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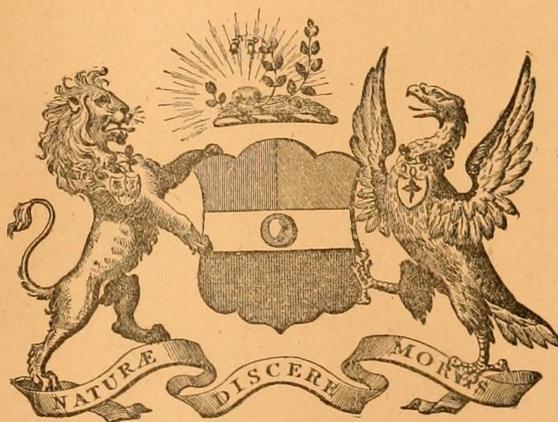
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THE PERCY SLADEN TRUST EXPEDITION
TO
THE INDIAN OCEAN IN 1905,
UNDER THE LEADERSHIP OF
MR. J. STANLEY GARDINER.

REPORTS Nos. 15-21.



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No. XX.—POLYCHÆTA OF THE INDIAN OCEAN.

PART I. THE AMPHINOMIDÆ.

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(Communicated by J. STANLEY GARDINER, *M.A.*, *F.R.S.*, *F.L.S.*)

(Plates 45 & 46.)

Read 4th June, 1908.

THE Polychæta, of which this is the first part of a description, are contained in three collections from different parts of the Indian Ocean. The first two were made by Mr. J. Stanley Gardiner, F.R.S., of Caius College, Cambridge, the first in the Maldivé Archipelago in the year 1899 and the second in the Seychelles and Chagos groups in 1905. Incorporated with these is a third made by Mr. Cyril Crossland, M.A., at Zanzibar in 1901-2. Part of the Eunicidæ and the Chætopteridæ from Zanzibar and the Maldives have been described by Crossland*, but absence from England has prevented him from prosecuting the work. The Annelids from Zanzibar were received late and only a single species is here noticed. The noteworthy feature of this assemblage of Amphinomids is the wealth of new species, though this might only be expected in the neglected state of the group. Previously collections from the Indian Ocean have only been made at Ceylon. In Willey's description of the Annelids collected by Professor Herdman, only two Amphinomids are mentioned. Of these it is interesting to observe that the widespread *Chlœia flava* is absent from this extensive collection, though the genus is represented by four species. The re-discovery of *C. fusca*, a single specimen of which was dredged by the 'Challenger' off the Moluccas, is also a noteworthy feature. A number of examples of *Eucarunculata grubei*, a genus and species described in 1906 by Malaquin and Dehorne from the Malay Archipelago, were also obtained.

The Polychæta of the Red Sea have now been very thoroughly described by Gravier. In a new species of *Amphinome* from the Maldives we have a very close resemblance to *A. djiboutensis*, Gravier, though the Red Sea collections were, as a whole, poor in Amphinomids.

Genus *CHLÆIA*, Savigny.

The Chlœias of this collection belong to the group of *C. fusca*, which possesses "bifid bristles of three kinds, viz.: (a) very slender and attenuate, (b) with stout short tips, and (c) with longer tips serrated externally on the longer limb."

* C. Crossland, P. Z. S. Lond. 1903, vol. i. pp. 169-176, vol. ii. pp. 129-144; 1904, vol. i. pp. 287-330.

1. *Chlæia fusca*, McIntosh. (Plate 45. figs. 1, 2.)

Voyage of H.M.S. 'Challenger,' Report on the Annelida (McIntosh), p. 14, pl. ii. figs. 1-2, pl. i. a, figs. 14-15, pl. ii. a, figs. 1-2.

Several specimens of this form are contained in Mr. Gardiner's collection. It was only known previously from a single specimen obtained by the 'Challenger' from the Moluccas. The presence of the three types of setæ mentioned above is the most strongly marked character, but there are also recognisable in the forms under examination the well-developed caruncle composed of rather loosely arranged vertical lamellæ, the well-developed median tentacle exceeding the caruncle in length, the mouth whose posterior border is formed by the third body-segment, and the sinuous gills with their longitudinal axis lying outwards and backwards, which McIntosh has described in his excellent account.

In colour and markings (Pl. 45. fig. 1) the Seychelles specimens show considerable variation from the original form. McIntosh speaks of the colour as an "iridescent dusky brown," and concentration of pigment occurred, for instance on the branchiæ. In these there is a pale ground-colour with a couple of thin longitudinal purple stripes near the dorsal middle line. There is also on each side a line of segmentally repeated orange-coloured crescentic markings parallel and external to the purple stripes. Beneath each dorsal bundle of bristles is a purple ring shading off into orange, and the gills are pigmented, the axis being tinged with orange and the pinnæ with crimson. The dorsal cirri are a dark purple.

The single example obtained by the 'Challenger' did not allow of a thorough examination of the setæ, many of the segments being swept bare. On looking through the plentiful material in this collection all three types of bifid setæ recognised by McIntosh are found, and some information may be added as to their distribution. Throughout the body the slender elongate type occurs, but it is in the anterior segments alone that the stout kind of smooth seta occurs. Posteriorly it is replaced by McIntosh's third type with a fork of a "tuning-fork" description and serrations on the longer ramus. There is always, moreover, a tendency for the second type to vary toward the third, and setæ are found even in the anterior segments, which resemble the latter type in form and differ only in the absence of serrations.

The caudal appendages, which were absent in McIntosh's specimen (*vide* description) are rather short sausage-shaped structures. It is rather unfortunate that *C. fusca* should have been figured with a pair of long slender styles in the 'Challenger' report.

Locality. 6 dredged in 34 fathoms, E 9, and 9 in 25-80, E 11. Both Amirante Islands.

They were living "among the basal fronds of *Halimeda*"*: with the first batch was associated *Notopygos gardineri*, and with the second a considerable number of *N. hispida*.

* The quotations in this and other cases are from Mr. Gardiner's notes.

2. *Chlæia longisetosa*, sp. n. (Plate 45. fig. 5.)

Measurements. Length 11 mm., greatest breadth 4 mm. (without setæ); no. of segments 21.

The body of this annelid is regularly fusiform in shape, proportionately broader at the middle than *C. fusca*. The body is of a pale colour throughout, only relieved by a row of purple spots on the crest of the caruncle. The branchiæ are white, but the dorsal cirri are deep purple as in *C. fusca*.

In most details a strong resemblance to *C. fusca* may be traced. The median crest of the caruncle is, however, not quite so elevated and compressed, and the median tentacle barely attains to one-half of the length of the caruncle. The head and its appendages are otherwise similar, and the branchiæ also agree with those of *C. fusca* in their structure and the backward direction of their main axis.

The very characteristic appearance of the species is due to the enormous length and thickness of the white glassy setæ (Pl. 45. fig. 5), while the dorsal cirri also show up conspicuously on account of their length and deep coloration.

