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MARINE ANNELIDS (POLYCHÆTA)

OF

SOUTH AFRICA.

PART II.

BY

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INTRODUCTION.

In this as in the previous part attention may again be drawn to the comparatively large number of European forms in South African waters, and to the very wide distribution of others which occur there. Thus the purple Polynoid, *Polynoë* (*Macellicephala*) *mirabilis*, ranges from the north-west of the North Island of New Zealand to the Cape on the one hand, and to the Kara Sea (Levinsen) on the other; whilst *Polyeunoa lævis* stretches from the Strait of Magellan to Prince Edward's Island and is now brought within 25 miles of the Cape. Indeed almost everyone of the species in this section is remarkable for its cosmopolitan tendencies, and, as critical examinations extend in future, it is probable that one or two still doubtful may be included in the same category. The range of such forms as *Chaetopterus variopedatus*, *Cirratulus cirratus* and *tentaculatus*, *Dasybrauchus caducus*, *Nicomache lumbricalis*, *Potamilla reniformis*, *Bispira volutacornis* and even the crustacean parasites of Annelids is remarkable, and show how much has yet to be done in the distribution of marine animals, and moreover illustrates the bold contrast they present to the distribution of land animals.

Fam. POLYNOIDÆ.

POLYNOË (MACELLICEPHALA) MIRABILIS, McIntosh, 1885.

1885. *Polynoë* (*Macellicephala*) *mirabilis*, McIntosh, Ann. "Challenger" p. 121, Pl. xvi. fig. 1, Pl. xii. figs. 9-11.

1886. *Oligolepis violacea*, Levinsen, Kara-Havets, Ledorme, p. 4, Pl. xxv. figs. 1-4.

This purple polynoid was procured in the trawl at 470 fathoms, 25 miles off Cape Point Lighthouse, bottom, green sand and hard ground. The specimens had been put in formalin and their colour was fairly preserved. The rich purple or deep mauve tinted the whole of the dorsum where it was most intense, the proboscis and the feet, the tips of which were less deep in colour. The ventral surface was also somewhat pale—marked along the ventral line by the nerve-cords; and a pale line passed from each segmental papilla to the middle line—nearly transversely in front, but obliquely forward and inward behind.

This form, a single example of which was first dredged during the cruise of H.M. Ship "Challenger" at Station 169 (off the north-west corner of the North Island of New Zealand) in 700 fathoms, is evidently an inhabitant of deep water. The South African examples, from their mode of preservation are

much more richly tinted than the original one. They agree, however, in all essential characters with the type-specimen. They are somewhat larger, the body of the most complete measuring 28 mm. in length (exclusive of the appendages) and of similar breadth to that procured by the "Challenger."

No scales existed on any of the examples (three), so that they would seem to be very slightly attached. Whether the delicate scale with a group of small papillæ—in the bottle beside the specimens—pertained to this form is unknown. The caudal cirri were likewise absent, the bristles of the last pair of feet being directed backward and greatly diminished in length.

In the description of the specimen from the "Challenger" * it is stated that the dorsal surface of the partially extended proboscis shows two papillæ, one beneath each flattened frontal lobe, but such probably refers to the two marked lateral fillets, which when the organ is fully extended occur opposite the gap between the dorsal and ventral series of terminal papillæ. The basal region is somewhat constricted and minutely corrugated and divided by a furrow into two fillets. Beyond the latter the organ dilates and forms a dorsal and a ventral crescent, whilst the lateral region passes forwards as a peak. The dorsal and ventral series of papillæ at the tip of the organ in extension are 9 in number, and they readily fall off in the preparations. The horny jaws follow the ordinary arrangement, the right of the dorsal pair passing between the ventral.

In the structure of the feet and of the bristles—both dorsal and ventral—they agree with the example from New Zealand. Opposite the base of each foot is a deep dimple causing the foot from the dorsal surface to have a bilobed base. Attached to the tip of one or two segmental papillæ—by a stalk from the lumen—were little whitish masses of sperms—all the specimens apparently being males. It comes to be a question as to whether such a type is not more or less pelagic at this period, a feature perhaps not unconnected with its wide distribution. The alimentary canal posteriorly formed a small empty tube, the body-cavity being filled with masses of sperms.

The *Oligolepis violacea* of Levisen, from the Kara Sea, published the following year (1886) appears to be the same form. †

POLYEUNOA LÆVIS, McIntosh, 1885.

1885. *Polyeunoa Lævis*, McIntosh, Ann. "Challenger," p. 76, Pl. xii., fig. 2, and Pl. xx., fig. 8.

A single example devoid of scales was obtained in the trawl by Dr. Gilchrist in 470 fathoms, 25 miles off Cape Point Light-

* Op. cit. p. 122.

† Kara-Havets Ledorme, Kjöbenhavn, 1886.

house; bottom—green sand and hard ground. Several loose scales, however, were in the bottle beside it and *Polynoë* (*Macellicephala*) *mirabilis*, the other form procured at the same time.

The occurrence of this species off the Cape is interesting—showing a nearer approach to shore than in those dredged by the “Challenger” off Prince Edward Island in 310 fathoms. The species likewise stretches to the Strait of Magellan. Whilst two of the loose scales in the bottle agreed with those of the examples from the “Challenger,” a third had a group of small papillæ, but its connection with the rest was uncertain. The example was a female with ripe eggs.

Fam. CHÆTOPTERIDÆ.

CHÆTOPTERUS VARIOPEDATUS, Renier, 1804.

1804. *Tricetia variopedata*, Renier, Osservazioni postume di Zool. Adriatica, p. 35.
 Meneghini, *ibid.* p. 38.
1844. *Chætopterus pergamentaceus*, Will, Archiv. f. Naturg. t. x., p. 328.
 Leuckart, *ibid.* t. xv. p. 340.
- ” ” *Leuckartii*, De Quatref. Annel. II., p. 216.
 ” *pergamentus*, Kowalewsky, *Entwick.* d. Rippenqualler, p. 6.
1855. ” *Capensis*, Stimpson, U.S. Surveying Exped. Proceed. Acad. Nat. Sc., No. 33.
1861. ” *hamatus*, Schmarda, Neue Wirb. Thiere. ii., p. 16, Taf. xix., f. 166.
1868. ” *variopedatus*, Claparède, Ann. Nap., p. 338.
1885. ” ” *Carns*, Faun. Medit. i., p. 257.
1890. ” *variopedatus*, Joyeux-Luffine, Arch. Zool. Expér. (2) viii., p. 245, Pls. xv.-xx.
1894. ” ” De St. Joseph, Ann. Sc. Nat. 8^e Sér., xvii., p. 147, Pl. vii. f. 189-199.
1897. ” ” Ehlers, d. Hamburg. Magalhæn. Sammelreise, p. 109.

Between tide-marks, at St. James', in False Bay.

Ten bristled segments occur in the first region, the last joining the long wings, as in the example of the same species from the Channel Islands, England and Scotland. The head dorsally bears the long tentacles, at the bases of which externally are the eyes—a linear series of isolated pigment-spots which in the preparation are covered by the free flap of the collar. One or two

specks, however, are visible externally at the base of the collar on each side. The great setae occur on the 4th segment and are modifications of ordinary bristles for special work (Plate V. fig. 51). They are of great size, widened at the tip and specially thickened by the chitinous secretion there, a feature well seen in forms which have not yet been worn. These, as in the figure, have the tip on one side acute, and, moreover, the edge is minutely serrated, as if to show its connection with the ordinary forms. These serrations disappear in those subjected to wear. Considerable variation in size occurs in representatives of the species from different quarters, thus in some Neapolitan examples these bristles are considerably smaller (Plate V, fig 52), but they retain their essential characters.

In the sickle-shaped anterior feet, again, the bristles present a characteristic gradation from the slender terminal forms with narrow wings (Plate V, fig. 53) to the spathulate kinds which succeed, and which in varying proportions occur throughout the greater part of the edge of the foot (Plate V., fig. 54) to the greatly developed series towards the base (Plate V., fig. 55) which not only have a much larger spathulate tip, but a thicker shaft, the figures being drawn to the same scale. The flattened and tapered tips of the spathulate bristles have probably special functions in progression, and in the various movements in the manufacture of the tube, just as the powerful bristles of the fourth segment have in these and other respects.

The hooks of the anterior region (Plate V. fig. 56) and those of the posterior agree with those from European waters, though the figures just quoted may not correspond in all cases. Thus in the able memoir of Joyeux-Laffine these hooks (Arch. Zool. Expér. 2d Sér. viii., Pl. XV., f. 4) are represented by an example which has the processes for the tendons at each end too large, as is also the tendon itself, and either an unusually long hook or one not fully on its flat has been selected for illustration. The French author has correctly indicated a double series of striations on these hooks. In the South African examples the most superficial striations slant downwards and forwards from the posterior border of the hook, whilst by deeper focussing a finer series pass from the teeth obliquely—with a slight inclination downwards and backwards.

A former comparison of examples from the various British areas in which it occurs with those from Naples led to the view expressed by M. Joyeux-Laffine,* viz., that so far as these go one species alone is concerned. The same conclusion is reached when the form from the Cape is included, for in all essential particulars it is identical with the European examples. This opinion is shared by Mr. Cyril Crossland, who is doing

* Arch. Zool. Expér. 2d. Sér. viii. pp. 346-50.

such good work amongst the annelids collected by himself at Zanzibar, and to whom the specimens had been shown before their final examination. The present examples are comparatively small—much less than those from Herm and Guernsey, or even from Shetland.

So far as can be gleaned from Stimpson's account, the same form is referred to, though he places the great bristles on the 3rd. foot. The general description and the number of teeth in the uncini agree. He found his examples at Simon's Bay, Cape of Good Hope. Schmarcla procured his *Chætopterus hamatus* (op. cit.) from the same bay, and though his description is lax, there is little doubt, taking his figures also into consideration, that he refers to the present species. He mentions that the tube is constructed externally of fine sand-grains, whilst internally it is smooth. His figure of the animal in its tube gives a good idea of the relative proportions.

Chætopterus variopedatus is one of the most beautifully luminous annelids, bright flashes being emitted from the posterior feet, but the most vivid phosphorescence is at a point on the dorsum between the lateral wings of the tenth segment. Here the copious mucus exuded by the animal can be drawn out as bluish purple fire of great intensity, which besides, now and then gleams along the edges of the wing-like processes and illuminates the surrounding water. A very characteristic odour, somewhat resembling that of phosphorus in combustion, is given out by the animal during such experiments, and in this connection it may be observed that Quoy and Gaimard mention that an odour similar to that around an electric machine is produced by luminous marine annelids. An elaborate account of this phenomenon is given by Panceri,* who concludes that the luminosity arises in special epithelial cells.

The species of *Chætopterus* stand much in need of revision, and when this is carried out it will be found in all probability that the species here mentioned (*C. variopedatus*) has a very wide distribution and has been described under various names as new species; nor is this surprising in an annelid which frequents the shores of at least three great continents, viz. :—Europe, Africa, and America.

Fam. ARICIIDÆ.

THEODISCA (ANTHOSTOMA) HEXAPHYLLUM, Schmarcla, 1861.

1861. *Anthostoma hexaphyllum*, Schmarcla, Neue wirb. Thiere, I., II., p. 61, Taf. xxvii., fig. 217.

Obtained between tide marks at St. James', False Bay.

* Atti d. Accad. d. Scienze. Napoli. 1875.

The head forms a small conical flattened process devoid of eyes or appendages.

Body of variable length, ranging from 135 to 200 m.m., somewhat tetrahedral in form, slightly tapered in front, and more gently posteriorly, but the tail is by no means slender, and it ends in an oblique funnel directed ventrally, with a somewhat frilled margin and a ventral process with three papillæ. So frequent is this organ in process of reproduction that it is difficult to say what its precise condition is. In many it is bordered externally by a fringe of the developing and rudimentary feet which resemble papillæ. The latter, indeed, seems to be the normal condition, the frilled lips of the anal funnel being sometimes separated by a smooth margin due to the papillose continuations of the feet. All that can be said of the adult specimens is that the tail ends in an anal funnel, the folds of mucous membrane internally forming six or seven symmetrical plaits on each side, whilst its rim is smooth. The dorsal surface is somewhat hollow, the ventral convex.

The first segment is achætous, and has the mouth on the ventral surface, out of which protrudes the foliaceous mass which gives origin to the name of the genus, and which is its proboscis, as in allied forms. In partial protrusion three lobes are visible, whilst in full extension there are six or more. The organ forms a complex series of folded lobes the grooves of which converge to the central one. It can be entirely retracted.

