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FAUNA OF THE CHILKA LAKE.

POLYCHAETA OF THE CHILKA LAKE AND ALSO OF FRESH AND BRACKISH WATERS IN OTHER PARTS OF INDIA.

By ROWLAND SOUTHERN, *B.Sc.*, *M.R.I.A.*

(With Plates XIX–XXXI and 18 text-figures.)

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POLYCHAETA.

By ROWLAND SOUTHERN.

INTRODUCTION.

It was considered advisable, whilst describing the Polychaeta from the Chilka Lake, to examine also those species of the group in the Indian Museum which, at various localities in India, had been found in water which was either fresh or periodically mixed with fresh water, or in other words was not distinctively marine. The collection contains very few species which spend their whole lives in fresh water. The majority live either in brackish water of low salinity, or belong to the "Euryhaline" group. The latter term was first used by Moebius to designate those species which can live in water the salinity of which varies between wide limits. In Europe very few species of Polychaeta can tolerate marked changes in the salinity of the seawater and fewer still can reproduce under such conditions, but in India, judging from the list of species dealt with in the present paper which is obviously far from exhaustive, they are relatively far more numerous. This adaptation may be correlated with the sharp division of the climate into wet and dry seasons, whereby the littoral region is periodically flooded with water of low salinity, especially in bays and estuaries.

From the whole of India only two species of Polychaeta have been recorded from fresh or brackish water. These are *Matla bengalensis* Stephenson (1908, p. 39 and 1910, p. 82) and *Spio bengalensis* Willey (1908, p. 389) both from brackish pools at Port Canning, Lower Bengal. *Matla bengalensis* is based on juvenile specimens of a Capitellid, and neither it nor *Spio bengalensis* were represented in the present collection. Records of littoral marine Polychaeta from Indian shores are practically absent. A number of species have been recorded from Ceylon by Schmarda, Grube, Michaelsen, and Willey. It is therefore not surprising that almost all the species in the present paper are new to science, especially when one remembers the peculiar nature of the habitat in which they have been found. Many of the species of Polychaeta known from the Indian Ocean and South Pacific have been very imperfectly described and inadequately figured, judged by modern standards. Any specimens now referred to such species would be involved in a cloud of uncertainty, and it seems preferable, where there is any doubt, to ignore them until they have been redescribed from trustworthy material.

LIST OF SPECIES.

Ancistrosyllis constricta, sp. nov. Chilka Lake.
Lycastis indica, sp. nov. Gangetic Delta; Cochin Backwater.

Tylonereis fauveli, sp. nov. Chilka Lake.
Nereis (Nereis) chilkaënsis, sp. nov. Chilka Lake.
Nereis (N.) glandicincta, sp. nov. Gangetic Delta.
Nereis (N.) reducta, sp. nov. Chilka Lake.
Perinereis marjorii, sp. nov. Chilka Lake.
Dendronereis aestuarina, sp. nov. Gangetic Delta.
Dendronereides heteropoda, gen. et sp. nov. Gangetic Delta.
Nephthys polybranchia, sp. nov. Chilka Lake.
Nephthys oligobranchia, sp. nov. Cochin Backwater; Chilka Lake.
Diopatra variabilis, sp. nov. Chilka Lake.
Marphysa gravelyi, sp. nov. Chilka Lake.
Lumbriconereis polydesma, sp. nov. Chilka Lake.
Lumbriconereis simplex, sp. nov. Chilka Lake.
Glycera alba, Rathke, var. *cochinensis*, var. nov. Cochin Backwater.
Glycinde oligodon, sp. nov. Chilka Lake.
Scoloplos marsupialis, sp. nov. Chilka Lake.
Polydora hornelli, Willey. Chilka Lake.
Polydora (Carazzia) kempi, sp. nov. Gangetic Delta.
Myriochele picta, sp. nov. Chilka Lake.
Heteromastus similis, sp. nov. Chilka Lake.
Barantolla sculpta, gen. et sp. nov. Gangetic Delta.
Mastobranchus indicus, sp. nov. Gangetic Delta.
Euclymene annandalei, sp. nov. Chilka Lake.
Sternaspis costata, Marenzeller. Chilka Lake.
Potamilla leptochaeta, sp. nov. Gangetic Delta.
Laonome indica, sp. nov. Chilka Lake.
Fabricia (Manayunkia) spongicola, sp. nov. Chilka Lake.
Ficopomatus macrodon, gen. et sp. nov. Cochin Backwater.

The species represented in the collection fall naturally into three geographical groups, viz. (1) those living in the Gangetic Delta and in the neighbourhood of Calcutta, (2) those collected in the Cochin Backwater, near Ernakulam, on the south-west coast of the Madras Presidency, and (3) those collected in the Chilka Lake.

1. THE GANGETIC DELTA.

Specimens were collected at the following localities :—

Barantolla. In brackish pools and salt lakes.
Chingrighatta. In a canal of slightly brackish water.
Durgapur. In a canal of slightly brackish water.
Beliaghatta Canal. Water slightly brackish.
Garia. Pools of slightly brackish water.
Dhappa. Salt lake and adjacent ditches of brackish water.

All these places are within 10 miles of Calcutta. The salinity of the water is very variable, but never high, probably never exceeding sp. gr. 1·015 at 15°C.

The Sunderbans. In a pool of brackish water inside the protection embankment of a clearing high up the Munda River. Vide p. 602.

Port Canning. The variation in the salinity of the ponds at Port Canning is very great, ranging from 0·82 to 22·88 parts per thousand of saline residue.

The following species were collected in the Gangetic Delta :—

Lycastis indica, sp. nov. Beliaghatta Canal ; Garia.
Nereis glandicincta, sp nov. Barantolla ; Garia ; Dhappa.
Dendronereis aestuarina, sp. nov. Sunderbans.
Dendronereides heteropoda, gen. et sp. nov. Barantolla.
Polydora (*Carazzia*) *kempi*, sp. nov. Chingrighatta Canal.
Barantolla sculpta, gen. et sp. nov. Barantolla.
Mastobranchus indicus, sp. nov. Barantolla.
Potamilla leptochaeta, sp. nov. Port Canning.

In addition, *Matla bengalensis* Stephenson, and *Spio bengalensis* Willey, have been recorded from Port Canning.

2. The Cochin Backwater.

Collections were made in the Cochin Backwater near Ernakulam, on the south-west coast of the Madras Presidency. These backwaters are part of a system connected both with the sea and with large freshwater lakes. The salinity is probably very variable, according to the season of the year, but precise information is not available.

The following species occur here :—

Lycastis indica, sp. nov.
Nephthys oligobranchia, sp. nov.
Glycera alba, Rathke, var. *cochinensis*, var. nov.
Ficopomatus macrodon, gen. et sp. nov.

3. The Chilka Lake.

The following species were obtained here :—

Ancistrosyllis constricta, sp. nov.
Tylonereis fauveli, sp. nov.
Nereis chilkaensis, sp. nov.
Nereis reducta, sp. nov.
Perinereis marjorii, sp. nov.
Nephthys polybranchia, sp. nov.
Nephthys oligobranchia, sp. nov.
Diopatra variabilis, sp. nov.
Marphysa gravelyi, sp. nov.
Lumbriconereis polydesma, sp. nov.
Lumbriconereis simplex, sp. nov.
Glycinde oligodon, sp. nov.
Scoloplos marsupialis, sp. nov.
Polydora hornelli, Willey.
Myriochele picta, sp. nov.
Heteromastus similis, sp. nov.
Euclymene annandalei, sp. nov.
Sternaspis costata, Marenzeller.
Laonome indica, sp. nov.
Fabricia spongicola, sp. nov.

No species is common to the three districts. *Lycastis indica* was found in the Gangetic Delta and the Cochin Backwater, whilst *Nephthys oligobranchia* was found

in the Chilka Lake and the Cochin Backwater. So few species were found in the latter locality that it may be left out of further consideration. As regards the Chilka Lake and the Gangetic Delta, in the almost complete absence of any knowledge of the species comprising the Polychaete fauna of the Indian littoral, it is quite impossible to reach any reliable conclusions as to whether the species here described are peculiar to, or specially adapted to survive in the euryhaline conditions in which they occur. Nevertheless, certain opinions which I have formed may be stated for what they are worth. The collection of species from the Chilka Lake has a typically marine facies. It probably represents an impoverished remnant of the Polychaete fauna which inhabited the open bay before the present lake was almost completely cut off from the sea by the spit of sand which forms its eastern boundary (*vide* Annandale and Kemp, 1915, p. 5). How far the species living in the Chilka Lake have been differentiated from their relations still probably living in the adjacent open sea, in order to fit themselves for the altered environment, cannot at present be stated, but the changes have probably not been great. It seems likely that only those species survived which already had the capacity to withstand great variations of salinity. This point receives further consideration below (p. 571).

The group of species found in the Gangetic Delta conveys the impression, in a rather vague manner, of having undergone greater modification than the Chilka Lake group. The eight species found here are all new to science, and two of them belong to genera previously undescribed. All the species possess branchiae, or analogous organs for performing the function of respiration. Six of the species belong to genera which have seldom or never been found before. Speculations of this nature, however, will have greater claims to validity when the whole fauna of the two areas is taken into consideration. In other groups of animals, the species common to the Chilka Lake and the Gangetic Delta are more numerous (Annandale and Kemp, 1915, p. 15).

DISTRIBUTION OF POLYCHAETA IN THE CHILKA LAKE.

For a full account of the conditions, topographical and hydrographical, prevailing in the Chilka Lake, reference must be made to the account given by Annandale and Kemp (1915, p. 1). For our purposes, a very brief description will suffice. The Chilka Lake is on the east coast of India, and is connected by a very narrow opening with the Bay of Bengal. It lies mostly in Orissa, but the southern extremity extends into the Madras Presidency. It is about 40 miles long, the greatest breadth is 12½ miles, and it occupies an area of about 350 square miles. It is divisible into two well-defined areas, where the biological and physical conditions are very different. There is the main area, a shallow lagoon 4-8 feet deep in the dry season, 10-15 feet in the wet season. The northern part of the lake is very shallow, and very few Polychaeta were collected there. The bottom of the lake is predominantly muddy, though on the shores of some of the islands, and at the south-western extremity there is an admixture of sand. Near the middle of the eastern shore there is a shallow bar leading into a narrow channel about 12 miles long and a mile wide, which connects the lagoon with the Bay of Bengal, the outer opening being only several hundred yards wide. The

channel is separated from the sea by a narrow spit of sand. The inner part of the channel has a bottom of mud and sand, whilst the outer part is clean sand, and has an extensive oyster bed at Manikpatna. The dominating feature, at any rate in the channel, is the great seasonal change in the salinity of the water. All the main rivers enter the lake at the northern end. In the rainy season an enormous amount of fresh water enters this part of the lake, and gradually expels the salt water, so that from the middle of August to the middle of October, the northern half of the lake and the whole of the channel are occupied by water which is quite fresh. In the dry season the volume of water in the lake is reduced by evaporation, and salt-water from the Bay of Bengal enters the channel, and occupies it entirely as far as the inner entrance to the main area. Here the transition to water only slightly brackish occurs in a small space, and the main area is filled with water of low salinity. The southern half of the lake receives no large rivers, and throughout the year contains water only slightly brackish, varying between the limits sp. gr. 1·001-1·015. The variation at any particular spot in this part of the lake is not more than ·010, and is usually less, or one-third to one-fifth of that in the channel, where the sp. gr. ranges from 1·000-1·027ö. The level of the water in the lake is 5 or 6 feet higher in the freshwater season (August to December) than in the salt-water season (December to August).

The following table shows the distribution of the various species in the lake, the date of capture (salt or freshwater season), the specific gravity of the water where they were found, and the extreme observed range of the specific gravity they would have to endure if they lived there throughout the year. The true range is probably greater, as the limits represent observations made only in February and March (salt-water season) and in September (freshwater season) in 1914 (Annandale and Kemp, 1915, p. 6). The majority of captures at the south-west end of the lake were made during the salt-water season, but this is largely due to the lower level of the water at that period rendering it easier to reach the habitat of the various mud- and sand-dwelling species. In the outer channel the bulk of the records were made in the fresh-water period, because it was only at that time that the launch used for dredging and trawling, could cross the shallow bar which separates the main area from the outer channel, at Mugger-Mukh. These circumstances limit to some extent the conclusions which might be drawn from the distribution of species as known at present.

TABLE I.

Species.	SPECIFIC GRAVITY OF WATER.[1]		Distribution.	Date of capture.
	At time of capture.	Annual range at place of capture.		
Ancistrosyllis constricta	1·000—1·010	1·000—1·027	South and south-west shores; outer channel.	S. F.[2]
Tylonereis fauveli	1·000—1·0265	1·000—1·027	Outer channel.	S. F.
Nereis chilkaënsis	1·002—1·011	1·001—1·015	South of lake.	S. F.
Nereis reducta	1·000	1·000—1·027	Outer channel.	F.
Perinereis marjorii	1·000	1·000—1·027	Outer channel.	F.
Nephthys polbranchia	1·001—1·0115	1·001—1·015	South of lake.	S. F.
Nephthys oligobranchia	1·0015—1·0115	1·001—1·015	South of lake.	S. F.
Diopatra variabilis	1·000—1·010	1·000—1·015	South and north-west of lake.	S. F.
Marphysa gravelyi	1·008—1·0115	1·001—1·015	South of lake.	S.
Lumbriconereis polydesma	1·011	1·006—1·015	South of lake.	S.
Lumbriconereis simplex	1·011	1·006—1·015	South of lake.	S.
Glycinde oligodon	1·000—1·011	1·000—1·026	South of lake: once at inner end of outer channel.	S. F.
Scoloplos marsupialis ..	1·0264	1·000—1·027	Outer channel.	S.
Polydora hornelli	1·000	1·000—1·027	Outer channel.	F.
Myriochele picta	1·005—1·010	1·001—1·015	South of lake.	S. F.
Heteromastus similis ..	1·000—1·0261	1·000—1·0265	Inner end of channel, near bar.	S. F.
Euclymene annandalei	1·002—1·011	1·001—1·015	South of lake.	S. F.
Sternaspis costata	1·000	1·000—1·027	Outer channel.	F.
Fabricia spongicola	1·006—1·011	1·001—1·015	South of lake.	S. F.
Laonome indica	1·009	1·004—1·009	South of lake.	S.

[1] At 15°C. [2] S = Salt-water season (February—July); F = Freshwater season (September—November).

When the distribution of the species in Table I is studied, two main groups are easily distinguished. In the first are those species confined to the south end of the lake, which have to withstand variations in the salinity ranging from 1·001-1·015, if spread over the whole area. If very localised in range, the variation may be much less The species in this group are :—

GROUP I.

Nereis chilkaënsis.
Nephthys polybranchia.
Nephthys oligobranchia.
Marphysa gravelyi.
Lumbriconereis polydesma.
Lumbriconereis simplex.
Myriochele picta.
Euclymene annandalei.
Fabricia spongicola.
Laonome indica.

In the second group are those species which have only been found in the Outer Channel. These are :—

GROUP II.

Tylonereis fauveli.
Nereis reducta.
Perinereis marjorii.
Scoloplos marsupialis.
Polydora hornelli.
Sternaspis costata.

There remain four species not included in the above groups. *Glycinde oligodon* was found at eleven stations in the southern end of the lake, and at one station in the inner part of the Channel, south of Mahosa, so that it may be considered as essentially belonging to Group I. *Heteromastus similis* was taken at three stations between Nalbano and Barhampur, that is to say, near the inner entrance to the lake. It is thus intermediate in distribution between the two groups, and probably likes the bottom of muddy sand which occurs there. *Diopatra variabilis* was found at eight station in the south end of the lake, twice near the middle, and once at the north-west corner, off Kalapara Ghat, so that it probably belongs to Group I. *Ancistrosyllis constricta* was taken four times at the south end of the lake, and twice in the Outer Channel during the freshwater season, though it probably lives there the whole year round. Of all the Polychaetes in the lake, this is the species which can endure the greatest range of conditions. A more complete knowledge of the distribution of the species in the lake might cause some changes in this grouping, though probably not to a great extent. The species in Group II have to endure much greater variations in the salinity of the water than those in Group I. It would, however, be rash to claim that the salinity is the determining factor. The species found in the Outer Channel are sand-loving forms, whilst those in the lake are chiefly mud-loving, though some of them live in sponges, etc. The faunistic boundaries are probably two in number, one lying close to the inner entrance of the lake near Barhampur, and limiting the inward range of the sand-loving euryhaline species of the Outer Channel; the other lying in the area roughly bounded by Patsahanipur—Nalbano—Parikudh—Kalidai Id.—Barkul Point, and cutting off; in the south end of the lake, the mud-loving species living in water of low, but not greatly varying salinity. There is not yet sufficient evidence to decide whether the determining factor is the salinity of the water or the nature of the bottom.

Annandale (1915, p. 7) has stated, with reference to the Chilka Lake fauna, that "the great majority of what we may call the permanent residents are, for the reasons that I have already given you, very ordinary in appearance. There is an absence both of brilliant colours and of colouration specially in a high degree adapted for concealment. There is a lack of bizarre form, and the majority of the animals are not modified structurally to a visible extent." Our complete ignorance of the littoral Polychaeta of the Bay of Bengal prevents any analogous statements being made here. To anyone accustomed to examining the Polychaeta of the European coasts, a collection which, out of 17 genera, contains representatives of *Ancistrosyllis*, *Tylonereis*, *Glycinde*, *Myriochele*, *Heteromastus*, *Sternaspis*, *Laonome*, and *Manayunkia*, cannot be considered as ordinary in appearance. This impression is also greatly strengthened if the species from the Gangetic Delta are added, though it might be dissipated by a knowledge of the species in the adjacent sea.

It may be stated generally that the species in Group I are adapted for life in waters of low, but not very variable salinity, and the majority of them prefer a muddy bottom. The species in Group II can live in water ranging in salinity from quite fresh to normal sea-water of the Bay of Bengal, and they seem to prefer a sandy bottom.

SEXUAL MATURITY.

In an environment like that of the Chilka Lake it may well be that some species are able to live throughout the later larval and adult periods of their life, without being able to reproduce there (Annandale and Kemp, 1916, p. 337). Free-swimming adults and larvae, or eggs, may be periodically carried into the lake by favourable winds, currents and tides, to places which are suitable for their further growth. This is much more probable in the case of those species which live in the Outer Channel than in those which occupy the main area of the lake. Such a sterile migration is much more probable in the case of mobile animals like the fishes and Crustacea than in such a relatively sedentary group as the Polychaeta. Of the 20 species found in the lake, 8 contained genital products more or less mature, the species *Nereis chilkaënsis* being represented by the Heteronereis in all stages of maturity. A number of quite small and immature individuals of several species were also collected. Probably the majority of the Polychaeta, if not all, are permanent residents. The subject is worthy of further investigation.

HABITAT OF THE CHILKA LAKE POLYCHAETA.

Five types of habitat may be provisionally distinguished. Information on this subject is very defective, and the scheme may be greatly modified by further observations.

Species found mainly or wholly on a muddy bottom.

Ancistrosyllis constricta.
Nephthys polybranchia.
Nephthys oligobranchia.
Diopatra variabilis.
Marphysa gravelyi.
Lumbriconereis simplex.
Glycinde oligodon.
Myriochele picta.
Euclymene annandalei.
Laonome indica.

Species found mainly or wholly on a sandy bottom.

Tylonereis fauveli.
Nereis chilkaënsis (?).
Nereis reducta.
Lumbriconereis polydesma (?).
Scoloplos marsupialis.
Sternaspis costata.

In the case of the two species queried, the distribution in the lake would lead one to expect a muddy habitat, though the labels attached indicate sand.

Species found on the oyster bed at Manikpatna in the Outer Channel.

Ancistrosyllis constricta (on one occasion).
Perinereis marjorii.
Polydora hornelli.

The last named only is a true shell-borer; the two former species probably only take shelter amongst the oysters.

Species living in sponges (*Spongilla* and *Laxosuberites*).

Nereis chilkaënsis.
Fabricia spongicola.

Species living amongst weeds.

Nereis chilkaënsis.
Fabricia spongicola.

DIAGRAMMATIC REPRESENTATION OF THE PARAPODIA.

An effort has been made, by means of diagrammatic text-figures, to give a more precise idea of the structure of the parapodium, and the distribution of the various types of setae, than is possible in the usual method of illustration. In the latter, the foot—the horizontal axis of which is at right angle to the main axis of the trunk—is shown either from the anterior or posterior point of view. The text-figures now endeavour to represent the foot diagrammatically as seen from the side, that is to say, when looking at the distal end of the various lobes. The observer is supposed to be looking at the parapodium on the right side of the specimen, so that the anterior face of the parapodium is on the right, facing the head, and the posterior face on the left, facing the tail. Further details are given on p. 576 and text-fig. 1.

MATERIAL NOT FIT FOR IDENTIFICATION.

For various reasons a small number of specimens in the collection were not identified. They were either too immature, or too imperfect, or (in one case) the preserving fluid had evaporated and the specimens had shrivelled up. They furnished sufficient evidence, however, to prove the presence in fresh or brackish water, of a number of additional species not described in the present report. Of special interest was a tube of dried specimens from a canal of slightly brackish water at Durgapur, near Calcutta, containing species of the genera *Perinereis*, *Lepidonotus* and *Phyllodoce*, the two latter belonging to families not otherwise represented, whilst the *Perinereis* sp. was distinct from *P. marjorii* of the Chilka Lake.

Family HESIONIDAE.

Ancistrosyllis constricta, sp. nov.

(Plate XIX, figs. 1A–1G.)

This species, of which many individuals were taken, was found only in the Chilka Lake.

The general appearance of the body is very characteristic. The greatest width is at the anterior end, the peristomial segment being the widest. The body narrows rapidly as far as the 4th setigerous segment, this anterior region enclosing the large thick-walled pharynx, which causes it to be circular in section. The body then becomes flat, and on account of the greater size and length of the parapodia, it seems to increase considerably in width, but in reality the trunk, after a slight increase, remains the same width for some distance, and then gradually tapers towards the tail. The body has thus a distinct neck, or waist, and hence the specific name. Towards the posterior end the ventral surface becomes rather more convex, and the feet appear to be on the dorso-lateral surface.

The peristomium and three anterior setigerous segments (fig. 1A) are longer than the succeeding ones, and are only separated from each other externally by very indistinct grooves.

In the largest individuals the posterior region is absent. A fragment, 23 mm.

long, had 120 setigerous segments. Another fragment, full of sperm, was 16 mm. long, with 65 setigerous segments, and was rather stouter than the other immature specimens. A complete individual 19 mm. long had 105 setigerous segments.

The head (fig. 1A) bears in front two flattened palps, fused in the median line where they are very thin and transparent. The front margin is concave. Each palp has a small terminal joint. The postero-lateral angles, where the head is widest, are rounded and indented. The posterior border is concealed beneath the very thin projecting margin of the peristomium. There are three tentacles, the median, which is nearly twice as long as the laterals, being slightly in front of them. The lateral tentacles project a little beyond the palps.

As in *A. robusta*, Ehlers, the entrance to the pharynx is guarded by large pear-shaped papillae, 14 in number. In *A. robusta* there are 16 of them. When the proboscis is fully extruded, the mouth is a vertical slit, but when retracted the mouth is large and gaping, bounded behind by the much folded lower lip, in front and at the sides by the folded and flattened palps. No jaws are present. In the dorsal median line the projecting collar of the peristomium is fused with the head, and only separated from it by a faint groove. At the sides of the head, and in front of the tentacular cirri, the peristomium has two forwardly projecting rounded lobes. There are two pairs of tentacular cirri placed near the front of the peristomium. The dorsal pair are about one quarter longer than the ventral pair, and all have filiform tips and swollen bases. Neither setigerous lobes, setae, nor spines are present.

The succeeding segment bears the first pair of parapodia. They are distinguished from the remaining feet by the very long and tapering dorsal cirri (fig. 1B), which doubtless function as tentacular cirri, and are as long as the median tentacle. The ventral cirrus is clavate, less than one-third as long as the dorsal cirrus. The setigerous lobe is pointed at the tip, where the spine terminates. Two rows of simple capillary setae lie obliquely above and below the spine. The anterior setae in each row are short, strongly curved, and coarsely serrated (fig. 1F). The posterior setae are three times as long, gently curved and very slender, the upper edge being smooth and very thin. There is a gradual transition from one extreme to the other, and the two groups, above and below the spine, are similar. The dorsal division of the foot is represented by a single short and very slender spine, which pierces the base of the dorsal cirrus.

The second foot (fig. 1C) is very minute. The clavate dorsal cirrus projects beyond the conical setigerous lobe, and there is no ventral cirrus, a rather remarkable feature. The dorsal spine is very small. In each group of setae there are six or seven with coarse teeth, two with short teeth, and three or four smooth setae. The next few feet increase till the normal size is attained. The setae increase in numbers, and there are very few intermediate between the coarsely serrate and the smooth forms, except as regards length. One of these intermediate forms is shown in fig. 1G. Some of the long posterior setae show minute serrations, and this is probably the original condition, the smooth ones having lost their teeth by abrasion, as the edge of the seta on which they occur is very thin. In the 4th foot the dorsal spine is

small and straight, just reaching the base of the dorsal cirrus. In the 5th foot it is much longer, passing into the cirrus, but not piercing the epidermis. In the 10th foot all the setae show at least traces of serrations, and the anterior setae have longer teeth than those in the example figured from the 1st foot. In the 20th foot the dorsal spine is curved at the tip, but still completely embedded in the foot. There are two minute papillae on the base of the dorsal cirrus. The setae in the upper group are longer than those in the lower group, and the number of coarsely serrate setae is relatively less.

Between the 30th and 40th feet a stout sickle-shaped seta appears in the dorsal division (fig. 1D). It is in addition to the dorsal spine, which still persists, thin and curved, and does not pierce the epidermis. Ehlers (1908, p. 60) says that in *A. robusta*, the stout sickle-shaped seta replaces the slender spine. The sickle-shaped seta tapers gradually towards the tip, which pierces the skin, and there is no nodulus such as MacIntosh shows in *A. groenlandica* (1877, pl. 65, fig. 3). Behind it are a few small conical papillae on the base of the dorsal cirrus.

The succeeding feet do not show much change. In the posterior 27 feet of the specimen examined the spine and hook of the dorsal division are joined by a slender capillary seta (fig. 1E) which pierces the skin. The spine tapers very rapidly near the curved tip. The papillae on the base of the dorsal cirrus are larger and more numerous than in the anterior and middle feet, and the setigerous lobe is shorter and more rounded. The anus is terminal, and the anal segment bears two slender ventrolateral cirri, equal in length to the last six segments.

A specimen with the body-cavity full of ripe sperm was found in September, in the Outer Channel, during the freshwater season.

This species greatly resembles in many respects the *A. robusta*, Ehlers (1908, p.59), found at Great Fish Bay, S.W. Africa, but differs in the following characters:— (1) the shape of the body; (2) the palps are fused almost throughout their length, and are flat, not cylindrical; (3) the 1st foot has a well-developed setigerous lobe, and the dorsal cirrus is $3\frac{1}{2}$ times as long as the ventral cirrus. In *A. robusta* the setigerous lobe is small, and the dorsal cirrus twice as long as the ventral; (4) the papillae on the base of the dorsal cirrus, and the dorsal capillary seta of the posterior feet were not observed by Ehlers in *A. robusta*; (5) the proboscis has 14 papillae, that of *A. robusta* 16; (6) the absence of the ventral cirrus of the second pair of feet is not mentioned by Ehlers nor MacIntosh.