The general nature of the setæ shows that this form should be classed with the group of *C. fusca*, differing, however, in the absence in the dorsal feet of the slender attenuate type of bifid bristle (*a*). In *C. fusca*, moreover, as mentioned above, the setæ of type (*b*) predominate in the anterior segments and are replaced entirely by those of type (*c*) in the posterior segments. In this species setæ of type (*c*) are the more numerous throughout the length of the body. Some slight difference may be traced between the setæ of this type in the anterior and posterior regions, the number of serrations on the external limbs increasing from 17-18 to 25-26.

Locality. A single specimen, S. Suvadiva, Maldivæ Is., 45 fathoms, amongst mud.

Another single specimen, badly preserved, appears to belong to this species. Mulaku, A 73.

3. *Chlæia rosea*, sp. n. (Plate 45. fig. 3.)

Measurements. 11 mm. long, 3 mm. broad; no. of segments 20.

The body is of a fusiform shape, but distinctly slenderer than is *C. longisetosa*. It is uniformly coloured a reddish pink, even the setæ sharing the hue. The head, though rather smaller, is similar to that of *C. fusca*, with two conspicuous pairs of eyes, the anterior larger and nearer together. There is a large stout median tentacle longer than the caruncle, as in *C. fusca*, but in contrast to the species just described. The lateral tentacles and palps are comparatively short and slender. The branchiæ, which, as usual, begin on the fifth body-segment, are exceptionally well-developed and so long as to overlap in the middle line (Pl. 45. fig. 3). The tendency for the longitudinal axes to be directed inwards, instead of posteriorly, is in contrast with the arrangement in the preceding species. Lateral branches are not so numerous or so long proportionately as in *C. fusca* and *longisetosa*.

The setæ though shorter and more sparsely developed than in *C. longisetosa* are essentially similar. In both the slender attenuate type of dorsal seta (*a*) is absent. The simple bifurcate seta (*b*) of the anterior segments is replaced posteriorly by the setæ

with a longer serrated fork (*c*), in which the angle of divergence of the rami is not so great as in (*b*). Ventrally there is only the single type of smooth bifurcate seta, exactly similar to (*b*). All setæ show at the apex the curious reticulate pattern which was noticed by McIntosh for *C. fusca*. Posteriorly the setæ become much longer.

The dorsal cirri are even longer than the dorsal bundle of setæ, and the ventral cirri by no means so conspicuous. The caudal styles are developed as in the preceding species.

It is very noticeable how closely this species adheres to the *C. fusca* type. The only differences from the original species are but trifling, viz., the coloration, structure, and arrangement of gills, and the absence of a single type of seta.

Locality. Single specimen, Amirante, dredged from 30 fathoms. "Associated with a purple Alcyonarian."

4. *Chlæia maculata*, sp. n. (Plate 45. fig. 4; Plate 46. figs. 1, 2.)

Measurements. 13 mm. long and 4.5 mm. wide; no. of segments 20.

The body has a fusiform shape, very similar to *C. longisetosa*. Intersecting diagonal striæ ornament each segment on the dorsum, but the body is unpigmented save for a faint median dorsal line, on which is situated at the posterior border of each segment a dark purple spot (Pl. 45. fig. 4). The caruncle is rather small and the median tentacle equals it in length. The oval head bears two pairs of large black eyes. In front the lateral tentacles are about half the length of the median tentacle and tinged with rose-colour. The gills are small, and project backwards as in *C. fusca*, &c. The pinnate branches are better developed on the outer side of the main axis.

The dorsal cirri are as long as the dorsal bundle of setæ and contain a pink pigment. The setæ are brittle and glassy, and resemble those of *C. fusca*, though not quite so much so as the last two species. The slender attenuate type of the dorsal bundle is absent here, as in *C. rosea* and *C. longisetosa*. Anteriorly the bifurcate setæ show a distinct angle of divergence between the limbs of the fork, and a series of rather indistinct serrations on the inner side of the longer limb (Pl. 46. fig. 1). Posteriorly the "tuning-fork" type is developed, and with the appearance of serrations on the outer side of the limb those on the inner disappear.

The ventral setæ are of the usual type, save for the existence of strong serration on the inner side of the longer limb (Pl. 46. fig. 2). This is not confined to the anterior segments, but is met with throughout, though smooth setæ also occur posteriorly.

The anal cirri are rather longer than in the other species here described.

The essential diagnostic character of this species contrasted with the rest of the group is the serration of the setæ.

Locality. Cargados Carajos, B 15, 30 fathoms.

Genus *NOTOPYGOS*, Grube.

The species of this very homogeneous genus are unfortunately rather ill-defined. A great deal of importance has been attached to the presence or absence of serrations in the dorsal or ventral setæ. Unfortunately, there appears to be a certain amount of

variability in this respect, and it is clear that care must be taken in diagnosing species by this character. It will be useful, however, to give a list of the known species to illustrate the variations of serration and indicate the position which the new species should occupy:—

	Dorsal setæ	Ventral setæ
<i>Notopygos crinita</i> , Grube	serrated.	non-serrated.
— <i>maculata</i> , Kinberg	non-serrated.	non-serrated ?
— <i>flavus</i> , Haswell	”	”
— <i>parvus</i> , Haswell.....	”	”
— <i>labiatus</i> , McIntosh	”	serrated.
— <i>megalops</i> , McIntosh	serrated.	”
— <i>hispidata</i> , sp. n.	non-serrated.	” (in first few segments only).
— <i>variabilis</i> , sp. n.....	”	” ” ”
— <i>gardineri</i> , sp. n.....	serrated.	” ” ”

It is necessary to comment upon two points with reference to the above. Firstly, in most of the specimens examined in this collection serrations occurred only in the first few segments. A re-examination of such species as *N. flavus* and *N. parvus* might reveal the presence of serrated setæ in regions of the body where they had not before been looked for. Unfortunately the former accounts do not expressly state in the case of any individual species whether serrated setæ are found throughout its length or not. Secondly, in *N. variabilis* some of the examples were searched through for serrated setæ in vain, and the occurrence or non-occurrence of this particular character appeared to be an individual variation.

5. *Notopygos hispidata*, sp. n. (Plate 45. figs. 6, 7; Plate 46. figs. 3-5.)

Measurements. Varies from 15-27 mm. in length; no. of segments 23-27.

The body is elongate and slightly fusiform, more pointed at the tail than at the head. It is surrounded by a dense fringe of white glassy setæ, which in some individuals meet over the middle line with those of the other side. The dorsum is flattened, the ventral surface slightly curved, while the latter is unpigmented; a couple of broad purple bands with a paler line between run longitudinally down the dorsum, broadening out at the junction-line of each pair of segments. There is also a purple patch in front of each dorsal bunch of setæ.

The caruncle is large, extending backwards to the end of the sixth segment, and consists of a median crest and lateral wings, both composed of transverse plications. The crest is separated from the wings by a smooth linear pigmented area on each side, but it is characteristic of this species that the lax folds of the wings and crest often come into contact and obscure the area. The white colour of the plications is only relieved by a line of purple pigment down the crest, which sometimes breaks into a line of dots.