The second segment has dorsally two processes, an inner flattened lamella with a blunt tip, and a tuft of long, slender and nearly straight bristles with closely arranged serrations, springing from its inner side. Externally is a shorter bluntly conical process arising behind a dense row of shorter and stouter bristles, the longer showing serrations, the shorter with blunt tips and only a trace of the serrations, the former lamella pertains to the dorsal region, the latter to the ventral division of the foot.

At the sixth bristled segment another conical process (branchiæ) appears on the inner side of the longer lanceolate leaf and is continued backwards. Whilst the former process remains more or less lanceolate, the outer lobe at this foot presents a broad lamellar base, which by and by extends downwards as a ridge behind the bristles.

The arrangement just noted reaches its maximum at the 25th bristled foot (Plate V., fig. 27), which has dorsally and ventrally a somewhat enlarged and tapering inner gill, then the lanceolate lobe and its tuft of long serrated bristles, and, after an interval, a short conical process and the long ridge behind the bristles. The latter consist of a long row of arcuate blunt forms, of others with slender serrated tips, and, ventrally, of elongated serrated intermediate forms. The condition resembles that in such forms as *Aricia Cuvieri*.

Behind the 25th foot the inner gill rapidly increases in size and inclines inwards over the dorsum, the tips turning forwards when they meet in the middle line. Coincident with the change in the inner gill, the dense row of ventral bristles diminishes in size and strength (the 28th foot terminating the larger anterior series) so that at the 45th foot (Plate V., fig. 29), the ventral division has assumed the shape of a short broad leaf with a few short blunt bristles in front of it—ventrally a short tuft of finely tapered serrated bristles, and dorsally a longer series having the same structure. Dorsally is the longer lanceolate process, which like the ventral has its convex base external, and the long tuft of tapering serrated bristles. Internally is the vascular and richly ciliated gill, the tip of which is tapered and devoid of cilia.

At the 70th bristled foot the change is small, viz., a slight diminution of the ventral lobe which also has lost its external convexity at the base.

Little alteration occurs towards the tip of the tail except the increase of the dorsal lanceolate lobe which is carried erect, and the slight diminution of the branchiæ on the more limited surface, for they are continued to the anal funnel. This region of the body is readily reproduced, but its precise condition in the adult as contrasted with the young is still in need of elucidation.

A whitish encapsulated body occurred on the ventral edge of an anterior foot. The capsule was filled with somewhat coarse granules.

A small Isopod was found on the surface of an example, but its presence may have been accidental. The head had two black eyes, and was followed by 7 segments and the telson.

This species is at once distinguished from *Aricia Cuvieri* by the condition of the dorsum anteriorly, and the absence of the pectinate rows of papillæ in the same region laterally. It is, however, in all respects an *Aricia*.

Schmarda's genus *Anthostoma*, which he constituted for the reception of the species from the Cape and one from Jamaica, had little that was definite in it, the characters being as follows:—Tentacles and tentacular cirri absent. Segments differing. A lobate proboscis. Branchiæ (cirri) with the exception of the anterior segments, three in number, and so with the bristle-tufts. Capillary and aciculate bristles. Fritz Müller appears to have included the same type in his genus *Theodisca*—afterwards more fully exemplified by Claparède, whose diagnosis is:—Ariciidae with strap-like branchiæ; distichous feet—the inferior division bilabiate. Proboscis extensible as a digitate membrane. Head devoid of tentacles.

The relationship of the Mediterranean forms, viz., *Theodisca anserina*, and *Th. liriostoma* to the South African is uncertain, but the latter (*T. liriostoma*) comes very near it. Kinberg* records another species (*A. dendriticum*) from Vancouver.

The *Anthostoma robustum* of Verrill† seems to have a very similar structure, and the same may be said of the *Aricia lævigata* (Grube) of De St. Joseph,‡ from the Mediterranean. The species described by Treadwell|| from the Antilles are very similar, as also is the *Aricia setosa* of Verrill,§ from Flatts Inlet beach, Bermuda—in shell-sand at low tide. In the latter form the branchiæ also begin on the sixth setigerous segment and continue nearly to the end of the body.

A small form about 5 or 6 mm. in length presents certain differences from the foregoing.

Head forming a small blunt cone—larger in proportion than in the adult.

Body very little tapered in front—more distinctly diminished towards the tail—where it ends in 4 short cirri (Plate V., fig. 28.)

Each segment has similar appendages to those of the adult, viz., an inner ciliated branchial process, a dorsal lamella with the tuft of tapering finely serrated longer bristles, a conical ventral lobe with a few spines, the tips of which have an f-shaped curve, and a group of shorter serrated bristles as in the adult. The f-shape of the tips of two of the spines is noteworthy at this stage.

The presence of 4 short subulate anal cirri—two dorsal and two ventral, if this be the same species (and it appears to be) is therefore a feature of moment, and shows that a change occurs during the development of the anal cup. At this stage, therefore, if the above interpretation is right, the posterior end agrees with that of *Theodisca* as described by Claparède¶ and Cunningham and Ramage,** but Claparède does not mention bifid bristles or hooks, whereas Cunningham and Ramage do, so that it is doubtful if the latter pertains to the same genus. At any rate the young form alluded to in the foregoing sentences agrees with the *Theodisca* of Claparède; and in all probability the adults have the same appendages.

* Öivers. K. Vetensk-Akad. Förk. 1866. No. 9, p. 337.

† Op. cit. p. 597, Pl. xiv., fig. 76.

‡ Ann. Sc. Nat. 8c., Sér. v., p. 300., Pl. xxi, l. 168-175.

|| Bullet. U.S. Fish Com. 1900, p. 203.

§ Trans. Conn. Acad. x., p. 651. 1900.

¶ Glanures Zoolom. p. 44, Pl. iv., fig 6, and Ann. Chet. Nap. p. 310. Pl. xxiv., fig. 3.

** Trans. R.S.E., vol. xxxiii., p. 642, Pl. xl., fig. 8.

Fam. CIRRATULIDÆ.

CIRRATULUS CIRRATUS, O. F. Müller, 1776,
(= capensis, Schmarda).

1776. *Lumbricus cirratus*, O. F. Müller, Zool. Dan. Prodr., p. 214.
 1843. *Cirrattulus borealis*, CErsted, Ann. Dan. Consp., p. 67.
 1843. " " Id. Grœnl. An. Dors., p. 54.
 1856. " *australis*, Stimpson, Proc. Acad. Nat. Sc., Philad., p. 392.
 1861. *Cirrattulus capensis*, Schmarda, Neue wirb. Th. I. ij., p. 56, Taf. xxvii., fig. 213.
 1865. *Cirrattulus anstralis*, Johnston, Cat. B. M. 210.
 1867. " " Malmgren, Ann. Polych., p. 205.
 1885. *Cirrattulus capensis*, McIntosh, Ann. "Challenger," p. 383, Pl. xxivA., figs. 9 and 10.

The two Cape species form a parallel to the two common British forms, viz., *C. tentaculatus* and *C. cirratus*.

This form takes the place of the *Cirrattulus cirratus* of the British area, and it is very closely allied to it, so closely that it has now been thought unnecessary to separate them.

The head is less horse-shoe shaped and more pointed, and it is devoid of eyes—so conspicuous in the British form. The buccal segment is of considerable breadth, and is followed by another segment free from bristles. The third segment bears hooks and bristles, as well as a branchiæ dorsally, close to the bristle tuft. The fourth has a similar arrangement. At the fifth is the dense group of branchiæ on each side, but the filaments spring from one or two of the succeeding segments. For forty of the following segments, the branchiæ arise close above the dorsal bristles, but they afterwards, and to the tip of the tail, have a considerable interval between them and the dorsal bristles, in this respect agreeing with the British examples. As in the British form, the size of these branchiæ is in contrast with that of the other species from the Cape.

The first ventral tufts are slender and bristle-like, but soon two or three dark brown hooks are found in each segment (Plate vi., fig. 30), the shape being f-like, with a forward bend at the point, and considerably stouter than in the next form. As a rule, only two are found in the posterior region of the body. Dorsally is a tuft composed of three long and finely tapered simple bristles—alternating with three slightly curved and somewhat longer spines than in the ventral series.

Posteriorly, the ventral hooks increase in size and strength, but the dorsal tuft has the same arrangement as in front.

In the intestinal canal is muddy debris, containing fragments of crustacea, sponge-spicules, diatoms, and other structures.

The branchiæ are, on the whole, more numerous than in the British examples.

Stimpson first found this form in the "circumlittoral zone," at False Bay, Cape of Good Hope, and he describes it as greenish or reddish brown, nine inches in length, and having a breadth of .45 inch. He points out that the inferior bristles (except anteriorly) are short, stout, and arranged in groups of three. Schmarda gives the examples he procured at Table Bay a violet colour. The specimens obtained by the "Challenger" came from Sea Point, near Cape Town. Langerhans* met with this species, three c.m. long, in the Canaries, whilst Marenzeller† includes it in his account of the Annelids from Angra Pequena. He notes that Stimpson's form is the same, and, therefore, that his title should have priority to Schmarda's, but this is now of less consequence, since the form is identical with O. F. Müller's.

CIRRATULUS TENTACULATUS, Montagu, 1808.

1808. *Terebella tentaculata*, Montagu, Linn. Trans. ix., p. 110.
 1834. *Cirratulus Lamarcii*, Audouin and Edwards, Annel. p. 271, Pl. VII., figs. 1-4.
 1865. *Cirratulus tentaculatus*, Johnston, Cat. B.M., p. 209.
 1868. *Audouinia filigera*, Claparède, Ann. Nap. p. 267, Pl. XXIII., fig. 3.
 1889. *Cirratulus tentaculatus*, var. *meridionalis*, Marenzeller, Zool. Jahrb. iii., p. 16 (sep. abdr.) Taf. I., fig. 7A.

This form takes the place of the British *C. tentaculatus* and is larger than the preceding.

The head is bluntly conical and devoid of eyes. The peristomial and the succeeding segments have similar proportional breadth.

The body is elongate, measuring from three to five inches in length, tapered at either extremity, and furnished with numerous long, slender cirri. The first cirrus is attached above the fourth bristles, and another is over the fifth and sixth respectively; then a dense group occurs in a transverse series to the inner side of the latter, a short gap in the middle line separating the two

* Nova Acta. Bd. xlii., No. 3, p. 115.

† Zool. Jahrb. iii., p. 19 (sep. adr.).

sides. This barrier indicates the division between the wider anterior and the narrower segments which follow. The cirri continue along the sides backward to the tail, on every segment and close to the dorsal bristles. They are on the whole longer and more slender than those of the preceding species, just as occurs in the British forms.

The anus is a longitudinal dorsal slit at the tip of the tail.

The bristles in this species are longer than in the former, both ventral and dorsal of the first bristled segment being slender, long, and finely tapered, and the tips are densely covered with a slender filamentous algoid. For a long distance backward both dorsal and ventral bristles remain capillary, and the middle of the body is passed before the ventral hooks are well developed (Plate VI., fig. 31). They are proportionally longer and more slender as well as more numerous than in the former species, with a slight bend of the shaft and a marked curve at the tip. A slender bristle or two occurs amongst them. The dorsal bristles retain the characters they have in front to the tail, so that in this respect alone there is a marked difference between the species.

The majority of the specimens were loaded with ripe ova.

This species resembles the British *Cirratulus tentaculatus* in several respects, but differs in the number and shape of the ventral hooks, which are shorter and fewer in the British form, in the segments of the anterior region and other particulars. In both the cirri spring close to the dorsal bristles.

The parallelism between the two species of *Cirratulus* at the Cape and the two common British forms is of great interest, and, allowing for the variations due to the divergent environment, it has been thought proper to unite the respective species. This opinion to some extent is that of Marenzeller, who makes the examples from Angra Pequena only varieties of the European species (*var. meridionalis*, Marenzeller). Moreover, if *Andouinia filigera*, Delle Chiaje, is synonymous then this common form ranges to the Straits of Magellan.*

Fam. HALELMINTHIDÆ.

The *Halelminthidæ* or *Capitellidæ* were represented by several examples, one or two of which were devoid of branchiæ, whilst all the rest had these organs. As, however, both had the same number of capillary bristles (13 pairs) and segments ("thoracic") in front, and both agreed in the arrangement of

* Ehlers, Polychæt. Magalhaen, Hamburg, 1897, p. 110.

the rows of hooks (*tori*), in all probability all the specimens pertain to the genus *Dasybranchus*, those devoid of branchiæ having either retracted or lost them.

DASYBRANCHUS CADUCUS, Grube, 1846.

