

XIV.—On a New Species of *Sclerocheilus*, with a Revision of the Genus. By J. H. Ashworth, D.Sc., Lecturer in Invertebrate Zoology in the University of Edinburgh.\*

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[Plate XXXVII.]

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The Polychæte family Scalibregmidæ comprises seven genera, the limits and inter-relationships of which are, however, still imperfectly known. The present paper results from a detailed study of one of these genera, a new species of which is described, chiefly from a specimen collected in Scotia Bay, South Orkneys, and entrusted to me for examination by Dr W. S. BRUCE.

DESCRIPTION OF THE SPECIMEN COLLECTED IN SCOTIA BAY, SOUTH ORKNEYS.

This specimen, the only Scalibregmid found by the Scottish National Antarctic Expedition, was dredged on a stony bottom in ten fathoms at Station 325, in Scotia Bay, South Orkneys (lat. 60° 43' 42" S.; long. 44° 38' 33" W.), in August 1903.

The worm, which is yellowish brown in colour (in alcohol), is 19 mm. long. The anterior portion is broad; the maximum breadth, 3 mm., is reached about the level of the 10th segment; from this region the worm tapers gradually to the anal segment. The dorsal surface of the worm is strongly convex; the ventral surface is flattened, and there is a well-marked depression which extends along the mid-ventral line from the 2nd chætiforous segment almost to the anus.

The prostomium is drawn out at each side into a stout, bluntly conical process (Pl. XXXVII, fig. 1). On the middle region of the dorsal surface of the prostomium there is a  $\Lambda$ -shaped area of dark-brown pigment representing the eyes. The point of the  $\Lambda$  is median, and is situated near the centre of the prostomium; each limb of this pigmented area passes obliquely backwards and down the side of the prostomium.

The peristomium consists of a single, achætous ring, which is incomplete ventrally, where it forms the antero-lateral borders of the mouth (figs. 1, 2).

\* A grant in aid of the expenses incurred during this research has been received from the Earl of Moray Endowment of the University of Edinburgh. The cost of the woodcuts and of the reproduction of the figures on the plate has been defrayed by the Carnegie Trust for the Universities of Scotland.

There are 43 chætiferous segments, the last of which is small and evidently recently formed; this is succeeded by the anal segment or pygidium (fig. 5).

The first chætiferous segment is narrow mid-dorsally, wider at the sides, *i.e.* where the parapodia are borne, and enlarged mid-ventrally, just behind the mouth, to form a well-marked "under-lip," the front margin of which is lobate—about six lobes being indicated (fig. 2). This segment consists of two annuli, the anterior of which is much the larger and bears the parapodia.

The second chætiferous segment (figs. 1, 2) is tri-annulate, there being a small ring in front of and another behind the chætiferous annulus. These smaller rings are visible on the dorsal and ventral aspects, but are not seen in the lateral view of the worm.

The third chætiferous segment has a similar constitution, but the fourth is composed of four rings—the chætiferous annulus together with two rings in front and one behind. All the succeeding segments up to and including the 41st are also four-ringed; the annulation is much less clear in the next segment, and the 43rd segment is a single narrow ring bearing very small parapodia.

In the fifth and succeeding chætiferous segments the annuli are subdivided on the dorsal surface\* by antero-posterior furrows, so that the skin is marked out into more or less quadrangular areas, as is the case in other Scalibregmidæ. This sculpturing of the skin is well marked up to about the 23rd segment, but in the following segments is exhibited only by the chætiferous annuli.

The anal segment or pygidium is a short ring on which ventrally there are two slight enlargements (one on each side of the middle line), of which the left bears a slender cirrus about .5 mm. in length (fig. 5). Other cirri have been lost; it is not possible to say with certainty how many, but probably the original number was four.

There is no trace of gills in this specimen.

#### *Parapodia.*

The notopodia and neuropodia of the first segment are little elevated above the general surface, but in the following segments there is right and left a prominent elevation extending over the whole lateral region of the segment from each of which the notopodium and neuropodium arise. From about the seventh segment onwards the raised area presents papilliform elevations the epidermis of which is glandular. There is usually one of these papillæ anterior and another posterior to the lip of each chætal sac, that just behind the lip of the chætal sac being especially well marked, forming in most of the segments a prominent, rounded knob.

A cirrus is present on the posterior face of the 18th left neuropodium, and on all the succeeding neuropodia up to and including the 40th. Cirri were probably originally present also on the 41st and 42nd segments, the parapodia of which are

\* This subdivision of the annuli is feebly marked on the ventral surface.

slightly damaged and no longer bear cirri. In the 18th and 19th chætiferous segments the neuropodial cirrus is a short conical process, .05–.08 mm. in length; but those of the succeeding segments (fig. 6) rapidly increase in length, so that the cirri of the 33rd to 40th segments are finger-shaped and .25–.3 mm. long (fig. 5). There are no notopodial cirri.

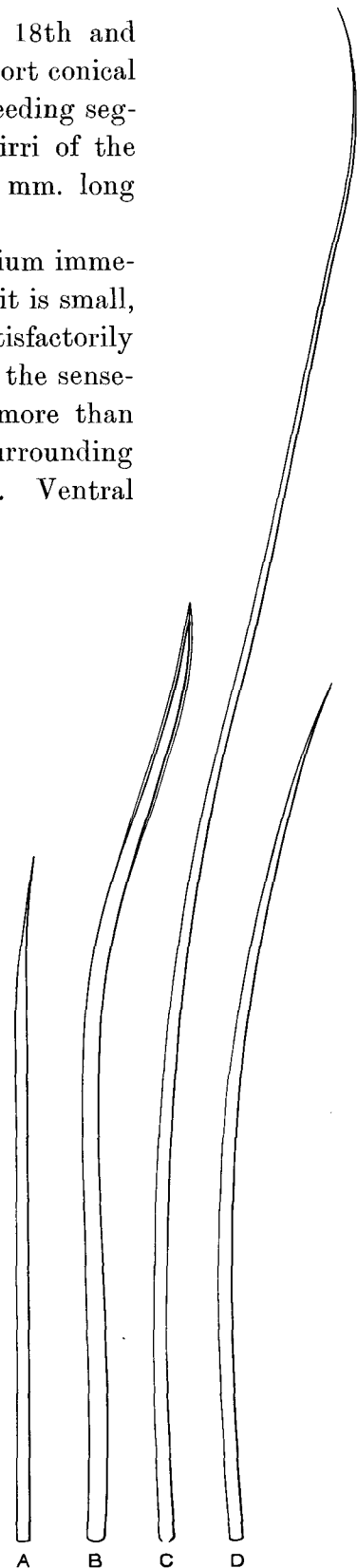
A lateral sense-organ is present in each parapodium immediately ventral to the base of the notopodium; but as it is small, and usually hidden in a depression, it can be seen satisfactorily only in sections. The surface of the organ which bears the sense-hairs is oval in outline, and its longer diameter is not more than about  $40\mu$ . This area is sunk below the level of the surrounding epidermis of the papilla on which the organ is situated. Ventral to the papilla bearing the sense-organ is a larger elevation the epidermis of which is glandular (fig. 6).

