorsum of the metacarpals and blending with the fascia over the radial side of the manus. This is the usual carnivorous plan, but in this instance the tendinous expansion appears to be unusually large and strongly developed. A further point to notice is the presence of a tendinous intersection running for some distance up into the fleshy belly, into which the fibres on each side are inserted, giving a pectiniform arrangement, so commonly seen in the deltoid muscle.

(ix.) *Extensor profundus digitorum* is inserted into digits 2, 3 and 4, the last being very feeble. The two outermost slips are inserted into the *bases* of the proximal phalanges, that to the second digit being prolonged onwards, reaching nearly to its distal end. A membranous expansion extends between the tendons. The condition of the outermost tendon seems to indicate approaching extinction. Absence of any slip to the pollex is a noticeable peculiarity on account of the relatively large size of that digit.

(x.) *Extensor ossis metacarpi pollicis.*—I was unable to detect any origin from the radius. The groove on that bone for the tendon was comparatively deep. In origin this muscle agrees with *Otaria*, in which there is no radial origin, while in *Trichechus* the only bony origin is from the radius.

Immediately subjacent to this muscle a long tendon was to be found which

appeared to arise in common with this extensor and was inserted into the fascia covering the dorsal surface of the carpus.

I am omitting any account of the muscles of the hinder extremity, as the limbs were so rigidly fixed in the older specimens and the muscles in such a brittle condition that any data which could be obtained seem to me to be unreliable. The facts related with regard to the muscles of the anterior extremity are, I believe, so far as stated, trustworthy.

A consideration of these facts tends towards certain conclusions :—

(i.) The muscles as a whole show a closer agreement with the muscles of *Trichechus* than with those of *Otaria*. There are one or two exceptions (*e.g.* Flexor brevis digitorum, Extensor ossis metacarpi pollicis), but the general tendency is as just stated.

(ii.) Mivart's suggestion of a Lutrine origin for the Phocidæ seems to receive some additional support, the muscles as a whole agreeing rather more closely with the accounts given by Drs. Parsons and Windle of the myology of *Lutra* than with that of other terrestrial Carnivores.

Alimentary System.

The upper lip, which is cleft in the middle line, carries six rows of stiff elongated vibrissæ on either side. The tongue also is cleft at the tip, though in the later embryonic stages the fissure is relatively not so deep. The lingual papillæ do not become distinctly visible to the naked eye until the latter part of fœtal life, and even in the oldest specimens the anterior third of the dorsum of the tongue appears to be destitute of them. On the posterior two-thirds of the dorsum filiform papillæ are distinctly visible, being arranged in fairly regular transverse rows, where they are so closely set as to give rise to the appearance of almost continuous ridges with a slightly backward inclination. At the root of the tongue, in the region of the foramen cæcum, there is a group of well-marked fungiform and circumvallate papillæ.

The faucial region is much constricted, allowing only a small passage into the œsophagus. Neither the anterior nor posterior pillars of the fauces are evident, nor is any uvula present. On each side of the fauces is a patch of follicular-looking tissue, which probably represents the tonsil.

The teeth have not erupted in any of the specimens. The dental formula of Weddell's Seal agrees with that of the other members of the sub-family Monachinæ, viz., $i\,\frac{2-2}{2-2}$, $c\,\frac{1-1}{1-1}$, $pm\,\frac{4-4}{4-4}$, $m\,\frac{1-1}{1-1} = 32$. The median incisors in the upper jaw are relatively small, the outer ones being considerably larger and more caniniform in shape. There is no diastema between the incisors. Between the outer incisor and the canine there is an interval, but none between the canine and first premolar. Passing towards the posterior end of the jaw, the intervals between the cheek teeth

progressively increase, that between pm^4 and m^1 being of considerable width. Pm^1 is a comparatively small tooth, while the remaining premolars are sub-equal; if anything, pm^2 is slightly the largest of the series. From the fact that the Phocinæ still retain the characteristic number of three incisors in the upper jaw, it may be presumed that the loss of an incisor in the Monachinæ has taken place comparatively recently, and the question arises, which of the three is the missing tooth? Comparison with other mammals, *e.g.* Rodents and Marsupials, affords no clue, since the tooth differs in both these orders. I have, therefore, examined serial sections of the upper jaw in these seals at different ages in order to try and determine this point.

In a specimen with a body length of 147 mm. (No. 17), I found what I believe to be distinct evidences of three upper incisors. Of these the first and third were considerably larger than the vestige of the intervening tooth, $\overline{i^1}$ already giving evidence of calcification. A consideration of the facts appears to lead to the conclusion that it is the second incisor which is missing in the adult. If this conclusion be correct, it tends to support Mivart's opinion of a Lutrine origin for the seals, for in Lutra itself $\overline{i^2}$ is the smallest of the series, and in many cases this tooth is so crowded out that it occupies a position quite behind the other incisors. Mere inspection of the teeth would lead to the conclusion that $\overline{i^2}$ is in process of extinction among living Otters.

So far as I have been able to determine, the tooth-genesis in the seals affords no distinct evidence as to their phylogeny.

It is well known that the milk dentition of the seals is but feebly developed, and it is generally stated that the teeth belonging to that series are usually shed just before or very shortly after birth. From an examination of these jaws, I am of opinion that many of the deciduous teeth either do not all develop beyond the stage of a non-calcified enamel organ, even if so far, or else if they attain a stage of calcification that they disappear at an earlier age than is usually supposed.

In the jaws here figured the only milk tooth which was present was $\overline{dpm^2}$.

Further detailed investigation would no doubt settle these points, but I have not deemed the matter of sufficient general importance to work through all the material in the present instance, though I hope I may be permitted to do so on a future occasion.

As already mentioned, owing to the curvature of the vertebral column in the cervical region, the œsophagus is deflected to one side.

There is a considerable amount of black pigment present in the mesentery and peritoneum generally. In the dorsal part of the cavity it is present in so large an amount as to give the peritoneum in this situation an almost uniformly black appearance.

The greater part of the stomach lies to the left of the mesial plane; it is relatively broad, so that the organ has an almost globular shape. The liver becomes more multilobed as age increases, the individual lobes exhibiting a considerable amount of

fissuring (figs. 9, 10, 11). In the oldest specimen there is a greatly elongated lobe on the left side which runs some distance backwards along the dorsal abdominal wall.

The intestine was considerably convoluted. Owing to its brittle condition it was impossible to obtain exact measurements, but the total length of the gut was approximately 2·5 metres in the oldest fœtus. The large intestine was not sacculated, the diameter being the same throughout the length of the intestine, with the exception of the rectum, which was slightly enlarged. There was no cœcum, Meckel's diverticulum, or any appendices epiploicæ.

Respiratory System.

Two points in the natural history of Weddell's Seal direct attention to the morphology of the organs of respiration. The one, common to all marine mammals, is the prevention of the passage of water into the lungs; the other, the production of sound.

Dr. Wilson (*loc. cit.*) describes the voice as commencing "with a long and musical moan at a high pitch, which gradually got lower, and sounded much like the ice-moans that are common on an extensive sheet of ice. This was followed by a series of grunts and gurgles, and a string of plaintive piping notes, which ended up exactly on the call-note of a bullfinch. Then came a long shrill whistle, and a snort to finish, as though he had for too long held his breath."

In all the specimens in the collection the external nares were situated at the anterior end of the snout and not on the dorsal surface, the position they assume in the adult. At first they are in the form of small horizontal slit-like apertures without any valvular apparatus. In the largest fœtus the slits are crescentic, the convexity being turned towards the median line of the nose; they are almost vertical in direction. The openings are guarded by valves formed by a prolongation inwards of a fold of skin from the outer margin of the meatus. This flap when pressed down completely occludes the orifice. Closure of the valve is effected by the lower fibres of the pyramidalis nasi muscle, which on reaching the nose curve outwards and pass into the substance of the valvular lid. Below the nares, these muscular fibres bend inwards towards the middle line, some to be inserted into the premaxillary bone, others to mingle with the fibres of the levator labii superioris muscle, and appearing ultimately to interdigitate with the fibres of the pyramidalis of the opposite side. Thus, the two muscles acting in conjunction form a kind of sphincter for both nostrils and effectually close the valves. The nostrils lead into two large nasal cavities (*l. n. c.*), one on each side, which are separated by a median cartilaginous septum (figs. 13, 14). Springing from the outer wall of each chamber is a delicate scroll-like turbinal. From the posterior part of the floor of each lateral chamber is an opening leading into an elongated median chamber (*m. c.*) which overlies the posterior part of the palate. The glottis opens into the floor of this median chamber at its back part, the anterior surface of

the epiglottis abutting against the posterior free (mesial) border of the palate. At this stage the aryteno-epiglottic folds are in close apposition, so that the cleft between their margins lies in the horizontal plane, whereas the true rima glottidis is vertical (fig. 15). The relation of the parts agrees in considerable detail with the description given by Waldeyer of the larynx in the Manatee (12). The intra-narial position of the epiglottis at an early fœtal stage is interesting, in connection with the question as to whether this condition is a secondary one in the Mammalia or not. The late Professor Howes (5), after bringing forward a considerable amount of evidence, concluded that a consideration of the facts "weighs heavily against the supposition that the introduction of the epiglottis into the narial pharynx can have been a secondary process," and further, "as the case stands the facts point to the uselessness of the epiglottis in deglutition, and, to my thinking, to a primary association in mammals between that organ and the *velum palati* for purposes of respiration exclusively through the nostrils."

In order to more effectually shut off the respiratory passage from the gullet the posterior margin of the velum palati grows backwards on either side of the larynx to become, in later fœtal life, united with the dorsal wall of the œsophagus, the food having therefore to pass either to the right or left of the larynx.

Even in the oldest specimens at my disposal there is no trace of any tubular prolongation of the larynx and epiglottis such as is present in the Cetacea; indeed, the epiglottis in these seals is relatively diminutive. The particular adaptation here present to prevent the entrance of water into the lungs approaches much more closely to that of the Sirenia than to that of the Cetacea.

The high pitch of the voice referred to by Dr. Wilson is probably due to the relative shortness of the vocal cords.

The only other fact to record in regard to the larynx is that I was unable to detect the existence of the cartilaginous nodule lying in the thyro-hyoid ligament which Dr. Murie found to be present in the Sea-lion (*Otaria jubata*), or of the somewhat similar nodule, described by Howes, lying along the inner edge of the posterior corner of the hyoid bone which he regarded as a "remnant of one of the post-oral visceral arches such as are now known . . . to exist in the urodele amphibia."

The trachea passes backwards with a considerable ventral curve. Owing to the curvature of the cervical spine, to which reference has already been made, it lies to one side of the median line (in the specimen examined the trachea was to the left side). The trachea bifurcates into a right and left bronchus, the right being in almost direct continuation with the trachea itself. The eparterial bronchus is given off from the right side of the trachea on a level with its bifurcation.

The right lung has the usual three lobes of the Mammalia, the left lung being bi-lobed. Of the two the right lung is much the more massive. Owing to the great dorso-ventral obliquity of the diaphragm, the postero-dorsal margins of both lungs are prolonged backwards for some considerable distance; but, a condition which one

would not have expected is that, in spite of the presence of a large liver, the right lung extends backwards to a greater distance than does the left, thus giving the right lung a greater antero-posterior, as well as a greater transverse diameter. A small *lobus impar* was present connected with the root of the right lung.

In specimen No. 24 the actual measurements were—

Greater antero-posterior length—right lung . .	88·5 mm.
Greater antero-posterior length—left lung. . .	85·3 mm.

Circulatory System.

As in the case of the other systems, the anatomy of the circulatory system of the Pinnipedia has been so fully and carefully described by Dr. Murie (*loc. cit.*) that there remains but little to add, and I shall content myself by referring merely to a few points which have either been omitted by that author, or which I wish to accentuate.

The heart appears to be somewhat disproportionately broad, being mainly due to the breadth of the right ventricle. The heart in specimen No. 24 furnishes the following measurements :—

Total maximum breadth . . .	55 mm.
Total maximum length . . .	50 mm.
Right ventricle breadth . . .	35 mm.
Right ventricle length	50 mm.
Left ventricle breadth	20 mm.
Left ventricle length	35 mm.

The apex is traversely blunted, with a distinct notch separating the apices of the two ventricles. There is nothing in the interior of the heart requiring special mention beyond the fact that there is a well-marked moderator band.

From the arch of the aorta spring three arterial trunks, an innominate, a left carotid, and a left subclavian, as Murie has shown to be the case in the Otariidæ but not in the Trichechidæ. There is but a single renal artery to each multilobular kidney. With regard to the middle sacral artery, around the morphology of which so much discussion has centred, I failed to discover, even in quite young specimens, any evidence of a primitive double nature. So far as I was able to determine, this artery was distinctly a median continuation of the dorsal aorta arising at the point of bifurcation, perhaps slightly from the dorsal aspect. In one fœtus (No. 24) the middle sacral took origin from the dorsal aspect of the right common iliac artery, just at its commencement; I could find no corresponding branch arising from the left common iliac.

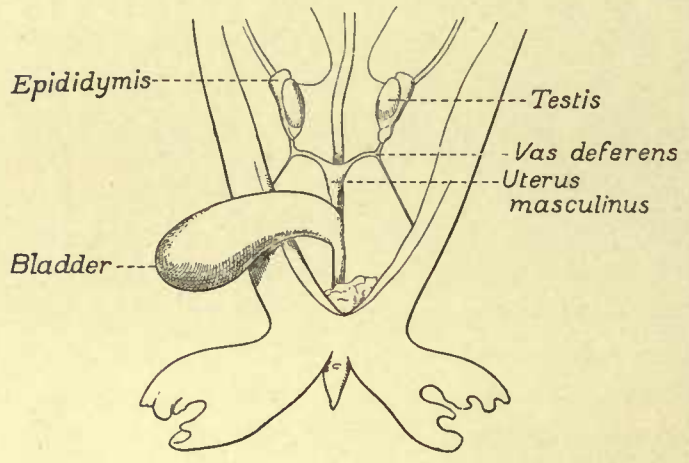
The middle sacral itself, as one would expect from the very reduced size of the tail, is an exceedingly slender vessel. About the distance of a couple of vertebræ from the point of origin it gives off a pair of bilaterally symmetrical branches which have all the appearance of ordinary segmental arteries.

Genito-urinary System.

The kidneys, as already stated, are multilobulated, the lobules being small and numerous with a connective tissue packing between the sulci. On either side was a single ureter, each of which opened separately into the base of the bladder.

I was unable to distinguish the sexes in the earlier stages by their external character, and it so happened that the four specimens which I dissected all turned out to be males. Whether this was simply bad fortune or whether it indicates that the number of males born preponderates over females I am unable to say.

The testes develop in relation to the kidney, and when recognisable as distinct organs, they lie at the posterior end of the kidney, there being a distinct depression in the latter in which the testis lies. The epididymis lies along the postero-external border of the testis, the *globus major* and *globus minor* being distinctly marked. The vas deferens leaves the hinder end of the epididymis and runs backward for a short distance and then bends sharply inwards towards the middle line. The two vasa enter the basal angles of an elongated hollow organ, which I think must be regarded as an unusually large uterus masculinus (see fig. above). Indeed, when I first saw this structure lying between the bladder and rectum I made sure that I was dealing with an ordinary female uterus. I found, however, that it opened into the neck of the bladder, and examination of the testis proved that my first opinion was incorrect.



The sudden bend toward the middle line made by the vas deferens appears to be due to its being held in position by a delicate cord-like structure, which I at first took to be the round ligament of the uterus, but which can be no other than the gubernaculum testis passing forward from the inguinal canal.

The descent of the testis appears to take place during the latter half of intra-uterine life, for in the older specimens it already lies in the inguinal canal, the position it retains throughout life.

Placenta.

The placenta of seals has been described in more or less detail by Alessandrini, Rosenthal, Eschricht and Barkow, but the most detailed account of its structure and of the arrangement of the fœtal membranes is that given by Sir William Turner.

In most of the recorded cases the uterus contained but a single fœtus, as is the case in the uterine specimens in this collection. Mayer, quoted by Turner, records an instance in *Phoca vitulina* in which the left horn of the uterus contained five embryos and the right horn four. Turner also had in his possession twin fœtuses from the uterus of a *Phoca greenlandica*. There can, however, be no doubt that the presence of more than a single fœtus is quite exceptional, and that the fœtus is situated in one or other of the cornua, the non-gravid horn being very slightly, if at all enlarged.

There is little or nothing to add to the description already given by Turner of the macroscopic characters of the placenta. As is the case in the Carnivora generally the placenta of the seal is zonary. The fœtal surface (fig. 16) shows a series of elongated cord-like elevations with intervening depressions. These elevations lie more or less parallel with one another and run in the long axis of the placenta itself (fig. 16).

The histological characters were examined by means of longitudinal and transverse sections from the margin and central portion of placenta of different ages. In order that no point of importance should be overlooked I submitted the sections for examination to my friend Mr. Richard Assheton, who has done so much to elucidate the structure and comparative anatomy of that organ, and to his kindness I am indebted for the description here given.

Two distinct stages are represented in the specimens examined. The earlier one is of an age equivalent to the 24th to 26th day of pregnancy of the dog, the older of an age equivalent to perhaps the 40th to 45th day of pregnancy of the same animal. There is, as one would expect from Turner's description (10), a very close resemblance to the placenta of Carnivora such as the dog or ferret.

In the earlier stage the angioplasmode formation of Duval has become well established but forms as yet only a thin layer. The mouths of the uterine glands are blocked by the trophoblast and by degenerated uterine epithelium, but the preservation of the material is not sufficiently good to determine the boundary between the two. The distal parts of the glands are expanded, and by this expansion and consequent thinning out of the intervening tissue the "lamelles mésentériques" are formed (fig. 17).

In the younger stage the embryonic blood corpuscles are still nucleated. Even in the early stages lacunæ containing extravasated maternal blood, lying between the maternal tissue and the trophoblast—or bounded on nearly all sides by the trophoblast —have commenced to appear. (Compare Assheton 1, pl. 13, *Canis*.)

In the older specimen (fig. 18) the angioplasmode layer has increased enormously. In the earlier stage it is only about one-sixth to one-quarter of the thickness of the sub-mucous layer, whereas in the later stage it is about twice the thickness of that layer. The dilated glands are now still more dilated, and Mr. Assheton thinks that in many cases the angioplasmode projects into their cavities.

The lacunæ of extravasated maternal blood are large and the trophoblast cells forming their walls are gorged with red maternal blood corpuscles.

There appear to be no important differences between the placenta of the seal and

that of a carnivore such as the dog; special differential staining might bring out unimportant differences in the minor details. It is impossible from the material at hand, there being no complete series, to determine whether the placenta is of the more "plicate" (Strahl) or the more "cumulate" (Duval) type.

In conclusion, may I once more tender my most grateful thanks to Professor Jeffrey Bell of the British Museum (Natural History) for having entrusted the material to me for examination and to Mr. R. Assheton for his kindly assistance in reporting on the structure of the placenta.

BIBLIOGRAPHY.

1. Assheton, R.—"The morphology of the Ungulate placenta, particularly the development of that organ in the Sheep and notes upon the placenta of the Elephant and Hyrax." Phil. Trans., vol. 198 B (1905), pp. 143–220.
2. Barrett-Hamilton, G. E. H.—"Seals." Résultats du voyage du 'S.Y. Belgica' en 1897–1898–1899 (1901), pp. 3–19.
3. Beddard, F. E.—"On the structure of Hooker's Sea-lion (*Arctocephalus Hookeri*)." Trans. Zool. Soc. Lond. (1887), pp. 369–380.
4. Howes, G. B.—"On some points in the anatomy of the Porpoise (*Phocæna communis*)." Journ. Anat. and Phys. xiv. (1879), pp. 467–474.
5. Howes, G. B.—"Rabbit with an Intra-narial Epiglottis, with a suggestion concerning the phylogeny of the mammalian respiratory apparatus." Journ. Anat. and Phys. xxiii. (1889), pp. 263–272.
6. Howes, G. B.—"Additional observations upon the Intra-narial Epiglottis." Tom. cit., pp. 587–598.
7. Leboucq, H.—"Organogénie des Pinnipèdes. I. Les extrémités." Résultats du voyage du 'S.Y. Belgica' en 1897–1898–1899" (1904), pp. 3–17.
8. Mivart, St. G.—"Notes on the Pinnipedia." Proc. Zool. Soc. Lond. (1885), pp. 484–501.
9. Murie, J.—"Researches on the anatomy of the Pinnipedia." Pt. I. "On the Walrus (*Trichechus rosmarus*)." Trans. Zool. Soc. Lond. vii. (1870), pp. 411–464. Pt. II. "Descriptive Anatomy of the Sea-lion (*Otaria jubata*)." Tom. cit., pp. 527–526. Pt. III. Op. cit. viii. (1870), pp. 501–582.
10. Turner, W.—"On the placentation of the Seals." Trans. Roy. Soc. Edin. xxvii. (1876), pp. 275–304.
11. Turner, W.—"Seals." Reports of the Scientific results of the voyage of 'H.M.S. Challenger' (1888), vol. xxvi. pt. 68.
12. Waldeyer, W.—"Beiträge zur normalen und vergleichenden Anatomie des Pharynx mit besonderer Beziehung auf den Schlingweg." Sitzungsb. der König. Preuss. Akad. Berlin (1886), pp. 233–250.
13. Wilson, E.—Appendix to "The Voyage of the 'Discovery,'" London (1905), 2 vols., by Captain R. F. Scott, R.N.
14. Windle, B. C. A., and Parsons, F. G.—"On the myology of the terrestrial Carnivora." Proc. Zool. Soc. Lond. (1897), pp. 370–409; (1898), pp. 152–186.

ILLUSTRATIONS OF *LEPTONYCHOTES WEDDELLI.*

PLATE I.

FIG. 1.—Dissection of a uterus, showing the youngest fœtus in the collection *in situ*. The hind limb is as long and well-developed as the fore limb.

FIG. 2.—A slightly older specimen, showing the position of the vestige of the external ear (*e*). Enlarged.

FIG. 3.—The head of the same specimen still more enlarged.

FIGS. 4, 5, 6, and 7.—Four embryos (natural size), showing the gradual alteration in the position of the limbs.

FIG. 8.—Foot of the largest embryo, showing the webbing of the digits and position of the nails. Natural size.

FIGS. 9, 10, and 11.—Three stages in the development of the liver. *b. d.* = Bile duct. Natural sizes. Seen from ventral side.

PLATE II.

FIG. 12.—Mesial section of an embryo, showing curvature of the cervical spine. Natural size.

FIG. 13.—Section through the head of the oldest embryo, slightly to the right of the mesial plane. The median nasal septum has been partially removed. A probe (*a*) is shown passing through the external nares into the lateral nasal cavity (*l. n. c.*). Another (*b*) through the opening from that cavity into the median chamber (*m. c.*), and a third probe (*c*) from that chamber through the rima glottidis into the trachea (*t.*), which has been opened. Reduced.

FIG. 14.—Section through the head before removal of the median nasal cartilage (*m. n. cart.*). *m. c.* = median chamber. The lateral wall of the larynx has been removed to show the communication between the median chamber and trachea.

FIG. 15.—Dissection of the larynx from above, showing the intra-narial position of the epiglottis (*epigl.*). *r.* = true rima, which is *vertical* in position; its posterior part has been drawn backwards in order to expose it. *v. p.* = velum palati.

FIG. 16.—Uterine surface of the placenta.

FIG. 17.—Section through the younger stage of the placenta.

a = lacuna of extravasated maternal blood.
b = "lamelles mésentériques."
c = "angioplasmode," trophoblast, embryonic, and maternal capillaries.
d = maternal portion of the placenta, showing uterine glands cut across (*e*).
e = uterine glands cut across.

FIG. 18.—Section through a slightly older placenta.

a = mesoblast of embryo.
b = "angioplasmode."
c = maternal portion of placenta.
d = uterine glands.

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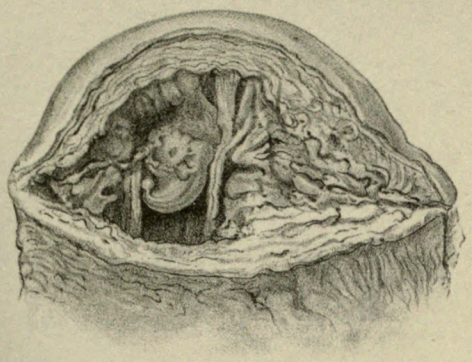

FIG. 1.

FIG. 4.

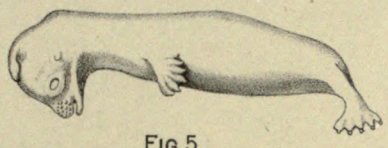

FIG. 5.

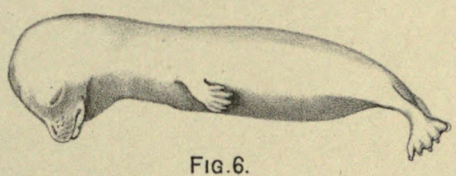

FIG. 6.

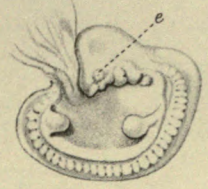

FIG. 2.

FIG. 3.

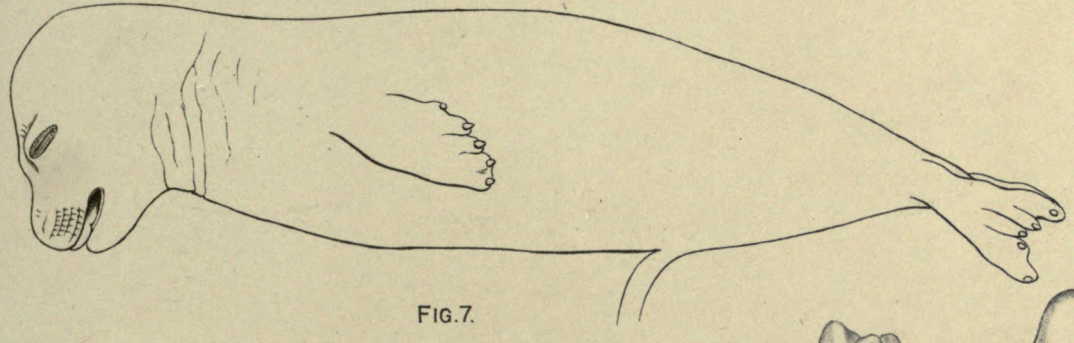

FIG. 7.

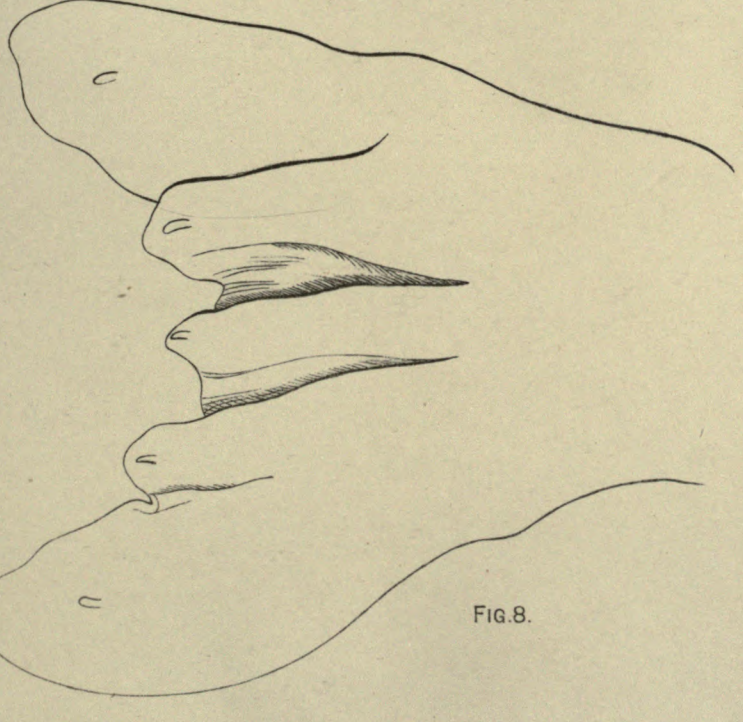

FIG. 8.

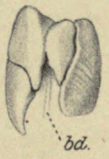

FIG. 9.

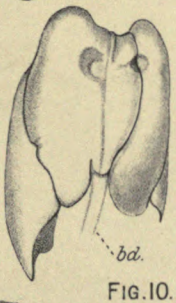

FIG. 10.

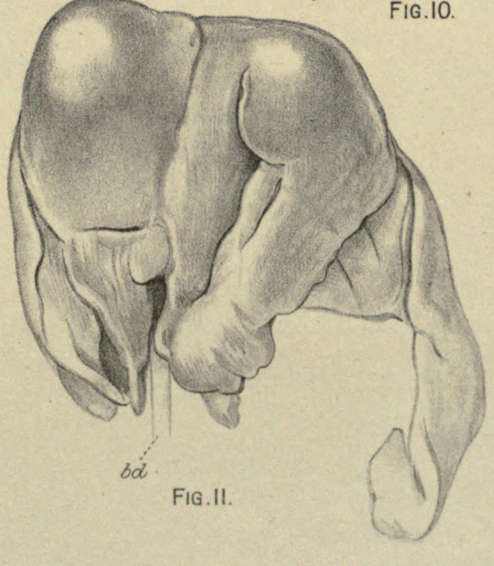

FIG. 11.

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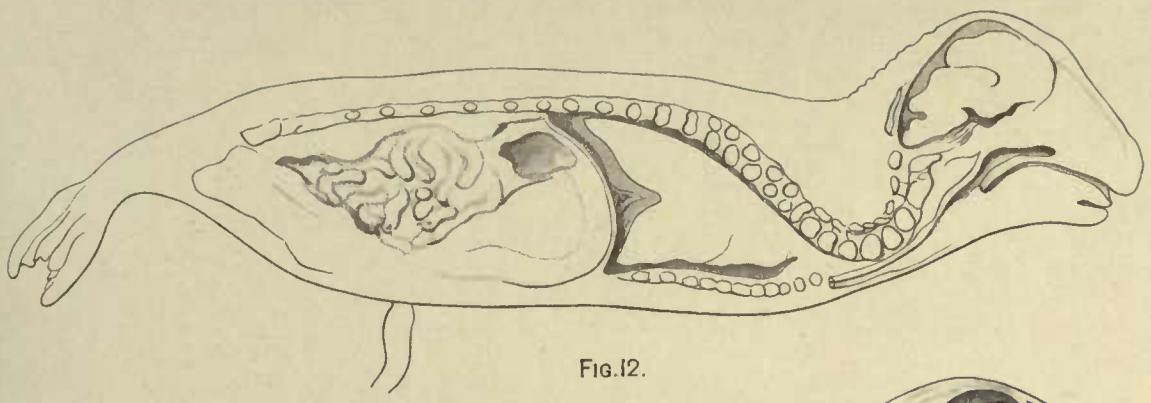

Fig.12.

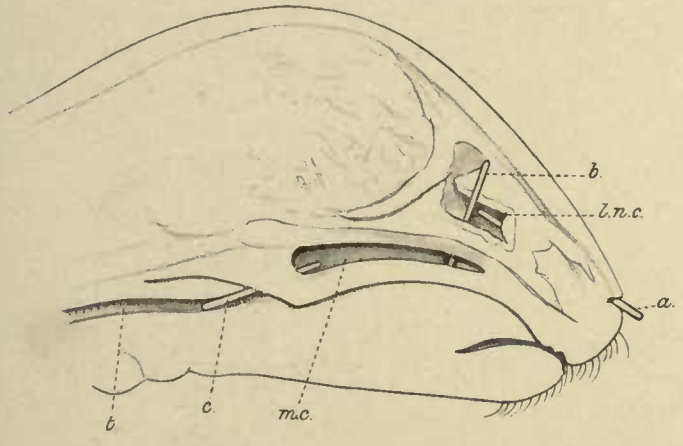

Fig.13.

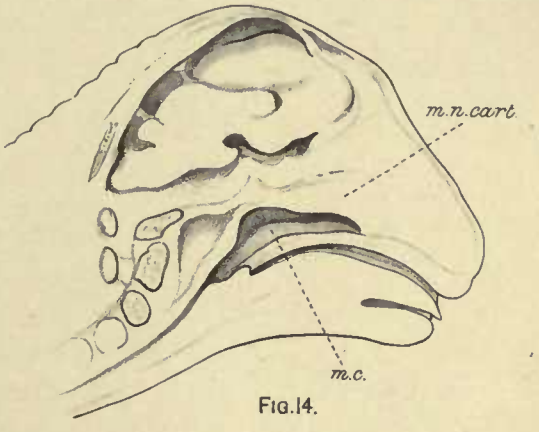

Fig.14.

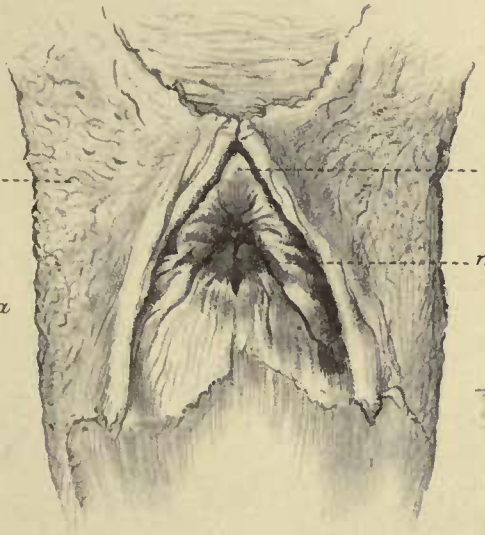

Fig.15.

Fig.18.

Fig.16.

Fig.17.

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TUNICATA.

By W. A. Herdman, D.Sc., F.R.S.,

Professor of Zoology in the University of Liverpool.

(7 Plates.)

This is a small but interesting collection consisting of about twenty-two species, represented by about 2,000 specimens. By far the greater number of the latter belong, however, to a few species of Salpidæ. If we omit the Thaliacea and Larvacea, the remaining simple and compound Ascidians number only thirty-three specimens, belonging to fourteen species. They are distributed in families as follows :—

Ascidiacea :

- Styelidæ—two species.
- Halocynthiidæ—two species.
- Boltcniidæ—one species.
- Molgulidæ—four species.
- Ascidiidæ—one species.
- Clavellinidæ—one species.
- Didemnidæ—two species.
- Polyclinidæ—one species.

Thaliacea :

- Salpidæ—four species.
- Doliolidæ—one species.

Larvacea :

- Appendiculariidæ—at least two species.

Of these I find that I must describe ten (two species of *Styela*, one of *Halocynthia*, one of *Boltenia*, four of Molgulidæ, and two compound Ascidians) as new to science, although none of them are very remarkable forms in any way. The greater part of the collection was obtained through closely adjacent holes in the ice near the Winter Quarters of the 'Discovery' in McMurdo Bay. Those species labelled simply "Winter Quarters" must be regarded as coming from shallow water between the ship and the shore in that locality.

I have already* expressed the view that the Ascidian fauna of the far South is

* Report of British Association for 1892, p. 787; and elsewhere.

characterised by the abundance and the large size of the individuals of a comparatively few species. Every collection that has been brought home from the Antarctic since has demonstrated the correctness of this conclusion, and I find that Dr. Sluiter, in a recent publication,* draws attention to the same set of facts. The aspect, for example, of the present collection, with its comparatively few species, is in marked contrast to that of a collection from the Indian Ocean, or any other tropical or sub-tropical region, where the species are numerous and small. In the present collection as large specimens we have *Styela spectabilis*, measuring 18 cm., *Molgula hodgsoni*, measuring 4 cm., and *Halocynthia setosa* up to 10 cm.; while in the collection of the Scottish Antarctic Expedition, now in my hands, this appearance of a fauna characterised by few but gigantic species is still more marked. This possession of unusually large species is a character in which the far southern seas certainly seem to surpass those of the far North. The Arctic Tunicate fauna, which is now so very much better known than the Antarctic, shows no such marked assemblage of gigantic forms.

Although so many expeditions have collected in Antarctic seas of late, it cannot be said yet that the fauna is sufficiently well known, as several of the collections have not yet been worked out. We have reports upon the 'Valdivia,' the 'Charcot,' and the 'Southern Cross' Tunicata, but those of the 'Belgica,' the 'Scotia,' and the 'Gauss' are not yet published. There will undoubtedly be a certain amount of overlapping in the collections from these various expeditions, but each will probably add something to our knowledge of the Antarctic Tunicata. That knowledge is not yet sufficiently detailed to permit of a close comparison with the corresponding Arctic fauna; but a certain similarity in families and genera—which does not, however, extend to identity of species—is noticeable. For example, amongst simple Ascidians, both polar regions are characterised by the presence of Ascidiidæ and Molgulidæ, while tropical seas have more Cynthiidæ. Other resemblances might be pointed out, but I believe the time has not yet come to make a detailed analysis of the two polar faunas.

One difficulty met with in attempting any record of a section of the Antarctic fauna is the absence of any natural northern limit and the want of agreement as to where such a limit should be arbitrarily placed.

If we take the Antarctic region in a wide sense as including the Strait of Magellan, Tierra del Fuego, the Falkland Islands and Kerguelen Island, then we have a large recorded fauna belonging to all groups of the Tunicata and characterised by abundance of specimens belonging to many species (see, for example, those collected during the 'Challenger' expedition). If, however, we use the term 'Antarctic' in a more restricted sense, as including only the sea-area south of, say, 60° S. latitude, then we cut out all land except the shores of the Antarctic continent itself; but even from this restricted region some fifty species of Tunicata are already known. The following

* Expédition Antarctique française (Charcot). Tuniciers. Paris, p. 1.

is a list of the species which have been recorded from this restricted area, including those described in the present Report:—

DISTOMIDÆ ..... *Colella pedunculata*, Q. et G.; Port Charcot (Sluiter).
Distoma glareosa, Sluit.; Chenal de Schollaert (Sluiter).
Distaplia ignota, Herdm.; Cape Adare (Herdman).

DIDEMNIDÆ ..... *Leptoclinum biglans*, Sluit.; Port Charcot, &c. (Sluiter).
L. glaciale, sp. n.; off Coulman Island (Herdman).
L. sp.; McMurdo Bay (Herdman).

ASCIDIIDÆ ..... *Corella eumyota*, Traust. (= *Corella antarctica*, Sluit.); Booth Wandel Id. (Sluiter).
Ascidia charcoti, Sluit.; Booth Wandel Id. (Sluiter).

CLAVELLINIDÆ ..... *Stereoclavella antarctica*, sp. n.; McMurdo Bay (Herdman).

STYELIDÆ ..... *Styela lactea*, Herdm.; Cape Adare (Herdman).
S. flexibilis, Sluit.; Booth Wandel Id. (Sluiter).
S. grahami, Sluit.; Booth Wandel Id., &c. (Sluiter).
S. spectabilis, sp. n.; McMurdo Bay (Herdman).
S. rotunda, sp. n.; McMurdo Bay (Herdman).
Bathyoncus (*Bathystyeloides*) *enderbyanus*, Michlsn.; Enderby Land (Michaelsen).
B. herdmani, Michlsn.; Enderby Land (Michaelsen).

HALOCYNTHIIDÆ ... *Halocynthia setosa*, Sluit.; Booth Wandel Id. (Sluiter).
H. discoveryi, sp. n.; McMurdo Bay (Herdman).

BOLTENIIDÆ ..... *Boltenia turqueti*, Sluit.; Booth Wandel Id. (Sluiter).
B. salebrosa, Sluit.; Booth Wandel Id. (Sluiter).
B. scotti, sp. n.; McMurdo Bay (Herdman).
Culeolus murrayi, Herdm.; Enderby Land (Michaelsen).

MOLGULIDÆ ..... *Bathypera splendens*, Michlsn.; Enderby Land (Michaelsen).
Molgula maxima, Sluit.; Booth Wandel Id. (Sluiter).
Molgula hodgsoni, sp. n.; McMurdo Bay (Herdman).
M. bacca, sp. n.; McMurdo Bay (Herdman).
M. longicaulis, sp. n.; McMurdo Bay (Herdman).
M. concomitans, sp. n.; McMurdo Bay (Herdman).

POLYCLINIDÆ ..... *Tylobranchion antarcticum*, Herdm.; Cape Adare (Herdman).
Pharyngodictyon reductum, Sluit.; Booth Wandel Id. (Sluiter).
Polyclinum adareanum, Herdm.; Cape Adare (Herdman).
Amaroucium meridianum, Sluit.; Chenal de Schollaert (Sluiter).
A. cæruleum, Sluit.; Chenal de Schollaert (Sluiter).
A. antarcticum, sp. n.; off Coulman Island (Herdman).
Lissamaroucium magnum, Sluit.; Port Charcot, &c. (Sluiter).
Atopogaster elongata, Herdm.; Cape Adare (Herdman).
Psammaplidium nigrum, Herdm.; Cape Adare (Herdman).
Ps. antarcticum, Herdm.; Cape Adare (Herdman).
Ps. ordinatum, Sluit.; Chenal de Schollaert (Sluiter).
Ps. triplex, Sluit.; Chenal de Schollaert (Sluiter).
Ps. radiatum, Sluit.; Port Charcot, &c. (Sluiter).
Ps. annulatum, Sluit.; Chenal de Schollaert (Sluiter).

SALPIDÆ ..... *Salpa runcinata-fusiformis*, Cham.-Cuv.; Cape Adare (Herdman).
S. mucronata-democratica, Forsk.; Lat. 60° S., &c.
S. cordiformis-zonaria, Q. et G.-Pall.; Lat. 50° S., &c.
S. hexagona, Q. et G.; McMurdo Bay.

DOLIOLIDÆ ..... *Doliolum resistibile*, Neumann ; * Lat. 65° S.

APPENDICULARIIDÆ..... *Oikopleura gaussica*, Lohm. ; Lat. 65·5° S., Long. 90° E. (Lohmann).
O. valdiviæ, Lohm. ; ditto.
O. sp.
Fritillaria borealis, f. *typica*, Lohm.
F. antarctica, Lohm.

According to this list fifty-two species are recorded from the Antarctic area south of 60° S. lat. ; eighty-one species were enumerated by Hartmeyer in "Fauna Arctica" in 1903.

In the following systematic statement the species are merely placed in families under the three great divisions of the Tunicata—groups of intermediate rank being considered unnecessary in a report of this nature.

ASCIDIACEA.

STYELIDÆ.

STYELA SPECTABILIS.

(Plate I.)

Locality.—Winter Quarters, 17. i. 03, Flagon Point, Dredge, 10–20 fms. One specimen measuring :—length 18 cm., dorso-ventral breadth (greatest) 9·5 cm., lateral thickness 7 cm., dorso-ventral breadth at posterior end 6·5 cm. ; across anterior end from branchial to atrial aperture, 8·5 cm.

External Appearance.—Body elongated, upright, somewhat flagon-shaped or swollen in the middle, not compressed laterally, attached by the posterior end (Plate I., fig. 1, and text-figs. 1 and 2). Both apertures are on the anterior end, the branchial turned ventrally and the atrial dorsally ; both are large and distinctly four-lobed (Plate I., figs. 2 and 3). The surface is even and fairly smooth, being merely creased and somewhat corrugated (see text-figs. 1 and 2), but these surface foldings probably disappear when the animal is expanded. The colour (in spirit) is yellowish grey.

Test thin, but leathery ; somewhat corrugated on the surface and finely wrinkled in places ; white in section and for the most part less than 1 mm. in thickness.

Mantle thin, but very muscular, closely adhering to test. External layer of circular and internal layer of longitudinal muscle bundles form a close and fairly regular network (see Plate I., fig. 4).

* Dr. Neumann described (Zool. Anzeiger, 5th Jan., 1909, p. 794) a new *Pyrosoma* and this new *Doliolum* from the collection of the German South Polar Expedition. It is only the *Doliolum*, however, that is really an Antarctic form, found in latitudes 64° and 65° S., as the *Pyrosoma* (*P. ovatum*, Neum.) was obtained in the South Atlantic at 30° S. latitude.

Branchial Sac with four large folds on each side, separated by wide interspaces (Plate I., fig. 5). There are about six strong bars on a fold and five in the area between two folds. The bars (fig. 6, *i. l. b.*) are wide and ribbon-like, and are far apart (except on the folds). The transverse vessels are of at least three different sizes, arranged symmetrically (Plate I., fig. 6). The meshes are elongated and may contain as many as twenty-five to thirty stigmata. The wall of the branchial sac is thrown into occasional undulations, as shown in fig. 6.

Tentacles large (1.5 mm. × 2 mm.), simple, about thirty in number; a few are smaller, but there is no regular alternation.

Dorsal Lamina a plain membrane, short and not very wide.

Dorsal Tubercle large and complicated in form (Plate I., fig. 7), having broken up into several distinct spirals with the horns coiled inwards.

Alimentary Canal very large, on the left side, œsophageal opening very far forward, within 5 cm. of the anterior end of the body, and leading by a short funnel-shaped œsophagus to a large smooth-walled stomach (Plate I., fig. 8, *st.*). The intestine is short and wide, and has the usual course (see fig. 8). The wide anus, close to the œsophagus, is fringed with about ten simple or compound projections.

Gonads enormous and placed on both sides of the body. They are like yellow sausages, fully 1 cm. in diameter, with small nipple-like ducts at their atrial ends (fig. 8, *g.*). Numerous large and small irregularly shaped endocarps (figs. 8 and 9) are present on both sides of the body; they measure up to 2·5 cm. in length.

This very fine species is probably the largest *Styela* known. In some respects it recalls *Styela rustica* of Arctic seas, but is very much larger, and differs in details of

FIG. 1.—*Styela spectabilis*, from left side.
(About one-third natural size.)

FIG. 2.—*Styela spectabilis*, from right side.
(About one-third natural size.)

structure. Although the two apertures differ so greatly in appearance (Plate I., figs. 2 and 3) in the preserved specimen, they are probably both widely open and more

or less square and funnel-like when the animal is alive and fully expanded. The other anatomical characters are sufficiently shown in the figures on Plate I. or described in the above diagnosis.

Styela rotunda.

(Plate VI., figs. 14–19).

Locality.—Winter Quarters, in McMurdo Bay.

External Appearance.—Shape almost globular, attached by a wide posterior end, not flattened. Both apertures minute, cross-slit, inconspicuous, sessile, on the rounded anterior end about 1 cm. apart. Surface even, but finely roughened. Colour yellow. Size 2 cm. dorso-ventrally × 1·8 cm. antero-posteriorly × 1·8 cm. from side to side.

Test thin, but leathery ; stiff, but not tough, easily torn.

Mantle closely adhering to inner surface of test.

Branchial Sac with four folds on each side, the ventral ones are the slighter and placed further apart. Very many longitudinal bars are present. There may be as many as eight or ten on a fold, and about twenty to twenty-four in the interspace (fig. 15). The transverse vessels are of three orders, but none are very wide. The meshes are elongated vertically and contain two or three long narrow stigmata each. They are crossed by a fine horizontal vessel (fig. 15).

Dorsal Lamina a narrow plain membrane.

Tentacles simple, at least forty large and a few smaller scattered irregularly between.

Dorsal Tubercle simple, horse-shoe shaped, turned with the opening to one side.

The Alimentary Canal is posterior to and partly on the left side of the branchial sac. The stomach is long and is very finely ridged along its length (fig. 17).

The Gonads are two or three narrow, yellow, convoluted tubes on each side.

This species recalls in some respects the species of *Dendrodoa* from Arctic seas, and especially perhaps *D. kuekenthali*, Hartmeyer, but differs in having gonads on both sides of the body—a character which determines its position as a *Styela*. It resembles in external appearance *St. nordenskjoeldi*, Michaelsen, from Magellan Strait and other localities at the south end of America, but differs wholly in the structure of the branchial sac and other details of anatomy. The figure (Plate VI., fig. 14) is from a photograph, and represents the specimen, of which the measurements are given above, at double the natural size. A second specimen slightly smaller, 1·8 × 1·6 cm., was obtained from "Dredge off Coulman Island—13. i. 02—100 fathoms."

HALOCYNTHIIDÆ.

Halocynthia setosa.

(Plate II.)

Halocynthia setosa, Sluiter, Bull. Mus. Nat. Hist. Paris, xi. (1905), p. 473.

Localities.—(1) Winter Quarters, 10 fathoms, 19. iii. 02, one specimen, 8 × 4 × 6 cm.; (2) East End of Barrier, 100 fathoms, 29. i. 02, bottom mud, stones and rocks, two specimens, 10 × 6 × 5 and 5 × 3 × 2·5 cm.; (3) Winter Quarters, D net, No. 12 Hole, 100 yards S. of Hut Point, 20. viii. 03, one specimen, 9 × 5 × 5 cm.; (4) Winter Quarters, 20 fathoms, net, one specimen, 6 × 3·5 × 4 cm.

External Appearance.—The body is ellipsoidal, with the longer axis dorso-ventral and the height about equal to the breadth. It is attached by a small bare area which occupies the middle half of the lower surface, and in the first specimen recorded above measures 4·5 × 3 cm. Colour yellowish grey, and due to the numerous long echinated spines that cover the test densely (Plate II., fig. 1). Branchial and atrial apertures 4-lobed and very far apart—5 cm. apart in a specimen measuring 9 cm. in greatest (dorso-ventral) diameter.

Test leathery, not thick, 1 to 2 mm. over most of the body, increasing up to 5 mm. on the base of attachment; white in section, smooth and glistening on the inside, covered externally with a dense and somewhat matted layer of tapering echinated spines (Plate II., fig. 2). The thickness of this layer varies from 5 to 15 mm. (fig. 2), and the individual spines, though tough, are not stiff, and the consistency of the covering is more like coarse hair than bristles. The longest spines reach 17 or 18 mm. in length and about 1 mm. in greatest diameter, and bear a large number of small sharp-pointed spinules or recurved hooks (see figs. 2, A, B, and C). Fig. 2 B shows a type of spine where the spinules are softer and more projecting; fig. 2 C a type where they are harder, sharper, and more recurved. Many of them are densely clothed with growths of diatoms and other minute organisms, and many small shells, fragments of Polyzoa, etc., are found entangled or attached to the spines. The specimens from localities (3) and (4) are almost wholly covered by the remains of a Hexactinellid sponge.

Mantle thick, opaque, scarcely attached to test. Musculature consisting of (1) the siphonal sphincters, (2) a circularly running layer surrounding both apertures (fig. 3), and (3) internal radial and longitudinally running stout fibres starting beneath the sphincters. A fine fibrous connective tissue surrounds and unites these muscular layers.

Branchial Sac with six large folds (fig. 5) on each side, the largest being that nearest to the dorsal lamina (fig. 4, *Br. f*). The internal bars are much more

numerous on the folds than in the interspaces (fig. 5). On the third fold, for example, there are about twenty-three on the fold and seven in the adjoining interspace. In another case, however, there were ten on a fold and five in the interspace. Transverse vessels are of four sizes, of which the three larger sizes (fig. 6, *tr*, *tr'*, *tr''*) are arranged with regularity (1—3—2—3—1, etc.), and the fourth or smallest size occur irregularly and may be as numerous as four or five between any two of the others. The meshes are elongated horizontally and contain nine to twelve stigmata. The stigmata are rather long and straight, and usually narrower than the interstigmatic vessels (fig. 6).

Dorsal Lamina represented by a series of languets, which are smaller and very closely placed anteriorly, and are further apart and larger posteriorly (fig. 4, *d. l*).

Tentacles about sixteen, large, of two orders, alternating with a third order of much smaller ones, so: 1—3—2—3—1.

Dorsal Tubercle very large, about 3 × 5 mm., horseshoe-shaped, opening anterior, horns turned inwards and coiled (fig. 4). Peri-tubercular area very wide.

Nerve-ganglion long and narrow, may be over 9 mm. in length, giving off two nerves at each end, which can be traced some way round the sphincters.

Alimentary Canal forming a very long straight loop. Œsophageal opening large, crescentic, with corrugated lips. Stomach having the wall folded into thin lamellæ projecting into the lumen. Anus with laminated edge, attached to the mantle exactly alongside of œsophagus.

Gonads an elongated compact mass on each side of body, with papillary openings into the atrial cavity. The left gonad entirely fills the intestinal loop.

This species, which would doubtless fall into the genus *Pyura* in the nomenclature of MM. Hartmeyer and Michaelsen, was first described by Prof. Sluiter in 1905,* and more fully in 1906,† in his report on the Tunicata of Dr. Jean Charcot's Antarctic expedition of 1903–05. That expedition obtained two specimens of this species at "Ile Booth Wandel, 40 mètres"; but the figure of the exterior (Expéd. Charcot, Plate V., fig. 57) is so formal, and the spines, as represented, are so formless compared with those constituting the most conspicuous feature of the 'Discovery' specimens, that I failed at first to recognise that I was dealing with the same species. Consequently I drew up the above detailed diagnosis and prepared the accompanying figures (Plate II.), before establishing the identity of my specimens with Sluiter's species. As Dr. Sluiter's lithographer has scarcely done justice to his subject, and as, moreover, there are some points of difference in detail between the figures of the 'Charcot' specimens and ours, I believe it will be useful to science that this present account of the 'Discovery' specimens should be published as a supplementary description of the species.

I would point out:—that Plate II., fig. 1, gives a much more life-like

* Bull. Mus. Nat. Hist. Paris, xi. (1905), p. 473.

† Expéd. Antarct. Franç. (Charcot). Tuniciers, p. 40. [No date.—Ed.]

representation of the species, as known to me, than does the 'Charcot' fig. 57; that the dorsal tubercle is more coiled and has the horns proportionately larger (cf. our fig. 4), than is shown in the 'Charcot' fig. 37; that Prof. Sluiter's text-figure of the branchial sac on p. 41 scarcely does justice to the marked differences between the transverse vessels which he describes on the following page (cf. our fig. 6, *tr.* *tr'*, *tr''*), and that the stigmata are in our specimens much more elongated than he shows. Other minor differences will be found on comparing the details of the two descriptions, but still it cannot be doubted that both refer to the same species.

I may add that this species was obtained in much greater quantity by the Scottish Expedition in the 'Scotia' at the South Orkneys.

Halocynthia discoveryi.

(Plate IV., figs. 6–12.)

Locality.—Winter Quarters, in McMurdo Bay.

External appearance.—Body wide and low, somewhat flattened, with the two apertures far apart on prominent siphons attached by posterior end. Surface irregular, much wrinkled; colour yellow-brown. Size:—2·5 cm. dorso-ventrally × 1·5 cm. antero-posteriorly × 1 cm. from side to side.

Test tough and leathery, very stiff, much corrugated on outer surface (fig. 6).

Mantle adhering closely to test, yellow, opaque and very muscular. Strong sphincters, and diaphragms at the base of the siphons.

Branchial Sac with six folds on each side. There are about seven or eight bars on a fold, and three rows of meshes in the interspace.

There are three sizes of transverse vessel, arranged symmetrically so:—*tr*, *tr''*, *tr''*, *tr''*, *tr'*, 3 *tr''*, *tr* (fig. 10). The meshes are about square, and contain each four or five very regular stigmata.

Dorsal Lamina represented by a series of closely placed tentacular languets; figs. 8 and 9 show two parts of the series.

Tentacles sparingly branched (fig. 11), and not at all bushy. There are twelve larger ones and a few additional smaller ones interposed irregularly.

Dorsal Tubercle large and complicated (fig. 12), occupying the whole of the triangular peritubercular area. The opening is anterior, and both horns turn outwards, but in place of coiling are bent abruptly downwards and upwards alternately.

This little species is a *Pyura*, according to the nomenclature of Hartmeyer and Michaelsen, and resembles several known forms more or less in appearance. It is, externally, not unlike *Pyura* (*Halocynthia*) *dura* (Heller), with which it also agrees in having six folds on each side of the branchial sac, but they differ totally in the dorsal tubercle, the tentacles, and other internal characters. Another form to which our species shows some resemblance is *Halocynthia clavigera* (Traustedt) (= *Cynthia nodulosa*, v. Drasche), and in this case our irregular dorsal tubercle is not unlike

the description given by Michaelsen (JB. Hamburgisch. wiss. Anstalten, XXV., 2 Beiheft, 1908, p. 250). *H. clavigera* has been recorded from various parts of the South American coast, Peru, and Chili.

The photograph from which the larger figure (Plate IV., fig. 7) is taken represents the single specimen about twice the natural size.

BOLTENIIDÆ.

Boltenia scotti.

(Plate VII., figs. 1–11.)

Locality.—Winter Quarters, in McMurdo Bay, Feb. 1902.

External Appearance.—Stalk from one-half to three times as long as body, attached by an expanded base to a fragment of stone, and tapering slightly upwards (figs. 1, 3, 5). Body rather longer than broad, of ovate sub-cylindrical form, the anterior end, where the stalk is attached, being the wider. Apertures distant, the branchial being nearly under the stalk (figs. 1, 3) and the atrial in the middle of the free posterior end of the body; both apertures sessile and cross-slit (figs. 2, 4). Surface of the body finely roughened all over with minute papillæ, ending in sharp spines (figs. 7 and 8); surface of stalk corrugated or wrinkled. Colour grey, nearly opaque; stalk rather yellowish. Size of largest specimen (fig. 1):—Body 1·5 cm. long, 1 cm. broad; stalk nearly 4 cm. long.

Test, thin but tough. The roughness on the outer surface (fig. 11) is seen under the microscope to be due to closely placed, minute, sharp-pointed spines (fig. 8) of a yellowish tint. Round the apertures the spines are depressed and point radially outwards (figs. 4 and 6).

Mantle thin, but moderately muscular, closely adhering to the test. The thin muscle bundles are in most parts arranged with regularity, so as to form quadrangular meshes.

Branchial Sac with six folds on one side and seven on the other. There are seven to ten bars on a fold, and one or two in the interspace between (fig. 10).

Dorsal Lamina composed of a series of short triangular languets, united by their bases to a wide membrane (fig. 10).

Tentacles compound, about eight larger, rather slender and feathery, and some much smaller ones between.

Dorsal Tubercle small, but prominent, on a rounded elevation; cordate, with both horns coiled inwards (fig. 9). The long nerve ganglion is visible behind and to one side of the dorsal tubercle.

Alimentary Canal very slender, forming a long narrow loop. Stomach globular, with longitudinal folds; intestine narrow and straight for the greater part of its length.

Gonads small, on both sides of the body.

This little species of *Boltenia* seems distinct from all other known species. It differs from the two species of the 'Charcot' expedition in having but few bars in the interspace between two branchial folds, in the condition of the dorsal lamina, and in other details of structure; and from *B. bouvetensis*, Michsn., of the 'Valdivia' Expedition, in the number of branchial folds and in the structure of the dorsal tubercle. The minutely spinose surface of our species is also a notable peculiarity.

In the same bottle with these specimens of *Boltenia* is a single specimen of a flattened, smooth Cynthiid (Plate VII., fig. 12) with 4-lobed apertures (fig. 13), which is in such bad condition that further identification is impossible. The muscles of the mantle are the only internal organs that can be seen under the microscope. Possibly the animal may have been dead and decaying when collected.

MOLGULIDÆ.

Molgula hodgsoni.

(Plate III., figs. 7–13.)

Locality.—Winter Quarters, in McMurdo Bay, 10 fathoms, 22.iii.02; one specimen, 4 × 2·2 × 2 cm.

External Appearance.—Body pyriform, with a wider anterior and a narrow pointed posterior end (Plate III., fig. 7). Apparently not attached, or only very slightly so, by the posterior end. Atrial aperture terminal. Branchial a short distance back along the dorsal edge (fig. 7); both are on prominent siphons. Right-hand side more flattened and left side more swollen and rounded. Whole surface slightly roughened, with a sparse coating of sponge spicules and occasional shell-fragments and other foreign bodies. Colour a warm grey, becoming browner at anterior end.

Test thin and membranous, but moderately tough, translucent, free on left side, but attached to mantle over the more muscular right side.

Mantle rather transparent, but moderately muscular, the bundles being few, but very distinct (figs. 8 and 9).

Branchial Sac with seven folds on each side, with four very wide bars on the fold, and four or five bars in the interspace; occasional very wide transverse vessels; stigmata curved and irregularly arranged, but never forming spirals or infundibula (fig. 11).

Tentacles much branched, of two sizes, six or seven of each. The tentacles rather slender, with long delicate branches.

Dorsal Lamina a plain narrow membrane, with no ribs nor marginal teeth. It is short, and rather inconspicuous.

Dorsal Tubercle broadly cordate in shape (fig. 10), with both ends turned spirally inwards and the opening between them directed posteriorly.

Alimentary Canal long, with the intestinal loop continued unusually far forwards. Stomach surrounded by conspicuous glandular cæca (figs. 12 and 13). Anus with a smooth, slightly thickened everted rim (fig. 12). Rectum loaded with diatomaceous ooze.

Gonads a yellow sausage-shaped mass on each side, about 10 mm. in length, and 2 to 3 mm. in breadth, with a duct at the anterior end directed towards the cloaca (fig. 13).

I have pleasure in naming this new species in honour of Mr. T. V. Hodgson, who showed both energy and ingenuity in his methods of collecting quantities of marine animals, of many groups, from under the ice-sheet at the Winter Quarters of the Expedition in McMurdo Bay.

On trying to find the position of this species in its genus by means of the dichotomising table in my "Revised Classification"* I find that its characters bring it alongside *M. cæpiformis* of N.W. European seas, and *M. pedunculata* from the Antarctic. It agrees with *M. cæpiformis* in being apparently unattached, but that species has only been found in the northern hemisphere and is of globular shape. The present species has some resemblance to *Molgula maxima*, described by Sluiter from Dr. Charcot's Antarctic expedition (Ile Booth Wandel, Ile Anvers, 30–40 mètres). It also recalls my own *M. pedunculata* from the 'Challenger' collection, found to the South of Kerguelen Island at a depth of 150 fathoms; and I notice that Sluiter states that his species may possibly be the same as my *M. pedunculata*. There is no doubt that all three are closely related forms, but I believe that, with our present knowledge, they had better be treated as distinct species. The easier course would no doubt be to say that these forms probably all belong to the one species, but so long as any distinguishing features can be pointed out, such a statement would be an erroneous identification. The more scientific course is surely to define such differences as we can, and leave it to our successors to dispose of these if they are able. We place before them the evidence for three species, which possibly they, with fuller knowledge, may be able to unite.

From the 'Challenger' *M. pedunculata* the 'Discovery' specimen differs in external appearance, in shape, in having the atrial aperture terminal, in the consistency and thickness of the test, in the number of bars in the branchial sac, and in the position of the dorsal tubercle; there are also minor differences in almost all organs. Sluiter has given the points in which his species differs from *M. pedunculata*; and I can add that the present species differs from *M. maxima* in the shape of the body (although the relative position of the apertures is the same in both), in the number of bars between the branchial folds, and in the tentacles.

* Journ. Linn. Soc., Zool., xxiii., p. 568. It is not always possible to identify species absolutely by such tables. They were not put forward for such a purpose (see footnote on p. 559). They serve, however, to indicate the position in the genus, after which the original descriptions should be consulted.

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Molgula bacca.

(Plate IV., figs. 1–5.)

Locality.—Winter Quarters, in McMurdo Bay. A single specimen, measuring in length of body 2·2 cm., breadth 1·6 cm., length of stalk 0·4 cm.

External Appearance.—Body pyriform, nearly globular, attached by a short posteriorly placed stalk (Plate IV., figs. 1, 2). Anterior end rounded, bearing both apertures, which are small, but distinct. The surface is absolutely smooth and shining. Colour pale yellowish grey.

Test thin as tissue paper, membranous and transparent. A few foraminifera and minute sand grains adhere to the test round the atrial aperture.

Mantle thin, but with delicate muscle bands and well-marked sphincters.

Branchial Sac very delicate, with seven folds on each side. There are five or six bars on a fold, and three between. Many of the stigmata are long and narrow, or nearly straight—especially those next the endostyle and in the middle of the interspaces; while they are coiled in well-marked infundibula in the branchial folds (fig. 3).

Dorsal Lamina a plain narrow membrane.

Tentacles branched, eight large and eight small, placed alternately, with a number of still smaller ones between (fig. 5).

Dorsal Tubercle narrow, elongated antero-posteriorly (fig. 5), with the opening directed laterally and both horns turned inwards. The tubercle lies upon the nerve ganglion.

Alimentary Canal showing through the test upon the left side of the body. The intestine is long and narrow and makes a circular loop. The rectum is closely adherent to the stomach (fig. 4).

This species is closely related to the last, but differs so remarkably in external appearance and in a few other points that it seems impossible to regard them as the same. The body is here very much more globular and the stalk is much shorter. The two apertures are equally anterior, and the siphons are relatively smaller. The single specimen was tensely filled with fluid, but when pierced at once collapsed to a flabby membrane. In the living state it was probably distended with sea water and nearly globular in form.

Our present species shows some superficial resemblance to the *Molgula chrystallina* of H. P. C. Möller, the *Pera pellucida* of Stimpson, but differs considerably in internal organisation, as that northern species has only five branchial folds on each side, while the present southern one has seven. Moreover, there are larger numbers of bars on the folds here—otherwise the branchial sacs are rather alike in their details. The dorsal tubercles in the two species are somewhat similar, and the course of the alimentary canal is the same in both. All this is rather curious, and suggests that we have in *M. bacca* a representative species to *M. chrystallina* of the northern hemisphere; but I must

emphasise the difference in the number of folds in the branchial sac, as that would prevent the present species from being placed with *M. chrystallina* in a genus *Pera*, characterised by having five branchial folds on each side.

Molgula longicaulis.

(Plate V., figs. 1 B, 3 and 8–11.)

Locality.—Winter Quarters, in McMurdo Bay. One specimen measuring 4 cm. in total length, including the stalk, which is 3 mm. in diameter, body 2·7 cm. in length × 1 cm. in breadth.

External Appearance.—Body long and narrow, tapering posteriorly to a long narrow peduncle, the lower recumbent half of which (fig. 3) is attached to a specimen of *Molgula concomitans* (fig. 1). The anterior end is bent over ventrally in such a manner that the six-lobed branchial aperture appears to be placed one-third of the way down the ventral edge, and the four-lobed atrial aperture projects terminally; both apertures are on short siphons. The surface is smooth and glistening all over, but somewhat wrinkled as the result of contraction. Colour grey.

Test thin and membranous, smooth both inside and out, transparent.

Mantle rather thin, but with a moderate musculature rather like that of an *Ascidia*, the muscle bands being distinct and yellow, though rather distant, and forming an irregular network, with fusiform swellings at intervals (fig. 9).

Branchial Sac with seven folds on each side. The internal longitudinal bars are narrow and rather distant, about six on a fold and two or three in the interspace. Stigmata very irregular, so as to break up the transverse vessels and render them inconspicuous (fig. 10).

Dorsal Lamina a short plain membrane.

Tentacles could not be determined with certainty on account of their condition.

Dorsal Tubercle large, of distorted cordate form (fig. 11), with both horns rolled inwards.

Alimentary Canal placed at posterior end and along dorsal edge of left side (fig. 8). Intestine long and narrow, forming a circular loop, after which the rectum adheres closely to the stomach and œsophagus. An unusually large curved renal sac occupies the right side.

The single specimen of this new species, which I name *longicaulis*, because of the elongated stalk which it possesses—a very unusual character in a *Molgula*—is unfortunately not in good condition. The outside appearance and proportions are probably very much as in life, but the branchial sac and tentacles, which seem delicate, are to some extent disorganised, so that it is difficult to determine the internal characters with certainty. Fig. 10 is made up of fragments visible here and there in several preparations of the branchial sac. The condition of the transverse vessels and of the tentacles must be left an open question.

Molgula concomitans.

(Plate V., figs. 1 A, and 2–7.)

Locality.—Winter Quarters, in McMurdo Bay. The single specimen measures:—Length 2·5 cm., breadth 2 cm.

External Appearance.—Body somewhat globular, rather flattened laterally, with a straight anterior and a rounded posterior end. Apertures at the ventral and dorsal edges of the anterior end, both on well-marked siphons, the atrial being the more prominent (Plate V., fig. 1A). The surface is not encrusted with sand, but has small tag-like excrescences scattered over it, especially around the siphons. Colour grey.

Test thin, cartilaginous, translucent; prolonged into minute processes connected with the vessels of the test, and bearing occasional foraminifera or minute grains of sand, especially about the anterior end.

Mantle yellow, opaque, and very muscular (fig. 4)—the sphincters being especially strong. The mantle adheres closely to the test.

Branchial Sac with seven folds on the right side and six on the left. There are seven bars on a fold, and one large, with several imperfect smaller bars, in the interspace. Stigmata not much curved, irregularly placed, varying considerably in length (see fig. 5).

Dorsal Lamina a short plain membrane.

Tentacles, eight very large and much branched, with some much smaller ones placed irregularly between.

Dorsal Tubercle large and simple, horseshoe-shaped, with the horns turned inwards (fig. 6).

Alimentary Canal bulky, intestine forming a narrow dark-coloured loop.

Gonads large and yellow, a single sausage-like mass on each side.

The single specimen of this species belongs to the group of Molgulids with a nearly naked test, not covered with adhering sand and gravel. In this respect it resembles *M. citrina*, *M. nuda*, *M. ampulloides*, and *M. helleri* from the Northern hemisphere, and *M. maxima* and *M. pedunculata* from Southern seas; but it differs from all of these in details of anatomy. It comes, perhaps, nearest to *M. maxima* (described by Professor Sluiter from the 'Charcot' collection); and, in fact, it closely resembles that Antarctic species in external appearance and in several other respects. It differs, however, notably in the mantle. Professor Sluiter describes *M. maxima* as having the mantle feebly developed, with a feeble musculature; whereas our specimen has an extraordinarily strong and opaque mantle, with conspicuous yellow muscles (fig. 4), like those of a *Microcosmus*. The atrial siphon is the longer and narrower, the branchial being short and wide. The large tentacles are extraordinarily bushy.

The branchial sac, although agreeing in some respects, such as the number of bars

on a fold, with that of *M. impura*, does not show the characteristic knob-like processes of that species figured by Dr. Traustedt.

This single specimen of *Molgula concomitans* has a specimen of *Molgula longicaulis* attached by the lower half of its long stalk near the anterior end (see fig. 1, B and fig. 3).

ASCIDIIDÆ.

Corella eumyota.

(Plate III., figs. 1–6.)

Corella eumyota, Traustedt, Vid. Medd., 1881, p. 271.
Corella novaræ, v. Drasche, Denk. Ak. Wien, xlviii., 1884, p. 382.
Corella antarctica, Sluiter, Bull. Mus. Nat. Hist. Paris, xi. (1905), p. 471; id., Exp. Ant. Franç. (Charcot), p. 31.

Locality.—Auckland Islands, Laurie Harbour; various dates, March, 1904; nine specimens ranging from 1·8 to 3 cm. in length.

External Appearance.—Body elongate-ovate, with the branchial aperture at the narrower anterior end and the atrial about half-way back, both on prominent siphons (Plate III., figs. 1–3). Attached by the greater part of the right side. Posterior end rounded. Surface smooth. Colour yellowish grey.

Test thin, cartilaginous to membranous, translucent, easily torn.

Mantle moderately muscular, recalling that of an *Ascidia*; sphincters well developed.

Branchial Sac with the spiral stigmata short, and traversed by many connecting radial or irregular short, wide, thin-walled vessels (fig. 6). Internal bars narrow, supported on triangular connecting ducts.

Dorsal Lamina represented by stout tentacle-like languets, with occasional shorter ones alongside (fig. 6).

Tentacles numerous and closely placed. There are about thirty large and at least thirty much smaller placed between (figs. 5 and 6).

Dorsal Tubercle simple, crescentic, with the horns more or less incurved. There is no peritubercular area, but behind the tubercle is a very large epipharyngeal languet with a deep groove (fig. 6), which forms the beginning of the series of dorsal languets.

I agree with Drs. Sluiter and Michaelsen in considering that Traustedt's *Corella eumyota*, from Bahia and Valparaiso in South America, is the same species as Dr. von Drasche's *Corella novaræ*, found during the 'Novara' Expedition at St. Paul's Island in the Indian Ocean. But I would go further, and suggest that Sluiter's *Corella antarctica*, obtained during the 'Charcot' Expedition at "Ile Booth Wandel, 40 mètres," is merely a larger, more polar, form of the same variable species; and in that case I would include also these smaller forms collected by the British Expedition at the Aucklands.

Two courses are open to us in such cases: (1) to include all the closely related

and evidently variable forms in the one species, or (2) to describe each group of individuals separately, and so recognise several species differing but slightly from one another. In the present state of knowledge all accurate descriptions of groups of individuals have their value, but it is unnecessary here to regard them as distinct species, and I prefer to take that course in the present instance.

In external appearance the 'Discovery' specimens (Pl. III., figs. 1–3) agree closely with von Drasche's figure of *C. novaræ*, do not differ from Traustedt's description of *C. eumyota*, and are like in shape, but much smaller than, the specimen figured in the 'Charcot' report; but it is evident from Dr. Sluiter's description that he had also smaller individuals under examination, and we are accustomed in the Tunicata to individuals in various species attaining relatively gigantic dimensions.

The characters of the branchial sac, dorsal languets, and tentacles of the 'Discovery' specimens are sufficiently shown in our figures (Plate III., figs. 1–6). The dorsal tubercle we have figured (fig. 6) is intermediate in character between the two conditions figured by Dr. Sluiter for *C. antarctica* ('Charcot' report, pl. ii., figs. 29 and 30). The lower part of the tubercle in Sluiter's fig. 29 is probably abnormal in character.

The alimentary canal and gonads agree very closely in our specimens with the condition figured in the report on the 'Charcot' Expedition. On the whole, I think that the differences in detail between our specimens and the description of *Corella antarctica* may be accounted for by the difference in size and presumably in age.

This species seems to be widely spread in the southern hemisphere. In addition to the coasts of Brazil and Chili (Traustedt) and the Indian Ocean (v. Drasche), it has been recorded from the Cape of Good Hope (Sluiter) and Patagonia (Michaelsen), and finally from the Antarctic ('Charcot' and 'Discovery' expeditions).

CLAVELLINIDÆ.

Stereoclavella antarctica.

(Plate VI., figs. 5–7.)

There are two colonies (Plate VI., figs. 5 and 6), obtained from Winter Quarters, in McMurdo Bay, 8. ix. 03., which may be placed in this genus.

The larger (fig. 5), measuring 3 cm. across the base, and about the same in height, contains eight or ten individuals, and the smaller (fig. 6), some four or five. In both cases the test is irregularly lobed, the basal mass being more solid and the distal part cut up into roughly cylindrical projections one corresponding to each ascidiozooid.

The ascidiozooid has a small clear thorax and a large opaque abdomen—the alimentary canal being apparently distended with dark muddy food. The apertures are not distinctly lobed (fig. 7), the atrial being somewhat square in outline. The whole

thorax is, however, so contracted that it is almost impossible to make out the internal characters. Any attempt to stretch out the contracted tissues leads to their disintegration. A much corrugated endostyle, a large number of small stigmata, and a few short, simple, branchial tentacles were all that could be made out.

This is the first member of the family Clavellinidæ found in Antarctic Seas.

DIDEMNIDÆ.

Leptoclinum glaciale.

(Plate VI., figs. 1–4.)