1846. *Dasymallus caducus*, Grube, Archiv f. Naturges, 1846, p. 166, Tab. V. figs. 3, 4.
 1885. *Dasybranchus*, sp. (*caducus*), McIntosh, Ann. "Challenger," p. 290, Pl. XLV., figs. 13, 14, Pl. XXIVA, fig. 17.
 1887. *Dasybranchus caducus*, Eisig, Capitell, Nap., p. 823, et ubique, Taf. 16-23.

The examples vary from 90-170 mm. in length, and the largest has a diameter at its widest part of 7 mm., a size considerably exceeding that of the European specimens, though not much larger than the Japanese form found by the naturalists of the "Challenger."

The conical snout resembles that of *Notomastus*, and the number of distinctly bristled segments of the anterior region is 13. The bristles are long and slender, with a filmy margin indicating the presence of narrow wings.

The dense rows of minute hooks are similar in structure to those of *Notomastus*, having a main fang and several small points above it, but the shaft appears to have a more distinct dilatation, and the larger wings are united distally so as to form a kind of hood.

The branchiæ occur only on the posterior part of the body—as small tufts of simple or slightly branched filaments arising on each side of the ventral pads, and thus are comparatively near each other. The ease with which the branchiæ are retracted or lost accounts for their varied appearance. Those newly reproduced are short and simple, the older forms are more or less branched and larger.

There is little to distinguish this form from the European. In all essential respects it corresponds both generically, and so far as can be at present observed specifically also with *Dasybranchus caducus*, Grube, a form which has been found at Madeira and other parts of the Atlantic, in the Mediterranean, in the Indian and Chinese seas and in the Pacific.

The *Hyboscovex longiseta* of Schmarda* is probably the same form—procured at Table Bay.

* Neue wirb. Thiere, I. ii., p. 54, Taf. XXVII. fig. 211.

Fam. MALDANIDÆ



NICOMACHE LUMBRICALIS, (O. Fabricius), var. CAPENSIS,
(McIntosh).

1780. *Sabella lumbricalis*, O. Fabricius, Faun. Grœnl, p. 374.
 1856. *Clymene lumbricalis*, Sars, Faun. lit. Norveg, II., p. 16.
 Tab. 2., figs. 23-26.
 1885. *Nicomache capensis*, McIntosh, Ann. "Challenger," p.
 399, Pl. XLVI., fig. 4., Pl. XXIVA., figs. 18, 19, and Pl.
 XXXVIIA., fig. 2.

A species of considerable size, probably reaching 130 mm. or more in length, and having a diameter of 5 mm.

The cephalic segment is enlarged, suddenly narrowed into a blunt ridge dorsally and running downward to the thickened oral border. On the ventral face the oral margin projects as a frilled ring, more or less dilated according to its condition.

Though on a comparatively gigantic scale in contrast with the British forms it is remarkable how closely the outline of the snout, its touches of reddish pigment, the form of the anterior segments, and the general conformation of bristles and hooks correspond.

The first four sets of bristles are stout, simple, tapering, slightly winged forms, the fourth having also a few very slender, almost capillary bristles. The fifth group has a few slender forms amongst the stronger with very minute spikes, and in the sixth and seventh these increase in distinctness till the condition shown in the figure of the "Challenger" is attained. Beneath each of the first three is a powerful spine, or occasionally two in the last. Under the fourth is a short row of the hooks characteristic of the species, and in the succeeding feet these increase considerably in number so that the rows are longer.

In comparing the 10th bristles and hooks of the British and South African forms little distinction is apparent except in size. The types are the same. It is true a larger number of spikes occur on the crowns of the hooks of the South African form, but this is due to their size.

The funnel (Plate VI., fig. 32) in the South African has from 14 to 30 papillæ round its border, whereas in the small British examples the number ranges from 14 to 20.

In a South African example there were 20 bristled segments, the entire animal being about 180 mm. in length. The smaller British examples appear to have the same number of segments though none were complete.

The tube is composed of whitish or translucent grains of coarse sand with fragments of shells and coral bound together by the secretion. Though comparatively thick it is readily broken.

It is difficult to make out the species described from the Cape by Schmarada,* under the names of *Clymene microcephala*, and *Clymene lyrocephala*. The former may have lost its head, and the latter might be *Nicomache* viewed from the ventral surface with the proboscis partially protruded.

The wide distribution of this form and its varieties is noteworthy, for it frequents both shores of the Atlantic, that is Europe and Africa on the one hand, and America on the other.

NICOMACHE MCINTOSHII, Marenzeller, 1889.

1889. (?) *Nicomache McIntoshii*, Marenzeller, Zool. Jahrb. III., p. 19, Taf. i., fig. 8.

A fragment of the posterior end apparently of this form comes from St. James', False Bay, between tide-marks.

The body ends obliquely in a large ovoid expansion (Plate VI., fig. 33) which is fixed to the dorsal (?) surface, but extends elsewhere all round as a broad rim, with a slight notch in the mid-ventral line. The anus forms a prominent cone with 13 crenations on the margin and situated slightly nearer the ventral than the dorsal edge. A considerable area posterior to the vent is dotted with low flat papillæ like variolæ.

After the bristle-papilla and row of hooks on each side the last segment narrows to the segment-junction. The segment in front is short, with a peculiar dorsal flap or process which is somewhat shield-shaped—the median curve posteriorly being close to the segment-junction, though elevated above it, and a lateral curve on each side running forward to the bristle-papilla—which is nearly in the centre of the short segment.

The segment in front is also short, and has a similar modified dorsal shield with a central prominent edge just behind the bristle-papillæ; and a similar, though less distinct shield occurs on the third from the end.

The fourth bristle tuft from the posterior end shows rather stout but finely tapered winged bristles.

The hooks (which are probably posterior) have a broad and strong head with a powerful chief fang, and four prominent sharp processes with the points directed forward above it, but of course other hooks are present in the crown, these being apparent distally in lateral view (Plate VI., fig. 34). A filament passes

* Op. cit., p. 15, Taf. XIX., figs. 163 and 164.

from the neck of the hook and curves over the tip. The shaft diminishes from the crown to the shoulder near the anterior third, and then narrows with a curve to the base.

Marenzeller had complete examples of this Maldanid from Angra Pequena, somewhat further northward on the eastern coast of Africa, but they seem to have been much smaller, only from 40 to 45 mm. long and 2.5 mm. in breadth, whereas the fragment from the Cape measures 48 mm. and is about 3 mm. in diameter, so that in all probability the entire animal would not be less than 60 mm.

The head appears to be less developed than in *N. lumbricalis*, though having similar characters. The first six bristle-bearing segments are shorter than the three following. The first three segments have simple hooks after the plan of those in the common species, the rest have the characteristic hooks, and Marenzeller's figure (fig. 8 E) of the anterior hook differs only in comparative length, being slightly shorter than that from the posterior fragment from the Cape. He also describes the anal plate as granular, but apparently the small size of his examples did not exhibit the variolar condition so conspicuous in the larger specimen from the Cape. No tube is mentioned by this author.

The posterior end of Grube's *Maldane glebifex** is bevelled somewhat in the same manner, but it appears to be on a much smaller scale proportionately. The posterior end of *Maldane elongata*, Verrill,† has an obliquely truncated posterior border surrounding the base of the large anal process, which is obliquely placed, foliaceous, obovate, with the posterior edge broadly rounded, the upper surface concave, and the margin entire.

The posterior end of the *Maldane amphiglypta* of Ehlers,‡ from Magellan, has likewise a free flap, but of a different character from the South African form.

Unfortunately no figure is given, so that it is difficult to make a minute comparison. The American form was got at low water mark near New Haven in thick tubes of fine mud.

PRAXILLA PRÆTERMISSA, Malmgren var. CAPENSIS, McIntosh.

1885. *Praxilla Capensis*, McIntosh, "Challenger" Annel., p. 404, Pl. xxxv A., fig. 8.

1867. *Praxilla prætermissa*, Malmgren, Nord. Hafs-Ann. p. 191.

1867 " " Ibid., Ann. Polych., p. 100, Taf. xi., f. 62.

A form about 250 mm. in length and proportionately large. The head has a frontal shield like that in the European *Praxilla*

* Archiv. f. Naturges., 1860, p. 92, Taf. IV., f. 4.

† Op. cit., p. 609.

‡ Polychæt. Magalhaen, Sammelreise, Hamb. 1897, p. 119, Taf. VIII. f. 187-193.

prætermissa, though on a much larger scale than in British forms. The lateral folds of the cephalic region are very distinctly marked, though not long. On each side of the median in front is a well marked division, followed by three larger lobes which are notched in the centre. Behind are about six crenations before the median dorsal furrow, with indications of a tendency to form larger lobes. The median and two lateral ridges are similar to those of *P. prætermissa*. The buccal and the following segments, and to some extent the vent are marked by creases like hard grained morocco leather.

The body has 21 segments besides the buccal segment and the funnel. It is rare to find a complete example in Britain, and only one occurs in the South African collection. The funnel has from 22 to 26 teeth.

The bristles, spines and hooks appear to be very closely similar to those of the British forms though all are larger.

The tubes are formed of fine and coarse sand grains and fragments of shells—lined by secretion, and are friable whitish structures.

The preparations from the "Challenger" material were labelled *Praxilla prætermissa* var. *capensis* and it was the connate condition of the dorsal longitudinal muscles that led to separation. It is doubtful if this is sufficient to separate forms so closely resembling each other.

The distribution of the species would seem to be very wide.

Fam. HERMELLIDÆ.

SABELLARIA (PALLASIA) CAPENSIS, Schmarda, 1861.

1861. *Hermella capensis*, Schmarda, Neue wirb. Thiere I. ii., p. 23, Taf. xx., fig. 171.

1885. *Sabellaria* (*Pallasia*) *Capensis*, McIntosh, Ann. "Challenger," p. 418, Pl. xxv.A, figs. 24, 25, Pl. xxvi.A., figs. 11, 12.

The specimens were procured at St. James', False Bay, between tide-marks. Those obtained by the "Challenger" were collected between tide-marks at Sea Point, near Cape Town, where it was first found by Schmarda, and subsequently by Kinberg.

The largest example, including the tail, measures 105 mm. in length, and it is evidently a richly coloured form. Schmarda states that his were olivaceous, but in many parts were purplish brown.

The species is allied to the ordinary *Sabellaria*, differing from the common southern form—*Sabellaria alveolata*—in

having only two rows of paleae, the shape of the inner being such that it compensates for the absence of the second inner row. Though Schmarda described and figured the paleae as notched at the tip, the condition differs, since the thin chitinous spatulate tip has a fold on the under surface the end of which projects dorsally in the form of a spur. When viewed in certain positions, as obliquely from above, the appearance of a notch is simulated by the arrangement. On the other hand a lateral view gives a hatchet-shape to the blade, and the terminal spur is very prominent. The paleae are crossed by curious transverse lines, which, especially along the convex edge, assume a wavy direction, and, moreover, a scaly aspect, apparently from friction, occurs along the same edge near the tip. Whilst it is possible to recognize these paleae in Schmarda's description and figure, it is otherwise with the inner paleae, for the contour of the latter, according to him, corresponds with a lateral view of the outer form—as a comparison of his figures with those of the "Challenger" will show.

The tip of the inner paleae is bluntly pointed, then it gradually expands into a large thick heel which projects beyond the somewhat slender shaft, so that the latter nearly forms the apex of a triangle, and the serrated upper or anterior edge the base. These are evidently modifications of the same type. In this case the outline resembles an attenuated leg with a long tapering foot furnished with a huge heel, the latter having the dorsal surface crenated. In one of the examples (a large one) two blades of a broad Alga were attached by their stems to the inner paleae, as in the case of that mentioned in the "Challenger" volume—and which had a single blade which overhung the crown like an operculum. A little below the bases of the outer paleae of the crown a closely set series of lobate cirri with narrow stems occurs. They are tinted of the deep purplish hue of the region, though in some specimens much of it is abraded. The cephalic branchiæ have about 16 stems on each side of the fork. The mouth has a long cirrus, or occasionally two, at the outer and posterior border of each palpus.

In the richly tinted thoracic region are the three typical sets of bristles. The oar-shaped forms of the dorsal row have a smooth blade. A high power shows only a few minute spines at the point of the most perfect examples, few of which are symmetrical distally. All have marked striæ at intervals. The ventral bristles are shaped somewhat like the hairs of *Ornithorhynchus*, the shaft dilating into a fusiform tip which is pointed. The hooks have a double row of teeth and an indistinct process.

The branchiæ are continued—from the first segment of the long posterior region of the body—throughout the greater part of its length, the posterior organs, however, being rudimentary. They cease at the seventh or eighth from the end—to which is attached the long anal tube.