The *A. groenlandica* of MacIntosh (1877, p.502), dredged in 410 fathoms in Davis Strait, is very different from *A. constricta* or *A. robusta*, but in several characters of the feet it shows the greater affinities with the former species. The setigerous lobe and dorsal and ventral cirri bear many small cylindrical papillae. More important, however, is the presence in the dorsal division, together with the stout sickle-shaped seta, of a slender bristle, generally enclosed in the tissues. According to Ehlers the sickle-shaped seta is a modified aciculum, which, in *A. robusta*, has replaced the simple curved spine of the anterior segments, and he does not regard the presence of both forms in the same foot in *A. groenlandica* as affecting this theory. It is clear,

however, in *A. constricta*, that the slender curved aciculum is present in all the feet, and that the sickle-shaped seta is an addition in the middle and posterior segments, in the latter of which it is accompanied by a slender capillary seta. It is extremely probable, therefore, that the sickle-shaped seta is a modified dorsal seta, and not an aciculum.

The *A. albini* of Langerhans (1881, p.107) is quite distinct from any of these species, if, indeed, it is a true *Ancistrosyllis* at all.

Habitat.—This species was found on six occasions in the Chilka Lake. Twice it was taken in the outer channel, three times near the southern extremity of the lake and once off Balugaon.

On one occasion it was found in crevices of oyster shells at Manikpatna, but usually it occurred on a muddy bottom in a few feet of water, and once it was taken on a sandy bottom south of Mahosa.

The salinity of the water varied from 1·000-1·015, but the occurrence in the outer channel at Manikpatna in oyster shells suggests that it can survive the salt-water season when the gravity is as high as 1·026.

Family NEREIDAE.

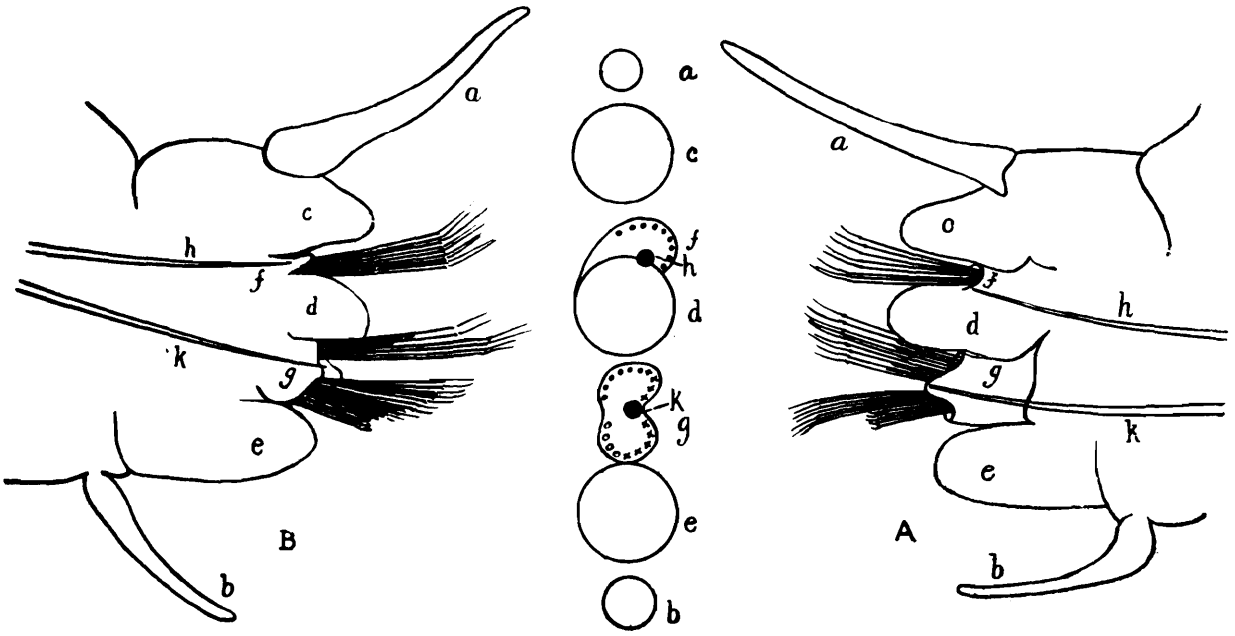
The wide variation usually to be observed in the structure of the parapodia from various parts of the same specimen of *Nereis* necessitates a very close examination. The difficulty of adequately representing the structure of the foot by the usual method of illustrating the anterior and posterior aspects led to an attempt to depict it diagrammatically from the terminal aspect. In text-fig. 1, a typical foot from the right side of a specimen of *Nereis pelagica*, L. is shown from the anterior (A) and the posterior (B) points of view and C is a diagram representing the same foot as it would appear if examined from the terminal aspect. The arrangement of the various lobes and different types of setae is obscure in A and B, but is clearly shown in C. The position of the setae and their differing structure are indicated by the use of various symbols.

The posterior side of the foot is on the left of the vertical axis and the anterior on the right. Thus the diagram represents the foot as it would appear if looked at *in situ* on the right side of the worm, with the head to the right and the tail to the left.

Complete uniformity has not yet been attained in the nomenclature of the various lobes which constitute the foot of a Nereid and the following explanation of the terms here used may conduce to this end. There is considerable variation in detail in the parapodia of the different species of the Nereidae, but the fundamental plan remains fairly constant. The simplest and most typical form is seen in the sub-genus Nereis, as represented by *Nereis pelagica*, L. (text-figs. 1 A–C). Here the foot consists of dorsal cirrus *a*, a ventral cirrus *b*, and three lobes designated in this paper the dorsal ligule *c*, the median ligule *d*, and the ventral ligule *e*. Between the dorsal and median ligules emerge the setae here known as "the setae of the dorsal division." Where they emerge from the foot, these setae are surrounded by a mem-

brane, the "dorsal fillet" *f*. Beneath the setae, and embedded in the upper part of the median ligule, is the dorsal spine *h*. The dorsal fillet is attached by its edges to the median ligule. Between the median and ventral ligules lie the "setae of the ventral division," enclosed within the ventral fillet *g*. The latter projects outwards in two lobes, a larger anterior and a smaller posterior. The "ventral spine" *k* terminates in the anterior lobe of the fillet.

Three types of setae are most commonly found in the Nereidae, and their position in the foot is fairly constant, the arrangement in *N. pelagica* being typical. Homogomph setae with elongate finely-serrated terminal pieces (plate XXI fig. 6K) occur in



TEXT-FIG. 1.—Foot of *Nereis pelagica*, L.

A. 10th right foot, front view. B. 10th right foot, posterior view.

C. 10th right foot, diagram.

The lettering is identical in the three figures.

a = dorsal cirrus; *b* = ventral cirrus; *c* = dorsal ligule; *d* = median ligule; *e* = ventral ligule; *f* = dorsal fillet; *g* = ventral fillet; *h* = dorsal spine; *k* = ventral spine.

= Homogomph setae with elongate tips; o = Heterogomph setae with elongate tips; × = Heterogomph setae with falcate tips.

the dorsal division, and in the upper posterior part of the ventral division. Heterogomph setae with elongate terminal pieces (plate XIX, fig. 2H) occur in the lower posterior part of the ventral division. Heterogomph setae with short falcate terminal pieces (plate XXI, fig. 7K) occur in two groups on the anterior side of the ventral division, one group above, and the other below, the spine.

Variations from this typical structure take the form either of reduction of the number of lobes on the one hand, or on the other of increased complexity due to branching. The condition of the various genera may be passed in review.

In *Lycastis* the foot is very simple, consisting only of dorsal and ventral cirri and the setigerous divisions. This simplicity is probably not primitive, but derived, as

the dorsal setigerous division is to be found in various stages of reduction. In *Micronereis* the foot has not yet been adequately described, but appears to consist of dorsal and ventral cirri, ligules, and setigerous divisions, the median ligule being absent.

In *Dendronereis* the foot appears to be normal, except that in some anterior segments the dorsal and ventral fillets project in a large and variable number of lobes. In *Dendronereides* the ventral ligule is absent. In some anterior segments the dorsal ligule is richly branched. In the posterior parapodia only dorsal and ventral cirri and median ligule are present. In *Tylonereis* the median ligule is apparently absent, but it may be represented in the anterior segments by the retractile lobe, and in the posterior segments by the lower lobe of the dorsal setigerous division. *Ceratocephala*, Malmgren, with which I am not acquainted, seems to be very abnormal. Judging from Malmgren's figures, it has a dorsal cirrus, a bifid ventral cirrus, a ventral ligule, dorsal and ventral setigerous divisions, and a lobe near the dorsal setae, which may be either the dorsal or median ligule. *Tylorrhynchus*, Grube, has dorsal and median ligules but no ventral ligule. The remaining genera of the family, comprising *Leptonereis*, *Leonnates*, *Nereis*, *Perinereis*, *Platynereis*, and *Cheilonereis*, have parapodia of typical structure.

Lycastis indica, sp. nov.

(Plate XIX, figs. 2A–J, and text-figs. 2 *a–d*.)

This species was taken in three different localities. It was not found in the Chilka Lake.

The five specimens from the Beliaghatta Canal are small, and the largest is incomplete. It is 26 mm. long, and consists of the head and 120 setigerous segments. Probably the perfect individual had at least 200 segments. The smallest specimen, 8 mm. long, has 40 setigerous segments. The specimen from the Cochin Backwater differs slightly from the others, and is described below. The specimen selected for the examination of the feet, from the Beliaghatta Canal, was complete, 16 mm. long, having 115 setigerous segments.

The dorsum is pale reddish brown in the anterior region, and the pigment increases in density and redness towards the tail. The ventral surface is colourless and deeply grooved.

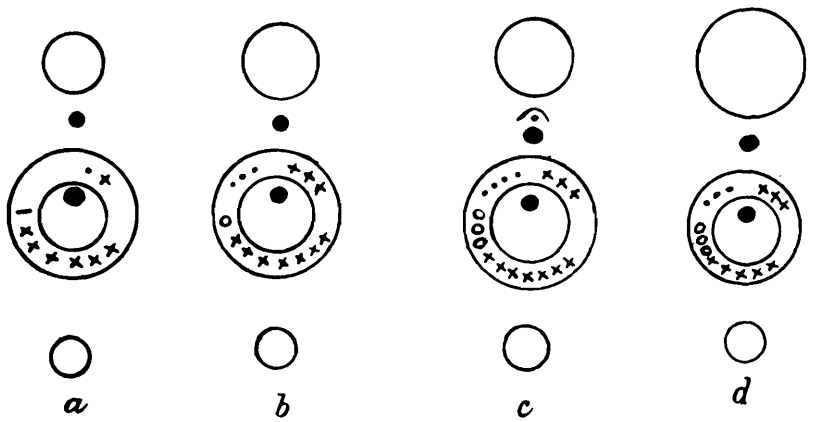
The head is thickly speckled with dark reddish brown pigment, except in the median groove and the posterior median part, where it is colourless. The bases of the tentacular cirri are pigmented, the remainder being colourless. The head (fig. 2A) is much broader than long, with two short tentacles in front. In the anterior median region there is a deep groove which widens to form a pit on the middle of the head. The eyes are on the posterior margin, almost in a straight line, and are provided with lenses. The palps are short, thick and stumpy, and the tentacular cirri are also rather short. The jaws are short, with 9 teeth. The everted proboscis has neither papillae nor paragnaths.

The buccal segment is rather narrower than the succeeding ones.

The feet increase in size up to the 7th pair. The two anterior feet differ from those of most species of the Nereidae in having a dorsal spine present.

The 1st foot (fig. 2B and text-fig. 2*a*) has a short stumpy dorsal cirrus, jointed at the base, and is shorter than the finger-shaped ventral cirrus. The setigerous lobe is broad and truncated, with a papilliform retractile tip. The dorsal division is only represented by a black spine. The ventral setae are in two groups, one above and one below the spine. The upper group, emerging from the front of the foot, consists of two setae, one a short falcate heterogomph (fig. 2F), the other a hemigomph with a long finely serrated terminal piece (fig. 2G). The lower group consists of heterogomphs, the upper posterior one having a long finely serrated terminal piece, the others short falcate tips.

In the 2nd foot the dorsal cirrus is larger than the ventral. The upper group of



TEXT-FIG. 2.—Parapodial diagrams of *Lycastis indica*, sp. nov.

a. 1st foot of specimen from the Beliaghatta Canal.
b. 10th ,, ,, ,, ,, ,, ,,
c. 10th ,, ,, ,, ,, Cochin Backwater.
d. 70th ,, ,, ,, ,, Beliaghatta Canal.

= Hemigomph setae with long finely serrated tips; x = Heterogomph setae with falcate tips; – = Heterogomph setae with finely serrated tips; o = Heterogomph setae with coarsely serrated tips.

setae consists of two hemigomphs with long finely serrated tips, and two falcate heterogomphs. The 3rd foot is similar, the dorsal cirrus being a little larger.

In the 10th foot (fig. 2C and text-fig. 2*b*) the upper group consists of three anterior falcate heterogomphs and three posterior hemigomphs with finely serrated tips. In the lower group the upper posterior seta is a heterogomph with a long tip which has very coarse serrations on its lower edge (fig. 2H). This has replaced the finely serrated heterogomph of the anterior segments. Beneath it are 4-7 falcate heterogomphs. The dorsal cirrus is jointed, with a cylindrical base, and the apparent increase in size of the dorsal cirrus in this and the succeeding segments is due to the enlargement of the base, which carries the dorsal cirrus at its tip.

In the succeeding feet there is little alteration, except as regards the gradual enlargement of the base of the dorsal cirrus (figs. 2D, 2E and text-fig. 2*d*). This enlargement is greatly accentuated about the 60th foot. In the posterior segments

it attains a relatively enormous size, and its length exceeds the width of the body. It is traversed by three main blood-vessels, which give off numerous capillaries lying beneath the cuticle. The dorsal spine emerges in a small papilla. In the posterior feet the spines are only black near the tip. The falcate heterogomphs in the upper group have rather longer and more spinous tips than those in the lower group. There may be as many as three heterogomphs with coarsely serrated tips in the posterior part of the lower group. The setae are fewer in the posterior segments.

The anal segment is button-shaped, with very bright and conspicuous streaks of reddish brown pigment. The anal cirri are as long as the posterior dorsal tentacular cirri.

The single specimen from the Cochin Backwater is 30 mm. long, consisting of 150 setigerous segments. The head, bases of the tentacular cirri, and anterior dorsum are bright rusty red in colour. The middle region is reddish brown, and the posterior region is bright red, especially in the lateral intersegmental areas. The anal segment is bright reddish brown. The tentacular cirri, feet, and ventral surface are colourless, except near the tail, where the ventral surface is pale reddish brown. The colour is due to granular pigment in the skin.

The most striking difference in the feet of this specimen is the presence, with the dorsal spine of the 10th to about the 60th foot, of a single slender hemigomph with a long finely serrated tip (fig. 2J). The arrangement of the setae in the 10th foot is shown in text-fig. 2*c*. The dorsal seta is guarded by a small fillet.

The specimen from Garia, Lower Bengal, is in bad condition, but resembles this form in having a single hemigomph in the dorsal division of the foot.

The head is similar in all the specimens, except that the tentacles and tentacular cirri are shorter in the Cochin specimen. All were immature.

This species is closely related to the *Lycastis hawaiiensis*, first described by Johnson (1903, p. 210) whose specimens were found in a spring near Honolulu, Hawaii. It was afterwards described by Horst (1909, p. 1), from specimens found in a fresh-water pond in the Botanical Garden at Buitenzorg, Java. The *Lycastis indica* differs from that species, as described by Johnson and Horst, in the following characters :— (1) the groove in the head ends in a pit, and does not run to the posterior border; (2) the eyes are almost in a line and are provided with lenses. According to Johnson, in the type the external pair are slightly in front of the internal pair, and have no lenses; (3) in the presence of much reddish brown pigment. Johnson says that the only pigment present in his specimens was in the yellow tips of the posterior dorsal tentacular cirri. Horst says: "The body of the preserved worms is quite colourless, except the underside of the head and of two or three anterior segments, having a yellowish hue.. .During life the worms appear to be flesh-coloured, due to the blood of the peripheral vascular system shining through the skin." (4) The arrangement and structure of the setae differ considerably. Neither Johnson nor Horst mentions the occurrence of the heterogomph setae with the long coarsely serrated tips. According to Johnson, the setae are in two groups, the group above the spine consisting of two or three moderately heterogomph setae (similar to the

hemigomphs shown in fig. 26), the lower group consisting of a number of falcate heterogomphs, the lower ones having shorter tips than the upper ones. Horst's description is substantially similar. Thus the present species differs from *L. hawaiiensis* in having falcate heterogomphs above the spine, and heterogomphs with long coarsely serrated tips below the spine. Horst found in the dorsal lobe of the 41st foot of one specimen "a faintly developed setose bristle."

In the present state of our knowledge of the genus *Lycastis*, this form has as much claim to specific rank as any of the previously described species. Sufficient attention has not been given to the precise arrangement and structure of the setae. On the other hand, too much significance has been attached to slight differences in the arrangement of the eyes.

The following six species of *Lycastis*, characterised by the great enlargement of the posterior dorsal cirri, have been described :—

L. brevicornis, Audouin and Milne-Edwards. Noirmoutiers (France). Marine.

L. abiuma, Grube. Desterro, Brazil. Marine.

L. senegalensis, de Saint-Joseph. Marsassoun (100 kilometres from the sea) Senegal, West Africa. Brackish water.

L. ouanaryensis, Gravier. French Guiana. Marine and freshwater.

L. Geayi, Gravier. French Guiana. Freshwater.

L. hawaiiensis, Johnson. Hawaii and Java. Freshwater.

L. Geayi is sufficiently characterised by the complete absence of falcate setae. In *L. brevicornis*, *L. abiuma*, *L. senegalensis*, and *L. hawaiiensis*, the heterogomph setae with coarsely serrated tips have not been described. There remains *L. ouanaryensis*, which was found both in the sea and in freshwater in French Guiana, on the north-east coast of South America. The similarities between this species and *L. indica* are very striking. The setae are very similar in arrangement, and the ventral division of the middle and posterior feet contains heterogomph setae with slender coarsely serrated tips, exactly as in *L. indica*. The anterior part of the body is rose coloured, the posterior green. The very slight distinctions between the two forms are as follows :—In Gravier's species (1) the longitudinal median groove on the head runs back to the buccal segment; (2) the eyes are devoid of lenses; (3) the tentacular cirri are shorter than in *L. indica*; (4) the jaws have six teeth, as against nine in *L. indica*; (5) the dorsal cirri of the posterior segments are longer than in *L. indica*; (6) the dorsal division of the foot contains 2 or 3 setae, and the falcate setae have tips of rather different shape.

L. indica is intermediate between *L. hawaiiensis* and *L. ouanaryensis* as regards the setae. It agrees with the former in the great reduction of the dorsal division of the foot, and with the latter in the presence of the coarsely serrated heterogomph setae.

Habitat. This species was obtained from the three following localities :—

In rotting cocoa-nut shell floating in the Beliaghatta Canal, near Calcutta, 26. viii. '09. Water slightly brackish. In the same tube was a specimen of the freshwater Oligochaete, *Branchiura sowerbyi*, Beddard.

Garia, near Calcutta, burrowing in mud.

The Cochin Backwater, near Ernakulam, in the Madras Presidency, September 1914.

In the two former localities the salinity of the water is very variable, but never high, probably never exceeding 1·015 at 15°C. The Cochin Backwater has also water of very variable salinity, but precise information regarding it is not available. It is part of a system connected both with the sea and with large freshwater lakes.

Tylonereis fauveli, sp. nov.

(Plate XIX, figs. 3A–J, and text-figs. 3*a–c*.)

Two complete specimens and fragments of four individuals of this species are available for examination.

The preserved specimens have retained very little pigment. The dorsum is pale yellowish brown, and the head is faintly marked as shown in fig. 3A. The anal segment (fig. 3B) is, however, of a conspicuously bright red colour.

The body is slender, and rather more delicate and transparent than is usual in the Nereidae. Of the two complete specimens, both of which are immature, one is 95 mm. long, composed of 200 segments, the other is 55 mm. long, with 150 fully formed segments and a number of developing segments at the posterior end. Several of the fragments apparently belong to larger specimens than either of these.

The head (fig. 3A) is rounded at the angles, divided into two lobes in front by a shallow indentation. The width of the posterior part slightly exceeds the length. The eyes are black, and the posterior pair are larger and closer together than the anterior pair. All are provided with lenses. The tentacles and palps are normal. The tentacular cirri are rather short, the anterior dorsal being two-thirds of the length of the posterior dorsal cirri, and a little longer than the posterior ventral cirri. The peristomial segment is only a little longer than the succeeding segments, and like them is grooved in the lateral regions.

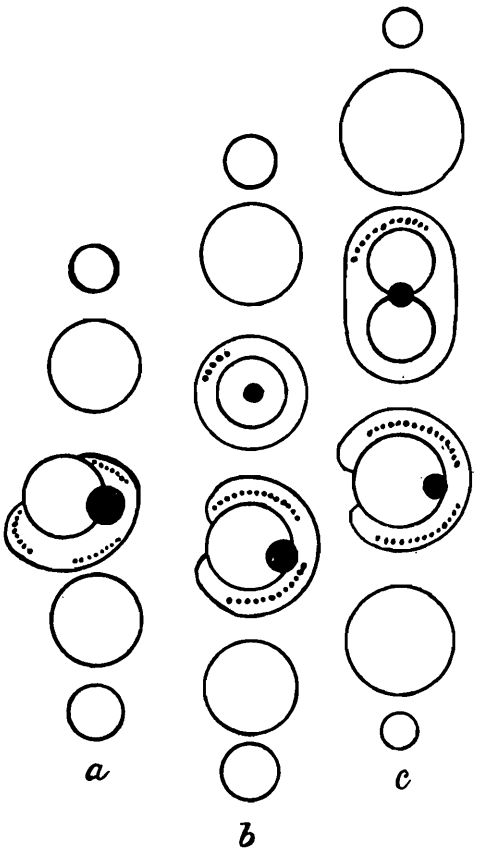
The proboscis was not everted in any of the specimens, and its condition could only be observed by dissection. No horny paragnaths are present, but two large papillae were seen on the dorsal surface of the basal ring, that is to say, one in each Group VI. An interrupted row of smaller papillae was seen on the ventral side of the maxillary ring, in Group IV. None could be seen in Groups V, VII or VIII, but they may be present, as it is difficult to observe the soft papillae in dissected specimens. The jaws are small and slender, pale except at the tip, with 12 teeth.

The feet increase in size up to the 6th pair. In the 1st and 2nd feet the dorsal setigerous division is absent.

The 1st foot (fig. 3C and text-fig. 3*a*) is relatively small. The dorsal cirrus is a little longer than the dorsal ligule. The ventral setigerous lobe is somewhat fusiform, and its base is enveloped on its anterior and ventral sides by a prominent fillet, which in side view resembles an additional lobe, and gives a bifid appearance to the setigerous lobe. In *T bogoyawlensky* Fauvel represents the setigerous lobe as terminating in three lobes (1911, Pl. XIX, fig. 2). The setae are in three groups,

two anterior, above and below the spine, and a posterior ventral group. They are all homogomphs, with slender finely serrated terminal pieces, those in the lower anterior group having shorter tips than the rest. The 2nd foot resembles the 1st, except that it is a little larger, the lobes are larger, and the setae more numerous.

In the 7th foot (fig. 3D, and text-fig. 3*b*) the dorsal cirrus is relatively smaller. The dorsal ligule is larger and flatter, pointed at the tip, and filled with glands. The dorsal setigerous lobe is long and cylindrical, rounded at the tip, and its base is surrounded by a sheath or fillet, within which it can be retracted by powerful muscles. It is penetrated almost to the end by the dorsal spine, the tip of which is surrounded by a sheath of columnar cells. There are three to five setae in the dorsal division. The ventral setigerous division remains as in the 1st foot, except that the setae are more numerous, and apparently only in two groups, and the ventral ligule is relatively thinner.



TEXT-FIG. 3.—Parapodial diagrams of *Tylonereis fauveli*, sp. nov.
a. 1st foot. *b*. 7th foot. *c*. 30th foot.
= Homogomph setae with spinose tips.

The 15th foot differs from the 7th only in having the dorsal and ventral cirri somewhat smaller, the dorsal ligule rather larger and flatter, and the lobes of the ventral setigerous division thinner and more elongate. The dorsal division has four setae, the ventral division ten in the upper group, sixteen in the lower group.

At the 22nd foot a slight indentation appears in the tip of the elongate dorsal setigerous lobe, and this gradually deepens till in the 26th or 27th foot the bifid condition shown in fig. 3E is attained. In smaller specimens the change may be complete in the 24th foot. A similar change occurs in *T bogoyawlenskyi*, but according to Fauvel only in the posterior segments, the exact position not being stated.

In the 30th foot (fig. 3E, and text-fig. 3*c*) the dorsal and ventral cirri and the ventral ligule are greatly reduced in size. The dorsal ligule is large and long, pointed at the tip, and full of glands. The dorsal setigerous lobe is deeply bilobed at the tip, the spine lying between the two lobes. Its tip, enclosed in the gland, is shown in fig. 3F. The dorsal setae, eight in number, lie above the two lobes, whereas Fauvel says that in *T bogoyawlenskyi* they emerge between the two lobes. The dorsal setae now differ markedly from those in the ventral division. The

terminal pieces are short, and they taper rapidly to a fine point (fig. 3J). The terminal pieces of the ventral setae are 2-4 times as long, and taper very gradually to the tip. The space between the ventral ligule and the ventral cirrus has greatly increased.

The 70th foot (fig. 3G) is smaller, and the setigerous lobes and fillets are reduced and flattened. The setae in the dorsal division have stouter shafts than those in the ventral division. In the posterior feet (fig. 3H) the two setigerous divisions are more widely separated. In the dorsal setigerous lobe the upper lobe is reduced to a small papilla, but the lower lobe has relatively increased. The ventral fillet is still very obvious, giving a bifid appearance to the ventral division. The dorsal setae have longer tips, which taper more gradually than those in the middle region of the body.

The anal segment (fig. 3B) is bright red in colour. It is button-shaped, and the anus is round and terminal. The ventral anal cirri are short and slender.

The dorsal setae are all pure homogomphs, but some of the ventral setae show a tendency towards the hemigomph condition, the enlarged cup-shaped tip of the shaft having a process on one side, of variable size.

This species is very closely related to the *T bogoyawlenskyi* described by Fauvel (1911, p. 376) from a single specimen collected in the Persian Gulf, for which he created the genus *Tylonereis*. This genus is characterised by the presence of soft papillae only on the proboscis, by the structure of the dorsal setigerous division of the feet, and by having setae of one type only. *T bogoyawlenskyi* differs from the present species chiefly by the trilobed condition of the ventral setigerous lobe in the anterior feet. Other minor characters distinguishing the present species are the shape of the head and tentacular cirri, the red anal segment, the shape of the setae, and the proportions of the various parts of the feet. The change in the condition of the dorsal setigerous lobe apparently occurs in a more anterior position in *T fauveli*. According to Fauvel there is no difference between the dorsal and ventral setae. A noteworthy character of the two species of *Tylonereis* is the apparent absence of the median ligule of the foot. Possibly, however, it may be represented in the anterior segments by the retractile lobe, and in the posterior segments by the lower lobe of the dorsal setigerous division.