The single specimen is a large but thin colony expanded over the surface of a fragment of dark-coloured rock (Plate VI., fig. 1), obtained from "Dredge off Coulman Island—13. i. 02—100 fathoms." It measures 3·5 × 4·5 cm. and from 1–3 mm. in thickness. It is of a grey colour, but that is largely due to its thinness, which allows the dark stone below to show through. The surface is smooth and glistening, and is marked with oval spots which indicate the bodies of the rather large flattened ascidiozooids. Part of the surface is torn, and the figure (Plate VI., fig. 1) is from a photograph which represents the greater part of the colony nearly twice the natural size. The arrangement of the ascidiozooids seems quite irregular, and no common cloacal apertures are visible. In the ovate areas over the ascidiozooids the calcareous spicules are less numerous (fig. 4), and therefore the colony is less opaque and less white at these points. Around the branchial apertures of the ascidiozooid there is a still clearer rounded area (fig. 4), towards one end of which the six-lobed opening is seen.

The calcareous spicules have very numerous and unusually fine rays (fig. 3). In some cases they are more irregular and blunter, but many of them have fine needle-like points. In addition to the spicules there are many large, rounded, triangular, or stellate coarsely granular cells (fig. 2), scattered through the test.

The two or three ascidiozooids examined, on the edge of the torn part, did not seem to be in sufficiently good condition to give any information as to the structure, and it did not seem justifiable to spoil the appearance of the single colony by tearing it further.

Leptoclinum sp.

A small package of specimens, belonging to the 'Discovery' collection, which reached me after the plates were printed, and when this report was nearly finished, included five small rounded colonies of a *Leptoclinum*, measuring from 1 to 1·5 cm. in length, obtained from "Winter Quarters, 3. vi. 03., 10 hole, 130 fathoms," and all of them attached to fragments of the calcareous polyzoon *Cellaria* sp. There is also one still smaller similar specimen from "Winter Quarters, 4. ix. 03, 12 hole, D. net."

This *Leptoclinum* is of a gleaming white colour, and is hard and brittle, and much more densely crowded with calcareous spicules than in the case of the preceding species. The spicules are especially abundant in the superficial layer of the test, making it white and opaque. In the deeper layer alongside the viscera of the ascidiozooids there is a certain amount of yellow pigment in the test.

These are probably young colonies; and although they do not seem to agree in character with any of the described Antarctic species of the genus, still the material does not seem sufficient for a satisfactory description of a new species. I therefore prefer merely to record that there is this second species of white *Leptoclinum* present in the neighbourhood of McMurdo Bay.

POLYCLINIDÆ.

Amaroucium antarcticum.

(Plate VI., figs. 8–13.)

A single club-shaped colony (Plate VI., fig. 8) was obtained from "Dredge off Coulman Island—13. i. 02—100 fathoms." It measures 5 × 3 cm. in extreme breadth at the upper swollen part of the stalk, but the upper surface of the head, where the ascidiozooids are placed, measures 2 cm. in diameter. The figure is from a photograph representing the colony about one-fifth larger than the natural size. The shape is not unlike that of the European *Amaroucium proliferum* or *A. argus*.

There is a little sand imbedded in the outer layers of the test (see figs. 9 and 10): not sufficient to give the surface a sandy appearance, as in the case of species of *Psammaplidium*, but just enough to make it gritty to the knife or needle. The large ascidiozooids are seen *in situ* in fig. 10, and fig. 11 shows one of them extricated from the tough test.

There are many rows of stigmata (fig. 11), and their arrangement and character are seen from the enlarged fragment of the branchial sac (fig. 13).

THALIACEA.

SALPIDÆ.

There are two jars of Plankton, largely composed of Salpidæ, in the collection, in addition to a number of tubes containing specimens of *Salpa* and *Oikopleura* that had been caught individually or picked out. Most of this Plankton material was obtained in far Southern, but not strictly Antarctic seas (such as 40° to 45° S. Lat.), and it includes only well-known cosmopolitan forms. Still, as it is a part of the 'Discovery' Collection, these specimens and localities will be given with the rest in the following list.

The two gatherings of general Plankton are so much alike that they may be taken together. The localities are :—

(1) "19. x. 01 ; Lat. 40° 12½′ S. ; Long. 32° 27¼′ E."
(2) "22. x. 01 ; Lat. 45° S. ; Long. 40° 57′ E. ; 8 P.M. ; surf. temp. 40°."

They both contain the following species of Salpidæ (none of them in good condition) :—

SALPA RUNCINATA-FUSIFORMIS, Chamisso-Cuvier, var. ECHINATA, Hrdm.

The solitary form of the strongly echinated variety of *S. fusiformis* was described by Herdman from the 'Challenger' Collection as a distinct species, *Salpa echinata*. It is, however, perhaps better, in the light of further knowledge, to regard it as a variety merely. It was obtained by the 'Challenger' Expedition in the South Pacific, near the Straits of Magellan, and off the West Coast of Africa, and by Prof. Ritter* off the Californian coast. It has also been described by Dr. Apstein† from specimens in the Hamburg Museum. The present specimens measure 3 cm. in length.

SALPA MUCRONATA-DEMOCRATICA, Forsk.—Solitary Form.

A large number of specimens with flagella measuring up to 6 mm. in length—average length of body, 1 cm. Also a few specimens with much larger flagella up to 13 mm. long.

SALPA MUCRONATA-DEMOCRATICA, Forsk.—Gregarious Form.

Many specimens, measuring about 1 cm. in length.

SALPA HEXAGONA, Quoy and Gaim.—Solitary Form.

Some imperfect specimens, with very broad muscle bands, probably belong to this species.

SALPA HEXAGONA, Quoy and Gaim.—Gregarious Form.

A few specimens apparently of this form, with two embryos each.

Passing now to the Collection in 48 tubes, we have :—

SALPA RUNCINATA-FUSIFORMIS, Chamisso-Cuvier.

From the locality "1. i. 02 ; Lat. 63° 4½′ S. ; Long. 175° 43′ E.," there are two large specimens of the gregarious form, measuring about 5·5 cm. in length, and

* The Pelagic Tunicata of the San Diego region, excepting the Larvacea. Univ. of Cal. Public. Zool., vol. ii. (1905), p. 67.

† Die Salpen, Deutsche Südpolar-Expedition 1901–1903, Berlin, Bd. ix., Zool. 1 (p. 165).

slightly echinated on the angles of the test; and one large specimen of the solitary form, over 7 cm. in length, with slightly echinated ridges on the test. At the same locality, and on the same date, were found seven large specimens of the gregarious form (in three tubes), measuring up to 7 cm. in length, with well-marked ridges on the test and slightly echinated in places; but the shape of the body is that of the typical *S. fusiformis*, and is not in the short rounded condition figured by Dr. Apstein for the form *S. fusiformis*, forma *echinata*, greg. (Deutsche Südpolar Exped. 1901–03).

On this date also were found 52 specimens of the gregarious form, measuring from 1 to 2 cm. in length, and two specimens measuring 4·5 cm., also one specimen of the solitary form measuring 6 cm.

This species was obtained by the 'Challenger,' near the Antarctic ice, at Stat. 152, Lat. 60° 52′ S., Long. 80° 20′ E., so the present is not a new record for Antarctic seas. It has also been found, in the gregarious form, at the localities:—"Dec. 26 off Island, air 32° F., water 32° F."—32 small specimens up to 18 mm. in length; "Dec. 26 off Island, air 32° F., sea 32° F."—12 specimens up to 15 mm. in length; "17. xi. 01"—about a dozen specimens up to 3·5 cm. and some small fragments of chains.

From the locality, "16. xi. 01, Lat. 61° 46′ S., Long. 141° 12′ E.," there are 204 specimens of the aggregated form up to 4 cm., and of the solitary form up to 6 cm.

The solitary form was also found at "51° 56′ S., 170° 0′ E."—one specimen torn, and in bad condition, probably measuring 8 cm.; "Dec. 29, Lat. 69° 25′ S., Long. 175° E., sea 32·5° F., air 30° F."—one specimen measuring 4·5 cm.; and "Winter Quarters, 29. v. 03, No. 4 hole, 5 fathoms"—one specimen, damaged at posterior end, measuring 1 cm.

Salpa runcinata–fusiformis, var. echinata, Hrdm.

This was found in the gregarious form on "2. i. 02"—six small specimens up to 2 cm.; and in the solitary form at "Dec. 25, Lat. 67° 5′ S., Long. 179° 30′ E., air 31½° F., sea 31½° F."—four large specimens in bad condition, 5 to 6 cm. in length; "3. i. 02"—three specimens, the largest measuring 5·5 cm.; and "8. i. 02"—one specimen, measuring 6 cm. In this specimen the muscle bands are narrower, more regular, and less swollen dorsally than in the solitary form of the species.

Salpa cordiformis zonaria, Quoy and Gaim.–Pallas.

This was found in the gregarious form at "26. xii. 01, Lat. 51° 56′ S., Long. 170° 3′ E."—six specimens (in two tubes) measuring up to about 3·5 cm.; and in the solitary form at "23. iii. 04, Laurie Harbour, Auckland Island. Tow-net"—one specimen measuring 7·5 cm. in length, with muscle bands up to 1 cm. in width; and "Laurie Harbour, Auckland Island. Surface"—one specimen measuring 6 cm.

S. HEXAGONA, Quoy and Gaim.

One damaged specimen from "Winter Quarters, 1. vi. 03, No. 8 hole" probably belongs to this species.

DOLIOLIDÆ.

DOLIOLUM sp.

Four imperfect specimens of the "nurse" form of *Doliolum*, measuring from 4 to 7 mm., were brought back from "1. vii. 04. Lat. 55° 44′ S.; Long. 95° 43½′ W. 5 fathoms." It is impossible to determine the species now.

LARVACEA.

APPENDICULARIIDÆ.

OIKOPLEURA GAUSSICA.

(Plate VII., figs. 14–17.)

Oikopleura gaussica, Lohmann, Zool. JB., Suppl. viii. (1905), p. 359.

A small tube from the Winter Quarters in McMurdo Bay, labelled "18. v. 03, No. 4 Hole, Plankton," contains three specimens of a large Appendicularian. They are not in very good condition, and all probably belong to the same species, and in external form and in detailed proportion of the internal organs seem to agree better with *O. gaussica* than with *O. valdiviæ*—the two large Antarctic species described by Dr. Lohmann.* The measurements of body and tail in these three 'Discovery' specimens are as follows:—

Trunk . . .	1·25 mm.,	1·5 mm.,	1·5 mm.
Tail . . .	7 mm.	9 mm.	9 mm.

This species was also found at "3. i. 02, Lat. 66° 52′ S.; Long. 178° 15′ E." —one specimen: "7. i. 02, South of Pack"—53 specimens; "11 Jan. 1902, Ross Sea"—one specimen; and "3–7"—six specimens. In some of these specimens the trunk measures up to 3 mm. in length, and the tail is about five times as long as the trunk, and may be as much as 2 mm. in width at its widest part.

Our fig. 14 on Plate VII. shows the appearance, to the eye, of these 'Discovery' specimens of (probably) *O. gaussica*, and fig. 15 shows the tip of the tail enlarged. Several sections through the tail are given in fig. 16 (A to D) to show the very different degree of development of the muscle bands in different parts of the same tail. D shows a case where the dorsal muscle band is co-terminous with the notochord,

* Die Appendicularien des arktischen und antarktischen Gebiets, &c. Zoolog. Jahrb., Suppl. viii. (1905), p. 353.

while the ventral band is absent. In A the ventral band is equal in extent to the notochord, and the dorsal extends a little beyond on each side. In B both ventral and dorsal bands are about twice the diameter of the notochord. Finally, in C each muscle band is about three times the diameter of the notochord, and in some sections I have found a slightly greater development of the muscles. In view of these variations, and of the fact that the subchordal cells are in some cases in one row, in some in two, or even three in a transverse row, I find it difficult to distinguish between Dr. Lohmann's two Antarctic species *O. gaussica* and *O. valdiviæ*. The first-named is described * as having "schmaler, die Chorda seitlich kaum überragender Muskulatur," while the second has "Muskulatur breit, etwa 4-mal so breit wie die Chorda"; but practically both these conditions are found in one tail of our specimens, and are shown in fig. 16.

The histological details of the wall of the notochord, the muscular and epithelial layers and the test, with part of a subchordal cell underlying it, are shown in fig. 17.

Oikopleura sp.

There are also about 20 small tubes containing much smaller specimens of *Oikopleura*, which I do not care to refer to a species. Most of them are probably young, all are very opaque, and some are shrivelled or mutilated. The only value of this record is to show that small forms of *Oikopleura* do occur, in some cases in considerable numbers, at the localities given in the following list :—

1. "31. xii. 01; Lat. 61° 12′ 39″ S.; Long. 173° 29′ 42″ E." (One specimen.)
2. "Winter Quarters, 6. v. 03; No. 4 Hole, 5 fms." (Two specimens.)
3. "Winter Quarters, 15. v. 03; No. 8 Hole, 10 fms." (One specimen.)
4. "18. v. 03; No. 4 Hole." (Three specimens.)
5. "Winter Quarters, 29. v. 03; No. 4 Hole, 5 fms." (Eighty specimens.)
6. "Winter Quarters, 1. vi. 03; No. 8 Hole, 10 fms." (Five specimens.)
7. "Winter Quarters, 1. vi. 03; No. 8 Hole, 10 fms." (One specimen.)
8. "Winter Quarters, 28. vi. 03; No. 8 Hole, 10 fms." (Twenty-one specimens.)
9. "Winter Quarters, 13. vii. 03; 10 fms." (Three specimens.)
10. "24. vii. 03; No. 8 Hole, 10 fms." (Six specimens.)
11. "Winter Quarters, 1. viii. 03; No. 8 Hole, 10 fms." (Seven specimens.)
12. "Winter Quarters, 13. viii. 03; No. 8 Hole, 10 fms." (Three specimens.)
13. "Winter Quarters, 21. viii. 03; No. 8 Hole, 10 fms." (Seventeen specimens.)
14. "Winter Quarters, 2. xi. 03; No. 12 Hole, 10 fms." (Three specimens.)
15. "12. vi. 04; Surface, Lat. 49° 40′ S.; Long. 172° 18′ 30″ W." (140 specimens.)
16. "21. vi. 04; Lat. 56° 12′ 45″ S.; Long. 136° 18′ 30″ W., 10 fms." (Fifty specimens.)

* Lohmann, op. cit., p. 359.

17. "24. vi. 04; Lat. 58° 49′ 45″ S.; Long. 124° 48′ W., 5 fms." (Twenty-three specimens.)
18. "25. vi. 04; Lat. 59° 19′ S.; Long. 120° 24′ 30″ W., 5 fms." (Thirty-eight specimens.)
19. "28. vi. 04; Lat. 59° 34′ 30″ S.; Long. 106° 28′ 15″ W., 5 fms." (Forty specimens.)

DESCRIPTION OF THE PLATES.

PLATE I.

FIG. 1.—*Styela spectabilis*, from the left side; natural size.
FIG. 2.—Branchial aperture, from ventral surface; slightly enlarged.
FIG. 3.—Atrial aperture, from dorsal surface; slightly enlarged.
FIG. 4.—Musculature of the mantle; natural size.
FIG. 5.—Part of the branchial sac, showing two folds (*br.f.*) and the intervening area; natural size.
FIG. 6.—Small part of the branchial sac, between two of the internal longitudinal bars (*i.l.b.*); × 50.
FIG. 7.—Tentacles, dorsal tubercle and dorsal lamina; slightly enlarged.
FIG. 8.—The alimentary canal and the gonads of the right side; natural size.
FIG. 9.—Some of the larger endocarps; natural size.

PLATE II.

FIG. 1.—*Halocynthia selosa*, Sluiter; natural size.
FIG. 2.—Section through the test and its dense covering of long spines; natural size.
FIGS. 2A, 2B and 2C.—Terminal parts of three test spines of rather different types; × 50.
FIG. 3.—The body after removal of the test, to show the powerful musculature; natural size.
FIG. 4.—Tentacles, dorsal tubercle, dorsal languets, branchial folds, etc.; natural size.
FIG. 5.—Part of the branchial sac, showing three folds; natural size.
FIG. 6.—Small part of the branchial sac between two bars, showing the transverse vessels and the stigmata; × 50.

PLATE III.

FIGS. 1, 2 and 3.—Three specimens of *Corella eumyota*, Traustedt, from the upper surface; natural size.
FIG. 4.—Dorsal tubercle and anterior end of dorsal lamina; slightly enlarged.
FIG. 5.—Tentacles; × 40.
FIG. 6.—Dorsal region of anterior end of branchial sac, showing tentacles, dorsal tubercle, epipharyngeal groove, dorsal languets and branchial sac; × 50.
FIG. 7.—*Molgula hodgsoni*, from right side; natural size.
FIG. 8.—Body after removal of test, right side; natural size.
FIG. 9.— „ „ „ „ „ left side; natural size.
FIG. 10.—Dorsal tubercle; × 50.
FIG. 11.—Part of branchial sac, from inside; × 50.
FIG. 12.—Alimentary canal and gonad of left side; slightly enlarged.
FIG. 13.—Alimentary canal and gonads of both sides, from the ventral surface; slightly enlarged.

PLATE IV.

FIG. 1.—*Molgula bacca*, right side; natural size.
FIG. 2.— „ „ left side; natural size.
FIG. 3.—Part of branchial sac from inside; × 40.
FIG. 4.—Alimentary canal; × about 2.
FIG. 5.—Tentacles and dorsal tubercle, etc.; × 40.
FIG. 6.—*Halocynthia discoveryi*, right side; natural size.
FIG. 7.—The same, left side, from a photograph; × 2.
FIG. 8.—Part of dorsal lamina, showing languets; × 40.
FIG. 9.—Another group of languets closer together; × 40.
FIG. 10.—Part of branchial sac, from inside; × 40.
FIG. 11.—One of the compound tentacles.
FIG. 12.—The dorsal tubercle; × 40.

PLATE V.

FIG. 1.—*Molgula concomitans*, left side, with *Molgula longicaulis*, right side, adhering; natural size.
FIG. 2.—Part of surface of test of *M. concomitans*, showing the irregular hair-like prolongations, with a few sand grains; × 40.
FIG. 3.—Base of stalk of *M. longicaulis*, attached to right side of *M. concomitans*; natural size.
FIG. 4.—*M. concomitans*, removed from test; natural size.
FIG. 5.— „ „ „ part of branchial sac, from inside; × 40.
FIG. 6.— „ „ „ dorsal tubercle; × 40.
FIG. 7.— „ „ „ one of the large much-branched tentacles; × 40.
FIG. 8.—*M. longicaulis*, removed from test; natural size.
FIG. 9.— „ „ part of mantle.
FIG. 10.— „ „ part of branchial sac, from inside.
FIG. 11.— „ „ dorsal tubercle; × 40.

PLATE VI.

FIG. 1.—*Leptoclinum glaciale*, from a photograph ; × 2.
FIG. 2.—Coarsely granular cells from the test ; × 40.
FIG. 3.—Stellate spicules, from the test ; × 40.
FIG. 4.—Surface of an Ascidiozooid, showing branchial aperture and distribution of spicules.
FIG. 5.—*Stereoclavella antarctica*, larger colony.
FIG. 6.— „ „ smaller colony.
FIG. 7.—Anterior part of an Ascidiozooid.
FIG. 8.—*Amaroucium antarcticum*, from a photograph.
FIG. 9.—Section of the colony.
FIG. 10.—Part of a section of the colony showing Ascidiozooids.
FIG. 11.—Ascidiozooid extracted from test.
FIG. 12.—Anterior end of Ascidiozooid enlarged.
FIG. 13.—Part of branchial sac.
FIG. 14.—*Styela rotunda*, from a photograph.
FIG. 15.—Part of branchial sac.
FIG. 16.—Part of surface of test, showing scales ; × 40.
FIG. 17.—Alimentary canal.
FIG. 18.—Mantle ; × 40.
FIG. 19.—Dorsal tubercle.

PLATE VII.

FIG. 1.—*Boltenia scotti ;* natural size.
FIG. 2.—Atrial aperture of same.
FIG. 3.—Another specimen with shorter stalk.
FIG. 4.—Atrial aperture of same magnified to show spines.
FIG. 5.—Smallest specimen of same.
FIG. 6.—Atrial aperture in profile to show spines.
FIG. 7.—Surface of test, magnified, showing three spines.
FIG. 8.—Two test spines in profile.
FIG. 9.—Dorsal tubercle of specimen shown in fig. 1.
FIG. 10.—Part of branchial sac and dorsal lamina of specimen shown in fig. 1.
FIG. 11.—Test in section, showing spines on surface.
FIG. 12.—Unidentified Cynthiid (see p. 8).
FIG. 13.—One of the 4-lobed apertures of same.
FIG. 14.—*Oikopleura gaussica*, Lohm., about natural size.
FIG. 15.—Tip of tail of same enlarged.
FIG. 16.—A, B, C, and D.—Four sections through the tail of *O. gaussica* to show different degrees of development of muscle bands above and below the notochord.
FIG. 17.—Magnified details of the wall of notochord, the muscle layer, etc., to show histological structure.

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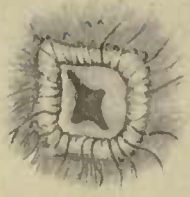

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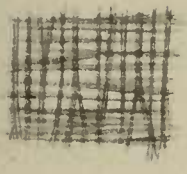

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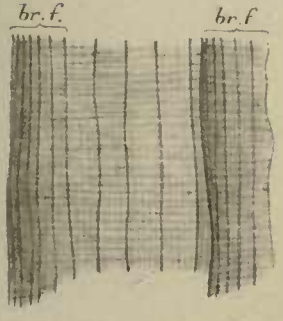

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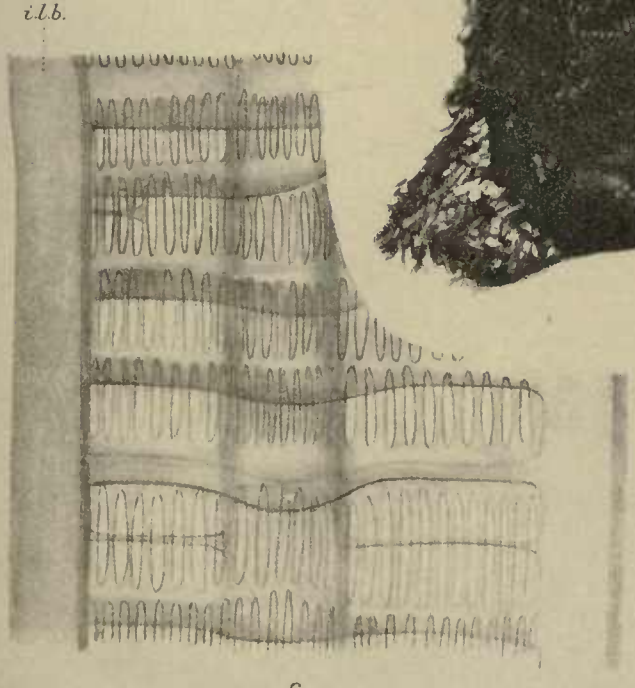

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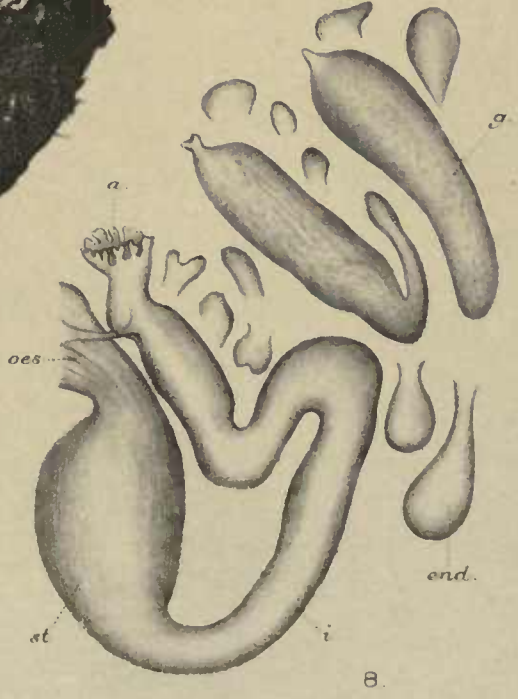

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Styela spectabilis

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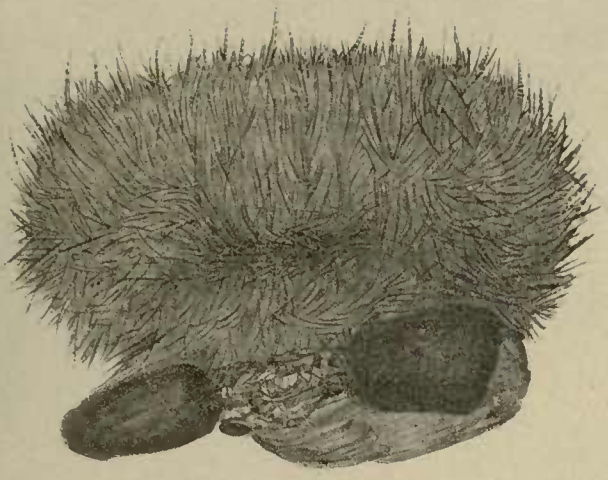

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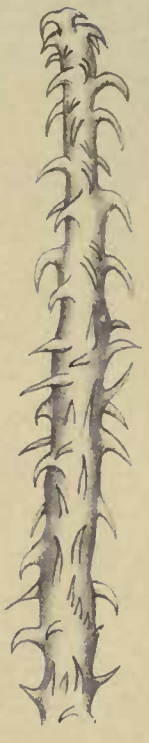

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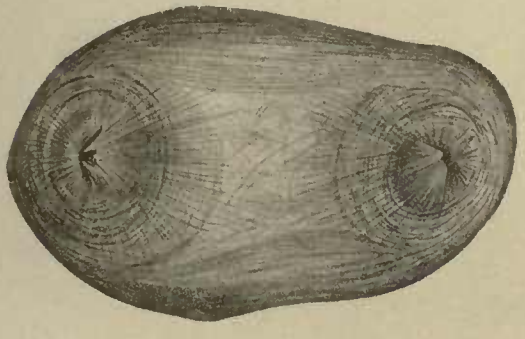

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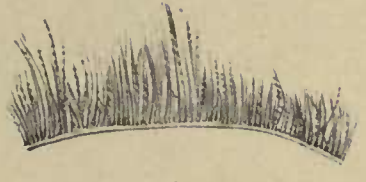

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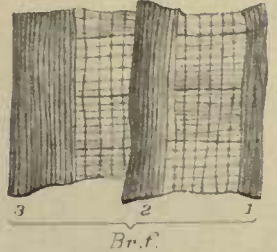

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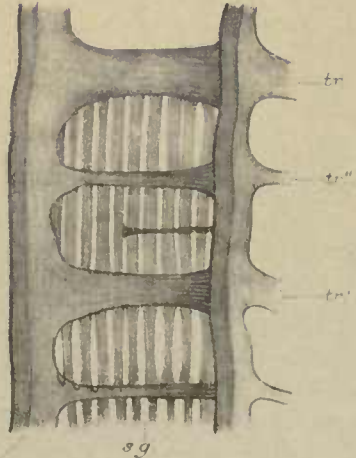

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Halocynthia setosa, Sluiter

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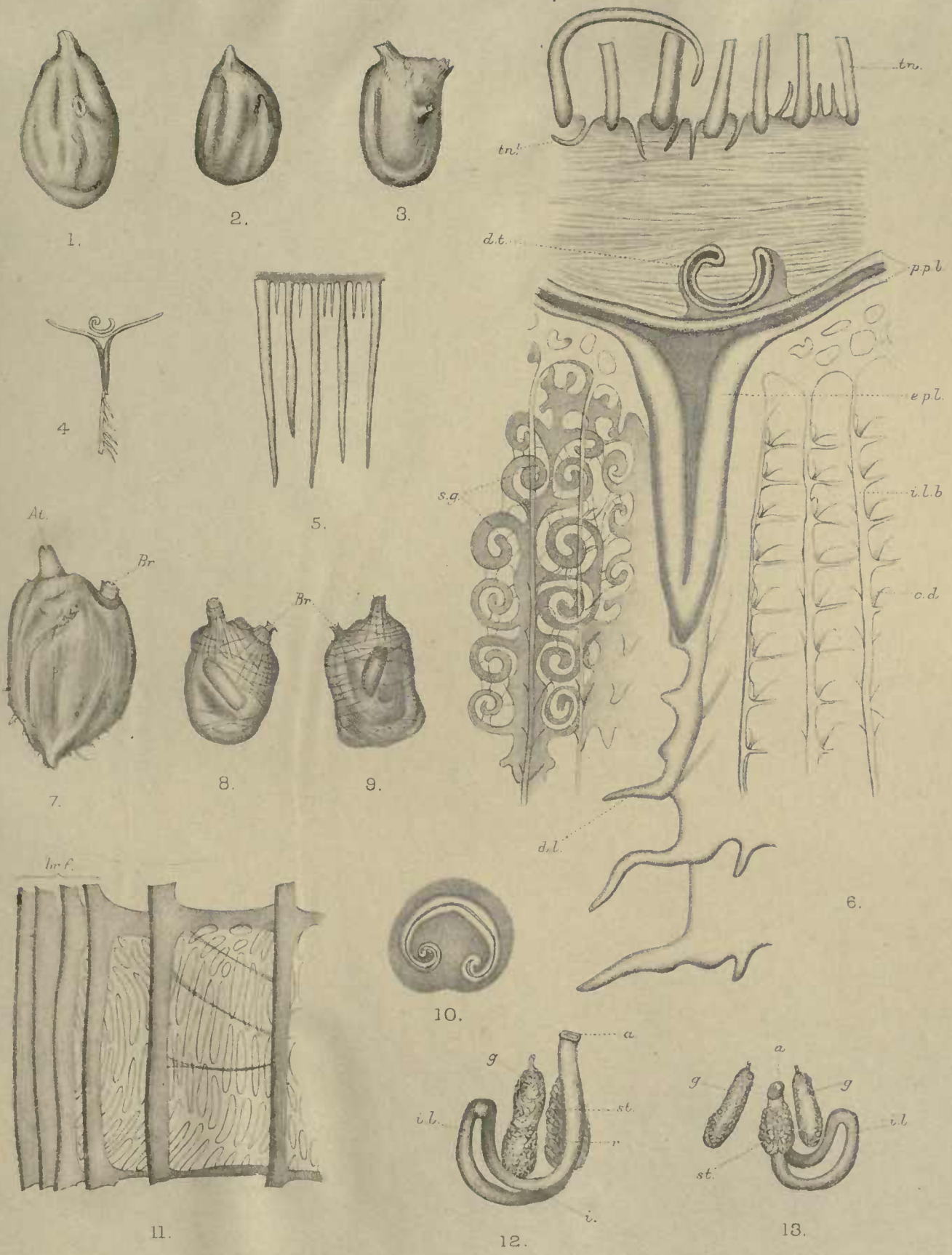

Antarctic (Discovery) Exp. Tunicata pl III W.A.H. del. Huth lith. et imp.

1 — 6 Corella eumyota Traustedt. 7 — 13 Molgula hodgsoni.

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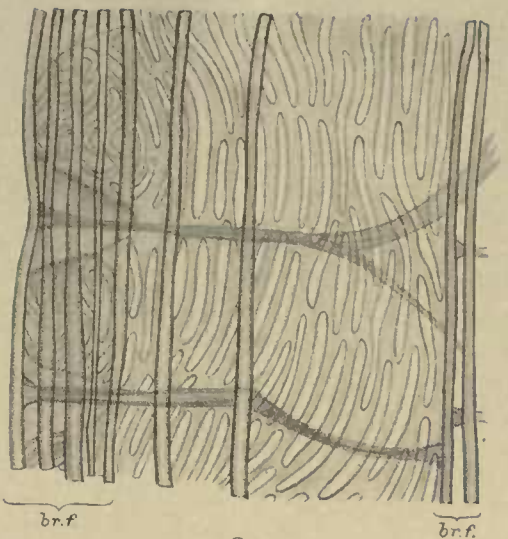

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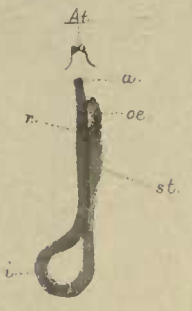

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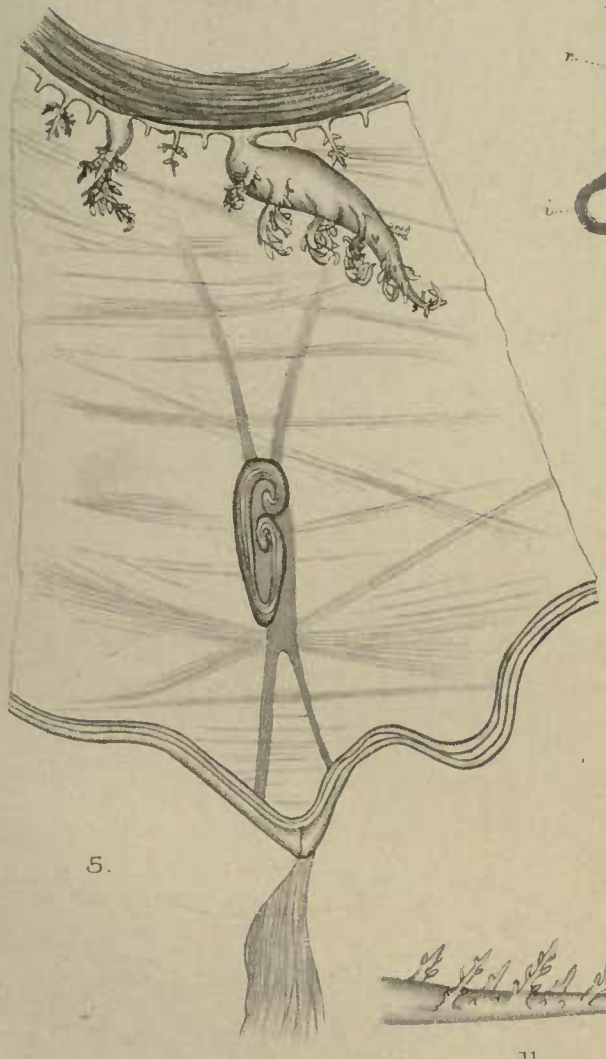

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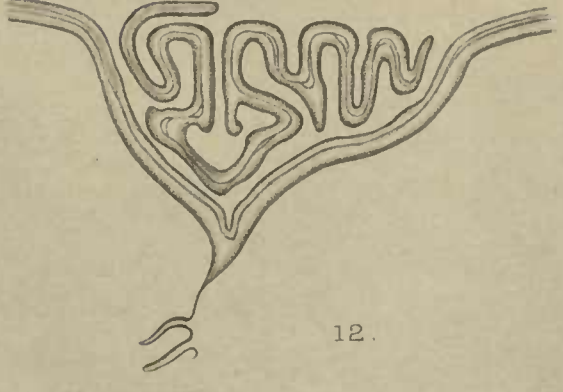

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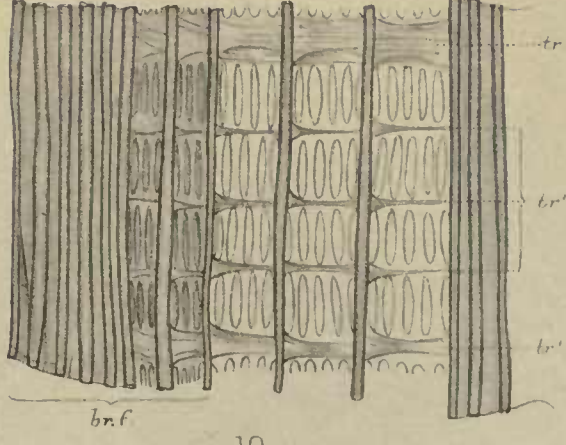

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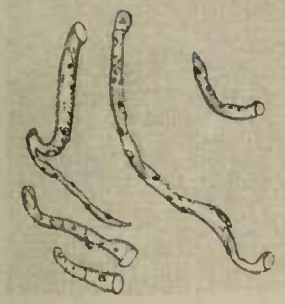

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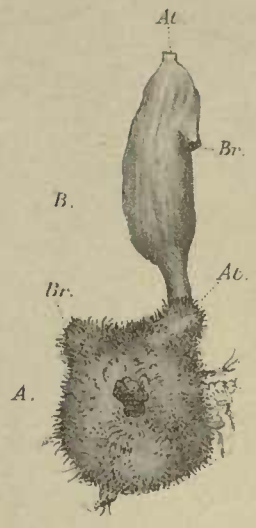

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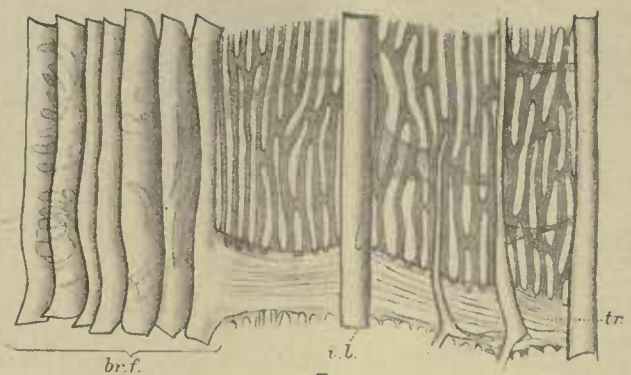

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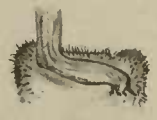

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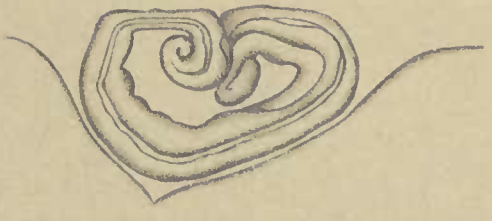

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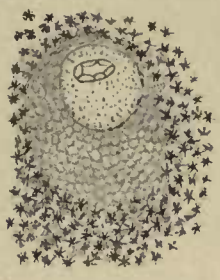

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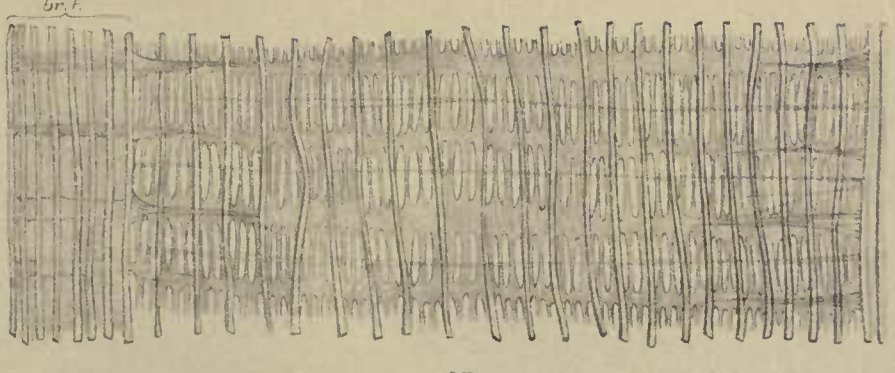

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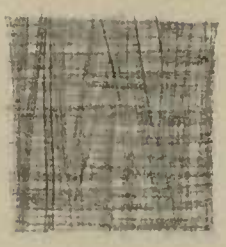

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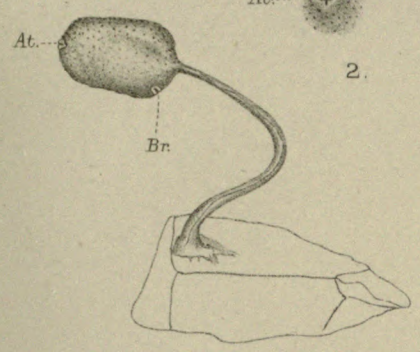

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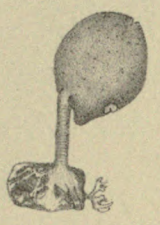

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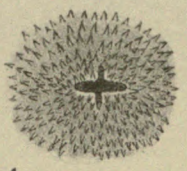

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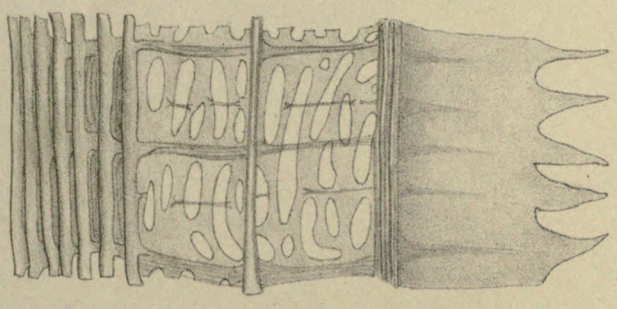

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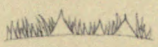

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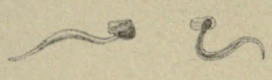

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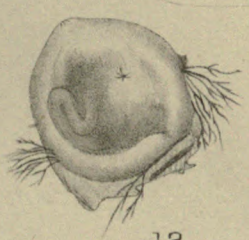

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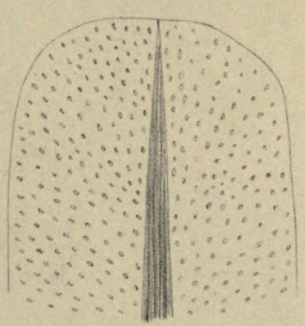

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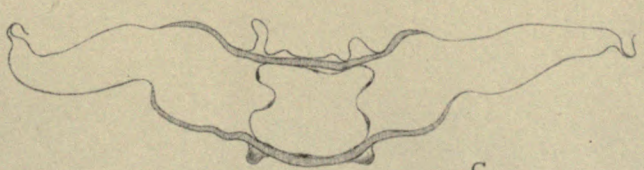

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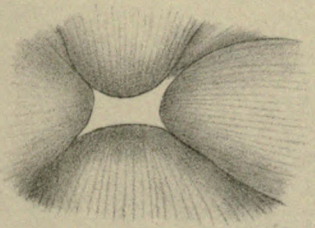

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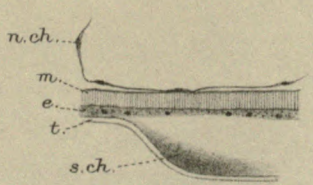

17.

D

16.

Antarctic (Discovery) Exp. Tunicata pl. VII. W.A.H. del. Huth lith. et imp.

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CRUSTACEA.

IX. ISOPODA.

By T. V. Hodgson, F.L.S.

(10 Plates.)

The collection of Isopoda brought from the Antarctic by the 'Discovery,' if not a large one, possesses no small degree of interest.

No less than twenty-five species were captured, and, with a few exceptions, these are not very numerous in individuals, in fact the number of species represented by a single specimen or by only two or three is unduly large. The labour involved in collecting in an ice-covered area was the only serious difficulty to contend with; of course the ice sheet reduced very considerably the area of operations, open water and a boat would have enormously increased the collections, and though the 'Discovery' was in Winter Quarters six weeks before the sea was effectively closed, that was a busy period, and it was only at intervals that a boat's crew could be obtained.

Another cause which operated against big collections was, in my opinion, the immense numbers of the Amphipod *Orchomenopsis rossi* which swarmed into the traps, devouring the bait, and sometimes the specimens captured, and which were themselves captured ten to thirty thousand at a time.

I have, I think, satisfactorily proved that *Serolis cornutus* Studer, is merely the immature form of *S. trilobitoides* Eights. The specimens captured by the 'Discovery' are not fully grown, but they are sufficiently so to show all the essential features described by that keen observer, Eights. Dr. Studer's specimens, as well as those described by Mr. Beddard, are much smaller and obviously far from mature. I do not think there can be any further doubt on this question.

No less than seven of the species described in the 'Southern Cross' Report have been found again, one in the same locality, the others with a much extended range, passing, in some cases, to the opposite side of the southern hemisphere.

The Arcturidæ is another family in which specific characters become seriously involved in sexual variation. The male and female of one species, *Antarcturus franklini*, appear on Pl. V. as two species, the male being there indicated under the name *A. australis*. It was only when all the specimens of both sexes, or as it was then thought to be, both species, came to be overhauled that the error was noticed. I am not aware of any such distinct case of sexual variation in other members of the genus, but that it occurs to a less extent is perfectly well known. The only species other than *Serolis trilobitoides* Eights, which was taken close to the Antarctic Circle, just as we were leaving those regions, that can be considered large is *Glyptonotus acutus*

Richardson. We were certainly unfortunate in not capturing a greater number of specimens. The small species belonging to the Janiridæ, Munnidæ and their allies were very abundant and much time was spent in going over the sponge débris, which was invariably the predominent feature in the shallow water fauna; they were taken for the most part by the D-net inside the 25-fathom line, and it is among these forms that the chief interest in the collection lies. Seven species, mostly assigned to new genera, have their eyes on enormous peduncles. This, I believe, to be an entirely new feature. In dealing with the Isopoda of the French Antarctic Expedition (12) Miss Richardson has introduced two species possessing this interesting feature to science; the 'Discovery' adds five more, and among those specimens the ocular peduncle is even more slender and elongated. Under these circumstances can the Isopoda be regarded as universally sessile-eyed? Up to the present it has been so, and the Munnidæ have been considered to be on the way to a different state of things. Among that family it is a very moot point whether the eye can be said to be on a peduncle at all, as the cephalic process is so large, but now these new southern forms show a long and slender peduncle quite on a par with those of the podophthalmous crustacea, which reduces the value of a hitherto characteristic feature of this group to a minimum, and the existence of a joint has only to be proved to destroy it altogether.

I here append a list, as far as I have been able to ascertain, of all Isopoda hitherto obtained in the Antarctic regions; several of these are as yet little more than mere names to me. Those taken by the 'Discovery' are marked with *. The total number is one hundred and eleven, of which twenty-nine belong exclusively to the Antarctic, seven more belong to both the Arctic and sub-Antarctic regions, and the remaining seventy-five exclusively to the latter. As stated in my Report on the 'Discovery' Pycnogonida, I take the northern limit of the sub-Antarctic region to be the mean annual isotherm of the surface water of 45° F., as defined by Buchan in the concluding volume of the 'Challenger' Reports, and the latitude 60° S. as the boundary between the sub-Antarctic and the Antarctic regions proper. I have, however, gone a step further in dealing with some Pycnogonids from the Magellan Straits. I then found it desirable to define a Magellan region, and therefore divided the entire Antarctic into three provinces, naming them from their points of attack, it being obvious that any visit to the South Polar regions would be made from the land masses to which these names refer, Kerguelen, of course, standing for Africa.

In accordance with the above I have noted the province from which each species has been taken:—

Australasian province between long. 100° E. and long. 130° W.
Kerguelen province between long. 100° E. and long. 20° W.
Magellan province between long. 20° W. and long. 130° W.

It may reasonably be objected that these boundaries are purely artificial, and that

it would have been more appropriate to make the provinces coincide with the oceans to the north. It may be so, but it seems to me to name the provinces from the point of attack is the wisest course in the present state of our knowledge. The more I see of the South Polar fauna the more certain I become that a very large proportion of species have a circumpolar distribution. It would also appear that the northwardly projecting spur of Graham's Land, which passes for some considerable distance beyond the Antarctic circle, constitutes a barrier round which species have a difficulty in passing. Whether the South Polar fauna originated in those latitudes and has spread northwards, or whether it has acquired its present aspect by migration from the north, is a speculation which will be material for discussion for many years to come. Be this as it may, our greatest knowledge will lie nearest to the three points of attack, and from these it will be comparatively simple to investigate the passage of various species northwards into the great oceans. A circumpolar fauna will specialise more or less distinctly as it passes northwards, and its ancestors or other relations become separated by the great land masses. Or, if investigation shows the migration to be in a southerly direction, we have in those oceans three independent streets down which the fauna passes to mix beyond their junctions, or to pass on to the uttermost limit where uniform conditions, within certain limits, must have their effect.

The collection brought back by the 'Français' from the west coast of Graham's Land is very like that of the 'Discovery,' no less than eight species are common to both, their total number being thirteen.

The collection of the 'Scotia' is still in my hands for description, the shallow water and littoral forms come from a more northerly latitude, the South Orkneys, the deep sea forms from the Weddell Sea. I can only say here that this collection does not contain a single species taken by the 'Discovery.' Three other Antarctic collections remain to be described; how far they will bear out the opinion expressed above remains to be seen.

	Antarctic.	Sub-Antarctic.
Apseudes antarctica Beddard		×
„ spectabilis Studer		×
Tanais willemoesi Studer		×
„ hirsutus Beddard		×
Typhlotanais kerguelenensis Beddard		×
Leptognathia australis Beddard		×
Nototanais dimorphus Beddard		×
* „ antarcticus Hodgson	×	
Paranthura neglecta Beddard		×
* Leptanthura glacialis	×	
* Gnathia antarctica Studer	×	×
„ tuberculosa Beddard		×
* Euneognathia gigas Beddard	×	×
Ægamagnifica Dana		×
„ semicarinata Miers		×
„ punctulata Miers		×
„ edwardsi Dollfus		×

	Antarctic.	Sub-Antarctic.
* Ægа antarctica n. n.	×	
* Cirolana meridionalis	×	
Rocinela australis Schiödte and Meinert		×
Anilocra laticauda Milne Edwards		×
Serolis paradoxa Fabr.		×
* „ trilobitoides Eights	×	×
„ plana Dana		×
„ convexa Cunningham		×
„ schythei Lutken		×
„ latifrons White		×
„ septemcarinata White		×
„ serrei Lucas		×
„ bromleyana Suhm		×
„ antarctica Beddard	×	
„ pagenstecheri Pfeffer		×
„ polita Pfeffer		×
„ bouvieri Richardson	×	
Exosphæroma gigas Leach		×
„ lanceolatum White		×
„ calcareum Dana		×
Dynamenella globicauda Dana		×
„ eatoni Miers		×
* Cymodocella tubicauda Pfeffer	×	×
Dynamene (?) darwini Cunningham		×
Cassidinopsis emarginata Guer-Men.		×
Cymodocea australis Hodgson	×	
Plakarthrium punctatissimum Pfeffer		×
Limnoria antarctica Pfeffer		×
Arcturus furcatus Studer	×	×
„ glacialis Beddard	×	
„ spinosus Beddard		×
„ brunneus Beddard		×
„ studeri Beddard		×
„ americanus Beddard.		×
„ stebbingi Beddard		×
„ coppingeri Studer		×
„ polaris Hodgson	×	
* „ adareanus Hodgson.	×	
* „ franklini Hodgson	×	
* „ hiemalis	×	
* „ meridionalis	×	
Astacilla marionensis Beddard		×
„ falklandica Ohlin		×
„ magellanica Ohlin		×
Glyptonotus antarcticus Eights	×	
* „ acutus Richardson	×	
Arcturides cornutus Studer		×
Macrocheiridothea michælseni Ohlin		×
„ stebbingi Ohlin		×
Idotea annulata Dana		×
„ rotundicauda Miers		×

	Antarctic.	Sub-Antarctic.
Idotea metallica Bosc.		×
„ miersii Studer		×
Edotia tuberculata Guer-Men.		×
„ magellanica Cunningham		×
„ lilljeborgi Ohlin		×
Cleantis granulosa Heller		×
Notasellus sarsi Pfeffer		×
* „ australis Hodgson	×	
Jæropsis marionis Beddard		×
* Austronanus glacialis	×	
* Austrofilius furcatus	×	
Jæra antarctica Pfeffer		×
Jais pubescens Dana		×
„ hargeri Bovallius		×
Ectias turqueti Richardson	×	
Iolanthe acanthonotus Beddard	×	
* Coulmannia australis	×	
* „ frigida	×	
* Notoxenus spinifer	×	
Munna maculata Beddard		×
„ pallida Beddard		×
* Haliacris antarctica Pfeffer		×
Austromunna antarctica Richardson	×	
* „ rostrata	×	
* Antias charcoti Richardson	×	
Pleurogonium albidum Beddard		×
„ serratum Beddard		×
* Austrosignum grande	×	
* „ glaciale	×	
Neasellus kerguelenensis Beddard		×
Astrurus crucicauda Beddard		×
Munnopsis australis Beddard		×
Eurycope sarsi Beddard		×
„ fragilis Beddard	×	×
„ spinosa Beddard		×
Echinozone spinoza Hodgson	×	
Ilyarachna quadrispinosa Beddard		×
* Notopais spicatus	×	
Acanthocope spinicauda Beddard		×
Tylos spinulosus Dana		×
Porcellio fuegiensis Dana		×
Oniscus augustus Dana		×
Styloniscus magellanicus Dana		×

NOTOTANAIS.

Nototanais Richardson (**12**), pp. 1 & 2.

This genus has been defined by Miss Richardson as follows :—

First pair of antennæ composed of three joints in the female, and five joints in the male.

Second pair of antennæ composed of five joints in both sexes.
Cephalon of the male large at the base, and prolonged anteriorly to a narrow extremity.
Cephalon united to the first thoracic segment, leaving six segments well developed.
Uropoda biramous, each branch composed of two joints.
The first gnathopods are dissimilar in the two sexes. In the male they are much enlarged, and the propodite is furnished with a process directed backwards, a thumb, which forms a chelate hand.

This genus has been instituted for the reception of *Paratanais dimorphus* Beddard (1), and *P. antarcticus* Hodgson (7), which, on account of their strongly marked sexual dimorphism, a character they share with *Heterotanais* G. O. Sars, and other minor features, can no longer be included in any existing genus.

Nototanais antarcticus.

Paratanais antarcticus Hodgson (8), pp. 240 & 241.
Nototanais antarcticus Richardson (12), pp. 2 & 3.

Body rather slender, but differing in its proportions in the two sexes, being rather longer in the female, notwithstanding the fact that the cephalosome is much longer in the male than in the female.

Male.—The cephalosome is pyriform, long, narrowest anteriorly ; this border being obtusely angulated, and having a well-marked conical projection laterally which is occupied by the eye. This cephalosome is a little longer than the first four free segments of the mesosome.

The mesosome comprises six segments ; the first is very short, and the next three progressively increase in length, the two following decrease, the last being nearly as long as the third.

The metasome is six-jointed, five of the segments being subequal in size, the last is twice as long and rounded, bearing the biramous uropoda postero-laterally.

Female.—The cephalosome is shorter and more distinctly conical than pyriform, and is not longer than the first three free thoracic segments. The proportions of these segments are similar to those of the male, though they are longer, the length of the mesosome in male and female being as 9 to 11.

First antenna. That of the male comprises five joints, of which the first is longer than the other four together, the proportion being as 6 to 4 ; the second is as long as the two terminal ones, the third being by a very little the shortest of the series. Except the penultimate all the joints bear a few long setæ distally ; the terminal joint has half-a-dozen or thereabouts. In the female this organ is tri-articulate, the first joint being nearly twice the length of the other two together. There are a few long setæ distally and in the middle of the first joint.

The second antenna in the female has five joints: the first is short, the next two are a little longer and subequal, the fourth is very nearly as long as these three together, the terminal one is about as long as the second or third, but of course a great deal more slender. This one terminates in a group of six long setæ; setæ occur distally on all the joints except the first.

In the female the mandible is strong, the cutting edge is incurved almost to a right angle and armed with three large teeth, a broad one behind the other two. The molar tubercle is long, at right angles to the main structure; it is slightly swollen and then tapers to its posterior border. This edge bears five well-developed teeth and a discoloured tubercle within this on the posterior border. The mandible of the opposite side has a well-developed cutting edge with a prominent tubercle posteriorly, but there are no long teeth here. There is no palp.

The first maxilla has a broad base, the external margin rapidly tapering to a slender band-like structure. It is much curved inwards distally, and armed with some half-dozen strong teeth, one of which, the most external, is longer than the rest. The so-called palp rises from the inner margin of the base, and is a slender structure about two-thirds the length of the main lobe, and terminating in two long setæ.

The second maxilla is only represented by a small ovoid lobe.

The maxillipeds together have a median, heart-shaped basal joint, which is divided longitudinally; the masticatory lobe is more than half the length of the basal joint, slightly increasing in diameter to the end, which is truncate, armed with a couple of small tubercles and quite devoid of any setæ.

The palp is five-jointed. The first joint is very small, the second is the longest with an oblique distal margin, the third is triangular in shape, the apex external, and therefore this side of the joint is reduced to a minimum; the fourth joint is large, and the terminal about half the length and much more slender; this is armed with four long setæ.

The epignath is about three-quarters the length of the basal joint and irregularly ovoid.

The first appendage of the mesosome, or chelipeds, of the adult male are very largely developed. The ischium is a broad joint prolonged below the point of its articulation to a broad, curved edge, like an axe-blade. The merus is a very short joint, wedged in obliquely between the ischium and the carpus. The carpus, excepting the dactylus, is the longest joint of the limb; it is very broad and rounded posteriorly. Its inner margin is produced into a knife edge. The propodus is a stout joint about half the length of the dactylus, and carries, on its inner side, at right angles to it, a large irregularly-shaped appendage which forms a chela with the dactylus. This appendage is curved; the proximal portion is broad, flattened, and produced into a stout spur, directed inwards. The distal portion is more slender, having a swelling with a few (three) long setæ on its inner side, beyond which it terminates in a slender incurved finger. The dactylus is very long, slender, and curved, longer than any other joint in the appendage.

In the female the first appendage of the mesosome is comparatively small; the ischium is produced as a rounded lobe, much narrower than that of the male, below the point of its articulation; the merus is not very different to that of the male; the carpus is cylindrical; both these joints bear a pair of long setæ. The propodus forms a well-developed chela; the two dactyli are stout and subequal in size, with discoloured teeth at their extremities. The immovable finger has a long seta on either side of its base and another pair on the inner margin close to a series of four small teeth which end against the terminal tooth.

In the female the first leg is slender, the first joint is as long as the succeeding four, the second is very short, and the others progressively lengthen and have a few setæ distally; the setæ are strongest at the extremity of the limb; the terminal claw is very slender and more than half the length of the joint which bears it. The two following legs are similar, but the terminal claw shortens. The last three pair are a little shorter and stouter, the setæ are more spinous, and the terminal claw is comparatively short and more definitely a claw. Those of the male are similar, but longer and more slender. The oostegites number four pairs, and are attached from the second to the fifth appendages of the mesosome. Each oostegite consists of a rather broad strap-like axis, from each side of which extends a very delicate membrane, the whole forming a concave structure nearly round in shape.

The pleopods are five pairs of the appendages adapted for respiration, and are similar in both sexes. Each consists of a protopodite of two joints, the first of which is very small, a large endopodite, ovoid in shape, the inner margin of which is fringed with stiff setæ, and these increase in size to the distal extremity. The exopodite is much smaller, slightly curved, and its inner margin is similarly setose, but the setæ are much reduced in number; the posterior pleopoda differ slightly in shape. The exopodite is attached half way along the second joint of the protopodite.

A very large number of specimens were collected during the whole of our stay in Winter Quarters. They were constantly being picked out of the sponge débris and obtained inside the 25-fathom line. It would appear from the great number of individuals of all ages and sizes that the acquisition by the male of the enormously developed chelipeds takes place suddenly. There were no specimens which indicate a gradual development of these organs, nor were there any specimens of small size showing this distinctly masculine character. A large proportion of the apparently adult females show no trace of oostegites, and it is quite possible that some at least were not completely developed males. The suddenness of the change is also emphasized by the fact that the mouth organs of the fully developed male are defective.

LEPTANTHURA.

Leptanthura G. O. Sars (**13**), pp. 47–48.

This genus was instituted by Prof. G. O. Sars in 1899, being separated from *Paranthura* by a number of small characters. The mouth organs seem to be the

essential features upon which this separation is based, but under any circumstances the two genera are very closely allied. The following species is most nearly related to *Leptanthura*.

Leptanthura glacialis.

(Plate I., fig. 1.)

Specific characters :—

Uropoda as long as the metasome, broad ; the exopodite rather less than half the length of the endopodite and cordate in shape.

This species attains a length of 21 mm.

The cephalosome is the smallest segment of the body, and its anterior margin is incurved to be produced in the middle line into a short point between the insertion of the antennæ. There are no eyes.

The mesosome comprises seven distinct segments, these are elongated, and the first is longer than the cephalon, the two following are very little longer and subequal, the two succeeding ones are a little longer still and subequal, the last is very little shorter than the first.

The metasome is narrower and all the segments are distinct. The first and fifth are rather the longest, the intermediate ones being subequal in size, the sixth is narrower and longer, having the posterior margin rounded.

The telson is elongate, linguiform tapering to a blunt point, which is setose. The uropods are large and with the telson form a conspicuous caudal fan.

The first antenna (fig. 1a) has a peduncle of three stout joints, progressively shortening from the first, the third only having a distal fringe of long setæ. The flagellum consists of four joints, the first being broad but extremely short, so much so as to be easily overlooked ; the next joint is comparatively long, the two terminals progressively shorten but are together half the size of the preceding one ; both, more particularly the terminal one, are provided with long setæ.

The second antenna (fig. 1b) comprises a peduncle of four very short joints ; of the first the inner margin is much swollen, the next joint is attached at an angle and has a rounded base, otherwise it is very short and stout ; the two following are subequal in length, but the more distal one, though still stout, is little more than half the diameter of the proximal one ; both are fringed distally with long setæ. The flagellum comprises five joints, the first is the largest, the other four are very small, all are fringed distally with long setæ, those of the terminal joint forming a dense tuft quite concealing all details as to the character of this joint.

The mandible is triangular, pointed, and bears a diminutive palp, in which I have only been able to discern two joints.

The maxilla (fig. 1c) is a single comparatively broad joint tapering to a fine point.

The maxilliped (fig. 1d) is elongated and has its inner edge straight, the outer one being rather rounded to the extremity. The masticatory lobe, such as it is, is represented only by a minute conical joint bearing a single seta, a small palp of a

single joint and about one-third the length of the entire appendage is present. Its apex is provided with a few long setæ. The epignath is very small and ovoid.

The appendages of the mesosome show a transition between the subchelate first and the more locomotive posterior ones. The first of these appendages (fig. 1e) is stoutly built, the basis is a little longer than the ischium. The merus is a peculiar joint and is short, very much expanded dorsally to embrace the base of the propodus; it bears several long setæ ventrally and two or three at the dorsal extremity.

The carpus is a small joint, on the inner side of the appendage, apparently wedged in between the merus and the propodus. Internally it forms a thin, roughly rectangular plate, rather than a joint, which carries a few setæ and a couple of spines. The propodus is large, rather flask-shaped, with its inner margin expanded as a thin plate; this expansion has a thumb-like process at the inner extremity, and is armed near its anterior border with a row of small but highly specialised spines. The joint is attached near its middle to the carpus, the rounded base being adapted to the crescentic enlargement of the preceding joint.

The specialised spines are about a dozen in number and are set in distinct sockets, and a long seta is associated with each. The structure of the spine is difficult to make out, but appears to consist of a stout shaft with a group of stout teeth on one side. In some cases one or two teeth are to be seen on the other side of the shaft, but much nearer its base. I have not deemed it desirable to injure the appendage in order to examine these spines more minutely. The dactylus is long and curved, set at the external angle of the propodus, and it carries on its inner margin a small number of widely separated setæ.

The second appendage (fig. 1f) is similar to the first in general structure, the basis is, however, proportionately longer and more slender, the merus and other joints are also smaller, and the expansion of the propodus which bears the specialised spines is not so great and its margin is much more nearly parallel to the axis of the joint. The spines themselves are rather longer, the lower portion cylindrical and the upper two-thirds tapering to a blunt point. On the posterior side of the shaft about its middle there is a series of small teeth, graduating in size from below upwards, *i.e.*, from large to small. On the opposite side of the shaft, where the tapering begins, there are one or two minute teeth.

The third appendage closely resembles the previous one, the basis and ischium are subequal in length, the latter being more expanded, the remainder of the limb is similar but on a smaller scale, and the specialised spines are more uniformly digitiform with fewer accessory teeth. In the last appendage (fig. 1g) the ischium is very little shorter than the basis and is dilated dorsally, the merus is about half its length and attains its greatest diameter distally. The propodus is approximately cylindrical, and the few spines that it carries only show the minimum of specialisation.

The metasome in its entirety is a little shorter than the two posterior segments of the mesosome.

The telson is distinctly separated from the rest of the metasome, and is a long thin structure tapering near the extremity to a blunt point, which is provided with long setæ.

The uropoda are large, though the basal joint is small.

The exopodite consists of a roughly cordate plate attached by its apex and almost completely conceals the proximal joint of the endopodite. The distal margin of this joint is indented.

The endopodite is two-jointed; a substantial proximal joint supports an ovoid distal joint, not quite so long, and the outer margin of this joint is supplied with long setæ, and these are longer and form a tuft at the extremity.

The pleopoda are all much alike, the first pair are, however, stronger and very little larger than the others.

Only two specimens of this species were taken in Winter Quarters inside the 25-fathom line, one of them in a damaged condition.

Gnathia antarctica.

(Plate I., fig. 2.)

Anceus antarcticus Studer (**18**), p. 4.
Gnathia polaris Hodgson (**8**), pp. 241–3.
Gnathia antarctica Richardson (**12**), pp. 3–4.

Specific characters :—

Male.

Cephalosome quadrangular, with a strongly developed spine in front of each eye. Usually with two spines near the anterior margin and the middle line.

Cephalosome and the anterior segments of the mesosome more or less spinous and fringed with long setæ.

This species was first described by Dr. Studer from an immature specimen taken off Patagonia. Miss H. Richardson identifies my *G. polaris* with *Anceus antarcticus* of Dr. Studer, which, when dealing with the Southern Cross collection, had escaped my attention. I have no reason to disagree with the identification.

The male.—The cephalosome is broad, roughly quadrangular, with the postero-lateral margins rounded; the anterior border forms three crescentic lobes, of which the median is most prominent, but only visible when the mandibles are divaricated; outside the more lateral lobes is a stout spur which is just external to the antennæ and in front of the eye, it has a broad base and its anterior border is irregular if not toothed. The lateral portion of the cephalon is rather swollen but depressed in the centre. It is covered more or less completely with minute spines.

The eyes are prominent and darkly pigmented. Immediately behind the cephalosome is a narrow crescentic segment, the first segment of the mesosome and one which does not reach the lateral margin of the body. The two following segments of the mesosome are short and broad, the next is attached by a distinct "waist" and

generally has a very obvious depression in the centre. The next, or fifth segment, is the longest, and there is a progressive increase in length from the first to the fifth, this one bears more or less distinct traces of a median longitudinal division. The sixth segment is a little shorter than the preceding, and posteriorly it terminates in three lobes, the median is short and the width of the abdomen, the lateral ones are large and project along the sides of that structure. The last segment of the mesosome is much reduced in size and almost fills the interval between these lobes. Laterally the second and third segments of the mesosome are covered with small spines or tubercles, a feature which is not brought out in the figure in the 'Southern Cross' Report. The cephalon and every segment of the thorax bears laterally a number of long slender setæ. A feature which is not alluded to in the original description is the crustaceous character of the exoskeleton, this is usually very prominent down to and including the fifth thoracic segment, although it is to a certain extent covered by a mass of diatomaceous matter. The posterior segments of the thorax and the abdomen are almost invariably thickly covered with a similar growth, often so much as to completely conceal all structural details.

The metasome consists of six joints of subequal size, the telson, a pointed triangular structure with a few long setæ distally being fused with the last one. The epimera are broad blades, curved to a slight extent backwards. The last abdominal segment has no epimera. The uropoda are well developed, the basal joint is short and stout, the two rami are subequal in length, but the endopodite is considerably broader than the exopodite, both are fringed distally with long setæ and have three shorter ones on their external borders.

The first antenna consists of a three-jointed peduncle and a short, four-jointed flagellum. The first two joints of the peduncle are short and subequal, the third is longer than the other two together, all bear a few setæ distally.

The second antenna comprises a peduncle of four joints and a flagellum of six or thereabouts. The first two joints of the peduncle are short, the third is about as long as the two preceding ones together, and the fourth is still longer; this one carries along the side of it a series of setæ of increasing length.

The mandible is scythe-like in general appearance, the amount of curvature of the free end being variable, the outer margin carries a sharp spur near its middle, and the inner cutting edge is slightly sinuous.

The maxilliped is a small structure, the basal plate is rather large, comparatively roughly triangular and attached by its truncated apex. The masticatory process is a small clavate process bearing two stout knobbed processes on the inner side. The palp consists of four small rounded joints which taper slightly from the first, and each carries a few long setæ on the outer margin.

The gnathopod is a large pyriform spoon-like structure forming an operculum over the residuum of the mouth organs. It is attached on one side near the base and its rounded free margin is fringed with delicately plumose setæ. Its surface is

marked with the three characteristic plates. The terminal joint is quite small, ovoid, with very fine setæ on its margin and stouter ones on its surface.

The pereiopods are as usual five pairs and differ but little from each other. The first two pairs are smooth generally, although the carpus of the first has three stout tubercles ventrally, and the propodus bears a row of small spines along its ventral border, one large pectinated spine about two-thirds of its length, and a similar but larger one distally. In all other cases only the two larger spines are present, and these are not so distinctly pectinated. The three posterior pairs have the bases tuberculated dorsally, and the other joints are also tuberculated but to a less extent ventrally. In all cases the ischium is dilated distally and the merus has a well-developed lobe projecting forwards. The limb is fairly well supplied with setæ of varying length and strength. The dactylus is powerful.

Female.—The adult female has an enormously swollen body, and the cephalosome is much smaller than that of the male and certainly not half the length. Its anterior margin has a rounded lobe in the middle line, below which some of the mouth organs project as a wide but truncated rostrum. The preocular spines are smaller than in the male. Two anterior segments of the thorax are distinct, the following three are completely fused though sometimes the lines of segmentation can be observed. The last thoracic segment, which is considerably reduced in the male, is in the same condition in the female. The younger individuals are much more slender, but the fusion of three segments of the mesosome is equally complete; the two anterior ones are more distinct. The cephalosome is smaller still and its anterior margin is angular with a truncated projection in front, and below this the mouth organs project as a conical rostrum; the precise condition of this depends on age. The pereiopoda are similar to those of the male, but more slender and without the tubercular processes.

The drawings illustrating *Gnathia polaris* in the 'Southern Cross' Report were made with great care, but one feature of importance has not been brought into the prominence it deserves, and that is the crustaceous character of the exoskeleton of the cephalon and some two or three segments of the mesosome. This, however, is a very variable feature, and during an examination of the large number of specimens brought back by that Expedition it also appears that the cephalic and thoracic outlines of the animal are not always as depicted in the illustration. The type figured requires no modification, but in other specimens where the jaws are closed the median projection is not visible; a rounded swelling appears at the base of each mandible, but I have been unable to detect the two stout spines which are so characteristic of the 'Discovery' specimens.

The preocular spines almost invariably bear a few more or less distinct subsidiary spinules on the front margin. The crustaceous character of the cephalosome and the first three segments of the mesosome is constant, though often much concealed by a diatomaceous deposit which sometimes covers the entire animal. The cephalosome, too, is more or less completely covered with very small spines; these also occur laterally

on the first three segments of the mesosome, and in some cases also extend as a band right across each segment. The last two segments of the mesosome in the 'Southern Cross' specimens are as a rule evenly rounded laterally, but in the more anterior one of the two there is sometimes a small incision which cuts off the hinder third. We must therefore expect to find a considerable amount of individual variation in this species. Another figure of the male is here given, and this has been drawn from a 'Discovery' specimen.

A number of specimens were taken by the 'Discovery' in Winter Quarters, all of them being extracted from sponge débris. In the roots of these organisms they made their homes. These specimens show a considerable range of variation; a typical example shows the following characteristic features. The cephalosome has a sinuous anterior margin with a very small spine in the middle line; on either side is a swelling which bears a distinct spine at its inner border not far from the middle line. Near the antero-lateral angle and just in front of the eye is a stout toothed spine; the cephalosome is depressed in the centre, but otherwise almost completely covered with small spines.

The first segment of the mesosome is a small crescentic structure squeezed in between the cephalosome and the next; the four following segments progressively increase in length, the fifth and sixth being subequal. The fourth is attached to the third by a conspicuous "waist." The first is only indistinctly spinous, the second and third, and, to a much less extent, the fourth, are strongly spinous, especially laterally, and along the posterior border in two segments at least.

The lateral margin of the fifth segment is invaginated posteriorly, the depression being occupied by a button-like process. The sixth segment is divided into two halves by a shallow transverse depression, and the posterior border, which is much arched, bears a stout tubercle laterally.

A small crescentic segment overlapping the first abdominal represents the seventh. The metasome exhibits five subequal segments with scythe-like epimera. The sixth segment is united to an acutely triangular telson, which bears a few setæ.

The uropoda are large, but not extending beyond the telson. The protopodite is stout, and its inner border is produced into a spinous projection. The endopodite is much broader than the exopodite, and both are fringed all round with long setæ. The entire body is fringed with long setæ, particularly on the cephalosome and anterior segments.

Although many of the 'Discovery' specimens are, to some extent at least, covered with a diatomaceous deposit, it never reaches that extent which it does in the 'Southern Cross' specimens. It is, however, sufficient to hide small details here and there. The variation is great, and in many cases the spinose covering is almost entirely absent, but may exist to a very variable extent. In many cases I have been unable to detect the three median spines on the cephalon as exist on the figured specimen, and the spur at the lateral angle of that structure is sometimes quite simple, at times truncated as if broken.

The crustaceous character of the mesosome is an exceedingly variable feature. Usually the first four segments show it very clearly; in the two following it is usually concealed. The fourth segment frequently has a conspicuous and quadrangular space in the mid-dorsal line, but as frequently this is quite absent. The succeeding segment also bears evidence of a median division, but often it is only partly crustaceous. The sixth segment is rarely crustaceous, but when it is the deposit is not evenly deposited. This segment only rarely exhibits the rounded postero-lateral margins so characteristic of the 'Southern Cross' species; but here, on turning the animal on to the dorsal surface, traces of the button-like process may be detected.

Numerous specimens, male and female and all ages, were taken from the roots of sponges inside the 25-fathom line. A few were taken at a time during the whole of our stay in Winter Quarters.

EUNEOGNATHIA.

This genus was separated from the more widely-known genus *Gnathia* by the Rev. T. R. R. Stebbing, on the ground that the first gnathopod of the male is six-jointed, and that the pleopods have both branches fringed with long plumose hairs.

Euneognathia gigas.

Anceus gigas Beddard (**1**), pp. 137–9.
Euneognathia gigas Stebbing (**15**), p. 338.

Specific characters :—

Male.

Cephalosome short and broad, with a sinuous anterior margin and a short spur laterally.
Depressed in the centre and tuberculated externally.
Maxilliped with 4-jointed palp, setose externally.
Gnathopods 6-jointed, with long setæ externally, short ones internally.

The single specimen measures some 16 mm. in length, the same size as the *Anceus gigas* described by Mr. Beddard in the Isopoda of the 'Challenger' Reports. The following description will show that it must be identified with that species.

The cephalosome is broad, rounded postero-laterally, and has a prominent spur at the antero-lateral angle external to the antennæ and just in front of the eyes. The anterior margin is sinuous, due to fine, small tubercular enlargements. The middle one is the smallest, and is slightly indented. Its surface is rather depressed anteriorly, but abreast and behind the eyes are two prominent tubercles on each side, of which the posterior is much the larger, and this latter is separated by a smooth narrow portion from the tumid posterior margin of the cephalosome. Mr. Beddard's specimen is not satisfactorily figured. The anterior margin of the cephalosome is similar to that of the 'Discovery' specimen, but the tubercles are more exaggerated. The ovoid lobes connected with the eyes do not exist as figured, but in place of them are two prominent swellings, the surface of which is coarsely tuberculated.