#### *Chætæ.*

The first notopodium bears chætæ of three or four different kinds, the relative positions and detailed structure of which have been studied as far as has been possible on the single intact notopodium available.

(i) There is an anterior series of about ten almost straight chætæ (text-fig. 1, A), approximately .5 mm. long and  $9-10\mu$  in maximum diameter. Each of these chætæ tapers rapidly in its distal fourth to a fine point, and the preparations indicate that the tips of these chætæ project little beyond the lips of the chætal sac.

(ii) Close behind the chætæ just described is a series of about fifteen stronger chætæ, each bent in a characteristic manner (text-fig. 1, B). These chætæ are .6–.65 mm. long, and their maximum diameter is  $10-12\mu$ . Each chæta tapers somewhat abruptly at its free end, and, when unworn, has along both sides, for a distance of .15 mm. behind the fine-pointed tip, a narrow and very delicate lamina which readily breaks up into a close-set series of minute, pointed processes, so that this region of the chæta appears to be finely spinous. It is possible that these chætæ are really in two rows, an anterior row of about



TEXT-FIG. 1.—Chætæ from the first notopodium of the specimen from Scotia Bay. ( $\times 200$ .)

ten and a posterior row of about five; but if so, the two rows stand very close together.

(iii) Posterior to the foregoing are tapering, capillary chætæ, which appear to be of two types, shown in text-fig. 1, C and D. There are about forty chætæ of the type shown in fig. C; each of these is .9–1.2 mm. in length and 7–9 $\mu$  in maximum diameter, and tapers very gradually to a long fine point; consequently the distal portion of the chætæ is very slender. There are fewer chætæ—about five—of the type shown in fig. D. These are about .5–.6 mm. long, and taper more rapidly than the preceding. They are originally laminate near their tips, at any rate along one side, but the lamina is exceedingly fine.

The first neuropodium bears capillary chætæ like those in the notopodium, and one chætæ similar to that shown in text-fig. 1, A, was observed, but there are no stouter, bent chætæ like those occurring in the notopodium.

The chætæ of the second notopodium include representatives of all the four types present in the first notopodium; there is a single row of eight or nine of the bent chætæ.

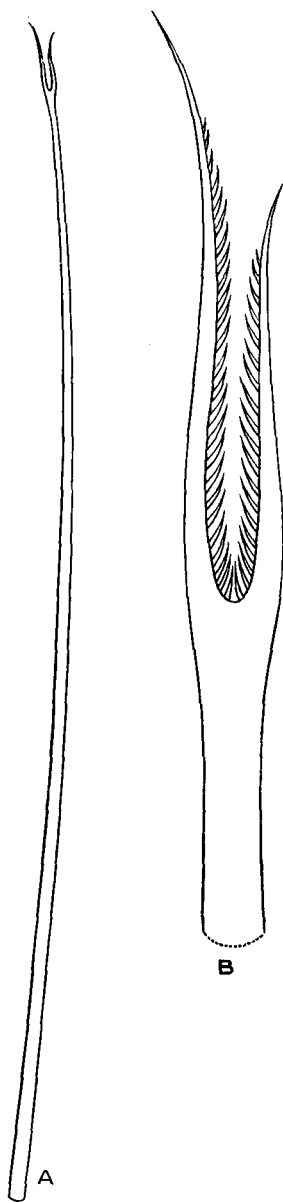
The second neuropodium contains capillary chætæ similar to those of the first neuropodium, but there are also present two of the peculiar furcate chætæ (see below), so characteristic of the family Scalibregmidæ. There are no stouter, bent chætæ like those in the notopodium.

The armature of the third notopodium consists of (1) an anterior row of eight or nine curved chætæ, similar to those of the first two neuropodia; (2) several furcate chætæ standing near the former; (3) a posterior series of capillary chætæ of two types, similar to those shown in text-fig. 1, C, D.

The third neuropodium bears capillary chætæ of the usual two types and several furcate chætæ.

In the following segments the capillary chætæ become considerably stouter and longer, attaining a length of 1.7–1.8 mm. and a diameter of 12–13 $\mu$ , and the differences between the two types gradually disappear, so that in most of the segments the two types are not distinguishable.

The furcate chætæ (text-fig. 2) form in both rami of the parapodium, from the third onwards, a fan-shaped series situated at the base and in front of the capillary chætæ. The shaft of each furcate chætæ tapers gradually in its distal portion to the



TEXT-FIG. 2.—A. Furcate chætæ from 25th parapodium of specimen from Scotia Bay. ( $\times 200$ .)  
B. Distal end of same chætæ. ( $\times 1500$ .)

base of the fork. The prongs, which are unequal in length, are usually curved, their fine tips pointing away from each other. In the anterior and middle segments the prongs are about  $50\mu$  and  $35\mu$  in length respectively, and in the posterior segments about  $40\mu$  and  $25\mu$ . Each prong bears along the inner edge of its proximal three-fourths a series of regularly-placed pointed processes. Only the fork and a short portion of the shaft proximal to it project beyond the lips of the chætal sac. In the middle region of the body there are about eight to twelve furcate chætæ in each of the rami of the parapodia.

#### SYSTEMATIC POSITION OF THE SPECIMEN FROM SCOTIA BAY.

The characters of the prostomium, parapodia, and chætæ, and especially the presence of the distinctive furcate chætæ, show clearly that the specimen described above belongs to the family Scalibregmidæ. It is referable to the *Scalibregma*-section\* of the family, for the body is sub-fusiform and the prostomium T-shaped, its lateral angles being drawn out to form short tentacular processes. To this section of the family belong the following genera:—*Scalibregma* Rathke, *Pseudoscalibregma* Ashworth, *Sclerocheilus* Grube, *Asclerocheilus* Ashworth, and *Oncoscolex* Schmarda.