Habitat.—This species was taken on two occasions, in the Chilka Lake, both times in the outer channel. It was taken in September, when the water was quite fresh, and in March, when the specific gravity was 1·0265, showing that it can withstand the full rigours of the violent seasonal alternation of conditions in the outer channel.

Nereis (Nereis) chilkaënsis, sp. nov.

(Plate XXII, figs. 8A–R, and text-figs. 4*a–c*.)

This species was found in great abundance in the southern half of the Chilka Lake. It is evidently quite at home there, for both immature and heteronereid stages were found.

The largest specimen is 92 mm. long, and has 81 setigerous segments. Others are 65, 56 and 44 mm. in length, with 84, 66 and 81 segments.

The dorsum is deeply coloured with purplish brown pigment, dark in front, and growing paler behind. The ventral surface is colourless. The head (figs. 8A, 8B) is deeply coloured, with a median pale streak which broadens out between the eyes. The palps are more faintly coloured. The basal part of the proboscis is tinged with the purple pigment. The bases only of the tentacular cirri are deeply coloured. The first few segments have the dorsum pigmented all over, except for a few pale oblique lateral grooves. Further behind, the pigment forms a definite pattern on each segment (fig. 8D). The central part becomes paler, leaving a dark band on each side, separated from the central part by a narrow pale band. The intersegmental areas are pale. In the anterior segments the base of each foot is pigmented, but in the middle and posterior regions the feet are colourless. The pigment is not uniformly diffused, but is more or less granular, especially in the dark lateral bands.

The head (fig. 8A) is considerably narrower in front than it is behind, and the length is about equal to the greatest width. It projects a little in front between the tentacles, which are $\frac{1}{3}$rd to $\frac{1}{4}$th as long as the head. In small specimens the palps are separated from the head by grooves, but in large specimens these grooves become indistinct. The palps are large and stout. The eyes, in immature individuals, are small and dark, equal in size, the anterior pair being a little further apart than the posterior pair. The tentacular cirri have dark ringed ceratophores. The posterior dorsal pair are much longer than the others, reaching back usually to the middle of the 6th setigerous segment, in some cases to the 8th and even the 12th segment. The anterior dorsal tentacular cirri are one-half to two-thirds as long. The ventral cirri are approximately equal in length, being half the length of the 1st dorsal cirri. These sizes and proportions are subject to great variations.

The paragnaths have the normal form and arrangement for the subgenus. Those on the basal ring are longer than those on the maxillary ring. They are arranged as follows :—

Group I, 6–10, usually 7 or 8.
„ II, 18–20.
„ III, 26–34, usually 28.
„ IV, 35–41, varying greatly.
Group V, absent.
„ VI, 3–5 usually 4, larger than the others, in a curved row.
„ VII and VIII, forming a continuous band in two rows.

The paragnaths of the anterior row in Groups VII and VIII are large; those forming the posterior row are more numerous and of different sizes.

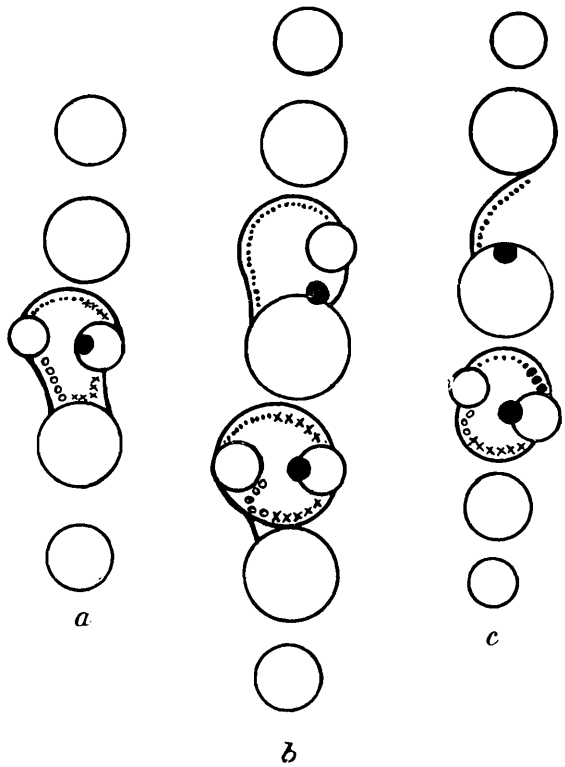
The jaws are of the usual shape, with eight teeth.

The peristomium (fig. 8B) is nearly twice as broad as the succeeding segments. In fig. 8A it is crushed by the extruded proboscis.

The feet were examined in a specimen 56 mm. long, having 66 setigerous segments.

The feet increase in size up to the 6th or 7th.

The 1st foot (fig. 8E, and text-fig. 4*a*) contains only the ventral setigerous division. The dorsal and ventral cirri are long and slender. The median (?) and ventral ligules are stout and conical. The ventral setigerous region consists of a fillet forming a dome over the setae. The fillet is produced outwards into two conical lobes, one in front of, and one behind the setae, and its lower edges are attached to the ventral ligule. The spine pierces the anterior lobe of the fillet. In some specimens there are two ventral spines. The setae are in three groups, a dorsal group consisting of a single row with falcate heterogomphs in front, long-tipped (spinose) homogomphs behind, and two ventral groups, an anterior group of falcate heterogomphs, and a posterior group of spinose heterogomphs. The 2nd foot is similar. The dorsal division appears in the 3rd foot.



TEXT-FIG. 4.—Parapodial diagrams of *Nereis chilkaënsis*,sp. nov.

a. 1st foot. *b*. 10th foot. *c*. 50th foot.

= Homogomph setae with long spinous tips; o = Heterogomph setae with long spinous tips; × = Heterogomph setae with long falcate tips; • = Heterogomph setae with thick shafts and tips.

The 10th foot (fig. 8F, and text-fig. 4*b*) exhibits the normal condition. The dorsal cirrus is long, greatly surpassing the dorsal ligule, but the ventral cirrus is small. The dorsal, median, and ventral ligules are large, thick, and bluntly rounded, the dorsal being the largest. In the dorsal division the fillet has a prominent pointed anterior lobe, and a smaller rounded posterior one, and its lower edges are attached to the median lobe, before and behind the spine. The setae are all homogomphs (fig. 8N) with long slender terminal pieces. The ventral division is as in the first foot.

In the succeeding feet the lobes become gradually more elongate and pointed. The dorsal setigerous lobe decreases in size, and fuses more or less completely with the median ligule. The dorsal part of the foot, including the median ligule, increases in size relatively to the ventral part and projects beyond it.

In the 50th foot (fig. 8G and text-fig. 4*c*) the dorsal cirrus is long and slender, the ventral cirrus small and thin. The dorsal and median ligules are large and pointed. The dorsal setigerous lobe is represented by a small swelling, pierced by the spine, on the upper side of the median ligule, and by a small and indistinct fillet guarding the dorsal setae. The ventral ligule is much smaller. The ventral fillet, with its two lobes, is as before, and forms an arch above and below the setae.

In the 63rd foot the dorsal cirrus is 2½ times as long as the dorsal ligule. The dorsal division is relatively still larger and more prominent than the ventral division. The upper group of the ventral division consists only of a single thick falcate heterogomph, the spinose homogomphs having disappeared.

There are four types of setae present in this species, in addition to the modified setae of the Heteronereid phase. In the dorsal division only homogomphs with long tapering spinose tips occur (fig. 8N). In the ventral division, the anterior setae, above and below the spine, are falcate heterogomphs (fig. 8P). They have moderately long terminal pieces, smooth at the tip, spinose below. The posterior setae consist of an upper group of spinose homogomphs, similar to those in the dorsal division, and a lower group of spinose heterogomphs. Between the 20th and 30th feet two or three setae appear in the upper anterior group of falcate heterogomphs of the ventral division, which have shafts rather thicker than those of the other setae. In the subsequent feet these setae increase in thickness, but diminish in number, and in the last few feet, as already stated, the upper ventral group is represented only by a single falcate seta with a shaft three times as thick as that of the normal type of seta. The terminal piece is relatively shorter, with only a few strong spines on the edge (fig. 8Q). The shafts of the falcate setae of the lower group also increase in thickness in the posterior feet, but not to the same extent.

There is considerable variation in this species. In some individuals the tentacular cirri and dorsal cirri are much longer than usual (fig. 8B).

The terminal pieces of the very thick ventral falcate setae have sometimes only three or four spines, and rounded tips, as in fig. 8Q, but in other specimens they may have ten or twelve spines, and pointed tips. This character doubtless depends on the amount of wear they have undergone. The eyes vary considerably in size, as do the paragnaths, and the intensity of the epidermal pigment. Some or all of these characters may be associated with approaching change to the Heteronereid condition.

Three specimens of this species were taken which had, in varying degrees, assumed the Heteronereid condition. The more advanced of the two female specimens was selected for examination. It is 40 mm. long, with 63 setigerous segments. The colour of the dorsum is much deeper than that of the immature individuals, and the eyes are much larger, but not connate. The paragnaths on the basal segment of the proboscis are larger than usual. The anterior 18 pairs of feet show no change. In the 19th foot the ventral cirrus shows indications of a small ventral lobe near the base. The 20th foot has a few of the characteristic swimming setae in both divisions of the foot, and the basal lobe of the ventral cirrus is well developed. The setigerous lobes and their fillets are enlarged.

In the 25th foot (fig. 8J) the dorsal cirrus remains unchanged. The ventral cirrus has a large ventral and a small dorsal wing near the base. The three ligules are elongate and pointed. The two lobes of the ventral setigerous division are enlarged and flattened, and the posterior one has two flat wings. The setae are mostly of the natatory type, but a few of the old setae remain. In the 30th foot the flattening of the various lobes is more obvious. In the 40th foot (fig. 8K) the dorsal cirrus has a

small flat wing above its base, and the wings of the ventral cirrus are larger. The posterior lobe of the dorsal fillet is greatly enlarged, displacing by its growth the median ligule. The ventral setigerous lobes are also greatly enlarged and flattened, and the ventral ligule is directed downwards. The 58th foot is much the same, but it is smaller, and has a larger proportion of the normal setae.

The eggs escape from the body cavity through the tips of papillae on the ventral surface near the base of the feet. The swimming setae (fig. 8R) are modified homogomphs. They are very transparent. The end of the shaft is cup-shaped, with an anterior spinous projection. The blade, which is minutely serrate, increases in width to near the tip, and then narrows suddenly to a sharp point.

The two female Heteronereids were found under stones on the shore. Another Heteronereid was taken on the surface of the lake, where it was gyrating in a spiral course. It is a fully developed Heteronereid, but the sexual products have been completely extruded. It is probably a male, as it differs in several important points from the specimen just described. It is small in size, being only 16 mm. long, but it consists of 72 setigerous segments. The eyes are very large, and the head is deeply pigmented, the white patch, which occurs in all other specimens, being absent. The anterior end of the body is dorsally very deeply coloured with metallic brown pigment, and is without the characteristic pattern. The tentacular cirri are unusually long.

The anterior 19 pairs of feet are unmodified, except that the 19th has a single swimming seta in the dorsal division, and that the dorsal setigerous division is in all the feet fused with the median ligule (fig. 8L). In the 20th foot the lobes are not altered, but the dorsal division contains only swimming setae, and a few of these are also in the ventral division. The only unchanged setae are the two thick falcate heterogomphs of the upper ventral group. In the 25th foot only one thick falcate seta remains. The setigerous lobes are enlarged and flattened, and the ventral cirrus has basal wings. In the 30th foot (fig. 8M) the median ligule, to which the dorsal setigerous lobe is fused, is enlarged and flattened. The ventral setigerous lobes are also flattened, the anterior one being large and foliate. The 18 posterior feet are not modified, and have only normal setae. The dorsal cirrus is very long, and the ventral cirrus has increased and projects beyond the ventral ligule. The spines are very thick and dark.

A specimen taken on the shore seems to represent a stage in the development of the last described form. It is a slender worm, 22 mm. long, with 62 setigerous segments. The body cavity is full of sperm morulae in an early stage of development. The head of this specimen is shown in fig. 8B. It has very large eyes, and the tentacular cirri are unusually long. In both these points it resembles the male *Heteronereis*. The colour, however, is normal. The most exceptional character of this specimen is that in a few of the posterior feet the dorsal ligule decreases very much in size (fig. 8H), a character noted in no other individual of this species. The jaws of this specimen have 10 teeth.

It is remarkable that all the partially or completely metamorphosed Hetero-

nereids are smaller than the average immature individual in the collection, though they have the normal number of segments. The two female Heteronereids were taken in January and February, the small immature male in February, and the spent male in November, so that the period of sexual maturity is evidently prolonged. The specific gravity of the water at these four stations varied only from 1·006–1·009.

Habitat.— This species was found at 15 stations, all south of a line drawn from Nalbano to Patsahanipur. Twice it was found in November, and on thirteen occasions in January to March. In this part of the lake, however, the season makes little difference in the specific gravity of the water, which ranged at the various stations from 1·002–1·011. The habitat of this species varies widely. It was often found in sponges, both *Spongilla* and *Laxosuberites*. It also lives under stones on the shore, amongst algae on the rocks, and in sand above and below high-water mark.

Nereis (Nereis) glandicincta, sp. nov.

(Plate XXIII, figs. 9A–L, and text-figs. 5*a–e*.)

This species was taken at four localities near Calcutta, in brackish lakes or pools. Twenty-six specimens are available, most of them approaching a state of maturity.

The preserved specimens are pale buff brown. Running transversely across the dorsal and ventral surface of each segment is a very conspicuous row of dark glands. The glands are continued into the feet, and are especially prominent in the dorsal ligule. They occur to a lesser degree in the median and ventral ligules and the base of the ventral cirrus, but are not found in the dorsal and ventral cirri nor in the setigerous lobes. There is usually a band of glands on the median dorsal area of the peristomium. There is considerable variation in the number of glands in each row. Sometimes they are absent from the median dorsal and ventral areas, and in other specimens they form complete and very thick bands round each segment. The specific name is derived from this character. The dorsal vessel shows very distinctly. The ventral surface is slightly grooved, and the nerve-cord shows as a pale line.

The type-specimen is 88 mm. long, and comprises 123 setigerous segments. It is a female, full of eggs, but shows no sign of assuming the Heteronereis condition.

In all the specimens which have the pharynx extruded, the peristomium is large, oval, and greatly inflated. Even when the pharynx is retracted, the peristomium is large, bulging out at the sides and in front of the head.

The head (fig. 9A) is narrow in front, wide behind, where the width exceeds the length. In front are the two short tentacles. The posterior angles are rounded. The eyes vary considerably in size in the different specimens, probably owing to the approaching condition of sexual maturity. They are provided with lenses. The pigmentation of the head also varies. In some specimens there is a conspicuous band on each side of the anterior part, reaching from the base of the tentacles to the front eyes. In others there are only two oval patches of pigment between the posterior pair of eyes. Others have two short lateral and a narrow median band as

in fig. 9A. The palps are very large and flat. The posterior dorsal tentacular cirri are twice as long as the anterior dorsal pair, and reach back to the 3rd setigerous segment.

The armature of the pharynx (figs. 9A, 9B) is of considerable interest. The maxillary ring has its full complement of teeth, but the basal ring is greatly reduced. The arrangement is as follows:—

Group I,	10 scattered unequal teeth.	Group V,	absent.
„ II,	10–13 large curved teeth.	„ VI,	one small tooth.
„ III,	transversely elongated band of 50 teeth, in 4 rows.	„ VII, VIII,	a single row of 7 minute teeth.
„ IV,	10–12 large teeth.		

In group III the two middle rows of teeth are larger than those in the outer rows. All the teeth on the maxillary ring are of the normal size and conical shape. On the basal ring, however, they are rudimentary. Dorsally there are two small pale paragnaths seated on rounded papillae (figs. 9A, 9C). Ventrally there is a single row of 7 similar minute paragnaths. In two other specimens there were only 3 and 4 paragnaths respectively in the ventral row. These rudimentary paragnaths easily fall off, and consequently some or all of them are frequently missing. The condition of things characteristic of the sub-genus *Ceratonereis* is thus attained. The two dorsal papillae can always be distinguished, even when the paragnaths have fallen off.

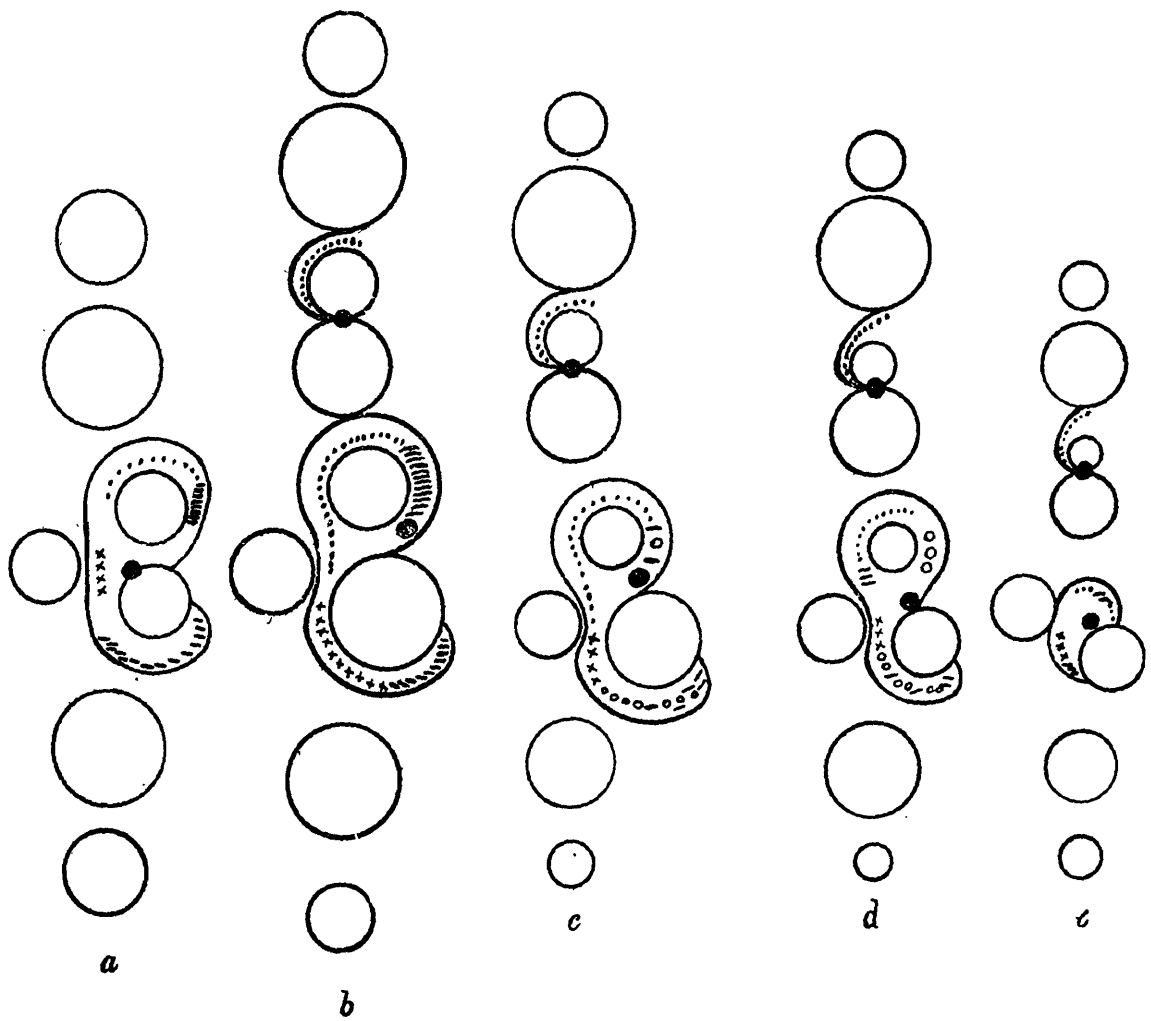
The jaws (fig. 9D) are slender, and have 15–16 teeth, an unusually large number. In a specimen from the Salt Lake at Dhappa, however, there are only 10 teeth on each jaw.

The feet gradually increase in size up to the 8th. The 1st foot (fig. 9E, and text-fig. 5*a*) has pointed dorsal and ventral cirri, equal in size and shorter than the adjacent ligules. The latter are stout pointed lobes. The ventral division consists of three slender lobes, two in front more or less completely surrounded by the fillet and setae, the third behind the setae. The edges of the fillet are attached to the lower anterior lobe. The setae are of three types. Above the spine there is a group consisting in front of hemigomphs with rather short coarsely serrate tips, behind of homogomphs with long slender finely serrate tips (fig. 9J). Below the spine the anterior and ventral group consists of hemigomphs as in the anterior dorsal group. Behind the spine is a group of hemigomphs with long finely serrate tips. The anterior hemigomphs with coarsely serrate tips resemble those shown in fig. 9K, except that the tips are shorter.

The 2nd foot resembles the 1st, except that it is larger and more glandular. In the 3rd foot the dorsal division appears. It is deeply bifid, with a few slender homogomphs. The 10th foot (fig. 9F, and text-fig. 5*b*) has small clavate dorsal and ventral cirri, much smaller than the adjacent ligules. The dorsal ligule is pointed and triangular in shape, richly supplied with glands. The dorsal setigerous division consists of a slender lobe lying in front of the dorsal setae The latter are homogomphs (fig. 9J)

with long finely serrate tips. They are guarded behind by a fillet which is attached to the dorsal and median ligules.

The tip of the spine, which is curved and enclosed in a sheath of gland cells, lies between the median ligule and the dorsal setigerous lobe. The ventral division resembles that of the 1st foot, except that the setae are much more numerous, forming a continuous row. At the 18th foot a number of falcate hemigomphs appear in the



TEXT-FIG. 5.—Parapodial diagrams of *Nereis glandicincta*, sp. nov.

a. 1st foot. *b*. 10th foot. *c*. 30th foot. *d*. 50th foot. *e*. 100th foot.

= Homogomph setae with long finely serrated tips ; — = Hemigomph setae with short coarsely serrated tips ; × = Hemigomph setae with long slender finely serrated tips ; o = Hemigomph setae with falcate tips.

ventral division. The 20th foot is very like the 10th in shape. The median ligule is relatively larger.

In the 30th foot (text-fig. 5*c*) the dorsal and ventral cirri, and the dorsal and ventral setigerous lobes have decreased relatively in size, whilst the dorsal, median and ventral ligules have increased. In the ventral setigerous lobe, as compared with the 10th foot, the setae are fewer and some of the hemigomphs with short coarsely serrate

tips have been replaced by falcate hemigomphs (fig. 9L) especially in the lowest group. These setae have very elongate spinous tips, and the point is boldly curved.

In the 50th foot (fig. 9G, and text-fig. 5*d*) there is no marked change in the dorsal division. In the ventral division the upper anterior group of setae are all falcate hemigomphs. A few hemigomphs with short coarsely serrate pointed tips appear in the posterior row behind the spine.

In the 60th foot the two anterior lobes of the ventral division are smaller, and the setae are fewer in number. The falcate hemigomphs have disappeared and are not present in the succeeding feet. In the 80th foot the upper anterior lobe of the ventral division is reduced to a small papilla, scarcely visible. In the 90th foot it has quite disappeared.

In the 100th foot (fig. 9H, and text-fig. 5*e*) all the foot lobes are slender and sharply pointed.

In the last few segments the dorsal cirrus increases in length till it surpasses the dorsal lobe. The dorsal setigerous lobe becomes small and rudimentary. There appear to be no true heterogomph setae in this species, their place being taken by setae having the shafts ending in the intermediate condition which has been termed "hemigomph." There is no sharp distinction to be drawn between these various types, the falcate seta shown in fig. 9L being nearer the true heterogomph condition than the coarsely spinose seta shown in fig. 9K.

The anal segment is conical, the anus forming a terminal slit. The anal cirri are short and slender, a little shorter than the anterior ventral tentacular cirri. There is a ring of reddish brown pigment (or glands) round the middle of the anal segment.

In a number of the specimens, the body cavity was full of eggs, but no indication of change to the Heteronereis condition was observed. This species is characterised by the armature of the proboscis, the structure of the feet, and the shape and arrangement of the setae, especially by the absence of falcate setae from the anterior and posterior segments. The girdle of glands on each segment is also very characteristic. *Nereis kerguelensis*, McIntosh, has some points of resemblance to this species but is otherwise not closely related to it. Of greater interest is a comparison with *Nereis reducta* (p. 593). In both species the paragnaths of the basal ring are greatly reduced in size and number, so as to be almost rudimentary. The dorsal setigerous division in *N. glandicincta*, though small, is much more developed than that of *N. reducta*. In both species the dorsal and ventral cirri are short, but *N. glandicincta* has a prominent dorsal ligule, whilst that of *N. reducta* is small in the anterior and posterior segments. In *N. reducta* the spinous heterogomph setae are absent in the anterior segments, and only in small numbers elsewhere, whilst in *N. glandicincta* it is the falcate setae which are absent from the anterior and posterior segments. These resemblances indicate no close affinity, but are probably due to convergence. They are mostly of a negative character, and may be due to modification fitting for life in brackish or freshwater. It is significant that *Lycastis*, the genus found most frequently in fresh and brackish water, shows great simplicity in the structure of the foot, little variety in the shape of the setae, and has no paragnaths on the proboscis.

Habitat.—Twenty-six specimens were found in the four following localities:—

Salt lake, Barantolla near Calcutta. Netted in 5–6 feet.

Brackish pools near the Salt lake, Barantolla, November 1913.

From mud in a ditch containing brackish water, at the edge of a salt lake at Dhappa, near Calcutta, January 1911.

Burrowing in mud at Garia, Lower Bengal.

These localities are all within 10 miles of Calcutta. The specific gravity of the **water** in which the specimens were found is very variable but never high, probably **never** exceeding 1·015.

Nereis (Nereis) reducta, sp. nov.

(Plate XXI, figs. 7A–7K, and text-figs. 6*a–d*.)

Only a single specimen of this species was obtained, about one mile inside the **mouth** of the Chilka Lake. The body is 50 mm. long, and is composed of 96 setigerous **segments**. It is relatively narrow, and the ventral surface is grooved. The **segments** are three times as wide as long in the anterior region, but the length **increases** and the width decreases till they are less than twice as wide as long. The **body** does not taper very much towards the posterior end. The head and dorsal **surface** of the anterior segments are pale brown in colour; the rest of the body is **colourless**.

The head (fig. 7A) is narrow in front, broad behind, and the length slightly **exceeds** the width. The eyes are small and distinct, with lenses. The palps are **large** and pointed. The tentacular cirri are rather short, the posterior dorsal pair **being** a little longer than the anterior dorsal.

The proboscis of the unique specimen is fortunately fully extruded (figs. 7A, 7B).