No tube accompanies these examples, but in those brought home by the "Challenger," the structure was as follows:—The tube was dense, composed of entire small shells, coarse fragments of shells, sand-grains and other structures cemented by the tough secretion which also forms a lining to the interior. This lining is in many parts tinted of a dull purple, yet this does not prevent it from being semi-translucent. As in many other tubes in the collection the colour is pale, from the semi-translucent grains. It is thus in contrast with huge and heavy masses formed by a *Sabellaria* brought from St. Vincent by Dr. R. M. Gunn, composed of agglutinated tubes of coarse yet smoothly worn minute pebbles. The majority are white, but dotted here and there are many minute black pebbles which seem to be less rounded than the white. Such a mass illustrates well the power of *Sabellaria* to form structures capable of resisting the heaviest surf-waves.

As indicated in the "Challenger" volume,* an intricate central muscular region occurs in the anterior division of the body, e.g., behind the mouth, and it is especially regular and beautiful in connection with the two median and two lateral channels in the dorsal region. The nerve-cords are internal and abut on the perivisceral chamber. Behind the foregoing the circular muscular coat is well-developed. The dorsal longitudinal muscles are much more massive than the ventral and are continuous over the vascular channel in the median line. The separate nerve-cords lie on each side of the median line. In the posterior region the dorsal and ventral muscles are proportionally small. The neural canal lies at the inner and inferior region of the nerve-cord. The great central area of the body is occupied by the distended alimentary canal, with the reproductive organs at the sides.

The contents of the alimentary canal consisted of sandy mud, numerous sponge-spicules, a few diatoms and organic fragments, besides many Gregarinæ.

The same species was found by Marenzeller † in the collection from Angra Pequena on the West Coast.

Fam. AMPHICTENIDÆ.

PECTINARIA CAPENSIS, Pallas, 1766.

1766. *Nereis cylindrararia*, Pallas, Miscell. Zool. p. 117, Tab. IX, f. 1-2.

A large species measuring in spirit about 150 mm. in length, and having a diameter behind the palæ of fully 12 mm.

* Op cit., p. 420.

† Zool. Jahrb. III., p. 21 (sep. abdr.).

Anteriorly the palulæ are fourteen on each side, set in a slightly oblique row, and with a dorsal curve. Each group forms a kind of stiff fan with the longest paleæ in the centre, the outer especially being shorter. A typical palea measures about 15 mm., is flattened and of a rich golden colour, iridescent under the microscope, and marked with longitudinal and transverse striae. The tip is usually abraded—forming a transverse dark edge. A wrinkled area slopes obliquely downwards, and is bounded by a membrane which commences at the subulate tentacle a little in front of the outer edge of each fan, and has its free edge cut into processes, small at first and then triangular and larger. Below the paleæ is a broad membranous fold with long filaments at its free edge, which encircles the two dense groups of tentacular cirri.

The body is broad in front and tapers after a short distance gently to the tail, which ends in a sausage-like appendage, having a broad furrow with thick folded edges dorsally, and terminating in a tongue-like flap with a wide crenated margin. Beneath the process is marked by fine creases (like leather) and has a median groove and three lateral furrows which slope outwards and backwards.

Anteriorly the dorsum has an elevated glandular whitish thickening from which a tapering tentacle extends forward. A ridge cut into flaps passes from the elevated mass and joins the pre-oral fold. Another smaller whitish pad occurs behind the former to the inner side of the first branchia. The latter is the larger, and arises from the ventral ridge behind the mouth, is fixed for half its length, the other or outer part passing as a free fold dorsally. From the basal stem the branchial tissue splits into fine lamellæ, so that aeration is readily carried out. The second gill is similar to the first, but arises from the succeeding glandular ridge further out, and its free stem extends further on the dorsum. On the ventral surface in this region are four small central areas or cushions connected with conspicuous bands passing dorsally. The first lies in the ridge behind the mouth and has a frilled (glandular?) band in front of it, connecting the inner (ventral) ends of the first branchiæ. The second has a stiff glandular ridge passing from its anterior border to the second branchiæ. The third is the least, and from its outer border a prominent fillet passes to and beyond the first bristle-bundle on each side. The fourth is shield-shaped, and from its anterior edge a flattened fillet extends to the side of the body, but does not reach the second bristle-bundle.

Sixteen pairs of bristle-bundles extend along each side, thus the number differs from that found in *Pectinaria*, where it is 17, the same number occurring in *Amphictoue Cistenides* and *Pista*, whilst *Lagis* has only 15. This form therefore occupies an intermediate position in this respect, though most nearly approaching *Pectinaria* (Plate VII). The bristles (fig. 33 a and b)

are somewhat stout, with tapering, winged tips (*a*) which often show a split (*b*) in the wings from friction, thus giving the tips a peculiar appearance, especially as a change seems to take place thereafter. The last bristle-bundles are small, but show similar structure, except that the shaft dilates towards the tip, which is often split as in front.

The hooks (Plate VII fig. 36) approach those of *Pectinaria*, in so far as below the eight upper and boldly curved teeth is a short portion of the margin armed with minute teeth above the truncated inferior angle. As the tip of the last large tooth curves over these they are often indistinct.

The alimentary canal was distended with white sand—like coral sand, much of which disappeared on the addition of acid.

The beautiful, straight tube formed by the animal was almost entirely composed of spicules of sponges in short lengths placed transversely and fixed by secretions so as to form a perfectly round tube 115 mm. in length gently tapered from the wide to the narrow end, the former having a diameter of 15 mm., the latter of seven or eight mm. The spicules appeared to be of the same size throughout the tube, which presented no special lining, the inner surface being as smoothly and neatly formed as the outer, though under the microscope the minute reticulations or cells of the cement often stretched over the component spicules.

The labour involved in selecting and fitting with such marvellous skill the sponge-spicules composing a tube so large must have been both continuous and considerable. Moreover, the smaller end of the tube had a diameter of seven or eight mm., so that in view of P. Fauvel's statement that but one tube suffices for the life of the animal, we are left in doubt as to how it fared in its early condition. In the preparation about an inch of the tail projected beyond the small end of the tube.

As stated, the intestine showed that the annelid frequented calcareous sand, and, therefore, specially selected the sponge-spicules for the formation of its tube. As this example was procured between tide marks, the conditions are wholly different from similar tubes formed by the deep-sea representatives of the family.

The account of the genus *Pectinaria* by Malmgren differs from the condition in this example in so far as the marginal lamina of the area on the ventral aspect of the palulæ is not entire, but has at each side a series of acutely conical smaller fimbriæ, followed by larger and somewhat triangular processes of considerable breadth, which occupy the central region. There are 16 instead of 17 bundles of bristles, but only 13 rows of uncini, beginning at the fourth bristle-bundle. The minute structure of the hooks corresponds with that of examples of *Pectinaria belgica* from various regions, and it may be that variation

occasionally occurs. In certain examples of *Pectinaria belgica* also the ventral lamina near the paleæ is frilled and slightly scalloped.

This large and fine species was first described and figured as *Teredo chrysolou* by Bergius,* and subsequently noticed by the sagacious Pallas, who examined many specimens procured at the Cape of Good Hope by Vosmaer, and he mentions that Rumphius discriminated the same form as a third species—"Penicilli marini." Pallas noticed the structure of the tube, which he experimented with in various ways, but did not make out its nature. His familiarity with the European species (*Pectinaria belgica*, his *varietas Belgica*) makes his description of considerable value, and he would seem to have observed the difference between the smooth dorsal edge behind the paleæ in the European and the slightly scalloped one of the South African. The general description which he gives, indeed, does credit to his acuteness and accuracy, and his figures of the annelid and its tube are recognizable, the former being shown of its natural size.

Ehlers includes *Pectinaria belgica* in his series from Magellan, so that much has yet to be done in the distribution of this species.

Fam. TEREBELLIDÆ.

SCHMARDANELLA PTEROCHÆTA, Schmarda, 1861.

1861. *Terebella pterochæta*, Schmarda, Neue wirb. Thiere I., II., p. 43.
 1885. *Schmardauella pterochæta*, McIntosh, Annel. "Challenger," p. 449, Pl. LIII. fig. 1, Pl. XXVII. A. figs. 24-26.
 1889. *Leprea pterochæta*, Marenzeller, Zool. Jahrb. III., p. 21 (sep. abdr.)

Obtained between tide marks at St. James', False Bay. Schmarda simply states he found it at the Cape. It is probable that he procured it in the same way as the naturalists of the "Challenger," who collected it between tide-marks at Sea Point, Cape Town. The specimens were scarcely so fine as those procured by the "Challenger," but traces of the greyish or olive-green pigment occurred on the dorsum.

As shown in the "Challenger" Annelids this form agrees with *Nicolea* in having two branchiæ, but instead of 15 pairs of bristle-bundles it has 33. The bristles, moreover, are diagnostic,

* Abhand. d. schwed. Akad. deutsch v. Kästner XXVII. p. 235, Taf. IX. (fide Grube).

for whilst the lower part of the tip is winged as usual, a special terminal modification in the shape of a tapering pectinated region occurs (*vide* "Challenger" Plates XXVII.A., figs. 24 and 25). The tips diminish in length from above downwards, and the wings become broader, the pectinated region at the tip being longer and more evident. The pectinations, indeed, are visible in the developing bristle in the interior of the setigerous lobe. The hooks had three or four small teeth above the great fang, while the posterior margin forms an almost continuous and uniform curve with the ventral or basal margin, a small mucro only indicating the separation. The posterior hooks present very little difference in form.

The examples were females laden with apparently ripe ova.

Marenzeller* considers that this form should fall under the genus *Leprea*, Malmgren, as shown by him in his careful classification of the group, and there is no objection to this arrangement in the meantime. He procured various examples from Angra Pequena-Bucht.

THELEPUS — ?

The examples of this form are much softened so that an accurate description of the exterior is not possible. In general aspect, however, they agree with Scottish forms of *Thelepus cincinnatus*.

The hooks (Plate VII., fig. 37) have a well-marked dorsal hollow, and the inferior margin terminates in a rounded process which projects almost as far as the mucro above it. Only a single hook occurs above the great fang. Posteriorly a pointed process projects from the angle as in *Grymwa*, but there is no tapering process beneath the mucro in front for the attachment of the ligament as in *Streblosoma* (*Grymwa*), which also has two teeth above the great fang. A further noteworthy feature is the tendency to the elongation of the stem of the mucro; and a slight tilting forward of the process as in *Enthelepus setubalensis*.† The hooks of *Thelepus setosus*, De Quatrefages, as figured by De St. Joseph‡ in his well-known "Annélides Polychètes des Cotes de Dinard," approach the South African form very closely. The chief differences are the presence of two hooks above the great fang, the less graceful curve of the base and the more erect mucro in the French form.

* Sitzungsber. d. k. Akad. d. Wiss. 1 Abth. Jhng, 1884, p. 18, etc.

† Ann. "Challenger," p. 465, Pl. xxviii.A, fig. 13.

‡ Ann.Sc. Nat. 8e Sér., xvii., p. 230, Pl. 10. f. 260.

Fam. SABELLIDÆ.

POTAMILLA RENIFORMIS, O. F. Müller.

1800. *Die niereuförmigen Amphitrite*, O. F. Müller, Naturges. Wurmarten, p. 194, Tab. xvi., figs. 1, 2 and 3.
 1849. *Sabella reniformis*, Leuckart, Arch. f. Naturg. xv. 1, p. 183, Tab. 3, f. 8.
 1865. *Sabella saxicava*, De Quatrefages, Années, II., p. 437, Pl. xv., f. 1-7.
 1867. *Potamilla reniformis*, Malmgren, Ann. Polychæt., p. 114, Tab. xiii., f. 77.
 1868. *Sabella saxicava*, McIntosh, Ann. Nat. Hist., 4th Ser. II., p. 286, Pl. xx., f. 5-8.
 1894. *Potamilla reniformis*, De St. Joseph, Ann. Sc. Nat. 8e Sér. XVII., p. 292, Pl. xi., fig. 296-298.

A species which shows a considerable amount of purplish brown pigment on the anterior region of the body and on the bases of the branchiæ even in spirit.

The collar anteriorly has a median furrow on the dorsal surface, with a slightly frilled triangular lobe on each side. The rim slopes obliquely downward and outward, making a shallow notch on the dorsum before reaching the line of the bristle-tufts. It then curves to the ventral surface, the rim on each side being separated by a median fissure. Dorsally, a median furrow passes backwards a short distance, not beyond the third bristle-tuft. The anterior region of the body consists of eight segments, marked by the bristle-tufts and pads. The ventral median groove goes forward to the second segment behind the anterior region, then slopes to the right towards the furrow between the anterior and the following region of the body, but is not continued on the dorsum.