The visible segments of the mesosome are smooth; the first is small, somewhat crescentic in shape and does not reach the margin of the body; the second and third are narrow and their epimera are cleft; the fourth segment is much longer than either of the two preceding. The fifth is very nearly as long as the first three together and shows indications of the median longitudinal division characteristic of many members of this family. The sixth segment is narrower but almost as long as the fourth, the postero-lateral angles project backwards as a large rounded process, the inner border of which forms a small tubercle. It is on this process that the last pair of pereiopoda are articulated. The last segment of the mesosome is very small and wedged in between these processes.

The metasome comprises six distinct segments, of which the first is the shortest; the sixth terminates in a telson which is triangular in shape and acutely pointed, fringed with short setæ and with a stout one distally. The epimera are scythe-like in form and distinct from the segment bearing them.

The uropoda are about the same length as the telson.

The protopodite is short and broad and situated at a considerable angle with the last abdominal segment, and prolonged internally as a stout process with setæ at the extremity.

The exopodite is a little the narrower of the two and actually longer than the endopodite. This latter is a little broader and has its inner margin more rounded. Both are fringed with short setæ and less abundantly with long plumose setæ, especially on the inner margin.

The first antenna comprises a peduncle of three joints, the proportions being 2. 2. 5, the last being very much the most slender; this is followed by a flagellum of some half-dozen joints, of which the first is minute.

The second antenna has a peduncle of four joints, the proportions being 2. 2. 4. 5·5. The flagellum has about eight joints. In both cases the joints of the peduncles bear a few setæ distally and also along the last joint; shorter setæ fringe all the joints of the flagellum.

In Mr. Beddard's description the two pairs of antennæ are described as having an extra joint in the peduncle.

The mandibles are strong and scythe-like. Each is slightly curved, pointed distally, and has a prominent spine on the outer margin. The inner border bears two small rounded flanges to fit similar ones from the opposite side.

The maxilliped (fig. 3a) comprises a very thick basal joint, straight on its inner margin, with a series of fine setæ distally, stronger ones proximally, rounded externally and fringed with longer and finer setæ. From its inner angle of this joint there projects a thin, rather triangular joint and externally a four-jointed palp. The joints of the palp are broad and flat; the terminal one, however, is more slender; their proportions are 1. 4. 3. 2. The external margin of all these joints is fringed with plumose setæ, and there are three distally on the terminal joint.

The gnathopod (fig. 3b) is a large, tapering six-jointed structure, articulated to the body laterally and curved forwards over the mid-ventral line; it is shielded externally by a curved and projecting flange of the exoskeleton. The first joint is short and stout, only indicated in the figure; all the other joints except the terminal one are large, flat, and broad; the first of these—the second in point of size—has a fringe of small setæ externally and six rather short plumose setæ distally on the inner margin. The next joint is the largest, and its inner margin is fringed with large plumose setæ; externally there are a few small setæ distally. The three following joints are scarcely as long as the second, the terminal one being minute. Collectively they taper to a blunt point; the third has plumose setæ all along the inner margin, and small fine setæ externally, the other two have these fine setæ all around, but the penultimate one bears a group of long, simple setæ near its distal extremity.

The proportions of these joints are 4. 6. 3. 2. 0·5.

The pereiopoda are all very much alike. In the first pair the second and third joints together are scarcely as long as the first, the carpus is about as long as the preceding, the propodus is longer, the dactylus is about half its size. The proportions are not quite the same on all the limbs, but in all cases the ischium and merus are expanded on their outer margin; in the merus this expansion becomes a forwardly directed lobe. Small groups of setæ occur on these swellings, and a few smaller ones are scattered elsewhere. One or two small spines may occur on the propodus.

A single specimen was taken off Coulman Island in 100 fathoms, 13th January, 1902.

ÆGA.

This well-known genus, established by Leach in 1815, now contains some twenty-five species from all parts of the world. The following species was first taken on the French Antarctic Expedition.

ÆGA ANTARCTICA.

(Plate II.*)

Æga australis Richardson (**12**), pp. 4–6, *not* Whitelegge, Mem. Austral. Mus. iv. (1901), p. 229.

Specific characters :—

No process on the propodus of the first three pair of pereiopoda.
The enlarged endopodite of the uropoda.

This species, of which several specimens were taken, attains a length of 28 mm. and a width of 13 mm.

The cephalosome is small, its anterior margin is slightly rounded, and a stout but short rostrum projects between the antennæ; its posterior margin is rounded, but not quite evenly, the eyes are very distinct, rather small, lateral in position, and irregular in shape.

* The legend should be as above, and not as it was printed off.

The first segment of the mesosome is a little longer than the next two, and about as long as the last; it partially encloses the cephalosome up to the level of the eyes, but owing to foreshortening this is not noticeable in the figure. Its epimera are not distinctly separated off from it, and they are pointed posteriorly. The fifth and sixth segments are longest and widest. The epimera of all but the first are distinct, their external margins are curved, and they are pointed posteriorly. The entire mesosome is covered irregularly with minute punctures, not readily seen while the body is wet. The metasome is a little narrower, and only five distinct segments are visible from the dorsum, the sixth being fused with the telson, which is rather short and broad, its margins slightly curved to a blunt point, the structure being strengthened by a poorly-developed median keel. The margin is finely serrated, and each "tooth" of the serration is accompanied by a spine; the whole border is fringed with small plumose setæ.

The uropoda are large, and project but little beyond the telson. The protopodite is short and stout, having its inner border prolonged in a scythe-like manner as far as the inner angle of the endopodite. The exopodite is narrow, lanceolate, both sides of the distal half bear stout spines at regular intervals, and there is one at the extremity; almost the entire margin is fringed with short plumose setæ.

The endopodite is broader, more leaf-like in shape; it projects to the same distance. The internal margin is serrated, each serration being accompanied by a small but stout spine. These latter are also to be found on the inner margin. All the outer and most of the inner part is fringed with long plumose setæ.

The first antenna has a peduncle of three joints, none of which are dilated; the first is stout and lies at a right angle to the axis of the body, the second joint is shorter, and the third, which is comparatively slender, is three-quarters of the length of the preceding two together. The flagellum is multi-articulate and not very long.

The second antenna has a peduncle of five joints; the first is very short and stout, the second is shorter, the other three progressively increase in length, the last being scarcely as long as the two preceding ones. The flagellum is multi-articulate and half as long again as the peduncle.

The mandible is stout. The mandibular palp is three-jointed; the middle joint is the longest, and the terminal one the shortest. The inner border of the second joint bears a group of setæ near its distal extremity. These setæ are very finely toothed along the distal halves or thereabouts. The distal joint has the external margin rounded; it is fringed with stiff setæ on its straight inner border. These gradually increase in length towards the extremity of the joint, and under a high power they are seen to be flattened and slightly expanded at their extremities. At the extremity of the joint are three or four very much longer setæ armed with delicate teeth, as on the preceding joint.

The second maxilla (fig. 2) is a single elongated joint, rather expanded at the base; its inner margin is straight, and at about two-thirds of its length there is a

notch, as indicating the presence of another joint. This distal portion is rounded, and bears at its inner extremity three prominent teeth. At the notch above alluded to there is a very small finger-like joint armed with two teeth.

The maxilliped (fig. 3) is a very stout appendage. Its basal joint occupies rather more than half the length of the entire structure, the distal joint is triangular and slopes away from the inner margin of the appendage. In the palp five joints may be distinguished; the first is short and broad, the second is roughly triangular, the base being internal, the third is the largest and irregular in shape, being expanded internally. The two terminals are small, and bear three or four strong teeth and a few spinous setæ. The epignath is about three-quarters the length of the basal joint, forming a slightly rounded cone with a few setæ distally.

The first pereiopod (fig. 4) is short and stout; the first joint or basis is very much the largest joint, the ischium is short, expanded distally, and forms the bend of the limb in its natural position; the merus is short and broad, bearing on its inner margin four stout stumpy spines; the carpus is equally broad, but not half the length, and bears two stout spines on its inner margin; the propodus is a little longer than the two preceding, with two strong spines and a few setæ in connection with the distal one. The dactylus is longer than the propodus, and forms a very strong curved claw; the inner margin of this for more than half its length bears a thin membranous addition to its edge.

In the two succeeding periopoda the merus projects over the base of the succeeding joint both dorsally and ventrally, but especially the latter; the carpus also projects ventrally, in both cases forming a curved spinous structure.

The remaining four pairs (fig. 5) are also much alike, but more distinctly destined for locomotion than for prehension. Their proportions are not exactly the same. The basis is the largest and strongest joint. The ischium and merus together are scarcely as long; the former is prolonged dorsally over the latter, and the latter also, but to a much less extent. All the joints except the first have distal fringes of very strong setæ, and the ventral margin bears setæ arranged more or less distinctly as short transverse bands than in a single row. They are, however, arranged as a row on the propodus. The terminal claw is of quite moderate size but powerful.

The pleopoda are of a tolerably uniform character. In the first the protopodite is stout and very broad. The exopodite and endopodite are situated at subequal intervals from the margins and each other.

The exopodite is egg-shaped, the round end being free and thickly fringed with long plumose setæ; the endopodite has a straight and thickened inner edge and is more triangular in shape, the apex being rounded and fringed with plumose setæ.

Specimens of this species were taken occasionally throughout our stay in Winter Quarters, at depths down to 125 fathoms. The smallest example is scarcely 12 mm. long. Several more or less digested specimens were taken from the stomach of a Weddell's seal.

CIROLANA.

Another of Leach's genera, established in 1818 and now containing about thirty species from all oceans. The following species has not been previously recorded.

CIROLANA MERIDIONALIS.

(Plate III.)

Specific characters :—

Fifth segment of the metasome narrower than the preceding one, but the lateral margins are not covered by the fourth segment.

No eyes.

The total length of the animal is 35 mm., its width 15 mm. The cephalosome is very strongly marked off from the body and no trace of eyes can be discerned. Its anterior margin is rounded but slightly, excavated for the origin of the first antenna, between which there is a small rostrum, it is unevenly rounded laterally and the posterior border is incurved to a slight extent.

The mesosome is quite smooth, in life rather thickly spotted with light yellowish spots on the brown ground colour. The seven segments are distinct, the first is the longest, but owing to the curvature of the body it is foreshortened in the figure and partially encloses the cephalosome; the second is about half the length; the others, up to the fifth, progressively increase in length; the sixth is very little shorter, and the seventh shorter still. Except on the first the epimera are distinct from their respective segments, increasing in size to the fifth and, again except the first, pointed posteriorly.

The metasome comprises six segments, of which the last is fused with the telson. The first segment is very short, the others progressively decrease in width, the fourth to some extent overlapping the fifth laterally. The epimera of the four anterior segments progressively increase in size from the first and are acutely pointed.

The telson is broad and rounded, but terminating in the middle line in a small projection. Its distal margin is setose.

The uropoda are large; the short and stout protopodite has its inner angle produced as a spur and bears a narrow leaf-like exopodite setose all round; the endopodite is really about the same length but broader and similarly setose; it projects just beyond the end of the telson.

The first antenna has a three-jointed peduncle, the first is very short and stout, the second less stout and shorter, the third is as long as the other two together. The flagellum is twice the length of the last joint of the peduncle and consists of a number of stout but very short ill-defined joints. Its anterior margin bears a number of stout setæ; at first sight these look to be more like spines, but they are certainly of a sensory character.

The second antenna also has a peduncle of three joints which progressively decrease in stoutness but increase in length. The multi-articulate flagellum is of some length.

The mandible is very strong and provided with a four-jointed palp. That of the left side of the animal has a straight cutting edge, bevelled anteriorly and posteriorly prolonged into a stout spur of some length. The cutting edge is hollowed out internally to receive the mandible of the opposite side, here there is no spur, and the cutting edge is cleft to form two very stout teeth. This is as examined *in situ*. The palp is four-jointed, but the first is extremely short, the proportions of the others being 5. 7·5. 3·5. The second joint has the distal half of its external border provided with somewhat specialised setæ, the longest are at the beginning of the series, and speaking broadly there are only two sizes. The terminal joint is curved, fringed throughout its inner border with stout setæ; these gradually increase in length distally and the joint terminates with three long ones.

The first maxilla (fig. 2) has a small but irregularly shaped masticatory lobe; its outer border projects forward as a broad lobe, its inner and lower border, which is rounded and considerably larger, bears three very large spinous processes; of these the most posterior is longest and most slender; each has a thick tuft of fine setæ about the middle of its length where the spine is distinct as such from its basal process. The outer lobe is large, arched towards the middle line, its margin there being almost straight. This is armed with eleven very strong spines though their length and strength is variable. At the lower inner angle there are two small spinous tubercles, one bearing five small spines arranged like the prongs of a fork, the other has only two spines.

The second maxilla (fig. 3) has a short and broad masticatory lobe; this has a slightly rounded internal margin armed with numerous long and strong setæ. Three setæ near the posterior angle are very much longer than any of the others, and become plumose by the presence of hair-like structures. The remainder of the setæ do not vary greatly in size, and all except those near the anterior angle are, to some extent at least, plumose. Two lobes arise from the outer part of the masticatory lobe, the inner one is the broader and of an elongated ovoid form; the inner border and distal extremity is provided with long and stout simple setæ of two distinct sizes, and form two rows along the inner margin. The outer lobe is narrow and terminates with four long simple setæ and two smaller ones.

The maxilliped (fig. 4) is remarkable for the disproportion between the masticatory portion and the palp. The former comprises a short but stout joint, the inner margin of which is rounded proximally, and this is followed by another short joint which has a straight inner margin, and from its distal inner angle it slopes rapidly to a much shorter slightly rounded external margin; the inner distal margin carries four stiff plumose setæ, and near these is a single prominent tooth. It is behind this that the first joint of the five-jointed palp lies. The joints of this

appendage are all very short and broad and thickly bordered on both sides with long simple setæ, some of which on the inner margins of the last two joints are distinctly spinous. The third and fourth joints are much expanded internally, and the fifth is a very broad stumpy joint. The second joint has short stout setæ on its distal margin. The epignath is a very small rounded plate external to the basal joint.

The pleopoda are approximately uniform in structure. The first has been removed for examination. The protopodite is short and broad; its external margin projects as a short, stout backwardly directed process, the inner margin is rounded and bears a dense fringe of short plumose setæ, among which are a number of spines. The exopodite is a pointed egg-shaped structure, attached near the point; its external and distal margins are densely fringed with rather long plumose setæ. The endopodite is directed inwards from its attachment and then bent at a right angle, the anterior and inner edges being thickened and straight; they are fringed with fine setæ, which ultimately become long and plumose around the distal third of the joint. The inner edge is rounded.

The perciopoda are all very much alike. In the first (fig. 5) appendage the basis is the largest joint and rather scantily fringed with long setæ along its dorsal margin. This fringe is double, that is to say, dorso-lateral. A strongly developed distal fringe occurs ventrally, the ischium is a short joint and its dorsal margin projects as a shield over the next joint for some distance; this shield is fringed with long setæ; a row of setæ occurs along the side of the joint near its end; a group occurs about the mid-ventral region and a row occupies the more distal portion; the merus is very short if measured along its ventral margin, but dorsally it projects quite to the middle of the propodus; this projection bears numerous long setæ; the ventral margin bears some four or five strongly developed spines and several weaker ones of irregular size. The carpus is quite a small joint, roughly triangular in shape, the distal half of its ventral margin is fringed with spines, which increase in strength and size distally, the dorsal margin is reduced to a minimum; the propodus is stout, slightly curved, with four spines ventrally. The dactylus is strongly developed, more than half the length of the propodus.

The other appendages are built on exactly the same plan, differing only in the strength and abundance of the spinous or setose armature. The four anterior pairs conform most distinctly to this type; in the remaining three the propodus is longer and more slender and the dactylus shorter.

The dorso-lateral fringes of setæ on the bases of the more posterior appendages become very strongly developed. The sixth appendage is typical of the other extreme of variation (fig. 6). The basis has two dense dorso-lateral fringes of plumose setæ, a few arise ventrally just beyond the middle of its length, while distally they form a dense tuft. The ischium is articulated at the dorsal angle of the basis; it is rather more than half its length, and the so-called dorsal shield projects but very little—it is scarcely prominent—the merus is two-thirds the length of the ischium, and the

dorsal shield is small and inconspicuous. The carpus is scarcely as long and much more slender, the propodus is longer and still more slender, the dactylus is rather short. There are but few spines properly so called on this appendage, the merus, carpus and dactylus bear several as distal fringes or on the ventral surface of the joint, which are of a distinctly spinous character. The setæ on the ischium, except those dorsally situated, are indistinctly plumose, elsewhere they are simple.

A single specimen of this species, a female, was taken in the traps in Winter Quarters, 29. 8. 03. in 25 fms. Another, mutilated, example was found in a seal's stomach, 31st January, 1903.

SEROLIS.

This genus was established by Leach in 1818 and now contains twenty-four species, nearly all of which are from the southern hemisphere.

Serolis trilobitoides.

(Plate IV.)

Serolis trilobitoides Eights (**6**), pp. 53–57.
Brongniartia cornuta Studer (**17**), pp. 21–24 ; Beddard (**18**), pp. 49–53.

Specific characters :—

Body broadly ovate, with large serrated epimera curved backwards, the sixth thoracic segment not extending much beyond the insertion of the uropoda.

Cephalosome with well-developed eyes, two swellings between them having the posterior margin three-lobed as the adult condition is reached.

Urosome pentagonal, margin dentate from the insertion of the uropoda, a median dentate keel terminating in a short caudal spine. On each side an oblique ridge terminating in a tooth near the insertion of the uropoda. Two teeth separated by a small recess in the middle line before the beginning of the median keel.

Special spines on the propodus of the second thoracic appendage consisting of sensory teeth alternating with broad leaf-like sensory structures, of which the blade is unequally developed on the two sides of the shaft.

The body is nearly circular, the largest specimen measures 48 mm. in length and 43 mm. in width. If the basal joints of the antennæ, which are directed forwards, be included the length of the animal is increased to 53 mm. The epimera are large with a finely serrated external margin, all more or less curved backwards ; those of the sixth thoracic segment reaching nearly to the end of the caudal shield. Those of the abdominal segments terminate just in front of this and are subequal. The posterior margin of each of the thoracic epimera bears a tubercular swelling at about one-third of its length. The urosome is pentagonal in outline, its free margin from the insertion of the uropoda is beset with numerous pointed teeth and terminates in the middle line in a stout spine. In the larger specimen this is broken, but, judging from the smaller one, it should be about 3 mm. long. The middle line of the urosome is marked by a prominent ridge bearing seven teeth of variable size ; the first is the largest and the posterior ones are the smallest. In front of this ridge, at the junction of the caudal shield with the third abdominal segment, there is a prominent lip which

bears two teeth separated by a rounded recess. Close to this rises a ridge on each side, which runs outwardly to end in a stout spine above the point of insertion of the uropoda. The cephalosome is about one-fifth the length of the body, it is separated off from the epimera of the first thoracic segment by a very distinct groove, which passes forward in a slightly curved line just outside the eyes. The anterior margin is bevelled to receive the first antenna, and presents three crescentic depressions, of which the median one is the largest, and further subdivided by a small median tubercle between the antennæ. A median plate with rounded angles lies between the eyes anteriorly, and behind it most of the space is raised into two irregular and flattened enlargements with their posterior margins rounded, a median lobe on each side being conspicuous.

Between and behind these enlargements is a narrow plate with a small dark tubercle in the centre. The eyes are prominent, large; except anteriorly they are separated off from the two tuberculated enlargements alluded to above by a deep groove. The cornea is oblong, lunulate, and composed of a large number of small facets. The first thoracic segment is separated from the second by a line of segmentation, distinct enough at its origin, but which dies away before it reaches the margin. The anterior margin of these two thoracic segments, like that of all the epimera, is minutely serrate. The last thoracic segment is invisible from the dorsum, and the first abdominal, which is without epimera, is enclosed by the arching forwards of the seventh thoracic. Only on the third, fourth and fifth thoracic segments are the epimera distinct from the thorax.

Eights' specimens attained a greater size than the largest obtained by the 'Discovery,' and measure 70 mm. × 57 mm., and an adult male is figured both from the dorsal and ventral aspects. Dr. Studer's specimens obtained from Kerguelen Island are not half this size, and those obtained by H.M.S. 'Challenger' from the same locality are intermediate, the largest being a female measuring 41 mm. × 35·5 mm.

For his specimens Eights describes and figures a ridge running obliquely backwards from the inner border of the epimera of the first thoracic segment towards the middle of its posterior border, before reaching which, however, it dies away. This is the only difference I can find between his specimens and those taken by the 'Discovery' when viewed from the dorsum. The dark coloured tubercle Eights regards as a possible ocellus; I am unable to make any statement on this point, this structure being injured in the larger specimen. Dr. Studer ignores it altogether, Mr. Beddard figures but does not refer to it.

Dr. Studer accentuates the fact that, in his specimens, the enlargement between the eyes forms conical tubercles, a single one on the inner side of each eye, instead of a diagonal row. The "diagonal row" is an expression due to a defect in Eights' figure, and Dr. Studer's fig. 2 might be a copy of Eights' as regards this particular feature. The point at issue seems to be whether these enlargements each form a

conical tubercle (Studer, Beddard), a rounded tubercle ('Discovery'), or as Eights words it the entire space is elevated to form "somewhat the figure of a corona in high relief." The description and figure are not too explicit, but it does not appear to be a matter of vital importance. Dr. Studer further points out that the median ridge of the caudal shield bears three teeth only, the first of which is the largest. His figure from its great breadth is probably that of a female.

Mr. Beddard gives much better figures of this species, and increases the number of teeth on the keel of the caudal shield from three to six.

From the sizes of the specimens obtained in these collections it would appear that the greater number are not adult. Eights' specimen, as figured, unquestionably is so; the larger 'Discovery' specimen is approaching that condition. In reply to an enquiry, my friend, Dr. Calman, confirms my suspicion that the 'Challenger' specimens are not adult, the largest female, which has been partially dissected, bears traces of having had oostegites, in the others they are quite rudimentary. None of the males have the third thoracic appendage modified.

The sternum is quite smooth, that of the first thoracic segment which bears the maxillipeds is narrow and enclosed by the succeeding one. It projects forwards in a conical manner between the maxillipeds and bears a median ridge. The second passes completely across the body, the epimera being separated by a groove.

In the middle line the median keel of the preceding segment is continued through half its length, where it widens out and disappears; behind this is a groove which forms the anterior boundary of a lip-like structure rather more than 5 mm. wide. The three following segments are conspicuously divided in the middle line, the remainder less distinctly so. The sixth is only indistinctly separated from the following, while the seventh and eighth are fused.

The posterior border of the first three abdominal segments is, in the middle line, produced backwards into a spine. Small in the first, it is but little larger in the second, but in the third it is very much larger. This feature is alluded to by Mr. Beddard as a sexual character, but one which is not constant in all species. For this particular species it is not alluded to either by him or Dr. Studer, and Eights' figure is not satisfactory in this respect. What I take to be the genital apertures are two small ovoid slits near the posterior border of the last thoracic segment and some little distance from the middle line. Mr. Beddard states that these apertures are invariably circular in the male, but neither he nor Dr. Studer allude to them for this species. Eights is equally silent on this point.

The first antennæ rise in a depression of the anterior margin of the cephalosome, and are directed outwards. Each consists of a tapering four-jointed peduncle, the proportions of these joints being 3. 5. 4. 2·5, and they are followed by a multi-articulate flagellum.

Dr. Studer states that the flagellum has twenty-two joints, Mr. Beddard states twenty-five. In all the 'Discovery' specimens the flagellum, although injured,

contains more joints than quoted by either of these observers. The peduncle and most of the joints of the flagellum show markings as of imbricated scales, and having at short intervals very delicate aborescent chromatophores. The joints of the flagellum each bear a tuft of a few setæ and a sensory seta. This is a rather long thin structure containing granular matter and mounted on a short but stout peduncle. Owing to injury it is difficult to make out the details of its structure, but in a few cases they appear to be identical with Mr. Beddard's figures.

The second antennæ have five-jointed peduncles, in each case the first joint is not visible from the dorsum and is small; this and the second are directed forward, the third being articulated at a right angle; this and the two following are grooved longitudinally, the proportions of the various joints being 1·5. 3·5. 5. 8. 11. The multi-articulate flagellum is not as long as the terminal joint of the peduncle. The margin of the peduncle is fringed with setæ, small and fine ones singly, longer ones in small tufts at intervals. The joints of the flagellum number sixteen, in agreement with Mr. Beddard, and have the appearance of being covered with imbricate scales, irregularly hexagonal in shape; along the centre joints there is a row of teeth, those figured by Mr. Beddard do not give an adequate idea of their structure. They occur on the fourth to the tenth joints inclusive, and consist of a strong tooth directed forwards, its posterior margin being produced into a thin blade like a knife edge.

The flagella of both antennæ are fringed with extremely minute spines.

The upper lip or epistome is triangular with its angles rounded, the broad base being posterior and straight, with the exception of a slight indentation in the middle line.

The anterior borders are enclosed by an independent but narrow ridge. The epistome itself bears two circular depressions, a fact noticed by Eights, but his figure as regards this structure is not good.

The mandible is very strong, and has a stout base directed obliquely inwards; a blunt process on its anterior margin marks the point where it turns to the middle line, tapering to end in a stout cutting edge. This edge is strongly coloured, and the left mandible, viewed externally, exhibits two small tubercular teeth with traces of a third; some little distance from the cutting edge there projects from under the posterior margin a tubercle belonging to the inner series, and behind this a rather long bifurcated spine. Internally there is a second cutting edge which comprises three stout tubercles and two small ones between and a little behind the first and second. Another weaker ridge lies behind this, and from the posterior end of it the bifurcated spine arises.

The palp is long and three-jointed; rising from the outer angle at the base of the mandible two joints lie in front of the epistome, the third being directed straight forwards between the antennæ. The proportions of the joints are as 5. 8. 3·5. The first joint bears a single long seta of simple structure, the second bears several, but at its distal and ventral extremity they become highly specialised. The last joint is a flat blade with a rounded dorsal margin and nearly straight ventrally. The

ventral margin is nearly completely occupied by the same highly specialised setæ. Here they graduate in size to the distal extremity, where they rather quickly become much larger than elsewhere. These setæ (fig. 3) consist of a shaft with very finely granular contents, the shaft tapers and ends in a blunt point, which in certain aspects appears to be an elongated knob. Both margins are fringed with very delicate flat teeth, very close, in fact contiguous to one another. These appear to be set on the shaft at an angle so as to form the limbs of a V, of which the shaft forms a very broad base. The ventral margin of the second joint is very minutely dentate. None of the authors previously cited deal with this appendage in any detail. Eights describes the left mandible as having "two corneous teeth, placed one within the other, that on the right contains but one; they are convex externally and internally concave, with a small foramen at their base." This latter statement I do not understand. As regards the palp, he states the two basal joints are subequal in length and the terminal one about half the size. Dr. Studer states that the cutting edge is divided into two ridges and bears no teeth, but only sharp undulating edges. This figure is not good; he omits almost all the setæ on the terminal joint of the palp, but in the comparative sizes of the joints they more closely resemble the 'Discovery' specimens. The only reference I have seen to the highly specialised setæ is contained in Dr. Pfeffer's description of *S. septemcarinata* (**11**), and he figures them for that species as being plumose to within a short distance of the enlarged end.

The first maxilla (fig. 4) consists of two lobes. The inner one is very small and delicate, the outer one large and strong. The inner one is irregularly ovoid upon a short peduncle, the outer one is stout and slightly curved. Its cutting edge is hollowed out to some extent, and the margin is fringed with stout spines of variable length, but the largest are most anterior. In the specimen examined there are eleven of these. The dorsal margin of this joint is covered with very minute teeth, which are replaced by simple setæ about the middle of its length.

The second maxilla (fig. 5) is more delicate in structure, and comprises a thin but broad inner lobe, rounded distally and there provided with upwards of thirty specialised setæ. About two-thirds the length of this lobe there arise externally two lobes of approximately equal size. It would, perhaps, be correct to say a single bifid lobe. Each of these lobes is armed distally with two stout specialised setæ, similar to, but much stronger than, those of the inner lobe. The setæ are all pedunculate. A central core runs continuously through the peduncle and shaft, and the latter is covered with a number of very minute but stout spines.

The maxilliped (fig. 6) consists of a short but very broad sub-triangular plate, which carries the large masticatory lobe, and an approximately rectangular epignath. The inner margin of the masticatory lobe is straight, rounded towards the base, where there is a group of rather long simple setæ, and a few other small ones are scattered along it. The anterior margin is nearly straight, and bears a stout tooth near each angle. The outer tooth is situated in rather a deep depression. The outer margin

is rounded. The palp is three-jointed. The first is very small, the second large, cordate in shape; the third is a rather short and broad lobe, articulated nearer to the outer portion of the second. The inner margin of the second joint and the extremity of the first are richly clothed with simple setæ. A few other small ones are scattered along the other margins, and also irregularly over the surface of the entire palp, masticatory lobe, and distal portion of the epignath.

Eights' description of this organ is not easy to interpret exactly, but as far as it goes it agrees with the above, except that a single tooth is only mentioned as occurring on the masticatory lobe. As the second may be easily concealed by the palp, this is of small moment.

The descriptions given by Dr. Studer and Mr. Beddard are very concise. The figure given by the former is very crude and incomplete, though fairly correct as far as it goes. Mr. Beddard's figure is very much more correct and detailed. Only one tooth is figured, the position of the second being covered by the palp. The basal plate is, however, figured as being divided. I have not been able to detect the existence of such a division even with a $\frac{1}{6}$ objective; bands of muscle interfere greatly and render its determination difficult.

The first appendage of the mesosome is subchelate and comprises six distinct joints, the first of which is subequal in length to the last but one. The three following are all very short, and two, the more distal ones, have a very irregular shape. These three short joints all bear a tuft of somewhat specialised setæ, which are numerous only on the third of the joints, and this one, with the second, bears a number of very minute teeth on its inner margin, the third having in addition two stout teeth and a third much smaller one. The propodus is large and ovate in shape, its inner margin being flattened to form a blunt knife edge and provided with a series of very highly specialised structures, which have not been described for this species, notwithstanding the fact that they afford valuable specific characters. Eights describes the margin of this joint as ciliate. Dr. Studer remarks that it is provided with lancet-like teeth, and figures five joints of this appendage, but on so small a scale as to be worthless. Mr. Beddard does not refer to this appendage except in very general terms. The specialised structures (figs. 7 and 8) consist of a regular series of stout teeth, and alternating with them are leaf-like blades, both being obviously of a sensory nature. The teeth have a strongly-marked "midrib," which, however, is not quite straight, and terminates in a delicate elongate sensory structure. The blade is very faintly striated, and terminates in an irregular manner, to allow the sense organ to protrude. The "leaf-like" organ also has a distinct "midrib," but the blade is very unequally developed on the two sides, and exhibits a much coarser striation than the tooth. The "midrib" terminates in precisely the same way and in a similar sensory structure.

Of the remaining appendages of the mesosome four progressively increase in size, the second to the fifth; this and the sixth are subequal in size, but the seventh is much smaller, but in the larger of the 'Discovery' specimens the greater part of most of these

appendages are lost; they are, however, uninjured in the smaller specimen. The first appendage of this series, the second of the mesosome, comprises six joints, the first of which is large and stout, the rest progressively decrease in size, and all are liberally provided with small arborescent chromatophores. The second joint has two serrations on its outer or ventral side, at each of which are a few long setæ, distally, both ventrally and dorsally, but not laterally; there is also a distal fringe of long setæ; the following joint has a single serration, the next has three, and the setæ connected therewith are distinctly spinous; the penultimate one has seven of these so-called serrations, but very small at first, increasing in size distally; the setæ they bear are very small at first but increase to long ones distally, on the opposite side of the joint the distal fringe is long and spinous. The ventral margin is slightly expanded and flattened as a blade, chiefly proximally. The sixth joint or dactylus is stout and capable of folding on the preceding one in a subchelate manner. This appendage constitutes a secondary sexual character in the adult animal where it becomes modified to form a prehensile organ, and differs considerably from the remainder which are distinctly locomotive in function. As such it is figured and very briefly described by Eights. For this species or *S. cornuta*, neither Dr. Studer nor Mr. Beddard give any description of this appendage as distinct from the others, though both refer to its modification generally among members of the genus. From this and other circumstances as previously indicated it may be assumed that their specimens were immature. The other thoracic appendages are alike in structure, the propodal joint is slender and not in any way expanded, nor does the dactylus appear capable of being reflexed upon it in a subchelate manner. The spinous armature varies with the size of the limb or the joint where it occurs, and the last appendage of the mesosome only differs from the others in size.

Of the abdominal appendages the first three pairs are adapted for swimming. The base of each limb is roughly in the form of a truncated cone directed towards the middle line, and articulated to the sternum near one corner of the narrow base which is curved outwards; this angle bears three stout setæ on the first and two on the remaining appendages, other fine setæ fringe these joints throughout.

The exopodite is a delicate semicircular structure fringed with fine setæ, and on its curved border with long plumose setæ. The endopodite is smaller and attached to the protopodite at about two-thirds of its length; this shows more distinctly a ribbed structure, each rib corresponding to a long plumose setæ. The three pair of appendages do not differ materially in shape or structure except that the straight posterior border is prolonged into the "penial filament." This is a slender rod-like body passing towards the middle line, it then bends somewhat abruptly backwards, and is grooved on its inner side. It is about 4·5 mm. long, and appears to be jointed at the bend; but this is probably due to injury, as there is no trace of such a structure in the smaller specimen where, moreover, this organ is very much smaller. This organ of the larger specimen is very much smaller than that indicated in Eights' figure. In their description of *S. cornuta* neither Dr. Studer nor Mr. Beddard allude to it.

The pleopoda are four paired structures occupying the entire area below the caudal shield. Each pleopod consists of a very broad and short basal joint bearing an exopodite and an endopodite, which lie over one another, the exopodite being the outer or more ventral structure. The exopodite of the first gill is the largest and coarsest in structure, forming an operculum over the rest. The plate is obliquely divided into two by a suture, and its stout straight inner margin is thickly fringed with fine setæ; the outer margin, which is rounded anteriorly and wide, tapers slowly to a blunt point and is fringed with rather long plumose setæ. The endopodite is much more delicate, rather smaller, having no setæ whatever, and it is not divided, though its outer margin bears a conspicuous notch where the division should be. The posterior gill is shorter and broader than the preceding one; the exopodite is obliquely divided, but the only setæ it bears are a few of both kinds at the distal extremity; the endopodite resembles that of the first gill.

The uropoda are attached to the caudal shield where the edge becomes dentate; the basal joint is short, expanded distally, and prolonged on the inner side into a spinous process. The exopodite is two-jointed, the terminal one being scarcely half as long as the other, pointed, and having two serrations on the outer side and two spines on the other. The endopodite is a little longer than the first joint of the exopodite, and its external margin is serrate and has a few setæ in addition; the internal margin is also serrate but only distally.

Two males and fragments of two others, sex uncertain, were taken by the 'Discovery' in lat. 67° 21′ 46″ S., long. 155° 21′ 10″ E., 254 fathoms, bottom mud. The trawl passed over a patch of stones probably dropped by some wandering iceberg, and brought up so large a quantity of these that the specimens were very severely damaged, and the trawl had to be slit up completely to save anything.

Both Dr. Studer's and Mr. Beddard's descriptions of *Serolis cornuta* are defective in many points. The niceties of specific discrimination as now understood were altogether unknown in Eights' day. Almost invariably the defects of previously published descriptions are those of omission rather than commission, and going through them exhaustively with the 'Discovery' specimens before me, I have no hesitation whatever in definitely stating that the 'Gazelle' and 'Challenger' specimens are immature specimens of *Serolis trilobitoides* Eights, and that the 'Discovery' specimen is only just arriving at the adult stage.

CYMODOCELLA.

Pfeffer (**11**), pp. 109–110; Hansen (**7**), p. 107.

The following definition of this genus is by Dr. Hansen—

> Both sexes similar without processes.
>
> Distal part of the abdomen somewhat produced, with the lateral walls bent strongly downwards and inwards, constituting rather a long tube open at both ends and with a slit on the lower surface.

Uropoda similar in both sexes, rami lamellar, exopodite considerably shorter than endopodite.

Mouth parts similar in both sexes.

Male with appendix masculina on the endopodite of the second pleopod.

Marsupial lamellæ overlap each other somewhat, the brood in an exceedingly large external pouch and in the marsupium.

Cymodocella tubicauda.

Cymodocella tubicauda Pfeffer (**11**), pp. 110–115.
Sphæroma egregium Chilton (**2**), p. 209.
Cymodocea antarctica Hodgson (**8**), pp. 243–245.
Cymodocella egregia Hansen (**7**), p. 126; Richardson (**12**), p. 7.

This species was first described by Dr. Pfeffer from specimens taken in South Georgia. It was then found by Dr. Chilton in New Zealand—the South Island; more recently it was taken by the 'Southern Cross' Expedition in the Auckland Islands.

On all these occasions it has been more or less perfectly described as a new species. It now turns up off the Antarctic continent at Cape Adare, and it is hoped that its identity is now fully and permanently established. As my description of the animal was so unsatisfactory it is here re-described. It is a little unfortunate that both Dr. Hansen and Miss Richardson have made use of Dr. Chilton's name for the species. That of Dr. Pfeffer has a priority of five years.

Specific characters :—

Body vaulted, cephalosome short, with small dorso-lateral eyes.

Antenna invisible from above.

Perciopoda ambulatory, first the shortest, the remainder very slightly increasing in size, armed with a stout curved claw on the dactylus and one, occasionally two, stumpy accessory ones.

Metasome, always with one distinct segment, and two others imperfectly separated dorsally; a pointed tubular urosome.

The cephalosome is small, rather broad but short, the anterior margin, seen from above, is rounded, it bends downwards and terminates with a small rounded rostrum between the antennæ; the lateral margins bulge for the reception of the small eyes which are postero-laterally situated; the posterior margin is incurved. It is about two-thirds the diameter of the first segment of the mesosome.

The mesosome comprises the normal seven segments of which the first is the longest and largely envelops the cephalosome, the epimera are large, ending posteriorly in a blunt point. The succeeding three segments are subequal in length, with rather small irregularly rounded epimera. Of the three posterior ones the first is a little shorter than the others. The epimera are larger and project backwards, the last of the three segments is narrower than the rest, and the posterior border of the epimera rises abruptly from its segment. In no case are the epimera separable from their respective segments.

The metasome comprises three or four segments and a urosome, a circumstance which does not seem to depend upon age. In many individuals of varied size, and therefore presumably of varied age, a short segment is to be seen between the backwardly projecting lobe of the epimera of the last segment of the mesosome. This segment is very often undeveloped or concealed. Another segment has a peculiar posterior border; it passes across the mid-dorsal line and at some little distance from it it forms an angular projection backwards, and then on in a slightly sinuous line to the epimeron. Just outside the angular projection two lines pass forward in a crescentic manner to lose themselves after a short course. This proves the segment to be incompletely divided into three.

The urosome is as long as the five posterior segments of the mesosome; it tapers posteriorly, and the lateral margin is inflected so that it terminates as a spout with an oblique orifice, and the pleopoda lie in a sort of pocket. The inflected margins are not fused distally, a narrow groove separates them.

The uropoda are conspicuous but not very large, not reaching the extremity of the urosome. They arise from a notch near its anterior border and possess a stout protopodite; the exopodite is much smaller than the endopodite, of which the inner half is much thickened; both are lanceolate in form. The endopodite is larger in proportion and somewhat more angular in some of the smaller specimens.

The antennæ are completely ventral in position, the first lies naturally in a groove between the cephalosome and the epistome.

The first antenna has a very stout peduncle of three joints. The first is as long as the other two together, very stout and bent at the base; the second is equally stout but short; and the third is much more slender and a little longer; the flagellum consists of six joints.

The second antenna is larger than the first and rises quite close to and underneath it; the peduncle is three-jointed, the three progressively increasing in length; the flagellum comprises eleven joints, each of which, except the first, has a couple of tufts of specialised setæ on the ventral surface.

The buccal mass is rather prominent, and the epistome is triangular in shape with a wide and shallow piece taken out of the base.

The mandible is strong, curved and tapering, but with a sinuous margin; the cutting edge is reduced to a blunt point, bifid, to form two strong but short teeth; on the inner side and a short distance from this is a group of stout spines. The molar process is stout, rather long, and forms a broad cutting edge.

There is a three-jointed palp, the first two joints of which are subequal, the third is shorter. The second has half-a-dozen strong spinous setæ distally on its inner margin, and the third has a series beginning about one-third of its length, at first small, but the distal ones are very long.

The first pair of maxillæ consists of two long slender lobes united at the base by a connecting piece; fully one-half of the inner lobe is imbedded in muscle; the

exposed part is a narrow, rather tapering band, terminating in four stiff plumose bristles; the outer lobe is much broader and terminates in four strong teeth and some half-dozen smaller pectinate ones.

The second pair of maxillæ is elongate, the inner lobe is broad, very slightly tapering and curved backwards; the inner border is fringed with fine setæ and distally with plumose bristles. Of the two outer lobes, the inner one is a little the broadest; both terminate in long plumose bristles.

The maxilliped is long, divided into two equal halves as regards length. The inner margin is straight throughout; the basal half tapers in a sinuous line to about half its diameter; the distal half is narrow, rounded externally, distally armed with numerous and thickened plumose bristles, one papilliform tooth, and at least two of these bristles occur on the inner margin. The palp is five-jointed; the first joint is small; the second is the longest and has distally a long stout digitiform process armed with setæ; the third joint is short, its process a little larger than the preceding and occupies the whole joint. The fourth is twice as long and a smaller process is directed forwards; the terminal joint is slender and setose. The epignath is of moderate size, about half the length of the basal joint and ovoid in shape.

The pereiopoda are all very much alike and of quite simple structure; the first is the shortest and stoutest, the second is a little longer, and from this onwards they progressively increase in size to the last; the increase is, however, very small and chiefly concerns the first two joints. Of the first pereiopod the basis is stout, constricted immediately beyond its articulation with the body; the ischium is more than half the length; the merus is short and considerably expanded dorsally to form a sort of shallow cup for the carpus; this joint is very small, triangular in fact, its dorsal margin being reduced to a minimum; the propodus is a stout joint, third in point of size, and its proximal end is in contact with the merus dorsally. The dactylus is half the length, stout, and carries a curved nail distinctively marked off from the joint, and immediately underneath is a small but very stout accessory claw. A few setæ occur distally on all the joints except the first two; on the carpus and propodus there is distally and ventrally a single stout denticulate spine, closely resembling those on the ovigers of many Pycnogonids.

In the remaining appendages the basis increases a little in length, the ischium increases more, so that on the last appendage it is nearly as long as the basis. The merus is larger than on the first limb, but very little larger than the carpus; both these joints are dilated distally, the former retaining its forwardly directed dorsal lobe; the propodus remains a simple cylindrical joint, and the dactylus stout and curved, discoloured, and provided with a small but very stout accessory; sometimes there is a second. Setæ occur distally on all the joints and occasionally elsewhere. There are no denticulate spines.

The pleopoda. The first pair comprises a very short and broad protopodite. The

endopodite has a broad base, a straight inner margin, the greater part of which is covered with fine setæ. The inner margin tapers to a rounded apex, which is provided with long plumose setæ. The exopodite is a little longer, much more delicate, ovoid in shape, fringed distally with long plumose setæ. Where the exo- and endopodites do not overlap the endopodite is very stoutly built.

The second pair, the endopodite, is similar to that of the first, but quite without any thickening; the exopodite is very much smaller, ovoid, and the plumose setæ occur throughout the outer margin as well as distally. The appendix masculina is a narrow structure of almost uniform diameter; it is slightly curved and enlarged near the distal end. On the inner side of this enlargement and on the outer side of the rounded extremity are series of very minute, backwardly-directed spines; it is longer than the endopodite. The third pleopod is like the second, but the inner margin of the endopodite is slightly strengthened.

The fourth pair has the exo- and endopodites subequal in size, heart-shaped, with a shallow notch near the apex; they are thicker and more fleshy than the preceding; they carry no setæ. Both endo- and exopodites have an oblique fold in passing from the antero-exterior margin towards the postero-lateral margin. The fifth pleopod is rather larger than the preceding. The endopodite is more irregularly cordate and has an oblique fold. The exopodite is larger and two-jointed, the second joint being about one-fifth the length of the whole and terminates in a blunt but thickened point. Another similar thickening occurs about the middle of its inner border and close to it, and on the main joint is a further thickened knob. A ridge runs from this along the inner border of the first joint for some distance and passes straight on inside a lobe of the exopodite.

A rather large number of specimens were taken at Cape Adare on February 24, 1904, from the root of a large laminarian *Lessonia grandifolia*, taken in 17 fms.

ANTARCTURUS.

The genus *Arcturus* was established by Latreille in 1804, and since that time it has received a very large number of species, chiefly from the Southern Seas. Now, however, the genus is to be broken up. Dr. zur Strassen has begun the operation and separates the northern species which contain the type, from the tropical and southern forms on the ground that in the type species the mouth parts are concealed from a lateral view, and that the dactyli of the anterior pereiopoda are comparatively very small. In the southern species the mouth parts are distinctly visible from a lateral aspect, and the dactyli of the anterior pereiopoda are large. For these the genus *Antarcturus* is instituted, and this contains the greater number of species. It is probable, however, that it is only a temporary delay in the further breaking up of the original genus, and if this alteration is to be carried on, minor characters, such as the

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absence of cephalic horns, may be found which will assist in further dividing the original genus; but, unless these divisions are indicated by some prefix to the name *Arcturus* so as to show what has become of closely related forms, no advantage can accrue to zoological nomenclature.

Antarcturus adareanus.

(Plate V., fig. 1.)

Arcturus adareanus Hodgson (**8**), pp. 249–250.

Specific characters :—

A small spine at the antero-lateral angle of the cephalosome, and a pair of stout spines behind the cephalic horns.

Two dorso-lateral spines on the first segment of the mesosome.

This species is very closely allied to *A. glacialis* Beddard, but may be readily distinguished from it by the characters given above, and especially by the first named.

The cephalosome has its anterior margin incurved as usual, and its antero-lateral angle terminates in a spine; a minute spine occurs behind this and in front of the eyes. The cephalic horns are not very large, they lie between the eyes and arch slightly outwards. A short distance behind them is another pair of small spines. The cephalosome is otherwise smooth.

The mesosome is covered with small spines throughout. The first four segments progressively increase in length to a slight extent. The posterior margin of each segment consists of a transverse ridge, which, in the case of the first three, widens out laterally to the full length of the segment. The dorsal area in front of the ridges is occupied by two more or less distinct rows of spines. The ridge on the first segment also bears two stout but blunt spines dorso-laterally, and the posterior border of the two following segments at least has a distinct row of small spines, laterally the segments are covered with several small blunt spines. The fourth segment is similarly covered, but here the lateral area is distinct from the transverse ridge. The three posterior segments progressively decrease slightly in length; each has a raised transverse spinous ridge, which, in the case of the first, widens out laterally, both anteriorly and posteriorly; in the case of the other two the ridges are straight anteriorly and widen posteriorly. Small blunt spines are numerous. Laterally the epimera form prominent swellings over the base of their respective appendages and are more or less well supplied with small spines.

The first three segments of the metasome are distinct though fused and covered with the same small spines. The epimera are comparatively large, roughly ovate structures, decreasing in size from the first to the third. The urosome is rounded, and at its extremity bears two prominent straight spurs. Its surface is covered with small spines which are seen to be in rows. A median row of small spines, a row of larger ones on either side and two other rows less distinct. The uropoda are large, the basal

joint has three rows of spines along its centre, its extremity is truncated and carries the very small pointed terminal joint.

The above description is taken from a rather small male. The female differs considerably in the anterior part of the body. This, as is usual with all members of the genus, is considerably swollen, a fact which of course involves the proportions of these segments. The spinous armature of the body is much more strongly developed, the small spines are rather larger and much more numerous; the first segment of the mesosome has a pair of dorso-lateral spines which are conspicuously larger than the rest, and on the second segment there is one smaller than on the first, on the third segment also, and that not very much larger than the surrounding ones.

The epimeral spines are generally more developed, and at the base of the fourth pair of appendages there is a stout spine directed to the mid-ventral line. This is not present in the male, and is apparently a secondary support to the brood pouch, which is composed of four pairs of oostegites.

The first antenna is of normal type. The first joint is stout, with a blade-like expansion along its inner margin. This is covered with minute stiff setæ. The second joint is not so long and slightly swollen towards the distal extremity, the third is sub-equal in length and cylindrical, and the flagellum, which carries some sixteen tufts of specialised setæ, is rather longer than the two preceding joints together.

The second antenna has, as usual, the two first joints extremely short, the proportions of the remainder with the flagellum are 4. 8. 10. 8. The third joint has a series of stout spines along its outer border and long setæ on the inner ventral border; the next joint is similarly provided, but here the spines are smaller and diminish to nothing during its proximal half. The last joint, a flagellum, bears small setæ, but these are not thickly distributed.

The mandible is massive and thickly pigmented with arborescent chromatophores. About half its length it is bent at a right angle. Its anterior margin is prolonged as a toothed edge; it bears two teeth, and passing obliquely backwards from the most anterior of these are two quite small ones; the posterior edge of this part is another very prominent tooth, and below this again is a group of spines arranged somewhat radially. The cutting edge is straight and broad.

The first maxilla comprises two lobes, the inner one, short and slender, slightly curved with fine setæ along its inner margin; its truncated extremity bears three stout spinous setæ with fine ones along them, rendering them coarsely plumose. The outer joint is stouter, double the length, with fine setæ externally and terminates in a crown of nine or ten stout spines.

The second maxilla has its inner lobe short and broad, with fine setæ along its internal margin. Distally the extremity is rather rounded and armed with plumose spines. Three of these plumose spines on the outer side of this lobe are much finer than the others. Of the two lobes the inner one is the smaller and terminates with three long slightly plumose spines. The outer lobe is much stouter and carries five of

these plumose setæ, but here they vary in length, and on both lobes the plumose structure exists only at the base, distally they become finely toothed.

The maxilliped does not exhibit any special features. The basal joint is short with the outer angles, particularly the anterior one, rounded. The masticatory lobe is long, two-jointed, the inner margin straight throughout, but the outer margin of the distal joint rounded. The distal margin is occupied by numerous short plumose spines. The palp is five-jointed, the proportionate length of the various joints being about 3. 3·5. 6. 5. 2. The entire organ is richly clothed with long setæ, more especially internally and distally. With a one-inch objective these are seen to bear a number of fine setæ about the middle of their length. The epignath is carried on a small plate, roughly ovate in shape, but having a flattened edge anteriorly. The epignath itself is a large plate ovoid though flattened on one side; it is just about as long as the masticatory lobe.

The whole of these mouth organs are richly pigmented with black arborescent chromatophores.

The first appendage of the mesosome is quite normal in general appearance, provided with long setæ on its ventral side from the distal extremity of the basis; the merus has both dorsal and ventral margins rounded, the former projecting forwards as a blunt point with a small tuft of setæ; the distal extremity of the carpus projects in a similar manner ventrally. The propodus is by far the largest joint, though not so broad as the merus; the dactylus, including the terminal claw, is about two-thirds the length; the claw has a very stout auxiliary. On the inner face of the propodus long setæ are arranged in eight or nine series; these and a very large proportion of those on or near the ventral margin are very finely toothed.

The three following appendages are provided throughout their length from the distal extremity of the basis with groups of very long and shorter simple setæ. The outer side of the basis carries a series of some half-dozen spines, and the ischium and merus have a dorsal and distal spine.

The three posterior pairs of appendages of the mesosome are strong, the proportions of the joints of the middle one are 5·5. 3·25. 2. 1·8. 5. 4. The basis bears several irregular but stout spinous processes along its dorsal border, the ventral border of the remaining joints, except the dactylus, are fringed with spines, these only develop as such along the ischium, dorsally there are a few scattered setæ of variable length. The dactylus has a few small setæ dorsally, but is otherwise smooth.

Five specimens of this species were taken in 300 fathoms off the Ice Barrier, Bottom Mud, lat. 78. 25. 40. S., long. 185. 39. 06. E. Four of these are females, one scarcely adult, two with ova, and one with numerous young not yet emerged from the brood pouch. In these young the various segments are rendered conspicuous by transverse ridges, but the only spinous armature visible on the entire body are the two posterior horns of the urosome; the cephalic horns are not present.

Antarcturus franklini.

(Plate V., figs. 2 and 3.)

Arcturus franklini Hodgson (**8**), pp. 250–1.

Specific characters :—

A small spine at the antero-lateral angle of the cephalosome.

Two prominent dorso-lateral spines on each of the first three segments of the mesosome; epimeral spines as well. No dorso-lateral spines in the male.

Urosome rounded, covered with small spines, with two slightly divergent terminal spurs.

The original description being quite unsatisfactory, and as I have now more material, I will take this opportunity to redescribe the species.

The body is usually covered with small, irregular chromatophores, which are most definitely arborescent on the cephalosome, which is smooth; its anterior margin is incurved, and just behind the lateral angle is a stout spine. Two strongly developed and pointed horns lie behind the anterior margin and between the eyes.

The three anterior segments of the mesosome are almost smooth, the fourth being covered with small spines; the first three carry a pair of very prominent spines dorso-laterally. The epimera of all four bear a stout spine, and there are also other smaller accessory ones, but these vary. The fourth segment is devoid of the prominent dorso-lateral spines. There is no great difference in the length of these segments, the first two are very nearly, if not quite, subequal, and the two following also, but these are a little longer. The three posterior segments are covered laterally with small spines, a band of them crosses each segment, forming a more or less prominent posterior fringe.

The metasome is also covered with small spiues; although all the segments are rigidly united, the two anterior ones are distinct, the third is fused with the urosome; there are no conspicuous spines here other than the two prominent ones which terminate the body; one pair, however, is a little larger than the remainder.

The first antenna is of the normal type; the first joint is short and stout, with its inner margin considerably expanded as a wing-like enlargement, the second joint is but little shorter and spindle-like, the third is but the merest trifle shorter still, and the fourth is scarcely as long as the two preceding ones together, and has nine groups of sensory setæ.

The second antenna is longer than the body; the first joint is very small and scarcely noticeable from the dorsum, the second is longer and its distal border forms two spikes, one each side. The proportions of the remaining joints and flagellum are as 5·5. 14·5. 19. 15. The third joint has four or more prominent spines near its outer border, the following joint also has a series, but they are smaller and diminish to nothing along the joint, which is also covered, but not very plentifully, with small

setæ, and these are plentifully distributed over the rest of the appendage. Nowhere are they conspicuous.

The first maxilla is a two-lobed structure, of which the inner is short, narrow and slightly curved; its inner margin is fringed with fine setæ, and the distal extremity is occupied by three stout, plumose setæ. The outer lobe is much larger and broader, its distal margin being fringed with about ten stout spines.

The second maxilla consists of a broad lobe rounded distally, the inner distal margin is armed with short and stout plumose setæ; towards the outer margin the setæ become longer, more delicate and much less plumose. Of the two external lobes the outer one is half the size of the inner and is armed distally with a few strong setæ, which are thinly plumose, those of the inner lobe are more numerous and intermediate in character.

The maxilliped presents quite a normal appearance. It rests on a broad plate which is nearly rectangular, but rounded on its outer side. The masticatory lobe is in two pieces; the proximal one being a little shorter than the distal, which has its outer margin rounded. Distally it is armed with short, stout, slightly curved setæ, which appear to be finely toothed rather than plumose. The palp does not present any special peculiarity; the first three joints progressively increase in length, the other two decrease; all are stoutly built and are provided in the usual way with long setæ. The epignath rests on a triangular plate of which the angles are rounded and the base is anterior; it is large and unequally oviform, the inner margin being nearly straight.

The first appendage of the mesosome, or gnathopod, does not differ essentially in its structure from that of the other species here described. The basis is stout, constricted near the base and rather irregular in outline; the three following joints are quite normal and plentifully provided with long, simple setæ. The propodus is supplied with long, simple setæ along its ventral margin, but on its inner face, that applied to the body, there are, towards the dorsal aspect, some half-dozen series of long setæ as well as others near the ventral margin, which are finely toothed rather than plumose. A rounded process on each side of the extremity of the propodus receives the dactylus. This is well provided with simple setæ, and the terminal claw is accompanied with an auxiliary more than half its size.

The three following pairs of appendages are fringed with long, simple setæ from the distal extremity of the basis. The first pair is the shortest, the other two subequal, the basal joint of the third being the largest and most spinous, but the three terminal joints are each rather smaller than on the preceding appendage. Externally the basis is provided with four stout spinous processes. The next joint has one very large one; the merus has two, a small proximal one and a large distal one; the carpus has but one of moderate size. The number of these spines only concerns this particular individual, they vary both in number and strength. The centre appendage has a length of 10 mm. on a body length of 20 mm.

The three posterior appendages of the mesosome are not very long, the proportions of the joints being 11. 6. 4. 4. 8. 7. The basis bears four or five stout spinous processes externally, the number and strength of these vary ; the ischium only bears short setæ with which it is fairly well covered ; the merus and two following joints bear along the ventral surface a series of stout spines, in addition to small setæ irregularly scattered. The dactylus is thinly covered with fine, small setæ and has a stout terminal claw and a small accessory.

A number of specimens of this species were taken in Winter Quarters inside the 25-fathom line, and one was taken in 125 fathoms. The average length of the body is 22 mm. Most of the specimens are females and, as one expects in members of this genus, the anterior part of the mesosome is considerably enlarged. Also the development of the spines is much increased, and those on the mesosome from which one of the specific characters are derived become comparatively enormous. There is also an indication of a stronger lateral spine on the third or fused segment of the metasome.

None of the females bear young, many of them have ova ; these were captured in October and February. The males have the dorso-lateral spines very much less prominent, and the body is uniformly cylindrical throughout.

The oostegites of the females number four pairs, and the most posterior pair are supported by a stout spine from the epimeron of the fourth segment of the mesosome which almost reaches to the mid-ventral line, this also bears subsidiary spines.

The species was described from a single small though apparently fully developed female taken off Franklin Island by the 'Southern Cross' Expedition. With that individual were associated three very small and obviously immature specimens. Knowing that the spinous armature increases with age, and more especially so among the females, I declined to regard these as other than possible juveniles of this species.

This turns out to be correct, but the complete absence of large spines in the male led me to regard them as another species which was to have received the name of *A. australis*. It was not till I found that all my specimens of *A. franklini* were females and all those of *A. australis* were males that I discovered the error. It is absurd to suppose that during a residence of two years, and capturing these animals one or two at a time, only one sex of each of two species should be taken. The figures will show the differences between the two sexes, the most remarkable being the complete absence of the larger spines.

The foregoing description of *A. franklini* is based entirely on the females.

In the male the four anterior segments of the mesosome are practically smooth, though rather tuberculated laterally, the first of them bears an epimeral spine. They progressively increase in length, the fourth being half as long again as the first.

The segments of the metasome, though fused, are more distinct than in the female ; two dorso-lateral spines, larger than the rest of those covering the urosome, are sometimes present.

The second antenna differs in the proportion of its principal joints and flagellum, being 3·7. 16·5. 21·5. and 16 as against 5·5. 14·5. 19. 15. of the female on which the detailed description is based. The first of these joints as measured, the third really, is devoid of spines.

About thirty specimens of both sexes were taken in Winter Quarters during the whole of our stay, all, but one, inside the 50-fathom line.

Antarcturus hiemalis.

(Plate VI., fig. 1.)

Specific characters :—

Cephalosome and first four segments of the mesosome each with a pair of stout spines forming a single row on each side of the middle line.

Epimera with very prominent spines.

Mesosome rounded posteriorly and having a median keel terminating in a spine, the third abdominal segment, which is fused with the urosome, having laterally a very stout backwardly curved spine.

Long setæ predominate.

The entire body is marked all over with small arborescent chromatophores. The anterior border of the cephalosome is incurved, and close to this margin is a pair of very prominent horns curved forwards and outwards, these are provided with several very long setæ. Behind this is another pair, much smaller but still prominent, and these also have long setæ connected with them. Abreast of the interval between these two pair of horns lie the prominent and well-developed eyes.

The first four segments of the mesosome are subequal in length, and each is provided with a pair of very prominent spines placed one behind the other on each side of the mid-dorsal line ; long setæ are associated with these. These segments are covered with minute spines, but outside the longitudinal rows they become much more prominent, and while varying in size, form a distinct fringe along the posterior border of each segment, the remainder of which is more or less coarsely tuberculated. The epimera bears one very pronounced spine and other smaller ones. The larger ones are setose.

The three posterior segments of the mesosome are minutely spinous, but as with the more anterior ones the spines are far better developed laterally and also form a strong postero-lateral fringe. The epimera are distinct from these segments and bear very prominent setose spines.

The metasome shows distinctly three segments and the urosome, all of which are fused. The first segment has a very large setose epimeral spine, the second has only a stout tubercle, while the third has an extremely stout backwardly curved spine, its base being as broad as the segment bearing it.

The urosome is rounded posteriorly, scabrous, and having a well-developed median keel which terminates in a spinous blade a little in front of the extremity. The borders are fringed with long setæ.

The first antenna (fig. 1a) conforms to the usual type, the first joint is broad, having a more definite wing-like expansion on its inner side than is usual, and on its outer border a strongly developed spine. The second joint is short, expanding distally. The third is much shorter still, these two together scarcely equal the first in length. The fourth joint is the longest and provided with a dozen tufts of specialised setæ. Every joint bears small arborescent chromatophores.

The second antenna is nearly half as long again as the body, and is fully clothed with long setæ. Of the five joints of the peduncle, the first is very short, the second is longer, and at its ventral extremity bears a very stout spine. The proportions of the four joints of the peduncle and the flagellum are approximately 3. 5·5. 11. 12. 13·5. The three terminal joints of the peduncle are plentifully provided with long setæ, and each joint of the flagellum bears a distal whorl of them as well as a few about the middle.

The first maxilla (fig. 1b) is stout, the smaller and inner lobe has a curved outline, the middle of its inner margin bears a group of long setæ, smaller setæ are plentiful distally, while the extremity is armed with three stout setose spines. The outer lobe, which is more than double the size, bears numerous chromatophores, compact at the base but becoming arborescent distally. The middle of both inner and outer margins is occupied by a group of short setæ, and the distal extremity is armed with eight or nine strong but simple spines.

The second maxilla (fig. 1c) is very broad, decorated as before with chromatophores, compact at the base and arborescent distally. The inner lobe is short and broad, its inner margin provided with fine setæ, distally it bears numerous spinous setæ, each provided with lateral setæ, but these are too short and stiff to justify the use of the word plumose. Of the two outer lobes, the outermost has been broken off in the specimen examined, the other is about one-third the diameter of the main lobe, and like it, it is provided with stout setæ furnished with small and stiff subsidiary ones.

The maxilliped (fig. 1d). The masticatory lobe is two-jointed, and in its entirety has something of an hour-glass shape, being constricted at the junction of the two joints; the distal margin and inner angle of the second joint is fringed with stout plumose setæ. The palp is five-jointed, stout throughout, none of the joints greatly exceeding the others in diameter; the first three joints progressively increase in length, the fourth is as long as the third but more slender, the terminal one is a stout knob. All are liberally provided with setæ on the inner margin, which increase in length to the fourth joint, and are more generally scattered over the first and second, the third and fourth having a distal fringe dorsally. The epignath is conical though not symmetrical, and the greater part of its margin is fringed with minute setæ. The entire appendage is covered with black chromatophores, only a few of which are aborescent; the majority are sharply-defined black spots, but many are irregular in shape.

The first appendage of the mesosome (fig. 1e) is prehensile. The basis is a long

joint approximately cylindrical and having a slight constriction near the proximal end, ventrally it bears a distal fringe of long setæ; the ischium is small and enlarged distally from a slender base; the merus is also short but very broad, almost circular though irregular in outline; the carpus is short, its ventral margin being nearly three times as great as the dorsal. These three joints are together about as long as the basis, and are plentifully supplied with long setæ on their ventral surfaces, and the two proximal ones have a few dorsally. The propodus is very nearly as long as the basis, its dorsal margin is straight with a few long setæ distally, ventrally it is swollen but not to any great extent and thickly fringed with long setæ, and a few are a little further back from the margin; on one side these are long, on the other they are short, and near the dorsal margin there is an irregular band of setæ of intermediate size. The dactylus is stout, but near its termination it becomes rather abruptly reduced in diameter and the claw is accompanied by a small accessory; the dorsal and external face of this joint is very richly supplied with long setæ.

The three following appendages of the mesosome are of the normal type and do not present any special features, they increase in size from the first to the third and the middle one, which may be taken as the type, has a length of 15 mm. compared to a body length of 27 mm.

The three posterior appendages of the mesosome are long. The proportions of the joints of the second are as 11. 7. 4. 4. 7. 5. The basis and the two following joints are covered with small tubercles and have a few straggling setæ, the inner margin of the carpus and propodus bears a row of slender spines, and at the end of the latter joint is a rounded lateral flange which supports the dactylus. This bears a very small accessory claw.

The uropoda are minutely tuberculated and fringed with long setæ. The marsupium of the female is composed of three pairs of plates, connected with the third to the fourth appendages of the mesosome.

This species was found in Winter Quarters at a depth of 125 fathoms. Only three adult specimens were taken; one of these is a female much larger than the specimen described. This specimen is abundantly overgrown with hydroids, polyzoa, worm tubes, etc., chiefly on the antennæ and anterior appendages; among all this were massed not less than sixty young. These are quite devoid of the spines so characteristic of the adult, and only two instead of the three posterior pairs of thoracic appendages are to be detected.

Antarcturus meridionalis.

(Plate VI., fig. 2.)

Specific characters :—

Body slender, second antenna nearly twice the length of the animal, not conspicuously setose.

Cephalosome as well as body quite devoid of any spines except coarse epimeral tubercles on the first four free thoracic segments.

Urosome rounded posteriorly, with a median ridge ending in a spine a short distance from the posterior margin.

The anterior margin of the cephalon is arched forward on each side of the middle line so as to form a more angular cleft than the usual crescentic curve. There are no spines nor any trace of the cephalic horns. Eyes well developed and lateral as usual though not so prominent. Of the segments of the mesosome the first three vary but little, the fourth is about half as long again as the first. These anterior segments all possess a tubercle of varying size on the epimera, and the dorsum is irregularly corrugated.

The two anterior segments of the metasome are long and slender, the fusion of the third with the urosome is more complete than usual and marked laterally by a tubercular swelling of no great size.

The urosome forms the greater part of the metasome and is rounded at the extremity, marked in the middle line with a slender ridge which terminates before the extremity in a blade-like spine.

The first antenna is of the usual *Arcturus* type; the first joint is short but stout, having its outer margin expanded; the two following are subequal and shorter; the last is about five times the length of either of the two preceding, and provided throughout the greater part of its inner border with the normal sensory setæ.

The second antenna is long and slender, measuring some 57 mm.

The first joint is very small and quite inconspicuous; the second is longer, though short, the proportions of the remaining joints and flagellum are approximately as 2. 4. 12. 12. 21. All these joints are rather sparingly supplied with small inconspicuous setæ. The joints of the multi-articulate flagellum are long and slender, each bearing a few small setæ at the middle and distally.

As there is only a single specimen the mouth organs have not been dissected. The maxillipeds, however, as far as can be seen *in situ*, presents no special features; the epignath is about the average size and distinctly conical in shape. The appendage is rather handsomely marked with large arborescent chromatophores.

The first appendage of the mesosome differs but little from the usual type, and is handsomely marked with the same large arborescent chromatophores. The basis is long, furnished ventrally and distally with a fringe of long setæ; the ischium is about half the length; the merus is shorter and nearly round owing to its lateral extremity projecting forward as a blunt point; the carpus is rather cup-like with a larger ventral than dorsal surface; these three joints are well provided with long setæ ventrally. The propodus is large but not greatly expanded, it is liberally fringed with long setæ; the dactylus is stout, considerably increasing in stoutness from the base to near its distal extremity, when the dorsal surface becomes abruptly curved downwards to form a finger-like process, and this bears a stout claw and a smaller accessory; the dorsal surface of this joint is well provided with long setæ, more especially in the area of the "cushion."

The three following appendages are of the usual type; the joints are smooth without spines or tubercles, but the long setæ are simple and arranged in serial

groups. The dactylus, however, has its ventral margin furnished with small close set spines, and instead of the terminal claw there is a group of three large spines.

The three posterior pair of limbs are rather long, graduating in length from first to last; the last is smallest, the middle one is 13·5 mm. in length. The joints are not specialised, except that the carpus has a series of seven or eight stout curved spines on its ventral surface; the propodus is similarly provided, and the dactylus, which is slender, is as long as the propodus and bears a small claw with a smaller accessory.

The specimen is a male, and there is a long median process about 3 mm. long in front of the pleopoda; this is thin, but has a slightly irregular outline and the extremity is rounded; it is cleft for one-third of its length.

The first pair of pleopods have a protopodite about as long as the process above described, the exo- and endopodites are thin plates subequal in size with truncated ends, and these are fringed with long setæ; the exopodite is much the strongest of the two. These have been examined *in situ*.

The single specimen is a male, and was taken in 300 fathoms off the Great Ice Barrier, Bottom Mud, January 27, 1902.

GLYPTONOTUS.

This genus was established by Eights about 1852 for a large species captured in the South Shetland Islands. It subsequently received other species, but these have, for some time past, been transferred to other genera, and the following species, first found on the French Antarctic Expedition, is the only other one that can be now assigned to it.

Glyptonotus acutus.

(Plate VII.)

Glyptonotus acutus Richardson (12), pp. 10–13.

Specific characters :—

Body more than twice as long as broad.
Sculpturing exactly as in *G. antarcticus*.
Urosome longer than broad, terminating in a prolonged spike.
Legs very long and slender.

Cephalosome is comparatively small, rounded posteriorly, being largely recessed into the first segment of the mesosome. The anterior margin is formed by two shallow crescentic depressions, above the origin of the antennæ these depressions are united in the middle line by a stout tubercle, and a smaller one occurs at the external border; from this the margin of the cephalosome slopes obliquely backwards to the posterior rounded margin in a slightly sinuous line.

The eyes are quite small, ovoid, and dorso-lateral in position; they lie on an oval swelling separated from the rest of the lateral plate by a shallow groove. The

surface of the cephalosome is sculptured in a peculiar way, but only differing in the minutest detail from that of the type species, *G. antarcticus*; two flattened patches occur behind the crescentic depressions of the anterior margin; immediately behind these is a transverse band more coarsely knobbed and posteriorly divided into four distinct tubercles, the outer ones being at least half as large again as the inner ones. This entire sculptured area is separated off from the "lateral plate," where the eyes are situated, by a conspicuous dermal fold, which reaches to about the centre of the level of the eyes.

The mesosome comprises the normal seven segments, and of these the fourth is the largest; the differences between any of them are, however, not great. All of them show a mid-dorsal longitudinal ridge more or less strongly developed. The sculpturing comprises a roughly triangular patch, its apex directed to the middle line. These patches are comparatively smooth on the third and fourth segments, but increase in roughness anteriorly as well as posteriorly.

The first segment arches forwards to partially enclose the cephalosome, a smooth dermal ridge runs round this segment and forms its anterior margin to a certain extent, but in front of it for a short distance either side the middle line is a thin band of irregular sculpturing. The three posterior segments are curved backwards, the curvature increasing progressively to the last which, with its epimera, completely hides the lateral margins of the two first segments of the metasome.

The epimera are large, smooth, the first three having their angles rounded; the posterior angle of the fourth is pointed. The epimera of three posterior segments are conspicuously separated from the segment bearing them; they become narrower, longer, and more acute from first to last.

In appearance the cephalosome and metasome are exactly like those of *G. antarcticus* Eights, the only difference being one of proportion.

The metasome comprises four free segments, visible dorsally, and a fifth, fused with the urosome, and this last is the longest; of the other four, the two middle ones are subequal in length, as are the first and fourth, which are a little shorter. The last segment of the mesosome conceals the lateral margins of the first, and its epimera hide, but not altogether, the diminutive epimera of the second segment; the epimera of the other two segments progressively increase, the last being large and directed backwards. The urosome has the fifth segment fused with it, and this irregularly tuberculated, and has a prominent mid-dorsal ridge; the urosome itself is long, comparatively slender, having a sinuous tapering margin and terminating in a strong and rather lengthy spine, the end of a well-developed median ridge.

Ventrally the fourth to sixth segments of the mesosome are conspicuously grooved in the middle line, and traces of such a character occur on all.

The oostegites are five pairs, and occur on the first segment to the fifth. In the largest female, which is the specimen examined in detail, they are not fully developed, and are strong ovoid structures which do not reach anywhere near the mid-ventral line.

A larger specimen, 119 mm. long, is a male, but this was dead when found, and, besides some injury, its inside had been almost completely eaten out. On the anterior border of the first segment of the metasome are a pair of penial filaments; these are cylindrical, about 5 mm. long, and terminate in an oblique orifice surrounded by a fringe of stiff setæ. A further sexual character is the long, slender, grooved filament connected, at its base only, with the endopodites of the second pair of pleopoda. It is half as long again as its endopodite.

The first antenna arise rather close to the middle line, and comprise a peduncle of three joints; the first two are subequal in length, and the third is nearly as long as the first two together. The first is slightly contracted in the middle, and has a group of stout setæ at its inner distal extremity; the second has a small group about the middle of its ventral border, as well as a distal fringe, which is, however, irregular, being most accentuated ventrally. The third joint is more slender, swollen, and setose distally. The flagellum is not as long as the third joint of the peduncle; it consists of a single joint, strongly curved near the proximal end, and has a band of fine setæ running along its outer border.

The second antenna arises immediately outside the first; the peduncle is five-jointed. The first joint is extremely short, the next two are subequal in size, the second having a strongly developed distal fringe ventrolaterally, and the third has a ventral mass of setæ rather than a fringe; the fourth joint is a little longer than the preceding, and, like it, widens distally; it has a well-developed dorsal distal fringe and a mass ventrally which is separable into two groups; the fifth joint is nearly as long as the third and fourth together; it carries along the distal half of the ventral margin four groups of setæ, besides a dorsal and ventral distal fringe. The flagellum is multi-articulate, and half as long again as the peduncle.

The buccal mass is very prominent; the supporting plate in front bears three tubercles, of which the median is very prominent. The epistome is an irregularly ovoid plate with a raised edge, and cleft in the middle.

The mandible is large and powerful, devoid of a palp; the cutting edge of that on the left side is strongly coloured, and overlaps that of the right.

The first pair of maxillæ (fig. 2) consist of the two normal lobes, the inner one considerably smaller and weaker than the other. The inner one terminates with three rather long and strong setæ and several others, much weaker; very minute setæ occur on both faces of the joint. The outer lobe, at least twice the length and breadth of the inner, has eight strong spines distally, and its outer border is fringed with minute setæ.