The paragnaths are distributed as follows:—

Group	I, A single large paragnath.	Group V, VI,	2 minute paragnaths.
,,	II, 6 paragnaths of varying size.		
,,	III, 11 ,, ,, ,, ,,	,, VII, VIII,	Numerous paragnaths in longitudinal rows.
,,	IV, 8–10 ,, ,, ,, ,,		

The paragnaths of the distal or maxillary segment are of the normal dark conical **type** (fig. 7C). Those of the basal segment are small, flattened, and circular, of a **pale** amber colour (fig. 7D). The dorsal group consists of two paragnaths close **together** in the median line, and may both be in Group V, or one each in Group VI. **They** are very minute, and easily overlooked. The ventral Groups VII and VIII **occupy** a large area, and are composed of numerous longitudinal rows, each containing 4–7 minute paragnaths.

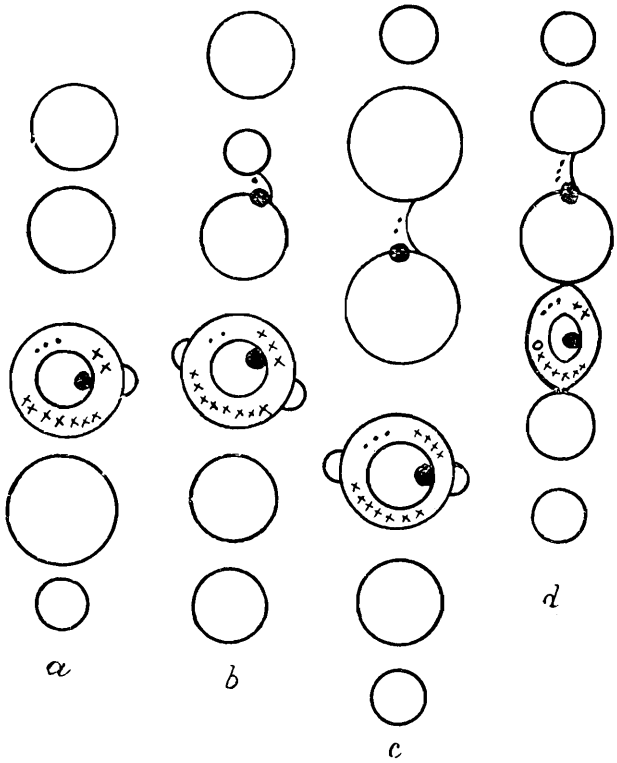
The jaws are provided with 7 or 8 teeth.

The feet gradually increase in size up to the 6th.

The 1st foot (fig. 7E, and text-fig. 6*a*) as usual, is represented by the ventral **division**, the dorsal cirrus and a lobe between them. This latter lobe, as a consideration of figs. 7F, 7F, and 7G clearly shows, represents the median ligule. The dorsal **and** ventral cirri are rather short and finger-shaped, the median and lower ligules

are still a little shorter and thicker. The ventral setigerous division consists of a stout central papilla, pierced at the tip by a spine, and surrounded by a stout fillet, which has an entire margin behind, but projects in front, forming a small lobe. The upper group of setae consist of 3 spinous homogomphs behind, and 2 falcate heterogomphs in front, the lower group of 7 falcate heterogomphs.

The 2nd foot closely resembles the 1st, except that the central papilla of the setigerous lobe is rather larger. In the 3rd foot (fig. 7F, and text-fig. 6*b*) the dorsal division appears. It consists of a small lobe, the rudiment of the dorsal ligule, and a small fillet in front of the spine, and a single spinous homogomph seta. In the ventral division the chief change is that the posterior margin of the fillet is produced into a papilla similar to but smaller than the one on the anterior margin. The setae are unchanged.



TEXT-FIG. 6.—Parapodial diagrams of *Nereis reducta*, sp. nov.

a. 1st foot. *b*. 3rd foot. *c*. 10th foot. *d*. 60th foot.

= Homogomph setae with long tips ; × = Heterogomph setae with falcate tip ; o = Heterogomph setae with long tips.

In the 10th foot (fig. 7G, and text-fig. 6*c*) the normal condition is shown. The dorsal and ventral cirri are relatively much smaller, whilst the upper and median ligules are considerably enlarged, especially the former. The dorsal setigerous division contains two spinous homogomphs, the ventral division showing little change in the setae. The dorsal ligule gradually increases in size from the 3rd to about the 23rd foot, and attains a size equal to that of the median ligule.

The 30th foot is much the same. The papillae on the fillet of the ventral division are not so prominent, and the margin is more vertical. The dorsal ligule has now begun to decrease again slightly. In the upper posterior part of the lower ventral group of setae there is a single spinous heterogomph. In the 40th foot the dorsal ligule is still smaller, and in the 50th foot is just shorter but thicker than the dorsal cirrus.

In the 60th foot (fig. 7H, and text-fig. 6*d*) the dorsal cirrus, dorsal and ventral ligules are about equal in size, the ventral cirrus being smaller. The largest lobe is the median ligule. The dorsal division contains three spinous homogomphs. The ventral setigerous division is flattened from side to side, and the margins of the fillet are rounded, the papillae noted in the anterior segments having disappeared. The

setae have the same arrangement, only a single spinous heterogomph being present. The remaining feet show no change, except that they decrease in size and the setae become fewer in number. The anal segment is button-shaped, with two very short anal cirri, only as long as the segment is wide. The anal segment and cirri are possibly regenerated, as the posterior feet are quite large.

The dorsal homogomphs are slenderer than any of the ventral setae (figs. 7J and 7K). The falcate setae have tips of medium size with spinous edges.

The most interesting characters of this species are those which exhibit a tendency towards degradation from the normal type. These are (1) the insignificance of the paragnaths on the basal segment of the proboscis. In this respect the species is approaching the condition found in the sub-genus *Ceratonereis*, Kinberg, in which the basal segment is devoid of paragnaths; (2) the insignificance of the dorsal setigerous division, indicated by the small number of dorsal setae, and the reduction in size of the dorsal ligule in the anterior and posterior segments; (3) the rarity of the spinous heterogomph setae, which only occur singly in the middle and posterior segments, and are absent from the anterior segments.

According to the classification of de Saint-Joseph (1898, p. 285), based on the structure and arrangement of the paragnaths, this species belongs to the sub-genus *Nereis* of the genus *Nereis*.

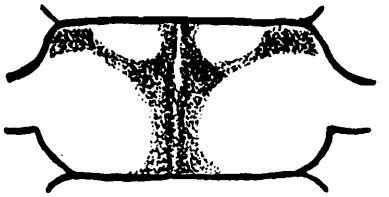
A point of considerable interest, clearly established in this species at any rate, is that the lobe beneath the dorsal cirrus in the 1st and 2nd feet represents the median ligule. A consideration of figs. 7E, 7F, and 7G leaves no room for doubt. The dorsal ligule appears in the 3rd foot as a small lobe.

Habitat.—Only a single specimen of this species was obtained, on the shore about one mile from the mouth of the Chilka Lake. It was taken in September, during the freshwater season, and the water was quite fresh.

Perinereis marjorii, sp. nov.

(Plate XXIII, figs. 10A–G, and text-figs. 7 and 8*a–c*.)

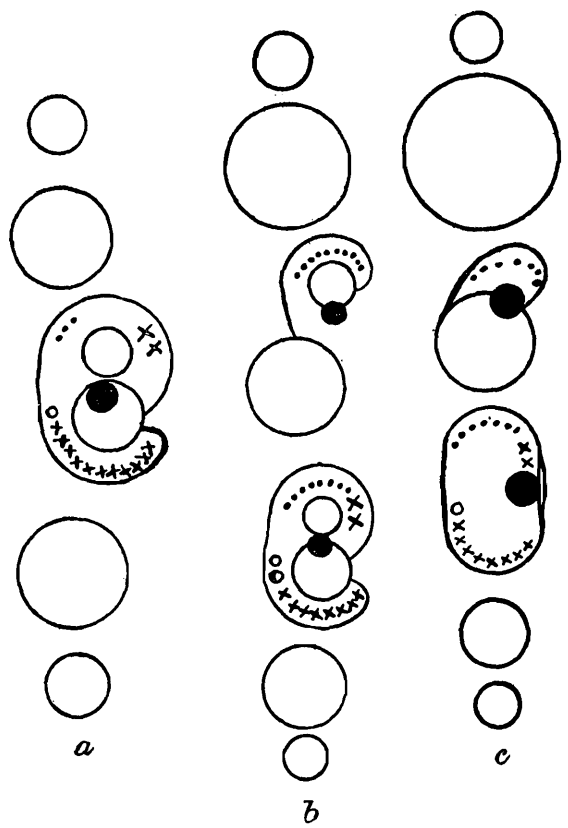
The largest of the 10 specimens of this species, from the Chilka Lake, is 61 mm. long, and has 80 setigerous segments. Another is 53 mm. long, with 76 setigerous segments. The body is long and slender, 2·5–2·75 mm. wide, including the parapodia at the widest part. The segments are very distinct, 2–3 times as wide as long, and the feet are comparatively short. The colour is pale purplish brown, and is strongest on the head and anterior dorsal region (fig. 10A). On the head there are three longitudinal bands of pigment, two of them marginal, and a shorter median one. Behind the latter, between the eyes, there is a V-shaped band. In the anterior region of the body there are three short transverse bars on the dorsum of each segment, the median being a little behind the other two, leaving a colourless patch in



TEXT-FIG. 7.—*Perinereis marjorii*, sp. nov. Dorsal view of a posterior segment, showing the colour-pattern.

front. From each of these bars a band passes to the posterior margin of the segment. In the middle and posterior regions the two lateral longitudinal bands disappear, but the median band remains very distinct (text-fig. 7). The ventral surface is colourless. The anal segment is short, cylindrical, and colourless, and the anus is terminal. There are two short tapering anal cirri equal in length to the last three segments.

The head (fig. 10A) is narrow in front, with an abruptly widening posterior part which bears the two pairs of dark eyes, each provided with a lens. The width of the posterior part exceeds the length of the head. The tentacles and palps are normal. The tentacular cirri are rather short, and of the usual relative proportions. All the paragnaths are large, well-formed, and dark in colour (figs. 10A, 10B). Group I consists of 5–12 teeth; Group II of curved bands each containing 18–22 teeth; Group III of 19 teeth; Group IV of 16–22 teeth; Group V of 3 large teeth curved backwards and arranged in a triangle; Group VI on each side of a single large semi-circular smooth tooth with the thin edge in front; Groups VII and VIII of a double row of fairly large teeth with oval bases, and approximately equal in size.



Text-fig. 8—Parapodial diagrams of *Perinereis marjorii*, sp. nov.

a. 1st foot. *b*. 10th foot. *c*. 50th foot.

· = Homogomph setae with spinous tips; o = Heterogomph setae with spinous tips; × = Heterogomph setae with falcate tips.

The jaws are of the usual shape, and have 10–12 small teeth.

The feet increase in size up to the 5th.

The 1st foot (fig. 10C, and text-fig. 8*a*) has slender dorsal and ventral cirri. The upper lobe (median ligule ?) is clavate, shorter than the dorsal cirrus. Only the ventral setigerous division is present. It consists of two slender lobes, and the black spine lies in the upper part of the lower and longer one. Almost surrounding these lobes and the setae is a large and prominent fillet, its edges attached in front to the lower of the two lobes. The setae above the spine consist of 2 anterior falcate heterogomphs and 3 posterior long-tipped homogomphs. Below the spine is a single posterior long-tipped heterogomph and 10 inferior falcate heterogomphs.

The 2nd foot resembles the 1st, but in the 3rd foot the dorsal division appears.

In the 10th foot (fig. 10D), and text-fig. 8*b*) the dorsal cirrus is equal in length to the dorsal ligule, the latter being stout and conical. The dorsal setigerous lobe consists of a small papilla lying above the dorsal spine. From the front face of this papilla the fillet runs above and behind it, and is attached below to the median ligule. The setae are all long-tipped homogomphs. The median ligule is stout and rounded. The ventral division is very much as in the 1st foot. The ventral ligule is finger-shaped, and the ventral cirrus is small and slender. The long-tipped homogomphs and heterogomphs are of the usual type. The falcate heterogomphs (fig. 10G) have short terminal pieces, with smooth tips, and the spinous portion is short.

The 20th foot is very similar, except that the two lobes of the ventral division are much smaller. In the 30th foot the base of the dorsal ligule has begun to elongate, carrying out the dorsal cirrus with it. The median ligule is also a little longer. In the ventral division the lower of the two lobes is broad and thin, and forms an almost indistinguishable part of the setigerous fillet. The upper lobe is very much reduced. The two upper anterior setae in the ventral group of falcate heterogomphs are much stouter than the other setae.

In the succeeding feet these tendencies are accentuated. The dorsal division of the foot is greatly enlarged (figs. 10E, 10F). The papilla in the dorsal setigerous division disappears, but the fillet remains (text-fig. 8*c*), both edges being fused to the median ligule. In the ventral division the small upper lobe disappears, and the lower one completely fuses with the fillet.

In the 70th foot (fig. 10F) the dorsal division is very large and conical, with many glands. The dorsal and ventral setigerous lobes are represented only by the fillets. In the anterior part of the ventral division two of the falcate heterogomphs just above the spine, and one below it are much thicker than the rest. All the feet are very vascular.

This species has some points of resemblance to *N. variegata*, Grube (*Paranereis elegans*, Kinberg, 1910, p. 53), Ehlers (1901, p. 112), especially in the colour pattern, but differs in the arrangement of the paragnaths, the length of the dorsal cirri and other foot lobes, etc. In the shape of the feet, especially in the position of the dorsal cirri, it is more closely related to *Pseudonereis novae-hollandiae*, Kinberg (1910, p. 52), from Port Jackson, Australia, but differs from the latter in having much shorter dorsal cirri and in the paragnaths of Groups I and V. From *N. camiguina*, Grube (1878, p. 87), it differs in the shape of the head, length of the tentacular cirri, colour pattern, etc.

Habitat.—Ten specimens of this species were found, living in burrows or crevices in oyster shells, at Manikpatna in the outer channel of the Chilka Lake. They were taken in September, during the freshwater season, when the water in the outer channel was quite fresh. From the nature of the habitat, it is probable that the species lives there throughout the year.

Dendronereis aestuarina, sp. nov.

(Plate XX, figs. 4A–N, and text-figs. 9*a–h*.)

Nineteen specimens of this species were obtained in brackish water in the Gangetic delta, in very good condition.

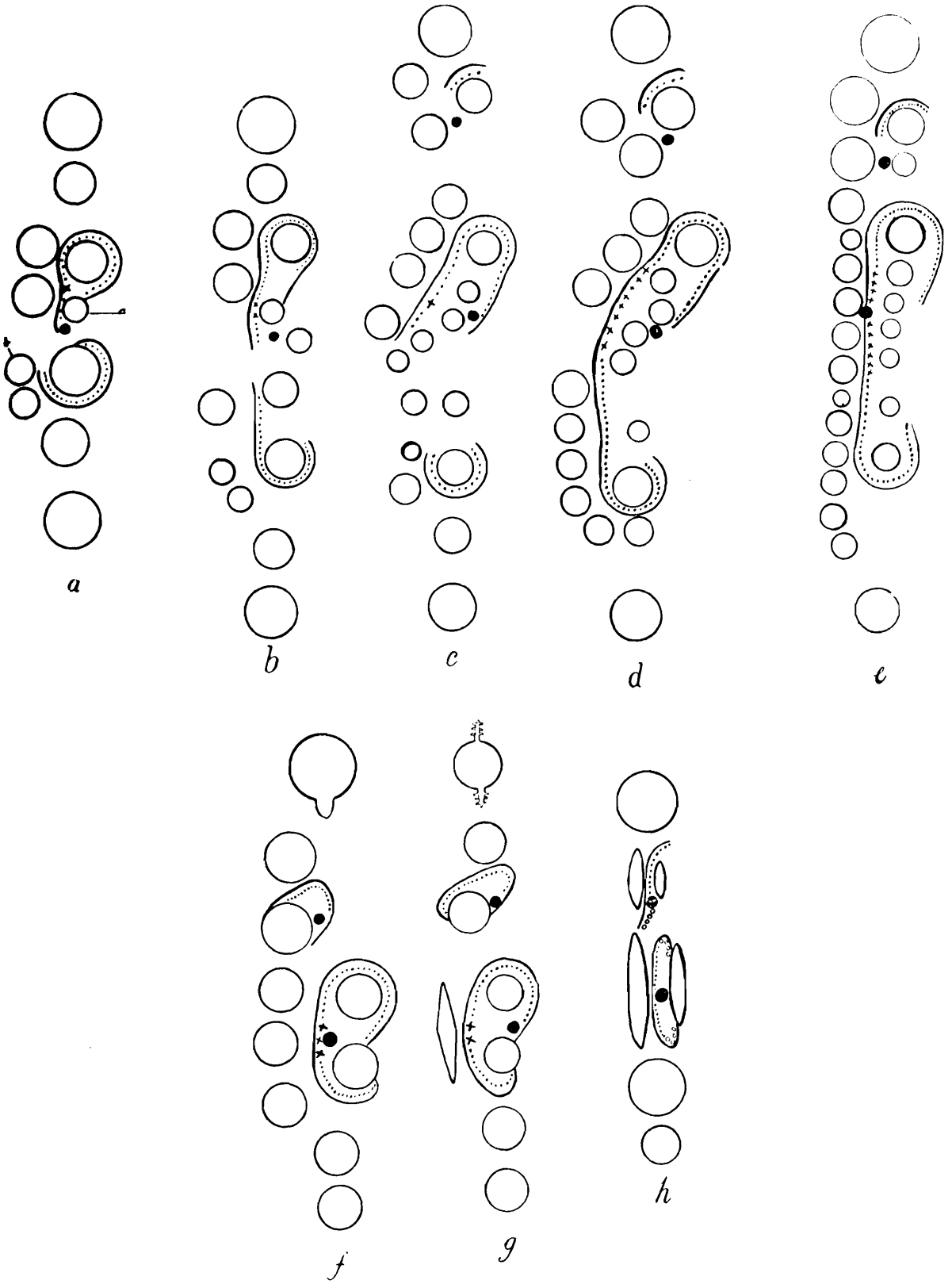
The type specimen is 160 mm. long, and consists of 160 setigerous segments. It is a female, full of immature ova. In life the body is reddish brown, the colour being probably due to the blood, and the gills and dorsal vessel are bright red. The body in front of the gills is much darker, and appears to be coloured with brown pigment.[1] The preserved specimens are colourless. On the ventral surface of segments 3—13, in the median line, there is in all specimens a definite pattern of grooves (fig. 4C).

The head (fig. 4A) is deeply indented in front, where it bears two small tentacles. The posterior part is short and wide, with rounded corners. It bears two pairs of large eyes, the pair on each side being close together. In front the head is prolonged into the two large conical palps. The peristomium bears four pairs of tentacular cirri, with large jointed ceratophores. The posterior dorsal pair are much the longest, and when laid backwards they reach to the end of the 9th setigerous segment. They are nearly three times as long as the posterior ventral pair, and $2\frac{1}{2}$ times as long as the anterior dorsal pair, whilst the latter are nearly twice as long as the anterior ventral pair.

The proboscis (figs. 4A, 4B) is not armed with horny paragnaths, but on the anterior border of the basal segment it carries a number of papillae. Of these the two largest are near the median dorsal line. On the ventro-lateral region there are two on each side, and there are three smaller ones in the median ventral area. The papillae are pear-shaped or fusiform. The whole of the basal segment is covered with low rounded papillae, but these are probably produced by the contraction of the proboscis in the preservative, and have no relation to the papillae on the anterior margin. The maxillary segment is devoid of papillae. The jaws have 14–17 teeth, 2 or 3 at each end of the row being indistinct.

The branchiae commence on the 15th foot (fig. 4F). Each branchia consists essentially of the greatly enlarged, flattened, and branched base of the dorsal cirrus. The dorsal cirrus itself is, as usual, a simple lobe, attached to the tip of the enlarged base. Two large blood-vessels traverse the main stem, giving off or receiving numerous branches which divide several times, and penetrate the filaments. Apart from the vessels in the filaments, there are numerous capillaries in the walls of the main stem of the branchia. In the 1st branchia (fig. 4F) there are 8 clavate lobes on the outer edge of the main stem. They are slightly contracted at the base, and diminish in size towards the tip of the stem. The 2nd pair of branchiae resemble the 1st pair. The 3rd pair, on the 17th feet (fig. 4G), have each 10 filaments, and indications of another row on the outer side of the stem. The 4th pair, on the 18th feet, show the complete development of the branchiae (fig. 4H). The main stem is almost

[1] This description is from a coloured figure, drawn from a living specimen, by A. Chowdhary.



TEXT-FIG. 9.—Parapodial diagrams of *Dendronereis aestuarina*, sp. nov.

a. 1st foot (lobes *a* and *b* sometimes absent); *b*. 2nd foot; *c*. 3rd foot; *d*. 4th foot; *e*. 10th foot; *f*. 15th foot; *g*. 22nd foot; *h*. 70th foot.

· = Homogomph setae with long smooth tips; × = Homogomph setae with coarsely serrated tips; o = Homogomph setae with thick shafts and short tips.

completely occupied by the two blood-vessels. There are 13 pairs of branches, each bearing a double row of slender filaments which are nearly as long as the branches. The slender dorsal cirrus is carried at the tip of the stem. The 5th, 6th and 7th pairs are similar, with 14 pairs of branches. The 8th and last pair, on the 22nd feet, are much smaller, with 9 or 10 pairs of branches. The base of the dorsal cirrus of the 23rd foot is short, simple, and slender.

In the anterior region of the body the feet differ so much that it is necessary to examine them all carefully. The first foot (fig. 4D, and text-fig. 9*a*) consists only of the dorsal cirrus with a lobe beneath it, which is either the dorsal or the median ligule, and the ventral setigerous division. The dorsal cirrus, seated on a jointed base, is long and tapering. The ventral division is composed of 6 or 8 lobes and the ventral cirrus. The setae are in two groups, each guarded by a fillet, the single spine lying between the groups. They are all homogomph setae (fig. 4L), with long minutely serrate or smooth terminal pieces. A single seta in the posterior row of the upper group differs from the rest in having a shorter terminal piece with long stout teeth (fig. 4M). The arrangement of the lobes and setae is shown in text-fig. 9*a*. Sometimes the lobe *b* is absent, sometimes *a* and *b*. The foot is very vascular, blood-vessels passing into each lobe. The 2nd foot (text-fig. 9*b*) resembles the 1st, but it has 11 lobes in addition to the ventral cirrus in the ventral division, and two setae with coarsely serrate terminal pieces. The lowest ventral setae, as in all other segments, have shorter terminal pieces than those in the upper part of the foot.

In the 3rd foot (text-fig. 9*c*) the dorsal setigerous division appears. It consists in addition to the dorsal cirrus and dorsal ligule, of two other lobes, the posterior one being the median ligule, between which lies the spine. Above and behind the anterior lobe is a group of a few slender homogomphs like those in the ventral division, guarded externally by a fillet. The ventral division consists of 15 lobes, in addition to the ventral cirrus.

The 4th foot is very similar (text-fig. 9*d*), especially the dorsal division. In the ventral division the setae now form a continuous series, guarded externally by a fillet. There are 16 lobes in the ventral division, of which 9 are behind, and 7 in front of the setae. The coarsely serrate setae are more numerous. The base of the dorsal cirrus shows signs of flattening.

The 5th foot is similar to the 4th, with more numerous setae. The 10th foot (fig. 4E, and text-fig. 9*e*) shows still greater complexity. The base of the dorsal cirrus is large and flattened. In the dorsal division the setae are more numerous, and an additional small lobe lies in front of the spine. The ventral division has 18 or 19 lobes, of which 12 form a fringe behind the setae, whilst the anterior 6 or 7 lobes are almost surrounded by the setigerous fillet. The upper posterior lobe of the ventral division is flattened at the base and pointed distally. The 11th–14th feet are similar.

At the 15th foot (fig. 4F, and text-fig. 9*f*), which carries the first branchia, there is a marked change. The dorsal division is reduced to the two posterior lobes, the upper one corresponding to the dorsal ligule of the anterior feet, the lower one to

the median ligule. The setae lie above and in front of the median ligule, to which the edges of the setigerous fillet are attached. The ventral division consists of two anterior lobes, almost surrounded by the fillet, three posterior lobes, the ventral ligule beneath the setae, and the ventral cirrus. The coarsely serrate setae are few in number.

In the 16th foot one of the posterior ventral lobes has disappeared. The 17th and 18th feet (fig. 4H) are similar. The two posterior lobes of the ventral division are flattened at the base, and the spine terminates in a small papilla. In the 19th and 20th feet (fig. 4J) the upper anterior lobe of the ventral division has a small papilla beneath it, which disappears in the 21st foot. The posterior lobes are still more foliate. In the 21st foot the lower posterior lobe is almost entirely fused with the upper one.

In the 22nd foot (text-fig. 9*g*) the two lobes of the dorsal division show signs of flattening. In the ventral division, the two posterior lobes have fused to form a single foliate lobe.

In the 23rd–40th feet (fig. 4K) the two dorsal lobes gradually grow thin and foliate, and the lower one assumes an anterior position. In the ventral division the upper anterior lobe is gradually reduced to a small papilla, and finally disappears, the ventral division then consisting of two foliate lobes, one on each side of the setae, a conical lobe between them, the ventral ligule and the ventral cirrus.

Between the 50th and 60th feet a new type of homogomph seta appears (fig. 4N). It is stouter than the others, and the terminal piece is short and smooth, tapering rapidly to a very slender tip. It occurs in the lower part of the dorsal division, and in the upper anterior part of the ventral division. There is no sharp distinction between these setae and the normal homogomphs, intermediate forms occurring both in shape and position. In the 70th foot (text-fig. 9*h*) these thick setae occur also on the lower anterior end of the ventral division. None of the coarsely serrated homogomphs were observed after the 35th foot. In the posterior feet the setae become fewer in number, the lobes of the feet greatly reduced, and the whole foot decreases in size. The tips of the shafts of the setae are more swollen than those of the anterior segments.

The anal segment bears two slender anal cirri, equal in length to the last six segments.

Members of this genus have rarely been found, and only two species have been described. The first of these *Dendronereis arborifera*, Peters, from the coast of Mozambique differs conspicuously in the structure of the branchiae, the main stem of which carries only simple branches. The second species, *D. pinnaticirris*, Grube (1878, p. 92), from the Philippines, agrees with the present species in the structure of the branchiae. It differs, however, according to Grube, in having no papillae on the proboscis, and in having only 6 teeth on the jaws, as compared with 14–17 in the present species. In *D. pinnaticirris*, the branchiae begin on the 12th or 13th segments, and there are 10–12 pairs of branchiae. In *D. aestuarina* they begin on the 15th foot, and there are only 8 pairs. In *D. pinnaticirris* all the branchiae appear to have two rows of com-

pound branches, whilst in *D. aestuarina* the three anterior pairs have only a single row of simple branches. The fully formed branchia of *D. aestuarina* has more branches than that of *D. pinnaticirris*. The anterior feet of the present species have many more lobes than those of *D. pinnaticirris*, but the brief description and figures given by Grube do not permit a close comparison as regards the structure of the feet. A re-examination of *D. pinnaticirris* would doubtless show other important differences.