The length of the largest example was 80 mm. but the posterior region was imperfect.

The branchiæ are about fourteen in number, appear to be proportionally short, and the filaments proceed quite to the tip. On viewing the fans from the dorsum, the rachis in several has three distinct pigment-specks, in others one or two, so that the branchiæ have a characteristic appearance. The purplish brown specks project from the line of pigment on the anus as globular bodies. Their number is variable, but none had so many as those described by Langerhans,* (his var. *polyophthalmos* with six or seven eye-spots), from Madeira. The branchiæ in the British examples are often speckled green and white. The tentacles are somewhat lanceolate and pointed processes.

* Zeit. f.w. Zool. Bd. XL., p. 266.

The first bristle-tuft occurs immediately behind the collar and is unaccompanied by hooks. The bristles of the anterior region form vertical rows, the upper eight or ten bristles have tapered tips with wings (Plate VII., fig. 38). They are followed by two rows with spatulate tips (Plate VII., fig. 39) the upper row having longer tips often with a central filament, and in some indications of transverse rows of spikes, the lower having broader tips (fig. 40).

The anterior hooks (Plate VII., fig. 41) have a prominent fang and a crest or crown with fine serrations. The anterior curve is bold, and the posterior process long.

Posteriorly the tips of all the bristles are produced as long processes, the wings being rather abruptly widened above the slightly constricted end of the shaft (Plate VII., fig. 42). The posterior hooks are smaller, have a rounded anterior curve and a shorter posterior process.

The tubes inhabited by this form are often grouped together in longitudinal bundles, and are composed of tough hardened secretion coated with sand. They resemble those of the British "*Sabella savicava*," though they are larger. In the same way the tips of the horny tubes are sometimes closed by being bent. In the larger tubes the grains of sand are coarser, and fragments of shells are added. In all cases the horny secretion is characteristically firm and more or less brittle. In one the tubes projected from a whitish mass of a compound ascidian, the sandy tube being in the centre and forming the axis on which the ascidian was supported. De St. Joseph finds that the tubes occur in a similar way between *Cyathia glomerata* and the granite rocks. In the Channel Islands as well as on the southern coast of England this species is very common. In the former it is abundant in oysters, *Pecten*, *Anomia* and other dead and living shells, in *Balanus* covering the sides of the Gouliot caves at Sark, the tube is coiled beneath the *Balanus* and pierces the latter to reach the surface. The species likewise perforates *Cellepora*, and even bores quite through the valve of a living *Pecten fusio*. It often occurs in the same oyster shell with *Gastrochaena*, *Polydora* and *Clione*, and it sometimes places its tubes in groups in convenient fissures of the shell without boring, so that they can be dislodged *en masse*, as has been the case in a series from South Africa. Another site is under empty limpet-shells amongst muddy debris, part of each tube being inserted into a perforation in the shell; while again the cracks and fissures of the rocks near low-water mark afford a very favourite habitat, and the tubes often project through incrusting sponges and ascidians both simple and compound. As a rule the tough horny tube has grains of sand protecting the exposed portion, whilst the part immersed is hyaline and more delicate. The tunnels in shell, limestone and chalk are

circular, and are easily distinguished from those of *Dodecaceria* or *Polydora*. *Potamilla reniformis* not only frequents north European shores, but extends to Iceland, Greenland, America, Madeira, and the Canaries, so that its occurrence at the Cape is less remarkable.

BISPIRA VOLUTACORNIS, Montagu, 1808.

1808. *Amphitrite volutacornis*, Montagu, Lin. Trans. VII., tab. vii., f. 10.
 1865. *Distylia volutacornis*, De Quatrefages, Annelés, II., p. 421, Pl. 20, f. 5-7.
 1894. *Bispira volutacornis*, De St. Joseph, Ann. Sc. Nat. 8e. Sér. XVII., p. 286, Pl. xi., f. 289-295.

A gigantic form (Plate viii., fig. 50) which in spirit measures fully 130 mm. with a breadth at its widest part of 17 mm.

Anteriorly a wide gap exists between the edges of the collar which are close to the first bristle-bundle. The collar expands in the middle line ventrally and is reflected, the left overlapping the right flap. Dorsally an elevated fold on each side of the middle line is sometimes formed between the edges of the collar—apparently by contraction. De St. Joseph describes the collar as of a deep violet with a border of white in the French examples.

The anterior region consists of eight segments. On the ventral surface of the third bristled segment on each side of the middle line are two elongated slit-like marks, and they are distinct as far back as the eleventh segment.

De St. Joseph found considerable variability in the thoracic segments, the number ranging from six to eleven, and, moreover, the sides are sometimes unequal, e.g., seven on the left and eight on the right.

The dorsal tentacles (*palfes*, De St. Joseph) are long, flattened (with a thicker and a thinner edge) tapering processes, and from the outer edge of each the web at the base of the branchiæ begins. The branchiæ are rolled in a spiral of great complexity on each side. The outer whorls have longer filaments, the central have shorter, and in addition to the ordinary filaments a series of almost pectinate folds occurs in some at the dorsal edge of the whorl where the rim joins the tentacle. The central whorls are very short. In all there are not less than 260 filaments with their pinnae which are rather short. The whole system is beautifully variegated. Thus a purplish belt marks the web, each filament having several touches of brownish purple alternating with pale regions, whilst the tips of many are

dark brownish purple. De St. Joseph mentions that some have entirely white branchiæ. The same author describes the basal branchial cartilages as forming only two spiral twists, whereas in spirit they appear to have three or four. Their vessels, he says, contain green blood. He observed an example with one of these organs in process of reproduction and represented by twelve white filaments. Both sides are spirally rolled, but the filaments are much shorter than in *Spirographis Spallanzani* from the Mediterranean.

Along the bases of the whorls an elevated collar or crest of mucous membrane winds, and probably has important functions in directing the streams of water and perhaps secreting mucus.

The arrangement of the spiral in *Bispira* as shown in this example is such that in a horizontal section only portions of three rows of branchiæ appear, for example near the base, the outer being the most complete, the next within (a continuation of the former) being less, and the third very short. The whole system really consists of a single lamina with its filaments spirally rolled on a firm axis which is thickest inferiorly and tapers superiorly. The upper central filaments are thus shortest, the outer and inferior, the web of which adjoins the collar of the annelid, are the longest. The spiral attachment thus winds round the axis from above downwards.

The outer whorl commences on each side at the tentacle, the web of attachment on the left having about two short tapering filaments as supports—before joining the first long branchial filament. On the right the branchial stems are disconnected, the membranous lamina attached to the base of the tentacle abutting inferiorly on a groove.

The body is massive, somewhat fusiform in outline—in so far as it is slightly tapered in front, and still more tapered to a blunt point posteriorly. The bristled segments are about 172 or more. It is rounded on the dorsal surface, flattened on the ventral, and terminates in the anus. A groove commences on the ventral surface at the anus, travels forwards in the middle line to the second post-thoracic segment, bends to the right towards the front of it, and passes obliquely through the segment in front to the space between the anterior and posterior regions, and is there lost, though in some old examples a shallow groove runs forward dorsally a little above the bristle-tufts and is lost at the collar. In front dorsally are the tentacles, and close to their bases ventrally is a frilled ridge on each side which amalgamates with the inner edge of the massive lips. In all probability the muddy water is conveyed along these to the mouth from the branchial spiral, so that both digestion and respiration are subserved. The lips form two prominent fleshy lobes projecting forward—darker in hue distally where slightly enlarged—paler below. Their inner edges are flattened, indeed, somewhat

hollowed below the vertical slit forming the mouth, and the ventral edge of which trends to the fissure between the lobes of the collar.

The species seems to be brightly coloured probably of a rich brownish purple, which in some uniformly tints the branchiæ. Each foot in the anterior region has a dark pigment-speck just in front of the papilla at its anterior and dorsal edge, and though the papilla is less distinct in the posterior region a similar speck of pigment continues to the tip of the body. Moreover, at the dorsal end of each hook-row in this region a dark speck is present.

The thoracic bristles are in eight bundles and differ from those in *Spirographis Spallanzani* by the greater length of the winged tips of the dorsal and the narrower wings of the ventral series (Plate VIII., figs. 43 and 44, the former form the upper series, the latter form the middle). In *S. Spallanzani*, the short broad spear-tips of the ventral are diagnostic, one being sketched by way of comparison in Plate VIII., fig. 45. The foregoing distinctions are still more pronounced in the posterior bristles, which have much more elongated tapering tips and narrower wings than in *Spirographis Spallanzani*—the respective forms being shown in Plate VIII., figs. 46 and 47 for the former and 48 for the latter. Moreover, the somewhat abrupt narrowing of the tip in *Spirographis Spallanzani* is diagnostic.

The anterior hooks have a similar arrangement to those in *Sabella*, and in minute structure (Plate VIII, fig 49) are closely allied to those of the Italian form, with which it has just been contrasted, except that the crown above the great fang is more distinctly serrated. The same features are shown in the posterior hooks.

The tube is composed of tough secretion having at the wider or lower end a few fragments of shells and coarse sand, the greater part, however, being bare. Above the middle this horny coat has a thick investment of muddy sand with here and there a shell-fragment. This leads to the upper region which is composed for the most part of muddy sand with only a thin lining of secretion. On the French shores De St. Joseph* has found tufts of *Amathia leudigera* growing on the posterior end, a feature observed in the tubes of other forms, such as *Chatopterus* and *Thelepus*, which are frequently feathered with graceful zoophytes.

This beautiful Sabellid, originally found on the beach at South Devon by the indefatigable Montagu, appears according to De St. Joseph, to live in colonies on the French shores, and probably also in South Africa, the young attaching their tubes

* Bollet, d. Soc. Adriat. d. Sc. Nat. viii., p. 296 (*Jule* De St. Joseph) also List Zeit. f. w. Zool. xlix., p. 248-286, Taf. iv. and v.

to those of the adults (De St. Joseph). Even the crustacean parasites on the body in the regions thus widely separated have a parallelism as shown in the account of the South African form which follows. Both males and females occur on the branchiæ of large specimens as well as on the body.

De St. Joseph found the sexual elements developed at the end of September, the eggs being 0.10 mm. in diameter, and the sperms very minute. He states that these elements escape by the pores of the segmental organs at the ventral base of the setigerous lobe. A young specimen of seven mm. had nine thoracic and nineteen abdominal. Its branchiæ (few in number) formed spirals.*

SABELLIPHILUS (?) BISPIRÆ.

Crustacean parasites of annelids have been known to zoologists since Krøyer† in 1837 described *Selius bilobus* as frequenting *Lepidonotus squamatus*, L. The same author next year found another on *Harmothoë imbricata*, L. which he provisionally termed *Silenium Polynoës*, but delay in publishing a description caused Steenstrup and Lütken, with Krøyer's consent, to substitute the title *Herpyllobius arcticus* for this crustacean. Sars‡ next contributed a description of four new species, viz., *Terebellicola reptans* on *Terebella debilis*, Malmgren, *Sabellacheres gracilis*, on *Myxicola Steenstrupi*, Kr., *Sabelliphilus elongatus* on *Sabella parvonia*, and *Choniophilus dispar* on *Euchone papillosa*, Sars. Kieferstein in 1863§ gave an account of *Nereicola ovata* occurring on *Nereis cultrifera*, Grube, and the author and Grube likewise noticed the same form which is not uncommon in the Channel Islands. In 1864 Nordman|| found a new copepod on *Nicomache lubricalis*, and he termed it *Domusa clymenicola*. A few years later Hesse¶ in his account of new crustaceans from the shores of France described *Chelodiniiformis typicus* from the lob-worm (*Arenicola marina*, L.). Claparède** the following year gave a resume of the literature of the subject up to date, as a preface to his description of a new species, *Sabelliphilus Sarsi* on *Spirographis Spallanzani*, Viviani. Three additional species were described by the veteran naturalist, †† Sars, the same year, viz., *Melinnacheres ergasiloides* on *Melinna cristata*, Sars; *Herpyllobius crassirostris* on *Exarve impar*, Johnston; and

* Op. cit., p. 291.

† Naturhist. Tidsskrift, 1ste R. I. Kjøbenhavn.

‡ Forhandl. Vidensk. Selsk. I. Christiania, 1861, p. 46 (sep. copy).

§ Zeit. f. w. Zool. XII. Bd.

|| Bullet. Acad. St. Petersb. 1864.

¶ Ann. Sc. Nat. 5th Sér. XI. p. 275. 1869.

** Ann. Sc. Nat. 5e Sér. xiii. Note p. 1, Pl. 7.

†† Nyt. Mag. Nat. Bd. xvii. 1870.