The second pair of maxillæ (fig. 3) are broad, if thin. The inner lobe is constricted about its middle, and then forms an ovoid enlargement. The inner and distal border of this is furnished with long slender setæ; the two outer lobes are very nearly equal in size; they are rounded distally and provided with long slender setæ; fine setæ occur on the outer border and the base of the external lobe.

The maxilliped (fig. 4) is large and strong. The basal joint is broad and stout, the

distal joint more than half the length, angular distally, and provided with a large number of thick setæ; the inner edge of this joint bears a group of fine setæ, of which two are larger and stronger than the rest, and both are thickened so as to form a broad wall rather than a narrow edge; this more particularly is the case with the basal joint. The palp is five-jointed and large; the first three joints progressively increase in length; the remainder decrease, but in no case is the difference great. Both the third and fourth are enormously expanded internally, each as a flattened plate with more or less rounded angles. The fifth joint is stout, but digitiform, almost surrounded with setæ, which increase in length to the distal extremity. The first joint only bears a few short setæ; the second, third, and fourth are richly setose internally, the third and fourth bearing short setæ externally as well. The epignath is a broad plate about the length of the basal joint.

The first three appendages of the mesosome are prehensile in function and exactly alike except in so far that they increase in size from the first to the third; the remaining four are ambulatory, exactly alike, and also increase in length from the fourth to the seventh.

The first appendage (Pl. VII., fig. 5) has a long basis, nearly as long as the four following joints, and carries a small tuft of spinous setæ ventrally at its distal extremity. The ischium is about half as long, and has two tufts of spinous setæ ventrally; it has a small external process which extends the articular surface. The merus is a very short joint with a large dorsal expansion which partially covers the succeeding joint and extends beyond the insertion of the propodus. This expansion terminates in a tuft of spinous setæ, and the ventral aspect of the joint, here very short, bears two groups of similar setæ on the inner side, and only one, which is smaller, on the other. The carpus is short and broadens dorsally, where it is very largely covered by the preceding joint; ventrally it carries three double series of stout setæ. The propodus is broad, rounded dorsally, nearly as long as the three preceding joints; the ventral margin appears as if serrated, and bears seven double groups of stiff setæ. A few short setæ occur dorsally at the distal extremity; the dactylus is slender, the point reaching as far as the carpus.

In the last appendage of the mesosome the proportions of the joints are 15. 9. 6. 12. 12. 6. The basis has the external articular process well developed, beyond which it is constricted; a flange runs along the ventral surface of this joint, to open out midway along it to form a protective shield for the base of the next joint. There is a small distal fringe dorsally. The ischium and succeeding joints are triangular in section, being flat ventrally. The dorsal ridge produced by this shape opens out on this joint to permit the more complete flexure of the succeeding joint and is armed with three groups of spinous setæ, five groups of such setæ occur ventrally. The merus has three and projects dorsally over the base of the carpus; the carpus has seven such groups and a distal fringe; the propodus has five, which more nearly approach transverse bands; there is also a short distal fringe dorsally. The propodus is long and slender.

The uropoda are large and opercular; a prominent ridge runs round the structure on all sides except the distal extremity; anteriorly and internally this ridge is some little distance from the edge and terminates in a point. The distal extremity is incurved and supports a pointed ovoid exopodite.

The endopodite is smaller, more regular in shape, and concealed by the exopodite.

The pleopoda are all very much alike; the exopodite and endopodite are elongate lamellæ, the former a little the shorter; both have setose margins. The sexual modification of the second pair in the male has already been alluded to.

Six specimens were taken at various times, in Winter Quarters, at depths varying from 20–125 fathoms. The largest of these was a dead male measuring 119 mm. in length and 42 mm. across the third segment of the mesosome. The smallest was not more than 13 mm. long. In the small specimen the mid-dorsal ridge is relatively more prominent, the metasome is proportionately longer, and the posterior band of sculpturing on the cephalosome is more strongly developed.

In life they are of a dull brown colour and of sluggish habits.

NOTASELLUS.

Instituted in 1886 by Dr. Pfeffer for a species taken in South Georgia, this genus now contains two species.

Notasellus australis.

Notasellus australis Hodgson (**8**), pp. 251–3; Richardson (**12**), p. 13.

Specific characters :—

Uropoda bi-ramous, longer than the urosome, which is approximately as long as broad, and terminates in a small rounded lobe between them.

Two specimens of this species were taken at Cape Adare from the root of a large Laminarian, *Lessonia grandifolia*, in 17 fathoms, February 24th, 1904.

It has also been taken by the French Antarctic Expedition in the neighbourhood of Graham's Land, the western side.

AUSTRONANUS.

Body ovoid, without distinct waist between any of the segments.

Cephalosome large, with stout lateral projections bearing the small eyes.

Second antenna. Peduncle 5-jointed.

Mesosome. Segments very uniform in structure.

Metasome, a single joint—the urosome.

Pereiopoda, all ambulatory.

Uropoda, minute, preterminal,* a single setose joint.

This genus is quite distinct from any other hitherto recorded, superficially at least,

* Notwithstanding my protests the author insists on the use of this neologism.—Ed.

it seems to resemble *Jæropsis* Koehler more closely than any other, though the structure of the second antenna and the uropoda should exclude it from the Janiridæ as at present defined.

Austronanus glacialis.

(Plate VIII., fig. 3.)

Specific characters :—

Cephalosome broad, rather pointed anteriorly.
Second antenna, second joint produced externally as a flattened blade.
Urosome with ten recurved teeth in front of the preterminal uropoda.

This is the most diminutive species in the whole collection, and is of ovoid form.

The cephalosome is large, with the lateral projections which carry the eyes scarcely as broad as the first segment of the mesosome. The ocular projections are very stout though not very long, their angles are rounded, and the eyes, which are red in colour, are quite small. Anteriorly the cephalosome is arched forwards in rather a pointed manner, and its anterior border is flattened. In length it is equal to that of the first two segments of the mesosome.

Of the mesosome the first two segments are subequal in length, the first is curved forwards, the second is the widest, and, with the third, straight; the remainder progressively decrease in length and in width, all of them being more or less curved in a backward direction. The epimera, not separable from the body, are almost the full length of their respective segments, with rounded angles, and a distinct space between each segment; there is no "waist" between the fourth and fifth segments.

The metasome comprises only a single plate, the urosome. This is slightly wider than the last segment of the mesosome and attached to it along half its width. The external margins, as far as the insertion of the small uropoda, are rounded and armed with ten flat curved teeth, which increase in size as far as these appendages; between the uropoda there projects a rounded lobe.

The uropoda are short, single-jointed stumps, setose at the extremity.

The first antenna is short, and has a peduncle of two short joints and a flagellum of five.

The second antenna has a peduncle of five joints; of these the first is small, the second is large and much dilated externally, the third is short, the fourth twice as long, and the fifth rather more than the length of the two preceding. The flagellum only contains about seven joints, and is scarcely twice as long as the last joint of the peduncle.

The mouth organs cannot be detected without dissection, and this has not been done as there is but a single specimen.

The first of the pereipoda is stout and a little shorter than the others. The basis and ischium are two stout joints, the latter not so long as the former, but details cannot be seen without removal from the body. The merus is short and enlarged dorsally in a rounded manner, overreaching the base of the carpus. The carpus is

stout, with a flattened ventral edge armed with a couple of spines. The propodus is stout, nearly as long as the dactylus, with a somewhat flattened edge ventrally and armed with a spine. The dactylus is rather stout at the base, tapering and curved, with a spine or accessory claw about the middle of its length ventrally. The remaining pereiopoda are much more slender, subequal in size, and comparatively small; the distal joints are cylindrical, and there is a stout curved seta on each dactylus.

Only a single specimen of this species was found among the dredge material in February, 1902, before the ship was frozen in to Winter Quarters, inside the 20-fathom line.

AUSTROFILIUS.

Cephalosome three lobed, the median one forming a broad rostral plate, the lateral ones flattened and bearing the small eyes.

First antenna small.

Second antenna, six-jointed peduncle, third joint with an external spine.

Mesosome having its segments variable, but not distinctly divided into two divisions.

Metasome forms a single plate with small preterminal biramous uropoda arising ventrally.

Pereiopoda all ambulatory, of moderate length.

Austrofilius furcatus.

(Plate VIII., fig. 2.)

The cephalosome is not quite so broad as the first segment of the mesosome, and over all it is about as long as the first two segments. The anterior part is reduced to nearly half the diameter of the posterior, and tapering slightly it terminates in two stout but widely separated spines. The antennæ arise in the rounded depression on either side of this rostrum, if such it may be called. The eyes are small and dorso-lateral in position, borne on small rounded tubercles.

The form of the mesosome is not easy to describe; briefly, the six anterior segments are separated from one another by conspicuous bands of dermis softer than that which makes up the bulk of the segment. The first three progressively increase in width, though only slightly, the remainder decrease in a similar way.

The first segment is the longest, and is slightly curved forwards and of uniform length throughout. Referring only to the harder parts the second is little more than half the length in the mid-dorsal line, but increases laterally to be subequal in length; the third is intermediate in length, curved forwards laterally; the fourth is straight. The lateral margins of all these segments are more or less rounded and setose. The fifth segment is the shortest, widening laterally, and not setose; the sixth and seventh

progressively increase in length, the former having a sinuous posterior border and rounded lateral margins, setose as the more anterior ones, the latter is curved slightly backwards, the lateral margins curved and setose, and the posterior sinuous. Intervals of varying width exist between the segments.

The metasome consists of a single plate, the urosome, which is attached by about one-third of its width; it enlarges rapidly to its full width very little less than that of the preceding segment; it is broadly cordate in shape; the antero-lateral margins bear small setæ, and are in part very finely and sparsely serrate.

Three small teeth occur in front of the uropoda, which are of moderate size, ventral in origin, and preterminal in position. They comprise a single-jointed protopodite with a small single-jointed exopodite and endopodite. The former is about two-thirds the length of the latter and much more slender; each bears a tuft of long setæ and a few along both margins.

The first antenna consists of a peduncle of two joints, the first of which is stout, the second longer and more slender; the flagellum is small, little longer than the second joint of the peduncle.

The second antennæ are destroyed in the specimen figured, four joints of the peduncle remain; all are short, and the third of them carries externally a spinous appendage. In another smaller example the second antenna is complete and shows two more joints, long and stout, the distal one longer than the proximal and a little more slender; both are covered, but not thickly, with fine setæ. The multi-articulate flagellum is about as long as the terminal joint of the peduncle; it is well provided on the inner side with specialised setæ in small groups.

The mouth parts are quite normal as figured on Plate VIII.

Of the pereiopoda the first is the shortest and a little the stoutest, the remainder are approximately subequal. They do not present any special features save that the terminal claw is well developed and accompanied by an accessory which is very nearly as large.

The pleopoda. The first pair are opercular.

Four specimens were obtained from the dredge material during February, 1902, taken inside the 20-fathom line. The largest is 3 mm. long.

COULMANNIA.

Cephalosome narrower than any segment of the mesosome except the last; the eyes are small and borne on elongated lateral peduncles.

Second antenna with a six-jointed peduncle, no accessory appendage on the third joint.

Mesosome without any conspicuous division between anterior and posterior portions.

Epimera not distinct from mesosome, prolonged and deeply cleft. Segments spinose in mid-dorsal line.

Metasome with one distinct segment spinose and a bulbous urosome with minute preterminal uropoda.

Pereiopoda ambulatory, except the first, which is prehensile.

Pleopoda, first pair forming an operculum over the remainder.

This genus is established for two closely allied species which cannot be located in any existing genera. It is unquestionably a member of the family Janiridæ and its nearest relations would appear to be the genera *Iolanthe* Beddard, and *Iolella* Richardson.

Coulmannia australis.

(Plate IX., fig. 2.)

Specific characters :—

First segment of mesosome with epimera cleft to form two blade-like processes.
Urosome pointed.

The body is 5 mm. long, vaulted with the elongated, though not separable, epimera of the mesosome divided by a deep and wide cleft so as to produce them as narrow blades. Each of these segments as well as the first of the metasome bears a slight ridge produced in the mid-dorsal line into a stout backwardly curved spine. The entire body is covered, but not thickly, with fine setæ.

The cephalosome is a little longer than the first segment of the mesosome, rounded in front and having, near the posterolateral angle, a slender finger-like process which carries a small eye. The posterior margin is very nearly straight.

The first four segments of the mesosome are subequal in length, the third is the widest, and the epimeral blades of this and the succeeding are subequal in size, those of the first two segments graduate from the first to the fourth. The mid-dorsal spines are well in front of the posterior border of their respective segments. The last three segments are more or less curved backwards, particularly the last, though in the last segment it would be more correct to say angulated. Their dorsal spines are on the posterior border of their segments. The first and only distinct segment of the metasome is quite small and wedged in the curvature of the preceding one. Its mid-dorsal spine, though not so large, is quite as prominent as any of the others. The urosome is smooth, finely setose and peg-top shaped.

The uropoda are quite small, single jointed finger-like processes with a few distal setæ. They lie at five-eighths of the length of the urosome.

The first antenna arises just in front of the eyestalk. The peduncle consists of two small joints, and seen from the dorsum these are subequal in length, though the first is very much stouter than the second. The multi-articulate flagellum is twice the length of the peduncle, and is composed of joints of very variable length and almost devoid of setæ.

The second antenna is longer, and has a peduncle of six joints. The first two are extremely short; the third is longer than the two first together, swollen externally and setose; the fourth is short, forming a sort of elbow in the appendage; the other two

are comparatively long, subequal, and provided with scattered setæ. The multi-articulate flagellum is scarcely as long as the peduncle.

The maxilliped (fig. 2a) has a comparatively stout basal joint and a distal masticatory obe about three-quarters of its length. The entire inner margin is straight, and not far from the base of the masticatory lobe are two papilliform teeth separated by a distinct interval. The distal extremity of this lobe is straight and its outer margin rounded. At the extremity and below the edge are three broad, denticulate spines. Three more, situated externally, are apparently simple; but this is due to their being seen sideways. The palp is five-jointed. The first three progressively increase in breadth, the first being very short, and the next two subequal in length, both these are setose on their inner margins, and the larger ones on their distal external borders also. The two terminal joints are comparatively slender, subequal in length and setose distally. The epignath is large, conical. A small rounded base, bulging considerably to terminate as a cone, it reaches nearly to the end of the masticatory lobe.

The pereiopods are not of any great length, and are very much alike throughout. The first pair only is modified to any extent. This is short, the basis is the longest joint. The ischium is about half the size. The merus is shorter still, but dorsally it is carried as a spine over the carpus for fully half its length, the carpus itself being rather swollen ventrally and proximally, having two or three stout spines about its centre. The propodus is stout and but little shorter, and also carries a few spines ventrally. The terminal claw is stout, the "nail" is distinct, and has a small accessory. The remaining perciopoda are very much the same, only longer and much more slender. This involves an increase in the length of some of the joints, and the carpus and propodus are the most affected. In the two posterior pairs the merus forms a pronounced dorsal lobe over the base of the carpus.

The first pair of pleopods forms a stout operculum over the remainder, and together form a rather narrow band, which widens out about two-thirds of its length, from thence it tapers to a blunt point; the margins are setose.

As only a single individual of this species was taken, I have been unable to go into any very great detail. The maxilliped of one side has been removed for examination, but that is all.

Coulman Island. 100 fathoms. Stony ground. February 13, 1902.

Coulmannia frigida.

Specific characters :—

First segment of the mesosome with only one epimeral blade.
Urosome prolonged as a distinct spine.

During the progress of this Report an Isopod was sent me from the British Museum which had been found clinging to the body of *Colossendeis frigida*. This specimen I at first thought to be identical with the preceding, but a very brief examination shows that it is quite distinct.

In general appearance this species greatly resembles the last, but it is instantly recognised by the fact that the first segment of the mesosome has its epimera produced into a single narrow blade only.

The cephalosome is rounded, narrower than in the Coulman Island species, which is figured on Plate IX., and the ocular peduncles are shorter and stouter. They do not reach to anything like the distance of the epimera of the first segment of the mesosome.

The mesosome is more distinctly setose than in the last species. The dorsal ridges, with their median spines, are more strongly developed. The urosome is, in its distal portion, prolonged into a definite terminal spine, and is densely setose. Both pair of antennæ appear to be very similar to those of the preceding species.

The pereiopoda are similar. The first pair are short and stout, prehensile in function, the basis is rather long, the ischium not half the length, and the merus shorter than that. This joint is expanded dorsally over the base of the carpus, and carries several stout setæ. The carpus is a stout joint, swollen ventrally and armed with setæ and two or three spines. The propodus is scarcely as long, stout and setose ventrally. The dactylus has a stout base, a comparatively slender claw, with an accessory spine and two curved setæ.

The remaining pereiopoda are distinctly ambulatory in function and have the normal cylindrical joints, excepting only the merus, which preserves its peculiar character and carries a spine dorsally. The carpus is stout and slightly swollen dorsally, with one or two spines and a few setæ ventrally, and the propodus is longer, more slender and slightly curved, with a few setæ ventrally. The dactylus retains its accessory spine and two curved setæ throughout.

There is but a single specimen of this species, taken at Winter Quarters in 125 fathoms.

NOTOXENUS.

Body much vaulted anteriorly, widening conspicuously to the third segment of the mesosome.

Cephalosome rounded, smooth, with long and slender ocular peduncles. Eyes very small.

Antennæ. Second pair with a peduncle of six joints, no accessory appendage.

Mesosome. First four segments straight or very nearly so, three posterior segments recurved. No special interval between any of them. A mid-dorsal spine on each.

Metasome. One very small segment and a large urosome with diminutive pre-terminal uropoda.

Pereiopoda. The first prehensile, the remainder ambulatory, not unduly long.

This genus is closely allied to *Coulmannia* of this Report, in fact I have long hesitated about separating them, but the bodily form which should be of greater importance than variation among the appendages, I think, quite justifies the course adopted.

Notoxenus spinifer.

(Plate IX., fig. 3.)

Specific characters :—

Cephalosome rounded, with long ocular peduncles ending in four small knobs surrounding the eye. Mesosome with mid-dorsal spine on each segment and also on first segment of metasome. Lateral extremities of every segment very distinct from each other.

Urosome very nearly as long as six segments of the mesosome. Top-shaped, with diminutive preterminal uropoda.

The body forms a pointed oval and is much vaulted anteriorly or round-shouldered. The interval between the third and fourth segments of the mesosome is a variable feature, but in no case is it specially conspicuous.

The cephalosome is subcircular when seen from above, but at first sight it does not appear to be so owing to the foreshortening due to the curvature of the body. The eye-stalks arise laterally, they are slender and extremely long, nearly as long as the diameter of the cephalosome, and extend that structure beyond the first segment of the mesosome. They are slightly enlarged at the extremity, and the eye lies in the middle of four small, blunt lobes.

The mesosome comprises seven distinct segments, in the first of which the cephalosome is to some extent embedded. The next three segments are straight, the third of the entire series being the widest. The three posterior segments are curved backwards, their curvature increasing as their diameter decreases. All the segments are provided with a backwardly curved spine in the mid-dorsal line, their size is proportionate to the size of the segment, but their position varies, those of the last three being on the posterior-border of their respective segments. The epimera are inseparable from their respective segments ; they are large and irregular in shape. Those of the first three segments are more or less directed forwards and to some extent rounded at the extremity, the fourth is more truncated, those of the last three are rounded.

The metasome consists of a single segment, wedged in the curvature of the last segment of the mesosome, and the urosome ; the former carries a mid-dorsal spine. The urosome is pointed, pegtop-shaped, more than one-third the length of the entire animal, with small preterminal uropoda. Its entire margin is fringed with small, rather coarse setæ, and its surface is also well covered.

The uropoda are very small, single-jointed, with terminal setæ. The entire body is rather sparsely covered with small setæ ; these are more abundant and conspicuous on the epimera.

The first antenna has a peduncle of two joints, the basal one being quite twice as long as the other, both are setose distally ; the flagellum is about twice as long as the peduncle and has only four joints, the first being rather long.

The second antenna has a peduncle of six joints ; of these the first two are very short, especially the second ; the third is as long as the two together ; the fourth is

about half the length of the third and forms a bend in the direction of the appendage. The two terminal ones are large and slender, the distal one being a little the longest. The peduncle bears numerous scattered setæ. The flagellum is scarcely as large as the two terminal joints of the peduncle.

The mandible is curved and rather tapering, it terminates in a cutting edge with two stout teeth, one of which, the lower one, is lobed; below these teeth are four or five spines which have their distal portions converted on one side into a thin finely serrated blade. The molar process which arises from the base of the organ, and is almost as large, is slightly constricted in the middle; the distal extremity is strong and has a curved process or tooth anteriorly. The palp is a comparatively delicate structure of three joints, the proximal two are subequal in length, the third is little more than half as long and terminates in a pectinate claw.

Both pair of maxillæ are quite normal.

The maxilliped (fig. 3a) is also normal in structure, the straight inner edge of the masticatory lobe bears two papilliform teeth, the distal extremity is straight and armed with setæ, three at least of these below the edge are broad and finely denticulate, exactly like the denticulate spines on the ovigers of so many Pycnogonids, the others are simple. The outer margin is rounded to some extent. The palp is five-jointed, the second joint being by a little the largest. The first three are broad and the two large ones have a few long setæ on their inner margin, and the other two joints are cylindrical with setæ distally. The epignath is large, rather more than three-quarters the length of the entire masticatory lobe, it is somewhat conical in shape, attached at the inner lower angle.

Pereiopoda. The first pair are short and stout, here the basis is long and cylindrical, the ischium is just half the length, the merus about half this, but enlarged dorso-ventrally and with setæ distally. The carpus is about half as long again as the merus, swollen ventrally and armed with three stout teeth and the stumps of one or two more. The propodus is rather short, stout and curved and bears several setæ, the stronger ones are ventral. The dactylus is long, slender, and has an accessory claw.

In the remaining pereiopoda the joints vary a little in their proportions, but there are no structural differences between them. All the joints are cylindrical except the merus, which is swollen dorsally. The carpus is elongated and armed ventrally with three or four spinous setæ. The propodus is curved slightly and carries a few strong setæ dorsally and ventrally, the strongest being ventral. The dactylus, long and slender, has a small if stout accessory claw, and between it and the terminal claw is a long seta.

The first pair of pleopoda form an operculum over the remainder in the female. The sympodite of the male is a narrow structure; the outer margin is curved gently outwards for about two-thirds of its length, it then tapers to a point. Against the exterior curvature is seen the ovate exopodite of the succeeding pair.

Several specimens were taken from sponge débris and other dredge material at intervals during our stay at Winter Quarters inside the 25-fathom line, 1902 and 1903.

HALIACRIS.

This genus was established by Dr. Pfeffer in 1886 for specimens obtained in South Georgia. It is very much open to question if it is distinct from *Munna*. I think not.

Haliacris antarctica.

Haliacris antarctica Pfeffer (**11**).
Haliacris australis Hodgson (**8**), pp. 253–4; Richardson (**12**), p. 16.

This species was very abundant in Winter Quarters, and was continually being taken in the dredge and D-net throughout our stay. As might be expected, the friction they enjoyed in either of these implements was such as to more or less completely dismember them. In consequence only a very few specimens were obtained in a sufficiently satisfactory condition to justify preservation. In the summer, however, we could manage better; the D-net was always kept on the sea bottom, and also always hauled to the surface before use to be certain that it was properly "set." Although the temperature was below freezing point, the weather was generally bright and warm, and these animals were often found wandering over the net or its frame. It was therefore a comparatively simple matter to pick them off and place them in a special pot, so that the majority arrived at the ship in a satisfactory condition. From the material thus obtained I have been able to examine this species in greater detail than hitherto. The description in the 'Southern Cross' Report is little more than worthless. There cannot be any doubt that the species there described is identical with that of Dr. Pfeffer taken in South Georgia. The 'Discovery' specimens also belong to the same species, and it is now seen that there is a sexual dimorphism, the old males modifying the shape of the urosome to a considerable extent. That this is due to age is certain, none of the smaller specimens have a urosome of such a shape, it is only found in the old males, some of which attain a length of seven millimetres. In these the posterior pereiopoda are of extreme tenuity. In life these animals are slow of habit; they crawl about with the metasome directed upwards, which seems to be its normal position. In colour they are a mottled-brown.

Cephalosome broad, as long as the first two segments of the mesosome, considerably reduced anteriorly to form a broad rostral plate; on each side of this is a curved recess terminating externally in a curved spine in front of the eyes. The eyes are comparatively large, on lateral processes which are slightly constricted at the base. The posterior margin of the cephalosome is rounded, and the rostrum fringed with small setæ.

Mesosome. Four anterior segments differing very little in breadth, first and

fourth shortest, subequal in length; the second and third also subequal, but little longer. All straight, the first partially enclosing the cephalosome. The three posterior segments subequal in length, increasing in curvature and decreasing in breadth to the last. Lateral margins of all the segments more or less truncated, the first three obliquely so, and all with distinct epimera, triangular in shape.

Metasome, a single small segment wedged in the curvature of the preceding segment, and a urosome, large vaulted, fringed, but not thickly with spinous setæ, and which form two small groups distally. Ventrally it forms a pocket for the pleopoda. In shape the urosome varies largely, in the smaller specimens it is ovoid with a slight depression for the reception of the diminutive uropoda. In the old adult males it becomes globular, with a truncated projection distally armed with two small groups of spines.

The males resemble the females, except that the latter are very much broader and the mesosome ovoid.

First antenna, the short peduncle is two-jointed. The first joint is short and stout, the second is slender and a little longer; the multi-articulate flagellum is about half as long again as the peduncle.

Second antenna, very long, peduncle six-jointed. The first three joints are very short, the second being as long as the other two together, and constricted in the middle; the other three joints are long, the fourth is long, the fifth much shorter and armed distally with a spine; the sixth is simply enormous, longer than the two preceding together. It is very slender, and provided with setæ throughout. The multi-articulate flagellum is longer than this joint.

Mandible. Strong, curved, cutting edge with two long teeth anteriorly, a third with which is associated a group of spinous setæ. Molar tubercle very prominent, its edge produced to a fine point posteriorly. Palp three-jointed, second joint a little the longest, the other two subequal; the second joint has two, and the terminal one three or four stout setæ armed with very fine closely set teeth.

First maxilla. Normal, the inner lobe terminates in three spinous setæ and a smaller one; these are coarsely plumose, at least on one side. External to these is a group of finer setæ. The outer lobe has about ten stout pectinate spines distally, another row of them internally, a short distance below. A group of much finer ones occurs on the inner edge of the joint.

Second maxilla. Normal, a rather broad blade reduced to about half its diameter in the distal half. This portion forms a blade, the inner and distal margin of which is thickly covered with stiff setæ. The external joint is bifurcated, the inner part being the stouter, both terminate with four long setæ.

Maxilliped. A short basal joint, the masticatory lobe is two-jointed, subequal in length. The distal joint is rounded externally and armed at its extremity and internally with coarsely plumose setæ. The inner margin carries four papilliform teeth about the middle of its length. The palp is five-jointed, the first short, the

second the longest, this and the next are considerably expanded internally and provided with long setæ distally, the dorsal aspect carries a few short ones; the two terminal joints are cylindrical, rather slender and setose in the same manner as the second and third.

Perciopoda. The first pair show a considerable sexual difference. In the male the limb is conspicuously clavate; the basis is long and slender, the ischium about half as long. The merus is shorter still, considerably expanded distally so as to become vase-shaped, with numerous fine setæ dorsally. The carpus is large and very stout, expanding distally and prolonged in its inner margin to an extent nearly equalling the length of the propodus; it is setose along its ventral margin, and distally where there are also two or three spines. The propodus is also a broad joint very much shorter than the carpus, it is expanded distally to form a sort of blunt spur ventrally, and this margin is covered with long slender setæ. The dactylus is articulated at the outer extremity of the propodus, is very stout and overlaps the carpal process by at least half its length, it terminates in a strong claw and a well-developed auxiliary; the ventral margin is fringed with long slender setæ. This limb is quite different in the female, the merus is but little expanded and does not differ otherwise from any ordinary joint; the carpus is a little longer, expanding distally with its ventral margin, forming a flattened blade which projects beyond the termination of the "shaft"; this blade is armed throughout with strong spines, longest and strongest distally; the propodus is stout, nearly as long as the two preceding joints together, with its inner margin rather swollen, and provided with three spines and several series of very fine stiff setæ, forming comb-like structures. The dactylus is long and slender, but does not reach the carpal process, it terminates in a long claw, with an auxiliary about one-third the size, the ventral margin of the joint is fringed with very small stiff setæ.

The remainder of these appendages differ but little in structure though a good deal in size; they are alike in both sexes and all are very slender. In the second appendage, the ischium is very little shorter than the basis, and carries a stiff seta; the merus is elongate, dilated dorsally, and also carries a stiff seta; the carpus is long, cylindrical, and provided with several setæ; the propodus is very much longer, armed along its ventral margin with spines; the dactylus is the shortest joint of the appendage armed with two claws and a seta between them. The three following pairs increase a little in length, but the posterior pair do so considerably. The basis is armed distally with a stout spur, the ischium is considerably longer; bent at a right angle, near its middle, the bend is distinctly shown in the structure of the joint, but it does not appear to be an articulation. All the other joints, except the dactylus, are lengthened, but their spinous armature is not strengthened.

The pleopoda, female. The first pair form a single opercular plate, which is broadly ovate and attached by a broad base; it is sparsely surrounded with short setæ, and the extremity is slightly irregular. The third pair is of more complex structure, the

endopodite has a rather broad peduncular joint, followed by a second nearly twice as long, its inner margin is nearly straight, its outer margin makes a bold curve outwards, sweeping round to the irregularly truncated extremity, which is armed with three large plumose setæ. The exopodite as a whole is falciform, it is composed of two joints, the basal one having an oblique extremity is very nearly as long as the entire endopodite; the second joint bears a conspicuous mid-rib, also seen distally on the other, and tapers gracefully to a point; a few small setæ occur externally.

The fourth pair has a small conical basal joint. The endopodite is long, curved and setose internally; it is composed of two joints, the distal one being about two-thirds the length of the other, it is armed distally with two blunt setæ or rather spines. The exopodite is scarcely as long as the endopodite, it is spoon-like, and the inner margin is sinuous, the outer boldly curved, then tapering to a blunt point. The remainder are similar, but the exopodite becomes more concave or spoon-like.

First pleopod of male. The sympodites are long narrow structures fused in the middle line. The external margins are curved inwards, dilating distally where they are deeply excavated and also appear to be tubular. This recess is occupied by a second joint, a thin ramus, the margin of which is ciliate. About three-fifths of the length of the sympodites there projects laterally an expansion from below.

The second pair is not quite so long, the inner edge of each is straight, the outer edge rounded, the structure being about four times as long as broad. The outer border is very finely ciliate and fringed with small setæ at intervals within the edge. This sympodite is marked with two strong muscle bands, the inner one bends abruptly inwards, connected with a stout irregular structure which passes forwards, projecting from the sympodite to bend again backwards as a large pointed blade. This is the exopodite. The other, the endopodite, forms a lobe rounded posteriorly, and has what appears to be a tubular mouth. The remainder are as in the female.

AUSTROMUNNA.

Austrimunna Richardson (**12**), p. 19.

This genus was instituted by Miss Richardson for a small Isopod found off Wiencke Island by the French Antarctic Expedition. The following is the second species assigned to the genus.

Austromunna rostrata.

(Plate X., fig. 3.)

Specific characters :—

Body ovoid.

Cephalosome small, with a short rounded rostrum, and with eyes on elongated peduncles.

Mesosome. Four anterior segments not widely separated from the three posterior, the three anterior segments with large truncated epimera.

Urosome broader than long with minute dorso-lateral uropoda.

The body is compact, ovoid in shape.

The cephalosome is of moderate size, exclusive of the eye-stalks. It is about one-third the greatest diameter of the mesosome; it is rounded anteriorly with a short stump-like rostrum in the middle line. The eye-stalks arise from the postero-lateral angles, but they can be hardly called slender, they extend to the margin of the epimera of the first segment of the mesosome. The eyes are not very strongly developed.

Of the mesosome the first four segments are separated by a distinct but short "waist" from the three posterior pair, this is more prominent in the female than in the male; the female also is proportionately broader.

The first segment is curved slightly to receive the cephalosome, and the broad truncated epimera are directed forwards, the three succeeding segments are subequal in length. The second has the anterior margin of its epimera extended forwards, on the third they are not so extended, and on the fourth they are smaller and rounded. The three posterior segments are much shorter, subequal in length and increase in curvature as they are reduced in diameter. Of these the epimera of the first are narrow and rounded, of the second they are enlarged and then form a blunt point, of the third they are more blade-like; the posterior margin is straight, the anterior being curved.

The metasome comprises one short narrow segment wedged in the curvature of the last of the mesosome and a urosome which is broader than it is long, rounded to the insertion of the uropoda, and to that point its margin is minutely dentate; beyond these it terminates in a blunt point.

The uropoda are very minute, dorso-lateral in position and comprise a small endopodite. The exopodite is extremely minute and can only be seen with difficulty. Both branches terminate with a few small setæ.

The body is entirely covered with very small setæ.

The first antenna consists of a two-jointed peduncle, the first joint being comparatively large and stout; the second is not more than half the length and much more slender. The flagellum is short, four joints only, of which the terminal one is the longest.

The second antenna has a peduncle of six joints, the first two are very small, the third is large, swollen externally; the fourth is very small and only forms a bend in the appendage; the fifth is smaller than the sixth, and the sixth is twice as small as the preceding. The flagellum is scarcely as long as the last two joints of the peduncle.

The mouth parts are normal.

The mandible has the cutting edge widely separated from the molar process, the latter is curved, tapering, and ends in three spinous teeth and four more slender spines below these; near the base of this process arises the three jointed palp. The cutting edge is an elongated process widening distally to a straight edge which bears one prominent tooth anteriorly.

The maxillæ hardly present any distinctive features.

The maxilliped is normal in character, it is short and thickened towards its straight inner border, and on this are two papilliform teeth; distally it carries a few spines. The palp is five-jointed, the first three progressively increase in length, the others decrease; the three distal bear rather long setæ internally.

The pereiopoda are not long, the first is short and stout, adapted as a prehensile organ. The basis is the longest joint, the ischium is about two-thirds its length and enlarged on its inner margin. The merus is half the length of the ischium and much enlarged dorsally and carries two setæ; the carpus is a large joint, slightly swollen ventrally and provided with spines and setæ; the propodus is shorter, stout and setose ventrally; the dactylus shorter still, with a strong accessory to the terminal claw and a curved seta near its extremity.

The remainder are distinctly ambulatory in function and are much more slender, every joint with the exception of the merus being approximately cylindrical; the merus is but slightly enlarged distally. There are but few small setæ scattered on these appendages, which slightly increase in size from the first pair to the last.

The first pair of pleopods act as an operculum to the remainder.

A number of specimens were taken from dredge material inside the 25-fathom line. A few individuals at a time were found during the whole of our stay.

ANTIAS.

Richardson (**12**), pp. 16–17.

This genus is another of those instituted by Miss Richardson for the Isopods brought back from the Antarctic by the French Expedition under Dr. Charcot. The species described below is identical with that found on the western side of Graham's Land and was abundant in our Winter Quarters.

Antias charcoti.

(Plate IX., fig. 1.)

Antias charcoti Richardson (**12**), pp. 17–19.

Specific characters :—

Cephalosome with a broad rostrum divided into two rounded setose lobes. A curved spur in front of ocular peduncle.

Both meso- and metasome fringed with long spinous setæ. A transverse row of fine setæ on four segments of the mesosome.

Uropoda large, biramous. Exopodite straight, endopodite curved.

The cephalosome is broad, but even including the ocular peduncles it is not quite so wide as the first segment of the mesosome. The anterior part is produced into two stout rounded tubercles, forming a broad and bifid rostrum, each part being well

provided with a number of stiff setæ. The eye-stalks are rather stout and in front of them; on the margin of the cephalosome is a stout slightly curved spur.

The surface of the cephalosome is sparingly covered with rather long setæ.

Of the mesosome the first segment is stout, the two following are subequal, but the third is the broadest, the fourth is a very little shorter and narrower than the preceding. All these have rounded epimera; they are rather widely separated and in the first segment they are directed forwards so as to partially embrace the cephalosome. All are provided with long spinous setæ, and the segments themselves are furnished with a transverse band of more delicate setæ.

The three posterior segments are curved posteriorly, their curvature increasing as their diameter decreases. The first of these segments carries a transverse row of setæ, the other two bear two or three stouter ones more laterally.

The metasome consists only of a single pentagonal plate, the angles of which are, however, rounded, and each of the three free ones bears a group of stout spinous seta similar to those on the epimera of the rest of the body. There are a few setæ on the surface of this plate, centrally and anteriorly.

The uropoda are very large and biramous. The protopodite is a single joint with a comparatively slender base and widening distally, the exo- and endopodite differ but little in size, the former is straight and provided on both sides with long stiff setæ; the latter is curved and only carries the setæ on the outer side of the curve and distally.

The first antenna is short, it comprises a peduncle of two joints subequal in length, but the proximal one is much shorter than the other, and fringed distally with stout spinous setæ. The flagellum is about half as long again as the peduncle and consists of only four joints, the first two are short, the others are more than twice as long, the last being very slender and provided with two specialised setæ.

The second antenna has a peduncle of five joints; of these the first three are very short and stout, the basal one having a long spine on its inner border and the third forms a characteristic bend in the appendage. The two terminal ones are long and slender, the advantage being with the more distal one; the flagellum is about as long as these two joints.

The mouth parts are normal.

The mandible is strong and the masticatory lobe terminates in four bilobed teeth, or, rather, two pairs, since one pair is larger than the other, the individuals of each pair being approximately subequal; below these are three slender teeth, having their upper margins produced into a serrated blade. The molar process is long and widens out distally into a plate-like structure, having anteriorly one prominent tooth and posteriorly several small tubercles. The palp is three-jointed, the first two joints are rather long, fringed on one side with very minute setæ; the third is a serrated spine less than half the length of the joint bearing it.

The first maxilla comprises a short and slender inner lobe armed distally with

four specialised setæ of varying length and bearing extremely delicate subsidiary setæ; the outer lobe, twice the size, is armed with several stout spinous setæ, each having a serrated inner margin.

The second maxilla consists of a comparatively large inner lobe, the inner margin of this is rounded distally and bears several slender spinose setæ, two of which, the innermost, are the longest and dentate; of the two outer lobes the innermost bears three slender, tapering and minutely serrated setæ, the other bears four.

The maxillipeds show a broad masticatory lobe upon a short basal joint of quite normal structure, the inner straight margin carries two papilliform teeth and distally there are a few dentate setæ; these are very minute. The palp is five-jointed, all the joints are slender and comparatively long. The epignath is long, rather spindle-shaped, most swollen on the outer side, and it terminates in a blunt point almost abreast of the distal border of the masticatory lobe.

The pereiopoda are short.

In the first the basis is a little longer than the ischium, both are slightly curved and quite smooth; the merus is short, expanded dorsally and carries a few stout setæ distally; the carpus is a little shorter with a stout spine ventrally; the propodus is rather longer with two such spines ventrally and a few delicate setæ distally; the propodus is stout with a strong claw and an equally strong though much shorter accessory with a fine seta between the two.

The second pereiopod differs in that the carpus is quite as stout as, but longer than, the merus; this latter bears one stout spine dorsally and a few fine setæ ventrally, the carpus bears several scattered setæ, strongest dorsally.

The third and fourth do not differ essentially; the fifth is rather longer, and the carpus bears four short and stout spinous setæ ventrally and three long ones dorsally, the two following are a little shorter and less conspicuously spinous. The brood pouch is formed by broad lamellæ on the second to the fourth appendages.

A large number of specimens of this species were taken during our stay in Winter Quarters; they were almost entirely picked out of the sponge débris.

Inside the 25-fathom line.

AUSTROSIGNUM.

Cephalosome sub-rotund, much narrower than the first segment of the mesosome.

Eyes small, on long slender peduncles.

Antennæ of moderate dimensions, peduncle of the second six-jointed, without an accessory appendage.

Mesosome, the three posterior segments distinctly separated from the four anterior, recurved and diminishing in size.

Metasome comprises a single independent segment and bulbous urosome often prolonged as a spinous process with minute preterminal uropoda.

Pereiopoda ambulatory except the first, which is prehensile.

Pleopoda, the first pair forms an operculum over the remainder.

This genus is a member of the family Munnidæ and probably more nearly related to *Pleurogonium* than to *Munna*.

Austrosignum grande.

(Plate X., fig. 1.)

Specific characters :—

Head small, rounded, with eyes on long slender stalks.

First segment of the mesosome much the longest, and all segments widely separated laterally; a distinct waist between the fourth and fifth segments.

Urosome pointed.

The cephalosome is small, rounded in front; it rests in a crescentic depression of the first segment of the mesosome which arches forwards on either side to receive it and is more than twice its diameter.

The eye scarcely appears to be well developed; it lies at the extremity of a long, slender peduncle which arises from the postero-lateral angle of the cephalosome. The peduncles very nearly attain the width of the first segment of the mesosome.

The first segment of the mesosome is nearly twice as long as the succeeding one but of smaller diameter, the second to the fourth are subequal in length, but the third is the widest by the merest trifle. There is a distinct waist between the fourth and fifth segments; the three posterior ones are subequal in length, decreasing progressively in width and increasing in curvature. The epimera are rounded, in the first segment unevenly so, and all are widely separated from each other, elongated, and not distinct from their respective segments.

The metasome comprises one very small segment wedged in the curvature of the preceding one, and a urosome which is ovoid in shape but having a slightly truncated extremity.

The uropoda are very small; they are situated at some little distance from the extremity, and comprise a comparatively stout pointed joint or propodite, and articulated to it at about half their own length from the extremity are two minute joints.

The first antenna comprises a two-jointed peduncle, both joints are comparatively long, the second being the longer; the flagellum is about as long as the peduncle.

The second antenna comprises a six-jointed peduncle, the first two joints of which are short and stout; the third is very nearly twice as long and more slender; the fourth is shorter than the preceding, curved to form the bend in the appendage, the other two are slender and as 2 to 2·5 in length; a few setæ are scattered throughout the peduncle. The flagellum is scarcely as long as the last joint of the peduncle.

The mouth parts are normal.

The mandible is stout, the cutting edge is prominent, expanding to its distal extremity which bears a very small tooth both anteriorly and posteriorly, the intermediate margin being minutely toothed. The molar process is stout, curved and tapering, it ends in two or three stout teeth and four slender spines below these.

The palp was not observed.

The first maxilla consists of the normal two lobes, the inner and smaller carries distally two large and one small seta, which are slightly plumose, the outer lobe is armed with stout spines.

The second maxilla. The principal lobe is nearly as broad as the other two together and is armed with stout pectinate spines, the innermost ones being the shortest and strongest. The other lobes are subequal in size, and each bears two long pectinate spines, which are much more delicate than those on the inner lobe.

The maxillipeds are of quite normal proportions; the distal margin of the masticatory lobe is armed with three or four denticulate spines. There are two papilliform teeth on the inner margin, these are rounded knobs with short stalks. The palp is five-jointed, the first three are broad and progressively increase in length, the remaining two become more finger-like.

The pereiopoda are, except the first, uniform in structure, slender and not inordinately long, as far as can be seen without removing a limb. The first pereiopod is rather short and much stouter than the others, obviously prehensile in function. The basis is stout and of moderate length, the ischium rather more than half as long. The merus and carpus are both very short and stout, the latter is much dilated, with two stout spines ventrally. The propodus is slightly curved and about as long as the two preceding joints. The dactylus is well developed, with a spine or accessory claw at the base of the nail and two curved setæ upon it.

Of the others the basis is rather long, the ischium much shorter. The merus is short and enlarged dorsally; the carpus is quite twice as long; the propodus a little longer and much more slender than the carpus; the dactylus is well developed, proportionally one-third the length of the propodus, and a "nail" is distinct with a small spine or spinous seta at its base.

The first pair of pleopoda which forms an operculum over the remainder consists of a comparatively narrow band which at about two-thirds of its length widens out considerably and then tapers to a blunt point. The lateral projection bears three small setæ, and the angular apex is due to the folding of the lateral margins inwards and downwards.

Four specimens were taken in Winter Quarters during February and March, 1902, before the ship froze in. Inside the 20-fathom line.

Austrosignum glaciale.

(Plate X., fig. 2.)

Specific characters :—

Head small, rounded ; eyes not well developed, at the extremity of slender peduncles.

First four segments of the mesosome subequal in length, and separated from the posterior three by a distinct " waist " ; the posterior three diminishing in diameter, and but slightly curved.

Urosome a pointed oval, rather elongate, with minute preterminal uropoda.

The cephalosome is small, resting in a shallow crescentic depression of the first segment of the mesosome, which has nearly twice its diameter. Near the postero-lateral margins arise long slender stalks which bear small, apparently simple eyes. These stalks are unjointed prolongations of the cephalosome, and in length they are nearly half its diameter.

Of the mesosome the third segment is the largest and widest; between the epimera of the fourth and fifth there is a distinct space, and the last three progressively diminish in diameter and increase in curvature, but not to any great extent. The epimera of all are rounded.

The metasome comprises a small joint and a urosome, which may be described as ovoid but attached by a short and broad peduncle.

The uropoda are very small, biramous ; the basal joint is extremely short, and each branch consists of two minute joints; the endopodite is the most slender and is no more than a very small joint and spine.

A few setæ are scattered about the margin of both mesosome and metasome.

The first antenna is short, comprising a peduncle of two rather elongated joints, the second being the larger. The flagellum is about as long as the peduncle.

The second antenna has a peduncle of six joints, the first two are short and stout; the third is about as long but more slender; the fourth very short, only forming a bend in the appendage; the fifth is rather long, and the sixth longer still; the flagellum is short, but little longer than the last joint of the peduncle.

The mouth parts are quite normal in structure. The mandible consists of a stout process with a small but strong tooth at its anterior border; the molar process is long and slender and armed with five teeth, of which one, the second, is larger than the rest; there are also several stout setose spines just behind this terminal group. The palp is long, three-jointed.

The first and second pair of maxillæ do not present any special features unless it be that some of the terminal spines on the outer part of the outer lobe are really strong teeth ; the lobes of the second pair are finely serrated.

The maxilliped is of normal appearance; the straight distal edge of the masticatory lobe bears some half-dozen stout setæ, which are finely serrated. Two

papilliform teeth occur on the inner margin. The palp is five-jointed ; four joints are short and broad ; the terminal one is also short, and, though much more slender, it is more correctly described as a stump. The three central joints are each provided on the inner border with two or three long setæ, and the third of the entire series is the largest.

The pereiopoda, except the first, are uniform in structure. The first is short and comparatively stout ; the basis is long ; the ischium little more than one-third the length ; the merus is quite short and expanded distally ; the carpus is a little longer, much expanded ventrally to form a round "cutting" edge which carries two stout spines. The propodus is a little longer still and similarly expanded ventrally, but not quite throughout the entire length of the joint ; the dactylus is about as long, slender, and bears a slender claw distinct from the joint and a much smaller though distinct accessory. A few setæ are scattered throughout the appendage.

The other appendages are slender, but not so long as the body. The basis is little longer than the ischium ; the merus is short and swollen dorsally. The other joints are comparatively long and become increasingly slender ; the propodus is a little longer than the carpus, and each of these have two spinous setæ ventrally. The dactylus is slender, slightly curved, rather more than half as long as the propodus.

The pleopoda are protected by a sort of hood formed by the urosome, and the first pair forms a shield to the rest. The ovigerous female is much broader than the male.

Four specimens were taken in Winter Quarters inside the 20-fathom line in February, 1902.

NOTOPAIS.

Cephalosome broad and short, excavated in front and without eyes.

Mesosome with the three posterior segments recurved, tapering and separated from the four anterior ones.

Cephalosome and anterior segments of the mesosome spinose.

Metasome a single plate with minute terminal uropoda.

Pereiopoda, anterior ones ambulatory, posterior ones defective, very slender and not disproportionally long.

Pleopoda, first pair opercular.

The Munnopsidæ (*Ilyarachna*), to which this genus should be assigned, are notorious for the natatory character of the posterior pereiopoda. A deficiency in this respect of this appendage is, therefore, serious. The genus *Ilyarachna* seems to be its nearest relation.

Notopais spicatus.

(Plate VIII., fig. 1.)

Specific characters :—

Cephalosome armed dorsally, with two stout spines and two lateral ones.

Mesosome with the five anterior segments armed with four strong forwardly directed spines, the first four segments having others laterally.

Urosome triangular, truncated, with minute terminal uropoda.

The cephalosome is wide, nearly as wide as any other part of the body. Its anterior margin appears to be rounded, but close examination shows that it is deeply excavated, and the first pair of antennæ arise near the anterior border of this excavation. Not far from the rounded lateral margins of the cephalon is a small but distinct spine, and there are two more prominent dorsally, but more distant from the middle line than on succeeding segments.

The impression one receives in examining this animal is that the cephalon and first segment of the thorax are distinct, the latter being much smaller than, and above the former, a condition which occurs in the genera *Ilyarachna* and *Pseudarachna* of Prof. G. O. Sars.

Of the mesosome the first two segments are subequal, and the two following ones are also subequal but a little longer, their anterior margins are provided with four stout and prominent spines directed forwards, these are placed at approximately equal distances apart, the median pair being the largest. The epimera are rather elongated, not separable from the body, but where they might be said to arise is a small, blunt spine ; the epimeron itself is in each case rounded, and about the middle of its margin is another spine not so large as the dorsal ones ; an additional one arises at their anterior margins in the first, second, and fourth of these segments. The three posterior segments are separated from the preceding by a distinct waist. These segments are curved backwards ; the first two are subequal, the third is about half the size ; the anterior margin of the first bears four large spines similar to those on the preceding segments.

The metasome comprises a single plate, the urosome, which is a truncated triangle, its margins sloping from the mid-dorsal line. It is covered with fine setæ more thickly than the rest of the body, where they are rather sparingly distributed. The uropoda are minute, terminal, and arise ventrally. Each consists of a very small exopodite, a rather barrel-shaped and diminutive endopodite of about half the size, both terminating in a few setæ.

The first antennæ arise quite close to the middle line just below the upper margin of the cephalon ; the first joint of the peduncle is very large comparatively and bears two teeth on its inner distal margin ; it terminates as a cone, and on the upper surface of this are one or two short joints, I cannot be certain which it is ; the flagellum is very slender and consists of a long joint, a very short joint and a long portion in which the articulations under existing conditions are indistinguishable.

Of the second antennæ only small portions remain. These arise close to the external border of the cephalon, and only four joints of the peduncles exist; the first three are very short and stout, armed externally with a stout spine; the third has a very oblique distal margin and is provided internally with several strong setæ; the fourth joint is also very small and much more slender than the others.

The animal has not been dissected at all, and from what can be seen of the maxillipeds *in situ* they are of the usual type and have a comparatively very large epignath, broad and ending in a blunt point. The palp is five-jointed, the first joint is short and broad; the second nearly three times as long; the third half as long as the preceding but narrower, the two terminals are subequal in length, rather short and setose.

The pereiopoda may be described as rather long, but not disproportionately so, and very slender; most of them have been more or less severely injured. The first pair are complete and are ambulatory; they exhibit a long slender basis, an ischium rather more than half the length, a short and dorsally-expanded merus, a carpus as long as the ischium, a propodus almost equally long, and a dactylus one-third the length. Ventrally the carpus and propodus bear scattered setæ. I have not been able to distinguish any accessory claw. The other pereiopoda are very similar as far as can be made out, but the proportions of the joints are rather different, and there is no accessory claw. They are too fragmentary to permit of a definite statement as to the adaptation of the posterior ones for swimming as is characteristic of the *Munnopsidæ*.

The first pleopoda are strongly developed as an operculum to the remainder, and the inner border of that of the right side is armed with four or five stout teeth.

Only a single specimen of this species was extracted from the dredge material shortly after arrival at Winter Quarters. Inside the 20-fathom line, February 28, 1902.

I have to express my sincere thanks to Messrs. West, Newman & Co. for the trouble and care they have taken in the preparation of the plates, also to Mr. F. S. Murray for other assistance.

[P.T.O.

The day after sending in the corrected proof of this Report I received from Miss Richardson a Supplementary Report on the Isopoda collected by the French Antarctic Expedition. She there records the following species :—

Nototanais antarcticus Hodgson.
„ *australis.*
Gnathia antarctica Studer.
Exosphæroma antarctica.
Cymodocella tubicauda Pfeffer.
Serolis polita Pfeffer.
Notasellus australis Hodgson.
Haliacris australis Hodgson.
Antias charcoti Richardson.
Austrimunna antarctica Richardson.
„ *serrata.*
„ *subtriangulata.*
Austrimunna incisa.

The individuals forming this collection are rather scanty in number and the majority have apparently been more or less severely injured. Of the five new species not more than four representatives were found for any of them. *Nototanais australis* is very closely allied to *N. antarcticus*, but differs in the structure of the first appendages of the mesosome of the male. Except for this difference the resemblance is exceedingly close.

Cymodocella tubicauda.—I have dealt at length with this species.

Haliacris australis.—I think I have satisfactorily proved that this species is identical with *H. antarctica* Pfeffer, and it should be included under that name.

Austromunna serrata.—This species does not appear to be assigned to the right genus; it closely resembles my *Austronamus*, but is distinct from the species I have described.

Austromunna subtriangulata.—This comes very close to, if it is not identical with, my *Austromunna rostrata.* Only a single specimen was found and no reference is made to its legs; these might easily have been injured.

Austromunna incisa.—This species is a very close relation to my new genus *Austrosignum*, to which, I think, it should be assigned. It seems most closely allied to *A. grande.* Here again there is no information as to the legs, beyond an outline figure of the first appendage of the mesosome.

The figures which accompany the Report do not impress me greatly, but if they are to be relied on the species are not to be identified with those taken by the 'Discovery.' In the last two species, however, I very much doubt this.

REFERENCES.

1. Beddard, F. E.—Report on the Isopoda collected by H.M.S. 'Challenger' during the years 1873–76. Part i. The Genus Serolis, vol. xi. (1884). Part ii. Isopoda, vol. xvii. (1886). H.M.S. 'Challenger' Reports.

2. Chilton, C.—Notes on some New Zealand Amphipoda and Isopoda. Trans. N. Z. Inst., xxiv. (1892), pp. 258–69.

3. Chilton, C.—A new species of Munna from New Zealand. Ann. and Mag., Nat. Hist., ix. (1892), pp. 1–12. Two plates.

4. Cunningham, R. O.—Notes on the Reptiles, Amphibia, Fishes, Mollusca and Crustacea obtained during the voyage of H.M.S. 'Nassau' in the years 1866–69. Trans. Linn. Soc. London, vol. xxvii. (1871), pp. 465–501.

5. Dollfus, A.—Crustacés Isopodes. Mission Scient. du Cap Horn, vol. vi. Zoologie, part ii., pp. F 55–76. One plate.

6. Eights, J.—Description of a new Crustaceous Animal found on the shores of the South Shetland Islands. Trans. Albany Inst., vol. ii. (1833), pp. 53–57. Two plates.

6a. Hansen, H. J.—Cirolanidae et familiae nonnullae propinquae Musei Hauniensis. Kgl. Danske Videns. Selsk. Skr., 6 Række, Math. Nat. Afd. V. 3 (1890), pp. 239–426. Ten plates.

7. Hansen, H. J.—On the Propagation, Structure and Classification of the Family Sphaeromidae. Quar. Jour. Micr. Sci., xlix. (1905), pp. 69–135.

8. Hodgson, T. V.—Crustacea. Report on the Collections of Natural History made in the Antarctic Regions during the voyage of the 'Southern Cross' (1902), pp. 228–61. Plates XXIX.–XL.

9. Hutton, F. W.—Index Faunae Novae Zealandiae, Isopoda, pp. 262–66, London (1904).

10. Ohlin, Axel.—Isopoda from Tierra del Fuego and Patagonia. 1. Valvifera. Svenska Exped. till Magellanslanderna II. (1901), pp. 261–306. Plates XX.–XXV.

11. Pfeffer, G.—Die Krebse von Sud-Georgien, part i. Jahrb. d. Hamburgischen wiss. Anstalt, Bd. V., pp. 43–150. Plates I.–VII.

12. Richardson, Harriet.—Isopodes. Expédition Antarctique Française, 1903–5 (1907).

13. Sars, G. O.—Isopoda. Crustacea of Norway, vol. ii. (1899).

14. Schiödte, J. C., and Meinert, F.—Symbolae ad Monographiam Cymothoarum; Crustaceorum Isopodum Familia. Naturhistorisk Tidsskrift, Vol. XII. (1879), pp. 321–414. Plates 7–13.

15. Stebbing, T. R. R.—A History of Crustacea. Internat. Sci. Series (1893), pp. 314–435.

16. Strassen, O. zur.—Ueber die Gattung Arcturus und die Arcturiden der Deutschen Tiefsee-Expedition. Zool. Anz., Bd. XXV. (1902), pp. 682–89.

17. Studer, T.—Ueber neue Seethiere aus dem Antarktischen Meere. Mitth. Naturf. Gesellsch. Bern (1876), pp. 75.

18. Studer, T.—Isopoden gesammelt während der Reise S.M.S. 'Gazelle' um die Erde 1874–76. Anh. Abhandl. der Akad. wiss. Berlin, 1883 (1884), 28 pp.

19. Studer, T.—Beiträge zur Kenntniss niederer Thiere von Kerguelensland. Die Arten der Gattung Serolis von Kerguelensland. Arch. f. Naturgesch. XLV. Bd. 1 (1879), pp. 19–34. One plate.

EXPLANATION OF THE PLATES.

PLATE I.

1. *Leptanthura glacialis*, ♀, × 6.
   - *a*. First antenna × 40.
   - *b*. Second antenna × 40.
   - *c*. Maxilla × 40.
   - *d*. Maxilliped × 40.
   - *e*. First appendage of mesosome × 40.
   - *f*. Second appendage of mesosome × 40.
   - *g*. Last appendage of the mesosome × 40.
2. *Gnathia antarctica*, ♂, × 14.
3. *Euneognathia gigas*, ♂, × 6.
   - *a*. Maxilliped × 15.
   - *b*. First appendage of mesosome × 15.

PLATE II.

1. *Ægа antarctica** × 3.
   2. Maxilla × 20.
   3. Maxilliped × 20.
   4. First appendage of mesosome × 16.
   5. Sixth appendage of mesosome × 16.

PLATE III.

1. *Cirolana meridionalis*, ♀, × 2.
   2. First maxilla × 20.
   3. Second maxilla × 20.
   4. Maxilliped × 20.
   5. First appendage of mesosome × 7.
   6. Sixth appendage of mesosome × 7.

PLATE IV.

1. *Serolis trilobitoides*, ♂, × 1, dorsal aspect.
   2. The same, ventral aspect.
   3. Specialised seta from mandibular palp, terminal joint × 312.
   4. First maxilla × 20.
   5. Second maxilla × 20.
   6. Maxilliped × 20.
   7. Sensory spine from propodus of second thoracic appendage × 312.
   8. Sensory lamella from propodus of second thoracic appendage × 312.

PLATE V.

Antarcturus.

1. *A. adareanus*, ♀, × 3.
2. *A. franklini*, ♀, × 3.
3. *A. australis*, ♂, × 3. (This is the male of *A. franklini*.)

* Not *Ae. australis*, as on the plate.

PLATE VI.

Antarcturus.

1. *A. hiemalis*, ♂, × 3.
   - 1*a*. First antenna × 20.
   - *b*. First maxilla × 20.
   - *c*. Second maxilla × 20.
   - *d*. Maxilliped × 20.
   - *e*. First appendage of mesosome × 12.
2. *A. meridionalis*, ♂, × 3.

PLATE VII.

1. *Glyptonotus acutus*, ♂, × 1.
   2. First maxilla × 6.
   3. Second maxilla × 6.
   4. Maxilliped × 6.
   5. First appendage of mesosome × 2.

PLATE VIII.

1. *Notopais spicatus*, ♂, × 27.
2. *Austrofilius furcatus*, ♂, × 30.
   - 2*a*. Mandible × 200.
   - *b*. First maxilla × 200.
   - *c*. Second maxilla × 200.
   - *d*. Maxilliped × 150.
3. *Austronanus glacialis*, ♂, × 70.

PLATE IX.

1. *Antias charcoti* × 27.
2. *Coulmannia australis*, ♂, × 20.
   - 2*a*. Maxilliped × 104.
3. *Notoxenus spinifer*, ♂, × 27.
   - 2*a*. Maxilliped × 200.

PLATE X.

1. *Austrosignum grande* ♂, × 27.
2. *Austrosignum glaciale*, ♂, × 27.
3. *Austromunna rostrata*, ♂, × 27.

INDEX.

Species described are marked with *. Synonyms in *italics*.

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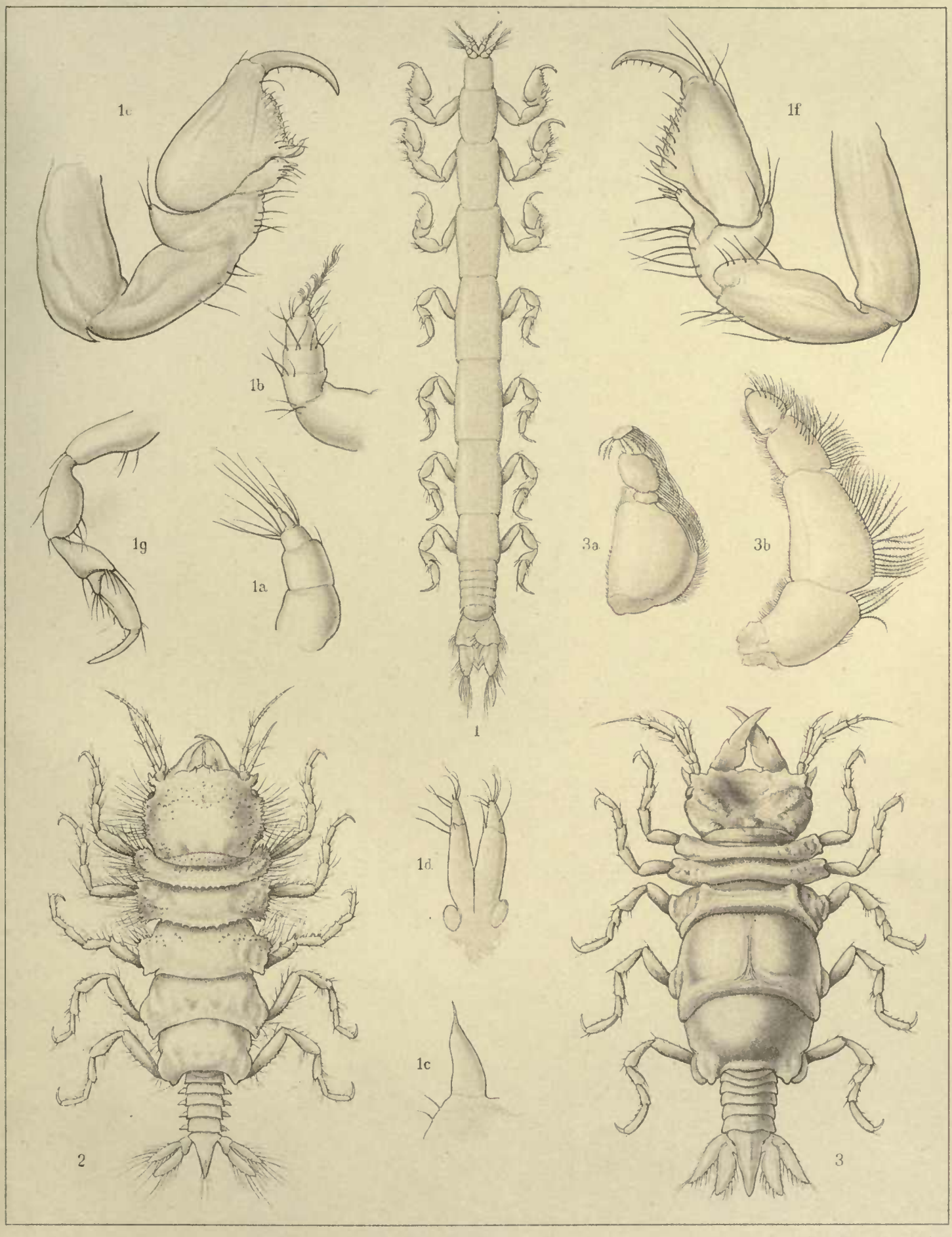

West, Newman del. et lith.

1. Leptanthura glacialis. 2. Gnathia antarctica. 3. Euneognathia gigas.

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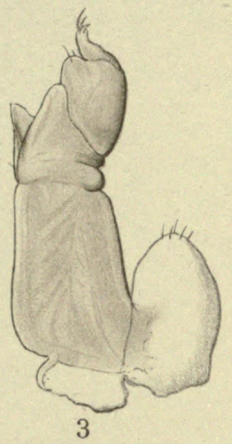

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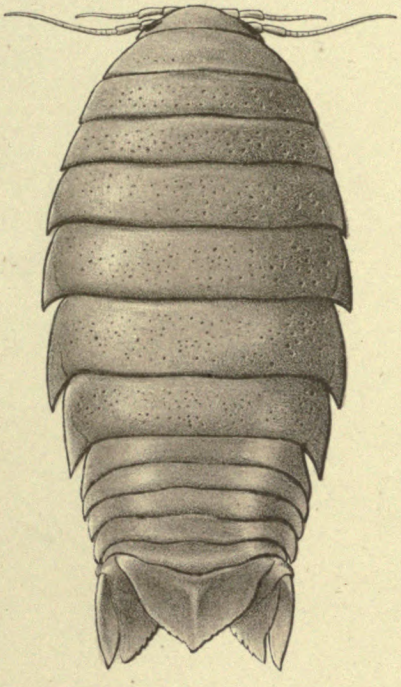

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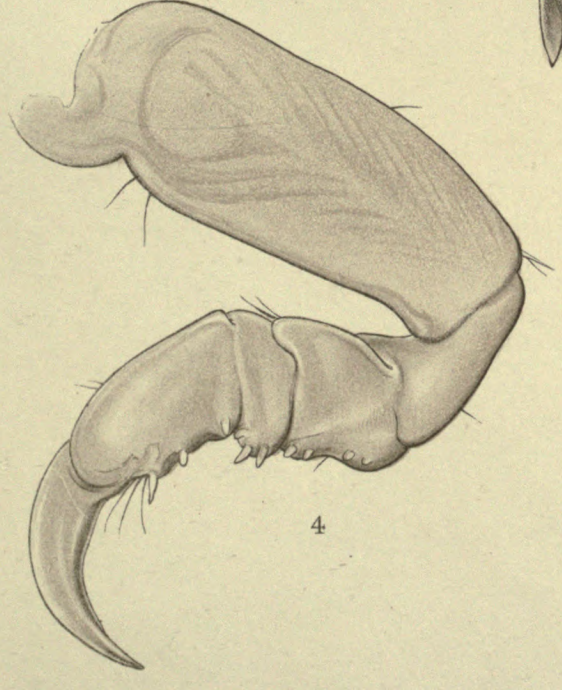

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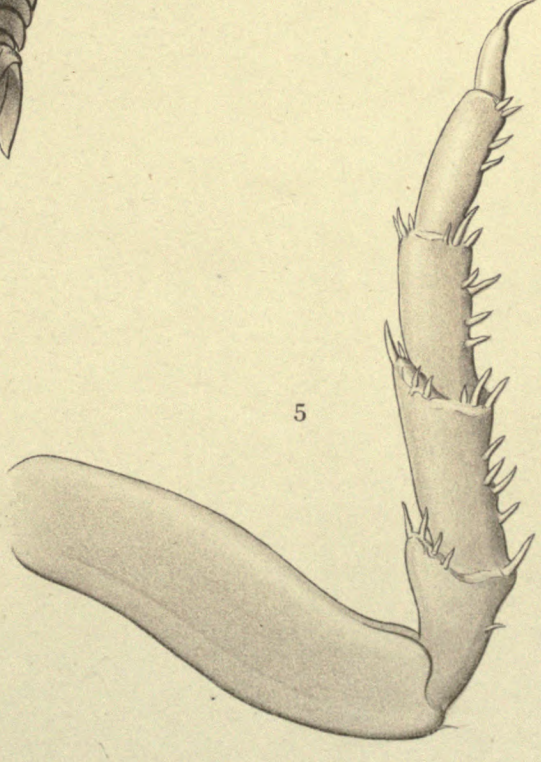

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Ægа australis.

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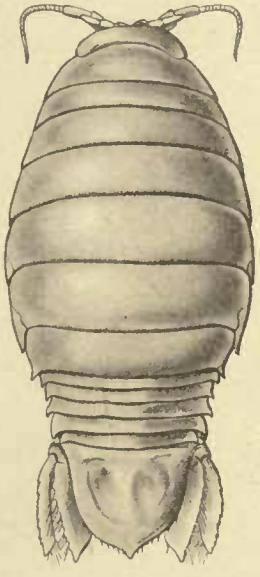

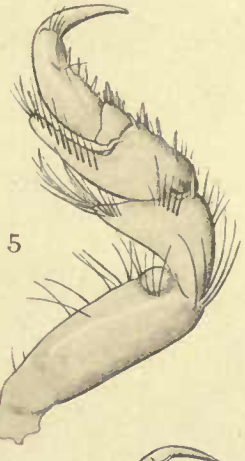

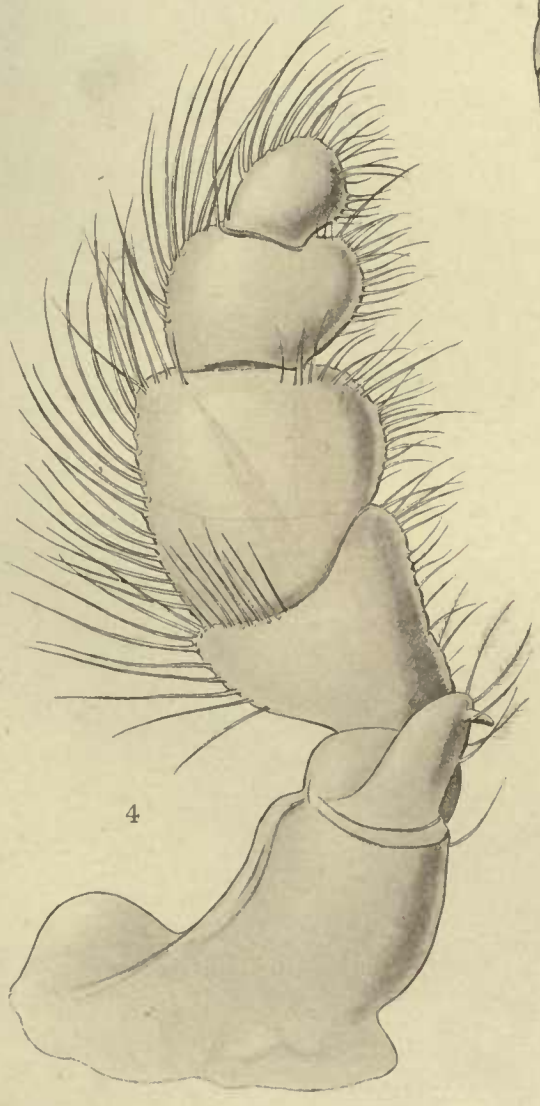

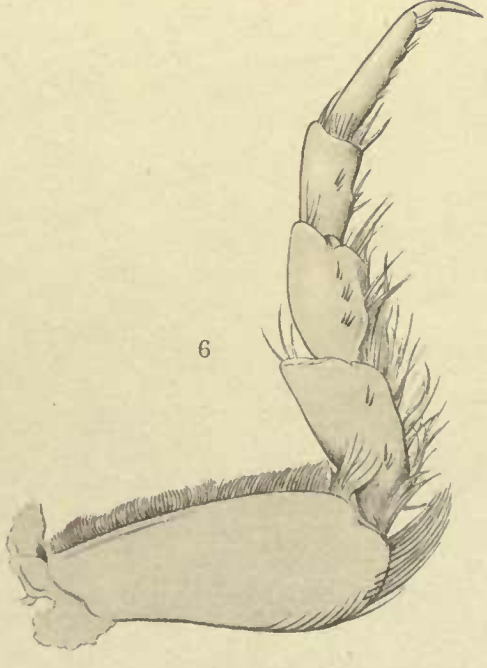

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Cirolana meridionalis.

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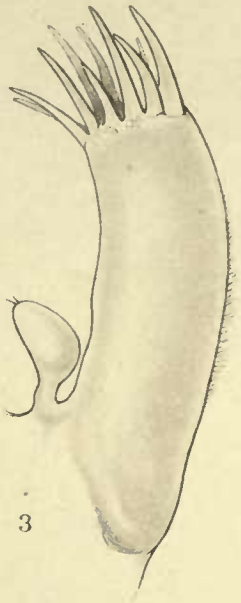

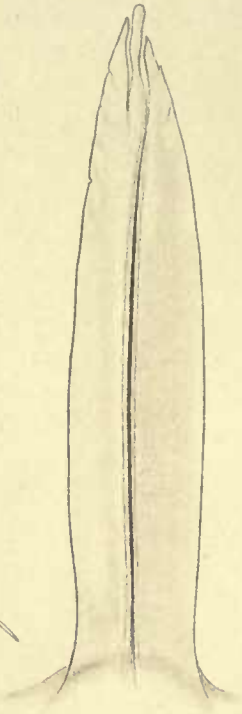

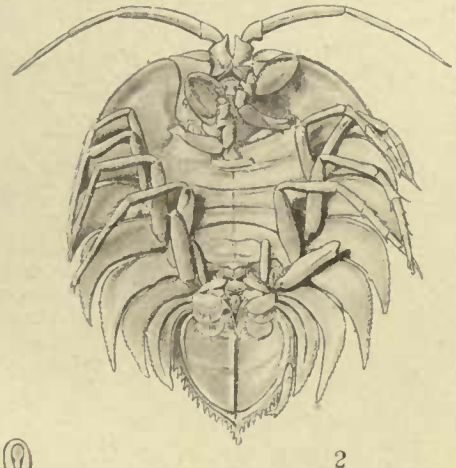

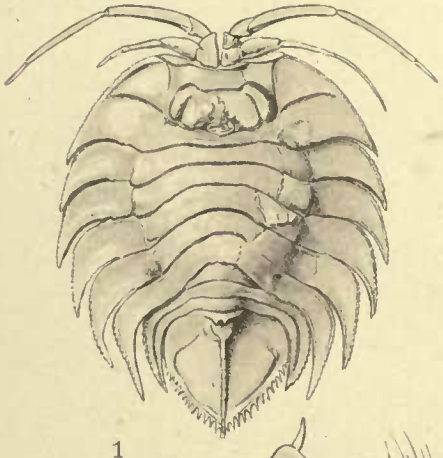

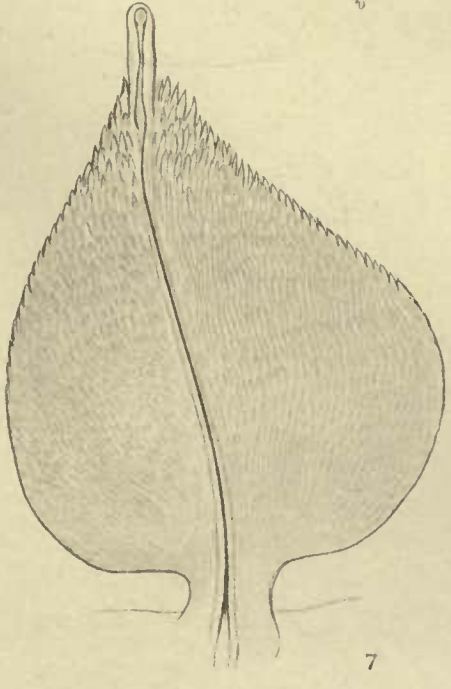

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Serolis trilobitoides.