Only a single specimen of *D. arborifera* has ever been examined, and according to Ehlers (1864–68, p. 581) the proboscis is retracted, and has no paragnaths. It is possible, however, that papillae may have been overlooked on the retracted proboscis, as they are often difficult to observe in this condition. In *D. pinnaticirris*, according to Grube, there are neither paragnaths nor papillae on the proboscis. Their presence then, in *D. aestuarina*, was rather a surprise, and I still think it possible that they have been overlooked in the other two species of the genus.

Habitat.—19 specimens of this species were collected on the 27th of November, 1911, by Mr. S. G. Platts in the Sunderbans, a district in the Gangetic Delta, and sent by him to the Indian Museum. In a letter accompanying the specimens he gave the following information:—"The Polychaetous worms I sent you this morning were found by me in a small pool of brackish water inside the protective embankment of a clearance fairly high up the Munda river. There were hundreds swimming round and round three or four vortices, and it looked as if they were coming up from the ground at these points. A few minnows were hovering about. These used to occasionally pull down a worm, but the fish were either not strong enough to swallow the worms, or the worms were not relished, since they were invariably let go."

The water in which the worms were despatched was analysed by Mr. David Hooper, who reported as follows:—

"The sample of brackish water you left with me yesterday contains 833 parts of solid matter and 376·3 parts of chlorine per 100,000 parts. This approximately represents a mixture of three parts of fresh water with one of sea water."

The two species of *Dendronereis* previously described were found in sea-water, so that the occurrence of the present species in water almost fresh is of considerable interest. The three known species live on or near the shores of the Pacific and Indian Oceans, and the genus is not known elsewhere.

Genus **Dendronereides**, gen. nov.

The following will serve as a preliminary diagnosis of the genus, until additional species are known:—*Proboscis armed only with soft paragnaths. Dorsal setigerous lobe absent in first and second feet. In some of the anterior feet, branchiae are present, in the form of numerous filaments situated below the dorsal cirrus. They are not provided with blood-vessels. Setae of two kinds, falcate homogomphs, and spinose homogomphs. In all feet except a few anterior ones there is a peculiar gland opening to the exterior beneath the dorsal cirrus. The ventral ligule is absent. In the post-branchial region the foot is greatly simplified.*

The presence of parapodial branchiae in this genus at once suggests relationship

to *Dendronereis*. The obvious distinction that the branchiae of *Dendronereis* are formed by modification of the dorsal cirrus, whilst those of *Dendronereides* lie beneath and do not involve the dorsal cirrus, is not so decisive as it appears at first. I have shown above that the branchiae of *Dendronereis* are attached to the *base* of the dorsal cirrus, the latter structure remaining unchanged, at the tip of the swollen base. If figs. 6E, 6H, are examined, it will be seen that the branchiae of *Dendronereides* also are attached to the base of the dorsal cirrus, though in this case the base is not elongate, and the area of attachment is condensed. A more important distinction between the two genera lies in the fact that the branchiae of *Dendronereis* are supplied with an elaborate system of blood-vessels, whilst those of *Dendronereides* are apparently not. In both genera the gills are concentrated on the anterior part of the body. These resemblances, however, may be due to convergence. It is remarkable, however, that in both genera there is great simplification of the foot behind the branchial region, and an unusually large number of foot-lobes in the anterior segments. In both genera the proboscis is provided with soft papillae, and devoid of horny paragnaths. In both genera also, heterogomph setae are absent, and a number of the spinose setae have very long slender teeth.

This genus also shows rather more distant affinities with *Tylonereis*, *Ceratocephala*, and *Tylorrhynchus*.

Dendronereides heteropoda, sp. nov.

(Plate XXI, figs. 6A—N, and text-figs. 10*a–f*.)

Nine specimens of this species are available. They are all immature, with new segments in process of formation in the posterior region. The type specimen is 66 mm. long, and consists of 140 segments. The body is long and slender, and attains its greatest width at the 8th setigerous segment. Dorsally the anterior margin of each segment is distinctly concave. The anterior segments are two or three times as wide as long. Further back, the length of the segments increases till it exceeds the width, but in the posterior region the segments become short again.

The anal segment is large and button-shaped, and the anus is terminal. The two short anal cirri are ventro-lateral in position, and taper to filiform tips.

The head, palps, tentacular cirri, and anterior dorsal region of the body are rusty red in colour, the pigment being most marked on the head. In some of the specimens the colour is quite gone, except for the three dark patches on the head.

The head (fig. 6A) is relatively very small, and the width greatly exceeds the length. In front it is deeply bilobed, with the small tentacles at the tips of the lobes. The eyes are rather small in the specimen figured, and are larger in other individuals. They are placed near the postero-lateral angles of the head, and the anterior pair are more widely separated than the posterior pair. The palps are short, stout, and contracted. At the back of the head, in the median dorsal line, is a narrow transverse band of deep reddish brown pigment. At the base of each tentacle there is a more diffuse patch of the same colour. The bases of the palps,

and the ventral surface of the head and body are colourless. The posterior dorsal tentacular cirri are stout at the base, and are twice as long as the anterior dorsal pair, three or four times as long as the posterior ventral pair.

The proboscis is only partially protruded in one specimen, showing the basal or oral ring (fig. 6B). In the dorsal region there is a group of 7 papillae; 3 median of which the largest is in front, the smallest behind; and lateral groups of 2 papillae on each side. These papillae may represent groups V and VI, or group V only. The three anterior papillae are seated on large hemispherical bases. Ventrally and laterally, in groups VII and VIII, there is a ring of papillae in two rows, 9 in each row, those in the anterior row being the largest and the lateral ones larger than the ventral. The distal, or maxillary ring had to be dissected, and as the proboscis is small, and the papillae soft, inconspicuous and crushed, their numbers and arrangement can only be stated approximately. Group I consists of about 12 papillae of different sizes, II of a small number of larger and more conical papillae. Ventrally are indistinct groups of very large conical papillae, which may represent two groups on IV, or possibly three groups on III and IV.

The jaws are of a pale amber colour, with numerous small teeth, 18–20 in number in one specimen, only 10 in another.

In the 1st and 2nd pairs of feet, the dorsal setigerous division is represented only by the dorsal cirrus.

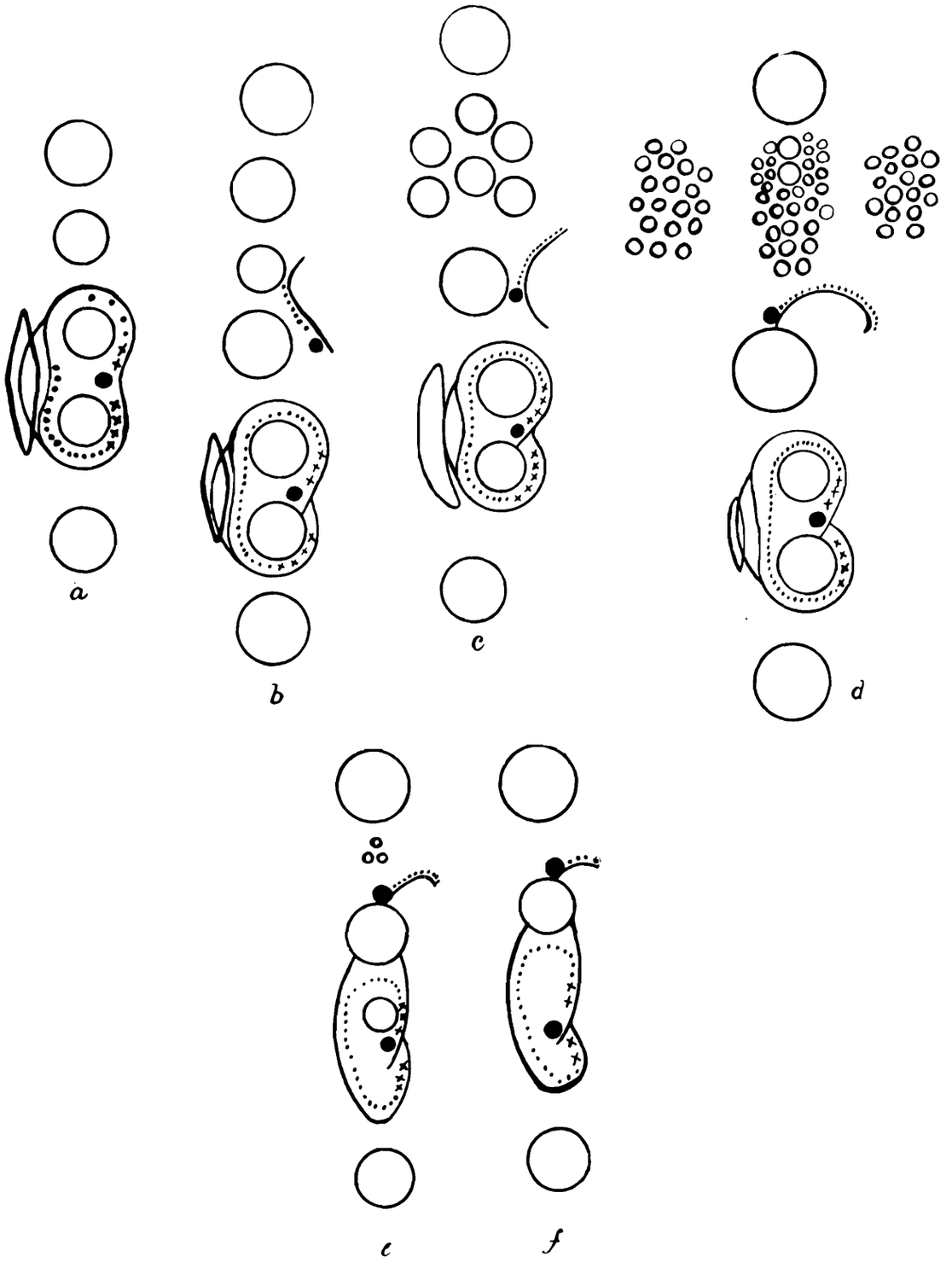
Above the ventral setigerous region (fig. 6C, and text-fig. 10*a*) is a clavate lobe representing either the dorsal or the median ligule. The dorsal and ventral cirri are short, stout, and conical. In the ventral setigerous division there are three lobes, two slender ones in front, and a posterior foliate lobe. The setigerous fillet curves right round the two anterior lobes, projecting outwards to form the posterior lobe behind, and a small papilla in front, pierced by the black spine. Two kinds of setae are present, both having homogomph shafts. At the front of the foot are two small groups of setae, above and below the spine, with short smooth terminal pieces (fig. 6M), rounded at the tip. The remaining setae have relatively long tapering terminal pieces with very long slender teeth on the lower half (fig. 6L). In the 2nd foot the upper ligule is nearly as large as the dorsal cirrus, and the line of setae is continuous behind the anterior lobes.

In the 3rd foot the dorsal setigerous lobe appears. Between the dorsal cirrus and the ventral setigerous lobe are the dorsal and median ligules, and a setigerous fillet lying in front of and just above the median ligule. There are three homogomph setae, having slender terminal pieces with long serrations, as in the ventral division. The spine lies beneath the setae.

In the 4th foot (fig. 6D, and text-fig. 10*b*) the dorsal division has now two lobes between the dorsal cirrus and the median ligule, and the setae are more numerous.

In the 5th and 6th feet there are three of these dorsal lobes, four in the 7th foot, five in the 8th foot.

In the 9th foot (fig. 6E, and text-fig. 10*c*) there are six dorsal lobes. The median ligule is now larger than the dorsal cirrus. The ventral division remains practi-



TEXT-FIG. 10.—Parapodial diagrams of *Dendronereides heteropoda*, gen. et sp. nov. *a*. 1st foot ; *b*. 4th foot ; *c*. 9th foot ; *d*. 21st foot ; *e*. 27th foot ; *f*. 30th foot · = Homogomph setae with long tips ; × = Homogomph setae with short tips.

cally unchanged. The setae of the dorsal division have longer and more slender terminal pieces than those of the ventral division, and the serrations are not so long (figs. 6K, 6L). The falcate homogomphs are confined to the ventral division. In some of the long-tipped setae the shaft is quite homogomph, but in others it is produced into a point at one side (fig. 6N), the so-called 'hemigomph condition.

The 11th foot has 8 lobes, the 12th has 9 lobes, in the dorsal division. In the ventral division the upper anterior lobe has increased, and the posterior lobe decreased in size relatively.

In the 13th foot the dorsal division has 11 lobes, in the 14th foot 21 lobes, in the 15th foot 28 lobes, and in the 16th foot 32 lobes. The number of these lobes or filaments reaches its maximum in the 21st foot, where there are about 65–70 (fig. 6F, and text-fig. 10*d*). They appear to be arranged in three groups, each group having a common stout stem, lying side by side. The median ligule is large, and the setigerous fillet of the dorsal division rises from its upper side, curves forwards and upwards, and is attached beneath the filaments. In the ventral division the posterior lobe is greatly reduced.

In the 23rd foot the lower anterior lobe of the ventral division has disappeared, and the upper one is small. The posterior lobe still has a pointed tip. The setae are much fewer in number, and there are about 55 filaments in the dorsal division.

In the 25th foot the dorsal filaments are much fewer in number, and appear to spring from four main stems. The ventral division is now without pointed lobes, and the setigerous fillet forms a broad rounded flap behind the setae, and a smaller one in front, the setae curving round the minute remnant of the upper anterior lobe, which is first visible in side view. The spines are only black near the tip, having grown gradually paler from the front backwards. In the 26th foot (fig. 6H) the filaments rise from four stems, the lower one being unbranched. In the 27th foot (text-fig. 10*e*) there are only three filaments rising from a single stem. The ventral division consists of two fillets attached to the median ligule. The remnant of the anterior upper lobe, round which the setae form a circle, is very small, and is not visible in side view.

In the 28th and 29th feet there is only a simple short filament beneath the dorsal cirrus, and in the 30th foot this also has disappeared (fig. 6J, and text-fig. 10*f*). The lobe inside the ventral setae has also vanished. In the middle and posterior parts of the body the foot does not change much in shape, but gradually grows smaller, the setae become fewer in number, and the median lobe and setigerous fillets smaller and more indistinct.

The falcate homogomph setae, with smooth terminal pieces (fig. 6M), are regularly present in the ventral divisions of the anterior 25 feet or so. They then become fewer in number, and are frequently absent in many adjacent feet. They were noted, however, in the 70th and 80th feet. The ventral and spinose setae have, as a rule, shorter terminal pieces with longer serrations, than those of the dorsal division (figs. 6K, 6L), but both kinds frequently occur in the ventral division.

It can hardly be doubted that the dorsal filaments of the anterior feet have a

respiratory function. They are not, however, supplied with blood-vessels as in *Dendronereis*. The filaments have an ill-defined central lumen (fig. 6G). Morphologically they appear to represent the proliferation of the dorsal ligule.

A remarkable glandular organ occurs in most of the feet. They first appear in the 14th setigerous segment, and continue to the end of the body. This distribution shows that they have no functional connection with the branchial filaments. At first they are small, but they rapidly increase in size. They lie in the upper part of the foot, and open to the exterior just beneath the dorsal cirri. Their usual shape and position is shown in figs. 6F, 6H, and 6J. Each consists of a number of elongate cells with granular contents, the whole being surrounded by a thick muscular coat. There is no common duct to the gland, and all the elongate cells apparently open to the exterior through the thickened lip of the gland. In the middle and posterior segments the gland decreases considerably in size, and consists only of a few elongate cells with a very thin muscular coat. In the segments where the glands occur, the nephridia are very large, with many black granules in the duct cells. The nephridia occupy most of the cavity of each foot, and are closely surrounded by branched blood-vessels.

In many respects this species is one of the most aberrant of the Nereids. The parapodia are very heterodox in structure, and it is difficult to homologise the various lobes. One of the most remarkable features is the presence of only a single lobe beneath the ventral setae. This may be either the ventral ligule or the ventral cirrus. As the latter is a much more constant structure than the former, it is highly probable that this lobe is the ventral cirrus, and that the ventral ligule is absent. As already mentioned, the dorsal lobe in the 1st and 2nd feet may be either the dorsal or median ligule. In all the other feet the median ligule is present. The dorsal ligule is absent at least after the 29th foot.

Habitat.—In brackish pools, salt lakes, Barantolla, near Calcutta. The salinity is very variable, but never high, probably never exceeding sp. gr. 1.015 at 25°C. The specimens were collected in November.

Family NEPHTHYDIDAE.

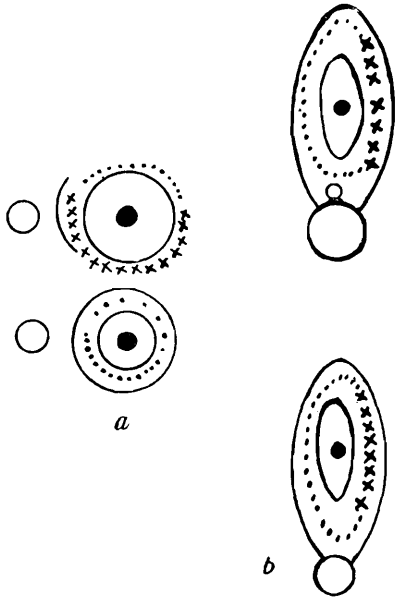
Nephthys polybranchia, sp. nov.

(Plate XXIV, figs. 11A–G, and text-figs. 11*a–b*.)

Twelve specimens of this species were taken in Chilka Lake. They were all approaching maturity, full either of ova or sperm. One specimen was 22 mm. long, and had 52 setigerous segments. Another was 19 mm. long, with 50 setigerous segments. No trace of colour remains in the specimens. The body is widest near the anterior end and tapers gradually towards the tail.

The head (fig. 11A) is rather elongate, with parallel sides. The dorsal tentacles are at the anterior angles, and the ventral pair are a little further behind on the lower surface of the head. At the posterior dorsal angles of the head are two small rounded papillae. The brain is clearly visible behind the head. It is bilobed, and on its

upper surface lie two small but distinct black eyes. No individual had the proboscis extruded, and so far as could be ascertained by dissection there are 20–22 rows of papillae, 4 in each row. There is no specially large one in the mid-dorsal line, but in the two median rows the anterior papilla is a little in front of the other rows, although only of the same size. This point needs to be verified with better material than was available.



TEXT-FIG. 11.—Parapodial diagrams of *Nephthys polybranchia*, sp. nov.
a. 1st foot ; *b*. 10th foot.
· = slender capillary setae ; × = camerated setae.

The 1st foot (figs. 11A, 11B, and text-fig. 11*a*) projects obliquely or directly to the front, and does not attain the anterior border of the head. It has well-marked dorsal and ventral divisions, with spines, but the lamellae are minute and the branchiae are absent. On the posterior face of each division there is a small cirrus. The dorsal division is conical. Above the spine there is a group of long slender capillary setae, with smooth or minutely serrated flattened blades. Below the spine is a group of camerated setae. There is a minute posterior lamella. The ventral division is truncated at the tip. The spine pierces a conical papilla, which is completely surrounded by the setigerous fillet or lamella. Emerging between the papilla and the fillet is a ring of long smooth capillary setae. No camerated setae are present in the ventral division.

The peculiar nature of the 1st foot may perhaps be explained by regarding it as composed of two imperfect feet. If the text-fig. 11*a* is turned round till the cirri are ventral in position, the resemblance of each division to a single division of a typical foot (text-fig. 11*b*) will be at once apparent. The ventral division, which does in fact lie somewhat in front of the dorsal division, would represent the 1st foot, armed only with capillary setae, whilst the dorsal division would be the 2nd foot, with an anterior row of camerated setae and a posterior row of capillary setae. The two cirri would correspond to the ventral cirri. The papillae at the posterior dorsal angles of the head may be the reduced dorsal divisions of the 2nd pair of feet. On this hypothesis the two anterior feet would be represented only by the ventral division of the typical foot, as in *Nereis*.

In the 2nd foot (fig. 11C) the dorsal and ventral divisions are widely separated from each other, and the various lamellae of the normal foot are present, though still very small. There is a small ventral cirrus, and camerated setae are present in both divisions. At the ventral side of the dorsal division there is a small lobe (fig. 11C, a), which appears to be the rudiment of the branchia.

In the 3rd foot the lamellae are more prominent, the branchia is rather larger, and there is a slight indication of the dorsal cirrus. The anterior row of setae in the ventral division are mostly barred, but a few smooth setae occur at the upper and lower ends of the row. The setae are now in two rows, before and behind the spines, not above and below them as in the 1st and 2nd pairs of feet. The 4th foot is very similar, but a distinct change occurs in the 5th foot, which is almost normal. The branchia is large and thick, with a small cirrus on its upper basal portion. The normal condition of the anterior feet is shown in fig. 11D (also text-fig. 11*b*) of the 10th foot. The spines, which are ringed at the tip, terminate in each division at the tip of a conical papilla, which is surrounded by a ring of setae. The setae in front are of the usual camerated type, rather short and stout. The posterior setae are very long and slender capillary setae, with slightly flattened blades very finely serrated along one edge (fig. 11F). They are more numerous than the camerated kind, and tend to invade the front row at the upper and lower ends of the bundles. Surrounding the setae is a fillet which, in both divisions, projects a little beyond the spine on the posterior side of the foot, but not on the anterior side. In the dorsal division the lower ends of the fillet are attached to the branchia, in the ventral division to the ventral cirrus. The dorsal cirrus is small but distinct. The vascular system of the foot consists of a vessel which traverses the branchia as a single loop (fig. 11D). On emerging, it divides, and the smaller branch runs down to the ventral division. It then curves back and terminates in a flask-shaped ampulla.

In fully grown specimens the barred setae are found only in the anterior 16 feet, whilst smaller specimens may have them in 12–15 feet. They are then replaced by smooth capillary setae (fig. 11G), which are smaller than those in the posterior row. The blade widens rather suddenly, and then tapers to a fine tip. The 20th and 30th feet (fig. 11E) are very similar, except that the anterior dorsal lobe of the fillet is rather larger, the posterior lobes are smaller, and the branchia is relatively very large. In the posterior feet the fillets are small, and are considerably surpassed by the spinal lobes. At the 45th foot the branchia suddenly becomes small, and is absent on the succeeding 7 posterior segments.

The anus is terminal, and there is a single short tapering anal cirrus.

This species is characterised by the structure of the proboscis, the shape of the head, and by the condition of the feet. As regards the latter, the most important characters are the size and shape of the lamellae; the restriction of the camerated setae to the anterior feet, and their replacement in the middle and posterior feet by peculiar capillary setae; the distribution of the branchiae, and the presence in them of only a single vascular loop.

Habitat.—The 12 specimens, all mature or approaching maturity, were taken at 4 stations, all in the south-west end of the lake between Rambha and Nalbano, the shore being mud or sandy mud. Two of the stations were worked in February, the salt-water season, and two in September and November, the freshwater season, but in this part of the lake the specific gravity only ranges from 1·001–1·0115

Nephthys oligobranchia, sp. nov.

(Plate XXIV figs. 12A–12C.)

This species is unique in the collection, insomuch as it is represented by specimens from the Chilka Lake and also from another locality, viz. the Cochin Backwater, near Ernakulam, in the south-west of the Madras Presidency.

The superficial resemblance of this species to *Nephthys polybranchia* is so strong that at first it was regarded as a mere variety of that species, but a closer examination revealed such striking differences as to indicate that the two forms are not closely related. The description will be confined to these points of difference. A mature male specimen was 17 mm. long, consisting of 51 setigerous segments. Another had 47 setigerous segments.

The head (fig. 12A) is rectangular, and the length slightly exceeds the width. At the posterior dorsal angles are two small rounded papillae. The brain is rounded behind, with a deep posterior indentation, and carries two small black eyes. The front margin is almost straight. The head in fig. 12A is distorted and widened, owing to the protrusion of the pharynx. The latter organ has in the distal region, 14 rows of papillae, 3–5 in a row. In the anterior dorsal line there is a conspicuously long median papilla, but no corresponding ventral papilla. The mouth is surrounded by 16 bifid papillae.

In small specimens the 1st pair of feet are directed forwards, alongside the head, which they slightly surpass, but in adults they point obliquely outwards, and do not reach the front of the head.

This species differs only slightly from *N. polybranchia* as regards the shape and arrangement of the setae. Camerated setae are as a rule confined to the anterior 13–15 pairs of feet, but in one specimen they persisted as far as the 18th feet. The setae which replace them subsequently in the anterior rows, differ slightly from those of *N. polybranchia*, the blade being narrower and more uniform in width.

There is a marked difference between the two forms in the structure of the feet. The first fully formed branchia is on the 6th foot, that on the 5th foot being very small. They cease abruptly on the 20th–23rd foot, and are quite absent from the feet of the middle and posterior regions of the body. Thus in a specimen having 47 setigerous segments, branchiae are present on 17 pairs of feet only, the 6th to the 22nd, and one specimen with 51 setigerous segments has 30 posterior abranchiate pairs of feet.

A typical branchiate foot, the 10th, is shown in front view in fig. 12B. The posterior lamellae are very small and are surpassed by the spinal lobes, so that in front view they are not visible. The anterior lamellae resemble those of *N. polybranchia*, and the ventral cirrus is equally small. The dorsal cirrus is very insignificant, being represented only by a small lobe on the upper side of the base of the branchia.

The vascular system of the foot differs from that of the preceding species. The vessel which penetrates the branchia, after emerging, sometimes for a considerable

distance, returns and traverses the branchia again, so that there appear to be four vessels in the branchia. The branch to the ventral division of the foot terminates as in the preceding species in a rounded ampulla. In a few of the anterior feet, branchiae containing only a single loop were occasionally noted, but a double loop is the normal condition. The presence of two loops in the branchiae of this species may be correlated with the relatively small number of branchiae.

One of the abranchiate feet is shown in fig. 12c. In the posterior region of the body the feet are large and deeply bilobed, the lobes being large, conical, and widely divergent, giving a characteristic appearance to these specimens.

The anus is terminal, and there is a single anal cirrus. Mature specimens, containing ova and sperm, were taken in January, February, March and September, in both the fresh and salt-water seasons.

This species differs from *N. polybranchia* (1) in having 14 rows of papillae on the proboscis, as compared with 22; (2) in having a long anterior unpaired papilla on the median dorsal line of the proboscis; (3) in the distribution of the branchiae, which occur fully developed on the 6th foot, and disappear on the 20th to the 23rd foot, whereas in *N. polybranchia*, the branchiae are large on the 5th foot, and persist almost to the end of the body; (4) in that the branchiae contain a double vascular loop, whereas there is only a single loop in *N. polybranchia*; (5) in that the posterior lamellae of the feet are considerably surpassed by the spinal lobes.

Habitat.—18 specimens were collected in the Cochin Backwater, near Ernakulam, in the south-west of the Madras Presidency. The salinity of the water is probably very variable in this locality, but precise information is not available.

In the Chilka Lake this species was taken at ten stations, all in the south-west end of the lake, between Rambha and Nalbano.

The species was apparently taken usually on a muddy bottom, both on the shore, and dredged down to 15 feet. Eight stations were worked during the salt-water season, and two during the freshwater season, but the gravity of the water in this part of the lake only varies between the limits of 1·0015 and 1·0115.

Family EUNICIDAE.

Diopatra variabilis, sp. nov.