The Scotia Bay specimen differs from *Scalibregma* in several striking respects, e.g. the absence of gills and dorsal cirri, the ventral cirri are much more slender, and there are stronger chætæ in the first and second notopodia, whereas such chætæ are not present in *Scalibregma*. Further, *Scalibregma* rarely possesses eyes.†

The genus *Pseudoscalibregma* was suggested by the writer‡ to contain certain little-known, abranchiate worms resembling *Scalibregma* in general appearance, but their real relationship to *Scalibregma* remains to be ascertained. These worms appear to agree in their external features with *Scalibregma*, except in regard to the absence of gills, and so differ from the Scotia Bay specimen in the parapodial and chætal characters mentioned above.

The characters of *Asclerocheilus* are little known, but the single species—*Asclerocheilus intermedius* (= *Lipobranchius* § *intermedius* Saint-Joseph)—referred

\* See the classification suggested by the writer in *Quart. Journ. Micr. Sci.*, vol. xlv (1901), pp. 296, 297.

† I have examined about sixty specimens of *Scalibregma* varying in length from 4 mm. to 56 mm., and including five epitokous examples. Eyes are present in only two specimens, both ordinary non-epitokous forms. For one of these specimens, which has been in my possession twelve years, I am indebted to Dr E. J. ALLEN, F.R.S., who collected it near Plymouth; for the other, collected in 1911 at Cap Lévi, near Cherbourg, I have to thank Professor FAUVEL, who, on finding that this specimen possessed eyes, kindly sent it to me for examination. Both specimens are similar in size, but only one—the Plymouth specimen—is complete; it is 30 mm. in length. In both, the eyes are on the right and left sides of the prostomium, and are wide apart, i.e. do not approach each other like those of *Sclerocheilus*. I have stained and cleared the Plymouth specimen, which exhibits on each side two eyes adjacent to each other, composed of a series of closely associated simple eyes, which in section are found to be similar in structure to those of *Sclerocheilus*.

‡ See *Quart. Journ. Micr. Sci.*, vol. xlv (1901), pp. 291, 292.

§ The genus *Lipobranchius* founded by Messrs CUNNINGHAM and RAMAGE to contain the species *L. jeffreysii* (= *Eumenia jeffreysii* McIntosh) cannot well contain also *L. intermedius* Saint-Joseph, which differs from the former in several respects, but especially in the nature of the chætæ of the first and second notopodia. A thorough revision

to this genus lacks eyes and neuropodial cirri, and in these respects, as well as in the form of the anal cirri, and the chætæ of the first and second notopodia, it differs from the Scotia Bay specimen.

The structure of *Oncoscolex* is also imperfectly known, but, as represented by the type-species *O. dicranochætus* Schmarda, it differs from the Scotia Bay specimen, for in the former the segments are composed of not more than three rings, the parapodia do not bear cirri, and stronger chætæ are not present in the first and second chætiferous segments.

The specimen under consideration cannot, therefore, be referred to any of the four genera just discussed, nor do its characters entirely agree with those generally accepted for the genus *Sclerocheilus*. The differential characters of this genus, as represented by the type-species, *S. minutus* Grube, have been emended and stated thus by SAINT-JOSEPH\* :—Prostomium small, with thick lateral processes and with eyes; notopodium and neuropodium of first chætiferous segment bear capillary chætæ and, a little above the neuropodium, five or six large, retractile, curved acicula, together with an equal number of slender and shorter acicula; the parapodial rami of the other segments bear capillary and furcate chætæ; small neuropodial cirri are borne on the last segments only; anus surrounded by five or six cirri; gills absent.

I have recently re-examined the series of specimens of *S. minutus* at my disposal, and have also, by the courtesy of Professor ANT. COLLIN, had the privilege of examining the entire series of the original specimens collected by GRUBE, and preserved in the Königliches Zoologisches Museum, Berlin, and am able to modify and supplement the characters given above.

#### OBSERVATIONS ON *SCLEROCHEILUS MINUTUS* GRUBE.

The prostomium (fig. 7) is drawn out antero-laterally into two stout processes, and bears eyes dorsally. The eyes † vary in development in different specimens; in some they are comparatively small, and the right and left eyes are separated by a distinct interval, but in other specimens they are larger, and in several cases are in contact, or are actually fused in front, forming a  $\Lambda$ -shaped, brown pigmented area. Near the posterior margin of these large eyes there is, on one or both sides, a simple eye, about  $9\mu$  in diameter, consisting of a cup-shaped mass of pigment-spherules and a spherical lens. This eye is situated below the epidermis, on or in the brain, and is therefore not seen except in cleared specimens.

Between the prostomium and peristomium there is on each side a protrusible of the genera *Lipobranchius* and *Eumenia* is required, and the relationship of *L. jeffreysii* to *E. crassa* should be re-investigated. I have collected considerable material in view of undertaking such revision, but until I have the opportunity of examining certain types, which have been imperfectly described, the work is necessarily at a standstill.

\* *Ann. Sci. Nat. Zool.*, vii sér., tome xvii (1894), p. 104 *et seq.*

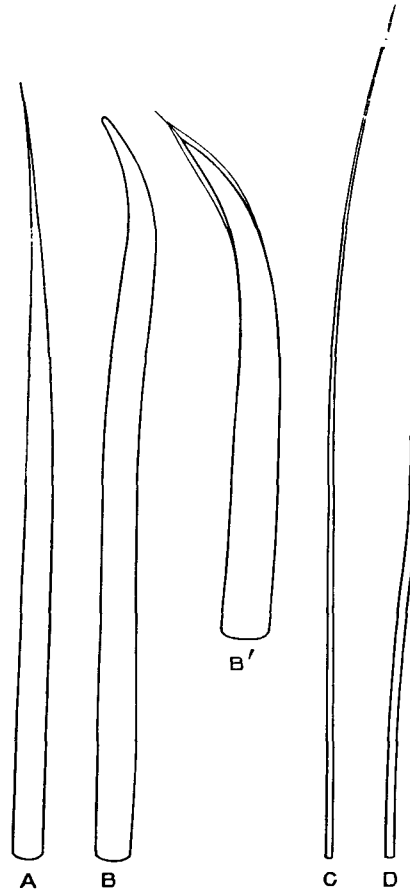
† For an account of the structure of the eyes, see A. et L. DEHORNE, *Arch. Zool. Expér.*, tome liii (1913), pp. 85–90.

nuchal organ, which, when everted, forms a sausage-shaped mass of considerable size (see fig. 7).

The peristomium is a single achætous ring, incomplete ventrally.

The first two or three chætiferous segments are usually bi-annulate, but the remaining segments, except a few of those last formed, are subdivided into four rings.