The head is transversely oval in shape, with two pairs of large black eyes, sometimes almost continuous, and carrying anteriorly a slender median tentacle barely a fifth

the length of the caruncle. The lateral tentacles and palps are rather shorter than the median tentacle. There are prominent oral lips, and generally the first three body-segments form the buccal segments. The branchiæ commence on the sixth segment and are short arborescent tufts mostly destitute of pigment, outer and inner divisions being recognisable. The main branches divide pinnately into short terminal twigs. The branchial cirrus is stout, of uniform thickness throughout, and of a deep purple colour, as is the basal part of the long external cirrus. The former greatly exceeds the branchia in height.

Throughout the body a single type of seta is found, bifurcate with the rami rather widely diverging and ending in sharp points. But while the dorsal setæ are found to be smooth throughout, the ventral setæ are noticeably serrate in the first few segments only, and smooth posteriorly. The most typical kind of serrate seta is shown (Pl. 46. fig. 3) possessing three serrations on the inside of the longer ramus and sometimes (Pl. 46. fig. 4) a single serration on the outer side. In most of the examples examined the triserrate setæ were confined to the first four segments; setæ with only two serrations were found in the sixth and seventh, and occasional uniserrate setæ in a few of the succeeding segments. Subsequently all the bristles were smooth. The anus is dorsal and found on the 21st segment. The body is terminated by short club-like appendages.

Locality. Amirante Is., E 11, 25-80 fathoms, 18 specimens associated with *Chlœia fusca*, found in "pores and cavities in the coral rubble." Saya de Malhas, C 15, 55 fathoms, a specimen with Nereids, and a second example in which the purple coloration was obscured by the development of brown pigment throughout.

6. *Notopygos variabilis*, sp. n. (Plate 45. fig. 9.)

Measurements. A specimen with 31 segments was 45 mm. long.

„	„	31	„	„	55	„	„
Another	„	29	„	„	27	„	„
„	„	30	„	„	25	„	„

In shape this worm agrees closely with *N. labiatus* as figured by McIntosh, being fusiform and showing in section a flat dorsum and rounded ventral surface. The dorsum is sometimes ornamented, a trapezoidal depression occurring in the anterior part of each segment. In individuals which retain some of their natural colouring a pattern of orange spots may be seen, so arranged on the dorsal surface as to give a chessboard effect. The appearance of the spirit-specimens gives the idea that the living worms are highly variable in colour and markings. While the majority of specimens appear almost unpigmented, three examples are coloured dark red or purple on both upper and lower surfaces. The caruncle extends back to the posterior margin of the fifth segment and is actually attached to the first four. The median crests and lateral wings consist, as in *N. hispida*, of transverse folds laxly arranged. While the wings end at the posterior border of the head, the crest extends on to and beyond the head, the median part of which is completely hidden (Pl. 45. fig. 9). Though a similar extension of the caruncle may be noticed in other species (*e. g.* in *N. gardineri*

and *N. hispida*, the description of which follows), it does not appear to project so far anteriorly or mask the head so completely as in *N. variabilis*. The folded regions of the caruncle are separated on each side by a smooth pigmented area, which is always to be seen (contrast *N. hispida*).

The head bears two pairs of large eyes, barely apparent under the sides of the crest of the caruncle, and a slender median tentacle of small size, less than $\frac{1}{5}$ of the length of the caruncle.

The branchiæ beginning on the fifth body-segment form a series of rather large spreading tufts, each with a definite stalk, from which arise a number of much subdivided branches. In the smaller specimens the gills are much smaller proportionately and appear to consist each of two main divisions. The branchial cirrus occurs at the inner border of the dorsal bundle of setæ, and is a slender, uniformly cylindrical structure, very little longer than the branches of the gill-tuft. The outer or dorsal cirrus proper has, as is usual, a thick basal division, which is in many of the specimens of a conspicuous orange colour, and a filiform pale-coloured distal division. This is, as in other species of the genus, much the longer and approximately equal in length to the dorsal setæ.

The setæ have a more or less marked greenish colour, and, save in one case, a flexible consistency and associated iridescence. One small specimen, however, possesses stiff setæ, which are, moreover, glassy and colourless, and it remains to enquire how far these differences of colour and texture constitute natural variations. The dorsal setæ are of the "boldly forked" type figured by McIntosh for *N. megalops* and *N. labiatus*, but, unlike the first, never show a trace of serration. The ventral setæ are almost identical in shape with the dorsal. As a result of careful examination it was found that two out of eight specimens possessed serrated ventral setæ, and so allow us to place this species along with *N. labiatus* in the group which possesses smooth dorsal and serrated ventral bristles. In the form alluded to above as possessing stiff setæ, occasional examples were found in the ventral bundles of the middle segments, with a couple of well-marked serrations underneath the hooked apex of the longer limb. In a large specimen the ventral setæ of the anterior two segments were largely bi- and triserrate, while in the third segment the serrations were barely recognisable and not met with subsequently.

The anus occurs on a rather conspicuous papilla on the dorsum in segments varying from the 22nd to the 25th.

The species appears to have affinities with *N. labiatus*, McIntosh, dredged by the 'Challenger' to the south of the Philippines and lately mentioned by Moore among the polychæts of the Hawaiian Islands. The species agree closely in size and number of segments, and also in such characters as the small size of the median tentacle, the prominent lips from which McIntosh's species takes its name, and the green colour of the setæ, as well as their serration. The peculiar relation of the caruncle and the head is perhaps the chief reason for the separation of this species.

Locality. Hulule, Male Atoll, Maldives, eight specimens. "Under loose coral stones of boulder zone lying on the bare flat reef."

7. *Notopygos gardineri*, sp. n. (Plate 45. fig. 8; Plate 46. figs. 6-8.)

Measurements. Length 50 mm.; no. of segments 34.

While affecting the fusiform shape common to all members of this genus, this worm differs from the preceding species in the rather flattened ventral surface. It is thus almost tetragonal in cross-section. A peculiar and characteristic appearance is imparted to the species by the long bristling tufts of setæ, which, owing to their size and stoutness, present an even more formidable aspect than the dense thickets of *N. hispida*.

The body is for the most part bleached, but patches of brown pigment are scattered irregularly on the dorsum and in front of the dorsal bundles of setæ. The dorsal segments have a rather characteristic ornamentation: beside the polygonal depressed area found anteriorly in each, the surface is cut up into lozenge-shaped areas by a number of diagonal and circular wrinkles.

The caruncle (Pl. 45. fig. 8), which just reaches the sixth segment, is remarkable for its regular elliptical shape, for the great height of the compressed median crest, and for the large number and the close-set nature of the transverse folds of which it is composed. The individual folds are narrow and not grooved, as is the case in other species. Rather broad smooth pigmented areas separate the median crest from the lateral folded portions, and otherwise the cream-coloured caruncle is only relieved by a line of brown pigment running along the ridge of the crest.

The head, on which the median part of the caruncle impinges, though hardly in so marked a manner as in *N. variabilis*, is hexagonal in shape. It carries two pairs of equal eyes and a median tentacle about $\frac{1}{3}$ the length of the caruncle (and so better developed than in the other species described here), slender and tapering to the apex. The lateral tentacles and palps are but slightly shorter.