(Plate XXV, figs. 14A–14R, and text-figs. 12*a–e*.)

Of this species there are fragments, more or less complete, of seven large specimens, all from the same station in Rambha Bay, and twenty-two small specimens from various parts of the lake. The nature of the habitat, and the relation between the large and small specimens, will be discussed below, when the large individuals have been described.

The largest (type) specimen, in three fragments, is 312 mm. long, composed of 451 segments. There is a short gap, probably consisting of about 20–30 segments, between the first and second fragments, as is shown by the condition of the branchiae, and a few posterior segments are missing, so that the animal originally had probably about

480 segments. The greatest width of the body, not including the feet, is 4–5 mm.

The whole body is suffused with iridescent purplish green, especially marked in the anterior region. The basal parts of the various appendages of the head are deeply coloured. In several specimens the anterior part of the body (10–14 segments) is paler in colour than it is further behind, especially the branchiae. This may be due to regeneration of the anterior end. The body is round in front, somewhat flattened behind.

The head (figs. 14A, 14B), as usual in this genus, is partly concealed dorsally by the projecting peristomium, ventrally by the palps. The median antenna is 11 mm. long, very slightly exceeding the inner paired antennae, and nearly twice as long as the outer pair. The median antenna if bent back reaches to the middle of the 10th setigerous segment. The swollen bases of the antennae are composed of 12–13 rings. The cephalic lobe is small, and the posterior part is hidden by the peristomium. It bears two dark pigment spots which may represent eyes. The outer antennae are attached beneath the median pair. The frontal palps are fusiform, shorter than the ringed bases of the antennae. The palps are large, and are grooved on the dorsal surface. The lower surface shows two portions differing in appearance, the inner (anterior) half being the more tumid, and marked off by a deep groove from the outer half. The peristomium is very little longer than the succeeding segments, and slightly narrowed. The tentacular cirri are about as long as the ringed bases of the antennae. At first sight they appear to be attached to the anterior margin of the peristomium, but a closer examination shows that they really spring from the dorsal surface, a short distance behind the front margin. Ventrally the peristomium forms a wide loose lower lip.

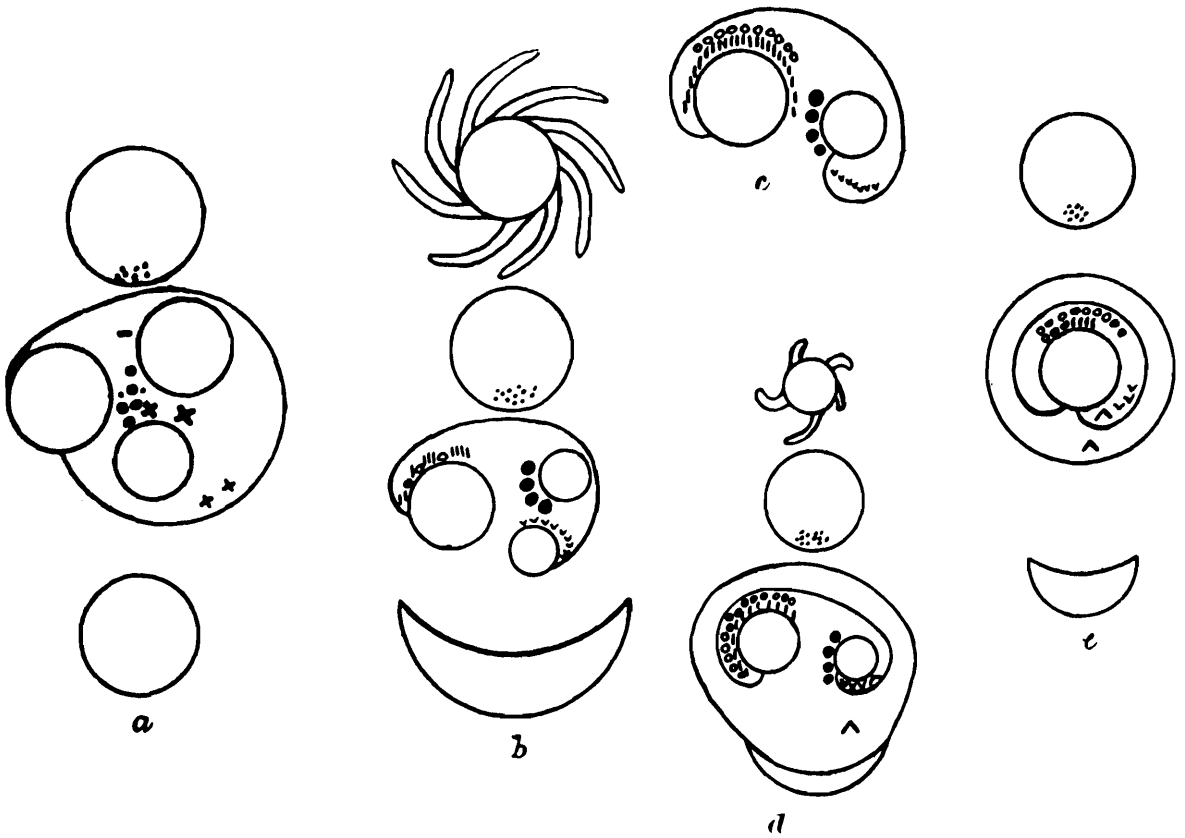
In six out of the seven large individuals the first branchia is on the 4th foot. In the other one, which is the smallest of the seven, the first branchia is on the 5th foot. The branchiae (figs. 14A, 14F) increase in size as far as the 4th–6th pair. The largest have about seven whorls of moderately long filaments, attached to a stout stem, the base of which is more or less distinctly ringed. The anterior 77 pairs of branchiae are branched and are approximately as long as the dorsal cirri, the two organs gradually decreasing together. The 78th pair consists of simple filaments. There are 20–40 segments with these simple filiform branchiae, the last few being like minute papillae.

The mandibles (fig. 14D) are fused at the anterior end. The front margin has a rounded notch at each side and a more acute notch on each lateral margin. The posterior limbs are black and slightly expanded distally. The maxillae are very broad (fig. 14C), the supports being rather short and rounded, the forcipate processes stout and boldly curved. The great dental plates have 6–8 teeth on the right side, 7–9 on the left. The azygos plate has 6–9 teeth. The crescentic plates have 7–10 teeth. On the outer side of the latter are two rectangular plates, without teeth.

The feet are all provided with long slender dorsal cirri, each of which has a bundle

of slender spines running into its base, but not piercing the skin. In the four anterior pairs of feet the setigerous lobe is relatively much larger than in the others.

The 1st foot (fig. 14E, and text-fig. 12*a*) has a large fusiform lobe behind the setae. In front of it lie two low rounded papillae, the dorsal one being the larger. A single capillary seta emerges behind the dorsal papilla. Ventrally there are 4 bifid hooks, 2 thin ones in front of the ventral papilla, and two thicker ones between the two papillae. In addition there are many stout and slender setae in the setigerous lobe and in the base of the dorsal cirrus which do not pierce the skin. In the bifid



TEXT-FIG. 12.—Parapodial diagrams of *Diopatra variabilis*, sp. nov.

a. 1st foot; *b*. 10th foot; *c*. 20th foot, setigerous lobe only shown; *d*. 70th foot; *e*. 150th foot.

— = dorsal capillary setae, without wings, in segments 1–4; × = bifid setae in segments 1–4; ·; =spines or setae of varying thickness, which are embedded in the tissues and seldom pierce the skin; o = brush setae; I = capillary setae, winged and smooth in anterior segments, serrate in posterior segments; v= ventral capillary setae, with flat smooth wingless blades; ∧ = stout ventral hooks of middle and posterior segments.

setae (fig. 14M) the tip is enclosed between two wings, and the shaft is obliquely striated. A short distance behind the tip there is in some cases a pseudo-articulation. The dorsal capillary seta is strong, broad, curved, and finely pointed, with smooth edges. The blade is flattened, but not winged.

The 2nd and 3rd feet are similar in shape, with two dorsal capillary setae, three stout bifid setae between the anterior papillae, and two thin ones in front of the lower papilla. The posterior lobe is rather more elongate than in the 1st foot. On the 4th foot is the first branchia, rather shorter than the dorsal cirrus. The rest of

the foot does not differ from those in front. In the 5th foot there is a marked change. The ventral cirrus is much shorter and stouter, and the bifid setae are replaced by capillaries. The upper capillary setae lie above and behind the posterior lobe, and now show a narrow wing (fig. 14H). They are accompanied by a single brush seta (fig. 14Q), which has an expanded oblique tip, with about 13 coarse teeth and two external slender teeth, the latter differing very little in length from the others. The ventral capillary setae (fig. 14J) are shorter than the dorsal, and have no wings. They taper suddenly to a very slender tip, and are obliquely striated with smooth edges.

In the 6th foot the ventral cirrus is reduced to a short stout stump and ventral pad. There are two brush setae in the dorsal division. Three spines lie between the two anterior papillae. They taper rapidly at the distal end to filiform tips, which pierce the skin. In the 7th foot the ventral cirrus is still more rounded, and in the following segments it consists of a flat glandular pad, large in the anterior segments, but gradually becoming smaller towards the tail.

In the 10th foot (fig. 14F, and text-fig. 12*b*) the setigerous lobe forms a relatively small part of the foot. The setigerous fillet runs from beneath the anterior ventral papilla round the front of the foot and is connected to the back of the posterior lobe. There are four stout spines in the ventral division, and a bundle of fine spines enters the base of the dorsal cirrus. There are three brush setae. The dorsal capillary setae are long, stout, tapering gradually, with narrow wings, only one of which can usually be seen. The ventral setae are shorter with much flatter blades, without wings, and taper much more rapidly to very slender tips. In the 15th foot there are 8 brush setae, in the 20th foot 10.

In the 15th foot the lower anterior papilla has disappeared (text-fig. 12*c*), and the fillet is attached to the ventral side of the upper anterior papilla. In the 28th foot a stout hook appears in the ventral part of the foot, below the setae. The tip (fig. 14N) is bifid, and the lower tooth, which is slightly bent, is stouter and longer than the upper one. The tip is guarded by two delicate flexible wings. In the 40th foot there are 18 brush setae and 4 or 5 capillary setae in the dorsal division. There are two ventral hooks, the lower one emerging far down on the ventral side of the setigerous lobe.

In the 70th foot (text-fig. 12*d*) the branchia and ventral pad are greatly reduced in size. The posterior lobe is still conspicuous, but the anterior papilla is not visible in side-view. Of the ventral setae, only two or three project beyond the skin. They have short broad blades, with slender tips. Some of them seem to have been converted into stout spines with filiform tips. Outside the setigerous fillet there is another fold of skin, which completely surrounds the setigerous lobe. One of the stout ventral hooks emerges with the ventral setae within the fillet, the other is more ventral in position and emerges outside the fillet. There are more brush setae than capillary setae in the dorsal group.

In the 100th foot the posterior lobe is greatly reduced, and the anterior papilla has disappeared. The setae form a single series, arched round the posterior lobe.

The 150th foot (fig. 14G, and text-fig. 12*c*) is mammillate, with a tapering dorsal cirrus. The posterior lobe is small, and is almost completely surrounded by the inner fillet. There are 12 brush setae and 4 capillaries in the dorsal group. In the ventral group there are 3 stout capillaries with acutely tapering tips, and 2 very thick bifid hooks. In the latter (fig. 14P) the lower tooth is now much longer than the upper one. Towards the posterior end of the body the foot becomes smaller and more elongate, the setae fewer in number, and only one ventral hook occurs. The spines which pierce the dorsal cirrus are fewer in number and much finer and shorter. In none of the large specimens is the anal end complete.

The dorsal capillary setae show certain interesting changes as one passes from the anterior end backwards. In the 4 anterior feet they are devoid of wings. A certain number of feet follow in which the setae have narrow wings and smooth edges (fig. 14H). In the middle and posterior feet they are as shown in figs. 14K, 14L. The wings are not quite opposite each other, so that in side view only one is seen. The proximal part of the wing expands suddenly, and the margin is finely but distinctly toothed. In setae from the posterior feet this serrate part is more elongate than in those from the mid-body. The ventral capillary setae also show changes. The blade becomes wider and shorter and the abruptly filiform tip more obvious in the posterior feet. The tapering part of the seta is minutely spinous. The acicula are not wider than the ventral capillaries, and approach them in shape, the filiform tip being very notable. The brush setae are not flat, but have the edges curved towards each other.

The smaller specimens differ in several respects from the above description. The most obvious difference is in the branchiae. Fig. 14R shows the 10th foot of one of these specimens. The branchia is many times longer than the dorsal cirrus, which is only about twice as long as the posterior lobe. The filaments are longer, and not so crowded on the stem. In a few specimens the 1st branchia is on the 4th foot, but in the majority it is on the 5th. The anterior branchiae are relatively much longer than in the large specimens. The last branchia occurs on the 37th–39th foot, and there are very few with only a single filament. In some specimens the filaments are long, and loosely arranged, but in others they are bushy, as in the large specimens. In the smallest of the large specimens the 1st branchia is on the 5th foot, and the filaments are long and loosely arranged, but the stem is only as long as the dorsal cirrus. In the small specimens the serrate part of the dorsal capillary setae is more elongate and not so wide as in the large specimens. The peristomium does not project over the posterior margin of the head.

Only one of the small specimens is complete. It measures 64 mm. in length, and has 150 segments. The rest are incomplete, some larger than this, and some smaller. The anal segment is button-shaped, and bears 4 ventral cirri, the upper pair being 4 times as long as the lower pair, and equal in length to the last 6 segments. In one of these small specimens, one of the ventral hooks of the 3rd foot has 2 teeth beneath the main fang, but this is exceptional. In the structure of the head, jaws and tubes, the two forms agree closely. If these specimens had come from

different localities they would probably have been regarded as distinct species. It seems very probable, however, that the distinctions observed are due to differences in size and age. The most important difference is in the relative lengths of the branchia and dorsal cirrus, and it is difficult to see how this can be a function of age and size. The large specimens were found only at one locality, in March, though empty tubes, apparently belonging to this form, were obtained in September. The small specimens were found both in March and September. The question of whether one or two species are involved can only be decided by a more ample supply of material, collected at different seasons of the year.

If all the specimens are regarded as belonging to the same species, then the following variations were observed :—

1. In the anterior segments the dorsal cirrus may be longer than, equal to, or only one quarter as long as, the stem of the branchia.

2. The branchiae may commence on the 4th or 5th foot.

3. The branchial filaments may be long and open, or short and bushy.

4. The stem of the branchia may be thick or thin, and the base may be clearly or obscurely ringed.

5. There may be few or many branchiae pairs of (33–120), according to the size of the individual.

6. There may be few or many feet with simple branchiae.

7. The peristomium may or may not project over the posterior part of the head.

8. There may be considerable variation in the number of teeth in the dental plates.

These variations show that many of the criteria which have hitherto been used to discriminate the various species of this genus, are of little or no value. Crossland (1903, p. 132) has already commented on this point. In these circumstances it is probably useless to compare the present species with the majority of the species previously described, which will need careful examination, and will probably be considerably reduced in number. The most characteristic features of this species are the long dorsal cirri (in the large specimens), and the shape of the dorsal serrate capillary setae in the middle and posterior segments. In the possession of long dorsal cirri, the species agrees with *D. amoena*, described by Kinberg (1910, p. 38), from the Atlantic, near the mouth of the Rio de la Plata. The text is too brief to be of any value, but judging from the figures recently published, *D. amoena* differs from the present species in having smaller, and probably fewer branchiae, with fewer filaments, more elongate feet and larger palps. The upper jaws also differ in shape, especially the supports and forcipate processes.

The smaller specimens, however, closely resemble certain species already described, such as *D. chiliensis*, Quat. (Ehlers 1901, p. 123), and *D. leuckarti*, Kinberg (1910, p. 38). The structure of the dorsal capillary setae, which apparently differentiates the present species, may have been overlooked by previous workers.

Habitat.—Dr. Annandale writes of the large specimens of this species—"I think it is the largest worm in the collection. Specimens were taken in February or March

with their tubes, near Ganta Sila, Rambha Bay. This worm lives at the edge of the lake in muddy sand or sandy mud, at a depth of about two feet below the surface of the bottom. When the water is high, its burrows are covered by 5 or 6 feet of water, but the fore part of the tube is exposed as the level sinks in the dry weather. The upper part of the tube is shaped like the ventilation funnel on a steamer, and in places where suitable molluscs occur, the worm fixes a single white shell on the top of the funnel, rendering the structure very conspicuous. The specimens of the animal are very difficult to obtain, and so far as I remember, we only succeeded in digging them out on one occasion, on which the tops of the tubes were exposed."

The tubes are large and thick-walled, formed of mud and sand on a membranous basis. These specimens were taken in water of specific gravity about 1·011. Empty tubes of similar form, though smaller, were taken in 10–12 feet of water, off Nalbano.

The small specimens were taken at nine stations, usually in the dredge, in as much as 15 feet of water. Seven of these stations were south of a line joining Patsahanipur with Nalbano, one station was a little north of this line, and the remaining station was in the north-west corner of the lake, off Kalupara Ghat. The water was always of low salinity, the specific gravity ranging from 1·000–1·010. Four stations were worked during the salt-water season, and five during the fresh-water season.

Marphysa gravelyi, sp. nov.

(Plates XXIV, figs. 13A–G, and XXV, 13H–L, and text-figs. 13*a–d*.)

Twenty-seven specimens of this species, all from the Chilka Lake, are available for study. They are of various sizes, but fall roughly into two groups, with probably an age difference of a year between them. A specimen from each of these two groups was examined, and there is no doubt but that they belong to the same species, the distinctions noted being all explicable by the difference in size and age.

The larger (type) specimen is 172 mm. long, composed of 360 segments. The body is cylindrical so far back as the 5th segment. It then becomes flattened dorso-ventrally. The skin is iridescent, and the dorsum shows faint white spots in front, which are probably much more distinct in living specimens.

The head (fig. 13A) is rounded at the sides, deeply indented in front. The indentation is continued as a groove, running dorsally to the base of the median tentacle, ventrally to the mouth. The median tentacle is slightly longer than, and the external tentacle slightly shorter than, the other two. Two small black eyes lie between the bases of the lateral tentacles, hidden by the projecting collar of the peristomium (fig. 13A is from a small specimen). The head is followed by two achaetous segments, of which the first—the peristomium—is about three times as long as the next and succeeding segments.

The anal segment (fig. 13B) is button-shaped, with a crenate margin. On the ventral border are two long cylindrical anal cirri, and beneath these another pair of very small stumpy cirri.

The branchiae are distributed in the type specimen as follows :—

No. of filaments.	*No. of segments.*	*Position of segments.*	*No. of filaments.*	*No. of segments.*	*Position of segments.*
0	32	1–32	7	38	268–305
1	6	33–38	6	17	306–322
2	4	39–42	5	2	323–324
3	22	43–64	4	12	325–336
4	19	65–83	3	10	337–346
5	44	84–127	2	5	347–351
6	12	128–139	1	5	352–356
7	27	140–166	0	4	357–360
8	101	167–267 [1]			

There is, of course, considerable variation in the distribution of the branchiae, and the numbers of filaments frequently differ on the two feet of the same segment. In three other specimens the first branchia appears on the 36th, 42nd, and 52nd feet respectively. The maximum number of filaments is 8 or rarely 9. They are much longer than the dorsal cirrus, and are crowded together on a short stem (fig. 13G).

The mandibles (fig. 13D) are blackish at the posterior ends, paler in front. The ringed anterior ends are small, and the two halves are not very firmly attached to each other. The maxillae (fig. 13C) are stout and boldly curved, the posterior processes being spatulate. The maxillary plates have 6 teeth on the right, 5 teeth on the left side. The azygos plate on the left has 7 or 8 teeth, whilst the anterior crescentic plates have 9 teeth on the right, 6 on the left. Dark horny patches of indefinite shape occur in front of and at the side of the anterior toothed plates. The right anterior crescentic plate bears less resemblance to its corresponding left plate than it does to the azygos plate.

The feet increase gradually in size up to the 10th. The 1st foot (fig. 13E and text-fig. 13*a*) has stumpy rounded dorsal and ventral cirri, and a short rounded median lobe behind the setae. In front there is a thin fillet guarding the setae. The foot is very vascular. There are three black spines, lying horizontally. The setae are in two groups, above and below the spines. The dorsal group consists of about 9 capillary setae of various lengths, with flattened, very finely serrate blades (fig. 13H). Ventrally there are 7 or 8 compound setae (fig. 13J). The tip of the shaft is bevelled, and has a row of spines along the upper edge. The blade is very finely serrated, and tapers to a long filiform tip. The 2nd foot resembles the 1st, but the setae are more numerous.

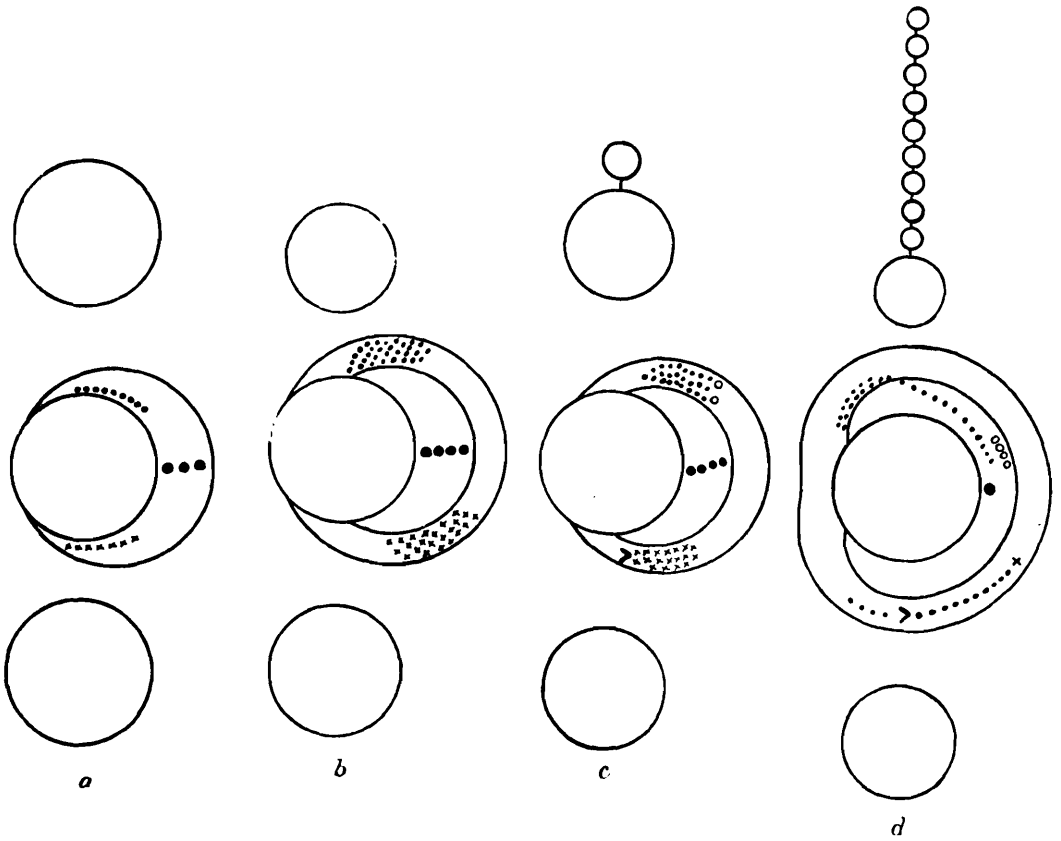
The 5th foot (text-fig. 13*b*) has 4 black spines. The setigerous lobe is relatively larger and the setae much more numerous. The setae are enclosed within two fillets, which are attached by their edges to the middle lobe, and lie outside the spines.

The 10th foot has 5 spines, and the ventral setae are still more numerous. In the 25th foot there are 4 spines, and 2 brush setae (fig. 13K) appear, lying in front

[1] A few of these have 9 filaments.

of the dorsal setae. They have expanded oblique tips, with numerous fine teeth, of which the two outermost are much longer and stronger than the others. At the 35th foot a powerful hook (fig. 13L) appears on the lower edge of the ventral setae. It is bifid at the tip, but in the anterior segments the points are either rounded or worn away. The tip is guarded by two delicate flexible wings, and the shaft is finely dotted.

The 40th foot (fig. 13F, and text-fig. 13*c*) has 3 or 4 spines, the upper one being colourless. The dorsal and ventral cirri are relatively smaller than in the 1st foot. In segments 50–120 there are two ventral hooks.



TEXT-FIG. 13.—Parapodial diagrams of *Marphysa gravelyi*, sp. nov.

a. 2nd foot; *b*. 5th foot; *c*. 30th foot of small sp., 40th foot of large sp.; *d*. 160th foot of small sp., 240th foot of large sp.

· = capillary setae; ● = spines; × = compound setae; > = simple bifid hook.

After the 100th foot, capillary setae appear in the ventral bunch, replacing the compound setae. A single compound seta remains in many feet, at the upper anterior border of the ventral bunch (text-fig. 13*d*), but the posterior 100 feet have no compound setae. At the 240th foot (fig. 13G, and text-fig. 13*d*) the branchia has its maximum of 9 filaments. The dorsal cirrus is short and conical, the ventral cirrus stumpy and round. The middle papilla is very small, and the internal fillet runs out to the tip of the black spine or spines. The external fillet now runs completely round the setigerous lobe. The dorsal division has 4 brush setae in front, arranged in

a gradual sequence, the uppermost being the shortest and smallest. The greatest number of brush setae noted in any foot was 4. The dorsal capillary setae lie close to the inner fillet, emerging inside it in the anterior region (text-fig. 13*d*). In the ventral division there is a single compound setae in the front of the foot, and a bifid winged hook on the lower margin. All the other setae are simple capillaries. The ventral setae are shorter than the dorsal, and the blades are more distinctly flattened.

In the posterior segments the setigerous lobe is smaller in proportion to the dorsal and ventral cirri. The setae are few and simple. There is one spine, one ventral hook, and 1–3 brush setae with somewhat coarser teeth than those in the anterior segments.

The smaller specimens differ from the above description in many respects, but these differences are due to age and size. The specimen examined was 66 mm. long, composed of 220 segments, with traces of others forming in front of the anal segment. The eyes are larger and more distinct, and are not hidden by the collar of the peristomium (fig. 13A). The first branchia appears on the 22nd foot, and the maximum number of filaments is 5, on segments 145–165. The branchiae are absent from the posterior 20 segments. The maximum number of spines present in any foot is 4. The first brush seta appears in the 20th foot, and the first ventral hook on the 26th foot. The capillary setae appear in the ventral division of the 80th foot, and there are no compound setae behind the 160th foot. Genital products were not observed in any of the specimens.