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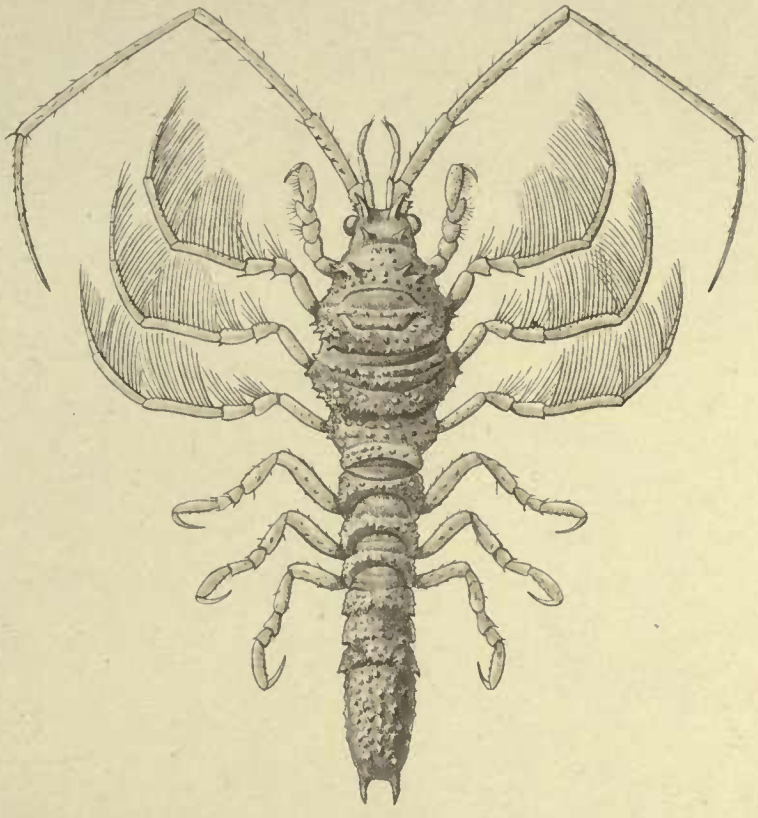

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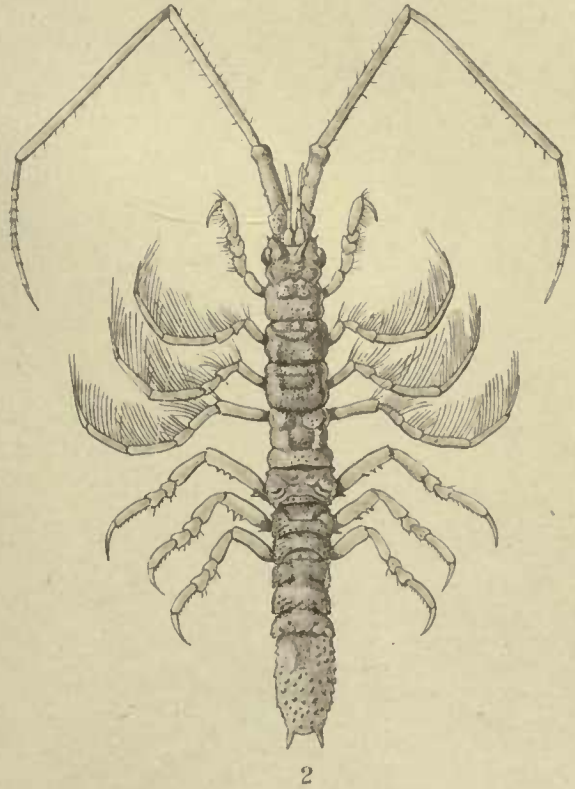

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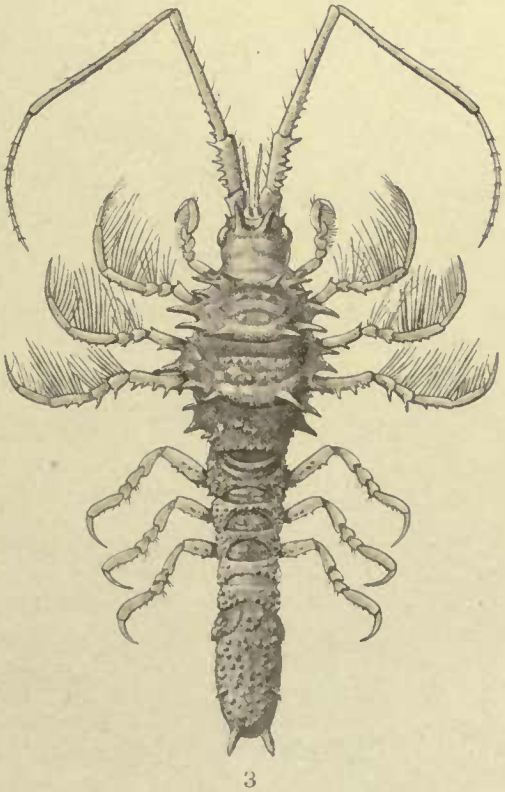

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Antarcturus.

1. A. adareanus. 2. A. australis. 3. A. franklini.

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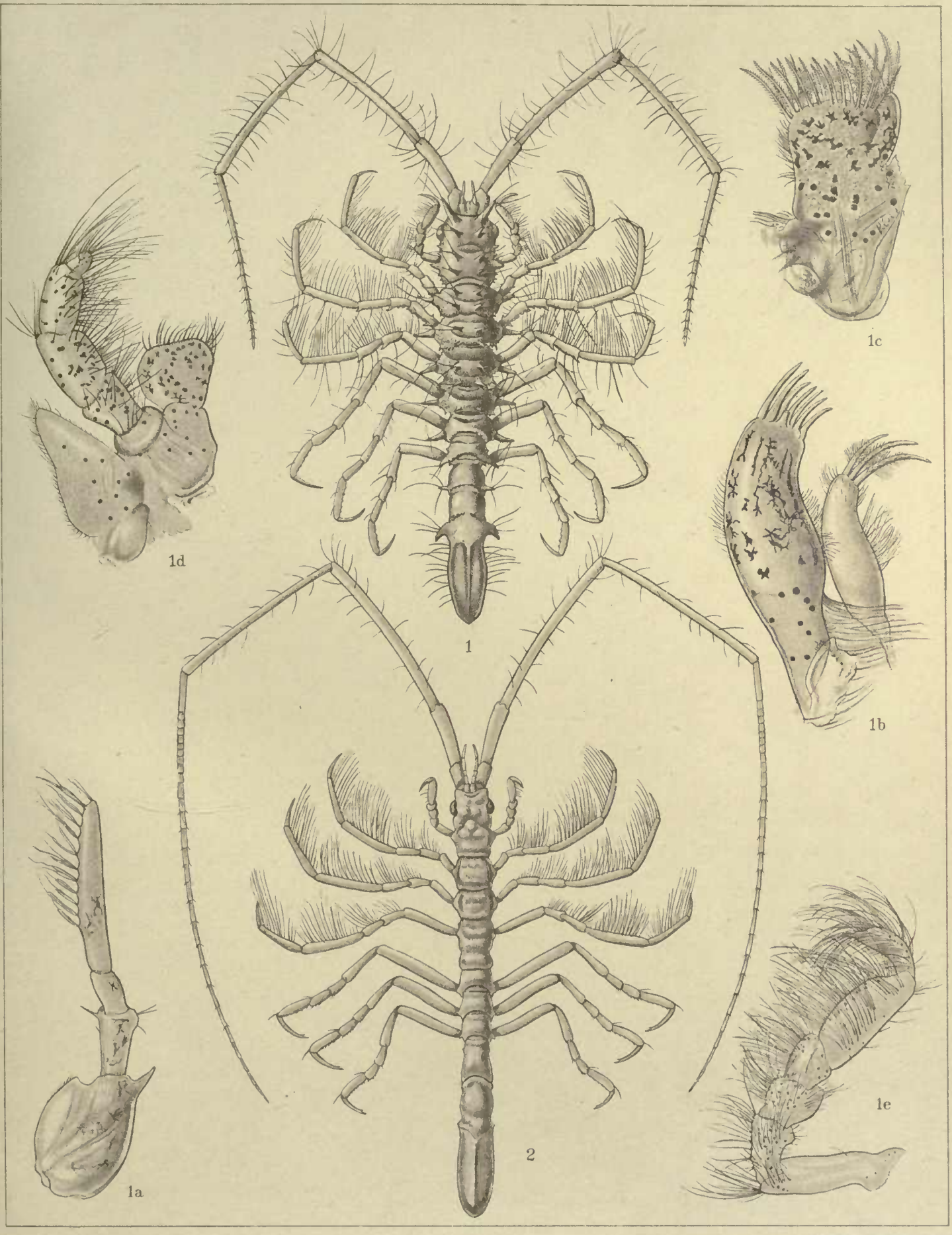

Antarcturus.

1. A. hiemalis. 2. A. meridionalis.

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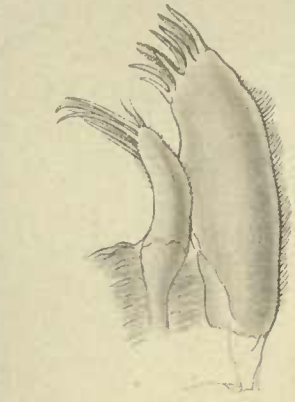

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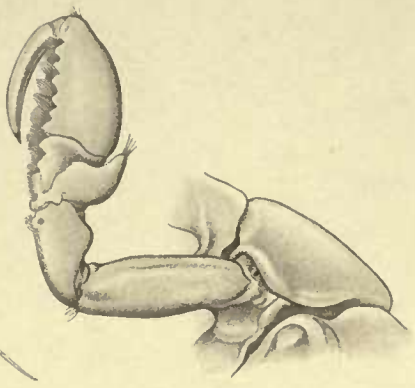

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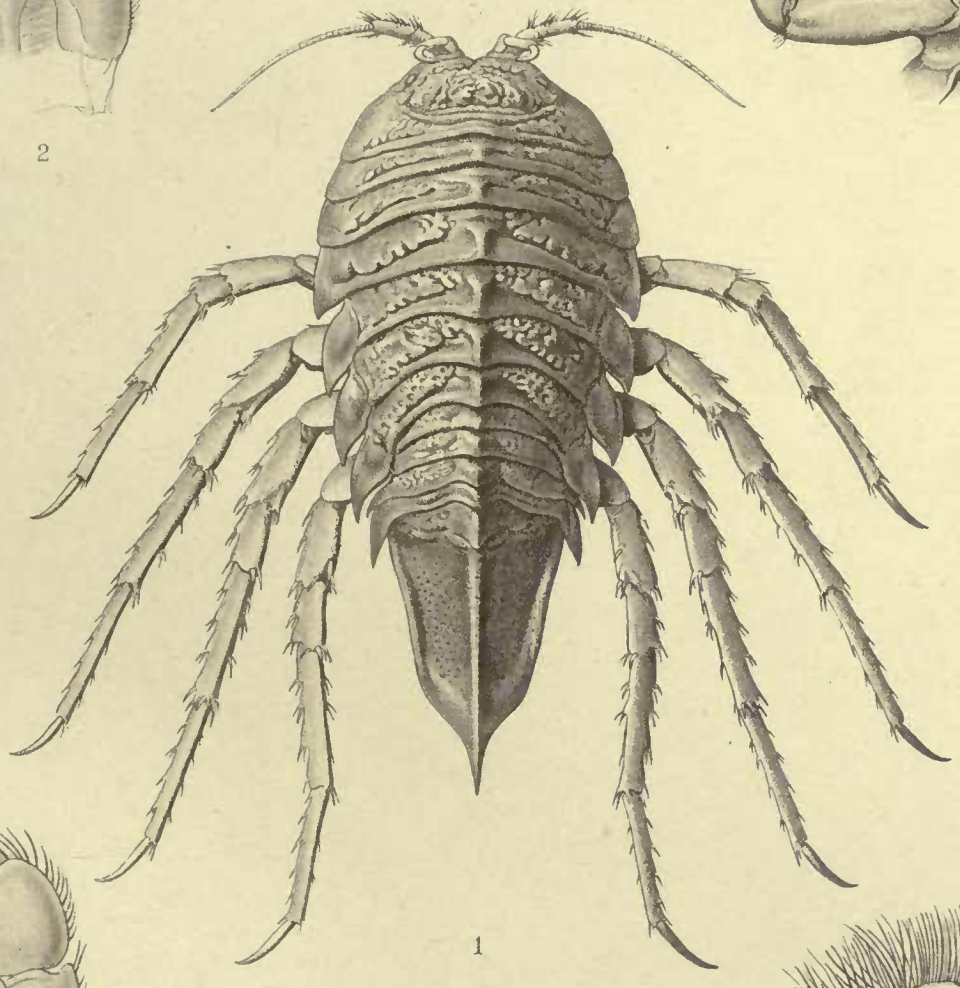

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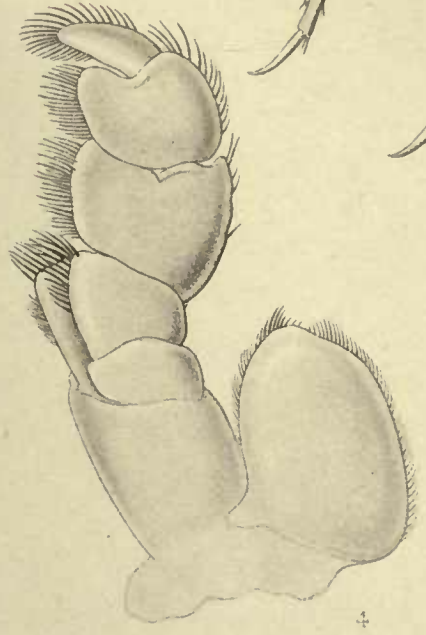

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Glyptonotus acutus.

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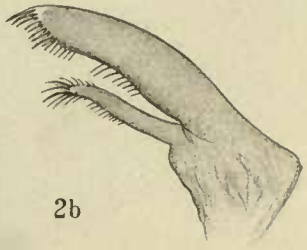

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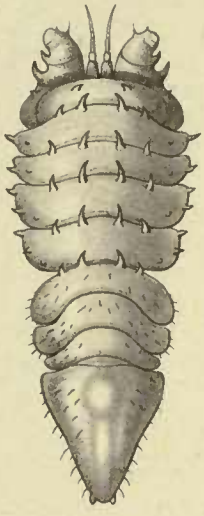

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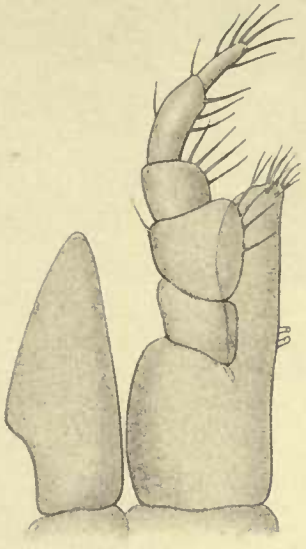

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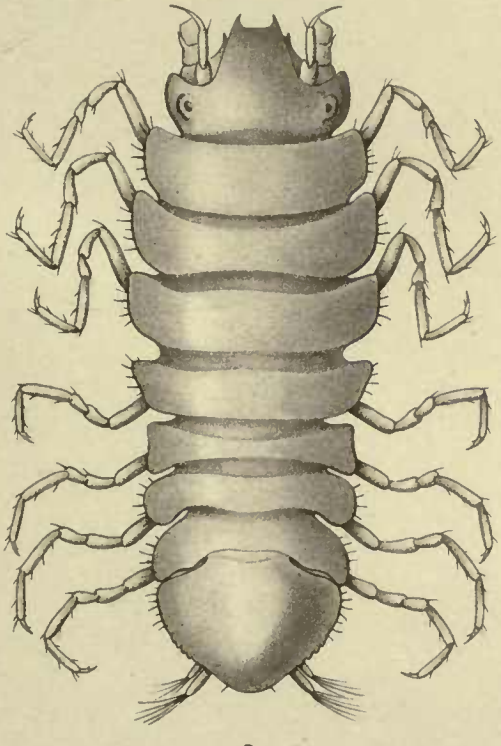

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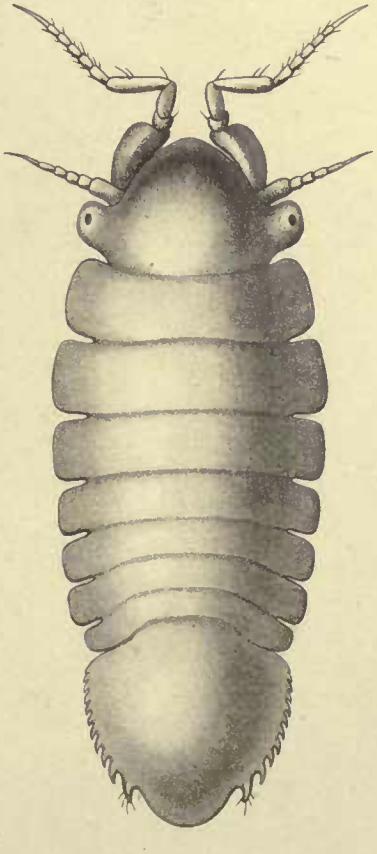

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1. Notopais spicatus. 2. Austrofilius furcatus. 3. Austronanus glacialis.

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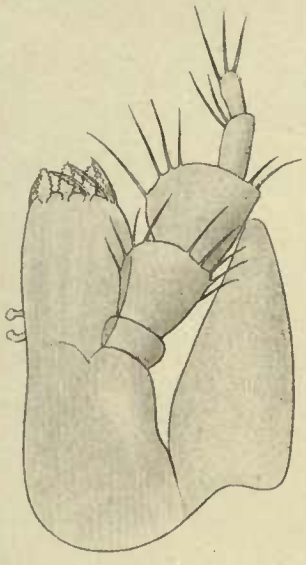

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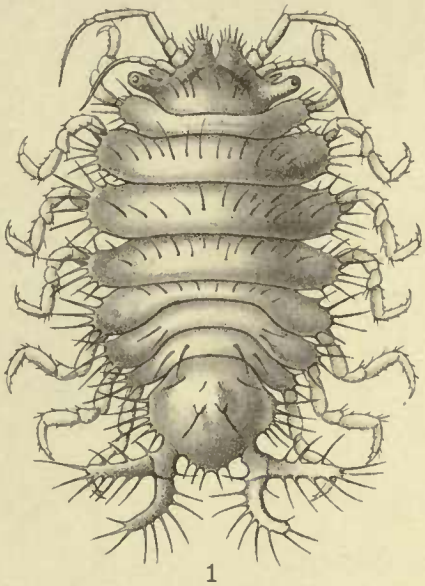

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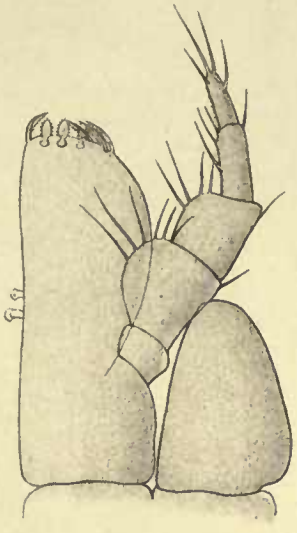

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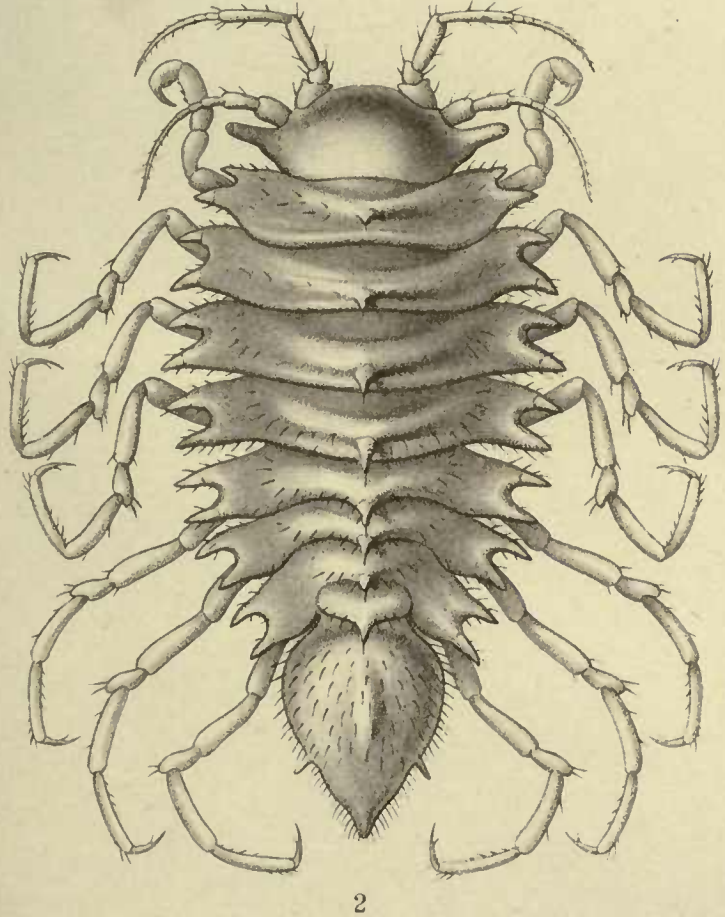

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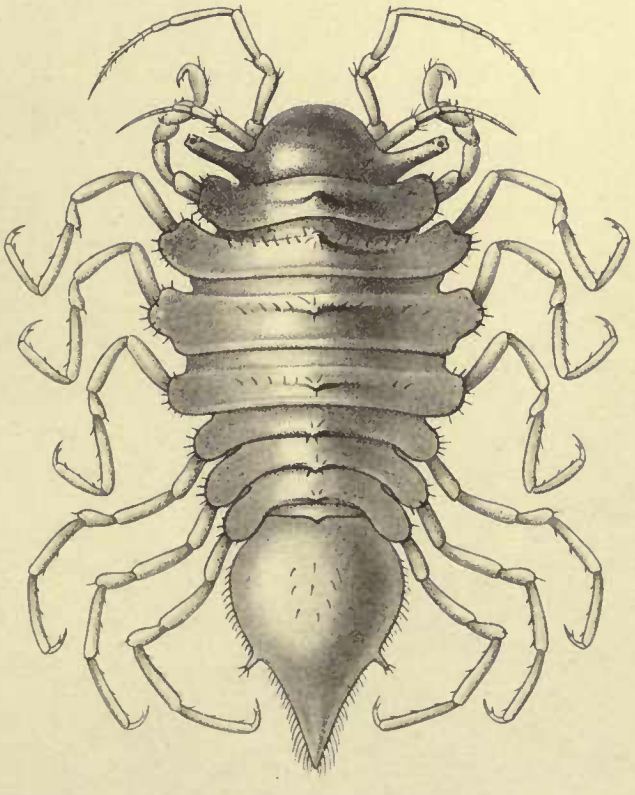

3

West, Newman del. et lith.

1. Antias charcoti. 2. Coulmannia australis. 3. Notoxenus spinifer.

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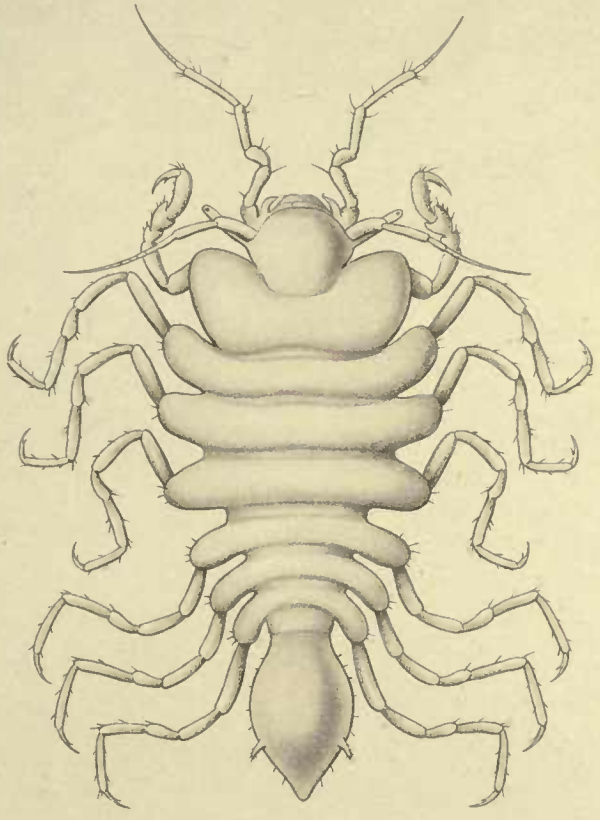

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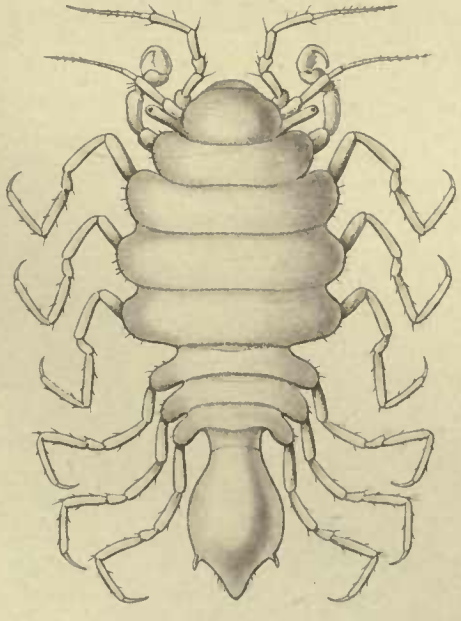

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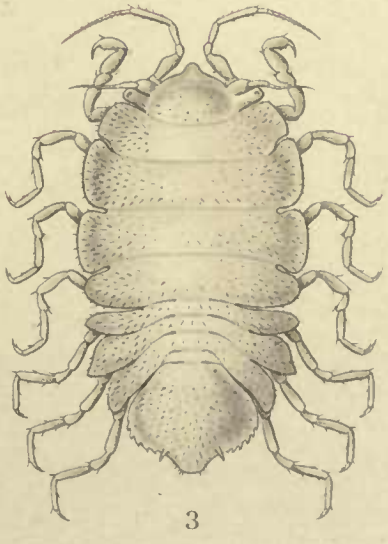

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West, Newman del. et lith.

1. Austrosignum grande. 2. A. glaciale. 3. Austrimunna rostrata.

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NEMERTINEA.

Par L. Joubin,

Professeur au Muséum d'Histoire Naturelle de Paris.

(1 Plate.)

Les Némertiens des expéditions antarctiques du 'Southern Cross' et du 'Discovery' ont subi des vicissitudes singulières avant de trouver leur repos définitif dans les collections du British Museum.

L'étude des premières fut d'abord confiée à mon savant collègue, M. Punnett, de Cambridge, qui en fit la détermination, exécuta des séries de coupes, et termina entièrement son travail. Il l'expédia complètement rédigé avec les dessins à l'imprimerie. Mais par un concours de circonstances déplorables le texte et les dessins furent perdus par la poste ! Justement dégoûté de cet accident, M. Punnett ne voulut pas refaire son travail. Ces Némertiens avec ceux du 'Discovery' furent ensuite expédiés au Professeur Hubrecht de l'Université d'Utrecht. Les échantillons étaient déjà beaucoup plus difficiles à étudier et à décrire, puisque plusieurs avaient servi à faire des coupes. Néanmoins le travail fut remis sur le chantier, de nouvelles séries de coupes furent faites ; mais le Professeur Hubrecht, occupé par d'autres travaux, fut amené à abandonner, lui aussi, cette étude.

C'est alors que MM. Jeffrey Bell et Hubrecht me demandèrent de me charger de ce mémoire. J'y consentis, mais je suis obligé de faire des réserves très grandes, et de dire pourquoi mon travail est forcément très incomplet. En effet, plusieurs espèces ne sont plus représentées que par des coupes ou des échantillons mutilés, sur lesquels la tête a été prélevée pour faire des sections ; tel est le cas de *Eupolia punnetti* ; ou bien il n'y a que des échantillons en mauvais état, complètement décolorés, sur lesquels il n'est plus possible de faire aucune description spécifique ; c'est le cas de *Lineus hanseni*. Enfin, pour comble de malheur, beaucoup de séries de coupes, teintes avec des couleurs d'aniline, se sont complètement décolorées, et il n'est plus possible d'y rien distinguer.

On comprendra donc que, dans ces conditions, il m'ait été impossible de faire un mémoire détaillé et de donner des descriptions suffisamment précises, d'autant plus que je n'ai eu aucun document, ni dessin, ni note de couleur, pris sur le vivant.

Il était absolument nécessaire que j'indique ces circonstances malheureuses, afin de dégager ma responsabilité. J'ai tiré ce que j'ai pu d'intéressant de ce matériel.

J'ai conservé les dénominations que M. Punnett avait indiquées, notamment sur

ses séries de coupes. Quant aux localités, elles ne correspondent pas exactement avec celles qui m'ont été communiquées sur une liste imprimée, mais ce fait n'a qu'une importance secondaire.

Les collections que m'ont été remises comprennent surtout de grands échantillons de *Lineus corrugatus*, provenant soit de l'expédition du 'Southern Cross,' soit du 'Discovery.' Un petit nombre d'autres se rattachent à plusieurs espèces, mais ne sont représentés que par une très petite quantité d'exemplaires. Je résumerai en un tableau final l'ensemble de ces documents en les plaçant à côté des espèces récoltées dans les régions antarctiques par les expéditions antérieures. On pourra ainsi se rendre compte de la composition de la faune antarctique des Némertiens telle qu'elle résulte de nos connaissances actuelles.

Lineus corrugatus.

1879. McIntosh. Philosophical Transactions of the Royal Society of London. Vol. 168, p. 262, pl. 15, f. 17–18.
1879. Studer. Archiv. für Naturgeschichte. Vol. 45, 1 p., p. 123.
1887. Hubrecht. Report voy. H.M.S. 'Challenger.' Vol. 19. No. 1, p. 41 ; pl. 1, fig. 17 ; pl. 11, f. 9 ; pl. 12, fig. 3, 4 ; pl. 13, f. 1–6 ; pl. 14, fig. 2, 4.
1904. O. Bürger. Nemertini. Das Thierreich. 20 Lief., p. 96.
1908. L. Joubin. Némertiens. Expédition antarctique française du Dr. Charcot, p. 6.

Localités.—'Southern Cross,' Cap Adare, 7½ fms., 24. xi. 1899, 28° 9 Fahr., 8 échantillons. 'Discovery,' Stn. 3, 96 fms., fond de pierres et graviers, 7. v. 1902, 3 échantillons ; 10. xi. 1902, 119 fms., 4 échantillons ; McMurdo Bay, 20 fms., 28. ii. 1902, 3 échantillons ; W. Q. Hut Point, 108 fms., 28. ii. 1902, 2 échantillons ; id., 107 fms., 2 échantillons ; W. Q. Hut Point, D. net., 108 fms., 8. x. 1902, 1 échantillon ; Hut Point, 113 fms., D. net, 30. x. 1902, 9 échantillons ; W. Q. Hut Point, 100 fms., D. net, 8. x. 1902, 2 échantillons ; id., 108 fms., 7 échantillons ; Sans indication de localité, 3 échantillons.

La description de cette espèce consiste actuellement dans une très brève note de McIntosh, reproduite par Studer et Hubrecht, et finalement transposée en une diagnose par O. Bürger. Je donne ci-dessous la texte de Bürger, mais je dois faire remarquer combien une diagnose ainsi faite est aléatoire, puisque l'auteur l'a tirée du texte très peu précis de McIntosh.

"Dunkelolivenfarben. Ein weisses Band kreuzt die Kopfspitze und säumt den vorderen Abschnitt der Kopfspalten. Bindegewebsschicht der Cutis muskelfrei, sehr stark und dicht und ebenso dick wie ihre Drüsenschicht. Mit sehr starkem oberen Rückennerven, der sich mit einem ungewöhnlich mächtigen, zwischen äusserer Längs- und Ringmuskelschicht befindlichen Nervengeflecht, verbindet. L. 200, Br. 15 mm. (in Weingeist).

"Indischer Ozean (Kerguelen Inseln), Tiefe 137–220 m."

La description donnée par le Prof. McIntosh est très incomplète, et elle ne donne

aucune figure de l'extérieur du corps ; on y trouve seulement deux dessins de coupes, l'une de la trompe, l'autre de la paroi du corps ; ces coupes ne montrent aucune particularité spéciale à cette espèce qui permette d'en tirer un caractère d'identification. Il en résulte que l'assimilation de l'espèce antarctique avec le *Lineus corrugatus* du Prof. McIntosh ne me paraît pas prouvée. Sa description pourrait presque aussi bien se rapporter au *L. hanseni*, d'autant plus que le séjour en alcool a fait disparaître les pigments colorés de la peau.

C'est surtout la provenance géographique des échantillons du Prof. McIntosh, relativement voisine, puisqu'ils viennent des îles Kerguelen, qui permet de tirer une conclusion plus précise sur l'identité spécifique de ceux du 'Southern Cross' et du 'Discovery.' D'autre part, les individus provenant de l'expédition du 'Challenger' et décrits par le Prof. Hubrecht provenaient aussi de Kerguelen. Mais, malheureusement, Hubrecht n'a pas donné d'autre figure de l'extérieur que celle d'un jeune vu de profil, où l'on ne reconnaît pas bien nettement les caractères de la tête, ni ceux de la peau, et les lignes pigmentées blanches n'y sont pas représentées. Cette figure ne donne donc pas d'indication suffisante pour l'identification des animaux adultes.

Cependant, Messieurs Punnett et Hubrecht, qui ont examiné ce matériel avant moi, ont déterminé ces grandes Némertes *Lineus corrugatus*. J'accepte donc leur manière de voir, mais sans conviction bien arrêtée.

Je dois ajouter que j'ai trouvé dans les Némertiens provenant de l'expédition antarctique du Dr. Charcot un spécimen que j'ai rattaché à cette espèce. Il ressemble beaucoup à ceux du 'Southern Cross' et du 'Discovery.'

Il y aurait encore lieu de discuter ici pour savoir si cette espèce doit être rattachée au genre *Lineus* ou au genre *Cerebratulus*, et à ce propos se demander si le genre *Micrura* mérite d'être maintenu. Mais cette discussion nous entraînerait beaucoup trop loin. Je crois seulement pouvoir dire que le genre *Micrura* me paraît à supprimer, et que les deux autres sont tellement peu différenciés qu'il n'y a pas de limite bien nette entre eux. Je réserve le nom de *Lineus* à ceux des Schizonemertini qui ont le corps à section ronde, mou, et non susceptible de nager, et le nom de *Cerebratulus* à celles dont le corps est plus plat, à bords anguleux, à consistance plus dure et susceptibles de nager. En dehors de ces caractères je ne vois pas de différences entre les deux genres, et l'on peut passer facilement de l'un à l'autre par de nombreux intermédiaires. En réalité, les Schizonemertini sont très uniformes, et leur division en genres tout à fait arbitraire.

Les nombreux échantillons de *L. corrugatus* que j'ai examinés sont tous conservés dans l'alcool ; par conséquent, comme cela arrive toujours chez les Némertiens, ils sont complètement dépigmentés, ne laissent plus distinguer aucun ornement, et ne permettent pas de constater la présence des bandes blanches signalées par le Prof. McIntosh.

Les exemplaires ont été les uns placés immédiatement dans l'alcool, les autres fixés au liquide de Perenyi. Leur longueur est donc variable selon la fixation, car ils se contractent beaucoup plus dans l'alcool que dans le liquide de Perenyi.

Longueur jusqu'à 60 centimètres ; ils ont alors la forme de rubans plats, qui n'est certainement pas normale. Largeur jusqu'à 25 millimètres, selon qu'ils sont plus ou moins contractés. Ceux qui sont fixés en état d'extension n'ont guère plus de 12 à 14 millimètres de large.

La tête est très petite, séparée par un pli de la portion buccale ; elle a de 4 à 5 millimètres de long sur 3 à 4 de large ; elle est à peu près cylindrique. Elle est pourvue de fentes céphaliques sur toute sa longueur, qui même s'étendent au-dessous du pli circulaire, et atteignent le commencement de la bouche.

La figure 1 de la planche donne une idée suffisante de l'aspect général d'un individu de 30 à 40 centimètres fixé en état de demie extension. La partie antérieure du corps est vue par la face ventrale ; la postérieure par la face dorsale ; le corps ayant été plié au milieu pour montrer ce double aspect. La figure 2 montre le dessus de la région antérieure d'un autre exemplaire à peu près de même taille.

On peut voir sur ces photographies que la région buccale est très développée, régulièrement conique, et que la tête, avec les fentes céphaliques, forme comme une sorte de bouton qui la surmonte. Cette région buccale est un peu plus large que celle qui la suit, et un peu moins circulaire. Le reste du corps est de section ovale, plus plate en arrière, et ne commence à diminuer en forme de queue que tout-à-fait en arrière.

On ne peut dire grand' chose de la couleur, dont il ne reste que des traces incertaines tirant sur le brun ou le vert olive foncé ; le ventre paraît un peu plus clair, tirant sur le jaunâtre.

Sur aucun échantillon je n'ai pu voir la bande blanche dont parle le Prof. McIntosh.

La peau est ridée sur tout le corps ; dans la région correspondant à l'œsophage les plis sont profonds, parallèles, longitudinaux ; en dessous de cette région ils sont plus petits, et coupés d'un grand nombre de petits sillons transversaux. Sur plusieurs exemplaires les plis de la région œsophagienne sont coupés de plis transversaux profonds de façon à imiter une mosaïque.

Il n'y a pas de plis sur la tête, et la première partie de la région sus-buccale est souvent lisse.

Souvent les gros plis parallèles sus-buccaux s'écartent en éventail, en dessous de la tête, pour descendre de chaque côté vers la bouche.

Sur la face ventrale du corps les plis sont longitudinaux, parallèles, peu profonds, plus atténués que sur la face dorsale. A un millimètre ou deux du bord (fig. 1 de la planche) de chaque côté, il y a un pli interrompu plus profond, qui marque une limite mal définie entre la peau du dos et celle du ventre. Elle commence en dessous de la région œsophagienne.

L'orifice buccal est énorme, et probablement très élastique, ce qui permet à l'animal d'avaler de très grosses proies, ainsi que je l'ai fait voir pour une espèce analogue recueillie dans l'Antarctique par le docteur Charcot. Les lèvres minces se replient vers

l'intérieur de l'orifice ; il est probable qu'elles sont protractiles, et peuvent englober les proies en dehors du corps. L'orifice est plus pointu vers le haut, où il s'avance jusque sous la tête ; plus arrondi vers le bas, où la commissure des deux lèvres est épaisse et charnue.

Tube digestif.—Si l'on ouvre l'animal par la face dorsale on voit l'intérieur du tube digestif, qui est fort intéressant (fig. 3 de la planche).

La bouche a la forme d'une boutonnière entourée d'un bourrelet saillant intérieurement, plus accentué en bas qu'en haut. De ce bourrelet partent des plis délicats qui deviennent rapidement très élevés et forment sur tout l'œsophage des lames parallèles qui descendent sur une longueur de 5 à 7 centimètres vers l'intestin. A cette distance elles changent brusquement de caractère. Elles s'arrêtent pour faire place à des plis transversaux, perpendiculaires aux premiers, excessivement nombreux, partant de la ligne médiane pour aller jusqu'aux parois latérales du corps, de plus en plus fins jusqu'au bout du corps.

Les plis médians ventraux de l'œsophage se continuent sur la portion primitive de l'intestin, mais ils ne tardent pas à s'atténuer. Sur la ligne médiane dorsale on trouve, faisant une forte saillie, la gaîne de la trompe, où l'on distingue celle-ci repliée plusieurs fois sur elle-même. La gaîne est continuée dans la portion terminale du corps par une série de plis épithéliaux longitudinaux, allant jusqu'à l'anus.

Les glandes génitales intercalées, sous forme de petits cylindres transversaux, entre les plis intestinaux font saillie dans la cavité intestinale quand elles sont gonflées, ce qui est le cas pour l'individu représenté (fig. 3) d'après une photographie.

Sur les coupes on distingue quelques particularités intéressantes de l'anatomie de cette Némerte ; j'en signalerai quelques unes.

Communication du rhynchodaeum avec le sinus sanguin de la tête.—La cavité du rhynchodaeum ne sert pas seulement à laisser passer la trompe, elle permet encore au liquide sanguin contenu dans les sinus généraux d'être évacué au dehors. Ces sinus se prolongent dans la tête par une vaste cavité en avant du système nerveux, entourant le rhynchodaeum. Deux orifices font communiquer ces sinus avec le dehors ; ils sont creusés dans la paroi musculo-conjunctive et offrent une disposition remarquable (*voir* figs. 1, 2, 3). L'orifice, de chaque côté, est très net, couvert d'un épithélium dans la paroi du rhynchodaeum. Puis l'épithélium devient moins net, la paroi plus anfractueuse, et criblée de petits trous qui conduisent dans un tissu spongieux, semé de cellules d'aspect lymphoïde, qui recouvre finalement la paroi vasculaire du sinus sanguin. Le sang contenu dans le sinus doit donc passer à travers ce tissu spongieux avant d'arriver dans le conduit qui le déverse dans le rhynchodaeum. Je ne sais s'il faut considérer cet appareil comme destiné à évacuer du sang, ou à le filtrer, ou comme une

FIG. 1.—Coupe schématisée montrant l'ouverture du vaisseau dans le rhynchodaeum et le tissu spongieux du côté du vaisseau céphalique. Cette coupe est faite transversalement.

sorte de soupape de sureté, destinée à empêcher la rupture du vaisseau céphalique lors de l'émission de la trompe. Il a l'aspect du tissu urinaire, et le vaisseau qui lui

FIG. 2.—Schéma de la disposition du vaisseau dans l'épaisseur de la gaîne de la trompe. L'ouverture unique inférieure donne accès dans un réservoir séparé du vaisseau par un tissu spongieux d'aspect lymphoïde.

FIG. 3.—Coupe à travers le sommet du réservoir et le tissu lymphoïde

sert de réservoir complète cette apparence. Cependant, comme cet appareil est très réduit par rapport à la masse du corps, j'hésite à le considérer comme faisant partie d'un système urinaire.

Organe céphalique.—Cet organe est bien marqué chez ce *Lineus*. Il consiste en une paire de cupules (fig. 4 de la planche) situées en avant de la tête, très près l'une de l'autre, tout-à-fait à la pointe. Elles reçoivent une forte branche nerveuse du ganglion cérébral. L'intérieur de la cupule est occupé par un tissu formé de fibrilles nerveuses, de cellules ovales, et de cellules à cnidocils qui forment comme une sorte de brosse au fond de la cupule.

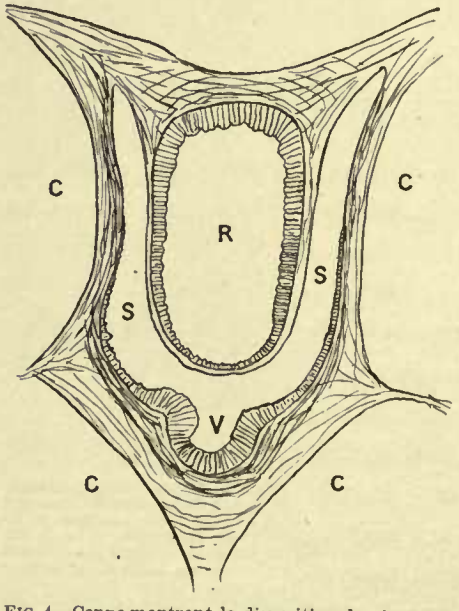

FIG. 4.—Coupe montrant la disposition du sinus sanguin après qu'il a franchi le collier nerveux, pendant son passage dans le cerveau. *C*, Cerveau ; *R*, Gaîne de la trompe ; *S*, Sinus ; *V*, point de départ du vaisseau.

Épithélium de la gaîne de la trompe.—J'ai représenté (fig. 5 de la planche) un fragment de la gaîne de la trompe pris dans le voisinage de la tête, pour montrer la disposition régulière des cellules qui, dans cette région, sont beaucoup plus serrées que dans le reste de cet organe. On remarquera l'épaisseur du tissu musculo-conjonctif qui supporte cet épithélium. Les colorations diverses prennent avec une grande intensité sur ce tissu spécial.

Sinus sanguin.—La disposition de l'appareil vasculaire présente aussi quelques particularités intéressantes à noter.

L'origine du sinus sanguin qui parcourt toute la paroi de la gaîne de la trompe sur la ligne médiane ventrale était bien nette sur les préparations que j'ai examinées.

Si l'on part du point où le sinus sanguin céphalique traverse le cerveau, on

constate qu'il forme là, dans le collier, une cavité constituant les trois quarts d'un anneau, dans la concavité duquel se trouve la gaîne de la trompe.

Aussitôt après avoir franchi le collier nerveux on voit dans le sinus un pli épithélial (fig. 4) se faire sur la ligne médiane ventrale (*V*). Puis les deux bords se soulèvent,

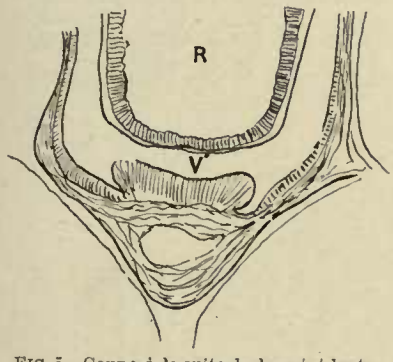

FIG. 5.—Coupe à la suite de la précédente ; commencement de la séparation du vaisseau de la trompe et des sinus.

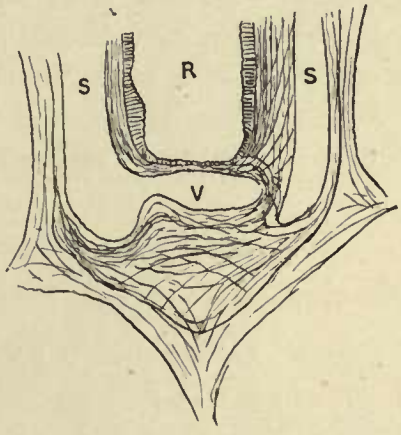

FIG. 6.—Coupe à la suite de la précédente ; la séparation du vaisseau et d'un sinus est accomplie d'un côté.

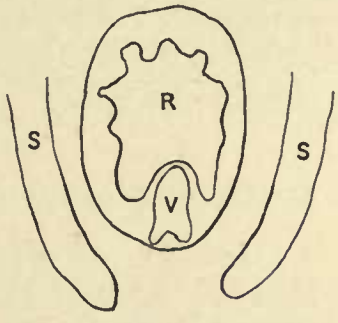

FIG. 7.—Le vaisseau, complètement séparé des sinus, est incorporé dans l'épaisseur de la gaîne de la trompe.

s'étalent (fig. 5) et l'un d'eux vient se souder à la paroi musculaire du rhynchodaeum (fig. 6). Le nouveau vaisseau est donc dès maintenant séparé, d'un côté, du sinus dont il n'est qu'une dérivation ; il ne communique plus qu'avec l'autre sinus. Il ne tarde pas à s'en séparer aussi, et dès lors le vaisseau est devenu indépendant. Il s'enfonce dans la paroi de la gaîne de la trompe (fig. 7) et la parcourt dans toute sa longueur. Ce

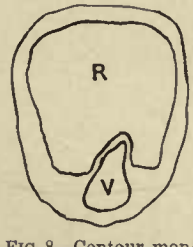

FIG. 8.—Contour montrant la transformation du vaisseau qui, de vertical, devient transversal.

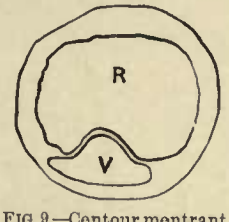

FIG. 9.—Contour montrant la phase intermédiaire de cette transformation.

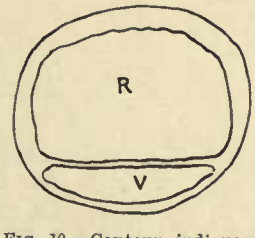

FIG. 10.—Contour indiquant la forme définitive du vaisseau de la gaîne de la trompe, qui restera ainsi jusqu'à son extrémité postérieure.

vaisseau change beaucoup de forme. Il a d'abord son grand axe vertical, puis il devient horizontal (fig. 8, 9, 10), et reste ainsi définitivement. On remarquera combien cette paroi vasculaire est mince.

Il est assez difficile, comme on a pu s'en rendre compte, de différencier cette Némerte des espèces voisines, en présence des documents insuffisants que j'ai eus à ma disposition. Il n'y a guère d'autre espèce que je puisse lui comparer, parmi celles qui proviennent des régions antarctique et subantarctique, que le *Cerebratulus charcoti*, que j'ai décrit il y a peu de temps. On peut voir d'abord que j'ai rattaché cette espèce au genre *Cerebratulus*, tandis que je mets la seconde dans le genre *Lineus*. Je ne veux

pas revenir sur ce que j'ai dit précédemment sur le peu de différences qu'il y a entre les deux genres, et combien sont fragiles les distinctions que l'on peut faire entre eux. J'ai cru devoir mettre dans le genre *Lineus* les Némertes anglaises parce qu'elles me paraissent plus molles, moins musclées, moins susceptibles de pouvoir nager, que l'espèce française, qui répond mieux à ces caractères ; mais cela n'a pas grande valeur.

Au point de vue de la différenciation des espèces, on peut remarquer que *C. charcoti* est entièrement blanc, sans pigment, que la moitié postérieure de son corps est flasque et ressemble à une peau vidée, tandis que la région antérieure est bien musclée. Au contraire, *L. corrugatus* est de musculature uniforme dans toute sa longueur, et pigmentée en brun.

Lineus hanseni.

Lineus hanseni Punnett (in litteris).

Localités.—'Southern Cross.' Au large du Cap Adare ; 7½ fathoms ; 23. xi. 99. Idem ; 7½ fathoms ; 23. xi. 99. Idem ; 7½ fathoms ; 23. xi. 99. Idem ; 7½ fathoms ; 23. xi. 99. Idem ; 26 fathoms ; 10. xi. 99.

Il m'est impossible de rien dire de précis sur cette espèce. Les 4 exemplaires conservés en alcool qui m'ont été remis sont en très mauvais état ; les uns ont été disséqués ou sont détériorés ; un autre a été sectionné en plusieurs tronçons, et les parties principales utilisées pour faire des coupes.

On distingue sur l'un d'eux des traces de pigment brun.

L'aspect général, la forme du corps, de la tête, de la bouche, de l'extrémité caudale me paraissent semblables à ce que l'on trouve dans *L. corrugatus*. Je n'aurais

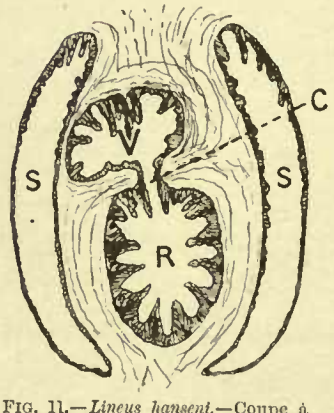

FIG. 11.—*Lineus hansent.*—Coupe à travers la tête, montrant le canal de communication, *C*, entre le rhynchodaeum, *R*, et le sinus, *S* ; l'ampoule, *V*, est tapissée par un épithélium différent de celui du rhynchodaeum.

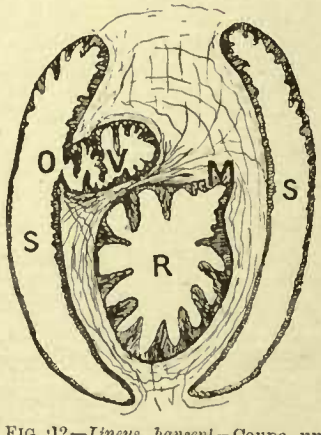

FIG. 12.—*Lineus hansent.*—Coupe un peu plus bas, montrant l'ouverture *O* de l'ampoule *V* dans le sinus *S* ; l'ouverture se fait à travers un tissu d'aspect lymphoïde. Au point *M* on commence à voir le début d'un second canal.

pas cru devoir différencier ces Némertes de *L. corrugatus* si M. Punnett, qui a eu les échantillons en bon état, ne s'était arrêté à cette détermination différente.

L'examen des coupes montre une trompe plus épaisse que dans *L. corrugatus*.

Mais ce peut être simplement le résultat d'une contraction musculaire plus forte causée par les réactifs fixateurs.

Le système vasculaire montre une communication entre le rhynchodaeum et le sinus sanguin céphalique analogue à celle de *Lineus corrugatus*, mais qui en diffère cependant par quelques particularités. Il y a 3 ou 4 de ces canaux de communication, tandis que je n'en ai trouvé que deux dans *L. corrugatus*. Leurs ouvertures *O*, *C*, sont plus nettes, plus larges, tant du côté du sinus que du côté du rhynchodaeum ; l'ampoule *U*, située entre les deux canaux, est plus courte, mais beaucoup plus large, et elle est tapissée par un épithélium qui présente un aspect moins lymphoïdal que dans l'autre espèce, cette disposition se trouvant confinée autour de l'ouverture *O* de l'ampoule dans le sinus.

M. Punnett a fait remarquer qu'il y a dans cette espèce un nerf periœsophagien formant un anneau complet. Ce fait confirme et généralise l'opinion émise par lui relativement à la présence de cet anneau nerveux chez les Némertiens de ce genre. ('On the Nemerteans of Norway,' Bergens Museums Aarbog, 1903, No. 2, p. 6.)

Eupolia punnetti.

Localité.—Hut Point, 'Discovery,' 41 fms., 1 échantillon fixé à la liqueur de Perenyi. Je n'ai examiné que deux fragments de cette Némerte. Le diamètre de ces fragments est d'environ 15 millimètres. L'un, antérieur, a de 5 à 6 centimètres ; mais il y manque la tête jusqu'à la moitié de la bouche. L'autre est un fragment du milieu du corps, de 2 centimètres environ. Ils sont complètement décolorées. Le grand morceau ressemble à la partie antérieure du corps de *L. corrugatus*. Les plis cutanés sont tout-à-fait analogues. Je ne puis baser une description sur de pareils débris, et je suis obligé d'accepter la détermination telle qu'elle m'a été transmise.

Fig. 13.—*Eupolia punnetti.*—Croquis de la région céphalique, d'après Hubrecht.

Je reproduis cependant un croquis de l'extérieur fait par M. Hubrecht (fig. 13) ; il est le seul document que je possède sur cette Némerte. Comme on le voit, la bouche est très grande, bien plus que dans les autres espèces du même genre. J'ai aussi fait une photographie qui montre (fig. 6 de la planche) la grande ressemblance du corps de cet animal avec le *L. corrugatus*, qui est placé à côté. On aurait facilement pu les confondre, surtout en l'absence de la tête. On y remarquera les mêmes plis en éventail sus-œsophagiens, les mêmes rides transversales de la région antérieur du corps. Je ne puis rien dire de la longueur totale de l'animal ; il est probable que sa partie postérieure était aussi ronde que l'antérieure, ce qui devait le différencier sur le vivant des *Lineus* d'aspect analogue.

Des coupes ont été faites dans l'animal à partir de la pointe de la tête, jusque

vers le milieu de la bouche ; une seconde série dans la partie moyenne du corps. Malheureusement, celles de la région céphalique sont inutilisables, ayant été presque complètement décolorées. Dans la seconde série les couleurs sont restées à peu près intactes, ce qui m'a permis de reconnaître les éléments et de les dessiner ; mais il n'y en a pas assez long pour pouvoir reconstituer les organes. Ce qui s'y trouve de plus intéressant est la disposition des organes reproducteurs.

L'ensemble des couches musculo-cutanées ne diffère pas de ce que l'on trouve chez

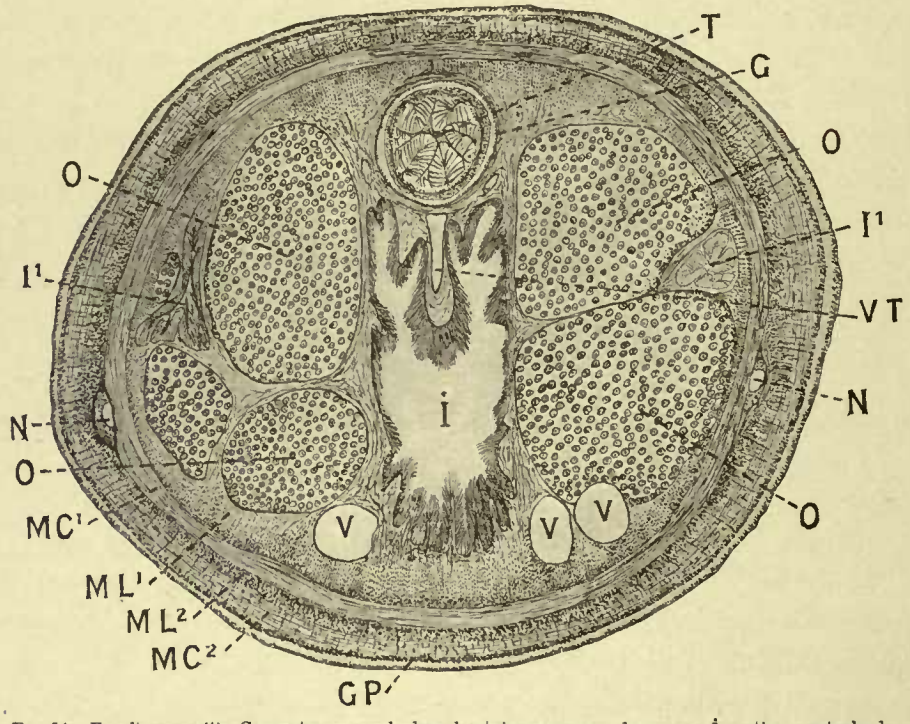

FIG. 14.—*Eupolia punnetti.*—Coupe transversale dans la région moyenne du corps : *I* portion centrale de l'intestin ; I^1, I^1, poches latérales de l'intestin ; *O*, *O* ovaires et poches à œufs ; *V*, *V* vaisseaux ; *T* trompe ; *G* gaîne de la trompe ; *N* nerf latéral ; MC^1, MC^2 muscles circulaires internes et externes ; ML^1, ML^2 muscles longitudinaux internes et externes ; *GP* glandes cutanées ; *VT* vaisseau longitudinal de la trompe. Grossissement 10·5.

les autres *Eupolia*. La couche de glandes cutanées, *GP*, fig. 14, est bien développée, mais les glandes y sont petites.

L'animal était une femelle dont les ovaires étaient en activité et les poches génitales (*O*) remplies d'œufs, probablement sur le point d'être pondus. Ces poches ont comprimé les diverticules intestinaux dont on retrouve les parois épithéliales (*I*), serrées entre les poches ovariennes. Celles-ci ont leur épithélium actif proliférant dans les parties avoisinant les culs de sac intestinaux ; le reste de leur paroi semble ne jouer qu'un rôle d'enveloppe, et non de prolifération.

La trompe (*T*) est très grosse par rapport à la gaîne, qu'elle remplit presque entièrement. Des vaisseaux se trouvent autour de cette gaîne, et le plus important d'entre eux détermine une saillie longitudinale qui se traduit par une grosse papille dorsale médiane dans l'intestin (*VT*).

Amphiporus multihastatus.

Amphiporus multihastatus Punnett (in litteris).

Localités.—'Southern Cross.' Au large du Cap Adare, 20 à 24 fms. 2. i. 1900. Temp. 29° Fhr. 9 échantillons.

Le matériel que j'ai examiné comprend un seul échantillon à peu près complet ayant environ 40 millimètres de long ; tous les autres sont, ou bien des fragments, ou bien des individus divisés pour être mis en coupes. Je n'ai pas eu ces coupes à ma disposition.

J'ai photographié le seul individu complet ; c'est celui qui est représenté par la figure 7 de la planche. Il est tellement contracté qu'il n'est pas possible de distinguer la tête de la queue, car les bourrelets épithéliaux de la peau plissée ont masqué tout ce qui est orifices ou sillons. Il ne reste pas trace de coloration ni d'yeux. Tout ce qu'on peut en dire c'est que la peau est garnie de bourgeons épithéliaux, qui paraissent dorsaux et de nombreuses rides circulaires.

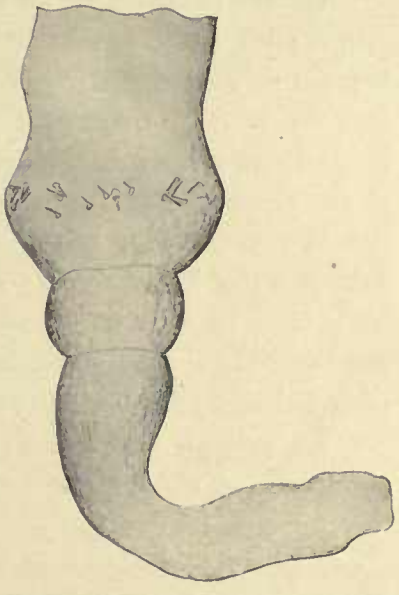

FIG. 15.—*Amphiporus multihastatus.*—Aspect de la partie centrale de la trompe, montrant les stylets, d'après une préparation montée dans le baume de Canada. Grossissement 14 fois environ.

La trompe est très développée, large et épaisse ; elle paraît avoir été extrêmement courte (fig. 8 de la planche). On y remarque la présence de nombreux stylets qui se distinguent même à l'œil nu (fig. 15). Tous ces stylets occupent une bande transversale dans le renflement central de cette trompe. On peut distinguer le stylet emmanché du milieu, mais il paraît avoir été déplacé au cours des manipulations, car il n'a pas sa situation normale. La figure 16 représente cette région des stylets à un grossissement de 45 diamètres environ ; on peut y voir 20 stylets ; il est probable qu'il y en avait d'autres plus petits en voie de formation, mais ils sont trop peu nets pour être représentés. On remarquera qu'au lieu d'être répartis par groupes dans quelques poches, ils sont disséminés isolement dans toute l'étendue de la zone stylifère.

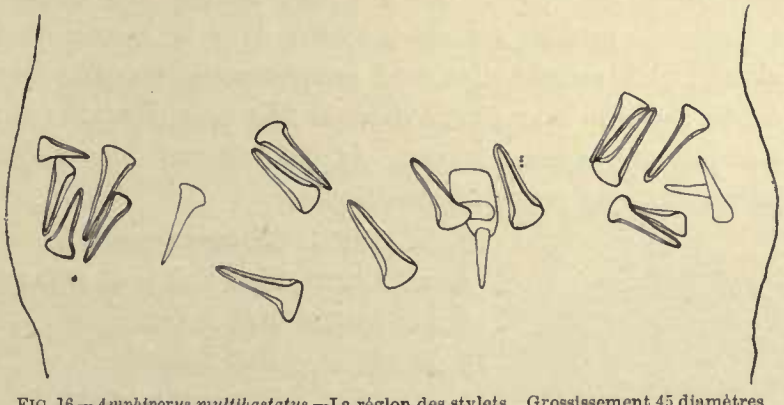

FIG. 16.—*Amphiporus multihastatus.*—La région des stylets. Grossissement 45 diamètres environ.

Je ne puis rien dire sur la structure de cette espèce ; tout ce que j'ai pu apercevoir sur la section c'est le grand développement de l'appareil musculaire.

Il n'est pas possible avec des renseignements aussi peu étendus de faire une comparaison de cette espèce avec celles de l'Antarctique actuellement connues se rapportant au même genre. On en trouvera la liste dans le tableau qui suit.

Tetrastemma unilineatum.

Tetrastemma unilineatum Punnett (in litteris).

'Southern Cross.' Cap Adare, 8½ fathoms. 13. xi. 99.

Quatre échantillons de cet animal ont été recueillis. L'un d'eux a été mis en coupes ; les 3 autres sont assez détériorés, notamment par la dessication. J'ai figuré le meilleur d'entre eux (fig. 9 de la planche).

On peut y remarquer une ligne brune foncée, médiane, dorsale, sur toute la longueur du corps ; des grains de pigment très fins sont répandus autour de cette ligne. Il est probable que l'animal vivant devait être verdâtre, ou vert olive, avec une ligne médiane vert brun plus foncée. On aperçoit vaguement les sillons céphaliques habituels des *Tetrastemma* ; mais je n'ai pu distinguer les yeux. On les trouve sur les coupes, ils sont très gros. Les autres échantillons sont moins pigmentés ; ils ont une ligne brune bien marquée seulement en arrière. La face ventrale du corps paraît avoir été d'un jaune verdâtre plus clair que le dos ; les grains de pigment y font défaut.

La trompe est à peu près aussi longue que le corps ; je l'ai figurée sur un exemplaire où elle était dévaginée.

L'étude de l'unique série de coupes qui m'a été remise ne m'a pas permis autre chose que de constater la ressemblance des organes avec ceux de tous les autres *Tetrastemma*. Mais leur décoloration presque complète ne laisse pas voir les détails histologiques. On peut cependant constater la grande concentration des organes excréteurs situés immédiatement derrière le cerveau et s'ouvrant au dehors au même niveau.

Larves Pilidium.

On a recueilli un assez grand nombre de larves *Pilidium*. Quelques unes, colorées au carmin, ont été montées dans le baume de Canada. Les autres sont en alcool ; mais comme elles sont complètement remplies de grains noirâtres qui s'y sont collés pendant leur séjour dans le filet pélagique, il est impossible de distinguer les contours précis de ces larves. Je me bornerai donc à donner leur provenance et les indications que portent leurs étiquettes.

19. ii. 1902. Winter Quarters.
4. xi. 1902. Hut Point, 41 fathoms.
1. xii. 1902. Hut Point.
10. xii. 1902. Hut Point.
16. ii. 1903. Winter Quarters.
21. x. 1903. Hut Point, 10 fathoms.
5. xi. 1903. Hut Point, 29 à 30 fathoms.
10. xii. 1903. Hut Point, 5 fathoms.

Espèces.	Côte Sud-Américaine, jusqu'au 41° 51' lat. S.	Magellan, Terre de Feu, Île Falkland.	Iles Péri-Antarctiques.	Expédition de la 'Belgica.'	Expédition du 'Français.'	Expéditions du 'Southern Cross' et du 'Discovery.'	
Carinoma patagonica Bürg.	..	+					
Cephalothrix, sp.	..	+					
„ sp.	+						
Carinina antarctica Bürg.	..	..	..	+			
Eunemertes violacea Bürg.	+						
„ sp.	+						
Amphiporus racovitzai Bürg.	..	..	..	+			
„ *gerlachei* Bürg.	..	..	..	+			
„ *lecointei* Bürg.	..	..	..	+			
„ *marioni* Hubr.	..	..	+	..	..	..	Marion.
„ *moseleyi* Hubr.	..	..	+	..	..	..	Kerguelen.
„ *michaelseni* Bürg.	..	+	..	..	+		
„ *spinosus* Bürg.	..	..	+	..	..	..	Géorgie du Sud.
„ *spinosissimus* Bürg.	..	..	+	..	..	..	„
„ *cruciatus* Bürg.	..	..	+	..	..	..	„
„ *mathai* Joubin	..	..	..	..	+		
„ *multihastatus* Joubin	..	..	..	..	..	+	
„ sp.	..	..	..	..	+		
„ sp.	..	..	..	..	+		
Drepanophorus crassus de Quatr.	..	..	+	..	..	..	Kerguelen.
Tetrastemma amphiporoides Bürg.	..	..	+	..	..	..	Géorgie du Sud.
„ *duboisi* Bürg.	..	..	+	..	..	..	„
„ *antarcticum* Bürg.	..	..	+	..	..	..	„
„ *valiani* Bürg.	..	..	+	..	..	..	„
„ *hansi* Bürg.	..	..	+	..	..	..	„
„ *georgianum* Bürg.	..	..	+	..	..	..	„
„ *gulliveri* Bürg.	..	..	+	..	..	..	„
„ *belgicæ* Bürg.	..	..	..	+			
„ *rollandi* Joubin	..	..	..	..	+		
„ *unilineatum* Joubin	..	..	..	..	..	+	
Eupolia curta Hubr.	+						
„ *punnetti* Joubin	..	..	..	..	..	+	
Lineus atrocæruleus Schm.	+						
„ sp.	..	+					
„ *autrani* Joubin	..	..	..	..	+		
„ *turqueti* Joubin	..	..	..	..	+		
„ *hanseni* Joubin	..	..	..	..	..	+	
Micrura glandulosa Bürg.	..	+					
„ sp.	..	+					
Cerebratulus longifissus Hubr.	..	..	+	..	..	..	Marion.
„ sp.	..	..	+	..	..	..	Kerguelen.
„ *steineni* Bürg.	..	..	+	..	..	..	Géorgie du Sud.
„ *subtilis* Bürg.	..	..	+	..	.	..	„
„ *validus* Bürg.	..	..	+	..	..	..	„
„ *magelhaensicus* Bürg.	+	+	..	..	+		
„ *charcoti* Joubin	..	..	..	..	+		
„ *corrugatus* McInt.	..	..	..	+	+	+	Kerguelen.

INDEX BIBLIOGRAPHIQUE.

1. Bürger (O.)—Sudgeorgische und andere exotische Nemertinen. Zool. Jahrbuch. Syst. vii. (1893).
———————Beitrage zur Anatomie, Systematik und geographischen Verbreitung der Nemertinen. Zeitsch. wiss. Zool. lxi. (1895).
———————Hamburger Magalhaensische Sammelreise. Nemertinen, 1899.
———————Das Tierreich. Nemertini. Berlin, 1904.
2. Hubrecht (A. W.)—Report on the Nemertea collected by H.M.S. 'Challenger' during the years 1873–1876. London, 1887.
3. Joubin (L.)—Note sur un Némertien recueilli par l'expédition antarctique du Dr. Charcot. Bull. Mus. Hist. Nat. 1905, no. 5.
———————Note préliminaire sur les Némertiens recueillis par l'expédition antarctique française du Dr. Charcot, *Tom. cit.*, no. 6.
———————Expédition antarctique française commandée par le Dr. Jean Charcot. Némertiens. Paris, 1908.
4. McIntosh.—Marine Annelida. Philosoph. Trans. of the Royal Society of London, vol. 168. 1879.
5. Punnett (R. C.)—On some Arctic Nemerteans. Proc. Zool. Soc. London. 1901.
———————On the Nemerteans of Norway. Bergens Museum Aarbog. 1903, no. 2.
6. Studer.—Die Fauna von Kerguelensland. Archiv. für Naturgeschichte, vol. 49. 1879.

EXPLICATION DE LA PLANCHE.

Fig. 1.—*Lineus corrugatus.*—Un individu de taille moyenne, entier. La partie antérieure du corps est vue par la face ventrale pour montrer la bouche ; la partie postérieure par la face dorsale. Grandeur naturelle.

Fig. 2.—*Lineus corrugatus.*—La partie antérieure du corps, vue par la face dorsale, pour montrer la forme de la tête, l'étranglement de la région œsophagienne, les plis en éventail du dessus de la tête. Grandeur naturelle.

Fig. 3.—*Lineus corrugatus.*—Un individu ouvert par la face ventrale, pour montrer la disposition du tube digestif ; les plis longitudinaux sont bien marqués dans l'œsophage, et les plis transversaux dans le reste du corps. Dans la moitié antérieure du corps on distingue la saillie de la gaîne de la trompe. Grandeur naturelle.

Fig. 4.—*Lineus corrugatus.*—Coupe de l'organe céphalique. Grossissement 900.

Fig. 5.—*Lineus corrugatus.*—Coupe de l'épithélium de la trompe. Grossissement 900.

Fig. 6.—*Eupolia punnetti.*—La région antérieure du corps, moins la pointe de la tête. Cette photographie montre la ressemblance de l'animal avec *Lineus corrugatus*. Grandeur naturelle.

Fig. 7.—*Amphiporus multihastatus.*—Photographie de l'animal, grossi 2 fois.

Fig. 8.—*Amphiporus multihastatus.*—Région antérieure et trompe dévaginée ; grossissement 13 fois environ.

Fig. 9.—*Tetrastemma unilineatum.*—L'animal entier, avec la trompe dévaginée, grossi 12 fois environ.

EXPLICATION DES FIGURES DANS LE TEXTE.

FIG. 1.—Coupe schématisée montrant l'ouverture du vaisseau dans le rhynchodaeum et le tissu spongieux du côté du vaisseau céphalique. Cette coupe est faite transversalement.

FIG. 2.—Schéma de la disposition du vaisseau dans l'épaisseur de la gaîne de la trompe. L'ouverture unique inférieure donne accès dans un réservoir séparé du vaisseau par un tissu spongieux d'aspect lymphoïde.

FIG. 3.—Coupe à travers le sommet du réservoir et le tissu lymphoïde.

FIG. 4.—Coupe montrant la disposition du sinus sanguin après qu'il a franchi le collier nerveux, pendant son passage dans le cerveau. *C*, Cerveau ; *R*, Gaîne de la trompe ; *S*, Sinus ; *V*, point de départ du vaisseau.

FIG. 5.—Coupe à la suite de la précédente ; commencement de la séparation du vaisseau de la trompe et des sinus.

FIG. 6.—Coupe à la suite de la précédente ; la séparation du vaisseau et d'un sinus est accomplie d'un côté.

FIG. 7.—Le vaisseau, complètement séparé des sinus, est incorporé dans l'épaisseur de la gaîne de la trompe.

FIG. 8.—Contour montrant la transformation du vaisseau qui, de vertical, devient transversal.

FIG. 9.—Contour montrant la phase intermédiaire de cette transformation.

FIG. 10.—Contour indiquant la forme définitive du vaisseau de la gaîne de la trompe, qui restera ainsi jusqu'à son extrémité postérieure.

FIG. 11.—*Lineus hanseni.*—Coupe à travers la tête, montrant le canal de communication, *C*, entre le rhynchodaeum, *R*, et le sinus, *S;* l'ampoule, *V*, est tapissée par un épithélium différent de celui du rhynchodaeum.

FIG. 12.—*Lineus hanseni.*—Coupe un peu plus bas, montrant l'ouverture *O* de l'ampoule *V* dans le sinus *S*; l'ouverture se fait à travers un tissu d'aspect lymphoïde. Au point *M* on commence à voir le début d'un second canal.

FIG. 13.—*Eupolia punnetti.*—Croquis de la région céphalique, d'après Hubrecht.

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FIG. 15.—*Amphiporus multihastatus.*—Aspect de la partie centrale de la trompe, montrant les stylets, d'après une préparation montée dans le baume de Canada. Grossissement 14 fois environ.

FIG. 16.—*Amphiporus multihastatus.*—La région des stylets. Grossissement 45 diamètres environ.