The branchiæ occur in spreading tufts of a similar arrangement to those of the last species, but rather smaller proportionately. The slender branchial cirrus exceeds them in length.

The dorsal setæ are arranged in fan-shaped groups in each segment. They are yellow in colour and remarkable for their great size and solidity. Anteriorly the setæ are shorter and are of a bifurcate type, with the rami of the fork diverging at a distinct angle. In the first two segments there is a distinct serration developed on the inner side of the longer ramus, three or more strong notches being visible in most (Pl. 46. fig. 6). Posteriorly, these are succeeded by a smooth type of seta, with the increase in length becoming bayonet-like in form, the longer ramus being continuous with the shaft of the seta and the spur-like smaller ramus not diverging noticeably. Two extreme varieties of the posterior setæ are here figured (Pl. 46. fig. 7, 8).

The ventral setæ are, as usual, shorter than the dorsal, and are throughout similar to the anterior kind of dorsal seta, with a rather widely divergent fork. The first three segments contain serrate setæ, which are generally triserrate in the first segment and bi- or uniserrate in the next two. Thus in both dorsal and ventral divisions of the parapodia setæ of a serrate type occur, as in *N. megalops*, McIntosh, from Bermuda.

The anus occurs on the dorsum of the 24th segment as a rather noticeable papilla.

Locality. Amirante Is., E 9, 34 fathoms. "Pores and cavities in coral rubble."

Chlæia fusca was found in some quantity in the same dredging.

Genus *AMPHINOME*, Bruguière.8. *Amphinome rostrata* (Pallas).

Aphrodita rostrata, Pallas, Misc. Zool. p. 106, tab. viii. figs. 14–18 (1766).

Amphinome rostrata, McIntosh, Polychæta, 'Challenger' Reports, p. 21.

The examples of this species show some discrepancy with the most recent account, that of McIntosh, so that some discussion of the points at issue is here given.

The characteristic slate-blue of the body and ferruginous hue of the tentacles and branchiæ are well shown. So far as can be seen in the rather bad state of preservation, the structure of the head is typical. The gills appear to be even more densely branching than the 'Challenger' specimens from the Bermudas. From a common base spring two main divisions, one inner, the other outer, which both give off five or six stout branches, dividing again into numerous terminal twigs.

Both dorsal and ventral setæ appear to be quite free from serration, while both kinds of dorsal bristles in McIntosh's specimens have this character. It is not possible to recognise the first stout type of dorsal seta described in the 'Challenger' Report, all appearing to end in long tapering tips. While an authoritative description of the setæ in these specimens can hardly be given, it must be pointed out that *e. g.* in Quatrefages's description of *A. rostrata* he refers to the dorsal setæ as tapering and smooth, and describes only a single type amongst them. It is noticeable that his material came from the Gulf of Bengal, Amboina, and the China Sea, and the suggestion may be made that the Atlantic form as described by McIntosh differs from the eastern form.

On the ventral surface segmental apertures appear, which are probably the external openings of the nephridia. A pair is found on each segment between the eighth and the end, and each one occurs inwards from the ventral bundle of setæ upon a rather broad papilla.

Locality. Goidu, Horsburgh Atoll, Maldives. "From a backwater full of weed and decaying vegetable matter."

9. *Amphinome maldivensis*, sp. n. (Plate 45. figs. 14,15; Plate 46. figs. 12–17.)

Measurements. 68 mm. in length, 11 mm. in width; no. of segments 55.

This amphinomid is remarkable for its grub-like form, a consequence of the insignificant development of the setigerous lobes of the parapodia. It has a tetragonal cross-section and tapers only slightly towards the head and tail, both being rounded, and the former only a little more pointed than the latter. The worm possesses a uniform flesh-colour in spirit, and while the ventral surface is smooth, the dorsum is wrinkled and covered with slight elevations. The prostomium is invisible from the dorsal surface, as in the contracted state of the worm it is tucked under the ventral surface and surrounded by the lateral parts of the first segment. It was necessary to make an incision from the ventral side to examine its structure.

The head (Pl. 45. figs. 14, 15) is very similar to that of *A. djiboutensis*, of which a

detailed description is given by Gravier *. Dorsally is seen the conical slightly developed caruncle with a tiny median tentacle at its base. (This was not observed by Gravier in his specimens, but he concluded that it had been lost.) A rounded median head succeeds, which is divided by a longitudinal furrow, and bears a single pair of indistinctly marked eyes. From underneath these last spring the stumpy cylindrical lateral tentacles, larger than the median tentacle and palps. Ventrally come the conspicuous buccal lips, pressed together to form a heart-shaped mass. At the sides of these arise the small palps.

The dorsal and ventral setigerous lobes of the parapodia (Pl. 46. fig. 14) are widely separated by a curved inflated surface. The former bears anteriorly the small compact gill-tuft almost masking the short dorsal bundle of setæ, which the filiform dorsal cirrus exceeds in length. The ventral lobe is composed of a bundle of setæ of superior length to the dorsal and possesses a ventral cirrus similar to, but rather thicker than, the dorsal organ. The parapodium of *A. maldivensis* almost exactly resembles that of *A. djiboutensis* (see Gravier, *t. c.* text-fig. 249).

The setæ are in rather marked contrast to such a form as *A. rostrata*, being fine, slender, and of a greenish hue. Dorsally are found a few hooked smooth setæ (these may perhaps be compared with Gravier, text-fig. 253, which, however, is straight and symmetrical), and a great number of setæ regularly diminishing to a point, slightly more slender than the first kind and provided with twenty or more serrations along one side (Pl. 46. fig. 12; *cf.* Gravier, text-fig. 251, but has larger number of serrations). Capillary setæ much finer than the others and half as long again occur in quantity. They end in a rather fine rounded point, but with high powers one or two denticulations can be made out under it (*cp.* Gravier, text-fig. 252). The ventral setæ differ in the anterior and posterior regions of the body. Anteriorly is found a slender hooked seta, generally distinctly serrated under the apex, but may be smooth; at some distance from the end of the serrations is a well-defined spur (Pl. 46. figs. 14-16; *cf.* ventral setæ of *Hermodice carunculata*). This form does not appear to exist in *A. djiboutensis*. Posteriorly there is a similar kind of seta, but the apical hook is more distinct, the serrations are not well marked, and the spur is absent, while it has a stouter character (Pl. 46. fig. 17). In both regions are short thick supporting setæ, attaining their greatest thickness some distance from the apex, and diminishing to end in a rounded brown point (*cp.* Gravier, text-fig. 256).

Gravier remarks of the Red Sea species that it belongs to the group of species of *Amphinome* with a very reduced caruncle and ill-defined gills, to which Quatrefages gave the name of *Linopherus*, and that it has affinities with *A. (Lenora) philippinensis*, which possesses, however, filiform gills and no palps, though the setæ appear to have a similar facies. The foregoing description of *A. maldivensis* emphasises the resemblance to *A. djiboutensis*, which differs, indeed, only in certain points connected with the setæ.

Locality. 2 specimens from Hulule, Male, Maldives.