The stronger, curved chætæ ("acicula" of SAINT-JOSEPH) on each side of the first



TEXT-FIG. 3.—A, B, C, D. Chætæ from the first notopodium of a specimen of *Sclerocheilus minutus*, 18·5 mm. long. ( $\times 200$ .)  
B'. A chætæ which had not come into use, from the first notopodium of a specimen 11 mm. long. ( $\times 300$ .)

chætiferous segment are undoubtedly part of the armature of the notopodium, and form a portion of the anterior series of chætæ. The following is a brief account of the chief chætal characters resulting from a study of specimens 11 to 18·5 mm. long.

The first notopodium contains three kinds of chætæ:—

(i) Strong and almost straight chætæ, which taper distally to a fine point (text-fig. 3, A). Each of these chætæ is about 0·5 mm. in length and 15–20 $\mu$  in maximum diameter, and in all the specimens examined only the tips\* of these chætæ project

\* Not more than about 0·04 mm.

beyond the lips of the chætal sac. There are generally four to six fully formed chætæ of this type, and two to five in course of formation, constituting the most anterior row of chætæ in the notopodium.

(ii) Stronger chætæ (the "acicula" of SAINT-JOSEPH), which lie in a row close behind the chætæ just described. These chætæ (text-fig. 3, B), which are about .5–.55 mm. long and attain a diameter of 24–28 $\mu$ , are curved distally, and project considerably beyond the lips of the chætal sac (Pl. XXXVII, fig. 8). Each chæta usually presents a blunt tip, but if one of these chætæ be examined before it has come into use it is found to be pointed at the tip and to be there enveloped by a flat sheath (visible as a delicate lamina on each side of the chæta), which also runs out into a fine, flexible tip (text-fig. 3, B'). When the chæta comes into use, the tip of the sheath is worn away; then the laminæ break up into minute pointed processes and soon disappear, and the tip of the chæta itself becomes blunted, assuming the form shown in text-fig. 3, B. There are usually three to five of these chætæ in use, and two or three in course of formation.

(iii) Capillary chætæ, the maximum diameter of which does not exceed 4 $\mu$  (text-fig. 3, C). These taper gradually to fine points. From eight to fifteen fully formed chætæ of this type, each about .5–.55 mm. long, are present, together with a few in course of formation. In one specimen the first notopodium of each side bears, among the capillary chætæ just described, one or two slightly stouter and shorter bristles (text-fig. 3, D) which taper more rapidly at their free ends. These chætæ are about .3 mm. long and 5 $\mu$  in diameter.

The series of stronger chætæ (text-fig. 3, A, B) arise in two closely apposed rows near the bottom of the large chætal sac, while the slender chætæ (C, D) arise more dorsally and on the posterior wall of the chætal sac. The two series of stouter chætæ stand well in front of the slender ones. The latter usually point backwards, while the strong, curved chætæ (the straight chætæ (A) in the anterior row are usually scarcely seen on external examination of the specimen) point in a quite different direction, either antero-dorsally or latero-dorsally. As the stout and slender chætæ are so different in appearance and direction, and are comparatively widely separated from each other at their exits from the chætal sac, it is scarcely surprising that the curved chætæ have not been considered to be part of the notopodial armature, but have been referred to a region between notopodium and neuropodium, the notopodium being regarded as having capillary chætæ only. There can, however, be no doubt that the strong chætæ belong to the notopodium. The lip of the chætal sac immediately to the outer side of the curved chætæ is very well developed, forming a prominent feature of the first chætiferous segment (fig. 8).

The first neuropodium is a simple conical elevation bearing capillary chætæ only. These appear to be arranged in two rows—an anterior row of about eight or ten chætæ similar to that shown in text-fig. 3, D, and a posterior row of thirty or forty longer and more slender chætæ like that represented in text-fig. 3, C.



The armature of the second notopodium and neuropodium is composed of two series of capillary chætæ, of about ten and forty respectively, similar to but rather longer than those in the first neuropodium. The chætæ of the anterior row are proportionately longer, and hence there is less difference in length between them and the chætæ of the posterior row. In several of the specimens examined there are in the second notopodium or neuropodium, or in both, two, three, or four furcate chætæ, but these are neither so large nor so well formed in regard to their prongs as those found in the following segments. They are very fragile, and perhaps this explains why they are not seen in preparations of the second parapodium in all cases.

In the notopodium and neuropodium of the third and following segments the capillary chætæ are similar to those of the second parapodium, but in addition there is an anterior series of furcate chætæ the prongs\* of which agree almost exactly in size and proportions with those shown in text-fig. 2 (p. 408), but the shafts are rather shorter.

The parapodia of *S. minutus* are very similar to those of the Scotia Bay specimen; the figure of one of the latter (fig. 6) would serve equally well for a parapodium from about the 36th segment of *S. minutus*, except that the latter is smaller (about three-fourths the size shown).

SAINT-JOSEPH states that behind the 22nd segment the parapodia bear neuropodial cirri, and a similar statement is made by Professor M'INTOSH and by M. and Mme. DEHORNE. I have examined fifteen well-preserved specimens from different localities—the Adriatic, Saint-Vaast, Plymouth, and the west coast of Ireland—and find that the most anterior neuropodial cirrus is situated on the 25th, 27th, 29th, or 31st chætiferous segment in the various specimens. Of five specimens from the Adriatic (collected by GRUBE) in which the neurocirri are preserved, three bear minute cirri on the 25th segment; in the other two the first neurocirri are on the 27th segment. Of the four specimens from Saint-Vaast, two have the first neurocirrus on the 27th segment, the other two on the 31st segment. The specimen from Plymouth presents its first neurocirrus on the 27th segment. Of the five specimens from the west coast of Ireland, two have the first neurocirrus on the 29th segment, and three on the 31st. In GRUBE'S figure † of *S. minutus* the first neurocirrus is shown on the 30th chætiferous segment. As GRUBE ‡ remarked, the cirri are not respiratory structures, for blood does not enter them. They are purely sensory, as the presence upon them of sense-hairs indicates, and are composed of epidermal cells surrounding a thin axial strand, formed apparently of nerve fibrils.

One of the neuropodia examined, from a specimen from Blacksod Bay, Co. Mayo,

\* In a neuropodium from one of the specimens from Blacksod Bay, Co. Mayo, Ireland, there occurs a furcate chætæ with an additional (third) prong, arising from between the bases of the two normal ones. This prong is shorter than either of the normal ones, the lengths being—normal prongs,  $45\mu$  and  $27\mu$  respectively; additional prong,  $18\mu$ .