Eurysilenium truncatum on *Harmothoë imbricata*, L. In 1877 Kurz* published an account of *Eunicicola Clausii* as a parasite on *Eunice Claparèdii*, De Quatrefages. The same year an important contribution by Levinsen† cleared up the ambiguity connected with *Herpyllobius arcticus*, Steenstrup and Lütken, and, besides, added four new genera and species to the list, viz., *Selloides Bolbroei* on *Harmothoë imbricata*, and a curious variety on *Gattyana cirrosa*, Pallas, *Rhodinicola elongata* on *Rhodine Lovéni*, Malmgren, *Bradophila pygmaea* on *Brada villosa*, H. Rathke, *Saccopsis Terebellidis* on *Terebellides Strœmi*, Sars, and *Crypsidomus Terebellæ* on *Amphitrite cirrata*, O. F. Müller. In the Annelids of the "Challenger" is recorded a new form attached to the foot of *Leanira areolata*, McIntosh,‡ from 345 fathoms, south of Yedo, Japan, viz., *Leaniricola rotundata*. List§ in 1890 gave a minute account of two forms, one of which—*Gastrodelphys Clausii*—had apparently been first observed on the branchiæ of *Bispira volutacornis*, Montagu, by De St. Joseph,|| the other, *Gastrodelphys Myxicola*, from the branchiæ of *Myxicola infundibulum*, Grube. The outline of *Gastrodelphys Clausii* differs considerably from the form subsequently described from South Africa, the latter having the appearance of an *Ergasilus*, and closely approaching the *Sabelliphilus Sarsii* of Claparède, the crustacean parasite of *Spirographis Spallanzani* in the Mediterranean. Various examples adhered to the largest, and probably oldest, specimen of the annelid both dorsally and ventrally, the anterior end being fixed in the fissure between two segments, and they also frequented the branchiæ, but they were not confined to the dorsal edge of the branchiæ, most, indeed, occurring on the pinnæ or close to their origin.

The crustacean, which may provisionally be termed *Sabelliphilus bispiræ*, parasitic on this annelid differs from the *Gastrodelphys Clausii* as described by List,¶ and which he found on the branchiæ of *Bispira volutacornis* of Montagu from the Adriatic. De St. Joseph had apparently obtained the same form on the French coast some years previously—fixed by the rostrum and ventral plate to the dorsal edge of the branchiæ, its long axis being parallel to that of the rachis. He had provisionally named it *Bispirophilus tenax*, but, as he himself observes, the name of List has precedence, and he appears to have satisfied himself that List was dealing with the same species.

In outline the South African ectoparasite leans more to the typical Ergasilidae than *Gastrodelphys*, which in the female is narrow in front and broad behind, whereas the present form is

* Sitzungber. Akad. Wiss. Wien, 1877.

† Videnskab. Meddel. Nat. Foren. Kjøbenhavn.

‡ Ann. "Challenger," p. 133. Woodcut, Fig. 2.

§ Zeit. f. w. Zool. xlix. Bd. p. 71 Taf. iv.-viii.

|| Ann. Sc. Nat. 8e Sér. xvii. p. 292, 1894.

¶ Vide Dr. Thos. Scott, 20th Rept. S. F. B., Part III., p. 288.

broad anteriorly and narrow posteriorly. In the male, moreover, the resemblance between the species is slight, the elongated body gently tapered from front to rear having little resemblance to the male of that from South Africa. It may be that two parasitic crustaceans occur in Europe, and that the present species agrees with one of them, but no evidence on the subject has been found. These crustacean parasites of Annelids approach in a close manner those of various fishes, *e.g.*, such as *Bomolochus*, are of the Ergasilidae, parasitic on the sole and the ling.

The female (Plate IX fig. 56) is about 1.2 mm. in length and in general outline resembles an *Ergasilus*, often seen on *Doris tuberculata*, having an ovate body (cephalothorax, Claparède) to which is appended the tapering tail. The anterior end is shaped like a hoof and the first segment is distinguished from the rest by a lateral peak on each side. The second segment is somewhat less in transverse diameter than the body at the peaks; in antero-posterior diameter it is wider than the two following, and the last segment is still less. A lozenge-shaped segment follows with a few hairs at each lateral peak; and this is succeeded by a larger ovigerous segment from which the bulky ovisacs extend. Four progressively diminishing caudal segments occur posteriorly, and to the last are attached the two caudal processes with long spines. The first of these segments in the male especially appears to be more or less fused with the genital segment. A lozenge-shaped greenish or brownish opacity occurs in the centre of the carapace in some and is probably due to the food.

The antennules (Plate IX fig. 53) are of average length and have seven segments, the second being the longest and the last minute. They have similar hairs to Claparède's *Sabelliphilus Sarsii** from *Spirographis*. The antennae are shorter than in the latter species, and have only two terminal hooks, and these do not seem to be so closely parallel as in Claparède's form. The buccal appendages appear to be similar to those of the latter. Dr. Thomas Scott, who, along with Prof. G. S. Brady has done so much good work in the group, kindly examined this form, "which has a general resemblance to *Bomolochus*, though it belongs to the closely allied family Lichomolgidae. The appendages of the mouth in the latter are very well described and figured in the 3rd volume of Prof. G. S. Brady's Monograph, and if the drawings be compared with the corresponding appendages of *Bomolochus* given in my paper in last year's Report of the Fishery Board for Scotland, a marked difference between them will be noticed, especially in the structure and armature of the mandibles and maxillae. On the other hand there is among the genera composing the Lichomolgidae a certain similarity in

* Op. cit.

the structure of the mouth-organs. In Part III. of the 12th Report of the Fishery Board is a note setting forth the more prominent of these differences—*Sabelliphilus* included.”

The first four pairs of thoracic feet are biramous, the stronger showing externally three joints, the distal segment being somewhat ovoid, and furnished with strong spines. The next segment also has a long spine—the other has an elongated terminal segment. The fifth pair appears to be rudimentary—probably represented by the lateral processes of the narrow segment in front of the genital segment (the first abdominal of some *e.g.* Claparède).* This segment has the enlarged vulvæ to which in the sketch the ovisacs adhere (Plate IX., fig. 56). These are distended with moderately large eggs. In some the ova were still in the ovaries, though ready for deposition, and in one filmy tissue adhered to the vulvæ—either for the purpose of receiving the ova on discharge, or which had been left after the escape of the eggs from the ovisacs. Moreover, in several a spermatophore was attached to the pigmented tissue of the vulva on one side, but was detached during examination (Plate IX., fig. 55).

The male is less than the female, measuring 7239 mm., and is proportionately more elongated (Plate IX., figs. 51 and 52), all the segments of the body being narrower. The antennules (Plate IX., fig. 53) agree in regard to the proportions of their segments with those in the female and so with the antennæ (Fig. *ibidem*). The other appendages of the region also correspond. In lateral view (Plate IX., fig. 52) the four anterior thoracic feet are more distinctly observed, and the shape of the rostrum is more clearly defined. The genital and caudal segments, however, do not readily take this posture, so that they are generally seen in a horizontal position—not on edge—probably because the genital segment, which is flattened from side to side, maintains this position. The condition of the genital segment at once distinguishes this sex, for it is broadly ovate, convex in front, but somewhat concave posteriorly. It contains an ovoid spermatophore on each side, and the apertures appear to be posterior, each debouching from a papilla. On extension the spermatophore is spindle-shaped (Plate IX., fig. 54). It however assumes a different aspect after the sperms have been utilized (Plate IX., fig. 55) for then the elasticity of its capsule gives it an elongated slipper-shape. The chitinous investment of the genital segment seems to lend itself more readily to its varying contents than that of the other parts—a feature probably due to its delicacy. As in the female, four caudal segments succeed the genital—each being slightly narrower than the one in front, and the last being somewhat longer. It bears the two elongated processes from which the spines extend.

* Ans. Sc. Nat. 5th Se. XIII p. 14.

The spermatophores would seem to be discharged by the male at the vulvæ of the female, one or more becoming attached thereto and fertilizing the ova as they pass, or otherwise. Whether the male secretes new spermatophores and repeats the process of fertilization could not be determined.

It is interesting that the South African form so closely agrees with the *Sabelliphilus Saisii* of Claparède from the Mediterranean *Spirographis Spallanzani*. The proportions of the antennules and of the antennæ differ, as well as the number of the terminal hooks in the latter. Moreover, in his figure he shows only three caudal segments behind the genital (the first having apparently been joined to the genital).

The following note by Mr. Andrew Scott on the Family, and the remarks of Dr. Thomas Scott, after consideration of all the features of the case, are of special interest in connection with this ectoparasite.

The Family *Sapphirinida*, which includes the genera *Pseudanthessius*, *Lichomolgus*, *Hedmannella*, and *Sabelliphilus*, and the Family *Ergasilida*, containing such genera as *Ergasilus*, *Bomolochus*, etc., are founded chiefly on the structure of the cephalic appendages, especially the mandible.

In the *Sapphirinida* the mandible is in the form of a thin plate, with a more or less distinctly serrate edge. The mandible in the *Ergasilida* is jointed, and terminates in a strong tooth, with a serrate edge.

The genera *Pseudanthessius*, *Lichomolgus*, and *Hedmannella* are distinguished by the structure of the inner branch of the fourth pair of swimming feet. In *Pseudanthessius* the inner branch is one-jointed; in *Lichomolgus*, two-jointed; and in *Hedmannella*, three-jointed. The other appendages are very much alike in the three genera.

Sabelliphilus is separated on account of the structure of the second maxilliped of the female. In *Pseudanthessius*, *Lichomolgus*, and *Hedmannella* the female second maxilliped terminates in a short, almost obsolete claw. In *Sabelliphilus* the maxilliped is well developed, and terminates in a long, strong claw.

Dr. Scott observes that this crustacean certainly belongs to the *Sapphirinida* (= the *Lichomolgida* of Brady and others). It does not agree with *Sabelliphilus* in the structure of the antennule, and to some extent in the structure of the first and second maxillipedes, and especially in the structure of the endopodites of the fourth pair of the thoracic legs. In *Sabelliphilus* the first two joints of the antennules are considerably dilated, and the endopodite of the fourth pair of legs are three-not two-jointed. On the other hand the specimens from South Africa—in the structure of the antennules, and especially in the structure of the endopodite of the fourth pair of legs—agree

very closely with *Lichomologus*, but differ very much from that genus in the structure of the second maxillipedes. In *Lichomologus* this pair of maxillipedes in the female are stout, and terminate in an almost obsolete tooth-like claw. Indeed, he (Dr. Scott) does not remember any described genus to which these specimens can be satisfactorily ascribed. If the specimen dissected had been a male instead of a female it would have agreed fairly well with *Lichomologus*, as the male in that genus has the second maxillipedes usually furnished with a moderately long claw, but as it is a female it exhibits in its appendages a relationship to both *Lichomologus* and *Sabelliphilus*.

Fam. SERPULIDÆ.

PROTULA CAPENSIS, McIntosh, an var. *tubularia*, Montagu.

1803. *Protula tubularia*, Montagu, Test. Brit. p. 513, and Suppt. p. 171.

1885. *Protula capensis*, McIntosh. Ann. "Challenger," p. 509. Pl. LIV., fig. 2 ; Pl. XXXI.A, figs. 12-13.

The species is large, attaining (in spirit) a length of 100 mm., and a breadth between the bases of the anterior bristles of .14 mm. Of the total length, about 18 mm. pertain to the branchiæ, 27 mm. to the anterior (thoracic) region, and 55 mm. to the posterior region.

The dorsal surface is grooved along the middle line anteriorly, but is convex posteriorly. The ventral surface, on the other hand, is deeply grooved throughout, the groove, however, being interrupted by the deep membranous apron at the posterior part of the thoracic region.

At the truncated anterior end the mouth opens dorsally as a deep pit with a smooth papilla projecting out of it. Similar grooves to those in *Bispira* lead from the spirals of the branchiæ to the mouth, and probably subserve the same purpose, viz., the conveyance of food and mucus.

The branchiæ form two dense masses on each side, attached by a surface shaped somewhat like a trefoil to the body. Moreover, the left mass is composed of three spirals which are mounted on a basal region composed of a single spiral. Such may be an abnormality.

The right side has but a single complex spire considerably longer than the compound one on the left, the last whorl terminating dorsally and sending from its edge a lamina towards the mouth, apparently for directing currents thereto.

The filaments have a dense series of somewhat short pinnae which proceed to the tip, the latter only being distinguished by

its larger bulbous end. As transparent objects the filaments (radioles) present an interrupted dark line in the centre, probably from a blood vessel, and the pinnæ are richly ciliated.