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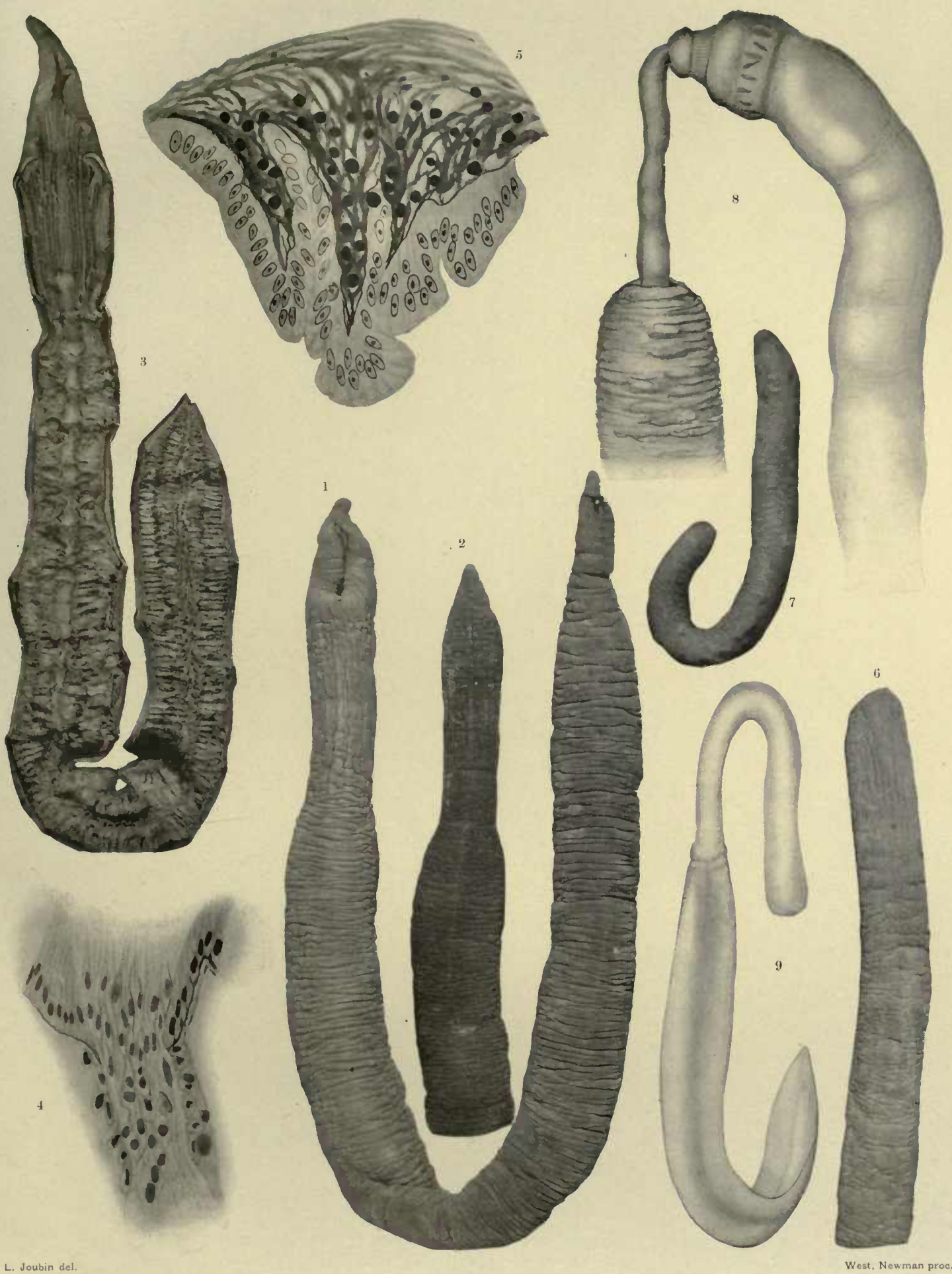

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West, Newman proc.

Antarctic (Discovery) Exp.

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V.—MEDUSÆ.

By Edward T. Browne,

Zoological Research Laboratory, University College, London.

(7 Plates.)

CONTENTS.

Introduction.

The collections of Medusæ brought home by the 'Discovery' and 'Southern Cross' are combined in this report. There was nothing whatever to be gained by keeping the collections separate, as they were made in localities not far apart, within two years of each other, and both belong to the British Museum. Many of the species are common to both collections, and as the collections contained a high percentage of specimens in very bad condition, it was a distinct advantage to be able to use the best specimens and to pass over the bad ones. Some of the specimens were in such bad condition that without a good clue it would have been impossible to determine the genus.

With such soft-bodied animals as jelly-fishes so much depends, for a good description and figure, upon the condition of the specimens. There is a difference between a description or drawing of a living Medusa in perfect condition and one based upon a contracted and damaged specimen. When dealing with the latter kind one has to use a certain amount of imagination, and to make allowances for defects. Although some of the figures may not be absolutely accurate in outline, still I have striven to make clear the characters of the species.

The collection made by the 'Southern Cross' in 1899–1900 came from the neighbourhood of Cape Adare (lat. 70° 18′ S., long. 170° 9′ E.). Some of the specimens were collected during May, 1899, and others during November and December, 1899, and January, 1900. The surface temperature of the sea on the 10th May, 1899, was 27° F., on the 13th Sept., 28·6° F., and during the summer months—December, January and February—it rarely rose above 32° F. During the winter months the temperature of the sea under the ice remained constant at 27·8° F.

Most of the specimens were taken in tow-nets or dredges in shallow, open water not far from shore, and a few were picked up after having been washed ashore. Unfortunately, the specimens were not sufficiently preserved, and were badly stored in bottles or tins; consequently they nearly all arrived home macerated and damaged. It was, undoubtedly, a stroke of good luck that two out of three of the species peculiar to the 'Southern Cross' collection happened to be in good condition.

A preliminary account of the Hydrozoa of the 'Southern Cross' Expedition was published by me in 1902. It was based upon a rapid survey of the collection, and abstracted from a manuscript written for the benefit of Mr. Hodgson, who was then about to sail in the 'Discovery.' The preliminary account carries no priority, as none of the species were named.

The 'Discovery' collection was made under conditions totally different from those of the 'Southern Cross' collection. Nearly all the specimens were captured in nets which were let down through holes in the ice. Owing to the low air temperatures the plankton on being placed in the collecting bottles froze in winter at once, and had to be thawed out on board ship. In summer the water in the bottles was generally full of ice crystals which, with the jolting of the sledge as it travelled shipwards, cut the more delicate animals to pieces (Hodgson, 1907). When Medusæ are collected under such severe conditions one must not be surprised at seeing damaged specimens.

The 'Discovery' was held fast in the ice for two years (March, 1902, to February, 1904) in McMurdo Sound (lat. 78° 49′ S., long. 166° 20′ E.). This sound is between the mainland of South Victoria Land and Ross Island, upon which the volcanoes Erebus and Terror are situated. The sound is converted into a bay at the southern end by Ross's Great Ice Barrier. At the barrier end the sound is over 400 fms. deep, but over the area covered by Mr. Hodgson's collecting the water is from 5 fms. to 180 fms. deep. Beneath the ice a current flowed through the sound in a south-easterly direction. The temperature of the sea beneath the ice ranged from 28·4° F. in winter to 30° F. in summer.

LIST OF MEDUSÆ COLLECTED BY THE 'DISCOVERY' AND 'SOUTHERN CROSS' EXPEDITIONS.

HYDROMEDUSÆ.

	Discovery.	*Southern Cross.*
Anthomedusæ—		
Margelopsis australis. n.sp.	×	..
Catablema weldoni. n.sp.	×	×
Perigonimus. sp.	×	..
Sibogita borchgrevinki. n.sp.	..	×
Koellikeria maasi. n.sp.	×	..
Eleutheria hodgsoni. n.sp.	×	..
Leptomedusæ—		
Ptychogena antarctica, Browne	×	×
Cosmetirella simplex. n.g. n.sp.	×	×
Cosmetira frigida. n.sp.	×	..
Trachomedusæ—		
Pantachogon scotti. n.sp.	×	..
Narcomedusæ—		
Solmundella mediterranea (Müller)	×	×

SCYPHOMEDUSÆ.

Incoronata—		
Lucernaria vanhoeffeni. n.sp.	..	×
Coronata—		
Periphylla dodecabostrycha (Brandt)	×	×
Atolla wyvillii, Haeckel	×	..
Semæostomata—		
Desmonema gaudichandi (Maas)	×	×
Diplulmaris antarctica, Maas	×	×
„ gigantea. n.sp.	..	×

There are altogether seventeen species belonging to at least sixteen genera, and with the exception of three species, all are either new species or have been recently described as new species from the Antarctic. The 'Discovery' brought back fourteen species and the 'Southern Cross' ten, but seven species are common to both collections. The 'Discovery' obtained seven species of the ten collected by the 'Southern Cross.' Eleven species belong to the Hydromedusæ and six to the Scyphomedusæ.

The Hydromedusæ have nine species belonging to the Anthomedusæ and Leptomedusæ, which are usually littoral Medusæ, but the Trachomedusæ and Narcomedusæ, which are generally oceanic Medusæ, are each represented by a single species. The preponderance of littoral over oceanic species is no doubt due to most of the collecting having been done not far from shore.

The nine species belonging to the Anthomedusæ and Leptomedusæ are probably all liberated from hydroids, which have still to be found. In the report on the Hydroids collected by the 'Discovery' Messrs. Hickson and Gravely (1907) draw attention to the fact that out of twenty-three species of Hydroids found in McMurdo Sound not one exhibits free-swimming medusiform gonophores. When we take into consideration the difficulties under which Mr. Hodgson worked, and the very small area of ground scraped by the trawl and dredge, there seem to be good reasons for presuming that more species have still to be recorded.

The Scyphomedusæ are represented by six species, of which two, belonging to *Periphylla* and *Atolla*, have a wide geographical range, and four are at present confined to the Antarctic region.

The reports on the Medusæ collected by the recent expeditions to the Antarctic have now been published, and I give a list of the species found south of latitude 60° S.

'Belgica' Collection. (Maas, 1906.)

Phialidium iridescens, n.sp.

Lat. 70° 21′ S., to 71° 15′ S. Long. 82° 48′ W., to 93° 17′ W. (Four specimens.)

Isonema amplum (Vanhöffen).

Lat. 69° 48′ S., to 70° 49′ S. Long. 81° 19′ W., to 93° 17′ W. (Forty-two specimens.)

Homoenema racovitzæ, n.sp.

Lat. 70° 09′ S. Long. 82° 35′ W. (One specimen.)

Solmundella mediterranea (Müller).

Lat. 69° 48′ S., to 70° 50′ S. Long. 81° 19′ W., to 92° 22′ W. (Twelve specimens.)

Couthouyia, ? sp. [= *Desmonema*].

Lat. 69° 59′ S. Long. 82° 39′ W. (One specimen.)

'Scotia' Collection. (Browne, 1908).

Halicreas papillosum, Vanhöffen var. *antarctica* nov.

Lat. 70° 02′ S. Long. 23° 40′ W. 0–1000 fms. (Two specimens.)

Botrynema brucii, n.g. et n.sp.

Lat. 64° 48′ S. Long. 44° 26′ W. 0–2485 fms. (One specimen.)

Atolla wyvillii, Haeckel.

Lat. 72° 02′ S. Long. 23° 40′ W. 0–1000 fms. (One specimen.)

'Français' Collection. (Maas, 1908.)

Couthouyia gaudichaudi, Lesson. [= *Desmonema gaudichaudi*, Maas.]

About Lat. 65° S. Long. 66° W. (Paris). Off Wandel Island.

Diplulmaris antarctica, n.g. et n.sp.

About Lat. 65° S. Long. 66° W. (Paris). Off Anvers Island.

'Français' Collection. (Bedot, 1908.)

Wandelia charcoti, n.g. et n.sp. [= *Eleutheria charcoti*, Bedot.]
About Lat. 65° S. Long. 66° W. (Paris). Off Wandel Island.

'Gauss' Collection. (Vanhöffen, 1908.)

Lucernaria australis, n.sp.
About Lat. 66° S. Long. 75° E. 385 metres. (One specimen.)

Desmonema chierchiana, Vanhöffen. [= *Desmonema gaudichaudi*, Maas.]
About Lat. 66° S. Long. 89° E. North of Kaiser Wilhelm II. Land.

Diplulmaris drygalski, n.g. et n.sp. [= *Diplulmaris antarctica*, Maas.]
About Lat. 66° S. Long. 89° E. (Several specimens.)

On glancing at the Table given on page 7 to show the distribution of the Medusæ in McMurdo Sound, it will at once be noticed that *Solmundella* was by far the commonest and most abundant Medusa. The number of specimens taken on certain dates shows that it must have been in shoals under the ice. If a Medusa like *Solmundella* was so frequently found in the tow-net, there is no reason for supposing that the net would fail to catch some of the other small Medusæ, if they were present. The regularity of the occurrence of *Solmundella* tends to show that the nets were being properly handled. The only conclusion which I can draw from the Table is that, with the exception of *Solmundella*, Medusæ were very scarce in McMurdo Sound. It is unfortunate that there were not more records for 1902, but it was during that year that Mr. Hodgson was battling with the difficulty of erecting suitable shelters to the holes in the ice, and then he had not found out how to avoid ice crystals in the nets. The crystals played such havoc with the plankton as to practically stop tow-netting.

The failure by Mr. Hodgson to catch *Desmonema*, though its tentacles were occasionally found entangled on the lines, was due to his not being able to use the right kind of net. For large Scyphomedusæ an ordinary plankton tow-net is perfectly useless. A large mosquito net with a mouth at least six feet square or a small otter trawl is required. With a net of that description one stands a chance of securing a specimen, or a bag full if a shoal is met with.

Geographical Distribution.—As Dr. Maas (1906) has given lists of Medusæ recorded for the Arctic and Antarctic regions, there is scarcely need for me to compile another. The conclusion which he arrived at, after fully discussing the distribution problem, is that, so far as Medusæ are concerned, there is no proof that a single species is common to both the Polar regions. With that conclusion I quite agree. It is probable, however, that when we know more about the species of *Solmundella*, *Periphylla* and *Atolla*, one species belonging to each of those genera may be found to extend through the oceans from Pole to Pole.

I now compare the Medusæ collected by the 'Discovery' and 'Southern Cross' with those collected in Stanley Harbour, Falkland Islands, by Mr. Rupert Vallentin.

TABLE SHOWING THE DISTRIBUTION OF MEDUSÆ IN McMURDO SOUND.

Sun below the horizon (March & April 1903 – Aug. 21, 1903).

	1902.						1903.																																						1904.
	Feb.		Aug.		Dec.		March.				March & April.	April.					May.									May & June.	June.			July.		August.				Sept.			Oct.		Nov.		Dec.		Jan.
	19	20	1	8	1	25	12	16	23	27		11	16	23	25	29	5	6	9	10	13	15	18	26	29		1	16	28	13	24	1	13	21	27	7	9	18	2	21	2	5	7	—	4
Margelopsis australis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Catablema weldoni	1	..	..	..	..	..	..	..	..	..	1	1	..	..	1	..	..	..	1	..	..	..	2	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Perigonimus sp.	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..
Koellikeria maasi	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	3	2	4	..	2	6	2	..	..	..	1	1	..	..	..	1	..	..	..	..	..	1	..
Eleutheria hodgsoni	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ptychogena antarctica	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cosmetirella simplex	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cosmetira frigida	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	2	..	..	..	..	..	2	..	1	..	..	..	..	..	..	..	1	..
Pantachogon scotti	..	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	4	..	..	4	..	..	7	..	1	2	..	..	2	..	..	..	..
Solmundella mediterranea	..	..	1	6	..	..	..	2	4	5	..	2	..	2	1	1	3	1	1	1	3	4	16	38	2	24	24	35	1	12	2	11	7	24	9	2	1	17	29	7	11	22	..	..	1
Periphylla dodecabostrycha	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Diplulmaris antarctica	..	..	..	..	..	..	1	..	2	7	2	..	2	6	..	..	..	..	..	..	1	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

1st Feb. 1902 : 'Discovery' arrived at Winter Quarters in McMurdo Sound.
24th March : Ship frozen in.
28th March : McMurdo Sound frozen over.
2nd March, 1903 : Six miles of ice between the 'Discovery' and the open sea.
16th Feb. 1904 : 'Discovery' escaped from the ice and left McMurdo Sound.

In the collection from the Falklands there are seventeen species of Hydromedusæ (for names, see Browne, 1902) belonging to sixteen genera. Not one of these species has yet been found in the Antarctic, and only two of the genera, namely, *Eleutheria* and *Phialidium*, are represented there. Among the Scyphomedusæ the genus *Desmonema* is common to the Magellanic and Antarctic regions, but the species are distinct. *Eleutheria charcoti*, found off the Antarctic continent near Wandel Island (south of the Falklands), is more like *E. hodgsoni* from McMurdo Sound than like *E. vallentini* from the Falklands. If we compare the Antarctic Medusæ with the records (which are still very meagre) from Australia and New Zealand, we find that only one genus (*Margelopsis*) and no species are common to both regions.

The recent Antarctic explorations have produced a fair number of new Medusæ, many of which have well-marked and interesting specific characters, but there are only about three new genera. I expect that ultimately not one of them will remain peculiar to the Antarctic fauna. All the genera, except those recently described, have representatives in other parts of the world, frequently living under totally different conditions and in localities far apart. As the littoral Hydromedusæ of the Antarctic have not yet been found in the Magellanic, South Australian, and New Zealand areas, it looks as if they belonged to an ancient stock which has long been isolated by the Great Southern Ocean from the rest of the world.

Sir John Murray, K.C.B. (1896), says: "In water of a low temperature the metabolism in cold-blooded animals would be much less rapid than in water of a high temperature, and all those changes which result in the evolution of new species would proceed at a much slower rate at the poles than in the tropical belt." If the Medusæ of the Antarctic region have long been isolated, and their evolution has proceeded at a slow rate on account of the coldness of the water, then, when an Antarctic species is compared with another species of the same genus inhabiting warmer water we ought to be able to see a difference and mark the course of evolution. As evolution is proceeding at a much slower rate in cold than in warm regions, the characters of an Antarctic Medusa should be more primitive than those of one from warmer seas.

The following are instances of this primitive condition :—

The genus *Solmundella* has a very wide geographical range, extending from the tropics to the Antarctic. It has only two opposite perradial tentacles, and the genus is descended, without doubt, from a genus which had four perradial tentacles. Beneath the two tentacles there is always a deep groove in the wall of the umbrella. In the Antarctic form there is still a conspicuous groove present in the two perradii without tentacles. The grooves have disappeared from the two perradii without tentacles in the species found off Ceylon. The species from Ceylon has not only lost all traces of the grooves, but in addition has developed about four times the number of sense organs found in the Antarctic species.

A new species of *Sibogita* found in the Antarctic has only four centripetal canals, whereas the other species have eight or more centripetal canals.

The Antarctic species of *Koellikeria* has fewer tentacles, with smaller compound basal bulbs, than are present in the species found in warm water and there are no ocelli. The absence of ocelli is not a characteristic feature of the Antarctic Medusæ, as *Eleutheria* possesses them.

The species of *Desmonema* found within the Antarctic region has about seven very thick tentacles in each group, but the species found in the Magellanic region has as many as sixty slender tentacles in each group.

The new genus, *Cosmetirella*, of the Mitrocomidæ is characterised by possessing no ocelli and no cirri. Their absence shows characters more primitive than are found in the other genera of the family.

Bathymetrical Distribution.—The occurrence of *Periphylla* at the surface on the Antarctic coast shakes my faith in the term "deep-sea" Medusæ, as it is commonly understood. The origin of the name is due to Prof. Haeckel, and is based upon certain Medusæ collected by the 'Challenger.'* It is necessary to remember that the nets used by the 'Challenger' were all open nets. The self-closing net is a later invention, and has not been very extensively used even by recent expeditions. The deep-sea Medusæ have been regarded as permanent inhabitants of the lowest zones of the oceans, living in very cold water and in darkness, and carefully avoiding sunlight and warm water.

Mr. Bigelow (1909) discusses very fully the bathymetrical range of Medusæ, and his conclusions are partly based upon the results obtained by the 'Albatross' in her cruise (1904–5) over the Eastern Tropical Pacific. Both *Periphylla* and *Atolla* were taken by the 'Albatross' within 300 fms. of the surface (one specimen of *Periphylla* was captured within 200 fms. of the surface). Within the area worked over by the 'Albatross' the temperature of the sea at the surface was between 65° F. and 85° F.; at 200 fms. between 48·5° F. and 56·7° F.; at 300 fms. between 42·7° F. and 48·2° F.; and at 400 fms. 41·9° F. and 42·5° F. Bigelow states that "not a single species was taken in hauls below 300 fms. which was not taken in other hauls between 300 fms. and the surface; although the majority of the genera of Medusæ as yet known to belong to the intermediate fauna were taken during the expedition, and several of them in considerable abundance." With regard to the term "intermediate" fauna, Bigelow prefers to adopt "intermediate" in preference to "deep-sea" ("Tiefsee"), as he term is ambiguous from its common application to abyssal bottom animals.

There is good evidence that some of the deep-sea Medusæ extend down to about 1,000 fms., but we do not yet know the depth which they usually frequent. Many more hauls with self-closing nets will have to be taken before we can find that out.

* *Cf.* The *Athenæum* for July 16th, 1881, where the writer (who may safely be supposed, from internal evidence, to have been Professor Moseley) said: "In reality there is no proof that any of the corals came from a greater depth than thirty fathoms. The dredge ranged whilst down from thirty fathoms, or one fathom, or ten fathoms to greater depths; but there is no proof that it did not pick up the corals at the least depth encountered."—Ed.

The occurrence of *Periphylla* at the surface in the Antarctic tends to show that the "deep-sea" Medusæ are lovers of cold water, or, at all events, flourish best at a cool temperature. If the temperature of the water fixes their bathymetrical distribution, then we can account for their keeping below the warm water zones in the tropical and temperate regions. I agree with Bigelow that the term "deep-sea" had better be abandoned, as it is only misleading, especially as the 'Albatross' obtained the majority of the deep-sea genera within 300 fms. of the surface where the temperature was above 42·7° F.

Anatomical Results.—In the Hydromedusan genus *Koellikeria* I have found the interior of the stomach covered with minute endodermal papillæ. Whether these papillæ have the same function as the gastric filaments of the Scyphomedusæ remains to be found out. In the Antarctic species of this genus there are radial grooves in the wall of the sub-umbrella, adjacent to the radial canals. The grooves are lined with columnar ectoderm cells, and evidently from their appearance have a definite function. The Mediterranean species (*K. fascicularis*) has not got these grooves.

The new species of *Sibogita* has its stomach completely converted into a reproductive organ when the gonads attain their full development. The stomach then ceases to function as stomach, and its cavity is filled with endoderm. The gonads are apparently in ectodermal pouches which are embedded in the endoderm, and the pouches have openings to the exterior for the discharge of their contents.

Classification.—The revisions of the old genera and sub-families and the addition of new genera which have come to light during recent years are gradually changing the system of classification as laid down by Prof. Haeckel. Although improvements have been made in some sub-families or groups, others still remain practically in their old condition, mainly through the want of fresh material to work upon.

By means of a new species of *Catablema* in the Antarctic collections I have endeavoured to show that the family Cladonemidæ is no longer required. The chief character which linked together the genera of this family is based upon the tentacles having branches, or filaments, or stalked nematocysts. It has resulted in the bringing together of a number of genera which have no true relationship with one another. The character selected for the family is more suitable for a generic or even a specific character. It is easy to abolish a family and to scatter the genera, but it is very difficult at the present time to assign new places for them, as this involves revision of other families or sub-families.

A new genus (*Cosmetirella*) of Leptomedusæ with open sensory pits led me to examine other genera with similar organs, and I have collected them together under the name of Mitrocomidæ, and have defined the genera.

A new species of the Margelidæ raised difficulties over the old genus *Rathkea*. As a revision of the species could not be satisfactorily accomplished without the use of another generic name, I considered it is best to revive the generic name *Koellikeria* of Agassiz, and thus to obtain a good type species.

In 1908 Prof. Bedot published a description of a new Coelenterate from the Antarctic under the name of *Wandelia charcoti*; with his assistance I have been able to show that it belongs to the genus *Eleutheria*.

I have been able to confirm Dr. Vanhöffen's statement that the tentacles described by Dr. Rennie as belonging to large Antarctic Siphonophores are the tentacles of a *Desmonema*.

HYDROMEDUSÆ.

ANTHOMEDUSÆ.

Family CODONIDÆ.

Margelopsis, Hartlaub, 1897. 1907.

Generic Character.—Codonidæ with four perradial groups of tentacles, each with two or more tentacles; with four radial canals; with gonad encircling the stomach.

Margelopsis australis.

(Plate IV., figs. 6 and 7.)

Description of the Species.—Umbrella bell-shaped, about as broad as high. Ex-umbrella covered with nematocysts which are not arranged in groups. Stomach cylindrical, nearly as long as the umbrellar cavity. Mouth circular. Four radial canals. Gonad completely encircles the stomach and forms a conspicuous globular swelling. Four perradial groups of tentacles, each group containing two small tentacles, placed one behind the other.

Size.—Umbrella about 0·75 mm. in width.

There is only one specimen of this little Medusa in the 'Discovery' collection. It was taken on the 29th May, 1903, in McMurdo Sound. The specimen very closely resembles *Margelopsis hartlaubi*, Browne (1903), which inhabits the fjords of Norway in the neighbourhood of Bergen. I have not succeeded in finding a good reliable character for distinguishing the Antarctic species from *M. hartlaubi*; this is partly due to the minuteness of the specimen, and to its somewhat contracted and crumbled condition.

When the specimens from Norway and the Antarctic are placed side by side they look like two distinct species, but the different appearance is mainly due to the shape of the umbrella, and to the much larger size of the Norwegian specimen.

The ex-umbrella of *Margelopsis hartlaubi* is covered with nematocysts which are grouped together into clusters, each cluster containing about a dozen nematocysts. The ex-umbrella of *Margelopsis australis* is covered with isolated nematocysts which are not arranged in groups. The stomach of *M. hartlaubi* has a very thick quadrangular base, which is situated in the jelly above the top of the umbrellar cavity.

This thick base is apparently absent in *M. australis*, but as the top of the umbrella is crushed in, it is impossible to see every detail clearly.

The arrangement of the tentacles is similar in both species. There are two tentacles, one placed behind the other (Pl. IV., fig. 7), on each of the four perradial bulbs. My figures of *M. hartlaubi* show the tentacles in this position, but I omitted to direct attention to the arrangement of the tentacles in the description of the species. Both species have practically the same kind of basal bulb. The tentacles of *M. australis* are closely contracted, and it is impossible to make out the arrangement of the nematocysts upon the tentacles. This is unfortunate, because if the structure of the tentacles should differ from *M. hartlaubi*, we should have a useful aid towards the determination of the species. I have decided to give the Antarctic *Margelopsis* a specific name because I cannot prove that it is identical with *M. hartlaubi*. One really wants another specimen in far better condition than this to definitely elucidate the specific characters.

The Medusæ which Prof. Dendy (1902) found attached to the Hydroid *Pelagohydra mirabilis*, which was washed up on the coast of New Zealand, probably belong to the medusoid genus *Margelopsis*. As these Medusæ had not detached themselves from the Hydroid and were without gonads, they must be regarded as quite early stages. They have five tentacles on each of the four perradial basal bulbs. These tentacles are arranged in two pairs, one behind the other, with the fifth tentacle by itself on the innermost side of the basal bulb.

Family TIARIDÆ.

Catablema, Haeckel, 1879.

Generic Character.—Tiaridæ with radial canals having lateral branches or diverticula.

The above definition of the genus may be regarded as rather vague, but it can be added to when all the genera and species of the Tiaridæ have undergone a thorough revision. The conformation of the sexual organs has hitherto been used as the chief means of distinguishing the different genera, but I am rather inclined to use the shape of the gonads for one of the specific characters. A new Antarctic species compels me either to omit the gonads from the generic character or to establish a new genus. I prefer, at any rate for the present, to place the new species in the genus *Catablema*. The new species is named after the late W. F. R. Weldon, who was for some years Professor of Zoology in University College, and who gave me my first lessons in this fascinating subject.

One of the characters which has always been associated with the genus *Catablema* is the presence of diverticula on the radial canals; but other species with similar diverticula have been placed in the genus *Turris*, because the conformation of their gonads is not like that in the typical *Catablema*. The type species of the genus *Turris*

is *Turris neglecta*, Lesson (1837), and this Medusa is quite unlike any *Catablema* or *Tiara*. It is generically distinct from *Turris digitalis* of Forbes and from the other species which have been recently added to the genus *Turris*.

In the genus *Catablema* Haeckel placed three species—namely, *C. vesicarium* (A. Agassiz, 1865), *C. campanula*, Haeckel, 1879 (the earlier references to *Medusa campanula* of Fabricius, 1780, are perfectly useless), and *C. eurystoma*, Haeckel, 1877. I think that the above three species may with safety be united under the name of *Catablema vesicarium*. Dr. Maas (1904) has already linked *C. campanula*, Haeckel, to *C. vesicarium*. It is clearly an Arctic Medusa, which occasionally drifts into the North Atlantic. *Catablema weldoni* has radial canals with long blind diverticula, which are simply long lateral canals. It is probable that the very short diverticula present in *C. vesicarium* are rudiments of long lateral canals.

In the genus *Turris* the following species have radial canals with diverticula or a jagged edge: *T. digitalis*, Forbes (1848); *T. coeca*, Hartlaub (1902); *T. pelagica*, Agassiz and Mayer (1902); *T. breviconis*, Murbach and Shearer (1903); and *T. fontata*, Bigelow (1909). I do not intend to attempt a revision of the Tiaridæ now, as it would be no light undertaking, so must leave it for another occasion or for some other student to accomplish.

Catablema weldoni.

(Plate I., figs. 1–5.)

Description of the Species.—Umbrella somewhat bell-shaped, with a rounded summit and thick walls, a little higher than broad. Velum narrow. Stomach large and globular, occupying the upper half of the umbrellar cavity. Mouth large, with four short lips and a closely folded margin. Four broad radial canals; each with about 20 pairs of long diverticula or branches, at right angles to the radial canals, variable in length and shape, and usually branched. Circular canal broad, with a few rudimentary diverticula. Gonads in eight longitudinal rows, extending along the whole length of the stomach, each row consisting of a series of transverse folds. About 24 long tentacles, evenly distributed round the umbrellar margin, each having on the inner side a series of filaments with nematocysts. One small marginal bulb between every two tentacles.

Size.—Umbrella up to 30 mm. in height.

Description of an Early Stage (Plate I., fig. 1).—Umbrella somewhat bell-shaped, with a rounded summit, and fairly thin walls, about as high as broad. Velum narrow. Stomach small and somewhat quadrangular. Mouth with four rather long lips and a slightly folded margin. Four fairly broad radial canals, each with about 16 pairs of short, simple diverticula, variable in length, but not branched. Circular canal rather narrow, without diverticula. Gonads just appearing in small folds along the stomach. Two long, opposite perradial tentacles with filaments, and two very

small opposite perradial tentacles at an early stage of development, with filaments just appearing. Four interradial marginal bulbs and eight adradial bulbs, smaller than the interradial.

Size.—Umbrella about 4 mm. in width and height.

The presence of two long opposite perradial tentacles in the early stage indicates that this Medusa begins its free-swimming career with only two tentacles. The genus *Catablema* is very closely related to the genus *Tiara*. It is known that *Tiara pileata* is liberated from a hydroid belonging to the genus *Perigonimus*, and that on liberation the Medusa has only two opposite perradial tentacles. It is very likely that *Catablema* is also liberated from a *Perigonimus*-like hydroid. The early stages of *Catablema weldoni* were taken in January and June, and the adults during April and May.

The 'Discovery' collection contains nine specimens of this new species, which can be easily distinguished from the others of the genus by the tentacles possessing filaments with nematocysts, and by the length of the lateral diverticula of the radial canals. The specimens all came from under the ice in McMurdo Sound. There are two early stages with four tentacles, and two intermediate stages with 9 and 12 tentacles. The others are adults with 16 tentacles. Only two specimens are in good condition.

The 'Southern Cross' collection possesses ten specimens, all of which are in a very bad and rotten condition. They are solely recognisable by the structure of the tentacles and by the lateral diverticula of the radial canals. These specimens, however, were useful, for some are larger in size and possess more tentacles than those in the other collection. They were all taken at Cape Adare, at the surface and near the beach, on 10th May, 1899. Temperature of the sea, 27° F.

As the stomach is large, its attachment to the roof of the umbrellar cavity is strengthened by "mesenteries." These so-called mesenteries are formed by outgrowths of the stomach along a portion of the radial canals, and consequently the canals leave the stomach not at the top, but laterally. In *Catablema weldoni*, the outgrowths are very short, extending just over the top of the umbrellar cavity, and unless specially searched for are likely to be overlooked. Prof. Haeckel attached importance to the presence or absence of mesenteries in his classification of the Tiaridæ, and included them in the character of the genera. They are not true mesenteries, such as *Ptychogastria polaris* possesses, but simply outgrowths of the stomach, and their extension along the canals depends greatly upon the size and weight of the stomach.

The gonads (Plate I., fig. 5) are arranged in eight straight, adradial, longitudinal rows, which extend along the whole length of the stomach. Each row is composed of many small transverse folds, which bear the generative cells. The arrangement of the gonads in straight rows is only seen in those specimens which have the stomach properly expanded. Two specimens have their stomachs contracted back, and the gonads are curved and thrown back against the top of the umbrellar cavity.

In *Catablema campanula*, Haeckel, the diverticula of the radial canals are short

and dendritic in shape, forming a kind of ornamental border to the radial and circular canals. Haeckel calls these diverticula "leberartigen Canal-Drusen," but there is no evidence that they function as glands. The diverticula of the radial canals in the early stage of *Catablema weldoni* are simply short lateral outgrowths without any branching. In the adult, though some of the diverticula are short and simple, most of them are more or less branched. The mode of branching is, however, very variable, and scarcely two diverticula are alike. It is important to notice that the diverticula are long and that some nearly meet those from the adjacent radial canals; there is no definite arrangement of the diverticula upon the sides of the canals. They are sometimes in opposite pairs, sometimes alternate, and apparently develop wherever there is a sufficient space. In some of the other species of *Catablema* the circular canal has diverticula upon its upper margin, similar to those upon the radial canals. In *Catablema weldoni* the diverticula of the circular canal have disappeared, and their former presence is just indicated by a few minute vestigial outgrowths.

The most interesting feature of this Medusa is the presence of filaments (Plate I., fig. 4) along the inner side of all the tentacles. The filaments are closely packed together, forming a kind of frill which extends along nearly the whole length of the tentacle, being absent from the basal portion only. The crowding together of the filaments, so as to form thick dense masses, depends entirely upon the contraction of the tentacle. In a semi-contracted tentacle the filaments are about four deep, transversely, and when the tentacle is closely contracted they are denser still. In a fully-expanded tentacle the filaments are probably arranged in a single or double row, and then they should somewhat resemble the appearance of the filaments on the tentacle of *Ctenaria ctenophora*. In some of the specimens, owing to great shrinkage, the tentacles have the appearance of long narrow ribbons, with one edge lined with filaments.

The state of preservation of the specimens is not good for minute histological details, but is sufficiently so to show that the filaments are composed of ectoderm cells. The filaments are solid, and have a central strand of mesoglaea. They are capable of a certain amount of expansion and contraction. There is no visible evidence that the endoderm of the tentacle enters the filament. Sections through the tip of a filament show that it contains numerous very minute nematocysts.

The tentacles are frequently very long; some measure 60 to 80 mm. in length, and are by no means fully expanded. They are hollow and well supplied with ectodermal muscle fibres.

The basal bulbs of the tentacles are laterally compressed and curve over the thick margin of the umbrella. There is not the slightest indication of a pigment spot on the basal bulbs, nor of any other kind of sense organ. Between every two tentacles there is a small marginal bulb, which is probably capable of developing a tentacle when another is needed.

One specimen has nine long tentacles, with a small bulb in between every two

tentacles on the one half of the umbrellar margin, and on the other half only twelve small bulbs. Another specimen has one short tentacle and five bulbs close together in one quadrant, and the other three quadrants are without tentacles, bulbs, or a circular canal. These specimens are either congenitally abnormal, or else in the process of repairing serious injuries. The latter specimen has every appearance of having lost the greater portion of its original umbrellar margin, and the wound seems to have healed up. The former probably lost one half of its tentacles and has begun to develop a fresh set.

There is an interesting abnormality in one specimen. From one of the radial canals, not far from the top of the umbrellar cavity, hangs down an extra stomach with a mouth. The stomach has the shape of a slender tube, and bears a few genital folds. The mouth is fairly large for the size of the stomach, and its margin is folded.

A large Amphipod belonging to the genus *Hyperia* was found inside the umbrellar cavity of two specimens.

Perigonimus. sp. ?

In the 'Discovery' collection there are four specimens of a little Medusa which looks like a very early stage of a *Perigonimus*. They are all about the same age and have not been long liberated from their hydroid. The shape and structure of the tentacles are not in favour of this Medusa being a very early stage of *Catablema*.

Description.—The umbrella is about 1 mm. or less in length and width, with a small conical process on the summit. The stomach is short, and the mouth has four little lips. Four radial canals. The gonads have not begun to develop. There are two long, opposite perradial tentacles, with large tapering basal bulbs. Two very small, opposite perradial and four very small interradial tentacles.

Family BYTHOTIARIDÆ (Maas, 1905), Bigelow, 1909.

Genus Sibogita, Maas, 1905.

sens. em.

Generic character.—Bythotiaridæ with four perradial canals; with four or more centripetal canals, which may either remain blind canals, or join the radial canals (when the latter have the appearance of being branched), or join the base of the stomach.

Mr. Bigelow (1909) has recently emended Maas' original definition of the genus, so as to be able to include within the genus a new species called *Sibogita simulans*, found in the Tropical Pacific between Panama and Chatham Island, and also in the Behring Sea; and another new species called *S. nauarchus*, found in the Gulf Stream off the North American coast. I now find it necessary to slightly alter Bigelow's definition of the genus for the admittance of a new Antarctic species, named *Sibogita borchgrevinki*, in honour of the leader of the 'Southern Cross' Expedition to the South Pole. I think it is advisable to leave the structure of the gonads out of the generic

definition, and instead of saying "numerous" centripetal canals, to fix the number at four or more.

The type species of the genus *Sibogita* is *S. geometrica*, Maas. This Medusa, according to Maas' figure, certainly has the appearance of possessing radial canals with lateral branches, as stated by Maas, and there is no indication of the lateral branches being really centripetal canals, which originate from the circular canal and afterwards join the radial canals.

It was my intention to place the Antarctic species in a new genus, but Mr. Bigelow's account of the development of the canal system of *Sibogita simulans* has led me to place the new species in the genus *Sibogita*. I believe that Mr. Bigelow is right in associating his two new species with the genus *Sibogita*, especially as the tentacles and the umbrella are similar to those of the type species.

The two specimens of *Sibogita simulans* collected in the tropical Pacific have eight adradial blind centripetal canals, but the single specimen from the Behring Sea is older than those two and has twelve centripetal canals, which all unite with the base of the stomach. In *S. nauarchus* the centripetal canals are more numerous and are all blind. *Sibogita borchgrevinki* has only four centripetal canals, which may or may not unite by lateral branches with the base of the stomach.

In the species described by Dr. Maas and by Mr. Bigelow the gonads are transversely folded, and occupy the whole space between the perradii. The gonads of the new Antarctic species are distinctly peculiar, as they are in pockets, and the whole stomach is converted into a reproductive organ.

Sibogita borchgrevinki.

(Plate II., figs. 1–5.)

Description of the Species.—Umbrella ovoid, a little higher than broad, and very thick. Velum narrow. Stomach about one-third the length of the umbrellar cavity, somewhat conical, tapering slightly towards the mouth, and with four perradial ridges. Mouth with four small lips and the margin slightly folded. Four perradial canals, and four interradial centripetal canals. The latter may or may not unite with the cruciform base of the stomach. Gonads (male) in pockets and embedded in the wall of the stomach, with definite openings to the exterior. About sixteen fairly long, hollow, smooth tentacles, each with a large terminal bulb containing nematocysts.

Size.—Umbrella 15–18 mm. in width and 20 mm. in height.

Three specimens of this interesting Medusa were taken at the surface during November 1899 at Cape Adare by the 'Southern Cross' Expedition. The specimens are in very good condition, but all have the margin of the umbrella so very much contracted that it was necessary for examination to cut it into pieces. Two of the specimens are fully ripe males, and the third specimen has shed its gonads.

The jelly of the umbrella is not only very thick, but very firm. There is no apical depression in the wall of the umbrella, as found in *S. nauarchus*. The margin of the umbrella is divided by grooves, which are opposite the tentacles, into small lobes.

The mouth has four short perradial lips, and the margin is arranged in slight folds. Just inside the mouth there are four interradial, endodermal processes somewhat triangular in shape. On the closing of the mouth these processes meet and close the entrance to the stomach. One specimen is, however, abnormal, and its mouth has seven pointed lips. It has five longitudinal ridges on the stomach.

The most interesting features in this Medusa are the gonads and their position with regard to the stomach. The stomachs of two specimens were cut into transverse sections. One series (Plate II., fig. 4) shows ripe spermaries, and the spermatozoa in the process of being discharged; the other series (Plate II., fig. 5) shows the condition of the stomach after the gonads have been discharged.

On the outside of the stomach there are four perradial longitudinal bands (fig. 2) which slightly project as ridges. Inside each ridge runs a canal-like cavity lined with endoderm (fig. 4). These canals branch out from the interior of the "mesenteries," and are in direct communication with the top of the stomach and also with the radial canals. They run down the wall of the stomach nearly to the mouth, and there terminate blindly, without any communication with the exterior.

Between the perradial bands on the outside of the stomach there are numerous small holes (fig. 2). The shape of the holes varies in the different specimens, and they may be either circular, oval, or somewhat quadrangular. The holes are arranged in a single row on both sides of the perradial bands, and a few occupy the interradial spaces in the upper part of the stomach. Within these holes, or protruding from them, is a whitish flocculent substance, which is composed of spermatozoa.

The sections show very clearly that the growth of the gonads has converted the stomach into a reproductive organ, and that its function as a stomach has ceased. There is practically no cavity for the reception and digestion of food, for although a very small cavity does exist in the centre of the stomach (fig. 4), it is not in communication with the mouth. In the lower part of the stomach the endoderm forms a solid mass in the centre.

The spermaries form globular or spherical masses encased in a very thin membrane which lies next to the endoderm of the stomach. The endoderm, stained with hæmatoxylin, in the sections, has the appearance of a mosaic pavement in different tints of blue. The cells have not a well-defined wall and are filled with a rather dense homogeneous cytoplasm. The preservation is not good for cytological details, and it must be borne in mind that the specimens were merely preserved for the determination of the species.

It is unfortunate that there are no intermediate stages of this Medusa in the collection for the elucidation of the development of the gonads. The four perradial

longitudinal canal-like tubes, which run along the stomach, are probably the four corners of an ordinary quadrilateral stomach which has become nearly blocked up owing to the growth of the gonads. I do not think that they are permanent canals, like the radial canals, but rather spaces in the stomach which have not become filled up with endoderm. At the same time it is possible that they might be used as channels for the conveyance of nutriment to the developing gonads.

Although the gonads have every appearance of being next to the endoderm, without the intervention of a layer of mesoglæa, and without a trace of ectoderm, still there is no evidence that they are of endodermal origin. The gonads are shut off from the endoderm by a very thin delicate membrane which may be a layer of mesoglæa. As the gonads are fully ripe they have probably in the course of development absorbed all the adjacent ectoderm cells. The position of the ripe gonads is certainly peculiar, and a few young and intermediate stages were much wanted for tracing the development.

The sections of the stomach belonging to the specimen which has shed all its gonads are also of interest. The positions of the shed gonads are marked out by spaces, which are either straight simple cavities or tubular cavities more or less curved (fig. 5). These cavities are lined with a well-marked ectoderm which has apparently developed after the shedding of the gonads. The new ectoderm is continuous with the old ectoderm on the outside of the stomach.

The specimen which has quadrangular holes alongside the perradial ridges has somewhat the appearance of having its gonads arranged in short, transverse folds, as described in the other species of the genus. But it is after all only an external resemblance.

The four perradial canals are in direct communication with the stomach through the interior of the "mesenteries" upon which the stomach is suspended, and which form its cruciform base. The four interradial canals have no direct communication with the stomach. They run nearly the whole length of the sub-umbrellar cavity. Some terminate at their proximal end, i.e., nearest to the top of the umbrellar cavity, either in a straight point, or in slight diverticula (fig. 2), without any communication with the stomach or the perradial canals. In this condition they have every resemblance to long centripetal canals which develop direct from the circular canal.

A few of the interradial canals at their proximal ends do communicate with the perradial canals by means of irregular branches. There is either a single branch running to one of the adjacent perradial canals, or two opposite branches running to both the adjacent canals. The union with the perradial canals is at the point where the "mesenteries" are about to becomes radial canals. In one specimen none of the interradial canals show any connection with the perradial canals. But in another specimen three of the interradial canals have a connection by means of an irregular branch or branches.

In the distal half of the umbrella the perradial and interradial canals are alike in size and appearance, but in the proximal half the interradial canals are thinner and more slender than the perradial. It is evident that the connection between the interradial and perradial canals is very slight, and probably takes place late in life. The main current from the stomach to the circular canal runs through the perradial canals. From the general appearance of the interradial canals I am inclined to the view that they originate as centripetal canals and that some of them make a union with the perradial canals or the base of the stomach. One specimen shows a slight variation by the presence of two centripetal canals in one quadrant.

There are about sixteen tentacles; eight of which are opposite the radial canals, and one is usually present between every two canals. Two specimens have in addition a few very minute tentacular processes, which are evidently tentacles in an arrested state of development. The tentacles (Plate II., fig. 3) are about 10 mm. in length and, although hollow, have rather a stiff appearance. At the distal end there is a large hollow bulb, the ectoderm of which is thickly packed with nematocysts. The basal portion of the tentacles lies in a little groove formed in the margin of the umbrella, and the basal bulb is inconspicuous, just a slight enlargement. One abnormal tentacle with two terminal bulbs was seen; the extra bulb being on a short lateral branch not far from the distal end.

There are no indications of any sense organs upon the margin of the umbrella.

Sibogita borchgrevinki may be distinguished from the other species of the genus by the structure of its gonads, and by the presence of only four (interradial) centripetal canals.

Family MARGELIDÆ.*

Genus Koellikeria, L. Agassiz, 1862.

Rathkea (partim), Haeckel, 1879.

Rathkea, Maas, 1905.

Generic Character.—Margelidæ with four perradial and four interradial groups of tentacles; and with four branched oral tentacles.

The genus *Rathkea* was instituted by Brandt (1838) for *Oceania blumenbachi*, Rathke, 1835. This is the type species of the genus, and unfortunately it has been inadequately described and badly figured. According to Rathke's figure the Medusa has eight radial canals, eight groups of tentacles, each group having three tentacles. The mouth is shown in a crude drawing which is difficult to interpret. Haeckel, however, defines the genus *Rathkea* with only four radial canals, and suggests that the other four (interradial) canals in Rathke's figure are probably radial muscle bands. *Rathkea blumenbachi* was found near Sevastopol, in the Black Sea, and since Rathke described it, no one else has again recorded it.

* This form of the family name has the sanction of custom only, to which it has been agreed to defer.—Ed.

Another species placed by Professor Haeckel in the genus *Rathkea* is *Cytæis octopunctata* of Sars (1835). This species is fairly well known and has been found in the Arctic regions and in the North Atlantic, along the coast of North America, and also along the coast of Europe, from Norway to about as far south as the English Channel. There is no evidence that the species occurs in the Mediterranean. *Cytæis octopunctata* belongs to the genus *Margellium* Haeckel. It has four radial canals, eight groups of tentacles, and a peculiar mouth. The mouth has the appearance of possessing four perradial tentacles, each of which is distally bifurcated and terminates with a small globular cluster of nematocysts. These are not true tentacles, but simply the four corners of the mouth stretched out so as to resemble stalks. The clusters of nematocysts are really on the margin of the mouth and there is no mistaking their position when the mouth is seen wide open.

Rathkea fasciculata (Péron, 1809) is the third and last species mentioned by Prof. Haeckel. This species is well known and has been described and figured by Gegenbaur (1856), by Keferstein and Ehlers (1862) under the name of *Lizzia koellikeri*, and by Leuckart (1856) under the name of *Bougainvillia koellikeri*. It was originally named by Péron *Melicerta fasciculata*, and was transferred by L. Agassiz (1862) to a new genus called *Koellikeria*, because *Melicerta* was a pre-occupied name. This Medusa has four radial canals, eight groups of tentacles on the margin of the umbrella, and four perradial oral tentacles which are very much branched. The oral tentacles arise a little way from the margin of the mouth, which has four lips without any clusters of nematocysts upon them. The species is confined to the Mediterranean, and is well known at Naples by the name of *Lizzia koellikeri*.

I do not think that *R. blumenbachi* belongs to the same genus as *R. fascicularis*, as Rathke's drawing of the mouth does not represent branched oral tentacles, such as *R. fascicularis* possesses. It is also necessary to bear in mind that Rathke figured eight radial canals.

For the classification of the Margelidæ it is necessary to know not only the number of groups of marginal tentacles, but also whether the species has definite oral tentacles (which may be branched or unbranched) or only clusters of nematocysts on the margin of the mouth. Under the circumstances I think it is best to give *Rathkea fascicularis* another generic name, and to place *Rathkea blumenbachi* on the dormant list until we really know something more about it. There is not much to be gained by retaining a badly described type species, as it only leads to confusion.

I think it will be an advantage to use in future the name *Koellikeria* for the genus, and then *fascicularis* will become the type species. To this genus should be transferred *Rathkea octonemalis*, Maas (1905), found at Ternate, and *Lizzia elegans*, Mayer (1900), found off Tortugas, Florida. I am also rather inclined to include *Chiarella centripetalis*, Maas (1897). *Chiarella* is distinguished from the other genera of the Margelidæ by possessing a double bundle of tentacles in each of the eight groups, and by having interradial extensions of the circular canal, but these are almost too slight to be called

centripetal canals. The characters selected for the genus would make very good specific characters. *Chiarella centripetalis* was found by Agassiz in the Gulf of California.

Koellikeria maasi.

(Plate IV., fig. 1–5.)

Description of the Species.—Umbrella very thick, a little higher than broad, with a rounded summit. Stomach fairly large, cross-shaped, and internally covered with papillæ. Four oral tentacles, each of which is many times dichotomously branched. Four broad radial canals. Gonads separated perradially into four masses, which cover very nearly the whole wall of the stomach. Eight groups (four perradial and four interradial) of marginal tentacles, each group containing seven tentacles, of which the central tentacle is the largest. Compound basal bulbs of the tentacles very inconspicuous. Ocelli absent.

Size.—Umbrella up to 9 mm. in width and 10 mm. in height.

Description of an Early Stage (Plate IV., fig. 1). Umbrella moderately thin, without a mass of jelly above the stomach and slightly higher than broad. Stomach small and cross-shaped, about one-third the length of the umbrellar cavity. Four oral tentacles, each of which is 2–3 times dichotomously branched. Four fairly broad radial canals. Eight groups of marginal tentacles, each group containing three tentacles, of which the central one is the largest. Umbrella about 1·5 mm. in width.

It is a pleasure to me to associate this new species with the name of Professor Otto Maas.

There are twenty-four specimens of this Medusa in the 'Discovery' collection. The specimens, especially the larger, were difficult to examine, owing to the contraction of the umbrellar margin and to its curling far up into the interior of the umbrellar cavity. For the drawing (fig. 2) of the adult several specimens were used. Its outline may not be quite correct when compared with a living specimen. It shows, however, the characters of the species.

The specimens were taken from May to December, 1903. As the early, intermediate, and adult stages occurred during May, and different stages of development during the other months, it is probable that the Hydroid has no definite breeding period.

The stomach in transverse section has the shape of a cross, and is attached at its base to the radial canals. Its interior is covered with minute endodermal papillæ (0·1 to 0·3 mm. in length), which are formed by outgrowths of the wall of the stomach. A series of sections, from a specimen which happened to be in a fair state of preservation, shows that the cells of the papillæ are similar to those which form the endodermal wall of the stomach (fig. 5). Along the centre of the papilla runs a slender strand of mesoglæa, which is in continuation with the mesoglæa between the ectoderm and endoderm in the wall of the stomach.

One of the intermediate stages has its mouth widely expanded, so that a good view is obtained of the interior of the stomach. The papillæ are arranged in longitudinal rows, which are interradial and adradial in position. The interradial papillæ are a little longer than the adradial ones, and evidently were the first to develop. In the adult the papillæ have the appearance of being rather irregularly scattered over the stomach, but they are not present in the perradial portions. The papillæ extend only over the areas occupied by the gonads. As these papillæ are simply outgrowths of the wall of the stomach, their function is probably digestive. After finding papillæ in this species I examined specimens of *Koellikeria* (*Rathkea*) *fascicularis* (Péron) and found the stomach well covered with them. I do not think that papillæ have hitherto been recorded inside the stomach of any Hydromedusæ, but on account of their minuteness they may easily have been overlooked.

The oral tentacles in the youngest stage of the series are three to four times dichotomously branched, and the number of branches increases with age. The adult has its oral tentacles at least seven times dichotomously branched. The branching is sometimes irregular, and a semi-contracted oral tentacle has a tree-like appearance. The distal branches all terminate with a small cap containing nematocysts.

The radial canals are broad and are adjacent to the ectodermal lining of the sub-umbrella. The ectoderm cells opposite the radial canals are quite different in shape and appearance from the flat epithelial cells which form the sub-umbrellar lining. They are distinctly columnar (fig. 4) and project out so as to give a jagged outline, and are, moreover, within a well-marked groove, which runs along the whole length of the umbrellar cavity. I have not seen these grooves with specialised columnar cells in any other Medusa, but owing to their minuteness they are not easily detected, except in transverse sections. There are also indications of columnar cells forming a narrow interradial line, about three cells wide, but here the groove is absent.

The gonads practically cover in an even layer (fig. 5) the whole outer wall of the stomach, but they are divided into four separate masses by very narrow perradial bands of ectoderm which are completely free from genital cells.

The number of tentacles in each of the eight groups depends upon the growth and age of the individual. The youngest specimens of the series have three tentacles in each group, and the large adults have seven (fig. 3), which is probably the maximum. The number of tentacles in the perradial and interradial groups are frequently the same, but not always. One large adult has seven tentacles in the perradial groups and five in the interradial (fig. 2). Among the intermediate stages specimens occur with five tentacles (perradial groups) and three (interradial groups). In each group of tentacles the central tentacle is always the largest, and the central perradial tentacle is larger than the central interradial tentacle. The difference in the size of the tentacles is due to a difference in age. The central tentacle in each group is the first to appear, and as the central perradial tentacles are the largest, the Medusa,

on liberation from its Hydroid, either has only four perradial tentacles or eight (four perradial and four interradial) tentacles. The tentacles which appear later develop in pairs and in the order shown by these figures—4, 3, 2, 1, 2, 3, 4. Some of the specimens have the groups of tentacles quite close together, which gives the appearance of the tentacles being uniformly distributed round the margin of the umbrella; but their position is entirely due to the contraction and shrinkage of the jelly, and this is especially noticeable in the specimens preserved in alcohol. The tentacles are solid, and the endodermal core is in direct contact with the endoderm of the circular canal. The lower side of the basal portion of the tentacles in each group is covered with a layer of ectoderm containing nematocysts. There is no well-marked, conspicuous compound basal bulb common to each group of tentacles, such as occurs in *Margelis* or *Chiarella*. The tentacles in a semi-contracted condition show at their distal ends conspicuous circular bands of nematocysts (fig. 3), but these bands seem to disappear when the tentacles are fairly well expanded, and the nematocysts become evenly distributed. There is not the slightest trace of ocelli at the base of the tentacles.

Family CLADONEMIDÆ.

Prof. Haeckel, in 1879, collected together various genera of Anthomedusæ having either tentacles with branches, or tentacles bearing appendages armed with nematocysts, or tentacles provided with stalked cnidophors, and placed them in the family Cladonemidæ. The character of the family has remained practically unaltered to the present day, but the genera have slightly increased in number and have been revised and re-classified by Mr. R. T. Günther (1903) and by Dr. Hartlaub (1907), who adopts Mr. Günther's classification of the genera.

The Cladonemidæ are divided into two sub-families:—

1. Pteronemidæ with unbranched tentacles having filaments with nematocysts, or tentacles armed with cnidophors.

   Genera—*Pteronema, Zanclea, Halocharis, Mnestra, Ctenaria.*

2. Dendronemidæ, with branched tentacles; one branch terminating in a sucker or adhesive disc, the other branch or branches provided with batteries of nematocysts.

   Genera—*Eleutheria* (*Clavatella*) *Zancleopsis, Cladonema, Dendronema.*

In accordance with the classification at present in vogue for the Anthomedusæ, the new Antarctic Medusa which I have described under the name of *Catablema weldoni* on page 13 should have been described as a new genus of the Cladonemidæ and not placed in the genus *Catablema* of the Tiaridæ. Although this Medusa has tentacles which bear appendages or filaments armed with a terminal battery of nematocysts, I do not consider that it has any connection with the Cladonemidæ. The structure of the gonads, the basal bulbs of the tentacles, and the mouth are

distinctly of the type belonging to the Tiaridæ. To place *Catablema weldoni* among the Cladonemidæ because of the presence of filaments upon the tentacles when all its other characters are distinctly those of the Tiaridæ would, in my opinion, be wrong.

Placed among the Cladonemidæ is the remarkable *Ctenaria ctenophora* of Haeckel. It has filaments upon the tentacles somewhat similar to those of *Catablema weldoni*; but it has an important character, namely, the presence of oral tentacles round the mouth, a character which alone should be sufficient to place it in the family Margelidæ.

The genus *Zanclea*, sometimes called *Gemmaria*, which is the generic name of its Hydroid, has tentacles provided with cnidophors situated on very fine thread-like, contractile stalks. These are not at all like the filaments on the tentacles of *Ctenaria* or *Catablema weldoni*. The Hydroid *Gemmaria* belongs to the Syncorynidæ, and there is no reason, so far as I can see, why *Zanclea* should not be placed among the Codonidæ, not far away from the genus *Sarsia*, which is connected with the Hydroid *Syncoryne*.

Pteronema is one of Prof. Haeckel's genera and its two species have not been recorded since they were first described. *Pteronema darwini* has radial canals with short diverticula, like those of a *Catablema*, so it may turn out to be one of the Tiaridæ.

Mnestra is a curious parasitic Medusa. As the cnidophors on the tentacles are much like those of *Zanclea*, it may belong to the same family.

Halocharis is a Hydroid genus belonging to the Syncorynidæ, but its Medusa is not known.

In the second sub-family, the Dendronemidæ, there are three important genera :— *Eleutheria*, *Cladonema* and *Dendronema*. Both *Cladonema* and *Dendronema* have oral tentacles round the mouth, a character also belonging to the Margelidæ.

Eleutheria, better known under the name of *Clavatella*, is usually associated with *Cladonema* on account of both having suckers on the tentacles. The suckers are specialized organs which have arisen and been perfected by a change in the habits of the Medusæ belonging to these two genera. Suckers also occur in certain genera belonging to the Trachomedusæ. *Eleutheria* is distinctly a crawling Medusa, and its habits are not like those of *Cladonema*, which is an active swimmer, and only uses its suckers for attachment. Except for the presence of suckers, there is nothing in common between *Eleutheria* and *Cladonema* to justify their being placed in the same family.

Zancleopsis is a new generic name for *Gemmaria dichotoma* of Dr. Mayer (1900), and it is evidently an early stage without gonads.

It seems to me that the characters selected to distinguish the Cladonemidæ from the other great families (Codonidæ, Tiaridæ, and Margelidæ) of the Anthomedusæ are more suitable for generic or specific characters, as they are based upon the structure of the tentacles. Moreover, the structure of the tentacles does not belong to one

definite type, but to three distinct independent types, as found in *Zanclea*, *Ctenaria*, and *Cladonema* respectively.

Genus Eleutheria, de Quatrefages, 1842.

This genus is better known to English zoologists by the name of *Clavatella*, through Hincks's description of *Clavatella prolifera*, which had, however, been previously described by de Quatrefages under the name of *Eleutheria dichotoma*. The Medusa has normally six tentacles, each of which is bifurcated. The upper or outer branch of the bifurcation terminates with a large cluster of nematocysts, and the lower branch ends with an adhesive disc or sucker, by means of which the Medusa is able to crawl about sea-weeds at the bottom of rock-pools.

A second European species is recorded under the name of *Eleutheria claparedii*. It differs from *E. dichotoma* in having both branches of the tentacles terminating with clusters of nematocysts. It is quite probable that it is only an abnormal form of *E. dichotoma*, with some nematocysts in the adhesive discs.

Another species of this genus inhabits Stanley Harbour, Falkland Islands. A single specimen was found there by Mr. Rupert Vallentin in 1898, and I described it under the name of *Eleutheria vallentini*. In 1900 Mr. Vallentin obtained some more specimens which have not yet been described. This species has twenty-four tentacles, each of which is bifurcated. The upper branch bears a terminal cluster of nematocysts, and, in addition, two to three clusters along the upper side, and occasionally a cluster on the lower side. The other branch of the bifurcation has an adhesive disc. The finding of an *Eleutheria* in the Falklands was of considerable interest, because the genus had been previously known only to Europe.

In 1908 Prof. Bedot published a Paper bearing the title "Sur un Animal Pélagique de la Région antarctique," and the animal was named *Wandelia charcoti*. It was taken off Wandel Island, lat. 65° S., long. 66° W. (Paris), by the 'Français' Expedition. The specimens, as the figures show, were in a very fragmentary condition. Although Prof. Bedot felt sure that the animal was not the remains of a Siphonophore, he was uncertain about its position amongst the Coelentera.

At first I did not recognise the animal, but on a second reading a picture of an *Eleutheria* came into my mind. As there was nothing in the description or figures to render the idea an impossible one, I wrote to Prof. Bedot. I suggested that his remarkable animal might possibly be an *Eleutheria*, and sent him the original drawings of *Eleutheria vallentini* for comparison. Prof. Bedot most kindly sent me specimens of *Wandelia* for examination, and I, in return, sent specimens of *Eleutheria hodgsoni*. We both came definitely to the conclusion that *Wandelia* was undoubtedly an *Eleutheria*.

The condition of the specimens of *Wandelia* was so bad that without a good clue it was practically impossible to associate the animal with an *Eleutheria*. I was

able to provide this clue by means of my figures of *Eleutheria vallentini*, but they have not yet been published, and only a preliminary description of the Medusa has been printed. To any one who has seen either specimens or drawings of *Eleutheria vallentini* or *E. hodgsoni* it would be fairly easy to identify the genus.

Eleutheria charcoti, now called by its rightful name, is, I consider, a new species, and is distinguished from *E. vallentini* and *E. hodgsoni* by the radial canals having slender lateral branches with a tendency towards anastomosis. As I have compared Prof. Bedot's figures with the original specimens, I must say that his drawings are of the greatest accuracy, even to the minutest details.

The largest specimens of *Eleutheria* in the 'Discovery' collection have 20 to 32 tentacles, and in general appearance closely resemble the species from Falkland Island. Each tentacle is bifurcated, the upper branch has clusters of nematocysts and the lower is provided with a terminal adhesive disc. There are more clusters of nematocysts, and their position upon the branch is different from that of *E. vallentini*, but similar to that in *E. charcoti*. They are arranged laterally along the branch, *i.e.* at right angles to the clusters of *E. vallentini*.

There are also other characters, which will be mentioned later on, showing that the *Eleutheria* in the 'Discovery' collection is specifically distinct from the one found in the Falklands. The two Antarctic species are more closely related to one another than to *E. vallentini*.

I have much pleasure in associating the new Antarctic *Eleutheria*, brought home by the 'Discovery,' with the name of Mr. T. V. Hodgson, whose perseverance and energy under the most trying conditions have led to a very considerable advance in our knowledge of the marine fauna of the Antarctic region.

Our knowledge of the habits of *Eleutheria* is almost entirely based upon *Eleutheria dichotoma*, which only moves about by crawling, and is apparently incapable of propelling itself through the water. There is no evidence that it uses its tentacles for swimming, and its umbrella is far too much reduced for that purpose. Mr. Vallentin saw the Falkland *Eleutheria* alive, and states in his notes that it is able to swim at a fairly respectable pace by means of its tentacles, which rapidly open and close, and so in a manner the Medusa rows itself along. But it evidently prefers to crawl amongst seaweed, for Mr. Vallentin writes in his notes, "These ambulatory gonozooids appear to live on a fine weed which is uniformly spread over the bottom of the harbour. The gonozooids are always on the move, crawling in and out of the fine filaments and twisting themselves into the most peculiar shapes as they slowly progress through the miniature tangled forest."

Mr. Hodgson informed me that he caught his specimens in a tow-net, which was left all night over the stern of the 'Discovery.' The ship was at anchor and swung with the tide.

Eleutheria hodgsoni.

(Plate III., figs. 1–4.)

Description of the Species.—Umbrella rudimentary, and reduced to a nearly flat circular disc, 1·5 to 2 mm. in diameter. Velum very broad, covering the whole of the under side of the umbrella. Stomach conical, partly projecting through the aperture of the velum. Mouth small and circular. Radial canals eight in number and very short. Gonads surrounding the stomach. Tentacles twenty to thirty-two, each of which is bifurcated close to the basal end; the upper arm bears five to six pairs of lateral clusters of nematocysts and a terminal cluster; the lower arm, without clusters of nematocysts, terminates in an adhesive disc, or sucker. On the under side of the basal portion of the tentacles is situated a thick pad of nematocysts, and on the upper side, close to the ex-umbrella, a conspicuous reddish-brown ocellus is present.

The 'Discovery' collection contains six well-preserved specimens of this interesting Medusa. They were taken on 20th February, 1902, ten days after the ship had taken up her position for the winter, and a month before she was frozen in.

The youngest specimen of the series is about 1 mm. in diameter, with the gonads just visible. It has eleven radial canals, and nineteen tentacles in various stages of development, seven of which are tiny buds. The other specimens are much older and approach nearer to the adult stage.

Notes on the Specimens.—The umbrella is rudimentary in the sense that it has completely lost its function as a swimming organ owing to the almost complete disappearance of the umbrellar cavity. A reduction in the length of the umbrella has taken place, and this gives it the appearance of its being flattened out. The velum is very broad and covers the whole of the lower side of the umbrella, and its aperture fits tight round the conical stomach. In nearly all the specimens the velum is close against the sub-umbrella, and in this position it is not at once recognised. The largest specimen has its velum more expanded and curved outwards, so that a space is clearly visible between the velum and the wall of the sub-umbrella. This space represents the umbrellar cavity, and is, I believe, used as a brood pouch for the development of the ova up to the planula stage.

The stomach has the shape of an inverted cone, and when expanded projects through the aperture of the velum. At the apex of the cone is a small circular mouth. The radial canals (fig. 2) are variable in number. Three specimens have eight canals, and three specimens have six, ten, and eleven canals respectively. The canals are very short, extending from the base of the stomach, across the top of the sub-umbrella, to the circular canal. According to Mr. Vallentin, the Falkland species has four radial canals.

The gonads form a continuous ring round the stomach and are extended into seven or eight swellings. Sections of one specimen show that each swelling contains a large ovum, which is absorbing the small surrounding germinal cells. There are no

visible signs of Medusa-buds in any of the specimens, and, if this species does reproduce asexually, then some buds should be present in the young stages. It is quite probable that only *Eleutheria dichotoma* in this genus has Medusa-buds.

The number of the tentacles increases with age, and they are closely packed together round the margin of the umbrella. It is very likely that the number of tentacles present when the Medusa is liberated from its Hydroid corresponds to the number of radial canals, one tentacle being opposite each canal. The tentacles opposite the radial canals in the later stages have their ocelli further in from the margin (Plate III., fig. 2), indicating that they are the oldest of the series. Each tentacle is bifurcated or branched, and the bifurcation is visible soon after the first appearance of the tentacle. The upper branch comes off close to the umbrella, and, when fully developed, is provided with ten to twelve clusters of nematocysts arranged laterally in pairs, and a terminal cluster of nematocysts is also present. When the branch is expanded (Plate III., fig. 1) the clusters are far apart and form an alternating series, but in a contracted branch (fig. 4) their arrangement is pinnate. It is by the position of these clusters of nematocysts that this species can be easily distinguished from *Eleutheria vallentini*, which has two or three clusters on the upper (aboral) side, and occasionally one on the under side. The lower branch of the bifurcation is without clusters of nematocysts, and it terminates in a slight enlargement, the adhesive disc or sucker, which is composed of specialised ectoderm cells. The tentacles are hollow and the endodermally lined lumen extends along both the branches. The basal portion of each tentacle is covered on its under side with an extra thick layer of ectoderm containing nematocysts (Plate III., fig. 3), but there is no enlargement of the nature of a basal bulb. Both *Eleutheria dichotoma* and *E. vallentini* have a continuous band of nematocysts round the margin of the umbrella. This band is absent from *E. hodgsoni*, but it is represented by isolated patches of nematocysts on the basal portion of the tentacles.

LEPTOMEDUSÆ.

Family LAODICIDÆ.

Ptychogena, A. Agassiz, 1865.

Generic Character.—Laodicidæ with four radial canals; with a central stomach and mouth; with the basal bulbs of the tentacles without ocelli (Browne, 1907).

Ptychogena antarctica.

(Plate II., figs. 6–9).

Ptychogena antarctica, Browne, 1907, p. 474.

In my preliminary notes on the 'Southern Cross' Hydrozoa I alluded to this Medusa under the name of *Laodice*. Later on, when I revised the Laodicidæ, it was placed in the genus *Ptychogena*, and a brief description of the species was given.

The 'Southern Cross' collection contains three specimens, taken at Cape Adare. The largest is in a mutilated condition, having a clean-cut hole through the centre of the umbrella. The stomach and mouth have completely disappeared, and so also have the proximal ends of the gonads, but the margin of the umbrella is in good condition. The two other specimens are intermediate stages in bad condition.

The 'Discovery' collection also contains a mutilated specimen, which was taken in McMurdo Sound on 27th March, 1903, through one of the holes in the ice.

Description of the Adult.—Umbrella slightly convex, and thick, about four times as broad as high. Velum broad. Four radial canals with sinuous margins in the gonadal regions, but without conspicuous lateral diverticula. Gonads large and broad, arranged in lateral and transverse folds, and extending over nearly the whole length of the radial canals. Tentacles long and slender, about 300, with a reddish pigment in the endoderm, and with laterally compressed basal bulbs. One long club-shaped cordylus between every two tentacles.

Size.—Umbrella up to 60 mm. in diameter.

Notes on the Specimens.—The 'Discovery' specimen shows that the gonads extend from the base of the stomach nearly to the circular canal. They are arranged in a series of lateral folds, along both sides of the radial canals, and form a closed tube. There is no evidence of a mouth extending over and along the gonads, a character which distinguishes *Staurophora* from *Ptychogena*. The radial canals of *Ptychogena antarctica* have not the conspicuous lateral diverticula of *P. lactea*. In the proximal part of the canals there about two very short irregular diverticula, but the margins of the canals are of a rather irregular wavy nature, so that the pinnate arrangement of the gonads, conspicuous in *P. lactea*, is absent in this species.

The tentacles are closely packed together round the margin of the umbrella, and are like long, slender threads, some of which measure 40–50 mm. in length. The endoderm of the tentacle, including the basal bulb, contains a dark reddish pigment (in formalin). Sections show that the pigment is in minute globules, either isolated or grouped in clusters. The ectoderm of the tentacle is thick, and composed of many layers of very small cells, amongst which are numerous long slender nematocysts, about 15 μ in length. The nematocysts frequently congregate in clusters or layers adjacent to the mesoglæa, and look in that position just like spicules. The basal bulbs of the tentacles are laterally compressed (Pl. II., fig. 8) and the upper (aboral) side of the bulb is arched, but when viewed from the aboral side, the basal bulbs look long and tapering (Pl. II., fig. 7).

The cordyli are long and club-shaped (fig. 9), and are situated on the margin of the umbrella close to the velum. There is usually only one cordylus between every two tentacles. The cordyli are without pigment. Some of the cordyli possess just a few nematocysts similar to those in the tentacles. I have not noticed nematocysts in a cordylus before, but here at any rate is an exception to the rule. Haeckel (1882) in his description of *Ptychogena pinnulata* states that the cordyli appear chalk-white in

reflected, black in transmitted light. I noticed that a few of the cordyli of *Ptychogena antarctica* were chalk-white, and this conspicuous whiteness was also present in patches on the surface of some of the gonads. I am unable to explain the cause of the whiteness, but it is evidently due to minute particles, which are perhaps products of the decomposition of the endoderm. The white cordyli mounted in balsam show no cellular structure, but seem to be simply masses of granules.

The two intermediate stages in the 'Southern Cross' collection taken on 19th May, 1899, are in a bad condition. Their connection with the large specimen, mentioned above, was traced by the shape of the basal bulbs of the tentacles and by the presence of the long club-shaped cordyli. The umbrella has the appearance of being hemispherical in shape, and measures about 25 mm. in width. The margin of the umbrella is crowded with tentacles, the number of which is estimated at about one hundred. Long cordyli were found between some of the tentacles, but not between every two tentacles. Their scarceness is no doubt due to the condition of the specimens. The better of the two specimens shows the gonads with the characteristic folds and a stomach. Unfortunately the stomach and gonads are compressed into a flat mass and matted together. Dissection could only be incompletely carried out owing to the rotten condition of the tissues. There is every appearance of a large central stomach, which hangs down in the umbrellar cavity, and a large mouth with a folded margin. The gonads extend along the radial canals from the base of the stomach nearly to the circular canal. The radial canals can be traced up to the centre of the umbrella, where they meet, and probably the stomach hangs down from them.

Mr. Borchgrevink may have alluded to this species in his book "First on the Antarctic Continent," p. 125: "10th May, 1899. In the forenoon I had discovered a small white clear jellyfish with a distinct blue cross in it." The gonads of the two intermediate stages showed a deep bluish-black colour when, some years ago, I first examined them; but now the colour has changed to a dark brown (in alcohol).

The single specimen in the 'Discovery' collection is in a fairly good state of preservation, but is mutilated and out of shape. It was useful for the description of the gonads, which are fairly perfect in this specimen and contain large ripe ova. The umbrella is rather thin, and is about 35 mm. in diameter.

Ptychogena antarctica is distinguished from *Ptychogena lactea* by the absence of the conspicuous diverticula on the radial canals, and by the colour of the tentacles, which are red.

Mr. Bigelow (1909) described a new species—*P. erythrogonon*, from the eastern tropical Pacific (between Galapagos Islands and Callao). It has well-marked specific characters, possessing a very thick globular umbrella and about 80 tentacles. Its coloration is a very brilliant brick-red.

Family MITROCOMIDÆ (Haeckel, 1879), Torrey, 1909.

Character of the Family.—Leptomedusæ with open sensory pits on the velum, containing otocysts.