* Gravier, *Nouv. Arch. de Mus. d'Hist. Nat. sér. 4, t. iii. 1901, p. 245.*

Genus *EUCARUNCULATA*, Malaquin and Dehorne, 1906.

10. *Eucarunculata grubei*, Malaquin and Dehorne*. (Plate 45. figs. 10-11; Plate 46. figs. 9, 10.)

Malaquin et Dehorne, Les Annélides de la Baie d'Amboine, Rev. Suisse Biol. t. xv. 1906, pp. 358-361, pl. 51. fig. 2, pl. 53. figs. 12-15, 17-20.

(After some hesitation I have decided to put the three specimens of *Eucarunculata* into a single species, though they differ considerably in general appearance, and even in points which might fairly be considered as of specific value. A number of *Eucarunculata* were found, on looking through Mr. Crossland's Zanzibar collection, which partially bridge the gap existing between the forms already examined. A fairly continuous series can now be arranged with regard to size and possibly concomitant modifications. For the smaller specimens are instituted two varieties, but it is recognised, that they may possibly be growth-stages, the typical species being the adult worm. The differences between species and varieties are found in the form of the caruncle, serration of the ventral setæ, and the number of branches on the gills. Though the colour varies, the markings are similar throughout.)

Measurements. Length 104 mm., breadth 7 mm.; no. of segments 73.

This magnificent annelid at once attracts attention by the elegance of its shape and the beauty of its markings. While the buff-coloured ground-colour is well shown on the ventral surface, dorsally it is masked by irregular dark longitudinal stripes of a bronze colour, and flecks and masses of white or yellow pigment. The longitudinal stripes are just faintly discernible on the ventral surface, and the light pigment is present in less quantity but arranged in more definite spots. As in most amphinomids, the dark pigment is concentrated in front of the bundle of dorsal setæ.

In shape it is not unlike *Hermodice carunculata* as figured by McIntosh, though the dorsum would appear to be more arched and the section less tetragonal. A noteworthy character is the prominent development of the beautiful silky bristles, which are both longer and more numerous than in the Atlantic form. The anus is located on the dorsum of the last segment.

The caruncle is attached to the first and second body-segments and reaches back to the middle of the fourth. In this specimen it is a broadly spreading trapezoidal structure, composed of six or seven folds rising on each side from the middle line, which is not marked by a median axis. Its breadth as great as its length, its generally irregular and spongy character, and the absence of the median axis would appear to be characteristic features; but a comparison with other examples, smaller but otherwise identical, seems to show this structure of the caruncle to be associated with the greater size of the annelid. The folds are swollen wrinkled structures, only displaying their secondary pinnate branching on close examination. The second on each side is bifid terminally. The whole organ is tinted a soft brown and marked with yellow spots.

* My own account had already been written and was in the hands of the printers when I came across the description of *Eucarunculata grubei* cited above. This is very detailed and it was judged best to leave the succeeding paragraphs as they were. Malaquin and Dehorne described smaller specimens than the one from Chagos, and the differences in form of caruncle and setæ are probably due to varying age. There is little doubt that the species is the same in the two cases.

The broadly ovate head bears two pairs of rather ill-defined eyes, of which the anterior are rather larger. The median tentacle appears to be short and slender; the lateral tentacles being of the same length, dilated but with a pointed termination, while the palps are longer and slender throughout.

The small size of the branchiæ is noticeable, and their appearance is in contrast to the ramifying tufts of *H. carunculata*. The branchiæ begin on the first body-segment and consist of inner and outer divisions, the latter being larger, which divide at once into short club-shaped terminal branches. These are brown with white tips, and are greatest in number on the anterior segments (50 on the fifth segment), and diminish until there are only 3 on the last segment.

Attention has already been drawn to the well-developed dorsal setæ, which rise in a compact bundle from the well-marked setigerous prominence. Two kinds of setæ are represented: one long, very slender, gently tapering, which, unlike the similar kind in *H. carunculata*, never possesses roughened tips; and another much stouter and shorter kind, hollow up to the apex and symmetrically tapering to a blunt point. This possesses a row of very numerous serrations (more than sixty) along one side. The dorsal cirrus is two-thirds the length of the dorsal tuft of setæ and is composed of a swollen basal and filiform terminal portion. The ventral setæ are not half the length of the dorsal tuft, and are much coarser than those described above. There is but a single type, a stout bristle not tapering markedly but ending in a slightly curved hook-like tip. The setæ may be smooth or possess a series of rather faint serrations under the tip varying in number up to 12. A very striking difference is presented compared with the strongly serrated setæ of *H. carunculata*, which, moreover, possess a pronounced spur below the region of serrature, which is here absent.

Locality. Ile du Coin, Peros, Chagos; a single specimen. "Sand under loose coral masses." (See note on p. 371 for additional localities.)

11. *Eucarunculata grubei*, var. *gracilis*, var. n. (Plate 46. fig. 11.)

Measurements. Length 28 mm., breadth 4 mm.; no. of segments 41.

This is a much smaller and slenderer form than the preceding, but the similarity of the scheme of colour-markings is rather striking. The ground-colour is a greyish brown and the large development of yellow pigment on the dorsum gives a rather silvery coloration to the animal as a whole. The ventral surface is beset with spots of light pigment. The dark striæ remarked in the foregoing description are equally prominent here.

The caruncle is rather smaller, being attached to the first and second body-segments and reaching to the middle of the third segment only. It is of a compact and regular form, ovate and broader anteriorly; but the breadth is always distinctly less than the length. There is a very definite median axis expanding into a heart-shaped tract anteriorly, and lateral regions consisting of five or six folds respectively, on the two sides. The folds are entirely separate from one another, and are deep narrow lamellæ which subdivide with pinnate branching. The connection of the first fold on either side with the median axis is not plainly shown. The whole structure is of a dark brown colour with yellow spots.

The head bears a median tentacle of greater size than that described for the typical form, attaining nearly half the length of the caruncle. The branchiæ are similar to those of the parent species, but have a smaller number of terminal branches, never rising above fifteen.

The arrangement of the setæ is not so compact, nor is there the white silky appearance so striking in other members of the genus, but they possess a flexibility like that in *Notopygos variabilis*. The finely attenuate type of dorsal seta resembles that of *H. carunculata* in possessing a roughened or rather finely serrated inside edge. The ventral setæ (Pl. 46. fig. 11) possess a more incurved apical hook and more distinct and numerous serrations than those described above.

Locality. Single specimen from Egmont Reef.

12. *Eucarunculata grubei*, var. *minuta*, var. n. (Plate 45. figs. 12, 13.)

Measurements. Length 16 mm., breadth 2 mm.; no. of segments 34.

This variety possesses a characteristic appearance, which is due to the slender body and the long tufts of dorsal setæ, whose length exceeds the width of the body (Pl. 45. fig. 12). The colour is pale, but the longitudinal striæ are regular and purple in hue, recalling the colour-patterns described above. There is an absence of yellow spots of pigment.

The caruncle (Pl. 45. fig. 13) is similar to that described for var. *gracilis*; the lines of the secondary branching are followed by delicate traces of purple pigment. The median tentacle has a length equal to one-third of that of the caruncle and is distinctly moniliform. The lateral tentacles and palps are not quite so long.