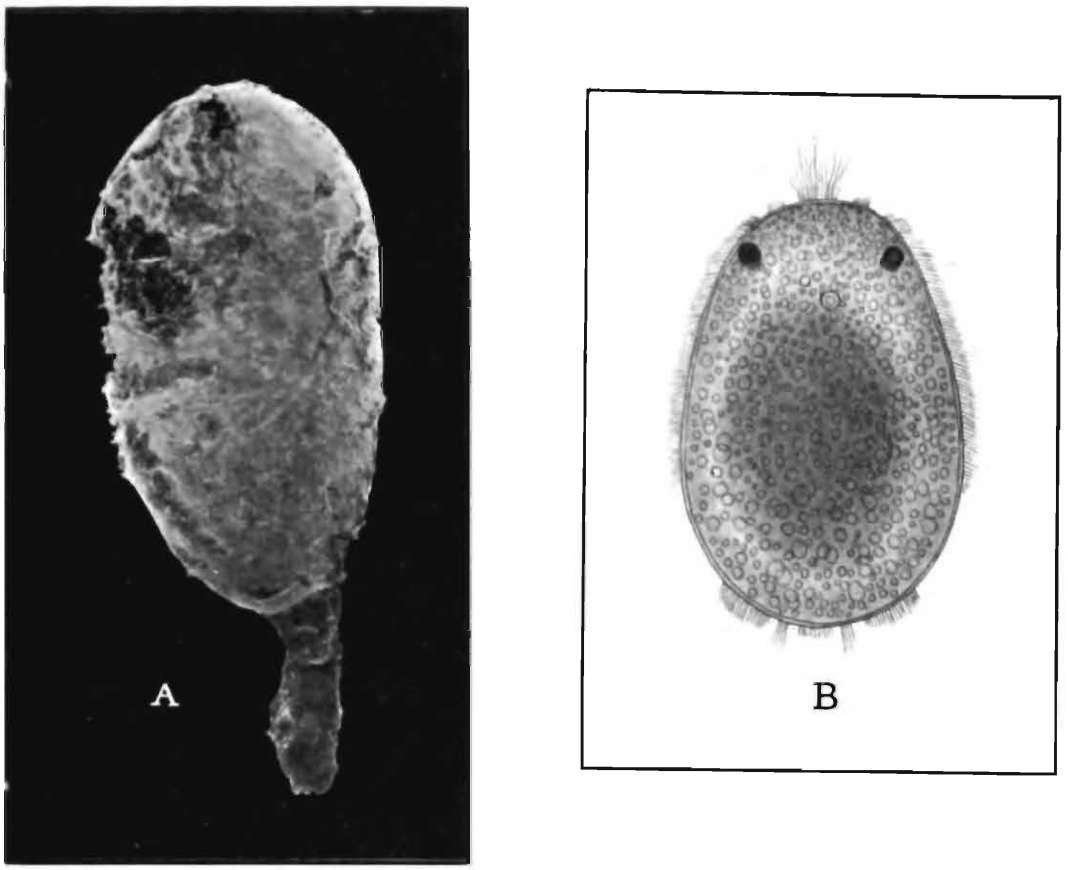
This species belongs to the *M. sanguinea* group. The most remarkable character is the appearance of the capillary setae in the ventral division of the feet in the middle and posterior parts of the body. It is improbable, considering the size of the larger specimens, that this is a larval character, especially as these setae appear at relatively the same position in both large and small specimens, viz. near the beginning of the middle third of the body. The same proportion is also seen in the position of the last compound seta, viz. segment 150 in the small specimen, and segment 240 in the large one. In this character there is a tendency towards *M. mossambica*, Grube, which has no compound setae.

This species has also some resemblance to *M. californica*, Moore (1909, p. 251), but differs in the shape of the head, relative length of the tentacles, number and distribution of the branchiae, etc. *M. californica* has two kinds of brush setae in the middle segments, one kind with many, the other with few teeth. Moore's specimens were incomplete behind, so that no comparison can be made as to the arrangement of the setae, a feature so characteristic for *M. gravelyi*.

Dr. Annandale writes *in litt.* of this species :—"Another interesting Eunicid was obtained only in very small numbers, though actually abundant everywhere round the lake where the shores are muddy. This species produced large balloon-like masses of gelatinous spawn anchored to the mud by a tubulous structure and known to the Ooriyas as *nowdar*." It is possible that this may be the same species as was found by Borradaile (1901, p. 714). In a lagoon at Jaffna, on the north coast of Ceylon, he found a species of *Marphysa* which liberated its eggs in a pear-shaped mass of

jelly, attached to the bottom by a short stalk. He has described the early development of the worm most carefully, but unfortunately all the adult specimens were lost, and the species was never definitely identified, but was said by Willey, who saw a damaged specimen, to be identical with, or closely allied to, *M. teretiuscula*, Schmarda, a species differing distinctly from the present form.

Dr. Annandale further writes that similar spawn is a conspicuous object in shallow creeks and lagoons of brackish water both on the east coast of India and on



TEXT-FIG. 13[1].—*Marphysa gravelyi*, sp. nov.

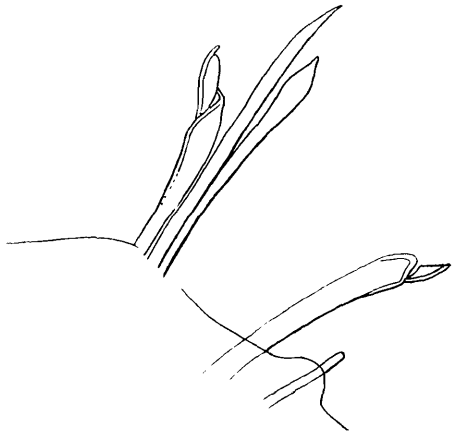
A. Egg-mass. × ½. The outer layer has been removed at one spot, showing the clear jelly containing the eggs. B. Larva, highly magnified.

that of the Malay Peninsula. It was common at the outer edge of and in small ditches connected with the outer section of the Tale Sap on the Gulf of Siam[1] in January 1916, where the mass seemed as a whole more cylindrical than those in the Chilka Lake. In the Chilka Lake the masses are pear- or egg-shaped, often as much as six inches long, and are anchored to the mud, in which the worm burrows to a considerable depth, by a tube at one end. The mass consists of jelly, which is quite hyaline and colourless, and contains the eggs or larvae to the number of several hundreds. The eggs are minute and scattered. The outer part of the gelatinous mass is stiffer than the central part, to which the eggs are confined, and the whole is

[1] Concerning this lake see *Mem. Asiatic Soc. Bengal*, VI. pp. 3–6, text-fig. 3 (map).

covered by a thin, soft, sticky layer, transparent in itself but soon powdered with fine silt, which adheres to it firmly. This soft external layer and also the outer, stiffer layer of the central mass are continued at the base to form a narrow tube, which is usually filled with the excreta of the worm. The tube goes straight down into the mud for a foot or more and is inhabited by the parent worm. In the photograph of an egg-mass of *M. gravelyi* here reproduced the basal tube is well shown; also the thin external layer, which is torn at one place, revealing the egg-mass with the minute contained eggs or larvae.

Dr. Gravely adds that the unhatched larvae (text-fig. 13[1]*b*) can move freely in the jelly in which they are embedded. They closely resemble Borradaile's larvae, but minute examination revealed somewhat greater differentiation among the cilia than is indicated in his figures. Two groups of setae crushed out of a larva with two setigerous segments are shown in text-fig. 13[2]. It will be observed that of the simple setae in the anterior group one is pointed at the end and the other somewhat blunter, as described by Borradaile. There is, moreover, a single jointed seta associated with them. Neither this jointed seta nor the one in the second group is, however, quite like either of the jointed setae figured from Borradaile's older larva. The figures of the Chilka larva have been prepared under Dr. Gravely's supervision.



TEXT-FIG. 13[2].—Parapodium of larva of *Marphysa gravelyi*, sp. nov., highly magnified.

A minute nematode worm *Monhystera uria*, Stewart (*Rec. Ind. Mus.* X, p. 247) is found in the jelly with the larvae.

Habitat.—27 specimens of this species were taken at 7 stations in Chilka Lake. All the stations were in the southern end of the lake, from Nalbano to Rambha, and the bottom was muddy. The species was apparently only taken during the salt-water season, from January to March. In this part of the lake, however, the specific gravity is only from 1·008 to 1·0115 in the salt-water season. It is certain that the species lives in this area throughout the year, when the gravity is as low as 1·001, and is only obtained in January to March because, at that time, the level of the water has sunk so low that the mud flats and banks, in which the worm lives, can be examined.

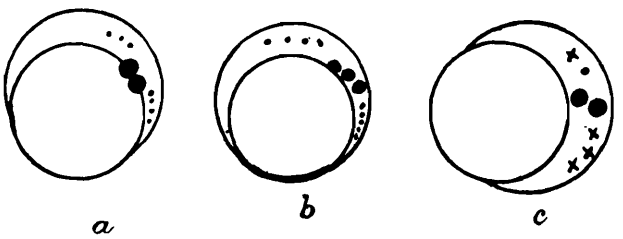
Lumbriconereis polydesma, sp. nov.

(Plate XXVI, figs. 15A–L, and text-figs. 14*a–c*.)

Only one specimen, fortunately quite complete, and a fragment of a second of this species were taken in the south-western end of Chilka Lake. It is 185 mm. in length, and is composed of 386 segments. It is not fully grown, as genital products are absent, and new segments are in process of formation in front of the anal segment.

The body is very slender, the greatest width being 1·0-1·2 mm., not including the feet. It tapers very gradually towards the tail, more rapidly, but to a lesser degree towards the head. The skin of the preserved specimen is opaque white in colour, with a faint green iridescence.

The head (figs. 15A, 15B) is rounded in front and at the sides. Dorsally the posterior border is covered by the projecting front border of the peristomium. No eyes were observed, though there is a small patch of pigment near the posterior border of the head, a little on the right of the median line. The mouth is bounded in front and at the sides by two large lips formed by the infolding of the lateral posterior margins of the head. Between the head and 1st setigerous segment are two achaetous rings, the first being twice as broad as the second. Ventrally the 1st ring is incomplete, being interrupted by a projecting lobe of the 2nd ring. Both rings are furrowed on the ventral side.



TEXT-FIG. 14.—Parapodial diagrams of *Lumbriconereis polydesma*, sp. nov.
a. 1st foot; *b*. 10th foot; *c*. 80th foot.
· = Simple capillary setae; × = crochets.

The feet increase gradually, and only very slightly, as far as the 10th. The 1st foot (text-fig. 14*a*) has a prominent rounded ventral lobe. The setae lie above and in front of this lobe, and are guarded externally by a conspicuous curved fillet. There are two colourless spines. The setae are stout winged capillaries, with bilimbate obliquely striated blades. There are 3 of them above the spines and 4 below.

In the 10th foot (fig. 15F and text-fig. 14*b*) the fillet forms a hood over the ventral lobe. It is attached to the middle of it in front, then curves over it, and is attached to it again on the lower posterior border. There are 3 spines in a horizontal row. They are colourless, except the tips of the two anterior ones, which are dark brown. There are 4 capillary setae above the spines and 5 below. The upper setae are rather longer than the lower, and they all curve towards the spines.

At the 29th foot the first crochet appears in the ventral division. The 30th foot has 2 colourless spines, 3 capillary setae above the spines, 2 capillary setae and 1 crochet below the spines. The fillet lies more in front of the ventral lobe than in the 10th foot, and its anterior line of attachment is near the ventral border of the lobe.

The 40th foot is similar in shape. It has 2 spines, 2 capillary setae and 1 crochet above the spines, 1 capillary seta and 2 crochets below.

In the 80th foot (fig. 15G, and text-fig. 14*c*) the ventral lobe is smaller and slenderer, and curves upwards. The fillet lies almost altogether on the anterior side of the lobe, and is hardly visible from the posterior aspect. There are 2 spines, 1 capillary seta and 1 crochet above the spines, 3 crochets below.

The shape of the feet is very uniform in the middle and posterior parts of the body. At the 300th foot (fig. 15H) the ventral lobe is rather longer and thinner.

The fillet is attached near the base of the lobe, and projects outwards, in front of it. There is a single colourless spine, one capillary seta and one crochet above the spine, and one crochet below. This capillary seta persists in all the feet.

The anus is terminal. On its ventral margin are the remains of 4 short stumpy cirri, the upper pair being the longer. The capillary setae (figs. 15J, 15L) have broad wings which tend to curve inwards, so that frequently only one is visible. They are obliquely striated, and taper to a slender tip. In the posterior feet the wings are broader than those in the anterior feet. The crochets (fig. 15K) have each two broad wings over the tip, with delicate oblique striations. The boldly curved terminal tooth has a crown of 6–10 slender spines.

The mandibles (fig. 15E) are fused throughout their whole length. The biting plate is composed of 5 or 6 half-rings. The shafts are striated longitudinally and also obliquely. The whole structure is very delicate and the edges are so thin that it is impossible to indicate the precise shape. The forcipate processes of the maxillae are normal in size and shape, and are equal in length to the posterior processes or "supports", which have a distinct waist. Lying alongside the forcipate processes are two narrow dotted strips of chitin. The main dental plates are each composed of a dark-coloured ventral part, rather narrow and bearing teeth, and a larger and paler reflexed plate lying above it. There are 5 teeth on the right side, 4 on the left. The 3rd pair of jaws have bifid tips, and the 4th pair strong simple tips. Fig. 15D shows them after they have been flattened. Lying alongside the 3rd and 4th pairs are two rectangular dotted plates.

This species is characterised by the very slender elongate body, the structure of the jaws, the shape of the head and setae, and the presence of capillary setae in all the feet.

In the shape of the jaws it resembles the *L. tetraura* (Schmarda) as described by Ehlers (1901, p. 137), but the two species differ widely in the distribution of the capillary setae and crochets. In the form of the setae, and in having two teeth on the 3rd pair of jaws, it resembles *L. indica*, Kinberg (1910, p. 48), from the Bangka Straits, but differs in having only a single tooth on the 4th pair of jaws, and in the presence of capillary setae in the posterior segments, etc. This species rather closely resembles the *L. heteropoda* of Marenzeller (1879, p. 30), from Japan. The latter differs in having a longer and more pointed head, shorter and broader body, with fewer segments, feet of somewhat different shape, and in the relative length of the two lobes. In the middle of the body the foot of *L. heteropoda* carries a rudimentary dorsal lobe with a few simple setae embedded in the tissues. The capillary setae are distributed as in the present species, and occur in the posterior feet. The jaws are similar as a whole, but differ in details, especially in the shape of the maxillae and mandibles. The tips of the crochets also differ.

Habitat.—A single entire individual and a fragment of a second were obtained by digging in sand just above high-water mark on the shore of Chiriya Island, in the south-western extremity of the Chilka Lake. They were collected during the salt-water season, in February, and the salinity of the adjacent water was 1·011.

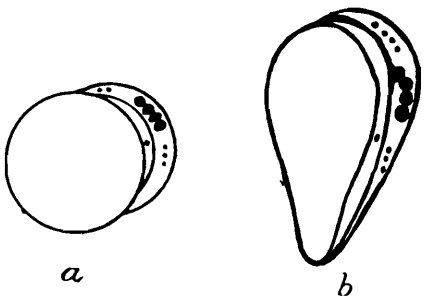
Lumbriconereis simplex, sp. nov.

(Plate XXVI, figs. 16A 16M, and text-figs. 15*a–b*.)

Six specimens of this species, from the Chilka Lake, all from the south-western end, are available for description, all of them in a fragmentary condition, and the posterior end is missing in all cases. The largest fragment is 32 mm. long, and consists of 125 segments. It is probably half the total length, or rather more.

The preserved animals are colourless, except for a delicate greenish iridescence. There is a dark amber-coloured spot near the base of each foot, on the ventral side, composed of granular pigment, like dried blood. Similar granules are scattered over each foot, especially near the tip of the setigerous lobe, and just above the foot. The body expands gradually up to the 15th setigerous segment, and then tapers still more gradually towards the posterior end. The feet are rather prominent. The width of the body at the 15th foot is 1·7 mm. or including the feet and cirri 2·7 mm. The 1st achaetous ring is 2½ times as long as the 2nd ring.

The head (figs. 16A, 16B) is triangular, with rounded angles, the length slightly exceeding the width. No trace of eyes could be found, though there is some subcutaneous pigment on the head. The mouth is bounded in front by two tumid lips belonging to the head, laterally by the first ring, and in the mid-ventral region by the second ring, which interrupts the first ring and projects forwards to the mouth.



TEXT-FIG. 15.—Parapodial diagrams of *Lumbriconereis simplex*, sp. nov.
a. 1st foot; *b*. 10th foot.
· = Simple capillary setae; • = spines.

The 1st foot (fig. 16G, and text-fig. 15*a*) consists of a setigerous lobe composed of two lamellae or fillets, and a rounded lobe lying behind and beneath the fillets. Between the fillets lie four colourless spines. The setae are in two groups, a dorsal bundle of two long bilimbate setae above the spines, and four similar but shorter setae beneath the spines. The upper ventral seta emerges inside the inner fillet, all the others between the two fillets. The succeeding feet increase in size and in the number of setae. In the 10th foot (fig. 16H, and text-fig. 15*b*) the posterior lobe is longer, bluntly pointed, and flattened, and the two fillets lie in front of it. There are four bilimbate setae in each bundle. The succeeding feet up to the 30th show little change. The base of the posterior lobe then becomes gradually fused to the fillets, and the terminal portion projects backwards as a finger-shaped lobe (fig. 16K). The number of spines in the 30th–50th feet is 3, in the 100th foot there are 2. From the 30th foot there are only 3 setae in each foot, one dorsal and 2 ventral.

In the anterior segments the setae (fig. 16L) are long and tapering, with smooth flattened obliquely striated blades. They are bilimbate, but the two wings are not directly opposite each other, so that usually only one is seen. The dorsal setae are longer than the ventral. In the middle and posterior feet the setae (fig. 16M) have wider and

flatter blades, and the wings are very narrow or quite absent. In a fragment, evidently from near the posterior end of a specimen, the feet are more translucent and more elongate. They have 1 or 2 spines, and 1 dorsal and 2 ventral setae. The blades of the setae are short, broad, and flat, with very narrow wings, and they taper rapidly to a long fine tip. The setigerous lobe is more conical at the tip, and the posterior lobe more elongate.

The feet of this species are remarkable for the richness of their blood supply, and they evidently function as branchiae. In many of the feet there is in the dorsal region of the base a large heart-shaped structure full of blood (fig. 16J), into which a number of vessels open. It is not present in all the feet, and is apparently formed by the swollen junction of the blood-vessels. When present, it forms a conspicuous spot on the dorsal side of the foot. From this 'heart' a large vessel runs into the foot, giving off numerous branches which lie under the cuticle on the front side of the foot. A large branch runs round the margin of the setigerous lobe, and another passes into the posterior lobe. All these vessels branch repeatedly, and the capillaries finally unite to form large vessels lying on the posterior side of the foot. In the fragment from the posterior end of the body, mentioned above, the blood-vessels are greatly reduced in size and number.

The mandibles (fig. 16F) are translucent, broad, and fused throughout almost the whole length. The anterior or biting end is composed of numerous semi-rings. There is very little pigment, which is confined to the lines of growth.

The maxillae (fig. 16C) are stout and boldly curved. Their posterior portions (the 'supports, or 'carriers') are laterally deeply indented. This part varies greatly in length, as is seen by comparing figs. 16C and 16D, but is always shorter than the forcipate processes The posterior oblique margin is thin and frayed. Lying on the outer margin of the forcipate processes is a long thin horny plate. The great dental plates have each 4 large teeth. At the anterior end each has a flat cap (fig. 16E). The dental plate itself is rather narrow, but it has a broad dorsal flange lying behind the forcipate process. The 3rd pair of jaws are bidentate. The 4th pair have each a stout tooth, which may be slightly bifid at the tip, possible through abrasion. Lying ventrally to the 3rd and 4th pairs of jaws is a thin rectangular coarsely dotted plate on each side.

So far as one can judge from the brief description and inadequate figures, this species resembles *L. atlantica*, Kinberg (1910, p. 47), from the mouth of the Rio de la Plata, especially in having only slender capillary setae. It appears to differ in the shape of the head, and in having two teeth on the 3rd pair of jaws.

Habitat.—Fragments of six specimens were taken at two stations, both of them on the shore of the south-western extremity of the lake, at Rambha, in mud. Of one station, no further information is available. The other station was in March, and the specific gravity of the water was 1·011.

Family GLYCERIDAE.

Glycera alba, Rathke, var. **cochinensis**, var. nov.

(Plate XXVII, figs. 17A–J, and text-figs. 16*a–c*.)

Two specimens of this species were collected in the Cochin Backwater, near Ernakulam. One of them is in good condition for description, the other is softened and lacks the posterior region.

This species closely resembles the European *Glycera alba* in appearance. The preserved animals are buff coloured. The type specimen is 30 mm. long, and consists of 120 setigerous segments. The body attains its greatest width between the 30th and 40th segments. From this region it tapers abruptly towards the head, and only very gradually towards the posterior end. On approaching the tail, however, it decreases rapidly in size. The segments are biannulate, the two rings being almost equal in length, or the ring bearing the feet is very slightly the longer of the two.

The mouth (fig. 17A) is bounded laterally by two large tumid lips, formed of two rings. In front of it are 10 rings which gradually taper towards the tip. The terminal ring bears four small tentacles. The large segment which forms the posterior margin of the mouth is much folded ventrally, and bears a fairly large pair of parapodia. In front of this segment are two others which are very narrow and incomplete ventrally. Each of them bears a pair of rudimentary parapodia, the anterior pair especially, being very small.

The proboscis in both specimens is completely retracted, and the jaws lie opposite the 21st pair of parapodia. The posterior part of the retracted proboscis is shown in fig. 17B. The expanded part—the gizzard—containing the jaws, is almost square in section, the rounded angles being formed by four large glands, whilst there is a smaller gland on each face. Attached to the front margin of the gizzard are four flat, almost rectangular lamellae, two directed forwards and two folded backwards. They are composed of large rounded cells with large nuclei.

The jaws (fig. 17E) are stout and curved. The fixing process is slender, and is attached near the middle of the jaw. It bears a thin triangular wing on the basal part. In the specimen figured, the posterior end of the jaw is bifid, but this is probably due to fracture, as it is entire in other jaws which were examined.

The internal surface of the retracted proboscis is covered with small papillae of various shapes. The most numerous variety has a cylindrical stem (fig. 17C), with an oblique mammillate tip, bounded by flat wings. The diameter of the stem is equal to the width of the wings, and the papilla is $2\frac{1}{2}$ times as high as the diameter. Another variety is pear-shaped (fig. 17D), whilst others are similar in shape, but slenderer. All are traversed by ducts opening at the tip.

The 1st foot is very minute, and consists only of a setigerous lobe with a group of compound setae, and a flat heart-shaped posterior lobe.

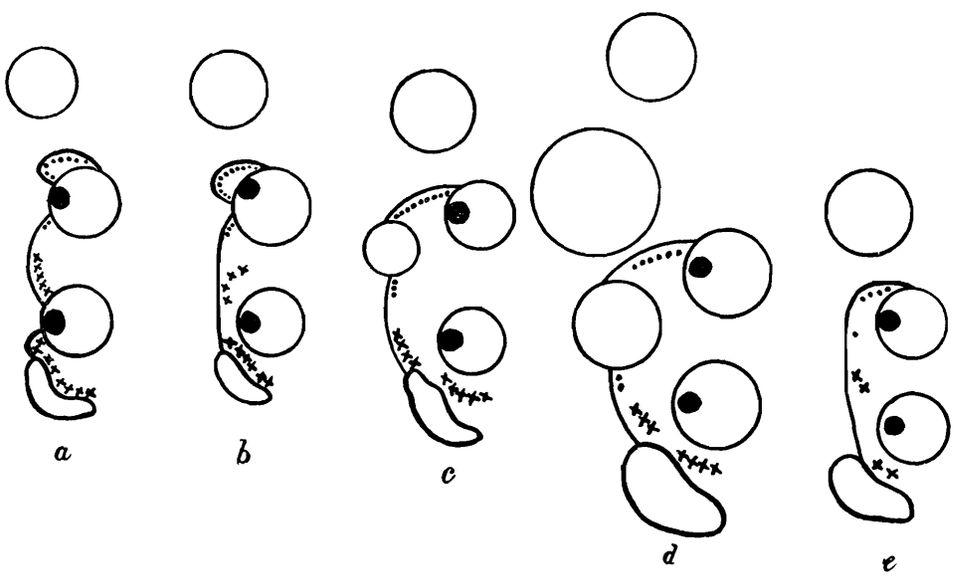
The 2nd foot is a little larger. The setigerous lobe has two bundles of compound setae, an anterior finger-shaped lobe, and a posterior cordate lobe.

In the 3rd foot, which is almost normal in size, there is a rounded dorsal cirrus,

and a group of dorsal capillary setae. There are two long slender anterior lobes. The posterior cordate lobe has now moved towards the ventral border, and there is no posterior lobe. There are two spines.

In the 4th foot (fig. 17F, and text-fig. 16*a*), the posterior cordate lobe of the 1st and 2nd feet has now definitely assumed its position as the ventral cirrus. The fillet, which lies behind the setae, is attached to the two anterior lobes in the region of the spines, and is thus broken into three sections. The dorsal capillary setae are in two bundles, above and below the dorsal spine, whilst the compound setae have a similar relation to the ventral spine.

The 6th and 8th feet (text-fig. 16*b*) are similar, except that the fillet runs further out along the upper anterior lobe. It then passes direct to the ventral cirrus, and is not fused to the lower anterior lobe.



TEXT-FIG. 16.—Parapodial diagrams of *Glycera alba* var. *cochinensis*, var. nov. *a*. 4th foot; *b*. 6th or 8th foot; *c*. 10th foot; *d*. 40th foot; *e*. 110th foot. = capillary setae; × = compound setae.

In the 10th foot (text-fig. 16*c*) the dorsal projection of the fillet now forms a posterior lobe, and is quite free from the upper anterior lobe.

In the 12th foot the posterior lobe is half as long as the upper anterior lobe. The fillet projects slightly outwards behind the lower anterior lobe.

The first branchia appears on the 17th foot, as a short stumpy lobe above the posterior dorsal lobe. It increases in size up to the 30th foot.

The 40th foot (fig. 17H, and text-fig. 16*d*) represents the normal condition. The branchia is very large, 3 or 4 times as long as any of the foot lobes. The upper posterior lobe is always much shorter than the anterior lobes, whilst the lower posterior lobe is only just indicated by the outward curve of the fillet.

Towards the posterior end the various lobes (excepting the dorsal cirrus, which remains short and rounded) become thinner and more pointed. The 110th foot (text-

fig. 16*c*) consists only of the dorsal cirrus, the two anterior lobes, and the ventral cirrus. The branchia and posterior lobes have disappeared, and the fillet is perpendicular. The posterior 12 feet are without branchiae. The anal segment bears a pair of long tapering cirri, stout at the base.

The setae are of the usual type. The dorsal capillary setae have slightly flattened blades, with slight traces of a wing. The compound setae have the ends of the shafts unequally bifid (fig. 17J), and slender terminal pieces. The edges of the latter are minutely crenulate, rather than serrate.

I have compared these two individuals carefully with specimens of *Glycera alba*, Rathke, from Ireland, and have been unable to find any differences worthy of specific rank. In the Cochin specimens the branchiae are a little longer, and the lobes of the feet rather more acute, the posterior lobes being shorter relatively. It is also possible that examination of more material would show differences in the structure of the anterior feet, especially in the origin of the posterior lobes. The structure of the proboscis is very similar in both forms.