The question as to whether the complex spirals in this large form (double the size of that procured by the "Challenger") are the product of age is interesting, and the fact that each side differs from the other in the character of the spirals shows that considerable variation is possible.

The collar commences by a wide fan-like flap at each side dorsally, and extends round the ventral border to the other side. The first or lateral flap is partially separated by a fissure from the rest of the collar, which otherwise is continuous. The lateral flap of the collar is continuous again dorsally with the loosely folded membrane which flanks the anterior or thoracic region, and which passes between each of the bristle-bundles to be attached as a folded or frilled band to the ventral surface, embracing on each side the soft pad for the rows of hooks. Dorsally, the whole forms a continuous membrane, for it is attached on the dorsal aspect of each bristle-bundle, and it is highly vascular, every part of it being permeated by the finely branched vessels with their dark blood. Posteriorly the ventral edges of the membrane are joined by a thicker fold (already alluded to), and which probably contains glandular elements like the area in front.

The anterior regions has seven pairs of golden bristle-bundles, each consisting of a dense group of fine bristles with delicately tapered tips and narrow wings. The great number of these slender bristles in a tuft is a feature of moment. No spine is present. The bristle-bundles are nearly of the same size from the first to the last. They appear to correspond in minute structure with those of *Protula capensis*.

In the same way the anterior hooks appear to differ only in size, for the curves are the same. These remarks also apply to the posterior hooks.

The species occupies a large white, calcareous tube (which was absent in the "Challenger" collections), sinuous in outline, and having an average diameter of 13-14 mm. It is smooth internally, but roughened externally by various growths such as tubes of *Filigrana*, patches of *Cellepora* (*Leptalia*), *Balan*i, coarse sand and *Melobesia*.

The many close structural resemblances between this and the European species (*Protula tubularia*, Montagu) raises some doubt as to the specific distinction on grounds so slender as the slight modification of hooks and other parts. Its much larger size in South African waters will account for some of these variations. On the whole it may be considered as a variety of the European species.



EXPLANATION OF PLATES.

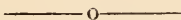
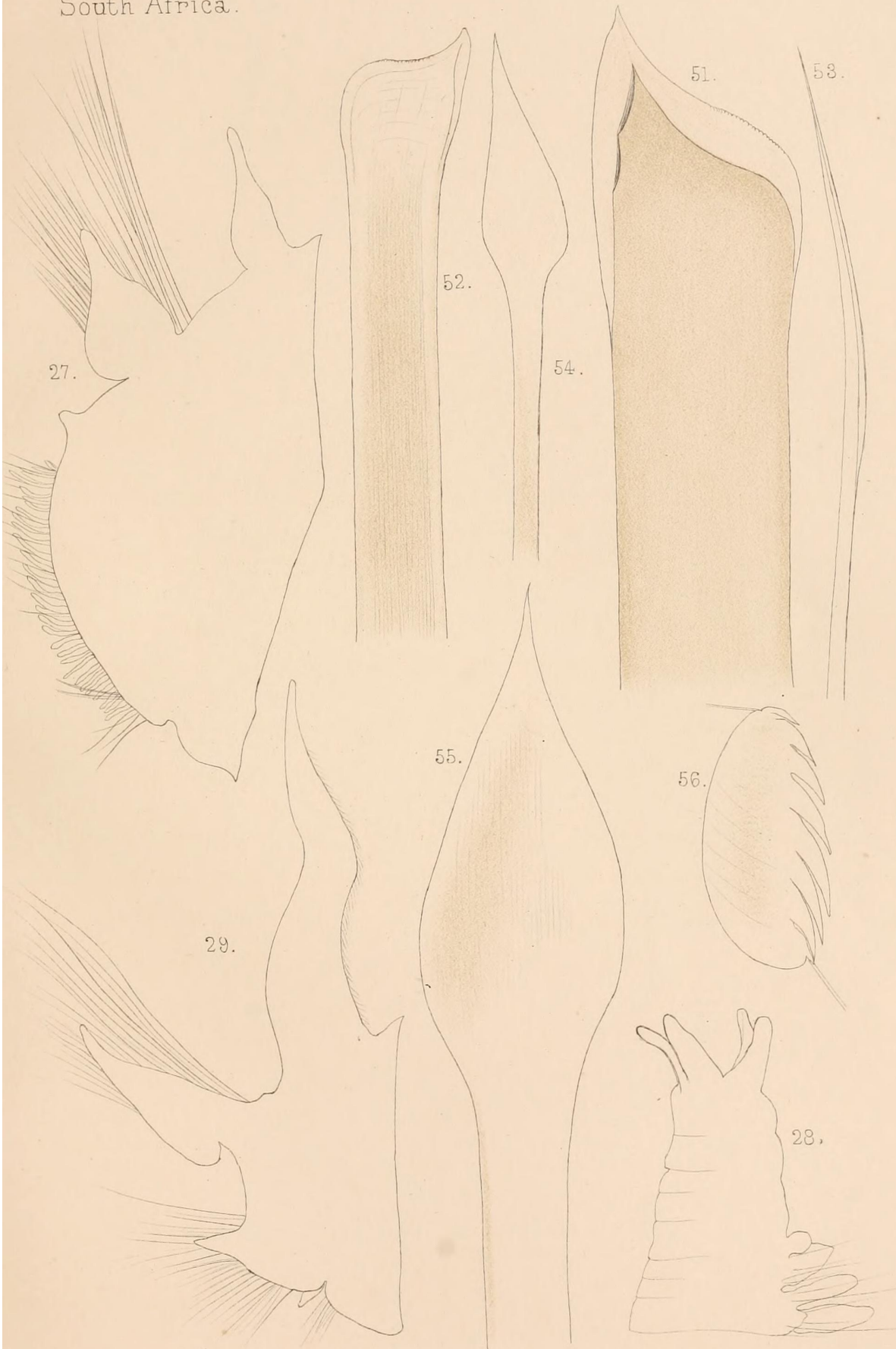


PLATE V.

FIG.

27. Twenty-fifth foot of *Thecodisca* (*Anthostonia*) *hexaphylla*, Schmarda. $\times 21$ diam.
28. Posterior end of a young example of the foregoing (?) with four anal cirri. $\times 90$ diam.
29. Foot of the foregoing (adult) from the middle region of the body. $\times 21$ diam.
51. Tip of great bristle from the 4th segment of *Chalopterus variopedalus*. $\times 100$ diam.
52. Smaller bristle of the same kind from an example from Naples. $\times 100$ diam.
53. Terminal winged bristle at the tip of the sickle-shaped anterior feet. \times Zeiss oc. 2, obj. D.
54. Spathulate bristle from the middle of the same foot. Similarly magnified.
55. Large spathulate bristle from the inner end of the series. Similarly magnified.
56. Anterior hook of the same species. \times Zeiss oc. 2, obj. D. + 3 in. draw-tube.



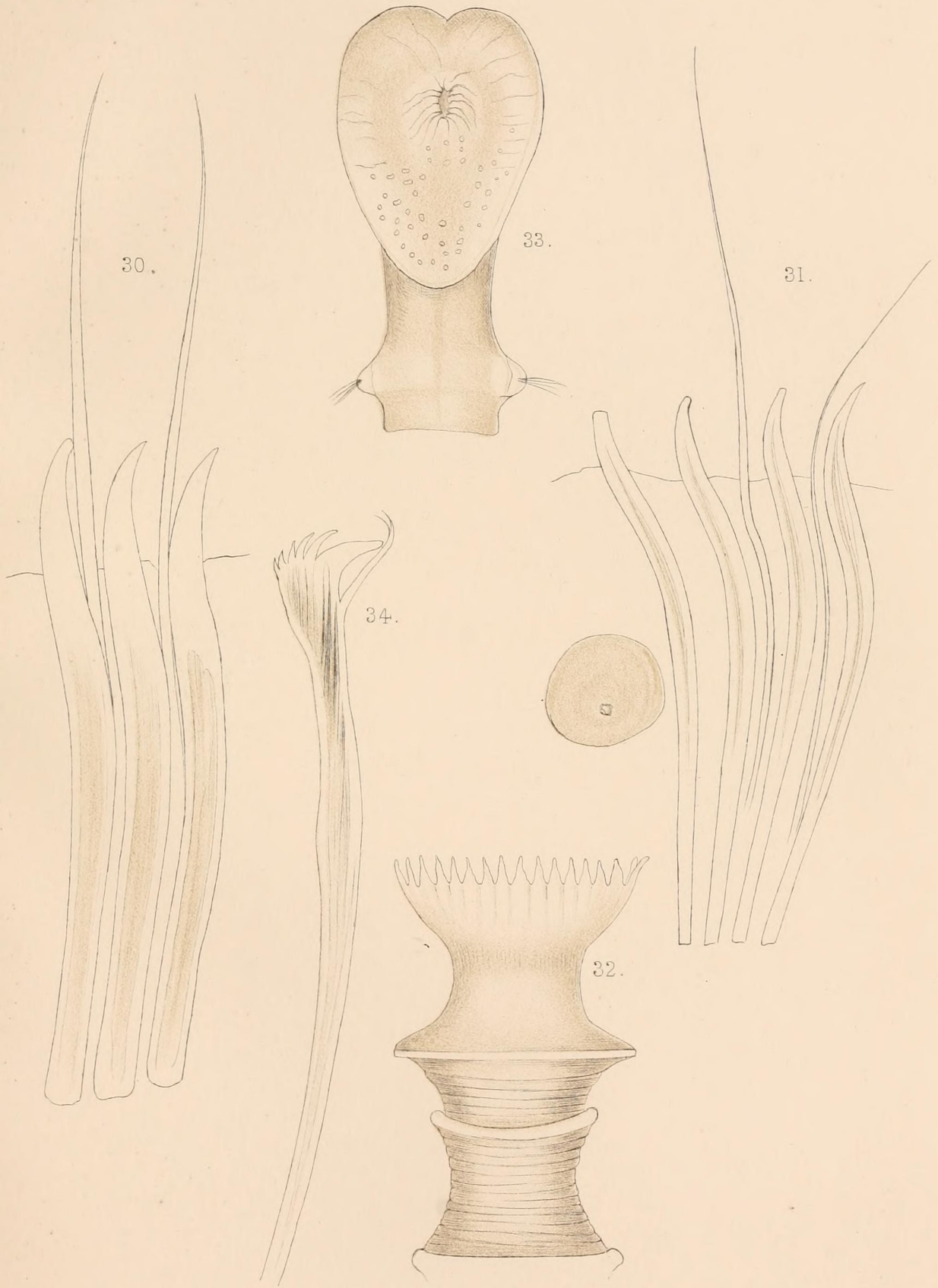
W.C.M. del.

Mintern Bros. lith.

PLATE VI.

FIG.

30. Anterior hooks and bristles of *Cirratulus cirratus*, var. *capensis*, $\times 100$ diameters.
31. Anterior hooks and bristles (drawn to the same scale) of *Cirratulus cirratus* from Britain. An ovum is on the left. $\times 100$ diam.
32. Anal funnel of *Nicomache tumbricalis* var. *capensis*. $\times 20$ diam.
33. Foliate anal expansion of *Maldane McIntoshii*, Marenzeller. (Under a lens.)
34. A posterior hook of the foregoing. $\times 150$ diam.



W.C.M. del.