The dorsal setigerous lobe is very prominent and bears a jointed dorsal cirrus. The setæ are like those described for the last variety. The ventral setæ are very slender, and sometimes end in a pointed hook. The serrations on the inner side are distinct and vary greatly in number. A second type, apparently derived by excessive elongation from the first, is met with, but rarely.

Locality. Single specimen from Amirante I., E 11, dredged in company with *Chlæia fusca* and *Notopygos hispida*.

Genus *EURYTHOË*, Kinberg.

13. *Eurythoë complanata* (Pallas).

14. *Eurythoë alcyonia* (Savigny).

15. *Eurythoë pacifica*, Kinberg.

These three species comprise all the common coral-reef-haunting members of the genus, and present such close resemblances to each other as to give grounds for regarding them as a single widespread species. *E. complanata* was described originally from the West Indies, but Baird has pointed out that its range extends as far as Australia and Zanzibar. *E. alcyonia* has, so far as I know, been identified by previous authors only in the Red Sea. It is perfectly clear, however, that this collection from the Maldives and Seychelles contains a very large number of forms which can only be referred to the last-named species*. *E. pacifica* occurs throughout the Pacific Ocean and was also obtained from the Bermudas by the 'Challenger.' While, then, to a slight

* McIntosh, Voyage of H.M.S. 'Challenger,' Annelida Polychæta, pp. 27-29.

degree their ranges overlap, they are at present separated as much by their geographical habitats as by their structural differences.

They agree, however, among themselves in the following characters:—

Their flattened rectangular form (twice as wide as high).

Oval head with 4 eye-spots, short appendages, the median tentacle shorter than the lateral, scarcely as high as the caruncle.

The caruncle ending in the middle of the third segment or beginning of fourth.

Three or four buccal segments forming the sides of the mouth.

Jointed dorsal and ventral cirri not so long as the bundles of setæ.

Gills consisting of a large number of branches.

The dorsal setæ containing characteristically a subfurcate type (Gravier, text-figure 262), the outer limb of which may or may not be serrate, and the straight serrate gradually tapering seta which is apparently common to all species (Gravier, text-figure 266).

The ventral setæ belonging to a much stouter furcate type (Pl. 46. fig. 20), the rami not slender but stout and curved: the outer ramus may or may not be serrated.

To my mind a species with the above characters is a perfectly natural one. There are, however, fairly wide limits of variation.

The only valid cause for separation of these "species" is found in the slight variations of the setæ.

E. alcyonia, as described by Gravier* (from a single specimen only, however), and *E. complanata* never possess furcate setæ with serrations on the outer limb of the fork.

In *E. pacifica* the setæ of the dorsal and ventral bundles are typically serrate, but McIntosh mentions the fact that in the specimens of *E. pacifica* from Ceylon belonging to the British Museum, one does not show distinct serrations. This, then, appears to be a variable character, and it is questionable how far it should be used to define a separate species.

In the present collection the majority of specimens examined (including all the larger examples) showed no serration of setæ.

In a homogeneous group of specimens like those from Funafuti it is noticeable that in the smaller individuals the posterior border of the mouth is formed by the fourth body-segment and not by the fifth as in the larger. Thus the number of buccal segments varies between four and five, and it is not safe to give a definite number of buccal segments as a specific character as Kinberg has done in his diagnoses of species †.

The trilobed character of the smaller forms at least is not easy to make out. Here again the period of growth influences the structure of organs, and the larger and older specimens alone show the fully developed caruncle with crenated lateral lobes.

The succession of setæ has not been sufficiently studied in these forms and a few facts with regard to this may well be added. In all specimens examined, the three types of

* Gravier, Nouv. Arch. de Mus. d'Hist. Nat. sér. 4, t. iii. 1901, pp. 248-254.

† Kinberg, Öfversigt af Vetenskaps-Akad. Förhand. xiv. 1857. *E. kamehameha* and *E. pacifica* have four buccal segments, *E. corallina* three. Savigny's original specimens of *E. alcyonia* from the Gulf of Suez had three buccal segments, but Gravier describes the species as possessing four.

dorsal setæ so carefully described and figured by Gravier have been recognised. In addition, a fourth type is found in the anterior segments (*cf.* Pl. 46. fig. 19), a slender distinctly furcate seta with, however, one ramus much more elongated than the other. By suppression of the shorter ramus it passes into the subfurcate type, which alone is present in the posterior segments, and in some of the anterior segments intermediate forms are found. The subfurcate type of bristle as figured by Gravier (text-figure 262) is essentially the characteristic type of this group of species.

Localities:—

(1) Rotuma, Fiji.

(2) Funafuti: 1 bottle with large specimens, largest 54 cms.; 1 bottle with moderate-sized specimens; some smaller specimens in tubes show serrations, and are therefore *E. pacifica*.

(3) Maldives: Hulule, Male Atoll, large number of specimens of all kinds; Goidu, Geifurfchenchi Atoll, one set of specimens is interesting for the rather marked development of the dorsal setæ, which are white and silky; Velu, Funado, Miladamadulu Atoll, another specimen with silky dorsal setæ; Minikoi, Laccadives, specimens of all kinds.

(4) Chagos: Salomon Atoll; and Ile du Coin, Peros Atoll.

(5) Seychelles, Coetivy.

16. *Eurythoë heterotricha*, sp. n. (Plate 45. figs. 16, 17; Plate 46. figs. 18, 19.)

Measurements. Length 60 mm., breadth 3.5 mm.; no. of segments 65.

The body is slender, rectangular in section, but not so flattened as in *E. complanata*, and unpigmented. The caruncle is minute, only extending back to the end of the second segment. The head is large and oval, and two pairs of eyes are situated upon it, the anterior being larger. A slender median tentacle stands equidistant from both pairs. The lateral tentacles are stouter and about the same length. There are three buccal segments.

The gills begin on the third body-segment as a simple furcate process. In the next segment there are four branches, but the branchiæ never attain to a very full development, reaching their limit in the middle with about fourteen branches.

A characteristic appearance is imparted to the annelid by the setæ, which are silky and are arranged in compact bundles, fraying out at the ends on account of the exceptional length of a few of the setæ (Pl. 45. fig. 17). The dorsal representatives mainly consist of two types, a straight symmetrically tapering serrate seta as found in other species* and a furcate type figured (Pl. 46. fig. 19). The presence of such a seta has just been remarked in the anterior segments of *E. complanata*, but it has been pointed out that it passes there into a subfurcate type. No such modification takes place, however, in this species, but the furcate type is present throughout the body and the subfurcate type is absent dorsally. The specially long setæ are derived from the furcate type by the excessive elongation of the outer ramus of the fork, which attains to a

* They do not appear to be so distinctly and evidently serrate as in *E. complanata*.

length greater than that of the shaft. There are also very stout smooth setæ, which serve for support and are rounded at the end.