In the summer of 1908, I began a revision of the Leptomedusæ with open sensory pits, but circumstances arose which compelled me to lay aside the work before the critical examination of the species was finished, and even now it must be deferred for another communication. Prof. Maas, in 1893, practically laid the foundation of the family, which he called the Lafoeidæ; but I agree with Mr. Torrey (1909) that Mitrocomidæ is a better name to use, and it was that which I was going to adopt. The hydroid genus *Lafoea* has no connection with the Medusæ belonging to the Mitrocomidæ. Messrs. Maas and Torrey include the genus *Halopsis* in the family with open sensory pits, but in the descriptions given by Prof. Agassiz (1865) and Mr. Fewkes (1888) of *Halopsis ocellata*, which is the type species of the genus, no mention is made of the sense organs being open pits. Before *Halopsis* can be included among the Mitrocomidæ the structure of the sense organs must be re-investigated.

The family consists of the following genera:—*Cosmetirella*, *Cosmetira*, *Tiaropsis*, *Mitrocomella* and *Mitrocoma*. I give the characters of the genera and just mention the species, but some of the latter have not been critically examined.

Cosmetirella.

Generic Character.—Mitrocomidæ with four radial canals; with eight sensory pits; without marginal cirri; and without ocelli adjacent to the sense organs.

This new genus is established to receive a new Antarctic species, described on p. 34, under the name of *Cosmetirella simplex*. This genus corresponds to *Phialella* among the Eucopidæ. The only real difference between *Cosmetirella* and *Phialella* is that the former has open sensory pits, and the latter closed sensory vesicles.

Cosmetira (Forbes, 1848), Hartlaub, 1909.

Generic Character.—Mitrocomidæ with four radial canals; with eight sensory pits; with marginal cirri.

The type species of the genus is *Cosmetira pilosella* (Forbes). It was originally described by Forbes under the name of *Thaumantias pilosella*, and he proposed *Cosmetira* as a sub-generic name. He never mentioned the existence of sense organs, which I found some years ago, when (1896) I temporarily placed the species in the genus *Euchilota*, which has closed sensory vesicles and belongs to the Eucopidæ. Subsequently I noticed that the sense organs were open pits, and realised that the species would have to be removed to another genus, for which I selected Forbes' name of *Cosmetira*.

Not long ago Professor Hartlaub informed me in a letter that he had obtained a new Medusa from Norway with open sensory pits, but thought, after all, that it must be *Thaumantias pilosella* of Forbes. An exchange of letters and specimens proved that the specimens were *Thaumantias pilosella*, and Prof. Hartlaub adopted the name *Cosmetira* for the genus.

Cosmetira pilosella is a very common Medusa during the summer months on the British coasts, and occasionally it occurs in vast shoals.

The Medusa described by Prof. Maas (1893) under the name of *Halopsis megalotis* belongs to this genus.

I have also placed provisionally in this genus a new Antarctic species called *Cosmetira frigida*, a description of which is given on p. 35.

Tiaropsis, Agassiz, 1849.

Generic Character.—Mitrocomidæ with four radial canals; with eight sensory pits; with an ocellus adjacent to each sense organ; without marginal cirri.

This is the oldest genus of the family, and contains about six species. Mr. Torrey (1909) has recently split the genus into two. For the species with tentacles which are all alike the old name *Tiaropsis* is retained, but for those species with two kinds of tentacles, large and small (some of which are no doubt young stages), he proposes a new genus called *Tiaropsidium*. The one character common to all the species, and it is a conspicuous character, is the presence of a definite ocellus adjacent to the sensory pit. I consider that it is best to keep all the species with this character together, and that another genus is not really wanted. I must leave for another occasion the critical examination of the species, which are at present as follows: *Tiaropsis multicirrata* (M. Sars), 1835, *T. diademata*, Agassiz, 1849, *T. mediterranea*, Metschnikoff, 1886, *T. rosea*, A. Agassiz and Mayer, 1889, *T. punctata*, Mayer, 1900, *T. davisi*, Browne, 1902, and *T. kelseyi* (Torrey), 1909.

Mitrocomella, Haeckel, 1879.

Generic Character.—Mitrocomidæ with four radial canals; with sixteen sensory pits; with marginal cirri.

This genus probably contains only a single species, namely, *M. polydiadema* (Romanes), 1876, which has been found on the coasts of the British Isles and Norway. On a casual examination it is easy to mistake this Medusa for *Cosmetira pilosella*, unless the number of sense organs be counted. I think the species described by me in 1903 under the name of *Mitrocomella fulva* had better be placed as a synonym of *M. polydiadema*.

Mitrocoma, Haeckel, 1864.

Generic Character.—Mitrocomidæ with four radial canals, with numerous open sensory pits, with marginal cirri.

This is the type genus of the family and contains four species, namely, *M. annæ*, Haeckel, 1864, *M. minervæ*, Haeckel, 1879, *M. mbengha* [sic], Agassiz and Mayer, 1899, and *M. discoidea*, Torrey, 1909.

Cosmetirella simplex.

(Plate I., fig. 6-8.)

For the generic characters, see p. 32.

Description of the Species.—Umbrella hemispherical, a little broader than high, and fairly thick. Velum narrow. Stomach quadrilateral and short. Mouth with four small lips having a slightly folded margin. Four radial canals. Gonads linear or cylindrical, extending over the central third of the radial canals. Thirty-two or more tentacles, having rather large conical basal bulbs, and usually a tentacular bulb between every two tentacles. Eight adradial sensory pits on the velum, containing several otocysts.

Size.—Umbrella up to 7 mm. in width and 6 mm. in height.

Three specimens were taken by the 'Discovery' amongst pack ice in lat. 66° 52′ S., long. 178° 15′ E. on 3rd January, 1902. One of them is at an intermediate stage of development, and has nineteen fully formed tentacles and about as many tentacular bulbs or tentacles in the process of development.

In the 'Southern Cross' collection there are two specimens which were taken at Cape Adare on 27th November, 1899. In my preliminary report upon the collection I mentioned these specimens under the name of *Phialidium*, and also stated that the marginal sense organs were not visible. They were visible, but I did not recognise them owing to the invisibility of the otocysts, which had lost their refrangibility in formalin.* After finding the sense organs in the 'Discovery' specimens, and thus knowing exactly what to look for, I again examined the 'Southern Cross' specimens and found the sensory pits.

The 'Southern Cross' specimens are similar to those in the 'Discovery' collection, except that the tentacles are very much longer and have larger basal bulbs, and the velum is a little broader.

There is a specimen in the 'Discovery' collection taken under the ice in McMurdo Sound on 16th March, 1903. It has evidently undergone a considerable amount of contraction and shrinkage, as the umbrella has become a flat disc about 7 mm. in diameter. There are forty-nine tentacles and thirteen sensory pits. The sensory pits are irregular in position, and their number in each quadrant is 4, 4, 3, 2 respectively. The gonads are large, cylindrical in shape, and look about ripe. It may be the fully grown adult of this species with an abnormal number of sense organs.

Another specimen in the 'Discovery' collection was taken during May, 1903. The umbrella is about 8 mm. in height and 5 mm. in width. The specimen is in

* This is a fact about the use of formalin which is new to me, and should, I think, be noted.—Ed.

formalin and shows no sign of shrinkage, but the length and narrowness of the umbrella are no doubt due to contraction at the moment of death. The stomach is very short and quadrilateral. The gonads contain fairly large ova and are evidently about ripe. They occupy the central third of the radial canal and are cylindrical in shape. The curious feature of this specimen is that it has only three little degenerate-looking tentacles. The margin of the umbrella looks quite perfect and shows no signs of damage. There are eight sensory pits, two in each quadrant. Although the margin looks perfect, yet it has an unnatural appearance. The presence of one interradial and two perradial tentacles, without any marginal bulbs, rather indicates that the normal course of development has not taken place.

Localities.—'Discovery' Coll.; 3. ix. 02; Lat. 66° 52′ S., long. 178° 15′ E. 'Discovery' Coll.; 16. iii. 03 and May, 1903; Winter Quarters, McMurdo Sound. 'Southern Cross' Coll.; 27. xi. 99; Cape Adare; Surface temp. 28° 9′ F.

Cosmetira frigida.

For the generic characters, see p. 32.

In the 'Discovery' collection there are several specimens of a Leptomedusa with tentacles, cirri, and traces of open sensory pits. All the specimens are in bad condition and it is impossible to give a satisfactory account of them, or a trustworthy drawing. As the exact number of sense organs remains unknown, this species is placed provisionally in the genus *Cosmetira*.

Description of the Species.—The umbrella is probably hemispherical in shape, with fairly thin walls. The largest specimen measures about 7 mm. in height and 10 mm. in width. The stomach is fairly large, with a cross-shaped base attached to the radial canals. The mouth is large and its margin is slightly folded. Four broad radial canals and a broad circular canal. The gonads extend along nearly the whole length of the radial canals, but not over the proximal and distal ends of the canals. They are band-shaped and hang down in folds. There are about thirty-two tentacles, fairly long and covered with transverse rows of nematocysts. Their basal bulbs are long, hollow and tapering, and slightly compressed laterally. Between every two tentacles there are numerous long cirri, some of which are situated on the side of the ex-umbrella, just a little way above the margin. The cirri have a minute, oval, terminal cluster of nematocysts.

The above description is based upon the best specimen, in which sense organs could not be detected. But three smaller specimens, which evidently belong to the same species, do show sense organs. They are open sensory pits with the aperture situated upon the inner side of the velum. The species has probably eight sense organs, which from their size should contain several otocysts.

There are four other specimens which may belong to the same species. They have smaller tentacles and basal bulbs, and their gonads are over the outer half of the radial canals. They also have cirri and open sensory pits.

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TRACHOMEDUSÆ.

Family TRACHYNEMIDÆ.

Genus Pantachogon, Maas, 1893.

Generic Characters.—Trachynemidæ with numerous similar tentacles; with gonads extending along the radial canals, and separated from the stomach by a short interval.

Pantachogon scotti.

(Plate III., figs. 5 and 6.)

Description of the Species.—Umbrella hemispherical, a little broader than high, and fairly thin. Velum very broad. Stomach very small, roundish, and not on a peduncle. Mouth with four short lips. Eight very narrow radial canals. Gonads long, extending over the proximal two-thirds of all the radial canals, and separated by a short interval from the stomach. Tentacles all alike, very short and numerous, about fifteen in each octant.

Size.—Umbrella up to about 4 mm. in diameter.

The 'Discovery' collection contains twenty-five specimens of this little Medusa. They were all taken from under the ice in McMurdo Sound from May to December.

It was not until after much consideration that I decided to place this new species, which is named in honour of the leader of the 'Discovery' Expedition, in the genus *Pantachogon*. The type species of the genus is *Pantachogon haeckeli*, Maas (1893), which has gonads distributed at intervals along the whole length of the radial canals. Another species is *P. rubrum*, Vanhöffen (1902), which has gonads upon the outer half of the radial canals. The new species has its gonads upon the proximal part of the canals, where they form a continuous band. There is a difference in the structure of the gonads compared with the type species, but I am rather inclined to regard this difference as a specific character. I think it is best to leave the new species in the genus *Pantachogon* until better specimens have been examined and the sense organs found.

The shape of the umbrella in most of the specimens is somewhat plano-convex, and, I believe, the shape is due partly to the shrinkage of the jelly and partly to the curling inwards of the margin of the umbrella. The drawing of fig. 5 is based upon a single specimen which is in fairly good condition.

Some of the specimens show a saucer-shaped depression at the apex of the umbrella, just over the top of the stomach. I am not sure whether the depression is a natural one or the result of shrinkage. There appears, however, to be a decrease in the thickness of the jelly above the stomach. Several specimens have a ring-shaped stomach, and the shape is due to the contracting back of the wall of the stomach. The

position of the gonads upon the radial canals is slightly variable. Some specimens have the gonads extending over the proximal half of the canals, and others over the central third portion of the canals. There is always a space between the stomach and the gonads, so that the species cannot be placed in the genus *Isonema* of Maas, which has the gonads adjacent to the stomach.

One specimen still retains most of its tentacles, but the other specimens have, as usual, lost their tentacles, and only the stumps remain. The tentacles are long and thread-like, and have more the appearance of long cirri. They are too macerated for a detailed description of their structure. Sense organs were searched for, but not found.

NARCOMEDUSÆ.

Family ÆGINIDÆ (Gegenbaur, 1856), Maas, 1904.

Solmundella (Haeckel, 1879), Maas, 1904.

Generic Character.—Æginidæ with two tentacles, and with a stomach having eight pouches.

Prof. Vanhöffen (1908), in his revision of the Narcomedusæ, recognises only one species for the genus, namely, *Solmundella bitentaculata* (Quoy et Gaimard), 1833. Under that name all the *Solmundellæ* taken by the 'Valdivia' on her long cruise (1898–1899) in the North Atlantic, South Atlantic, Antarctic, and Indian Oceans have been placed.

Prof. Maas, on the other hand, recognises two species, *S. bitentaculata* and *S. mediterranea* (Joh. Müller), 1851. The latter species Maas (1906) has also recorded from the Antarctic, where it was taken by the 'Belgica.'

The differences between the two species, according to Maas, are the shape of the umbrella, colour, and the number of sense organs. *S. bitentaculata* has a rather high conical umbrella, with its apex above the exit of the tentacles, and the fully grown adult has sixteen to thirty-two sense organs. *S. mediterranea* has a rather flat-topped umbrella, not usually extending above the level of the exit of the tentacles, and the sense organs do not exceed eight in number.

Dr. Bigelow (1909) points out that the number of sense organs would be the best character to select for the distinction of the two species. *S. bitentaculata*, however, passes through a stage with eight sense organs, and the number increases with age, so that at an early stage it resembles *S. mediterranea*.

I became familiar with *S. bitentaculata* in Prof. Herdman's collection of Medusæ from Ceylon, and after a prolonged second examination of the *Solmundellæ* in the 'Discovery' collection, I came to the conclusion that *S. mediterranea* is a distinct species. About twenty of the largest adult specimens in the 'Discovery' collection were specially examined for the number of sense organs. I could not find more than eight, and they are distinctly adradial. *S. bitentaculata* of a similar size would have

at least double the number of sense organs. I could not find a single specimen in the collection with the characteristic conical umbrella of *S. bitentaculata*. *S. mediterranea* is a colourless Medusa, and Mr. Hodgson informed me that the 'Discovery' specimens were colourless when alive. *S. bitentaculata*, on the other hand, has reddish gonads and tentacles, but the colour disappears after preservation.

Solmundella mediterranea.

Æginopsis mediterranea, J. Müller, 1851, p. 272, Taf. XI.; Leuckart, 1856, p. 33, Taf. II.; Metschnikoff, 1874, Bd. xxiv., p. 26, Taf. IV.; Haeckel, 1879, p. 352; Lo Bianco, 1904, p. 56, Taf. XXXV., fig. 142.
Solmundella mediterranea, Maas, 1906, p. 12, Taf. I. (fig. 5), Taf. III. (figs. 23, 24).
Solmundella muelleri, Haeckel, 1879, p. 352.
Solmundella henseni, Maas, 1893, p. 55, Taf. V., fig. 11.

The 'Discovery' collection contains about 300 specimens of this species, but only a few are in a satisfactory condition, and all are more or less contracted. It was by far the commonest Medusa in McMurdo Sound. In 1903 specimens were taken from the middle of March throughout the Antarctic winter up to the beginning of November. Young and adult stages frequently occurred together, and apparently the Medusa has no definite breeding season.

In the 'Southern Cross' collection there are three specimens of *Solmundella*, which no doubt belong to this species. They were taken at Cape Adare on 10th May, 1899.

The umbrella is a little broader than high, with a rather flat top, about on a level with the exit of the tentacles. The umbrella of the largest specimens measured 7 mm. in diameter. Over the ex-umbrella there are scattered many small clusters of cells, which are especially noticeable near the margin of the umbrella. These are ectodermal cells containing many well-defined granules, and amongst these cells are generally a number of nematocysts.

There are four peronial grooves in the wall of the umbrella. The groove below each tentacle is of the normal type, but the groove in each of the perradii without tentacles is in a rudimentary condition. Prof. Maas (1905), p. 72, figs. 74 and 75, mentions and figures slight peronial grooves in the perradii without tentacles in *S. bitentaculata*, taken by the 'Siboga' expedition in the East Indies, and he includes the presence of four radial grooves in the generic character. The specimens which I examined of the same species taken off Ceylon (Browne, 1905, p. 153) did not show a groove in the perradii without tentacles.

The Antarctic specimens have very conspicuous grooves in the perradii without tentacles. The grooves cut deep into the jelly at the margin of the umbrella, but the length and depth of the groove show a considerable amount of variation. The peronial band in each of the perradii without tentacles, after running alongside the sub-umbrella turns off at the level of the stomach to the ex-umbrella, where there is

a small funnel-shaped pit, which, like the groove, shows a fair amount of variation. This pit is probably a vestige of the upper part of the peronial groove. The existence of a peronial band and of the vestiges of a peronial groove in the perradii without tentacles marks the former existence of tentacles in those perradii, and shows that *Solmundella* is descended from a Medusa which had four perradial tentacles.

The gonads are usually confined to the pouches of the stomach. In one specimen, however, the gonads extend over the lower part of the stomach, nearly up to the circular mouth. Many of the specimens of *S. bitentaculata* from Ceylon had gonads on the lower wall of the stomach, as well as on the walls of the pouches.

The two tentacles are of the normal type, and are long, four to seven times as long as the diameter of the umbrella. None of the specimens possessed tentacles exceeding 40 mm. in length.

The margin of the umbrella was invariably curled up, and had to be unfolded or cut off for the examination of the sense organs. Not a single specimen examined possessed more than eight sense organs. There are four very minute interradial bulbs on the margin.

Distribution.—S. mediterranea, as its name implies, occurs in the Mediterranean, and it is also widely distributed over the Atlantic (Maas, 1893). It is recorded by Maas (1906) for the Antarctic. About a dozen specimens were taken by the 'Belgica' about lat. 70° S., long. 81° to 90° W. They were mostly larval stages, but one adult, 3 mm. in diameter, was also found. Dr. Fewkes (1886) recognised from a sketch a *Solmundella* which was taken in Discovery Harbour, lat. 81° 44′ N., long. 64° 45′ W. As one is not likely to be led astray over even a rough drawing of a *Solmundella*, the record shows that *Solmundella* extends from Pole to Pole.

SCYPHOMEDUSÆ.

INCORONATA.

Family LUCERNARIIDÆ.

Genus Lucernaria, O. F. Müller, 1776.

In the 'Southern Cross' collection there are two fine specimens of a *Lucernaria*, which were dredged off Cape Adare at the depth of 28 fathoms on 9th January, 1900. Both specimens are in a contracted condition, and it was necessary for the determination of the specific characters and for the investigation of the internal anatomy to cut them longitudinally in half.

When Prof. Haeckel (1881) described *Lucernaria bathyphila*, he pointed out that the reproductive organs had lobed sacs and branched hollow spaces, and that in this respect the species differed from the other *Lucernariæ*. He was rather inclined to make it a type of a new genus, for which he proposed the name *Lucernosa*.

In 1892 Dr. Antipa described three new species from the Arctic Ocean, and on account of their having gonads in tubular follicles he adopted Haeckel's name *Lucernosa* for the genus. The species with gonads of a simple structure are left in the old genus *Lucernaria*, and those with a compound structure placed in the genus *Lucernosa*. The new species from the Antarctic belongs to the latter group, owing to the structure of its gonads.

I am not in favour of the splitting up of the species into two genera solely on account of the structure of the gonads, especially as the structure of the gonads of *L. bathyphila* forms a connecting link between *Lucernaria campanula* and *Lucernaria vanhoeffeni* and also Antipa's species. The Arctic species of *Lucernaria* and *Lucernaria bathyphila* found in deep water, 540 fms., between Faroe Islands and Shetland Islands, are all of great size, and in this respect the new Antarctic species can take its place along with them.

Prof. Vanhöffen (1908) has described a new species of *Lucernaria* under the name of *L. australis*, which was found at the 'Gauss' winter station off the Antarctic continent at the depth of 385 metres (about 210 fms.). Unfortunately, only a single specimen was obtained, and this turned out to be an early stage without gonads. It is not likely to be an early stage of *L. vanhoeffeni*, because it has minute rudimentary tentacles, called "conuli" by Vanhöffen, one about midway between every pair of arms, and in addition there is no indication of a definite peduncle.

Lucernaria vanhoeffeni.

(Plates V., figs. 3–6, and VII., figs. 3 and 4.)

Description of the Species.—Umbrella campanulate, about as high as broad. Peduncle very short, expanding into a very large, broad, flat, adhesive disc; one chambered, with four interradial tæniolæ terminating in bulbous enlargements without muscles. Eight arms, about equal distances apart, with the four perradial bays about as wide and deep as the interradial. Each arm with about 300 tentacles, the exterior row of which has lateral adhesive pads. Stomach short, and containing branched filaments. Mouth with large leaf-like lips. Eight longitudinal bands of genitalia, extending from the stomach to the base of the arms; each genitalium composed of numerous elongated sacs which have tubular follicles containing gonads.

Size.—About 60 mm. in height (including peduncle) and 60 mm. in width.

It is a pleasure to me to associate this new species with the name of Prof. Ernst Vanhöffen.

Owing to the contraction of the arms the umbrella has lost to a slight extent its natural shape. The sub-umbrellar cavity is large and spacious. The walls of the umbrella are rather thin and have the appearance of being very pliable. The ex-umbrella is covered with a thick layer of ectoderm which is opaque and white in formalin.

The peduncle (Plate V., fig. 3) is remarkable for its shape. It is flattened out

into a very broad adhesive disc, by which the animal fixes itself to the bottom of the sea. There is no true stalk, and only a narrow constriction separates the umbrella from the adhesive disc. The peduncle is hollow and consists of one single chamber, which is partly filled up with the bulbous enlargements of the four tæniolæ. The internal longitudinal muscle bands of the tæniola terminate at the constriction, and do not proceed into the peduncle itself. In the peduncle the tæniolæ are wholly gelatinous, as in *Lucernaria campanulata*. The jelly or mesoglæa on the bottom of the peduncle and of the tæniola is permeated by small branched canals which come from the hollow chamber. The ectodermal surface of the peduncle is divided up into numerous small lobes and irregular folds, which are flattened out on the side used for attachment.

The mouth has a large, thin, leaf-like margin which is beautifully arranged in folds. It opens through a small constricted œsophagus into the stomach, which is rather small for the size of the umbrella, and is well packed with gastric filaments. The funnel cavities are large and penetrate about half the length of the stomach. The gastric filaments are very much crowded together on the tæniolæ. As a rule they are branched close to their base, and occasionally near their distal ends. They have the appearance of flat slender ribbons, about 5 to 10 mm. in length.

The arms are short and thick, and are about equal distances apart. Upon each arm is situated a large oval cluster of short capitate tentacles, the number of which is estimated up to about three hundred. The capitate apex of the tentacle is crowded with long nematocysts. The tentacles forming the outer row, on the ex-umbrellar side, are provided with a lateral adhesive pad (Plate V., fig. 4), and some of the tentacles in the second row have also similar pads. *Lucernaria campanulata* has adhesive pads of similar structure on the tentacles occupying the same position as those of *Lucernaria vanhoeffeni*.

The gonads extend from the stomach to the base of the arms, forming fairly broad bands. Each band consists of a large number of elongated sacs (Plate V., fig. 5). Transverse and longitudinal sections were cut of the sacs, but only a diagram (Plate V., fig. 6) of their structure is given, as the preservation was too bad for the drawing of an actual section. Each sac consists of a large number of little branched or unbranched tubes, lined with endoderm and separated from one another by mesoglæa. All the tubes are connected with a main duct, which runs the whole length of the sac and opens at one end to the exterior. The blind end of the tubes is blocked with cells, amongst which small ova are clearly visible. It is amongst these cells at the end of the tubes that the gonads develop, and when the ova reach a certain size they pass down the tubes into the main duct which opens into the gastric pouch. In the male the small tubes are not so well defined. There are masses of sperm mother-cells, which are connected with tubes leading into a large broad duct filled with spermatozoa. The structure of the gonads of *Lucernaria vanhoeffeni* is similar to that described by Antipa for *L. walteri*.

The eight narrow longitudinal muscle bands lie close to the interradial septa; each pair forming nearly parallel bands along the greater length of the umbrella, but diverging near the umbrellar margin to enter the arms. A circular marginal muscle band, divided into eight segments by the arms, is also present. The interradial septa do not extend quite to the umbrellar margin, and the space left forms an opening which places the gastric pouches in communication with one another.

The smaller specimen of the two, about 40 mm. in diameter, is abnormal. It has only seven arms, six longitudinal bands of gonads, and three septa. This individual probably received an injury, early in life, near one of the interradial septa, and the new growth has not taken the normal course. One arm is smaller than the others, with smaller and fewer tentacles, and this arm is next to where the missing arm should be. Here a septum is missing, and it is replaced by a tæniola, which runs along the whole length of the umbrella and is covered along its whole length with gastric filaments. The two bands of gonads are also missing on the injured side.

Lucernaria vanhoeffeni has certain characters in common with *L. campanulata*, the well-known British species, which occurs widely in Europe. The lateral adhesive discs on the outer row of tentacles, the absence of muscles in the tæniolæ within the peduncle, and the arrangement of the arms on the umbrellar margin, are common to both species. The shape of the peduncle distinguishes *L. vanhoeffeni* from the other species of the genus.

CORONATA.

Family PERIPHYLLIDÆ (Haeckel, 1880), Vanhöffen, 1902.

Genus Periphylla, Steenstrup, 1837.

(sens. emen. Vanhöffen, 1892; Maas, 1904.)

Generic Characters.—Periphyllidæ with four interradial sense organs; with 12 tentacles (three between every two sense organs); and with 16 marginal lobes.

Periphylla dodecabostrycha.

Chrysaora dodecabostrycha ?, Brandt, 1838, p. 387, Taf. XXIX., fig. 30.
Periphylla dodecabostrycha,* Haeckel, 1880, p. 421.
Periphylla mirabilis, Haeckel, 1880, p. 422; *id.*, 1881, p. 54, Taf. XVIII.–XXIII.; *id.*, 1882, p. 64, Pls. XVIII.–XXIII.
Periphylla dodecabostrycha, Vanhöffen, 1892, p. 10, Taf. II., fig. 1; Maas, 1897, Taf. XI., fig. 1; Mayer, 1906, p. 1136, Pl. III., figs. 5, 6.

In the 'Southern Cross' collection there are five specimens of *Periphylla*, which were found either at the surface or in less than 6 fathoms of water off Cape Adare in

* Prof. Haeckel had no authority to write Brandt's name as he did; *Dodecabostrycha* is (see Brandt, p. 387) one of the three sub-genera of *Chrysaora*, and the following is an exact transcript: "3. Art.? *Chrysaora* (*Dodecabostrycha*?) *Dubia*."—Ed.

December, 1899, and January, 1900. The ice was then breaking up and departing from the coast. The temperature of the sea at the surface was 29° to 30° F. These specimens were evidently ruined by bad storage. It is sad to see large specimens in such an unsatisfactory condition, especially when the correct determination of the species is of importance.

The 'Discovery' obtained a single specimen on 1st August, 1902. It was captured by hand in McMurdo Sound. This specimen also got broken into pieces.

The occurrence of *Periphylla* at or near the surface in the icy Antarctic region is very interesting, because it is not a surface-seeking Medusa in the Atlantic or Pacific, but prefers to inhabit the intermediate and deeper zones of those oceans. I have but little doubt, from the appearance and condition of the internal organs, that these specimens were alive and in healthy condition when taken out of the sea; and that they were not dying specimens, as Vanhöffen has suggested, or ones washed up from the depths of the Antarctic Ocean.

Haeckel, from the material collected by the 'Challenger,' described and figured in great detail two new species of *Periphylla*, namely, *P. mirabilis*, of which a single specimen was taken in lat. 40° 28′ S., long. 177° 43′ E. (off the east coast of New Zealand); and *P. regina*, a single specimen of which was found south-west of the Kerguelen Islands (lat. 62° 26′ S., long. 95° 44′ E.).

Messrs. Maas and Vanhöffen recognise three species of *Periphylla*, namely, *P. hyacinthina*, Steenstrup, *P. dodecabostrycha* (Brandt), and *P. regina* (Haeckel).

Periphylla mirabilis is considered by Maas (1897) and by Vanhöffen (1902) to be identical with *P. dodecabostrycha*.

According to Prof. Haeckel's description and figures, the rhopaliar pedalia of *P. mirabilis* are shorter than the tentacular ones. It seems to me that he has divided the rhopaliar pedalia into two parts by a transverse groove. In the 'Challenger' type specimen of *P. mirabilis* the groove is more like a crease on the surface of the jelly than a natural groove. If one disregards this crease, then the rhopaliar pedalia are longer than the tentacular pedalia, and are similar in shape to those on the specimens in the two Antarctic collections, and also similar to the pedalia of *P. hyacinthina* (Haeckel, 1880, Taf. xxiv.).

The 'Challenger' type specimen of *P. regina* in the British Museum consists of a few fragments. From a scientific point of view these fragments are of little value, and can now be looked at only as objects of historical interest.

The description and figures of *P. dodecabostrycha*, as first given by Brandt (1838), are based upon a large specimen about 200 mm. in length and width. The specimens taken by the recent exploring expeditions have usually been small ones, not larger than 27 mm. in height and 18 mm. in width. Mr. Bigelow (1909) has put forward good reasons for regarding the small specimens of *P. dodecabostrycha*, described by Messrs. Mass and Vanhöffen, as young and less pigmented forms of *P. hyacinthina*.

Dr. Mayer (1906) has described and figured some specimens of *P. dodecabostrycha* taken by the 'Albatross' off the Hawaiian Islands in June, 1902, at the depth of 577–480 fms. and 478–453 fms. The smallest specimen was 55 mm. high and 50 mm. wide at the tentacular zone, and the largest 70 mm. high and 100 mm. wide. From the description and figures these specimens agree very well with those in the Antarctic collections. Mayer draws attention to the shape of the umbrella changing with age, becoming flatter and relatively wider as the Medusa grows larger. All the specimens taken by the 'Albatross' were deeply pigmented with brownish purple, especially in the zones of the radial and circular muscles. Mayer is of the opinion that it is possible that all of the so-called species of *Periphylla* may in the end prove to be local races of one and the same form.

After the first examination of the specimens in the Antarctic collections I felt fairly sure that they were large specimens of *Periphylla hyacinthina.* My determination was based not so much upon the shape of the umbrella, or upon the amount of pigmentation, as upon the shape of the pedalia. All the specimens have the rhopaliar pedalia longer and narrower than the tentacular ones. In this respect they resemble Haeckel's figures of *P. hyacinthina.*

The rounded shape of the top of the umbrella is in favour of the specimens being *Periphylla regina.* But after comparing Dr. Wilson's sketch (Plate VII., fig. 1) with Agassiz's sketch of *P. regina,* drawn and coloured from life (see Maas, 1897, Taf. X.), I came to the conclusion that the specimens did not belong to that species. According to Prof. Agassiz's figure the pedalia of *P. regina* are semi-globular in shape, and all of the same size.

At present the three species of *Periphylla* are mainly distinguished by the shape of the umbrella and by the colour and amount of pigmentation. I think that we require a better and more definite character for the determination of the species, especially as the identification has usually to be based upon preserved specimens.

If *Periphylla hyacinthina* and *P. dodecabostrycha* be really distinct species, then I think a character could be found upon the margin of the umbrella, such as the shape of the pedalia, by which they could be readily distinguished.

I have placed the specimens collected by the 'Southern Cross' and 'Discovery' under the name of *Periphylla dodecabostrycha* because they agree very well with Haeckel's *P. mirabilis,* which is considered to be identical with *P. dodecabostrycha.* I am rather in favour of Mr. Bigelow's suggestion that the small *P. dodecabostrycha,* described by Messrs. Maas and Vanhöffen, are young stages of *P. hyacinthina.* I am also inclined to think that the large specimens called *P. mirabilis* and *P. dodecabostrycha* will eventually be proved to be only very large specimens of *P. hyacinthina.*

NOTES ON THE SPECIMENS. 'SOUTHERN CROSS' COLLECTION.

Specimen A.—This is the smallest specimen in the collection. The diameter of the central disc is about 50 mm. and its height nearly 40 mm. The umbrella is covered with a thick layer (about 7 mm.) of transparent jelly, and through it one can see the dark brown conical-shaped stomach. At its apex there is a short (nearly 2 mm.) spike-shaped projection. That portion of the Medusa which lies below the coronal furrow is not in good condition. The pedalia are present, but the lobes, tentacles, sense organs and pigment have either completely or nearly disappeared. The tentacular pedalia are about 10 mm. in width and 13–15 mm. in length (measured from the coronal furrow to the base of the tentacle). The distance from the coronal furrow to the distal edge of the marginal lobes is estimated at about 28 mm. The specimen is too much macerated to show any gonads.

Specimen B.—The external appearance of this specimen shows that it was originally placed mouth downwards in a tin can with straight sides and a flat bottom. The specimen is in a fairly good state of preservation, but spoilt through having been squeezed into a small can and stained with iron rust.

The central disc is about 75 mm. in diameter, but it has lost its natural shape, as the sides are straight and the top flattened. There is a thick layer (about 8 mm.) of jelly, which suddenly thins out to about 1 mm. in thickness, marking the apex of the umbrella. The tentacular and rhopaliar pedalia in general appearance resemble closely those in Prof. Haeckel's figures of *Periphylla hyacinthina* (1880, Taf. 24, fig. 11) and of *P. mirabilis* (1882, Plate 18, fig. 1). The tentacular pedalia are about 25 mm. in length and 15 mm. in width. The rhopaliar pedalia are about 33 mm. in length (measured from the coronal groove to the rhopalium) and about 13 mm. in width at the proximal end (next furrow), and about 8 mm. wide near the distal end. They have a somewhat wedge-shaped appearance, and are longer and narrower than the tentacular pedalia. The tentacles are broken off close to the pedalia, and the rhopalia are entirely gone. Some of the marginal lobes appear to be in fairly good condition, but have completely lost their pigment. The only conspicuous pigment left below the coronal furrow is a triangular patch within the tentacular pedalia, at the base of the tentacles. The distance from the coronal furrow to the distal edge of the marginal lobes is about 50 mm. The gonads are in a very immature condition. They are just narrow bands about 2 mm. in width.

Specimen C.—This is a large adult in alcohol, with the jelly very much shrunken and of a rather opaque whitish colour. The disappearance of the dark brown pigment and the thinness of the jelly, which resembles a thick tough skin, are no doubt due to the method of preservation.

The specimen has lost its natural shape, so that measurements are of little scientific value, but are given to indicate the size of the specimen. The central disc has a broad conical appearance, and its height is not less than 90 mm. The total

length of the whole umbrella is not less than 200 mm. The pedalia have lost their external form and have become flattened. The tentacular pedalia are a little over 40 mm. in length and 25 to 30 mm. in width. The rhopaliar pedalia are at least 60 mm. in length and 20 to 25 mm. in width. Nearly all the tentacles are present, and one measures 300 mm. in length. The tentacular lobes are a little over 55 mm. in length and 30 mm. in width. The gonads are large, about 80 mm. in length and 20 mm. in width, and show ova in different stages of development.

The other two specimens in the 'Southern Cross' collection are densely stained with iron rust, broken and much flattened out. They are of about the same size as specimen C, and have well-developed ovaries.

'Discovery' Collection.

The 'Discovery' specimen was preserved in chromic-formol solution, and is of a greenish colour, which is due to the chromic acid. It is very much broken and damaged.

From the appearance of the above specimens it seems to me that a large *Periphylla* requires not only careful preservation, but very careful packing. A specimen should be well soaked in several changes of formalin or alcohol, and then placed in a jar or can larger than the specimen, but not along with starfish, glass tubes, or the like.

The sketch of *Periphylla* made by Dr. Wilson, who is an accurate and skilled artist, is of considerable value. It is a life-size sketch of a living specimen. As such accurate sketches are very rare, I have given a photographic reproduction of it (Plate VII., fig. 1), and only regret that it was necessary to reduce the size.

The sketch shows that the specimen was nearly 200 mm. in height and about 300 mm. wide across the lobes. The central disc measures in height from the coronal furrow to the top of the umbrella about 100 mm., and its width is about 160 mm. The tentacular pedalia are about 40 mm. in length and 30 mm. in width, and the rhopaliar pedalia about 50 mm. in length and 20 mm. in width. (These measurements agree with those made upon the specimen, except that the rhopaliar pedalia are a little longer, nearly 60 mm.) Mr. Hodgson informs me that the Medusa when alive was of a reddish (?) brown colour, by no means intense, except round the lower portion of the umbrella, where the colour was very dark.

I have in my collection a well-preserved specimen of *Periphylla hyacinthina* from the North Atlantic. In this specimen two of the rhopaliar pedalia show a transverse groove, and the other rhopaliar pedalia do not. The groove is in about the same position as that figured by Prof. Haeckel for *P. mirabilis*. The absence of a groove on two of the rhopaliar pedalia points strongly to the groove being a crease formed by the bending back of the margin of the umbrella either whilst the Medusa was in the net, or on deck, or in the handling of the specimen.

Distribution.—Pacific Ocean : off the coast of Chile (Vanhöffen, 1892), off the coast of Central America (Maas, 1897), off the Hawaiian Islands (Mayer, 1906), off New Zealand (Haeckel, 1880).

Family ATOLLIDÆ.

Genus Atolla, Haeckel, 1880.

(sens. em. Vanhöffen, 1902, Maas, 1897–1904.)

Atolla wyvillii.

(Plate VII., fig. 2.)

Atolla Wyvillei, Haeckel, 1880, p. 488 ; *id.*, 1882, p. 113, Pl. XXIX., figs. 1–9 ; Vanhöffen, 1902, p. 13, Taf. V., fig. 22 ; Browne, 1908, p. 241 ; Bigelow, 1909, p. 39.

There is one specimen of this Medusa in the 'Discovery' collection. It was taken in lat. 70° 30′ S., long. 169° E., off Admiralty Range (near Cape Adare), in a trawl (bottom at 610 fms.), on 26th February, 1904, when the ship was among pack ice.

The aboral side of the umbrella is in good condition, but the oral side is damaged. The stomach is torn, and only two of the gonads remain. The jelly is of a dark green colour, which is due to fixing with chromic acid, but the dark reddish brown pigment, which should coat the greater part of the umbrella, has been rubbed off, and only traces of it now remain in grooves, depressions, and other more or less protected places.

This species has been very well described and figured by Prof. Haeckel. It is distinguished from the other species of the genus by the presence of conspicuous lobes, separated by broad furrows around the margin of the central disc of the umbrella. The specimen shows this character very clearly. It has 21 lobes separated from each other by a broad, deep U-shaped furrow.

The width of the umbrella is about 77 mm. and the height about 20 mm. The top of the central disc is probably not perfectly flat, but slightly convex ; its diameter measured 46 mm. There are 22 tentacles and an equal number of sense organs. The pedalia of the tentacles measured 6 mm. in length and 7 mm. in width. The length of œsophagus is about 20 mm. The diameter of circular muscle band is about 65 mm.

Until Prof. Agassiz carried out in the 'Albatross' (1904–05) his explorations in the Eastern Pacific, *Atolla wyvillii* was known from the Antarctic and sub-Antarctic regions only. Mr. Bigelow (1909), in his report on the Medusæ collected by Agassiz's expedition, records specimens from the neighbourhood of the Galapagos Islands, and from other stations. In the region explored *Atolla* occurs within 300 fms. of the surface.

SEMÆOSTOMATA.

Family CYANEIDÆ.

Desmonema, L. Agassiz, 1862.

(sens. em. Maas, 1908.)

Generic Character.—Cyaneidæ with eight rhopalia; with eight straight or nearly straight groups of tentacles, each group containing only a single row of tentacles; with eight tentacular and sixteen rhopaliar lobes; without radial muscles on the lobes.

In 1862 L. Agassiz placed *Chrysaora gaudichaudi*, Lesson (1830), in a new genus called *Desmonema*, and at the same time he described *Couthouyia pendula* as a new genus and species. Prof. Haeckel (1880) emended the definition of the genus *Desmonema* and reduced *Couthouyia* to a synonym of it. Dr. Vanhöffen (1888) has also emended the generic definition of *Desmonema* and added a new species called *Desmonema chierchiana*[*um*], on the ground that the earlier species were not recognisable owing to their imperfect descriptions.

Until quite recently the above-mentioned species had only been recorded from the Magellanic area, and it was generally considered that they belonged to one genus, and that probably only one species really existed. The occurrence of a second species of *Desmonema* in the Magellanic area has still to be proved, as *Desmonema chierchianum* is the only one which has been adequately described and figured from that area.

Dr. Vanhöffen (1908) in his report on the 'Gauss' Medusæ has recorded *Desmonema chierchianum* from Kerguelen and Heard Islands, and also large tentacles of a *Desmonema*, and early stages from the 'Gauss' Winter Quarters of Kaiser Wilhelm II. Land on the Antarctic continent.

Dr. Maas (1908) in his report on the Medusæ collected by the 'Français' Antarctic expedition records a *Desmonema* under the name of *Couthouyia gaudichaudi*, from Booth-Wandel Island, off Danco's Land on the West Antarctic continent. From Maas' description and figures there can be no doubt that his *Couthouyia* and the *Desmonema* in the 'Southern Cross' collection belong to the same species. It must be clearly understood that there is no proof whatever, at present, that *Desmonema* (*Couthouyia*) *gaudichaudi* of Maas is identical with *Desmonema* (*Chrysaora*) *gaudichaudi* of Lesson.

Dr. Maas (1906) has also given a brief description, without figures, of an early stage of a Medusa which he considers to be probably a young *Couthouyia*. This specimen was taken in October, 1898, by the 'Belgica,' in lat. 69° 59′ S., long. 82° 39′ W., at a station which is south-west of the 'Français' station off Danco's Land. According to Maas the specimen measured 15 mm. in diameter. It has sixteen marginal lobes which show the beginnings of branched canals, and eight tentacles and eight sense organs alternating with one another. This young *Couthouyia* is probably an early stage of *Desmonema gaudichaudi*, because *Desmonema chierchianum* of a similar

size has eight groups of tentacles, each group with one long tentacle and four to six minute tentacles or tentacular buds. (Browne, 'Scotia' Report, p. 244.) I regret that I cannot follow Maas in using the name *Couthouyia* instead of *Desmonema*. The latter seems to me to be the correct name to use, and Vanhöffen is also of this opinion.

I believe that *Desmonema chierchianum* (Vanhöffen) and *Desmonema gaudichaudi* (Maas) are two distinct species belonging to the same genus, and I shall also endeavour to show that the *Desmonema* taken at the 'Gauss' Winter Station is not *Desmonema chierchianum*, but *Desmonema gaudichaudi* (Maas). Before the name *Desmonema gaudichaudi* can be definitely established for the Antarctic species, the Medusa must be found in the Magellanic area, but I have decided to use the name in this report in preference to introducing a new specific name. Up to the present the records show that *Desmonema gaudichaudi* (Maas) is an Antarctic species occurring south of latitude 60°; whereas *Desmonema chierchianum* is a sub-Antarctic species occurring north of latitude 60°.

Desmonema gaudichaudi can easily be distinguished from *Desmonema chierchianum* by the thickness and number of the tentacles. The former has up to about seven tentacles in each group, and these tentacles become very thick, 5 mm. or more in diameter. The latter species, *Desmonema chierchianum*, has a very large number of tentacles, up to sixty in each group, and they are thin and slender, about 2 mm. in diameter. The difference in the number and size of the tentacles is not due to age (Plate V., figs. 1 and 2).

Desmonema gaudichaudi.

(Plate V., fig. 1.)

Couthouyia gaudichaudi, Maas, 1908, p. 3, Pl. I. ('Français' Exped.).
Desmonema chierchiana, Vanhöffen, 1908 (partim), p. 44, fig. 9, Taf. X., fig. 3, and text relating to specimens taken off the Antarctic continent, 'Gauss' Winter Station.

The 'Southern Cross' collection contains three specimens which were taken near the surface of the sea at Cape Adare on 27th December, 1899, and 15th and 17th January, 1900. It is not possible to give a complete description, as the specimens arrived in bad condition.

Specimen A.—The diameter of the umbrella, measured to the periphery of the circular muscles, is about 150 mm. There are eight groups of tentacles, each containing two large tentacles, and four of the groups have an additional small tentacle. The gonads are very much flattened out, and in this condition measured 25 mm. in length and 50 mm. in width. The genital openings are about 35 mm. in length and the spaces between, forming the pillars of the oral arms, are 6 to 10 mm. in width.

Specimen B.—The diameter of the umbrella measured to the periphery of the circular muscles is about 160 mm. The number of tentacles in each of the eight

groups is as follows :—3 large + 1 small, 2 l. + 2 s., 2 l. + 2 s., 2 l. + 2 s., 2 l. + 2 s., 2 l. + 1 s., 3 l., 1 l. + 1 s. The large tentacles are 4 to 5 mm. thick near the base, and one measured 260 mm. in length. The small tentacles are in the course of development; they vary very much in size and length, and are situated on the outer sides of the group. Some of these little tentacles are only just visible, and measure about 2 mm. in length. The gonads protrude about 30 mm., and the genital openings in the wall of the stomach are 20 to 25 mm. in width and 35 to 40 mm. in length, and the spaces between the openings about 8 mm.

Specimen C.—This specimen is in better condition than the other two, but it is by no means perfect. The diameter of the umbrella, measured to the periphery of the circular muscles, is about 220 mm. The umbrella is of moderate thickness and its external surface is smooth and free from warts or clusters of nematocysts.

The stomach is circular in outline, about 80 mm. in diameter, with sixteen radial pouches. The tentacular pouches are 45 to 55 mm. in width at their distal margin, and the rhopaliar pouches about 35 mm. The oral arms are incomplete, only the basal parts remain, and these have large frills. The width of the pillars of the arms is about 10 mm. The gonads in general appearance are similar to those of *Desmonema chierchianum*, and are about 70 mm. in length. The genital openings are large and somewhat rectangular in shape and measure about 40 mm. in length and 30 mm. in width.

There are eight groups of tentacles arranged in a single row, adjacent to the outer edge of the circular muscles. The largest tentacles are in the middle of the group and the smallest on either side. The large tentacles are broken off close to the umbrella, and stumps show that they were about 5 mm. in thickness. In each group there are two or three large tentacles and two that are smaller. The sense organs are eight in number and are very much like those in *Desmonema chierchianum.*

The tentacular lobes (Pl. V., fig. 1) measure about 45 mm. in length and 55 mm. in width, and their distal margin is without any clefts or indentations. The rhopaliar lobes are about 35 mm. in length and 25 mm. in width. The canal system in the marginal lobes is of the same type as that in *Desmonema chierchianum* (Pl. V., fig. 2). In the tentacular lobes there is a canal between every two tentacles. Owing to the fewness of the tentacles in *Desmonema gaudichaudi* the canals are also few in number, but they are much broader than in *Desmonema chierchianum*, and occasionally nearly coalesce in the proximal part of the lobes.

The young *Medora* stage of *Desmonema chierchianum* described by Dr. Vanhöffen (1908, p. 46, Taf. II., fig. 3) and taken at the 'Gauss' Winter Station, I consider to be a young *Desmonema gaudichaudi* Maas. It measures 38 mm. in diameter, with eight groups of tentacles, each group containing one large stout tentacle and one minute tentacle or tentacular bud. In the Report on the 'Scotia' Medusæ I described young stages of *Desmonema chierchianum* from the Falkland Islands. One specimen,

16 mm. in diameter, has one long slender tentacle and four to six minute tentacles or tentacular buds in each group. A specimen 25 mm. in diameter has in each group three to six tentacles, one of which is very long and slender, and about six tentacular buds ('Scotia' Report, Pl. II., fig. 2). It is clear that the young stages of *Desmonema chierchianum* have far more tentacles in each group than Vanhöffen's *Medora* stage, though the latter is larger in size. There is also a difference in the shape of the tentacular lobes.

Detached Tentacles taken in Nets.—The 'Scotia' when in lat. 72° 31′ S., and long. 19° W., on 5th March, 1904, found in a drift net at 1 to 100 fms. some long, thick tentacles. The longest was over four feet in length and the maximum thickness measured was 7 mm. These tentacles have been described and figured by Dr. Rennie (1905) and considered by him to be the tentacles of a Siphonophore.

The 'Discovery' obtained isolated tentacles in McMurdo Sound, and these were also examined by Dr. Rennie (1907), who considered them to be the tentacles of another Siphonophore. "These tentacles differ from those of the Scottish Expedition, both in colour and consistency, the latter being brownish and of a markedly gelatinous nature even in their badly preserved parts. They appear to belong to a distinct and otherwise unknown form."

Dr. Vanhöffen (1908) has proved, beyond all doubt, the tentacles of Rennie's Siphonophore to be the tentacles of a *Desmonema*. The 'Gauss' obtained similar large tentacles at her winter quarters off the Antarctic Continent.

I obtained from the British Museum a piece of one of the tentacles found by Mr. Hodgson in McMurdo Sound and cut some sections of it. The sections clearly show that Dr. Vanhöffen was right when he said that the tentacles belonged to a *Desmonema* and not to a Siphonophore. The structure of the tentacles of Dr. Rennie's Siphonophore is similar to that of *Desmonema gaudichaudi* in the 'Southern Cross' collection.

The tentacles of *Desmonema chierchianum* and *D. gaudichaudi* are similar in structure, but the muscle bands of *D. chierchianum* are smaller in size and more slender than those of *D. gaudichaudi*. As the tentacles of *D. gaudichaudi* are much thicker than those of *D. chierchianum*, so also are the muscle bands larger and thicker.

Distribution.—Antarctic Ocean. Booth-Wandel Island, lat. 65° S., long. 66° W. (Paris) (Maas, 1908, 'Français' Expedition); lat. 69° 59′ S., long. 82° 39′ W. (Maas, 1906, 'Belgica' Expedition); lat. 66° S., long. 89° E. (Vanhöffen, 1908, 'Gauss' Expedition); Cape Adare, lat. 70° 18′ S., long. 170° 9′ E. ('Southern Cross' Expedition); lat. 72° 31′ S., long. 19° 00′ W. (Rennie, 1905, 'Scotia' Expedition); McMurdo Sound. Lat. 78° 48′ S., long. 166° 20′ S. (Rennie, 1907, 'Discovery' Expedition).

Family ULMARIDÆ.*

Diplulmaris, Maas, 1908.

Generic Character.—Ulmaridæ with 16 rhopalia, 16 tentacles, and 32 marginal lobes, regularly alternating (with numerous radial canals, some branching and all anastomosing in a network at the periphery and communicating with a circular canal).

Diplulmaris antarctica.

(Plate VI.)

Diplulmaris antarctica, Maas, 1908, p. 9, Pl. II., figs. 2, 3.
Ulmaropsis drygalskii, Vanhöffen, 1908, p. 45, figs. 10–12.
Ulmaropsis antarctica, Vanhöffen, 1909, Deutsche Südpolar Exped. Vorwort, Bd. x. (Zool., Bd. ii.), p. v.

This interesting Medusa was first described by Maas as a new genus and species, and his description is based upon two specimens collected by the French Antarctic expedition. A few months after the appearance of Maas' report on the Medusæ of the French expedition, Vanhöffen's report on the Medusæ of the German Antarctic expedition was published, and in it he described a new Medusa under the name of *Ulmaropsis drygalskii*, n.g. et n.sp. Messrs. Maas and Vanhöffen soon recognised that both expeditions had collected specimens of this new Antarctic Medusa, and that they had described it under different names. This was, however, unavoidable, owing to the short interval of time between the publications of the two reports. Dr. Vanhöffen (1909) recognises Maas' priority and proposes that the name *Ulmaropsis antarctica* should be used instead of *Diplulmaris antarctica*. I am sorry that I cannot agree to Vanhoeffen's proposed generic name, because it is directly opposed to the rules of nomenclature, which are very clear and definite on this point. The generic name *Diplulmaris* has priority over *Ulmaropsis*, just as the specific name *antarctica* has priority over *drygalskii*. The name *Diplulmaris* is quite valid and must be used.

The 'Discovery' brought home twenty-six specimens of this species, and they nearly all belong to the ephyra and meta-ephyra stages; but three are certainly adults.

There is also a single specimen in the 'Southern Cross' collection. It belongs to the meta-ephyra stage, and was taken at Cape Adare on 10th May, 1899.

The Ephyra stage (Plate VI., figs. 1 and 2).—The smallest and youngest specimens of the series are between 4 and 5 mm. in diameter, and have the typical ephyra appearance. At this stage the ephyra has sixteen fairly long arms, each divided into two flat lobes, which in the adult become the marginal lobes of the umbrella, and each arm carries a rhopalium. There are thirty-two straight, unbranched, radial canals, sixteen of which run direct from the stomach to the rhopalia, and sixteen belong to

* As *Ulmaris* is a name coined by Prof. Haeckel, and not of Greek origin, *Ulmaridæ* may be allowed to pass, but *Diplulmaris* is so shocking a hybrid that a protest must be entered. *Ulmaropsis* is, of course, as bad.—Ed.

the tentacular series, regularly alternating with the former. The tentacular canals are evidently not of the same age as the rhopaliar canals, but of a slightly later growth.

The tentacles are just beginning to make their appearance, and are indicated either by bulb-like buds, by tapering elongated buds, or by minute tentacles. Four tentacular buds varying in size and age are found in the smallest specimens, and as the Medusa grows twelve more buds develop, making the total up to sixteen. It is clear that the tentacles do not all develop at the same time, but at irregular intervals and apparently in no definite order. Ultimately the full number is reached, and corresponds to the number of sense organs.

It is quite probable that there is a still younger ephyra stage, which is not represented in the collection—a stage with only sixteen rhopaliar canals, and without the tentacular canals.

The stomach is very small, circular in outline, and four gastric filaments are visible inside. The filaments increase in number as the Medusa grows. In the early stages one filament in each group is much longer than the others, and this is probably the primary one. The mouth is simply a large opening, without any definite lips or arms, which appear later.

The ex-umbrella is covered with small clusters of nematocysts. In the later stages the nematocysts are confined to the aboral side of the marginal lobes.

The circular canal is formed by outgrowths from the radial canals (Plate VI., fig. 2), and is evidently formed just before the branches of the rhopaliar canals begin to develop.

The Meta-ephyra stage.—The normal appearance of this stage has been very well figured by Maas (1908, Plate II., fig. 2). It may be distinguished by all the rhopaliar canals possessing two opposite lateral branches, which lead into the circular canal. The tentacular canals remain unbranched, as in the earlier stages. The branching of the rhopaliar canals in the 'Discovery' specimens is rather irregular, and there is a want of uniformity in the pattern. The number of tentacles or tentacular buds present is very variable and is not correlated with the size of the umbrella, which at this stage is 15 to 25 mm. in diameter.

Variation.—Among the ephyra and meta-ephyra stages fourteen specimens are sufficiently perfect for counting the number of rhopalia or rhopaliar canals. One specimen has eleven rhopalia, four have fourteen rhopalia, two have fifteen rhopalia, and seven have the normal number of sixteen.

The early stages were mostly taken by the 'Discovery' during April and May. As meta-ephyra stages were taken at the end of March and ephyra stages in May and June, there is no clue given as to the breeding season of this Medusa. The ephyra and meta-ephyra stages were found by the 'Gauss' in January and March. Vanhöffen's account of these stages is based upon nine specimens, 4 to 22 mm. in diameter.

The Adult.—The adult specimens were all placed in one jar and labelled "Winter Quarters, various dates, 1903. Chromic-formalin." They were afterwards transferred

to alcohol, as the storage room on the ship was below freezing point. These specimens have now been preserved about six years, and the tissues are still in good condition, and the mesoglæa remains transparent and pliable. The jar contained at least three specimens.

Specimen A.—The umbrella is about 60 mm. in diameter, and it is unbroken, though the margin is torn away and the whole of the mouth. This is, however, a valuable specimen, as it is the only one showing the gonads *in situ*, and they are in good condition.

Specimen B.—This specimen is represented by one-half of the umbrella, with about eight rhopalia and eight tentacles. The diameter of the umbrella is estimated at about 70 mm.

Specimen C.—This one consists of only one-half of the umbrella, with seven rhopalia. The diameter of the umbrella is estimated at about 75 mm. From the appearance of the radial canals, Specimens B and C belong to different Medusæ, and not to one Medusa torn in half. In addition to the above there are four fragments belonging to the margin of the umbrella, with tentacles and rhopalia. These fragments may be parts of the above specimens, or of other specimens.

Description of the Adult.—The umbrella is thin and probably slightly convex in shape. The margin of the mouth is studded with warts and short protuberances containing nematocysts. The fragments belonging to the mouth are from the margin of a large mouth with either four lips, or four short arms, about 35 mm. in length, something like the oral arms of *Aurelia aurita*, but thinner and more membrane-like. The stomach is a flat circular cavity, about two-thirds the diameter of the umbrella, and its lower side is covered with a moderately thick layer of mesoglæa.

In a normal specimen 32 radial canals should leave the stomach. Sixteen of these belong to the rhopaliar series and are branched, and sixteen to the tentacular series and are unbranched. All the radial canals communicate with a circular canal and also with one another by means of an irregular anastomosing network of canals near the periphery of the umbrella (Plate VI., fig. 3). The rhopaliar canals have opposite lateral branches, which are irregular in their position on the main canal. In the adult the primary lateral branches have not unfrequently lost their connection with the main canal, and are in direct communication with the stomach. This is evidently due to the outward growth of the periphery of the stomach cutting off the proximal portion of the radial canals, including the junctions of the branches. (In *Aurelia aurita* it is not unusual to find the interradial branched canals isolated from their main canal, which then runs as a straight isolated canal from the stomach to the sense organ.) The main rhopaliar canals have frequently secondary lateral branches, which originate nearer the margin of the umbrella. The secondary branches were not present in the ephyra stages, and were only seen in the adults.

The gonads begin to make their appearance in the meta-ephyra stage, and are then indicated by a very narrow band on the outer side of the gastric filaments. As

the gonads develop the band becomes sinuously folded and broadens. In the young adult the band is about 4 mm. in width and somewhat semicircular in shape. There is no sub-genital cavity as in *Aurelia aurita*. The gonads protrude from the stomach and hang down from the sub-umbrella like the gonads of a *Chrysaora*. In the meta-ephyra stage the genital sacs have the appearance of simple sac-like enlargements, with very thin walls ; on the wall of the stomach inside are situated two rows of gastric filaments and the embryonic genital band. By the time the gonads have reached maturity the genital sacs have become lobated (Plate VI., fig. 5). Internally the proximal end of the sac is covered with numerous gastric filaments, and its distal end or bottom holds the gonads, which are now arranged in more complicated and somewhat irregular folds.

The tentacles are very much laterally compressed, especially in the basal portion, but the distal portion is more round and tapers off to a slender point. Along the whole length of the tentacle, on the inner side, runs a band or ridge, which is closely studded with clusters of nematocysts. The outer side of the tentacle is smooth and free from clusters of nematocysts (Plate VI., fig. 6). The tentacles are hollow throughout their whole length, a flat tube-like cavity running close to the inner edge. They are apparently in a semi-contracted condition, and the tube-like cavity is contracted into a series of transverse folds, which, when viewed from the outer edge of the tentacle, have the appearance of a series of rings. The folding or wrinkling is present in all fully-grown tentacles, and is sufficiently conspicuous to be noticed by the naked eye.

In the adult there are normally sixteen sense organs, alternating with sixteen tentacles. The rhopalium, or tentaculocyst, is not well protected in this Medusa—neither by lying back in a groove nor by a covering formed by the marginal lobes. It is situated on the wall of the niche formed by the marginal lobes, and points upwards towards the aboral side of the umbrella. The rhopaliar canal, which leads from the circular canal to the sense organ, is broad and flat in the adult. Over the rhopaliar canal and on the surface of the umbrella is situated a small patch of darkly coloured cells, in the midst of which there is generally a slight depression forming the dorsal sensory pit. The pit has the appearance of being in a rather rudimentary condition and is occasionally absent.

Although the marginal lobes are more or less torn, there are no indications of any further increase in number, beyond the original thirty-two of the ephyra stage, by subsequent division. The ex-umbrellar side of the lobes is covered with numerous warts containing nematocysts. The lobes show a slight variation in shape, and fill up the space between the sense organs and the tentacles. As these are not always at equal distances apart, some of the lobes are broader than others.

Vanhöffen's description of the adult is based upon a large fragment of the marginal part of the umbrella, and Maas had only one quadrant of an umbrella to work upon. Vanhöffen describes and clearly figures tentacular lobes on the margin of the

umbrella in addition to the rhopaliar lobes. Each rhopaliar lobe is divided by a deep cleft. Maas, on the other hand, figures the rhopaliar lobes with an undivided margin. I have carefully examined the tattered marginal lobes of my specimens, and can occasionally see a small isolated lobe in the position of Vanhöffen's tentacular lobes. From their general appearance I have come to the conclusion that they are only detached portions of the torn rhopaliar lobes. Although none of my specimens have one absolutely perfect lobe, still, in building up a picture from the many imperfect lobes I cannot trace or find any definite cleft in these rhopaliar lobes.

Distribution.—Antarctic. 'Gauss' Winter Station, about lat. 66° S., long. 89° E.; north of Kaiser Wilhelm II. Land (Vanhöffen). Wandel Island; lat. 65° S., long. 66° W. (Paris) ('Français' Expedition). (Maas, 1908.) McMurdo Sound; lat. 78° 49′ S., long. 166° 30′ E. ('Discovery' Expedition). Cape Adare; lat. 70° 18′ S., long. 170° 9′ E. ('Southern Cross' Expedition).

Diplulmaris (?) gigantea.

In Mr. Borchgrevink's "First on the Antarctic Continent" there is an allusion to the capture of a very large Scyphomedusa. "One large jellyfish was caught near the peninsula, with arms, or extremities, about 12 yards long; its weight was 90 lbs." There are also two illustrations from photographs of this Medusa; one showing it at the surface of the sea, and the other after it was landed from the boat. This specimen was apparently caught on 10th October, 1899, and there is a record of another specimen for December 27th. "Mr. Fouger secured a magnificent specimen of a jellyfish." In the 'Southern Cross' collection there is one specimen of a large Scyphomedusa labelled "Cape Adare, January, 1900; 7 fathoms." It was originally in formalin, but was transferred to alcohol at the British Museum.

I saw this specimen soon after its arrival at the Museum. It was then in a broken condition and thickly coated with a deposit of iron rust, which had uniformly stained the surface of the Medusa a dark reddish-brown colour. It seems to me that this specimen must have passed through some other chemical besides formalin, because the jelly of the umbrella has become very much consolidated and rather hard and brittle.

When the specimen was laid out flat in a dish, the umbrella measured about 18 inches (500 mm.) in diameter. (The size of the "90-lb. Medusa" is not stated, but from the photographs I roughly estimate the umbrella to have been about $2\frac{1}{2}$ feet in width and about 1 foot in height.) There is a central mouth and four oral arms, which are not perfect. The longest arm measures 7 feet (over 2 metres), and another arm 5 feet. They must have been very much longer when the animal was alive. They have every appearance of great strength and length, so that I do not think that the length of 12 yards for the oral arms of the "90-lb. Medusa" was a very great exaggeration. The arms are evidently of the *Desmonema* type, V-shaped transversely, broad at the base, and tapering towards the distal end. The delicate membranous folds, which form the sides of the arm, have disappeared, and only the keel and thick

gelatinous parts remain. The basal portion of the arm, close to the mouth, is very much compressed laterally, resembling a thick fleshy leaf, about 130 mm. broad and about 20 mm. thick.

The lower wall of the stomach is thick and strong for carrying the weight of the oral arms. In it there are four interradial genital openings, which are semi-oval in shape, measuring about 20 mm. in length. These openings are very small for the size of the stomach, but larger openings would tend to weaken its lower wall. From one of the openings a gonad is protruding about 50 mm. The stomach is circular in shape, forming a large cavity without internal septa and without distal pouches. From the periphery of the stomach go forth many radial canals. The courses of several of the canals were traced by dissection. They pass through the layer of jelly and come to the surface of the sub-umbrella. It has already been stated that the Medusa is of a dark reddish-brown colour, which is an opaque surface layer confined to a very thin skin, which can be peeled off from the underlying jelly This skin, at first, was mistaken for the ectoderm, but after further investigation and consideration, it seems more likely to be an artificial product, formed after preservation On tracing the radial canals from the stomach it was found that they came to the surface of the sub-umbrella near the periphery of the stomach, and that their open ends were covered by the reddish skin. There is not the slightest trace of a canal system over the surface of the sub-umbrella, nor of any muscles. One would naturally expect to see powerful circular muscles on the sub-umbrella, considering the size of and thickness of the umbrella, and the great length of the oral arms. I believe that all the circular muscles, and the whole of the canal system on the sub-umbrella, have peeled off. Their absence would account for the abrupt termination of the radial canals after passing through the wall of the stomach.

The margin of the umbrella is very much damaged and broken, but there are indications, here and there, of lobes, which are, perhaps, the basal portions of larger lobes. There is not the slightest trace of a tentacle, nor of a sense organ. Except for the gonads the specimen is but little more than a gelatinous skeleton.

The presence of a central mouth, and oral arms without internal canals excludes this Medusa from the Rhizostomata. It, no doubt, belongs to the Semæostomata. The absence of marginal gastric pouches, and the presence of radial canals, indicate that it belongs to the Ulmaridæ. It is best to place this large Medusa provisionally in the genus *Diplulmaris*, as it is too imperfect to justify the possession of a new generic name.

LIST OF BOOKS AND MEMOIRS QUOTED IN THE TEXT.

Agassiz, A., 1865.—"North American Acalephæ." Catalogue Museum Comp. Zool., Harvard College, No. II. Cambridge, U.S.A.

Agassiz, L., 1860–62.—"Contributions to the Natural History of the United States of America," vols. iii., iv. Boston.

Antipa, G., 1892.—"Die Lucernariden der Bremer Expedition nach Ostspitzbergen im Jahre 1889." Zool. Jahrb. (Syst.), Bd. vi., pp. 377–396. Taf. XVII., XVIII.

Bedot, M., 1908.—"Sur un Animal pélagique de la Région antarctique" (Wandelia charcoti). Expéd. Antarct. Française (1903–5). Expédition Charcot. 5 pp. 1 Pl.

Bigelow, H. B., 1909.—"Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific . . . by the steamer 'Albatross,' 1904–5." No. 16. The Medusæ. Mem. Mus. Comp. Zool., Harvard, vol. xxxvii. 243 pp. 48 Pls.

Bigelow, H. B., 1909.—"Cruise of the Schooner 'Grampus' in the Gulf Stream during July, 1908; with description of a new Medusa (Bythotiaridæ)." Bull. Mus. Comp. Zool., Harvard, vol. lii., no. 12, pp. 195–210. 1 Pl.

Borchgrevink, C. E., 1901.—"First on the Antarctic Continent. 'Southern Cross' Expedition, 1898–1900." London.

Brandt, J. F., 1838.—"Ausführliche Beschreibung der von C. H. Mertens auf seiner Weltumsegelung beobachteten Schirmquallen, nebst allgemeinen Bemerkungen über die Schirmquallen überhaupt." Mem. Acad. Imp. St. Petersbourg, ser. 6, tom. ii. (Sci. Nat.), pp. 237–411. Taf. I.–XXXI.

Browne, E. T., 1896.—"On British Hydroids and Medusæ." Proc. Zool. Soc., London, pp. 459–500. Pls. XVI., XVII.

Browne, E. T., 1902.—"A Preliminary Report on Hydromedusæ from the Falkland Islands." Ann. Mag. Nat. Hist., vol. ix., pp. 272–84.

Browne, E. T., 1902.—"Hydrozoa." A preliminary account. Report Collections Nat. Hist., 'Southern Cross,' pp. 310–16. British Museum.

Browne, E. T., 1903.—"Report on some Medusæ from Norway and Spitzbergen." Bergens Mus. Aarbog., 1903, no. 4. 36 pp. 5 Pls.

Browne, E. T., 1905.—Medusæ, in "Herdman's Pearl Fisheries, Ceylon." Part IV., pp. 131–66. 4 Pls. Royal Soc., London.

Browne, E. T., 1907.—"A Revision of the Medusæ belonging to the Family Laodoceidæ." Ann. Mag. Nat. Hist., vol. xx., pp. 457–80.

Browne, E. T., 1908.—"The Medusæ of the Scottish National Antarctic Expedition" ('Scotia'). Trans. Roy. Soc. Edinburgh, vol. xlvi., pt. ii., pp. 233–51. 2 Pls.

Dendy, A., 1902.—"On a Free-swimming Hydroid, *Pelagohydra mirabilis*, n.g. et n.sp." Quart. Journ. Micro. Sci., vol. xlvi., pp. 1–24. 2 Pls.

Fewkes, F. W., 1886.—"Report on Medusæ collected by the Lady Franklin Bay Expedition," in Greely's "Three Years of Arctic Service," vol. ii., app. xi., pp. 399–408. 1 Pl. London.

Gegenbaur, C., 1856.—"Versuch eines Systemes der Medusen." Zeitschr. wiss. Zool., Bd. viii., pp. 202–73. Taf. VII.–X.

Günther, R. T., 1903.—"On the Structure and Affinities of *Mnestra parasites*, Krohn; with a Revision of the Classification of the Cladonemidæ." Mith. Zool. Stat. Neapel., Bd. xvi., pp. 35–62. 2 Pls.

Haeckel, E., 1879–80.—"Das System der Medusen." Jena.

Haeckel, E., 1881.—"Die Tiefsee-Medusen der 'Challenger'-Reise und der Organismus der Medusen." 205 pp. 32 Tafn. Jena.

Haeckel, E., 1882.—"Report on the Deep-Sea Medusæ dredged by H.M.S. 'Challenger,'" vol. iv. 154 pp. 32 Pls.

Hartlaub, C., 1897.—"Die Hydromedusen Helgolands." Wiss. Meeres. deutsch. Meere, Bd. ii., pp. 449–536. 10 Tafn.

HARTLAUB, C., 1907.—"Craspedote Medusen; Codoniden und Cladonemiden." Nordisches Plankton. XII. 135 pp. 126 figs, 2 maps.

HARTLAUB, C., 1909.—"Über Thaumantias pilosella, Forbes; und die neue Lafœiden-Gattung *Cosmetira*." Zool. Anzeiger, Bd. xxxiv., pp. 82–89. 4 figs.

HICKSON, S. J., and GRAVELY, F. N., 1907.—"Hydroid Zoophytes." National Antarctic Expedition ('Discovery'). Nat. Hist., vol. iii. 34 pp. 4 Pls. British Museum.

HODGSON, T. V., 1907.—"On Collecting in Antarctic Seas." National Antarctic Expedition, vol. iii. 10 pp.

LEUCKART, R., 1856.—"Beiträge zur Kenntniss der Medusenfauna von Nizza." Archiv. f. Naturgesch., pp. 1–40. Taf. I.–II.

LO BIANCO, S., 1904.—"Pelagische Tiefseefischerei der 'Maja' in der Umgebung von Capri," Bd. i. 91 pp. 42 Tafn. Jena.

MAAS, O., 1893.—"Die Craspedoten Medusen." Ergebnisse der Plankton-Expedition, Bd. ii., K.c. 107 pp. 8 Tafn.

MAAS, O., 1897.—Reports on an Exploration off the west coast of Mexico, Central and South America, and off the Galapagos Islands. 'Albatross,' 1891. Pt. 21. "Die Medusen." Mem. Mus. Comp. Zool. Harvard, vol. xxiii., pp. 1–92. 15 Tafn.

MAAS, O., 1904.—"Méduses provenant des Campagnes des Yachts 'Hirondelle' et 'Princesse Alice,' 1886–1903." Résult Camp. Scient. Monaco, fasc. xxviii. 71 pp. 6 Pls.

MAAS, O., 1905.—"Die Craspedoten Medusen der Siboga-Expedition." Monograph X. 84 pp. 14 Tafn.

MAAS, O., 1906.—"Die arktischen Medusen." Fauna Arctica, Bd. iv., pp. 481–526.

MAAS, O., 1906.—"Medusen." Expédition antarctique Belge ('Belgica'). 32 pp. 3 Tafn. Anvers.

MAAS, O., 1908.—"Méduses." Expédition antarctique Français, 1903–5. 18 pp. 2 Pls. Paris.

MAYER, A. G., 1900.—"Some Medusæ from the Tortugas, Florida." Bull. Mus. Comp. Zool. Harvard, vol. xxxvii., pp. 11–82. Pls. I.–XLIV.

MAYER, A. G., 1906.—"Medusæ of the Hawaiian Islands, collected by the 'Albatross' in 1902." Bull. U.S. Fish Com., 1903, pt. iii., pp. 1131–1143. Pls. I.–III.

METSCHNIKOFF, E., 1874.—"Studien über die Entwicklung der Medusen und Siphonophoren." Zeitschr. f. wiss. Zool., Bd. xxiv., pp. 15–83. Taf. II.–XII.

MÜLLER, J., 1851.—"Ueber eine eigenthümliche Meduse des Mittelmeeres und ihren Jugendzustand." Arch. Anat. Physiol., Berlin, pp. 272–277. Taf. XI.

MURRAY, J., 1896.—"On the Deep and Shallow Water Marine Fauna of the Kerguelen Region of the Great Southern Ocean." Trans. Roy. Soc., Edinburgh, vol. xxxviii., pp. 343–500.

RENNIE, J., 1905.—"On the Tentacles of an Antarctic Siphonophore." Proc. Roy. Phys. Soc., Edinburgh, vol. xvi., pp. 35–37. 1 Pl.

RENNIE, J., 1907.—"Tentacles of a Siphonophore." National Antarctic Expedition, 'Discovery,' 1901–4. Nat. Hist., vol. iii. 3 pp. 5 figs. British Museum.

ROMANES, G. J., 1876–77.—"An Account of some New Species, Varieties and Monstrous Forms of Medusæ." Journ. Linn. Soc., London. (Zool.) xii., pp. 525–531; xiii., pp. 190–194. Pls. XV.–XVI.

TORREY, H. B., 1909.—"The Leptomedusæ of the San Diego Region." Univ. California Publ., vol. vi., pp. 11–31. 11 figs. Berkeley, U.S.A.

VANHÖFFEN, E., 1888.—"Untersuchungen über Semaeostome und Rhizostome Medusen." Bibliotheca Zoologica, Bd. i., Heft 3. 54 pp. 6 Tafn. Map.

VANHÖFFEN, E., 1892.—"Die Akalephen der Plankton-Expedition," Ergeb. Bd. 2, K.d. 28 pp. 4 Tafn.

VANHÖFFEN, E., 1902.—"Die Craspedoten Medusen der deutschen Tiefsee-Expedition" ('Valdivia'), 1898–99. Wissen. Ergebnisse, Bd. iii., pp. 53–86. Taf. IX.–XII.

VANHÖFFEN, E., 1908.—"Die Narcomedusen der deutschen Tiefsee-Expedition ('Valdivia'), 1898–99." Wissen. Ergebnisse, Bd. xix., pp. 43–74. Taf. VII.–IX.

VANHÖFFEN, E., 1908.—"Die Lucernariden und Skyphomedusen," Deutsche Südpolar-Expedition, 1901–3. Bd. x. (Zool., Bd. ii., pp. 27–49). Taf. II., III.