† *Arch. f. Naturg.*, Jahrg. xxix, Bd. i (1863), Taf. v, fig. 3.

‡ *46 Jahresber. Schles. Ges.* (1868), 1869, p. 67.

Ireland, possessed, in the usual position, two cirri practically equal in length and arising close together.

A small lateral sense-organ is present just ventral to the base of each notopodium, *i.e.* in a position corresponding to the "Seitenorgan" of *Scalibregma*, and its retractor muscle is usually related to the notopodial musculature. Each sense-organ is (in the larger segments) a convex elevation of the epidermis, about  $50\mu$  long and  $20\mu$  wide, traversed dorso-ventrally along its middle by the "hair-field" bearing long, delicate sense-hairs.\* Between the sense-organ and the neuropodium there is invariably an epidermal papilla of considerable size, the cells of which are glandular, some of them ("bacilliparous follicles," CLAPARÈDE) producing curious rod-like secretions, usually sinuous in form.

The number of chætiferous segments in the complete specimens examined varies from 44 to 52.

The anal segment or pygidium bears long cirri, slightly thickened at their distal ends (fig. 9). These cirri are solid, like the neurocirri, being composed of epidermal cells with an axial strand of connective tissue and nerve-fibrils. There is evidently some variation in the number of the anal cirri. Of the six specimens with complete anal cirri which I have examined, one has five and each of the others four cirri. GRUBE described and figured four cirri in his original account of the species; SAINT-JOSEPH states that there are five or six; and Professor M'INTOSH and M. and Mme. DEHORNE found five in their specimens.

The Scotia Bay specimen agrees with *Sclerocheilus minutus* in the form of the prostomium and the presence thereon of pigmented eyes, in the division of the segments into four annuli, in the general characters of the parapodia and in the presence thereon of lateral sense-organs, in the possession by the posterior segments of neuropodial cirri, in the presence of anal cirri, and in the absence of gills. The stronger, bent chætæ present in the first three notopodia of the Scotia Bay specimen are evidently homologous with the much stronger chætæ of the first segment of *S. minutus*, and the three other types of chætæ present in the first notopodium of the Scotia Bay specimen have their homologues in the corresponding notopodium of *S. minutus*. These agreements in structure show that the Scotia Bay specimen is closely related to *S. minutus*, and should certainly be placed in the genus *Sclerocheilus* as a new species, for which I propose the name *S. antarcticus*.

#### OBSERVATIONS ON *SCLEROCHEILUS PACIFICUS* J. P. MOORE.

Only two species of *Sclerocheilus* have hitherto been described—namely, *S. minutus*, the chief external characters of which have been already stated, and *S. pacificus* J. P. Moore, 1909, from Monterey Bay, California. By the courtesy of

\* Since this was written the sense-organs have been briefly described by M. and Mme. DEHORNE in *Arch. Zool. Expér.*, tome liii (1913), p. 72.

Dr J. PERCY MOORE I have been able to examine the co-type of the latter species. The specimen is not in good condition, and I cannot add much to the account which Dr MOORE\* has given of the species, but my examination of the specimen leads me to the conclusion that it should not be placed in the genus *Sclerocheilus*. Dr MOORE's specimen differs from *Sclerocheilus* in the following characters:—(1) the absence of stronger chætæ in the first notopodium; (2) the absence of neuropodial cirri; (3) the segments are not four-ringed but three-ringed. It is, of course, possible that neuropodial cirri were originally present and have been lost, but had they been destroyed there would, I think, have been more evidence of damage to the parapodia. Further, Dr MOORE states that in the larger and better-preserved type-specimen there are no neuropodial cirri, and it may therefore be concluded that these organs were not present in life. Dr MOORE's species seems to be much more nearly related to the genus *Oncoscolex* than to *Sclerocheilus*, for it agrees with the former genus in:—(1) the segments from the 5th to about the 30th are tri-annulate, those further back (as far as about the 50th †) are bi-annulate; (2) the absence of parapodial cirri; and (3) the absence of stronger chætæ in the first notopodium. So far as I can see, *S. pacificus* differs from *Oncoscolex dicranochætus* only in the shape of the eyes, ‡ a difference which is probably of little account. Until I have had the opportunity of examining the better-preserved type-specimen, I am not prepared to give a final opinion on the systematic position of *S. pacificus*, but the information at present available indicates that the species should not be referred to the genus *Sclerocheilus*, and I believe it will prove to belong to the genus *Oncoscolex*.

*SCLEROCHEILUS CÆCUS* SAINT-JOSEPH.

SAINT-JOSEPH § recorded the capture of examples of *S. cæcus*, but this species was never described, the only information given about it being contained in the single phrase, "*Sclerocheilus cæcus*, différent sensiblement du *Sclerocheilus minutus* Gr." *S. cæcus* is therefore a *nomen nudum*, but there can be little doubt that the specimens referred to were those subsequently described by SAINT-JOSEPH under the name *Lipobranchius intermedius*.||

OBSERVATIONS ON A SPECIMEN OF "*EUMENIA OCULATA*."

The worm recorded by Dr CH. GRAVIER ¶ as *Eumenia oculata* Ehlers appeared to me to be closely related to the Scotia Bay specimen. Dr GRAVIER has kindly lent

\* *Proc. Acad. Nat. Sci. Philadelphia*, 1909, p. 282.

† The specimen has 62 chætiferous segments.

‡ Which are approximately round or oval in *O. dicranochætus*, and irregularly triangular in *S. pacificus*.

§ *C. R. Acad. Sci. Paris*, tome ci (1885), p. 1511.

|| See above, p. 409.

¶ *Deuxième Expéd. Antarct. Franç. : Annélides Polychètes*, 1911, p. 112.

me his specimen, and I am able to add some details to those given in his short account of it. This worm was taken at low water on the east coast of Petermann Island (lat.  $65^{\circ} 11' S.$ , long.  $64^{\circ} 10' W.$ ), off Graham Land, on 31st October, 1909. The specimen is in two portions; the anterior region is moderately well preserved, but the posterior portion is very fragile and is no longer intact behind. The worm was originally 11 mm. long. Its maximum width is 1.4 mm.

The prostomium is only partially seen, for both nuchal organs are everted, forming two lobulated masses which conceal a considerable portion of the prostomium (fig. 3). The antero-lateral processes of the prostomium are stout and rounded at their tips. The eyes, which are present on the dorsal surface of the prostomium, diverge as they pass backwards; they are not in contact at their anterior ends.