In the ventral setæ there are found again two types of furcate seta. The first (Pl. 46. fig. 18) is comparatively strong, but not so massive as in *E. complanata*. The longer ramus is about four times as long as the shorter, has an incurved tip, and invariably bears a number of serrations on the internal margin. The serrate type is prevalent throughout. The second type is slenderer, and resembles the furcate setæ of the dorsal bundle, but is rather more attenuate. The longer ramus often attains to as great a length as that described in the corresponding dorsal setæ. This kind of bristle seems, after the middle, to pass partly into such a subfurcate seta as occurs in *E. complanata*.

Locality. Mahlos Atoll, Maldives: a single specimen associated with several individuals of *E. complanata*.

NOTE.—It was at first intended to include an account of the *Palmyridæ* in this part. They include a new genus *Palmyropsis*, figures of which are given in Plates 45 & 46. The text of the description will follow in a subsequent part.

EXPLANATION OF THE PLATES.

PLATE 45.

- Fig. 1. *Chlæia fusca*: two middle segments.
 Fig. 2. „ „ tail.
 Fig. 3. „ *rosea*: two middle segments.
 Fig. 4. „ *maculata*: two middle segments.
 Fig. 5. „ *longisetosa*: tail.
 Fig. 6. *Notopygos hispida*: two middle segments.
 Fig. 7. „ „ head and caruncle.
 Fig. 8. „ *gardineri*: head and caruncle.
 Fig. 9. „ *variabilis*: head and caruncle.
 Fig. 10. *Eucarunculata grubei*: two middle segments.
 Fig. 11. „ „ head and caruncle.
 Fig. 12. „ „ var. *minuta*: two middle segments.
 Fig. 13. „ „ „ head and caruncle.
 Fig. 14. *Amphinome maldivensis*: head.
 Fig. 15. „ „ front end of body from ventral surface.
 Fig. 16. *Eurythoë heterotricha*: head and first segments.
 Fig. 17. „ „ 10th segment, dorsal view.
 Fig. 18. *Palmyropsis macintoshi*: head and first three body-segments in dorsal view.

PLATE 46.

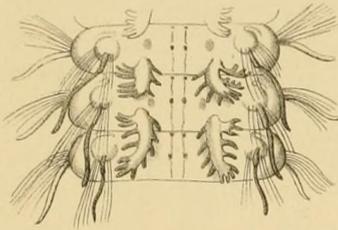
- Fig. 1. *Chlæia maculata*: anterior dorsal seta. × 100.
 Fig. 2. „ „ anterior ventral seta (form with short fork). × 250.
 Fig. 3. *Notopygos hispida*: dorsal seta from 3rd segment (triserrate). × 250.
 Fig. 4. „ „ „ „ 6th segment (uniserrate). × 250.

- Fig. 5. *Notopygos hispida* : outline of segment from middle of body to show dorsal cirri, gills, &c.
 Fig. 6. „ „ *gardineri* : dorsal seta from 1st segment. × 250.
 Fig. 7. „ „ „ „ middle of body. × 100.
 Fig. 8. „ „ „ „ „ „ × 100.
 Fig. 9. *Eucarunculata grubei* : ventral seta (non-serrated). × 400.
 Fig. 10. „ „ „ (serrated). × 400.
 Fig. 11. „ „ var. *gracilis* : ventral seta. × 400.
 Fig. 12. *Amphinome maldivensis* : dorsal seta (serrated). × 400.
 Fig. 13. „ „ „ (non-serrated). × 400.
 Fig. 14. „ „ ventral spurred seta (dorsal in tuft). × 250.
 Fig. 15. „ „ „ „ × 400.
 Fig. 16. „ „ „ „ × 400.
 Fig. 17. „ „ ventral seta. × 400.
 Fig. 18. *Eurythoë heterotricha* : ventral seta from 12th segment. × 400.
 Fig. 19. „ „ dorsal seta from 10th segment. × 250.
 Fig. 20. „ „ *complanata* : ventral seta (serrated) 4th segment. × 400.
 Fig. 21. *Palmyropsis macintoshi* : dorsal palea. × 50.
 Fig. 22. „ „ ventral seta. × 50.

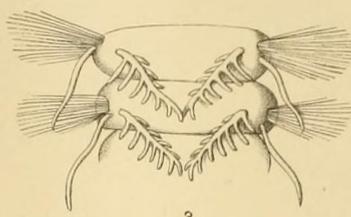
[Note received on 11th December, 1908.

Page 366. *Eucarunculata grubei*.

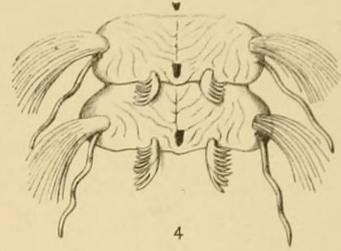
Mr. Crossland's Zanzibar collection contains 8 examples of this species ranging from 4 to 7 cms. in length. The caruncle in these is regular, with distinct median axis, as in the type-specimens. The serrations of the ventral setæ are more numerous than in the Chagos worm. The coloration and markings in most of the Zanzibar specimens coincide with the above description, but two small individuals, in which the longitudinal stripes of dark pigment are very narrow and distinct, resemble the variety *minuta* described on page 367.—F. A. P.]