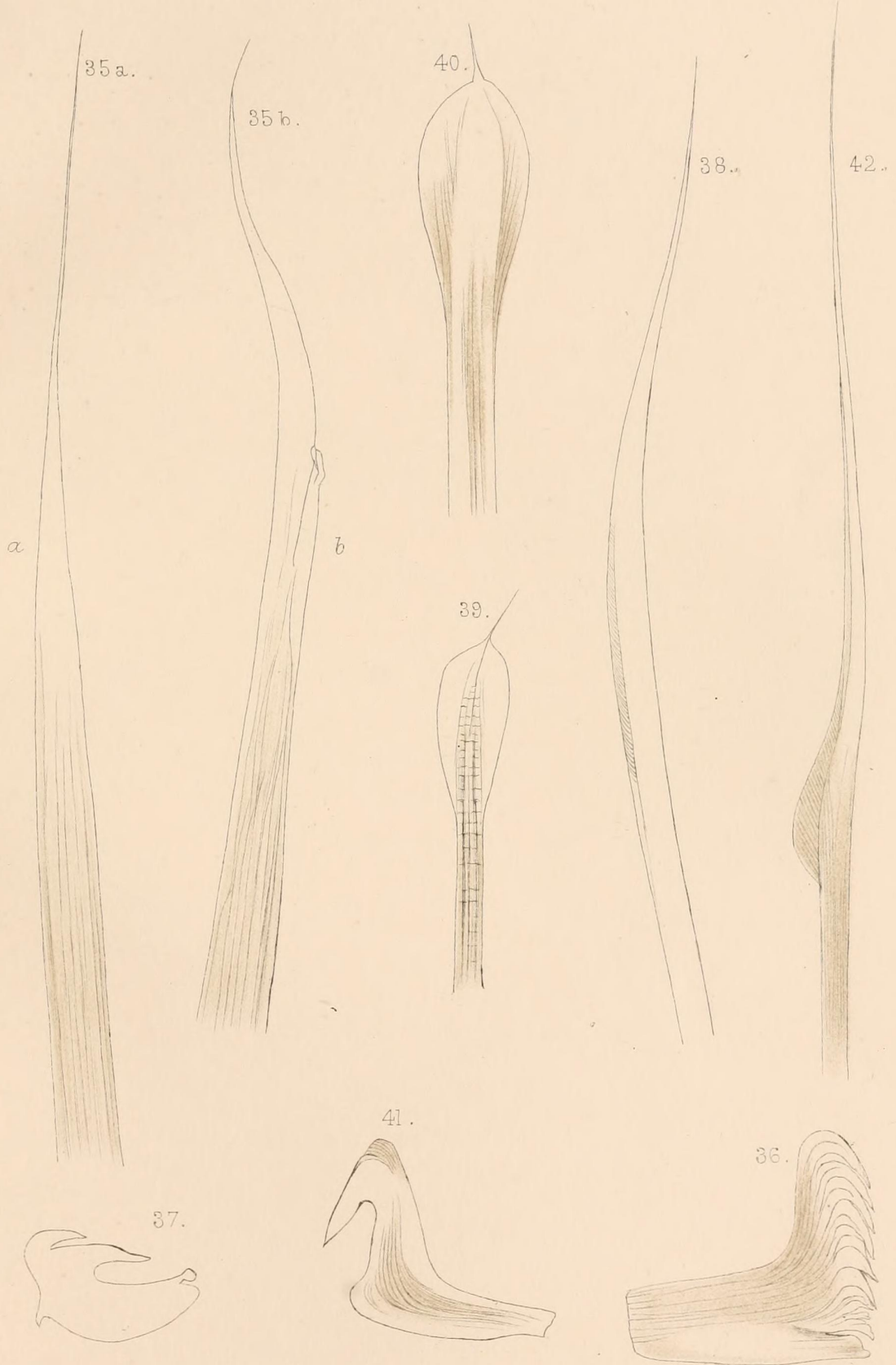
Mintern Bros. lith.

CIRRATULIDÆ & MALDANIDÆ.

PLATE VII.

FIG.

- 35a. Tip of bristle of *Peclinaria capensis*, Pallas. $\times 150$ diam.
- 35b. Tip of an injured bristle from the same region. $\times 150$ diam.
36. Hook of the same species in lateral view. \times Zeiss oc. 2, obj. D. + 3 in draw-tube.
37. Hook of *Thelepus*—? \times As in the foregoing.
38. Upper bristle of *Polamilla reniformis*, O. F. M. \times As before.
39. Tip of upper spatulate bristle of the same species. \times As in the foregoing.
40. Tip of a lower spatulate bristle of the same form. \times As before.
41. Hook of the same form. \times As in the previous example.
42. Tip of a bristle from the posterior region of the same species. Similarly magnified.



W.C.M. del.

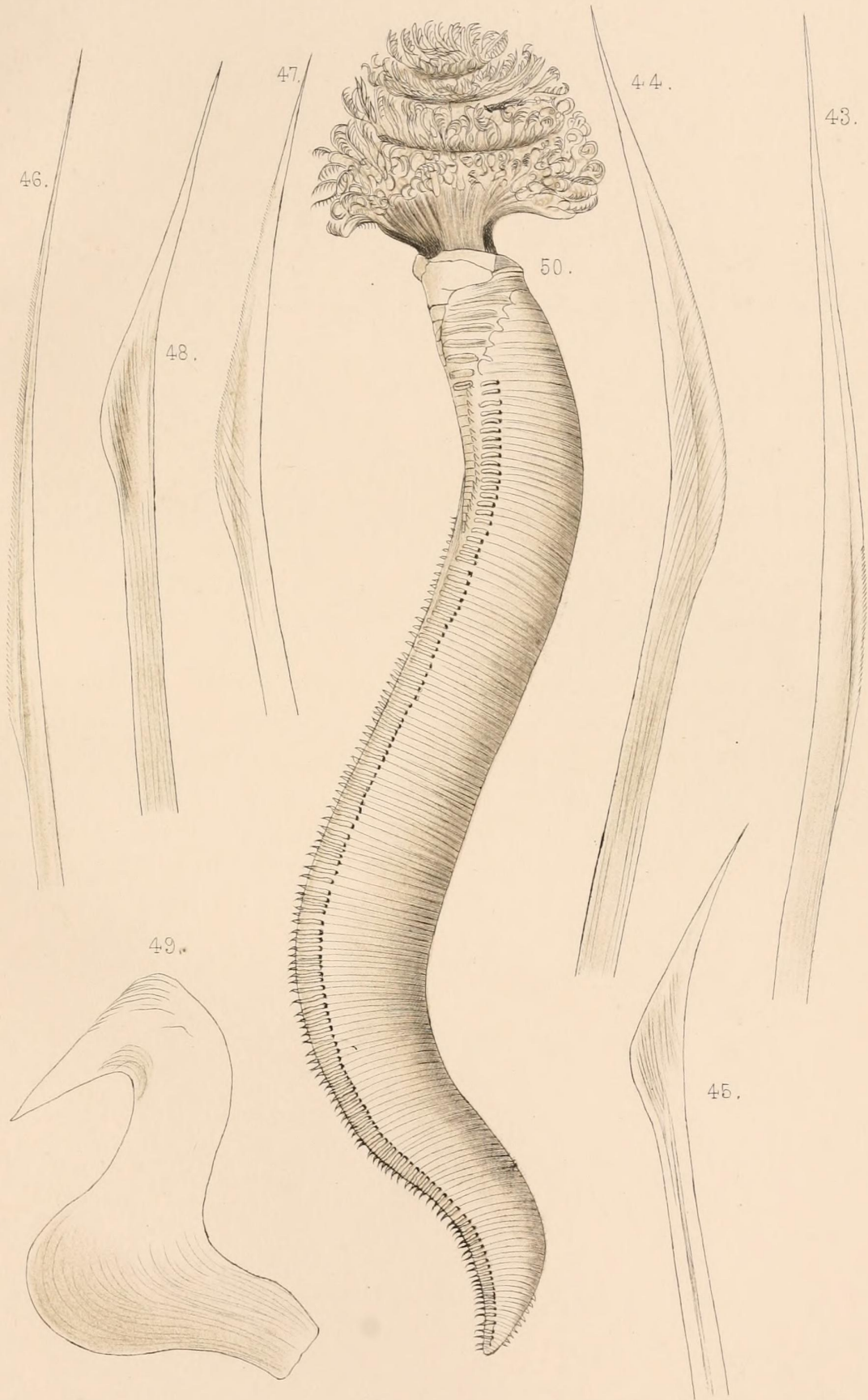
Mintern Bros. lith.

AMPHICTENIDÆ, TERESELLIDÆ & SABELLIDÆ.

PLATE VIII.

FIG.

43. Upper winged bristle from the region of *Bispira volutacornis*. × Zeiss oc. 2. Obj. D.
44. Winged bristle from the middle of the tuft (thoracic region). Similarly magnified.
45. Winged bristle from the same region in *Spirographis Spallanzani*. Similarly magnified.
46. Upper bristle with narrow wings from the posterior region of *Bispira volutacornis*. × As before.
47. Inferior bristle of the same tuft. Similarly magnified.
48. Winged bristle from the same region in *Spirographis Spallanzani*. × As before.
49. Hook of *Bispira volutacornis*. × Zeiss oc. 2. Obj. D. + 3 in draw-tube.
50. Lateral view of *Bispira volutacornis*. About natural size.



W.C.M.del.

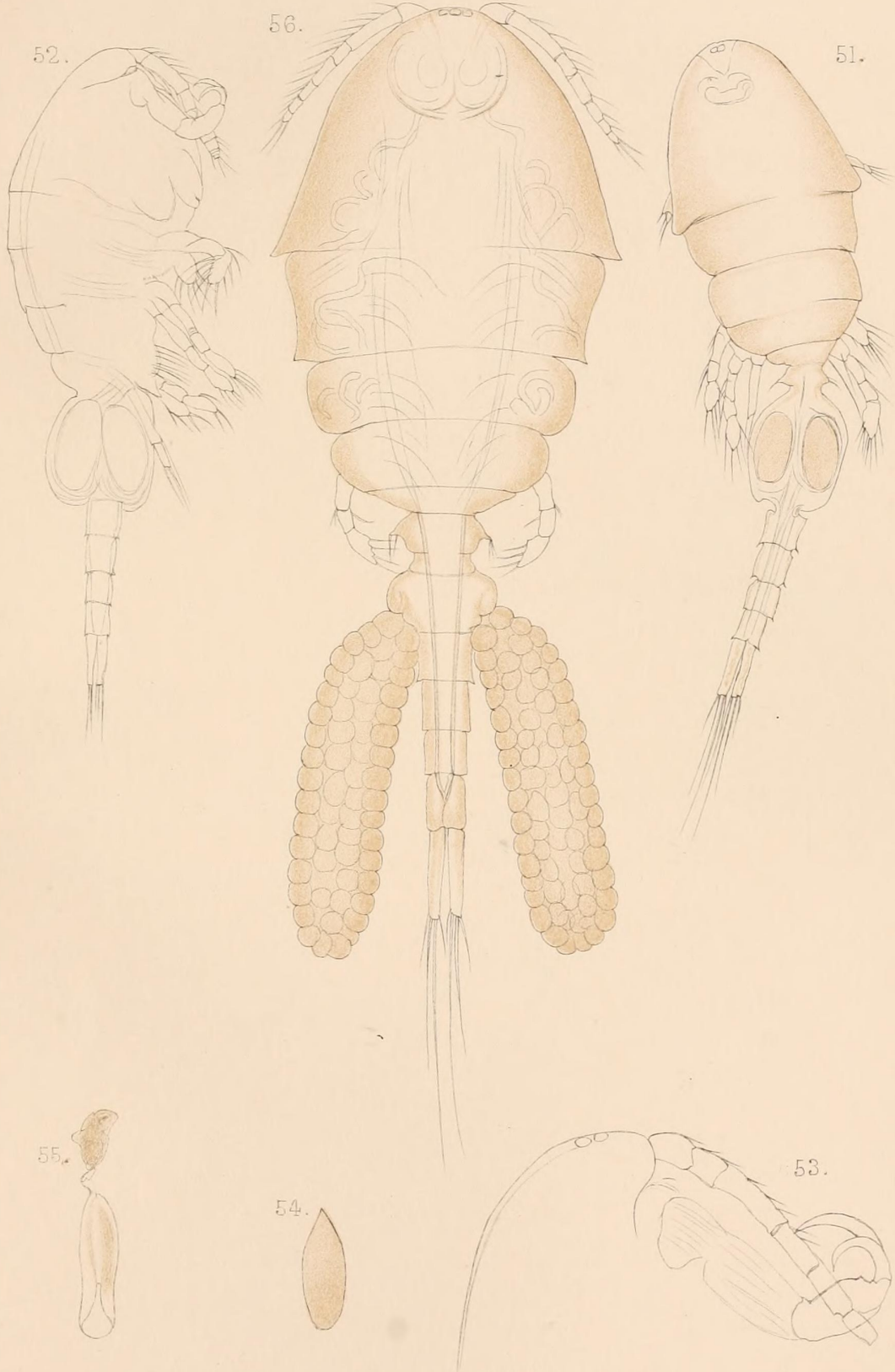
Mintern Bros.lith.

SABELLIDÆ.

PLATE IX.

FIG.

51. Male of *Sabelliphilus* (?) *bispira*, from the dorsum. × 100 diam.
52. Another example partly in profile. The genital segment and the caudal region, however, are seen from the dorsum. × As before.
53. Anterior region of the carapace of a male with the antennules and antennæ, the two powerful hooks of the latter being conspicuous. × Zeiss oc. 2. Obj. D.
54. Spermatophore when first extruded. × 100 diam.
55. Spermatophore as detached from the region of the vulva with its elastic capsule more or less contracted. × 100 diam.
56. An ovigerous female *Sabelliphilus* (?) *bispira*. Magnified to the same scale as the males.



W.C.M. del.

Mintern Bros. lith.

SABELLIPHILUS BISPIRÆ.