The peristomium consists of a single achætous ring which is broader ventrally, where it is incomplete (fig. 4).

The first and second chætiferous segments are each bi-annulate, the third and fourth show indications of subdivision into four rings, and the fifth and following segments, as far as they are still present (*i.e.* up to the 28th; there were originally 34 chætiferous segments), are clearly four-ringed. The rings are subdivided, on the dorsal side at any rate, into quadrangular areas.

The posterior end is now wanting, but Dr GRAVIER states that there were four short, slender, anal cirri.

The contours of the parapodia are not well preserved, but they were evidently of similar form to those of the Scotia Bay specimen (*cf.* fig. 6). Finger-shaped neuropodial cirri are present in the 21st\* and following chætiferous segments.

There are no gills.

The specimen is not sufficiently well preserved to have retained its lateral sense-organs, and these have, therefore, not been looked for.

Each of the first three notopodia bears, in front of the slender, tapering chætæ, a number of stronger, shorter, bent chætæ, which taper much more abruptly at their free ends. In the second notopodium, which I excised for examination, there are four kinds of chætæ practically identical in form with those described from the Scotia Bay specimen (see pp. 411, 412). The chætæ from Dr GRAVIER's specimen are, however, smaller, being about two-thirds the length and thickness of those of the Scotia Bay specimen. There are several chætæ like that shown in text-fig. 1, A; these are about .35 mm. in length and  $6\mu$  in greatest diameter. Nine stronger, bent chætæ (text-fig. 4) are present; these are about .45 mm. long and  $9\mu$  in maximum diameter. The longer capillary chætæ (*cf.* text-fig. 1, C), of which there are about thirty, are approximately .8 mm. in length and  $6\mu$  in greatest diameter; among these are several shorter capillary chætæ (*cf.* text-fig. 1, D) about .5 mm. long. I have not thought it necessary to figure all these types of chætæ, but a figure of one of the

\* Assuming, as is apparently the case, that there are no segments missing between the anterior and posterior portions into which the specimen is now divided.

bent chætæ is given to show that it is practically identical with those of the Scotia Bay specimen (*cf.* text-fig. 1, B, p. 407, and text-fig. 4).

The first neuropodium bears capillary chætæ of the two types shown in text-fig. 1, C, D. The third notopodium and neuropodium were not excised for examination, but the former contains an anterior row of eight stronger, bent chætæ, like those in the first two notopodia.

The fourth and following parapodia, which do not bear stronger, bent chætæ, contain in each ramus capillary chætæ and about half a dozen furcate chætæ identical in form and in the dimensions of their prongs with those described on p. 408, but their shafts are shorter (about 4 mm. long).

I have recently had the opportunity of examining the type-specimen of *Eumenia oculata* Ehlers,\* which was sent to me from the Königliches Zoologisches Museum, Berlin, through the kindness of Professor ANT. COLLIN, and I find that Dr GRAVIER's specimen does not agree with the type, for in the latter most of the chætiferous segments are three-ringed, stronger chætæ are not present in the anterior notopodia, and there are no neuropodial cirri. *E. oculata* has been placed by Professor EHLERS † as a synonym of *Oncoscolex dicranochætus* Schmarda, after he had examined the type-specimen of the latter.

Direct comparison of Dr GRAVIER's "*Eumenia oculata*" with the specimen collected in Scotia Bay, allowance being made for the disparity in size and age, shows that they belong to the same species. The chætæ of the two specimens exhibit an agreement in structure which is particularly striking, and prove that the specimens are specifically identical. There are only two slight differences between the specimens:—(1) the eyes of the Scotia Bay example are in contact, while those of Dr GRAVIER's specimen are separate, but a similar variation in the grade of development of the eyes is met with in different individuals of *Sclerocheilus minutus* (see p. 410); (2) the first neuropodial cirrus is borne on the 19th chætiferous segment in the Scotia Bay specimen, and on the 21st in Dr GRAVIER's, but a greater variation is met with in *S. minutus*, where the first neurocirrus may be borne by the 25th, 27th, 29th, or 31st chætiferous segment (see p. 413). A minute comparison of the two specimens shows that they are both examples of the same species, *S. antarcticus*, n. sp.

\* *Zool. Jahrb.*, Suppl. v (1901), p. 265. A fuller description of the specimen (collected at Tumbes, Chile) was given by Professor EHLERS in *Festschr. K. Ges. Wiss. Göttingen*, 1901, pp. 181, 182.

† *Abhandl. K. Ges. Wiss. Göttingen, Math.-Phys. Kl.*, N.F., Bd. iii, No. 1 (1904), p. 51; *National Antarctic Exped.*, *Nat. Hist.*, vol. vi (1912), p. 26; *Deutsche Südpolar Exped.*, 1901-1903, Bd. xiii, *Zool.*, v (1913), pp. 537, 538.



TEXT-FIG. 4.— Bent chaeta from the second notopodium of the specimen of "*Eumenia oculata*." ( $\times 300$ .) (*Cf.* text-fig. 1, B, p. 407.)

The only other Scalibregmid with stronger chætæ in the anterior notopodia which calls for mention here is that described by Dr AUGENER \* under the name *Oncoscolex (Eumenia) heterochætus*, in which the first three notopodia bear stronger, bent chætæ. The description is not as complete as could have been desired, but it affords sufficient evidence—the segments are three-ringed, and neuropodial cirri and eyes are absent (or at any rate not mentioned)—to indicate that this worm is not, in spite of its stronger chætæ, a *Sclerocheilus*.

The foregoing considerations show that the genus *Sclerocheilus* is represented by only two valid species—*S. minutus* Grube and the new species, *S. antarcticus*, described in the present communication. The diagnosis of the genus *Sclerocheilus*, as given by GRUBE, and emended by SAINT-JOSEPH, requires some further emendation on the addition of the new species here described. The diagnosis † may be given as follows:—

***Sclerocheilus* † Grube, 1863, emend. Ashworth.**

GRUBE, *Arch. f. Naturg.*, Jahrg. xxix, Bd. i (1863), p. 50.

SAINT-JOSEPH, *Ann. Sci. Nat. Zool.*, sér. 7, tome xvii (1894), p. 103.