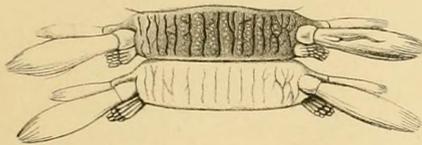
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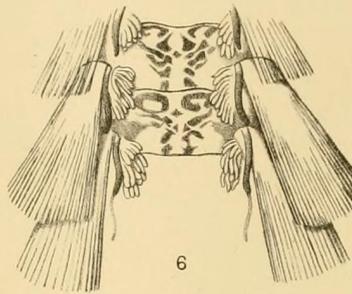
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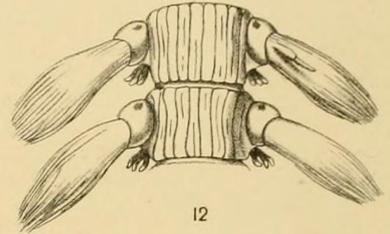
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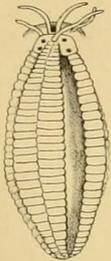
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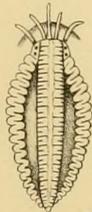
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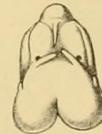
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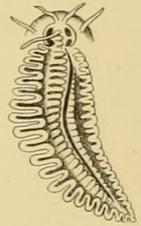
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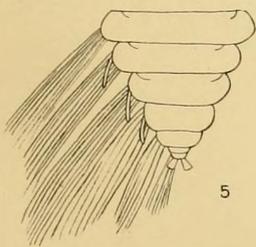
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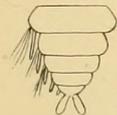
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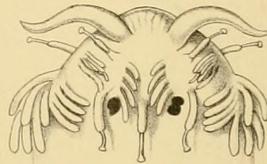
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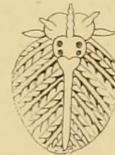
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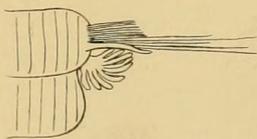
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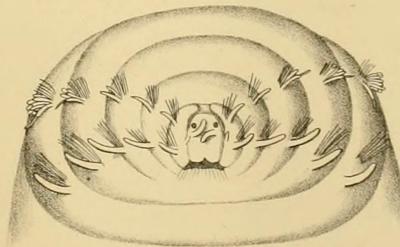
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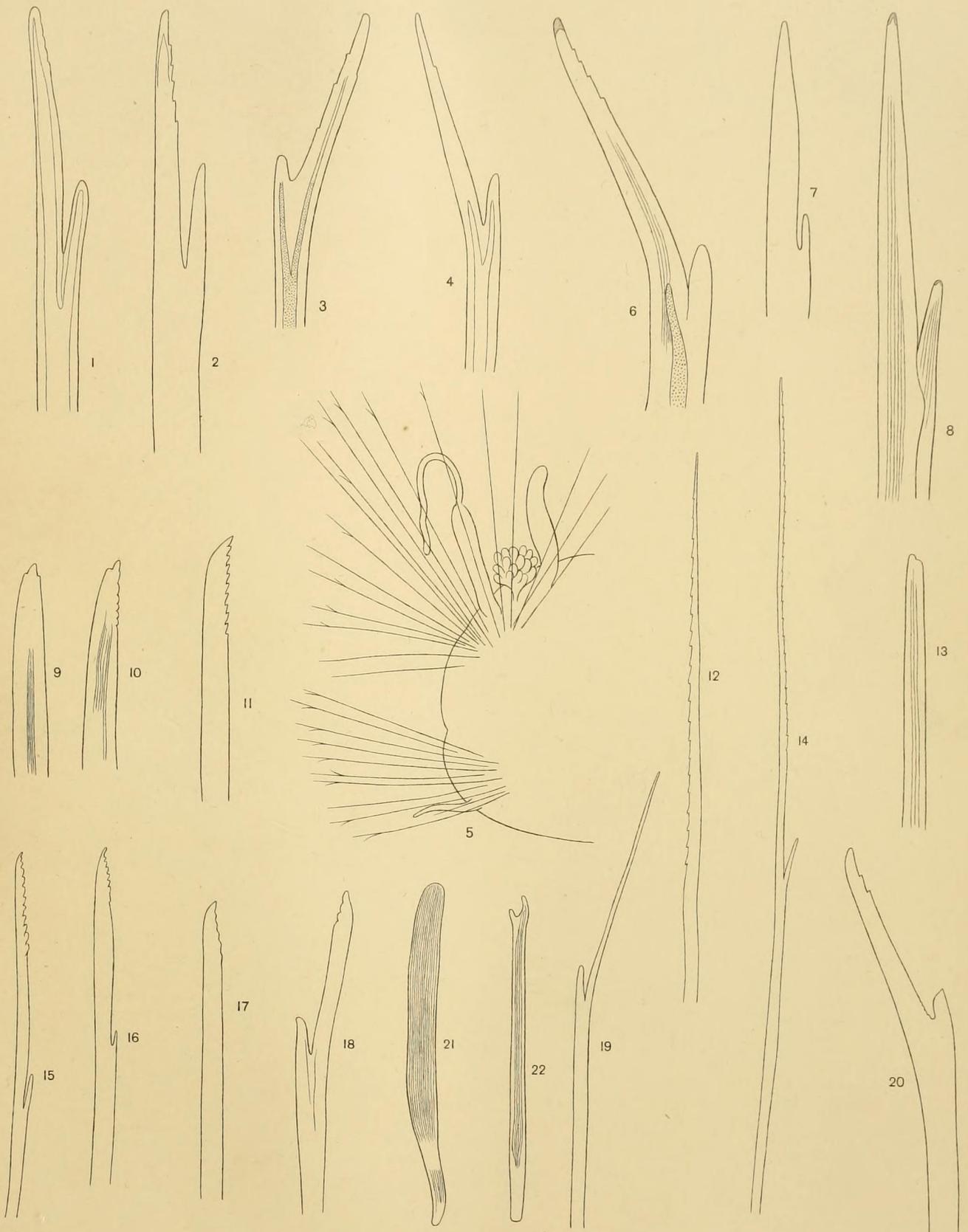


16

F.A. Potts, del.

POLYCHAETA FROM THE INDIAN OCEAN.

E. Wilson, del. et imp.



LINNEAN SOCIETY OF LONDON.

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Part IV.	1890.	0	12	0	0	9	0	Part II.	1903.	0	8	0	0	6	0
Part V.	1890.	0	6	0	0	4	6	Part III.	1903.	1	4	0	0	18	0
Part VI.	1891.	0	12	0	0	9	0	Part IV.	1904.	0	6	0	0	4	6
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Part VIII.	1892.	0	8	0	0	6	0	Part VI.	1904.	0	6	0	0	4	6
Part IX.	1892.	0	12	0	0	9	0	Part VII.	1904.	0	6	0	0	4	6
Part X.	1893.	1	8	0	1	1	0	Part VIII.	1904.	0	10	0	0	7	6
Part XI.	1894.	0	2	6	0	2	0	Part IX.	1905.	0	6	0	0	4	6
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Part II.	1894.	1	11	0	1	3	3	Part XI.	1907.	0	12	0	0	9	0
Part III.	1894.	0	10	0	0	7	6	Part XII.	1907.	0	3	0	0	2	3
Part IV.	1896.	1	4	0	0	18	0	Part XIII.	1907.	0	6	0	0	4	6
Part V.	1896.	0	10	0	0	7	6	Part XIV.	1907.	0	3	0	0	2	3
Part VI.	1896.	0	8	0	0	6	0	X. Part I.	1904.	0	3	0	0	2	3
Part VII.	1896.	0	12	0	0	9	0	Part II.	1904.	0	8	0	0	6	0
Part VIII.	1897.	0	2	6	0	2	0	Part III.	1905.	0	9	0	0	6	9
VII. Part I.	1896.	0	10	0	0	7	6	Part IV.	1905.	0	10	0	0	7	6
Part II.	1897.	0	12	0	0	9	0	Part V.	1906.	0	7	6	0	5	3
Part III.	1897.	0	6	0	0	4	6	Part VI.	1906.	0	3	0	0	2	3
Part IV.	1898.	0	10	0	0	7	6	Part VII.	1907.	0	3	0	0	2	3
Part V.	1898.	0	18	0	0	13	6	Part VIII.	1907.	0	4	0	0	3	0
Part VI.	1898.	0	13	0	0	9	9	(In Progress).							
Part VII.	1899.	0	18	0	0	13	6	XI. Part I.	1908.	0	4	0	0	3	0
Part VIII.	1899.	0	12	0	0	9	0	XII. Part I.	1907.	1	8	0	1	1	0
Part IX.	1899.	1	0	0	0	15	0	Part II.	1907.	1	4	0	0	18	0
Part X.	1900.	0	6	0	0	4	6	Part III.	1908.	0	16	0	0	12	0
Part XI.	1900.	0	2	9	0	2	0	Part IV.	1909.	1	10	0	1	2	6
								Index (in the press).							