VANHÖFFEN, E., 1909.—Deutsche Südpolar-Expedition. Bd. x. (Zool., Bd. ii.), Vorwort, p. v.

DESCRIPTION OF THE PLATES.

KEY TO THE LETTERING OF THE PLATES.

ad., adhesive pad (*Lucernaria*).
ad. f., adhesive disc of the foot (*Lucernaria*).
b., basal bulb.
c., cordylus.
ca., cavity of the peduncle (*Lucernaria*).
cc., circular canal.
cm., circular muscles.
dc., diverticulum of the circular canal.
ec., ectoderm.
ec. c., ectodermal cavities.
en., endoderm.
ex., exumbrella.
f., filament of the stomach.
g., gonad.
gd., genital duct.
inter. c., interradial canal.
k., canal in foot of *Lucernaria*.
m., mouth.
mb., marginal bulb.
mes., mesoglæa.
mesen., mesentery.
n., nematocysts.
oc., ocellus.
oc. l., ocular lobe (= rhopaliar lobe).
or., oral lip.
ot., otocyst.
ov., ovum ; ovary.
p., papilla.
per., perradial.
per. c., perradial canal.
r., radial canal.
rh., rhopalium.
rh. c., rhopaliar canal.
rh. l., rhopaliar lobes.
s. p., sensory pit.
spt., septum.
st., stomach.
st. r., perradial ridge of stomach.
sub., sub-umbrella.
t., tentacle.
ta., tæniola.
tc., tentacular canal.
tl., tentacular lobe.
uw., umbrella wall.
v., velum.

PLATE I.

FIG. 1.—*Catablema weldoni*. Early stage. × 10.

FIG. 2.—*Catablema weldoni*. Adult. × $3\frac{1}{2}$.

FIG. 3.—*Catablema weldoni*. The basal portion of a tentacle. Lateral view. × 12. *b.*, basal bulb ; *cc.*, circular canal ; *dc.*, diverticulum ; *ex.*, exumbrella ; *mb.*, marginal bulb ; *r.*, radial canal.

FIG. 4.—*Catablema weldoni*. The filaments upon a tentacle. Lateral view. × 25.

FIG. 5.—*Catablema weldoni*. Lower portion of the stomach, showing the gonads (*g.*), and the mouth (*m.*) with perradial lip (*per.*). × 20.

FIG. 6.—*Cosmetirella simplex*. Adult. Lateral view. × 7.

FIG. 7.—*Cosmetirella simplex*. A portion of the margin of the umbrella, showing a sensory pit (*s.p.*) and two tentacles. × 60.

FIG. 8.—*Cosmetirella simplex*. Transverse section of a sensory pit. × 480. *cc.*, circular canal ; *ot.*, otocyst ; *v.*, velum.

PLATE II.

FIG. 1.—*Sibogita borchgrevinki.* Adult. Lateral view. × 2½.

FIG. 2.—*Sibogita borchgrevinki.* Lateral view of the stomach. × 7. (Wall of the umbrella partly cut away.) *g.*, genital opening in the wall of the stomach; *st. r.*, perradial ridge or band along the stomach; *mesen.*, "mesentery" connecting the perradial canal (*per. c.*) with the stomach; *inter. c.*, interradial canal with diverticula.

FIG. 3.—*Sibogita borchgrevinki.* Lateral view of a tentacle. × 15.

FIG. 4.—*Sibogita borchgrevinki.* Transverse section through the middle of the stomach, showing the position of the gonads. × 20.

FIG. 5.—*Sibogita borchgrevinki.* Transverse section of the stomach of a specimen which has shed the gonads. *ec. c.*, cavities lined with ectoderm. × 20.

FIG. 6.—*Ptychogena antarctica.* Margin of the umbrella curled over, showing the distal portion of a gonad (*g.*), the width of the velum (*v.*) and the arrangement of the tentacles. Oral view. × 2.

FIG. 7.—*Ptychogena antarctica.* Basal bulbs of the tentacles and the cordyli (*c.*). Aboral view. × 15.

FIG. 8.—*Ptychogena antarctica.* The basal bulb of a tentacle. Lateral view. × 15.

FIG. 9.—*Ptychogena antarctica.* A cordylus. × 80.

PLATE III.

FIG. 1.—*Eleutheria hodgsoni.* Lateral view of the medusa. × 20.

FIG. 2.—*Eleutheria hodgsoni.* Aboral view of the umbrella, showing the base of the stomach (*st.*), radial canals (*r.*), the bases of the tentacles (*t.*), and ocelli (*oc.*). × 20.

FIG. 3.—*Eleutheria hodgsoni.* Oral view of the umbrella showing the mouth (*m.*), the gonads (*g.*), covered over by the velum (*v.*), and the bases of the tentacles covered with nematocysts (*n.*). × 20.

FIG. 4.—*Eleutheria hodgsoni.* A tentacle showing the arrangement of the clusters of nematocysts when the upper branch is contracted.

FIG. 5.—*Pantachogon scotti.* Lateral view of the medusa. × 13.

FIG. 6.—*Pantachogon scotti.* Diagram showing the position of the gonads upon the radial canals. Oral view.

PLATE IV.

FIG. 1.—*Koellikeria maasi.* An early stage. Lateral view. × 30.

FIG. 2.—*Koellikeria maasi.* Lateral view of the adult. × 6.

FIG. 3.—*Koellikeria maasi.* Portion of the margin of the umbrella, showing the perradial and interradial groups of tentacles of an adult. Oral view. × 20. *per.*, perradial; *v.*, velum; *cc.*, circular canal; *b.*, compound basal bulb.

FIG. 4.—*Koellikeria maasi.* Transverse section of a radial canal, showing the ectoderm cells and groove in the wall of the sub-umbrella. × 230.

FIG. 5.—*Koellikeria maasi.* Transverse section through the wall of the stomach, and showing a longitudinal section of a gastric papilla (*p.*), and the ovary. × 230.

FIG. 6.—*Margelopsis australis.* Lateral view of the Medusa. × 55.

FIG. 7.—*Margelopsis australis.* Oral view of a basal bulb, showing the position of the two tentacles. × 200.

PLATE V.

FIG. 1.—*Desmonema gaudichaudi.* A tentacular and two rhopaliar lobes on the margin of the umbrella, showing the canal system in the lobes and the bases of the tentacles. Nat. size.

FIG. 2.—*Desmonema chierchianum.* A tentacular and two rhopaliar lobes on the margin of the umbrella, showing the canal system in the lobes and the bases of the tentacles. Nat. size.

FIG. 3.—*Lucernaria vanhoeffeni.* The interior of the peduncle. × 2. *ta.*, tæniola with gastric filaments (*f.*) in the lower part of the stomach (*st.*), and terminating in bulbous enlargements; *ca.*, cavity of the peduncle in communication with the stomach; *k.*, blind branched canals from the cavity of the peduncle in the wall of the adhesive foot (*ad. f.*); *uw.*, wall of the umbrella.

FIG. 4.—*Lucernaria vanhoeffeni.* Tentacles with adhesive pads (*ad.*). × 16.

FIG. 5.—*Lucernaria vanhoeffeni.* Portion of the genital bands, showing the elongated sacs containing gonads. × 4.

FIG. 6.—*Lucernaria vanhoeffeni.* Diagram of a longitudinal section through a genital sac. *ov.*, ova or ovary; *gd.*, genital duct.

PLATE VI.

Diplulmaris antarctica.

FIG. 1.—Ephyra stage; showing an early stage of the development of the canal system and the tentacles. Oral side. × 15.

FIG. 2.—Ephyra stage later than fig. 1, showing the circular canal and the commencement of the branching of the rhopaliar canals. Oral side. × 5.

FIG. 3.—Portion of the margin of the umbrella of an adult, showing the anastomosing of the canal system. Oral side. × 2.

FIG. 4.—Sense organ. Aboral view. × 11.

FIG. 5.—Sketch of a gonad lying on the sub-umbrella. Oral view. × 2.

FIG. 6.—Tentacle of an adult. Lateral view. × 3.

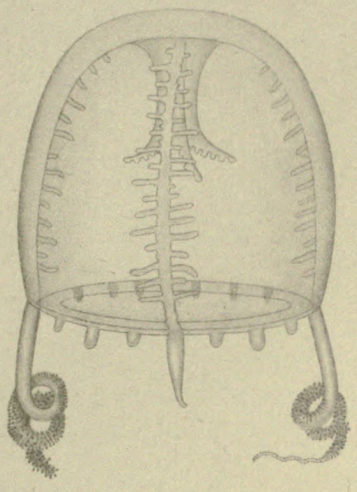
PLATE VII.

FIG. 1.—*Periphylla dodecabostrycha.* Photograph of Dr. Wilson's sepia drawing. Reduced nearly $2\frac{1}{2}$ times.

FIG. 2.—*Atolla wyvillii.* Photograph to show the wide furrows round the margin of the central disc. About natural size.

FIG. 3.—*Lucernaria vanhoeffeni.* Photograph showing a lateral view of the medusa. About natural size.

FIG. 4.—*Lucernaria vanhoeffeni.* Photograph of a specimen cut longitudinally to show the interior of the umbrella and the stomach. Slightly larger than natural size.



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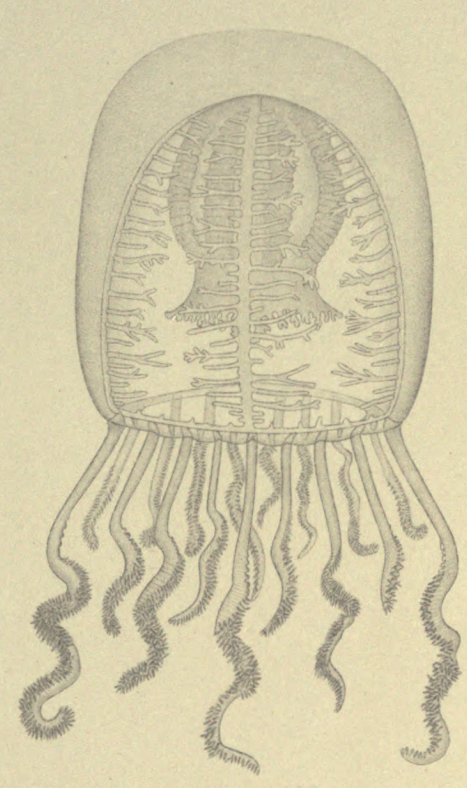

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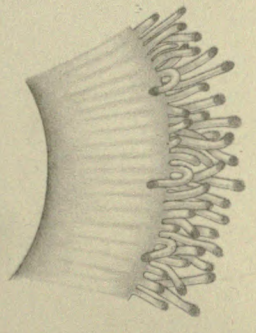

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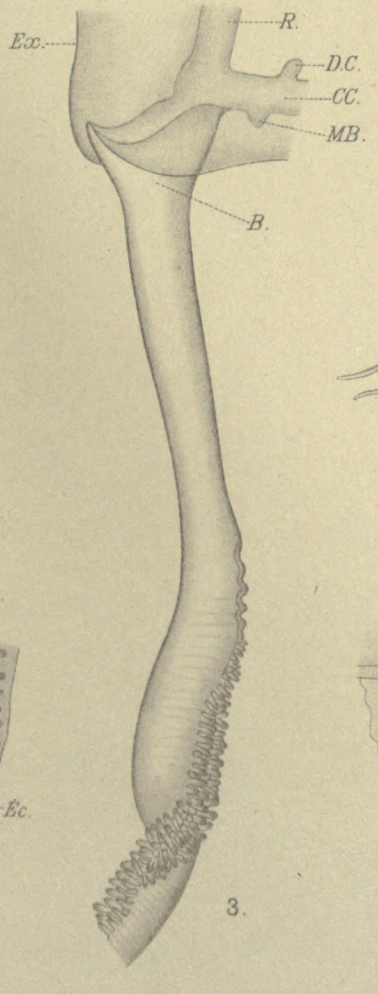

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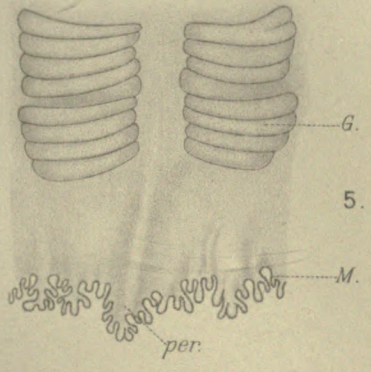

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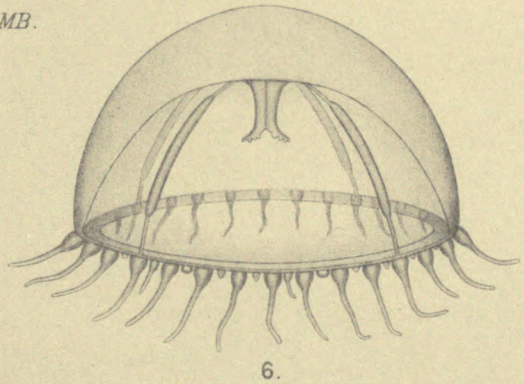

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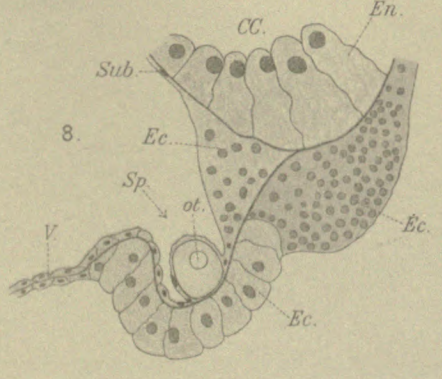

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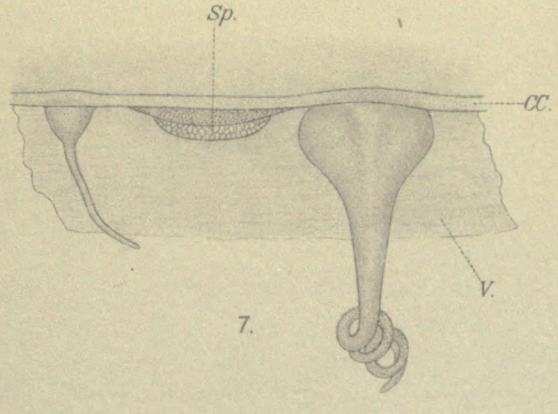

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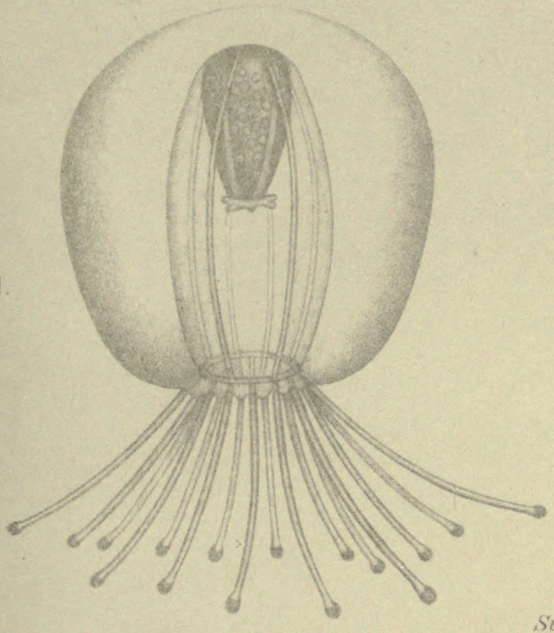

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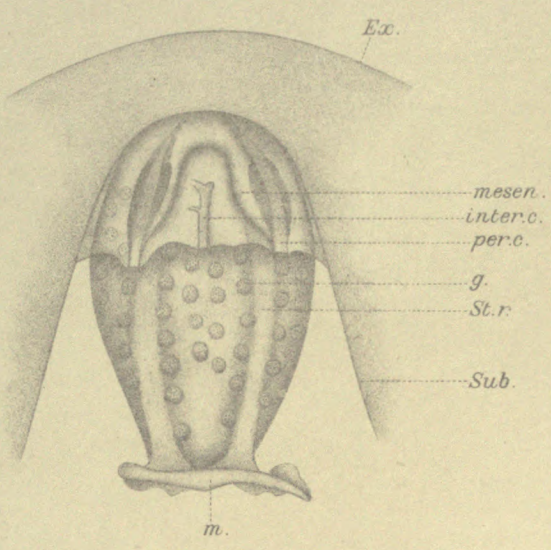

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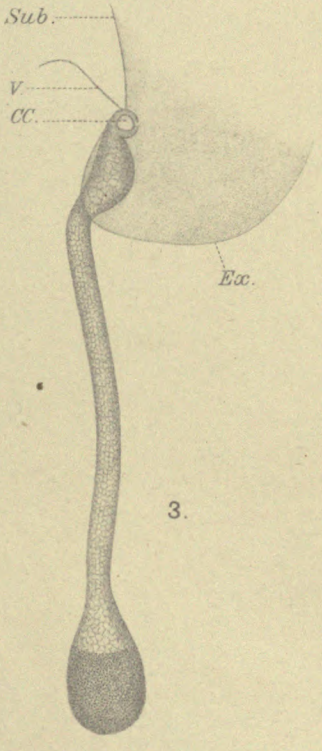

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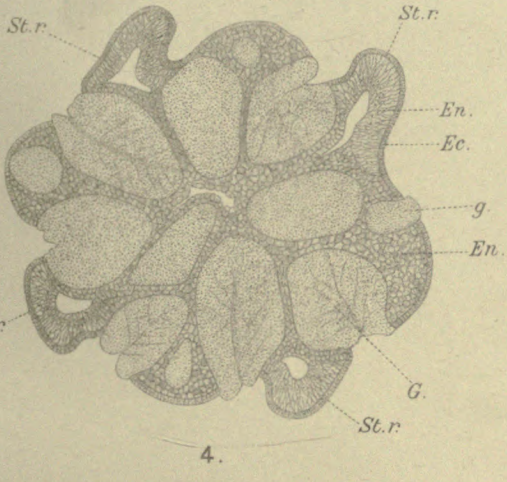

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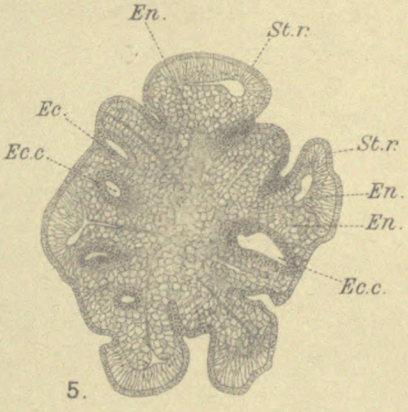

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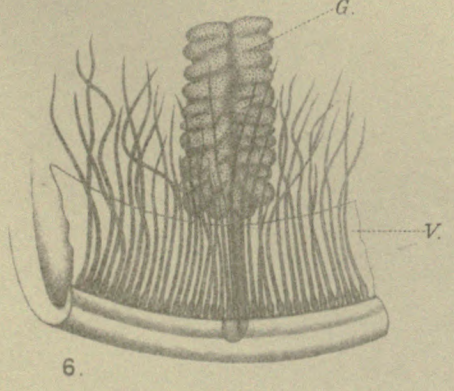

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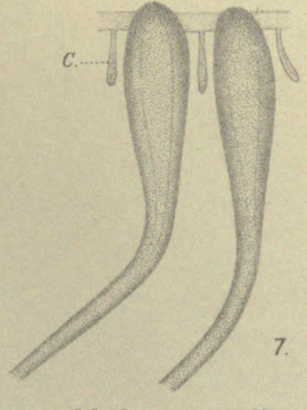

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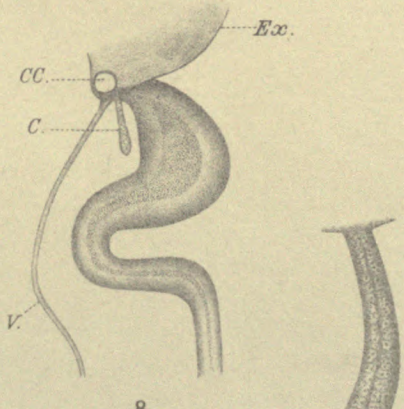

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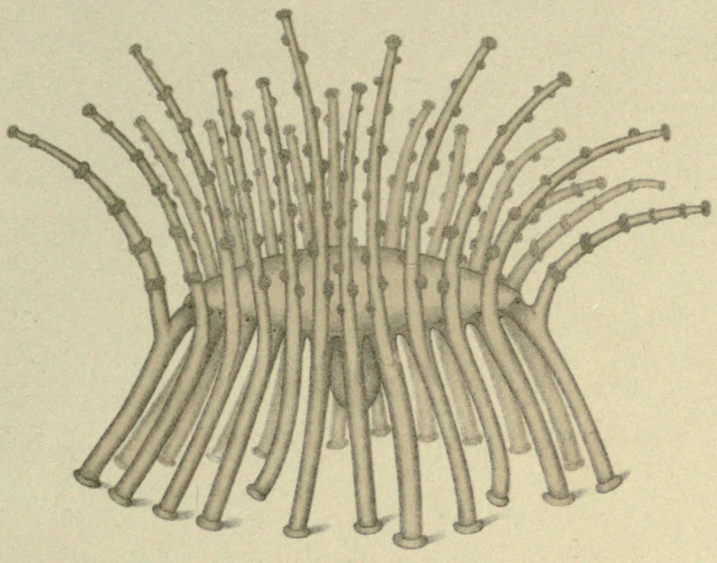

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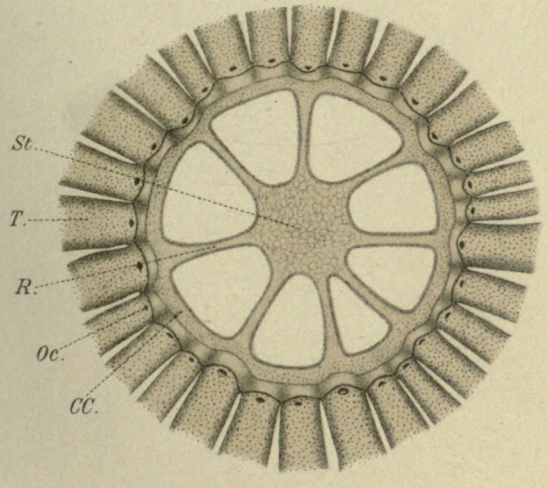

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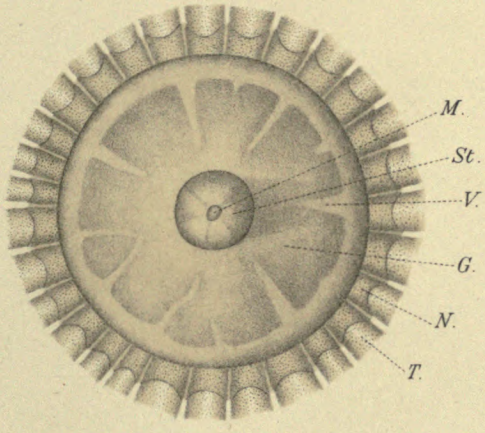

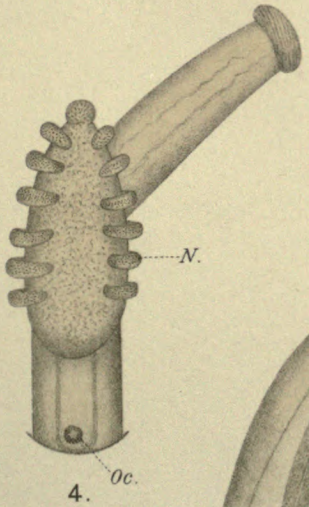

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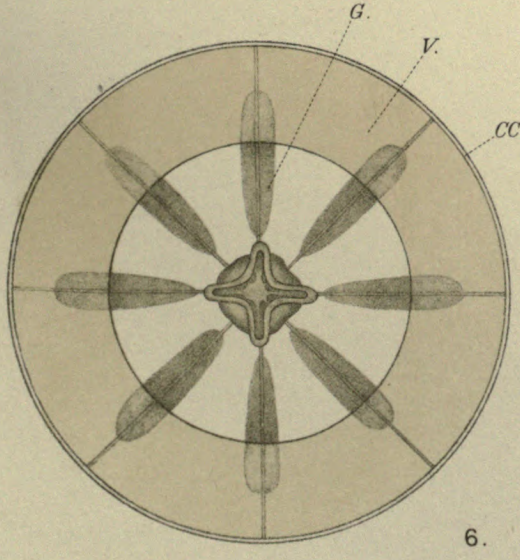

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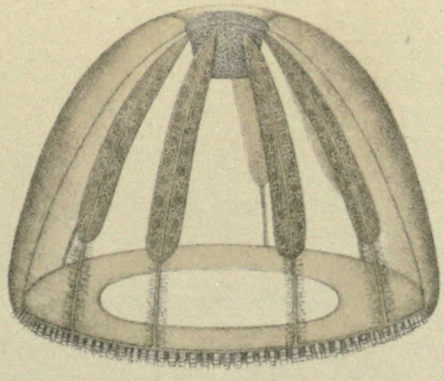

5.

Antarctic (Discovery) Exp. Medusae pl. III. Aut. del., Wilson lith.

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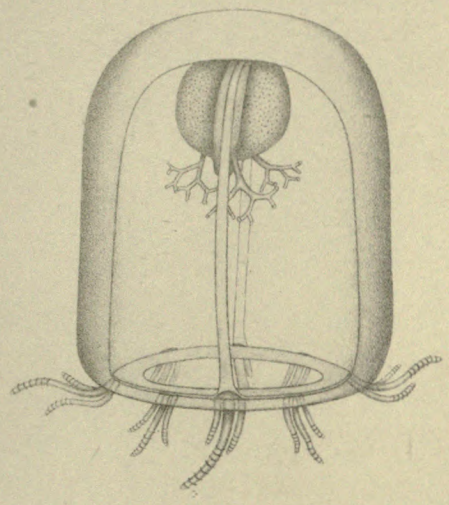

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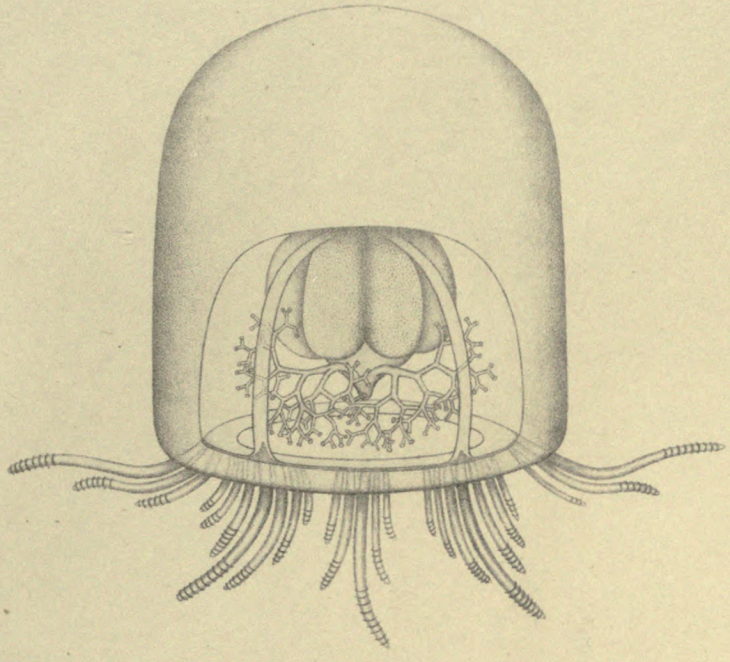

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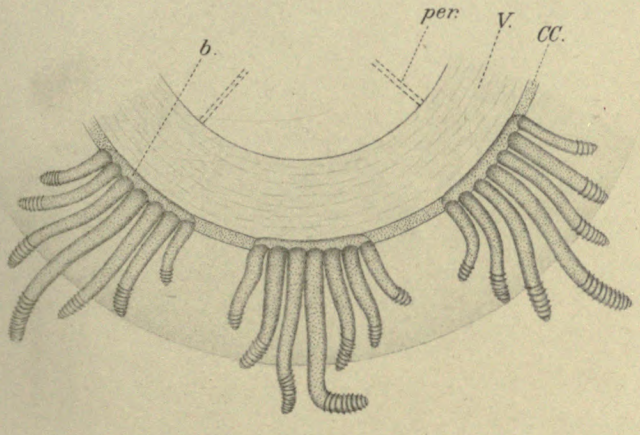

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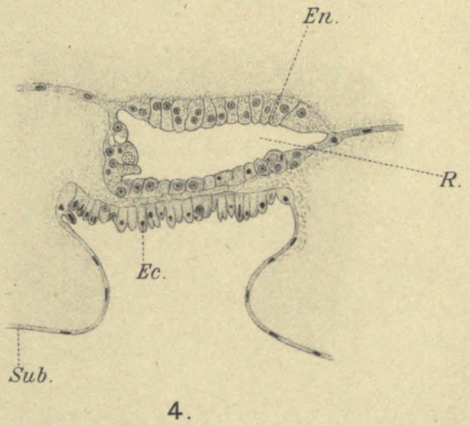

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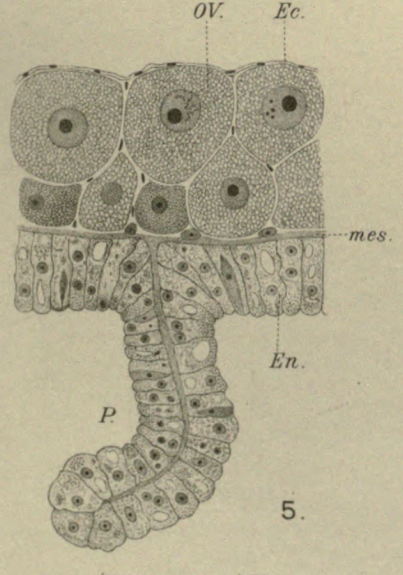

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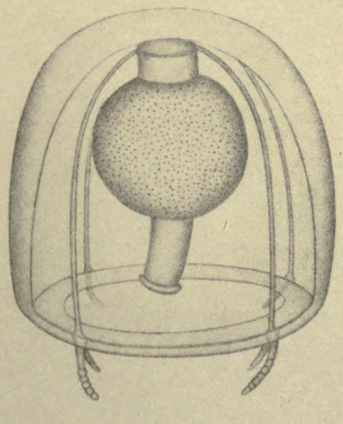

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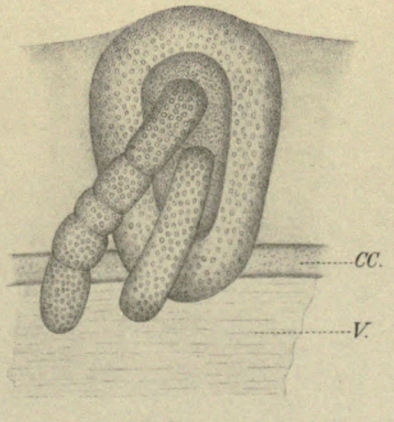

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Antarctic (Discovery) Exp. Medusae pl. IV. Aut. del., Wilson lith.

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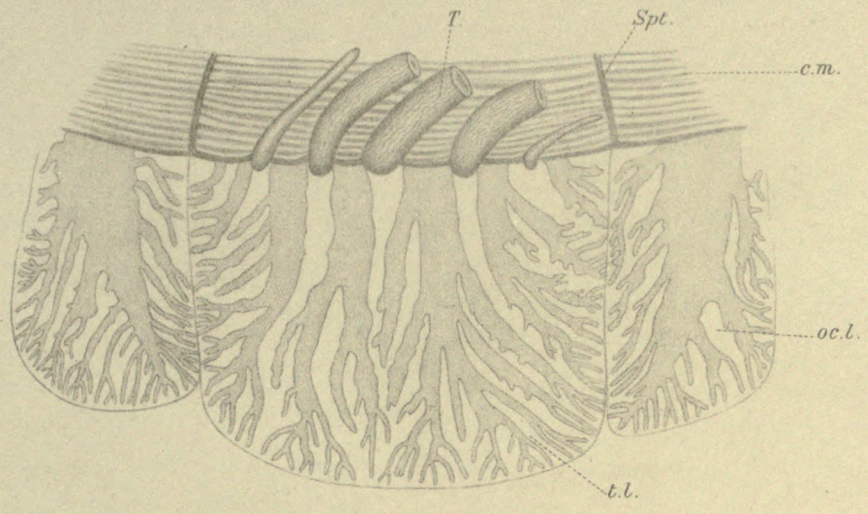

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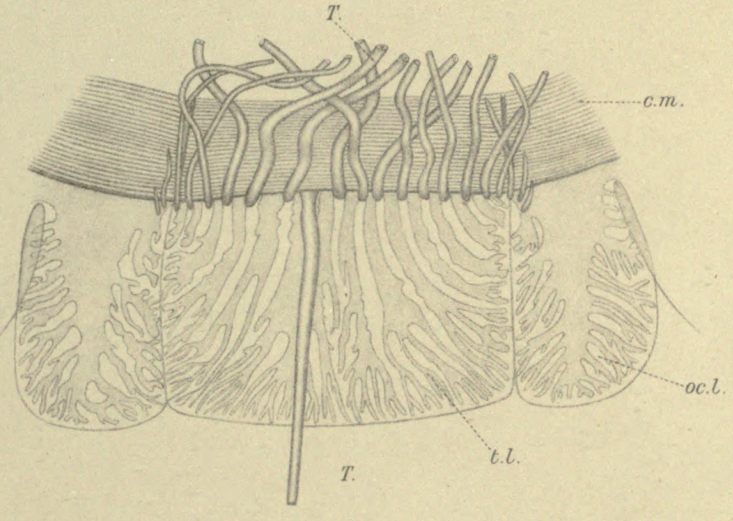

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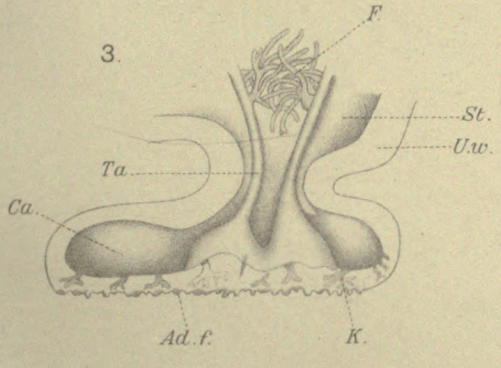

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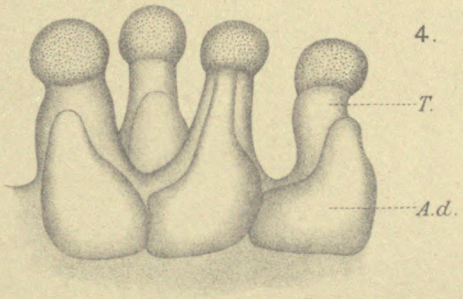

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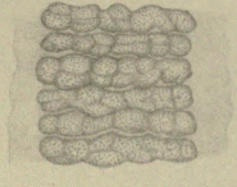

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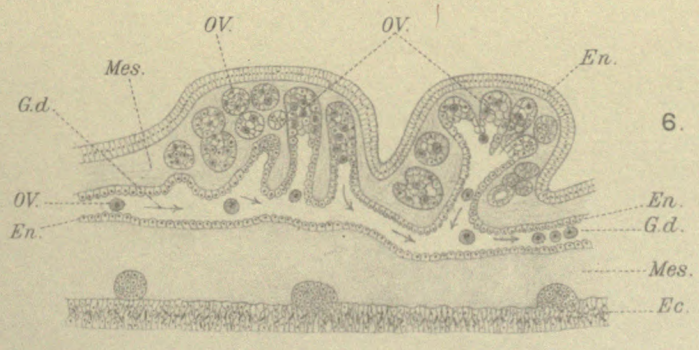

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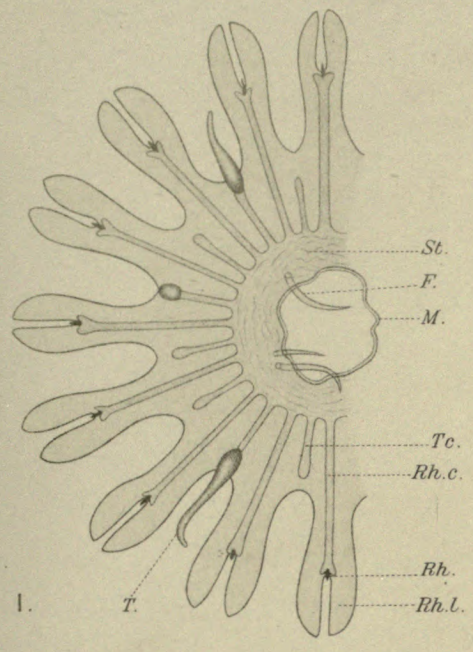

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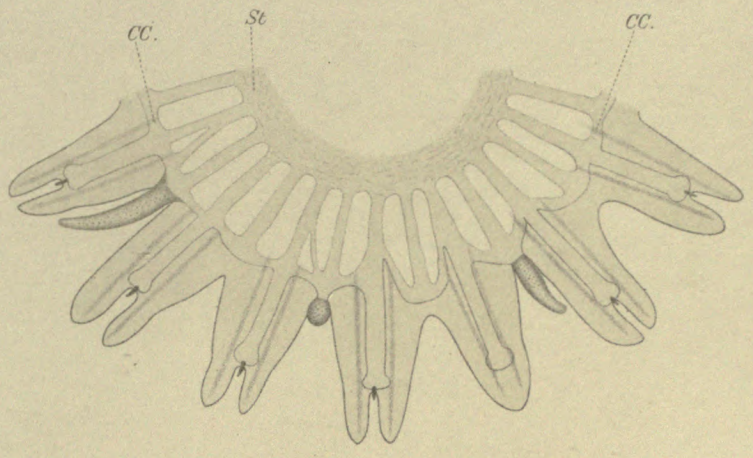

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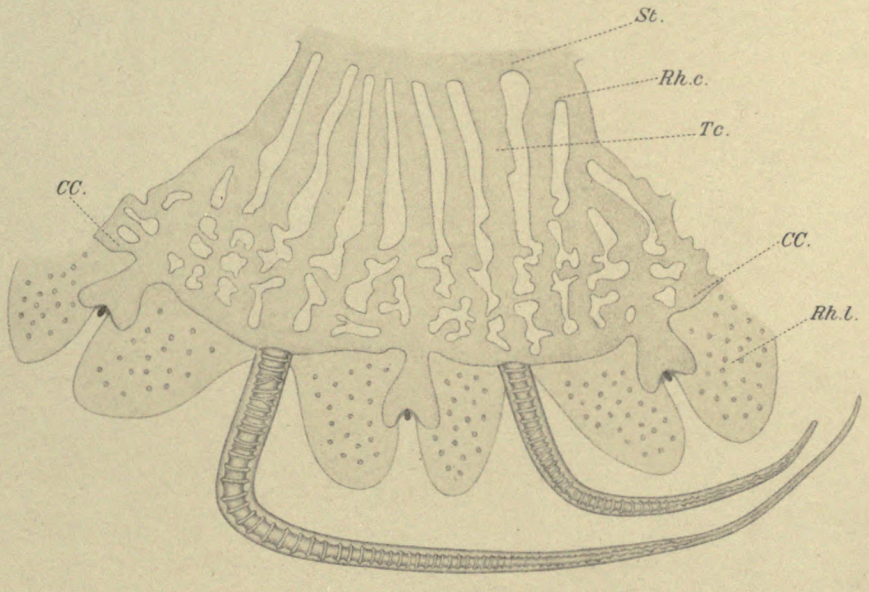

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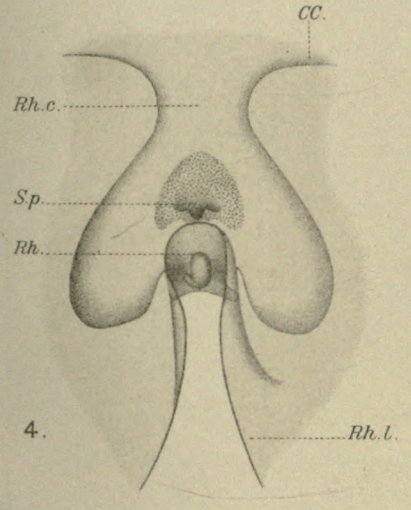

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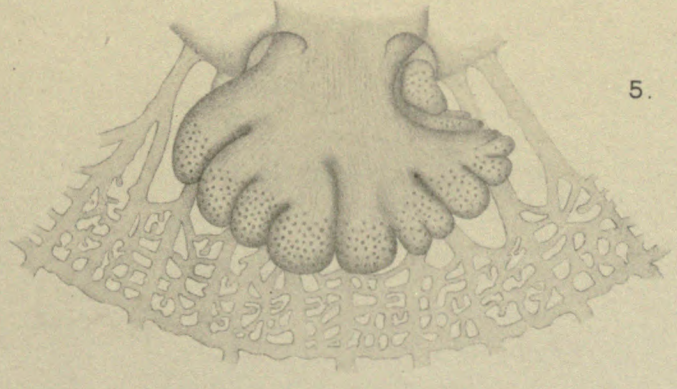

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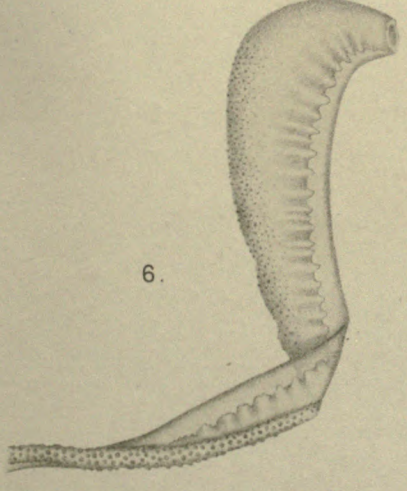

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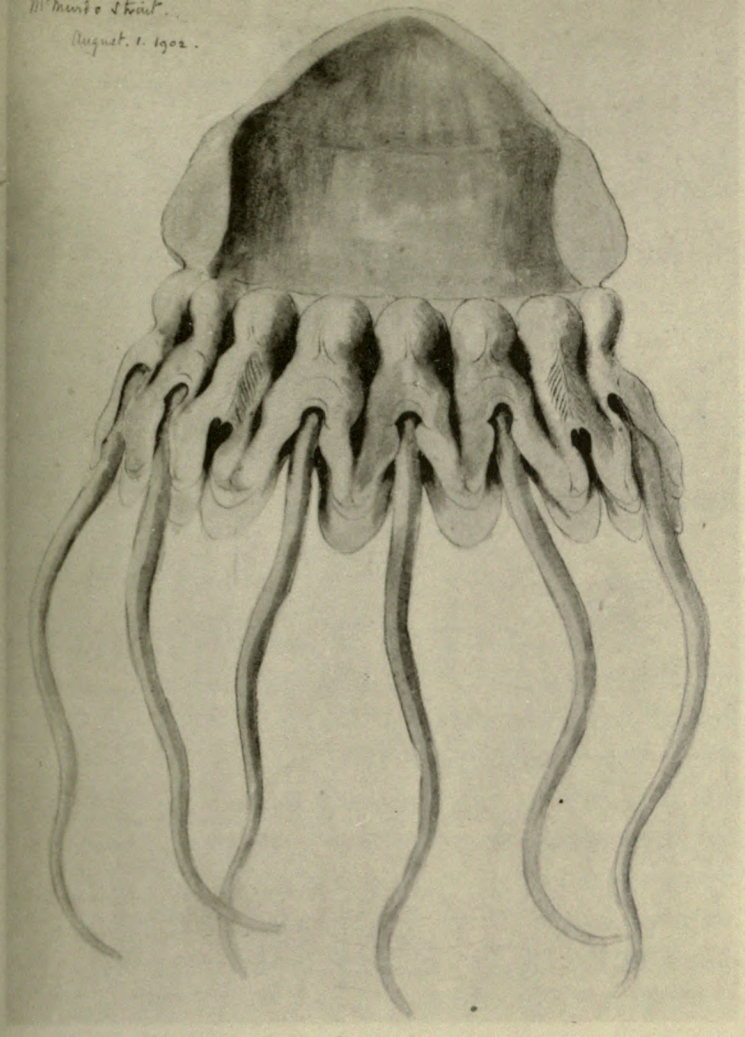
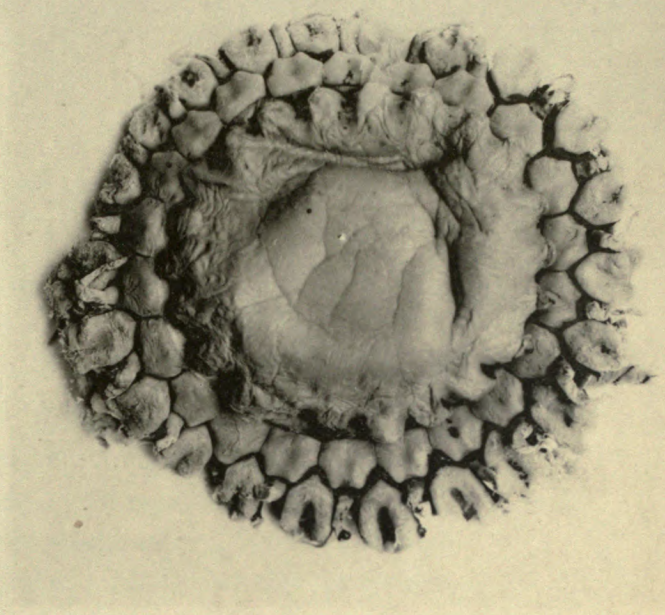
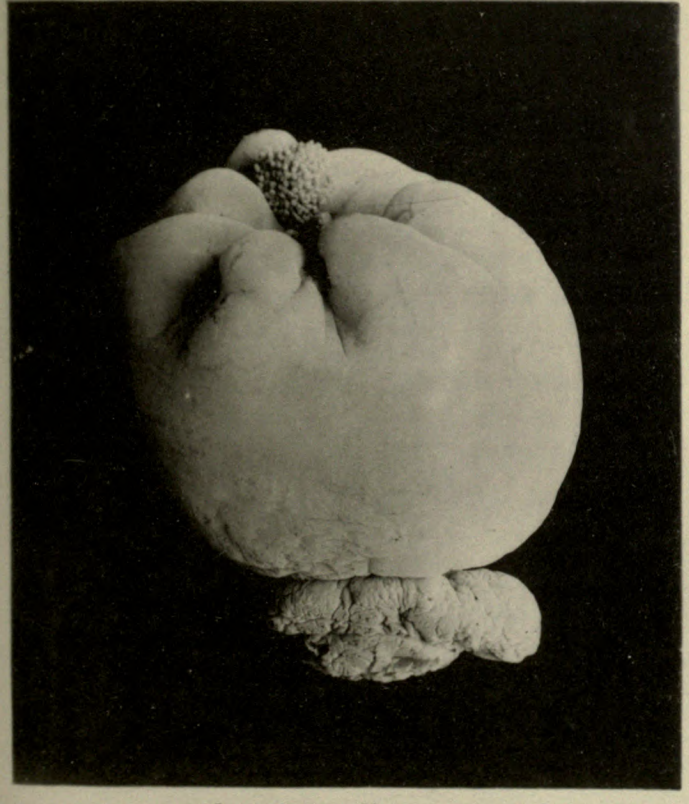


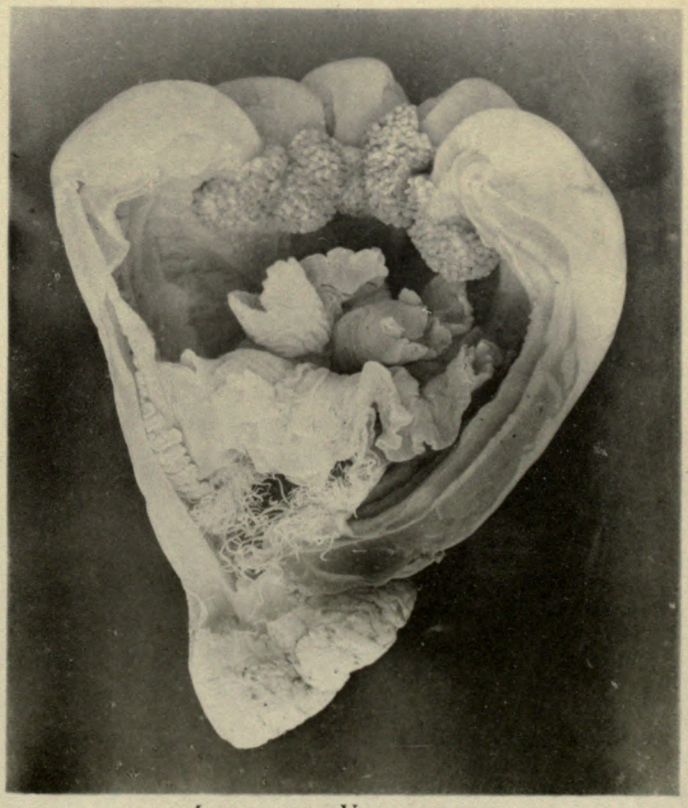
PERIPHYLLA DODECABOSTRYCHA.
Fig. 1.



ATOLLA WYVILLII.
Fig. 2.



LUCERNARIA VANHOEFFENI.
Fig. 3.
(*exterior*).



LUCERNARIA VANHOEFFENI.
Fig. 4.
(*interior*).

MEDUSAE PL. VII.

Morgan & Kidd—Photo.

LICHENES.

By Otto Vernon Darbishire.

(1 Plate.)

Including the material brought back by the British National Antarctic Expedition, there seem at the present moment to be recorded for the Antarctic continent, and a few islands off its coast, about eighty-eight lichens. In the Arctic regions a well-developed lichen-flora extends well to the north of 80° N. Lat. We might expect, therefore, to find lichens on the Antarctic continent in the same latitudes. As far as this particular group of plants is concerned, we have not yet reached the same latitudes south as north, and the furthest-south lichens are recorded from about 78° S. Lat. The southern lichens are found in small quantities only, and not in the abundance to which we are accustomed in the case of the Arctic regions. The real Antarctic lichens have a double interest. Their presence shows under what adverse conditions plant-life is possible. It is also interesting and important to observe that the species met with on the Antarctic continent do not belong to any new type of genus. There are of course several new species, but they all belong to already known genera, or genera which have representatives in warmer climes. In a paper on the Lichens of the South Orkneys I made some comparison between the Antarctic lichens and arctic and alpine lichens of Europe, but in that instance I included the lichens enumerated by Sir J. Hooker in his "Flora Antarctica." Only few of his plants came actually from the Antarctic continent. The time is not yet come to compare only the latter with the European species. We must wait till more plants have been collected. Not till then shall we be able to make suggestions regarding the origin of the lichen-flora of the Antarctic continent. I must mention that of the eighty-eight lichens recorded, thirty-eight species are new, and confined to the Antarctic south of 60°. But we may expect many additions to the Antarctic lichen-flora during the next few years.

The lichen-material brought back by the British National Expedition includes twenty-five species. But some of the plants were indeterminable, and in connection with these I would like to make a few remarks about the collection of lichens. Lichens should not be preserved in spirit, until after they have been named. It is next to impossible to determine even the larger lichens from such material, as their colour has been removed by the alcohol. After collection they should be dried by exposure, and then packed in soft paper tightly to prevent rubbing. A label should of course be placed inside. Very few botanists are lichenologists, but on the other

hand lichens form *par excellence* the outposts of plant-life, and their collection is of the greatest biological interest, as they occur in places where no other plants at all are met with. Mosses and Algae accompany the lichens only up to a certain point. No doubt more lichens might have been found if an expert lichenologist had accompanied Captain Scott; but, as it is, the material of the 'Discovery' is of very great interest. Most interesting is the discovery on Mount Erebus at a height of 1500 feet of *Gyrophora anthracina*, *Polycauliona regalis*, *Caloplaca citrina*, and *Neuropogon melaxanthum*. The first and last of these four lichens are also recorded from Mount Terror. All but the second of the four are also Arctic species. Of still greater importance is the finding at the highest point reached on the ridge of the Western Mountains—that is, at a height of 5000 feet—of a few bits of lichen. Two bits remained indeterminable, and a third—with some misgiving, it is true—was relegated to *Lecanora subfusca*. But it is of sufficient importance to discover any living organism at all in such a locality. Amongst the twenty-five species of lichens, there were five new to science.

The lichens of the 'Discovery' were collected in the neighbourhood of Granite Harbour, McMurdo Bay; at the Winter Harbour; on Mounts Erebus and Terror; and on the Western Mountains. The various substrata on which the lichens were found are moss, felspar-porphyry, dark basic scoriaceous lava, dark basic volcanic agglomerate, dark basic lava, dark basic tuff, and light acid volcanic ash. I have to thank Mr. G. H. A. Hickling for kindly naming the material on which the lichens were growing.

ENUMERATION OF THE SPECIES.

Lecidea auriculata.

Lecidea auriculata Th. Fr. Th. Fries, Lich. Scand., p. 499.

Locality.—Granite Harbour, McMurdo Bay, January 20th, 1902, on felspar porphyry.

Notes.—The specimens of this species, only a few apothecia of which were found, belonged to the var. *diducens* (Nyl.) Th. Fr.; *crusta fere nulla*. On the same stone were specimens of *Placodium murorum* and an undetermined species of *Endocarpon*. A few apothecia of *Lecanora polytropa* were also noticed on the same bit of porphyry. *Lecidea auriculata* is also recorded from the Arctic regions and from the northern and alpine parts of Europe.

Rhizocarpon geographicum.

Rhizocarpon geographicum (L.) D.C. Th. Fries, Lich. Scand., p. 622.

Locality.—Granite Harbour, McMurdo Bay, January 20th, 1902, on granite.

Notes.—This species is one of the most cosmopolitan of lichens in its distribution. It has been recorded for the Antarctic by MM. Hue (Charcot, no. 16), and Wainio

(Belgica, p. 31), and by Prof. Blackman ('Southern Cross,' p. 320), and myself (S. Orkneys, p. 2).

Gyrophora anthracina.

Gyrophora anthracina (Wulf.) Krb. Th. Fries, Lich. Scand., p. 165.

Localities.—From Mount Terror, October 21st, 1903, collected by Dr. Wilson's party. The same little box contains a second label with "Mt. Terror, October 27–28th, 1903, collected by E. A. Wilson," on it. Cape Royds, on rock at altitude 1500 feet (Erebus), January 11th, 1904, H. T. F. In both places the substratum was basic scoriaceous lava.

Notes.—Only small plants were found, and in both cases associated with *Neuropogon melaxanthum*. *Gyrophora anthracina* has not previously been recorded from the Antarctic, but it is common enough in arctic and alpine portions of Europe and America.

Gyrophora cylindrica.

Gyrophora cylindrica (L.) Ach. Th. Fries, Lich. Scand., p. 157.

Locality.—Over damp places on rocks (actual material not mentioned), Granite Harbour (New Bay), January 20th, 1902.

Notes.—A few sterile specimens were found. This species has a wide arctic and alpine distribution. M. Wainio records its presence on the Antarctic continent (Belgica, p. 10).

Gyrophora Dillenii.

Gyrophora Dillenii Tuck. Tuck., N. A. L., vol. 1, p. 87.

Locality.—Over damp places on rocks (material not specified), Granite Harbour (New Bay), January 20th, 1902.

Notes.—This species is recorded from Canada and also by MM. Wainio (Belgica, p. 9) and Hue (Charcot, p. 13) for the Antarctic.

Xanthoria lychnea.

Xanthoria lychnea (Ach.) Th. Fr. Th. Fries, Lich. Scand., p. 146.

Locality.—Granite Harbour (New Bay), McMurdo Bay, January 20th, 1902, on dark basic volcanic tuff; there was also another specimen of the same species, but without any label or record of locality.

Notes.—This is a cosmopolitan species and is recorded from the Antarctic by M. Wainio (Belgica, p. 22) and myself (S. Orkneys, p. 4).

Placodium elegans.

Placodium elegans (Link) Th. Fr. Th. Fries, Lich. Scand., p. 168.

Locality.—Granite Harbour (New Bay), McMurdo Bay, January 20th, 1902, on felspar porphyry.

Notes.—This is a common plant in most arctic and alpine regions. We have Antarctic records by Dr. Fries (Borchgrevink, p. 208), Prof. Blackman ('Southern Cross,' p. 320), Prof. Vanhoeffen (German Antarctic), and myself (S. Orkneys, p. 3).

Placodium murorum.

Placodium murorum (Hffm.) D.C. Th. Fries, Lich. Scand., p. 170.

Localities.—Summit of Observation Hill, Winter Harbour, December 12th, 1902, on felspar porphyry and light acid volcanic ash. Granite Harbour, McMurdo Bay, January 20th, 1902, on dark basic lava. "Red Lichen, Cape Royds, at altitude of 200 feet in moraine, January 11th, 1904, H. T. F.," on basic scoriaceous lava.

Notes.—Nearly all the specimens were either poor to begin with or were damaged. For this reason the above determination is open to doubt. Some of the specimens much resemble the figures in Hooker's "Flora Antarctica," vol. 2, plate 198, fig. 2, which are, however, marked *Lecanora miniata.* Our species is quite cosmopolitan in distribution. M. Wainio records it for the Antarctic (Belgica, p. 23), and so did Sir J. Hooker (Flora antarctica II., p. 535).

Polycauliona regalis.

Polycauliona regalis (Wain.) Hue. Hue, Charcot, no. 7.

Locality.—"Cape Royds, at various altitudes up to 1500 feet, January 11th, 1904, H. T. F.," on basic scoriaceous lava.

Notes.—The material has been determined as *Polycauliona regalis* with some hesitation. It was preserved in spirit and had thus become almost unrecognisable. The plant is Antarctic only, in distribution, M. Wainio (Belgica, p. 23) and myself (S. Orkneys, p. 3, plate 3, as *Placodium fruticulosum*) recording it.

Caloplaca citrina.

Caloplaca citrina (Hffm.) Th. Fr. Th. Fries, Lich. Scand., p. 176.

Locality.—Cape Royds, on rocks 1500 feet up Erebus, January 4th, 1904, "H. T. F.," on basic scoriaceous lava.

Notes.—This species is almost cosmopolitan.

Squamaria chrysoleuca.

Squamaria chrysoleuca (Sm.) Nyl. Th. Fries, Lich. Scand., p. 224.

Locality.—Granite Harbour, January 20th, 1902, on dark basic tuff.

Notes.—This plant is an arctic and alpine species, recorded by Dr. Fries (Borchgrevink, p. 208) for the Antarctic continent.

Lecanora epibryon.

Lecanora epibryon Ach. Th. Fries, Lich. Scand., p. 239.

Locality.—Winter Harbour, December 15th, 1903, over moss on earth.

Notes.—A few apothecia were found, evidently belonging to the above species. The spores measured ·013–·014 mm. by ·004–·005 mm. This species is recorded from arctic America and Asia and from Europe, also from Kergüelen.

Lecanora expectans.

(Plate I., fig. 2.)

Locality.—Winter Harbour, December 15th, 1903, over moss.

Diagnosis.—Crusta tenuissima, tartarea, albida aut cinerea, aut saepius obsoleta; apothecia ad 1 mm. lata, nigra, aut pallide rufescentia, discrete pruinosa, primum thallo immersa, margine cincta albido, crasso, demum elevatiora, sed semper margine distincto instructa, plana, saepe contigua et angulosa; hypothecium decolor, sed gonidiis superimpositum; sporae octonae, hyalinae, simplices, ·014–·015 mm. longae et ·005–·006 mm. latae. Habitat supra muscos.

Notes.—This new species resembles, in external appearance and by its habitat, some species of *Rinodina*, such as *Rinodina turfacea*, but on examination the difference in the nature of the spores is revealed. It is nearly related to *Lecanora epibyron*, but differs in the disk of the apothecium, generally being darker in our new species and also rougher and not smooth and shiny.

Lecanora lavae.

(Plate I., fig. 1.)

Locality.—Winter Quarters, on dark basic tuff.

Diagnosis.—Crusta minute granulosa, pulverulenta, aut quasi obsoleta, cinerascens; apothecia ad 1 mm. lata, semper elevata, saepius quasi stipitata, margine crasso, albido instructa, epithecium nigrum rarius pallidior et rufo-nigricans, primum depressum aut planum, demum convexum et margine altiori; hypothecium gonidiis superimpositum; sporae octonae, hyalinae, simplices, ·010–·012 mm. longae, ·004–·005 mm. latae. Habitat ad saxa vulcanica.

Notes.—This new species was found in the smallest interstices of lava. The specimens are hardly visible, and they owe their discovery to the presence of a yellow lichen, which has however remained undetermined. The thallus consists mainly of a few granular masses of sterile tissue containing gonidia, which are overshadowed by the apothecia which are almost stalked. These act also as assimilators, as they possess a dense layer of gonidia underneath the hypothecium.

Lecanora polytropa.

Lecanora polytropa (Ehrh.) Nyl. Th. Fries, Lich. Scand., p. 259.

Localities.—Granite Harbour, January 20th, 1902, on dark basic tuff. Summit of Observation Hill, Winter Harbour, December 27th, 1902, on light acid volcanic ash.

Notes.—The specimens from Observation Hill are just a bit doubtful. This species is almost cosmopolitan, and has been recorded from the Antarctic by M. Wainio (Belgica, p. 19).

Lecanora subfusca.

Lecanora subfusca (L.) Ach. Th. Fries, Lich. Scand., p. 238.

Locality.—" Lichen from ridge of West Mountains at highest point we reached, 5000 feet, December 15th, 1902, Western Sledge Journey, collected by Skelton," on granite.

Notes.—I am not at all certain that the specimens before me really belong to *Lecanora subfusca*. The material from this locality included some lichens that were quite indeterminable. It is however of first importance to find lichens at all in such a locality. The species is widely distributed and almost cosmopolitan.

Parmelia quarta.

(Plate I., fig. 5.)

Locality.—Granite Harbour, McMurdo Bay, January 20th, 1902, on dark basic volcanic ash.

Diagnosis.—Thallus 5–10 mm. latus, 3–4 mm. altus, peltatus-affixus, convolutus, superne apotheciis nigricans vel coeruleo-nigricans, sed partibus apotheciis destitutus et margine pallidior, inferne pallidior nudus et albidus, superne et inferne plentenchymatice corticatus; medulla laxe stupposa, sed ad umbilicum firma; gonidia protococcoidea; apothecia parmeleina; epithecium coeruleo-nigricans; parathecium decolor; hypothecium decolor sed gonidiis instructum numerosis; asci ventricosi; sporae 4-8nae, hyalinae, simplices, octonae, ·0075–·008 mm. longae et ·0065–·0075 mm. latae, quaternae, ·010 mm. longae et ·0075 mm. latae. Habitat ad saxa vulcanica.

Notes.—I think there can be no doubt that this is a new species, and that it belongs to *Parmelia*. The well-developed cortex above and below separate it from any species of *Squamaria*. The cortex in each case consists of branching cell-rows

running at right angles to the surface of the thallus. The plant appears as a small dark convolute lichen on a grey background of solidified volcanic ash, the most bleak substratum one can imagine.

Neuropogon melaxanthus.

Neuropogon melaxanthus Nyl. Nyl. Syn., p. 272.

Localities.—From Mount Terror, October 21st, 1903, collected by Dr. Wilson's party. The same box contains a second label with "Mount Terror, October 27th–28th, 1903, collected by E. A. Wilson," on it. "Cape Royds, on rocks at altitude 1500 feet (Erebus), January 11th, 1904, H. T. F." In both cases the substratum was basic scoriaceous lava.

Notes.—This plant is common in the Arctic and Antarctic regions, and also in New Zealand. It is recorded for the Antarctic continent by MM. Fries (Borchgrevink, p. 208), Wainio (Belgica, p. 11), Hue (Charcot, no. 5), and by myself (S. Orkneys, p. 2). Prof. Blackman ('Southern Cross,' p. 320) mentions *Neuropogon Taylori* Nyl. as occurring on Geikie Land. Through the kindness of Dr. Rendle, I was enabled to examine the specimens, on the strength of which this determination has been made. I have no doubt that they belong to *Neuropogon melaxanthus* Nyl.

Rinodina turfacea.

Rinodina turfacea (Wnbg.) Th. Fr. Th. Fries, Lich. Scand., p. 195.

Locality.—Land close about Winter Quarters, December 15th, 1903, over moss on earth.

Notes.—This species occurs in northern America and Europe. It has been recorded for the Antarctic by myself (S. Orkneys, p. 2).

Buellia frigida.

(Plate I., fig. 4.)

Localities.—Granite Harbour, McMurdo Bay, January 20th, 1902, on dark basic tuff. Some other specimens (localities not recorded) were found on felspar porphyry.

Diagnosis.—Crusta crassa, fusco-cinerea, continua aut saepius discontinua, et macula formans minuta, rimoso-diffracta, et saepius quasi tuberculoso-granulosa, margine obscuriori et effigurato distincto, hypothallo discreto; apothecia nigra, primum thallo immersa, marginata, demum emergentia, immarginata, plana vel convexa, ·5–1·0 mm. lata; epithecium carbonaceum aut rarius (in eadem specimine) decolor; hypothecium obscure fuscescens aut rarius decolor vel carbonaceum; apothecia rarius amphithecio (Rinodinae speciei simili) gonidia continenti instructa; sed maturiora semper amphithecio non cincta; sporae octonae, fuscae, bicellulares, ·009–·015 mm.

longae, et ·004–·007 mm. latae; spermogonia thallo immersa, irregulariter cavernosa; spermatia cylindrica, ad ·004 mm. longa. Habitat ad saxa vulcanica.

Notes.—This new species is, I think, undoubtedly a species of *Buellia*, but in its earlier stages the apothecium not unfrequently is partially lecanorine. The plant thus comes near to *Rinodina*. The hypothecium is often carbonaceous, especially near the margin of the fruit; but, of course, *Buellia* and *Rinodina* are very closely related to one another.

Buellia parasema.

Buellia parasema (Ach.) Th. Fr. Th. Fries, Lich. Scand., p. 589.

Locality.—Winter Harbour, December 15th, 1903, over moss on earth.

Notes.—The specimens consisted of small fragments only. This species is known from arctic America and Europe.

Buellia quercina.

(Plate I., fig. 3.)

Locality.—Probably from Granite Harbour, McMurdo Bay, January 20th, 1902, on dark basic lava.

Diagnosis.—Crusta tenuis, cinerascens, regulariter rimoso-diffracta, margine pallidiori, ambitu effigurato (Catolechiae speciei similis), continua; apothecia primum thallo, immersa, dein emergentia, elevata et quasi stipitata, immarginata; epithecium et parathecium carbonaceum; hypothecium fuscescens; amphithecium nullum; sporae octonae, fuscae, bicellulares, ·012–·014 mm. longae, ·0076 mm. latae. Habitat ad saxa vulcanica.

Notes.—This species shows a very well-marked effigurate margin, but the thallus as a whole is so thin that I think it is only a species of *Buellia*. The thallus is rimoso-diffract, and the young immersed apothecia recall some species of *Aspicilia*. It is very closely applied to the very rugged surface of the substratum. Only one specimen, measuring about 6 by 4 mm., was found. *Buellia quercina* is lighter in colour than *Buellia frigida*, and its margin is more clearly effigurate. The interrupted thallus of the latter, forming often small patches barely ·5 mm. in diameter, is another important external difference.

Physcia caesia.

Physcia caesia (Hffm.) Nyl. Th. Fries, Lich. Scand., p. 140.

Localities.—Granite Harbour, McMurdo Bay, January 20th, 1902, on granite. Winter Harbour, December 15th, 1903, over moss and possibly basis scoriaceous lava.

Notes.—The material from the latter locality is I think again open to doubt, especially that specimen which has the lava as its substratum. This species is cosmopolitan. It is recorded from the Antarctic by MM. Wainio (Belgica, p. 24), Hue (Charcot, no. 11), and Vanhoeffen (German Antarctic).

Acarospora chlorophana.

Acarospora chlorophana (Wnbg.) Mass. Th. Fries, Lich. Scand., p. 208.

Localities.—"From one of islets in 'old ice,' middle of strait (McMurdo). Collected by Dr. Wilson, December 10th (circa), 1903," on felspar porphyry. Granite Harbour, McMurdo Bay, January 20th, 1902, on basic scoriaceous lava.

Notes.—This is an arctic and alpine plant not previously recorded from the Antarctic.

Endocarpon.

Endocarpon sp.

Locality.—Granite Harbour, McMurdo Bay, January 20th, 1902, on felspar porphyry.

Notes.—A small fragment only of some species of *Endocarpon* was found on the same stone as the apothecia of *Lecidea auriculata*. Sections were cut of the few perithecia present, but they were old and contained no spores. Thus it was possible to determine only the generic name.

With regard to the specimens which were impossible of determination, the following remarks may be made. A bit of dark scoriaceous lava and a bit of dark basic agglomerate from "Cape Royds, alt. 1500 feet on Mount Erebus, January 11th, 1904, H. T. F.," both had lichens on them. But they were very simple in structure and also sterile, so that I was quite unable to name them. The alcohol-material from the same locality was, as already mentioned, quite useless.

There was a minute yellow lichen on some small bits of dark basic scoriaceous lava from "Winter Quarters," January 13th, 1903, which was not determinable.

Some felspar porphyry from Granite Harbour (?) has on it a lichen with incomplete apothecia, but with soralia here and there.

Some granite from Granite Harbour had on it a species of *Lecidea* (spores ·006–·007 by ·004–·005 mm.), which was in too incomplete a condition to name.

From Winter Harbour (December 15th, 1903), we have a quantity of moss on soil. On the moss are found specimens of *Lecanora epibryon* and *L. expectans*, *Rinodina turfacea*, and a yellow species which turns red on the application of potash. It is sterile and may belong to some reduced form of *Placodium*, but I have not been able to place it satisfactorily. It is not unlike "Arnold exsic. no. 1615, *Physcia cirrhochroa* Ach., thallus leprosus." The plant seems to be very common; but I have been unable, even after careful searching, to find any apothecia.

The following is an arrangement of the species under the different localities at which they were found.

Granite Harbour, McMurdo Bay.

All the lichens were found on rocks and stones :

Lecidea auriculata.
Rhizocarpon geographicum.
Gyrophora cylindrica.
„ Dillenii.
Xanthoria lychnea.
Placodium elegans.
„ murorum.
Squamaria chrysoleuca.
Lecanora polytropa.
Parmelia quarta.
Buellia frigida.
„ quercina.
Physcia caesia.
Acarospora chlorophana.
Endocarpon sp.

Islet in old ice, middle of strait, McMurdo Bay.

On stone :

Acarospora chlorophana.

Winter Harbour.

Over moss on earth :

Lecanora epibryon.
„ expectans.
Rinodina turfacea.
Buellia parasema.
Physcia caesia.

On stone :

Lecanora lavae.

Winter Harbour, summit of Observation Hill.

On stone :

Placodium murorum.
Lecanora polytropa.

Cape Royds, 1500 *feet up Mount Erebus.*

On stone :

Gyrophora anthracina.
Neuropogon melaxanthus.
Polycauliona regalis.
Caloplaca citrina.
Placodium murorum (200 ft. only).

Mount Terror.

On stone :

Gyrophora anthracina.
Neuropogon melaxanthus.

Highest point reached (5000 *feet*) *on ridge of Western Mountains.*

On stone :

Lecanora subfusca.

The following papers have been referred to in the course of this Report on the lichenes of the 'Discovery' :—

1. Blackman, V. H.—Lichenes. Report on the Collections of Natural History made in the Antarctic regions during the Voyage of the 'Southern Cross.' London, 1902, p. 320.
2. Darbishire, O. V.—The Lichens of the South Orkneys. Transact. and Proceedings of the Botanical Society of Edinburgh, vol. 23, pp. 105–110, plate 23, 1905.
3. Fries, Th. M.—Lichenographia Scandinavica. Upsaliæ, 1871–1874.
———— Lichenes antarctici. Nyt Mag. f. Naturvidenskab. Bind 40 (1902), p. 208.
4. Hooker, J. D.—The Botany of the Antarctic Voyage of H.M. Discovery Ships 'Erebus' and 'Terror,' in the years 1839–1843. London, 1847. (Flora antarctica.)
5. Hue, A. M.—Lichens. Expédition Antarctique Française (1903–1905), commandée par le Dr. Jean Charcot. Paris, 1908.
6. Nylander, W.—Synopsis Methodica Lichenum. Paris, 1858–1860.
7. Tuckerman, E.—A Synopsis of the North American Lichens. Boston and New Bedford, 1882–1888.
8. Vanhoeffen, E.—Veröffentlich. Instituts f. Meereskunde, Heft 5, pp. 143–154. Berlin, 1903.
9. Wainio, E. A.—Lichens. Résultats du Voyage du S. Y. 'Belgica' en 1897–1899. Expédition Antarctique Belge. Anvers, 1903.

DESCRIPTION OF PLATE.

Fig. 1.—*Lecanora lavae.*—Vertical section of apothecium, showing the gonidia under the hypothecium and the small granules at the lower end of the stalk of the apothecium. Magnification 100.
Fig. 2.—*Lecanora expectans.*—Vertical section of apothecium, showing the gonidia under the hypothecium and the loose hyphae infesting the moss-plant on which the lichen is growing. Magnification 100.
Fig. 3.—*Buellia quercina.*—Plant in situ on dark basic lava from Granite Harbour. Natural size.
Fig. 4.—*Buellia frigida.*—Plant in situ on felspar porphyry from unknown locality. Natural size.
Fig. 5.—*Parmelia quarta.*—Plant in situ on dark basic volcanic ash from Granite Harbour. Natural size.

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Fig. 1.

Fig. 2.

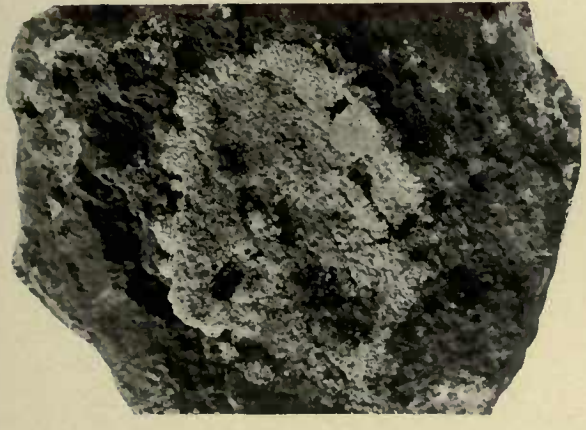

Fig. 3.

Fig. 4.

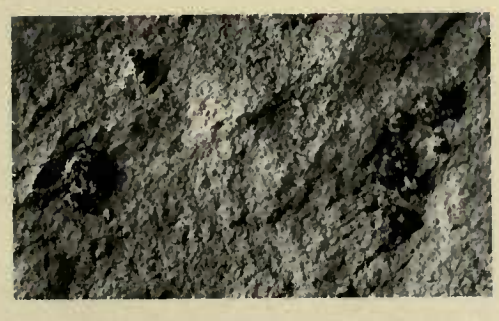

Fig. 5.

West, Newman proc.

Fig. 1. LECANORA LAVÆ. Fig. 2. LECANORA EXPECTANS. Fig. 3. BUELLIA QUERCINA.
Fig. 4. BUELLIA FRIGIDA. Fig. 5. PARMELIA QUARTA.

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