Abranchiate sub-fusiform Scalibregmidæ; the prostomium is drawn out into two blunt antero-lateral tentacular processes, and bears, dorsally, eyes which are either separate or are united to form a  $\Lambda$ -shaped pigmented area; the peristomium is a single achætous ring; the chætiferous segments (except the first two or three and a few of the most posterior) are subdivided into four annuli; the two rami of the parapodia are similar in form, and are simple oval elevations arising, in most of the segments, from a glandular raised area of the integument; stronger, bent chætæ are always present in the first notopodium (in *S. antarcticus* they are present also in the second and third notopodia), but not in the neuropodium; in the 3rd and all succeeding chætiferous segments each ramus of the parapodium bears slender capillary chætæ and, anterior to these, furcate chætæ; the segments of the posterior region possess conical or digitiform neuropodial cirri, and the anal segment or pygidium carries four or five (or six) digitiform anal cirri; a small lateral sense-organ (often recognisable only in thin sections) is present on each parapodium between the notopodium and neuropodium, but nearer the base of the former.

Type species, *S. minutus* Grube.

\* *Bull. Mus. Comp. Zool. Harvard*, vol. xliii (1906), p. 159.

† The external features only are considered; there is not sufficient material of *S. antarcticus* to enable me to furnish a description of the internal organs, or to state if any of these may be employed as generic characters.

‡ σκληρός, hard; χείλος, lip. A name derived from the same roots, but spelt slightly differently—*Sclerochilus*—was employed soon afterwards by G. O. SARS to designate a new genus of Ostracods of the family Cytheridæ. See *Forhandl. Vidensk.-Selsk. Christiania* (1865), 1866, p. 89.

The two known species may be separated thus:—

1. Stronger chætæ present in first notopodium only; the segment which bears the first neuropodial cirrus varies from the 25th to the 31st . . . *S. minutus*, p. 419.
2. Stronger chætæ are present in the first, second, and third notopodia, but are not so proportionately stout as in *minutus*; the first neuropodial cirrus is present on the 18th to the 21st segment . . . . . *S. antarcticus*, p. 421.

### *Sclerocheilus minutus* Grube, 1863.

- GRUBE, *Arch. f. Naturg.*, Jahrg. xxix, Bd. i (1863), p. 50; Taf. v, fig. 3 (Lussin piccolo, Crivizza, Neresine, all on Lussin Island, Adriatic).
- GRUBE, *Die Insel Lussin und ihre Meeresfauna*, Breslau, 1864, p. 85 (Neresine, Crivizza, Cigale).
- GRUBE, *Abhandl. Schles. Ges., Naturw. Abt.* (1868), 1869, pp. 105, 127 (Saint-Vaast).
- GRUBE, *46 Jahresber. Schles. Ges.* (1868), 1869, p. 67 (note on cirri).
- ASHWORTH, *Quart. Journ. Micr. Sci.*, vol. xlv (1901), pp. 293, 297.
- DEHORNE, A. et L., *Arch. Zool. Expér.*, tome liii (1913), p. 61 (Le Portel, near Boulogne).
- M'INTOSH, *Ann. Mag. Nat. Hist.*, ser. 8, vol. i (1908), pp. 380, 381 (Guernsey, Herm).
- Marine Biol. Assoc., *Journ. Mar. Biol. Assoc.*, N.S., vol. vii (1904), p. 231 (Plymouth).
- MARION et BOBRETZKY, *Ann. Sci. Nat.*, sér. 6, tome ii (1875), p. 86 (Gulf of Marseilles).
- MARION, *Ann. Sci. Nat. Zool.*, sér. 6, tome viii (1879), Art. No. 7, p. 5 (off Marseilles).
- PRUVOT, *Arch. Zool. Expér.*, sér. 3, tome iii (1895), p. 643 (Banyuls); *op. cit.*, tome v (1897), p. 16, "Catal. des Invertébrés, etc." (Brittany; Gulf of Lyons).
- SAINT-JOSEPH, *Ann. Sci. Nat. Zool.*, sér. 7, tome xvii (1894), p. 103 (Dinard and Saint-Malo); *op. cit.*, sér. 8, tome v (1898), p. 213 (Saint-Vaast); *op. cit.*, tome x (1899), p. 164 (Paimpol); *op. cit.*, sér. 9, tome iii (1906), pp. 147, 230 (Cannes).

A *Sclerocheilus* bearing in the first notopodium—(1) stout but straight, tapering chætæ; (2) very strong chætæ curved at their tips; (3) slender capillary chætæ. Stout chætæ are not present in any of the succeeding notopodia or in the neuropodia, the armature of which consists only of slender, capillary chætæ and furcate chætæ. Neuropodial cirri appear about the 27th segment (rarely anterior to this, and in some specimens not until the 31st segment), and are present in all the succeeding chætiferous segments (except in one or two of the last formed).

HISTORICAL ACCOUNT.—*S. minutus* was described by GRUBE from specimens collected by him on the shores of the island of Lussin, in the Adriatic. He, however, mistook the dorsal for the ventral surface. The generic name is based on another misconception, for the two dark plates described by GRUBE ("subtus ad os laminis 2 nigris corneis tricuspidibus armatus") as horny and on the ventral side of the head-lobe are the eyes which are situated on the dorsal side of the prostomium. The rest of the description and the figures are admirably clear, and the species was so well defined by GRUBE that subsequent workers have had no difficulty in recognising it when it came into their hands. GRUBE also, with his usual insight, recognised the close affinity of his new genus with *Scalibregma*.

The late Baron DE SAINT-JOSEPH revised and extended the description given by GRUBE, and added observations on some of the internal organs, *e.g.* the alimentary canal, nephridia, and reproductive organs. Quite recently M. and Mme. DEHORNE have given an account of the morphology of this species, dealing especially with the nervous system, eyes, and nephridia, with a discussion of the nature of the funnels of the latter. The other authors cited have either simply recorded the capture of specimens or have briefly referred to their external features. (For an account of the external features see pp. 410–414.)

BIONOMICS.—*S. minutus* lives in shallow water, and has been obtained either by shore-collecting between tide-marks or by dredging. The greatest depth from which it is recorded is 33–35 fathoms (at Cigale; GRUBE, 1864).

This worm has been frequently found between the lamellæ of old oyster-shells, and SAINT-JOSEPH suggested that the strong chætæ of the first segment served to excavate a shelter for the worm between the lamellæ. On emerging from its retreat *S. minutus* swims in the water by means of rapid wriggling movements, but soon falls to the bottom and lies on its dorsal surface with the anterior and posterior ends raised and the intervening portion curved. The worm probably feeds on mud and fine débris.

COLOUR.—*S. minutus* is usually reddish brown in colour, but may be a uniform dull brick-red (M'INTOSH). A female specimen full of eggs was greyish white (DEHORNE).

SIZE.—This species has not been found to exceed 20 mm., and most specimens are from 7 mm. to 15 mm. in length. The largest specimens seen by the writer are 18·5 mm. long; the smallest is one 2·2 mm. long, taken on the surface of the sea off Sark, and kindly lent to me by Professor M'INTOSH.

DISTRIBUTION.—I have examined specimens from most of the localities from which *S. minutus* has already been recorded—Lussin Island (Adriatic), Plymouth, Guernsey, Herm, Dinard, and Saint-Vaast.

Two additional localities may be given here. There are, in the Königliches Zoologisches Museum, Berlin, several specimens collected by GRUBE on the shores of Lesina, an island about one hundred and thirty miles south of Lussin. Through the kindness of Dr R. F. SCHARFF and Mr R. SOUTHERN, I have examined a collection of Scalibregmidæ from the west coast of Ireland, in which there are specimens of *S. minutus* from Blacksod Bay and Clew Bay, Co. Mayo. These are the first recorded Irish specimens, and they extend the area of distribution of the species north and west of its previously known range.

The range of distribution may be stated thus:—*S. minutus* occurs on the west coast of Ireland, in the English Channel,\* along the south coast of France, and on the eastern coast of the Adriatic.

Type-specimens in Königliches Zoologisches Museum, Berlin.

\* It will be observed that there is no record of the species from any point in the North Sea.



***Sclerocheilus antarcticus*, n. sp.**(Synonym: *Eumenia oculata* Gravier nec Ehlers.)*Eumenia oculata*. Gravier, *Deuxième Expéd. Antarct. Franç.: Annélides Polychètes*, 1911, p. 112.

A *Sclerocheilus* bearing stronger, bent chætæ in the first, second, and third notopodia, but these are not so proportionately stout as in *S. minutus*. Stouter, bent chætæ are not present in the succeeding notopodia or in the neuropodia, the armature of which consists only of slender capillary chætæ and furcate chætæ. Neuropodial cirri are present on all the segments (except one or two of the last formed) from about the 18th or 21st.

Only two specimens are known. One, the type-specimen, 19 mm. long, dredged in 10 fathoms in Scotia Bay, South Orkneys (see p. 405); the other, the para-type, 11 mm. long, collected at low water on the east coast of Petermann Island, off Graham Land (see p. 415).

Type-specimen in Scottish Oceanographical Laboratory, Edinburgh.

Para-type in Muséum d'Histoire Naturelle, Paris.

*Sclerocheilus cæcus* Saint-Joseph is a *nomen nudum* (see p. 415), and *S. pacificus* Moore is apparently not a *Sclerocheilus*, but should be referred to the genus *Oncoscolex* (see p. 414).

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*Addendum* (June 21, 1915).—While this paper has been lying in type Mr SOUTHERN has recorded the specimens of *Sclerocheilus minutus* from Blacksod Bay and Clew Bay, mentioned on the opposite page, in *Proc. R. Irish Acad.*, vol. xxxi, *Clare Island Survey*, pt. xlvii (1914), p. 137. Prof. M'INTOSH has given a general account of *S. minutus* in his *Monograph of British Annelids*, vol. iii, pt. i (1915), p. 42. Dr E. J. ALLEN, in a list of the Polychæta of Plymouth (*Journ. Marine Biol. Assoc.*, N.S., vol. x (1915), p. 640), states that *S. minutus* was formerly frequently taken near Plymouth, but it has not been found during the last two or three years in spite of special search.

[June 22, 1915. *Note by General Secretary*.—The proofs of this paper and of the accompanying plate were passed by the author on June 1, 1914; but owing to the war and the unavoidable delay in obtaining delivery of the copies of the plate from abroad, the paper could not be sent to press until to-day.]

## DESCRIPTION OF FIGURES.

*List of Reference Letters.*

AN. C. Anal cirrus.	NOT. <sup>1</sup> First notopodium.
E. Eye.	NOT. <sup>40</sup> Fortieth notopodium.
MO. Mouth.	NUC. O. Nuchal organ.
NEUR. <sup>1</sup> First neuropodium.	PER. Peristomium.
NEUR. <sup>39</sup> Thirty-ninth neuropodium.	PR. Prostomium.
NEUR. C. Neuropodial cirrus.	S.O. Lateral sense-organ.
NOT. Notopodium.	TENT. Tentacular process of prostomium.

Fig. 1. *Sclerocheilus antarcticus*, n. sp. Type-specimen from Scotia Bay, South Orkneys. Dorsal aspect of prostomium, peristomium, and first four chætiferous segments. The prostomium is retracted into and partially hidden by the peristomium. For further description see pp. 405, 406. ( $\times 25$ .)

Fig. 2. Ventral aspect of same specimen. ( $\times 25$ .)

Fig. 3. *Sclerocheilus antarcticus*, n. sp. Para-type (= "*Eumenia oculata*" of Dr GRAVIER) from Petermann Island. Dorsal aspect of prostomium, peristomium, and first four chætiferous segments. Note the two everted nuchal organs. For further description see p. 416. ( $\times 35$ .)

Fig. 4. Ventral aspect of same specimen. ( $\times 35$ .)

Fig. 5. *Sclerocheilus antarcticus*, n. sp. Type-specimen. Ventral aspect of the 39th-43rd chætiferous segments and the anal segment. Neuropodial cirri were probably originally present on the 41st and 42nd chætiferous segments, but have been lost therefrom. The anal cirri are also reduced in number, only one remaining. For further description see p. 406. ( $\times 30$ .)

Fig. 6. *Sclerocheilus antarcticus*, n. sp. The 24th parapodium of the type-specimen, posterior aspect. Immediately ventral to the notopodium is the papilla bearing the lateral sense-organ; ventral to this is a much larger papilla the epidermis of which is glandular. For further description see pp. 406, 407. ( $\times 30$ .)

Fig. 7. *Sclerocheilus minutus* Grube. Specimen 13.5 mm. long, from Plymouth. Dorsal aspect of prostomium, peristomium, and first two chætiferous segments. The right and left nuchal organs are everted. For further description see pp. 410, 411. ( $\times 35$ .)

Fig. 8. *Sclerocheilus minutus* Grube. Specimen 18.5 mm. long, from Plymouth. Lateral (somewhat ventro-lateral) aspect of peristomium and first chætiferous segment. ( $\times 40$ .)

Fig. 9. *Sclerocheilus minutus* Grube. Specimen 10 mm. long, from Saint-Vaast. Ventral aspect of posterior end, showing two chætiferous segments, another segment recently formed and as yet achætous, and the anal segment with four cirri. ( $\times 80$ .)

Ashworth : Sclerocheilus