Glycera africana, Arwidsson (1898, p. 21) and Fauvel (1902, p. 75), seems to be a similar variety of *G. alba*, hardly distinguishable from the present form. It has been recorded from Senegal, Cape of Good Hope, and the Red Sea. The branchiae of the European forms of *G. alba* vary considerably in size, *G. convoluta*, Keferstein, having apparently been described from specimens with very large branchiae. *G. alba*, var. *macrobranchia*, Moore (1911, p. 301), from San Diego Bay, California, is very closely related to the present form. A number of other species will probably eventually be referred to *G. alba*, which appears to have an almost world-wide distribution. It has not, however, previously been found in fresh or brackish water, though its wide distribution indicates great capacity for adaptation.

Habitat.—Two specimens were collected in September, 1914, by F. H. Gravely, in the Cochin Backwater, near Ernakulam, south-west coast of the Madras Presidency. The water is of variable salinity, but precise information on this point is lacking.

Glycinde oligodon, sp. nov.

(Plate XXVII, figs. 18A–Q, and text-figs. 17*a–c*.)

This species is widely distributed in the Chilka Lake. The type specimen is an immature female, 20 mm. long, having 97 setigerous segments. The colour of the body is a dark greenish yellow. In the intersegmental areas of the lateral region the pigment is much darker, except between the parapodia. In the median ventral line there is a row of dark spots—the neural eye-spots—not very distinct in the anterior segments. Each spot is formed, sometimes by a small bar on each side of the intersegmental groove, but more often by two short parallel longitudinal bars crossing the groove. The body is narrow in front, and gradually expands till the beginning of the posterior third. It then tapers a little, more rapidly in the last few segments, but still the tail terminates rather bluntly, especially in small specimens (fig. 18B). The anal segment bears two long cirri, swollen at the base, with long filiform tips. The

anus is terminal, and the cirri are ventral, equal in length to the last 9 or 10 segments.

The segments increase in length up to the 22nd, where the length of each is two-thirds of the width, then slightly decrease up to the 28th. Then they suddenly decrease greatly till the length is only $\frac{1}{6}$th–$\frac{1}{8}$th of the width, the latter having at the same time increased. The anterior part of the body is rounded, the middle and posterior regions are flat. In the anterior segments the nerve cords are widely separated (fig. 18A), and are indicated externally by faint lines of pigment, which are thickened to form a dot in the middle of each segment.

The basal ring of the head (fig. 18A) is broad, and has a small deeply seated black eye at each side. No other eyes were observed on the head. The distal ring of the head has four small tentacles, each having a small terminal joint furnished with palpocils. The ventral tentacles are a little in front of the dorsal. The head is composed of the basal ocular segment and eight tapering rings. The dorsal region of the head is defined by lateral grooves.

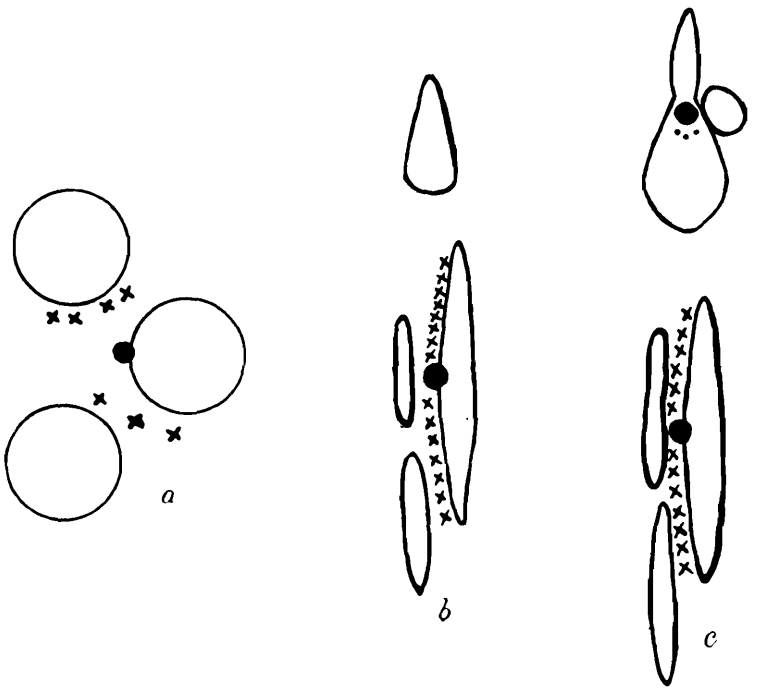
The everted proboscis is armed with two dorsal and two ventral bands of tooth-like papillae or paragnaths (fig. 18C). Each ventral band consists of two rows of papillae. The inner or median row is composed of soft mammillate papillae (fig. 18E), each with a pore at the tip. The outer row is composed of harder thick-walled paragnaths (fig. 18F), each with one large and one small tooth. These outer paragnaths are largest at the proximal end of the everted proboscis, and become smaller and more shapeless towards the distal end. Each dorsal band consists of four irregular rows of paragnaths. Between the bands, in the median dorsal line (fig. 18C), is a row of small rounded horny papillae with transverse apical pores. The paragnaths composing the inner row of each dorsal band are distinguished clearly from the others by their larger size and peculiar shape (figs. 18C and 18D). Each is attached near the middle, and the outer end is expanded to form a knob. The inner end is pointed, and a short distance from the tip on the upper side is a round pore. Lying externally to this row, are three very irregular rows of paragnaths, those in the outer row being usually the smallest. They have simple bases, and the tips may be simple or bifid, with terminal pores. The paragnaths, in addition to being in longitudinal bands and rows, are also arranged in transverse rows, each row being completed in the lateral region of the proboscis by a ridge. On this ridge, on each side, are two flat papillae with pointed angles (figs. 18C, 18G). These ridges and papillae are absent on the basal part of the proboscis, largest in the middle and distal regions.

The jaws (fig. 18H) are disposed in a single row, and are very few in number. There are two large ventral jaws (*a*) each with two or three large blunt roots and six teeth. There are no small jaws between the large pair. There is a dorsal row of four small denticles, each consisting of several rounded lobes (*b*), sometimes with two sharp teeth (*c*), or with four teeth and a larger bifid tooth (*d*) occasionally there is an additional denticle, still smaller and simpler.

The 1st foot is very small, the 2nd a little larger, and the 3rd almost normal in size.

The 1st foot (fig. 18J, and text-fig. 17*a*) consists of three lobes, one in front of the setae and two behind. The small spine, with bent tip, lies behind the front lobe. The setae are all compound, and lie in two groups, 4 beneath the upper lobe, and 3–4 between the anterior and lower lobes. The 2nd foot is similar, and there is an additional seta in each group. The 3rd foot has 9 dorsal and 4 ventral setae. In the 6th foot the anterior lobe is much flatter and wider, and a small lobe appears behind it. The two posterior lobes have moved further apart, and now obviously represent the dorsal and ventral cirri.

At the 10th foot (fig. 18K, and text-fig. 17*b*) all the lobes are flatter. The dorsal cirrus has taken up a more elevated position. It has a rounded ventral projection near the base, and is also indented near the tip, the latter characteristic being very



TEXT-FIG. 17.—Parapodial diagrams of *Glycinde oligodon*, sp. nov.
a. 1st foot; *b*. 10th foot; *c*. 30th foot.
· = simple dorsal setae; × = compound ventral setae.

constant in all the subsequent feet. The anterior lobe is very much enlarged, flat and tapering to a slender tip. There are 8 setae above and 7 below the spine. The 15th foot is very similar, the dorsal spine and setae being still absent. In the 20th foot the dorsal cirrus is still more obviously enlarged near the base, which projects outwards as two small papillae, between which terminate the dorsal spine and one or two slender spines.

At the 30th foot (fig. 18L, and text-fig. 17*c*) the dorsal division consists of the short stout swollen base of the dorsal cirrus, the latter organ, with its indented tip, being carried on the upper surface. Beneath the dorsal cirrus lies the dark reddish brown spine, accompanied by two or three dark brown setae (fig. 18N), which do not pierce the skin. In front of the spine is a small rounded papilla. The ventral divi-

sion shows little change, except that the posterior lobe is rather larger and wider. In some specimens, however, this lobe is narrower and longer than that shown in fig. 18L. The succeeding feet undergo little change, except that the various lobes gradually become shorter, and the dorsal division relatively increases in size, till at the 90th foot (fig. 18M) it slightly exceeds the ventral division.

The ventral compound setae are of the usual type (fig. 18P, 18Q). The end of the shaft is swollen, and the terminal piece is long and slender, with very minute serrations. The dorsal setae (fig. 18N) are of the shape characteristic for the genus *Glycinde*, having a curved tip with a long slender curved spine on the crest. In none of the feet do they pierce the skin.

This species is characterised (1) by the small number of rings composing the head; (2) by the structure of the proboscis, and especially by the small number of dorsal jaws; (3) by the structure of the feet.

G. oligodon seems to be most closely related to the *G. armigera* described by Moore (1911, p. 307), from California, in rather deep water. It differs in the shape of the paragnaths, the smaller number of dorsal jaws, the smaller number of rings composing the head, and in the shape of the foot-lobes.

Habitat.—Numerous individuals of this species were taken at 12 stations in the Chilka Lake. With one exception these stations were in the south-western half of the lake. The remaining station was in the outer channel, and was worked during September, when the water was quite fresh. At the other stations, 9 of which were worked in the salt-water season, and 2 in the freshwater season, the specific gravity of the water varied from 1·001–1·011. The species was usually taken on a muddy bottom, at some distance from the shore.

Family ARICIIDAE.

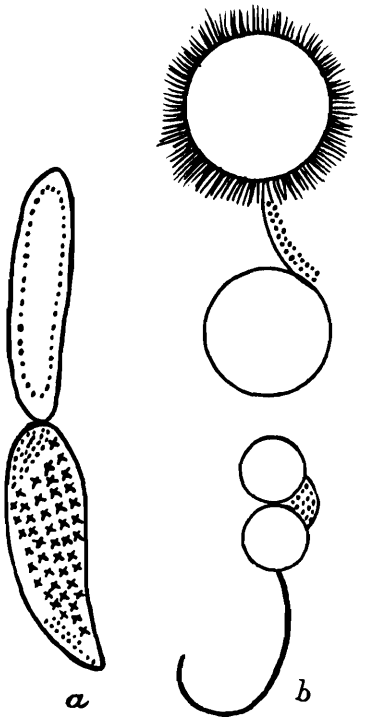
Scoloplos marsupialis, sp. nov.

(Plate XXVII, figs. 19A–G, and text-figs. 18*a*, *b*.)

Only a single specimen of this species was obtained, in the Chilka Lake, but fortunately it is complete. It is a male, and the body cavity is full of nearly ripe spermatozoa. The body is wide and flattened in front, attaining its greatest width at the 13th setigerous segment. It is 50 mm. long, and is composed of 210 segments. The ventral surface is flattened in front for a short distance, but soon becomes markedly convex, and is traversed by a median groove which commences in the 15th segment, and runs to the posterior end. The dorsal surface is convex up to the 5th setigerous segment, and then becomes flat, but the crowding of the parapodia on the dorso-lateral borders makes it appear concave. In the anterior region there is a transverse ridge running round the middle of each segment, dorsally and ventrally. In the middle and posterior regions, each segment is biannulate. The prostomium (fig. 19A) is composed of two rings. The anterior ring is a slender cone, separated by a groove from the posterior ring, which is much wider. The mouth is at the anterior end of the buccal segment, and has two lateral semicircular lips, with a longitudinal

slit—the mouth—between them. These lips may possibly represent the proboscis as it begins to be extruded. No eyes were observed. The intestine is full of sand grains.

The 1st foot (text-fig. 18*a*) has dorsally a numerous group of capillary setae, with serrated blades, diminishing in size from above downwards. They are guarded in front by a low insignificant fillet, behind by a rather more conspicuous one. The ventral bundle consists of three or four rows of stout hooks (fig. 19F). Above and below the hooks, and posterior to them are two groups of capillary setae like those in the dorsal bundle. The whole ventral bundle is surrounded by a low and inconspicuous fillet. The 2nd foot is similar. In the 3rd foot the dorsal bundle is relatively a little smaller, and has a small flat cirrus behind it. No cirrus was noted in the ventral division.



TEXT-FIG. 18.—Parapodial diagrams of *Scoloplos marsupialis*, sp. nov.
a. 1st foot; *b*. 30th foot.
= capillary setae; × = short hooks.

In the 4th foot (fig. 19B) there is a conical cirrus behind the middle of the ventral division, as well as the flat finger-shaped dorsal cirrus.

The short ventral hooks are only present in numbers in the anterior 8 setigerous segments. In the 9th segment only 2 were observed, and in the 10th, none. This type of seta has a number of coarse serrations beneath the rounded tip, which is guarded by two very delicate wings. The shaft shows a double curvature. In the anterior segments the ventral capillary setae are shorter and stouter than the dorsal setae, and the blade is more abruptly widened.

No further change occurs in the feet till the 13th setigerous segment, where the branchiae appear as minute papillae, and the dorsal cirrus commences to elongate. At the 17th foot (fig. 19C) the dorsal cirrus and branchia are very similar in size and shape, but the ventral cirrus is still small. In the 18th and 19th feet (fig. 19D) marked changes commence. The dorsal cirrus and dorsal setae are much longer. The ventral cirrus is longer also, and behind and beneath it is a large thin membrane shaped like a pocket. The latter commences on the 18th segment, and increases a little in size in the succeeding segments. All the setae are now longer, slenderer, and with finer serrations than those in the anterior region, the dorsal setae being longer than the ventral. Each bundle is supported by a number of pale spines. The ventral cirrus, however, still remains entire, and the area from which the ventral setae emerge is still elongate, as in the preceding feet.

In the 20th foot the metamorphosis is complete. The ventral cirrus is bifid at the tip, and the setae emerge in a small area in front of and between the two lobes. The dorsal cirrus is constricted near the base. The ventral setae have also changed

again slightly, the blade, instead of tapering very gradually, narrowing abruptly near the tip (fig. 19G). The branchiae have gradually increased, and the 30th foot may be taken as typical of the median and posterior regions of the body (fig. 19E, and text-fig. 18*b*).

The branchiae are large and tapering and covered with cilia. They lie close together near the median dorsal line. The dorsal cirrus is fusiform, and a thin fillet at its base lies behind the dorsal setae. The ventral setigerous lobe is also constricted at the base and bilobate at the tip. The ventral setae emerge in a bunch just in front of the bifid tip, and are guarded by a low anterior fillet. Beneath the ventral division is the delicate pocket-shaped membrane, from which the specific name is derived. It is attached by its anterior edge in a line with the setigerous lobes, and its shorter posterior margin is thus behind the foot. The setae are almost equally long in both divisions. Very little change takes place in the succeeding feet. In the 70th foot the dorsal cirrus is half as long again as the branchia, which is very short and stout, but in the 150th foot the two are equal in length. As only a single specimen was available it is impossible to say whether these variations have any significance. The posterior 10 pairs of feet decrease rapidly in size. The anal segment is large and cylindrical and the anus is terminal. There are two very slender dorso-lateral anal cirri.

This species differs from *S. armiger* (Müller) in many respects. In the latter species the pockets below the feet are absent. The position of the first branchia differs, as does the shape and arrangement of the anterior feet, the shape of the setae, etc.

S. kerguelensis, McIntosh, is easily distinguished from the present species by the shape of the setae, the position of the first branchiae, etc.

Habitat.—A single specimen was found in the outer channel at Manikpatna Island, during the salt-water season, when the specific gravity of the water was about 1·0264. It probably lives there throughout the year, though this remains doubtful, in the absence of material collected during the freshwater season.

Family SPIONIDAE.

Polydora hornelli, Willey.

(Plate XXVIII, figs. 21A–D.)

1905. *Polydora hornelli*, Willey, p. 286.

A single specimen, the posterior part of which is missing, was found in an oyster shell at Manikpatna, Chilka Lake. It exhibits no obvious characters by which it can be distinguished from the *P. hornelli* described by Willey (*tom. cit.*), who obtained his specimens from pearl oysters in the Gulf of Manaar, Ceylon. Unfortunately Willey's description is rather brief, and is illustrated only by a single figure showing one of the modified setae of the 5th segment. He gives no account of the structure of the posterior region, so important in diagnosing the species of this genus, and the absence of the tail in the Chilka specimen prevents me from completing his account.

The single incomplete individual is 31 mm. long, consisting of 92 segments. After preservation in alcohol, it is quite colourless.

The head (fig. 21A) corresponds fairly well with the description given by Willey. The prostomium is slightly indented in front. Between the bases of the tentacles there is an oval area of the prostomium, separated by grooves, which seems to correspond to the 'ocular area' of Willey. The prostomial ridge, or caruncle, runs back to the end of the 3rd setigerous segment. No eyes were observed. The tentacles are stout, long and firmly attached.

The 1st foot has a bundle of ventral capillary setae, with a cirrus (the ventral lamella) behind them. There are no dorsal setae, but just outside the base of the tentacles on each side is a small conical lobe, representing the dorsal lamella.

The dorsal bundles of the succeeding feet have two rows of setae, the anterior row consisting of short setae, the posterior row of long setae.

The 5th setigerous segment (fig. 21B) bears the modified setae. In the middle of the lateral region is a curved row of 8 or 9 stout hooks, alternating with as many pointed setae. At the anterior end of the row is a bunch of capillary setae, the dorsal superior setae. According to Willey (*tom. cit.*) these setae are absent in his specimens. There is no trace of dorsal or ventral lamellae. Beneath the middle of the modified setae is a tuft of capillary setae, representing the ventral bundle.

The tips of the hooks differ according to their position in the row. The oldest hooks, at the anterior end of the row, are worn at the tip (fig. 21C, *a*, *a*^{1}), which is spoon-shaped, with a distinct excavation, and a neck below. The unworn posterior hooks (fig. 21C, *b*) have a closely applied tooth, which occupies the concavity of the tip. The latter type is figured by Willey (1905, Pl. V, fig. 117). The capillary setae which alternate with the hooks, and which represent the anterior row of dorsal inferior setae, have rather short flattened blades and slender tips, and the dorsal superior setae resemble them.

The branchiae and ventral crochets appear on the 7th setigerous segment. The branchiae continue to the end of the imperfect worm (the 92nd setigerous segment at leāst). The crochets (fig. 21D) have a distinct constriction beneath the neck. The main tooth is long and pointed, making an angle somewhat less than 90° with the shaft. There is a simple tooth on the crest, making an angle of 45° with the main tooth.

This specimen is very close to the *P. hornelli* of Willey. The chief differences are (1) the caruncle extends over the 3 anterior setigerous segments, whereas Willey gives 2 segments for his specimens; (2) the dorsal superior group of setae of the 5th setigerous segment is present in the Chilka specimen, absent in the Ceylon specimens. It is possible that a closer examination of the Ceylon specimens would show other differences, which would necessitate the creation of a new species for the Chilka form, but meanwhile it may be regarded as a variety of Willey's species. There is no doubt but that this species is distinct from *P. ciliata* (Johnston).

Habitat.—In crevices of oyster shells, Manikpatna, Chilka Lake. The specimen was collected in September, when the water was quite fresh. From the nature of its habitat it is highly probable that it survives through the salt-water season.

Polydora (Carazzia) kempi, sp. nov.

(Plate XXVIII, figs. 20A–J.)

Five specimens of this species were collected from a canal near Calcutta. Unfortunately the specimens are all incomplete, and nothing is known of the posterior end. The longest fragment is 6·5 mm. long, composed of 27 setigerous segments. The body is of the usual shape, the anterior region being flattened dorsally, somewhat rounded ventrally. Near the 17th segment the body becomes round in section. The anterior segments are short, but gradually elongate, till at the 20th they are nearly as long as broad.

The anterior segments have each a single transverse line of black spots on the dorsum, but the line is sometimes reduced to two median spots.

The head (fig. 20A) is rather small and broad. It bears in front two short but distinct anterior lobes. There are four black eyes, the two posterior being small and round, whilst the anterior pair, which are more widely separated than the others, are crescentic. The posterior margin of the head is rounded, and there is no caruncular prolongation, but instead there is a large erect occipital tentacle, lying between the bases of the tentacular cirri. The latter organs are relatively large.

The 1st foot (fig. 20C) consists of a stumpy round dorsal papilla, without dorsal setae. The ventral setigerous lobe is vertically elongate, with a row of slender capillary setae, which have only slightly flattened blades.

The 2nd foot has a fairly large rounded dorsal lamella lying behind the dorsal setae. The dorsal setigerous lobe is conical, and the setae are long and slender, with only slight indications of a wing. The ventral setae are shorter and wider than the dorsal, with narrow wings.

In the 3rd foot the lower dorsal setae are wider than those in the 2nd foot, and have wings. The ventral setae have increased in size, and are very distinctly flattened, with slender tips. These changes are much more marked in the 4th foot (fig. 20D), especially in the dorsal division. The upper dorsal setae remain long and slender, with very narrowly winged tips, but there is a gradual transition to the lower ones (fig. 20G), which are short and boldly curved, with widely winged blades. The ventral setae, in two rows, are all lance-shaped (fig. 20H), those at the lower border being very slender. The lower edge of the dorsal bundle curves backwards a little, as in *P. antennata*, Clap. (Mesnil, 1896, p. 228), and this tendency is much more obvious in the next segment.

The 5th foot (fig. 20E) seems to be less modified than that of any other species of *Polydora*, and is very similar in structure to the 4th foot, as may be seen from a comparison of figs. 20D and 20E. Mesnil (1896, p. 235) on the contrary, expresses the view that in *P. polybranchia*, Haswell, and *P.* (*Carazzia*) *antennata*, Clp., the 5th segment has undergone greater modification than in any other species of *Polydora*. This opinion is apparently based on the presence, in these two species, of two kinds of modified setae in the 5th segment. If the 4th and 5th feet of *P. kempi* (a species very closely related to *P. antennata*) are compared, it will be apparent that

the only difference of note is in the shape of the dorsal inferior setae. In both feet the dorsal and ventral lamellae are similar, the dorsal and ventral bundles are vertically elongate, the dorsal superior setae are very long, with narrow wings, and the ventral setae are lance-shaped. In the 5th foot the dorsal inferior setae are sharply differentiated from the other setae. They consist of two rows, 11–15 in a row, of modified setae (figs. 20E and 20F). The anterior setae are bilimbate capillaries, short, with very broad wings and rapidly tapering filiform tips. The posterior row consists of rather stout hooks with curved tips. There is not much difference between the setae of the anterior row and the dorsal inferior setae of the 4th foot. Moreover, though the row of dorsal setae is distinctly curved at the lower end (fig. 20B), a similar tendency is observed in the 4th foot. If the 5th foot of *P. kempi* is compared with that of a typical *Polydora* (as in fig. 21B), it is difficult to see how Mesnil's assertion can be maintained. In the typical 5th foot, the dorsal and ventral lamellae are absent, and the general disposition of the dorsal and ventral bundles is more modified. The anterior row of dorsal inferior setae are usually modified as much as, or more than, those of *P. kempi*. The curvature of the dorsal row of setae of the 5th foot in *P. kempi* is much less than in the case of *P. antennata*, as figured by Mesnil (1896, Pl. XIV fig. 22), or Carazzi (1893, Taf. 2, fig. 12).

The 6th foot is very like the 4th, but the dorsal lamella is not quite so large. The setae are as in the 4th foot, except that the posterior row of the ventral division is composed of very slender thread-like setae.

There are two pairs of glandular pouches in the 6th and 7th segments, as in *P. antennata*.

In the 7th setigerous segment the branchiae appear. They are quite free from the dorsal lamellae, and at first are large. They are only 10–12 pairs of them, and the last few pairs are very small.

In the 8th foot the ventral crochets appear (fig. 20J). They are 18–20 in each foot, and they are not accompanied by any capillary setae. On the crest there is a slender tooth so closely applied to the main fang that there is no angle between them. The shaft swells gradually above, and abruptly below, the narrow waist. The longest crochets are in the middle of the row. These crochets greatly resemble those of *P. antennata*. The dorsal setae are longitudinally striated, slender, and very narrowly winged, the lower ones being short but narrow. The wide form of the 4th foot has disappeared.

In the 18th foot the dorsal setae, 8 or 9 in number, are very long and slender, wingless, or with indistinct wings. They emerge in a bunch, and no longer form a transverse row. The branchia is reduced to a small papilla, and the lamellae and fillets are small. In this region of the body the feet are insignificant, and project only slightly. In the absence of the posterior region it is impossible to be certain, but the insignificance of the feet in the middle of the body would seem to differentiate this species from *P. antennata*, where, according to Mesnil, the feet of the posterior region are very prominent, and the dorsal lamellae and fillets are well developed.

Moreover, in the latter species the branchiae extend from the 7th foot to the 40th or 50th.

There is no pharynx in this species.

None of the specimens was sexually mature, and probably they are not fully grown, so that changes may occur as growth proceeds.

There is no doubt that this species has its closest affinities with *P. antennata*. It resembles it, and differs from other species of Polydora, in the structure of the 5th setigerous segment, which is only slightly modified, and in the appearance of the crochets in the 8th setigerous segment and in their shape. In other ways the two species are alike. I agree with Mesnil that these differences justify the separation of *P. antennata* and the creation for it of the genus *Carazzia*, in which the present species must also be placed.

Habitat.—Five specimens were collected in October 1914, in a canal at Chingrighatta, near Calcutta. The specific gravity of the water was 1·004.

Family AMMOCHARIDAE.

Myriochele picta, sp. nov.

(Plate XXXI, figs. 30A–F.)

Very numerous specimens of this species were included in the collection, all from the Chilka Lake. Unfortunately, the tubes are so narrow and tough, and the animals so fragile and firmly attached to the tubes, that it is almost impossible to extract an entire specimen. Frequently, also, the posterior extremity seems to be missing, or to have been regenerated to a certain extent.

The tubes are very uniform in size, 7–11 mm. long, and only 2 mm. in width. They are composed of a tough inner membrane, covered on the outside with small quartz grains (fig. 30B). The posterior end of the tube is somewhat narrowed, and is covered with rather smaller quartz grains than the anterior end.

The worms themselves are 3–4 mm. long. No specimens containing sperm or ova were observed, so that possibly the worms attain greater dimensions, but their uniform size, whether found in February or September, tends to show that they are fully grown.

On the back of the head, opposite the anterior end of the mouth, is a conspicuous patch of reticulate purplish brown pigment (fig. 30C). This patch is fairly constant in occurrence, though of variable size and density. At the posterior end of the buccal segment is a transverse dorsal band of similar pigment. A fainter band may occur near the anterior dorsal margin of the first thoracic segment, and smaller patches are sometimes found on other parts of the head, though these are frequently absent, at least in the preserved animals.

A specimen, apparently complete (fig. 30A), was extracted from its tube. It is 3·5 mm. long, and consists of the head and 16 setigerous segments, of which 3 are thoracic and 13 abdominal. The head and buccal segments (fig. 30C) are quite fused, and frequently marked off from the thorax by a constriction. The head is some-

times swollen and bent, as in fig. 30A. The mouth forms a conspicuous opening on the ventral surface (figs. 30C, 30D). It is surrounded by a thick folded lip, which is richly ciliated.

The thoracic segments, 3 in number, are provided on each side with a group of capillary setae, 2-4 in number, and lateral in position. No hooks are present on the thorax.

The first abdominal segment is as long as, or a little longer than, the three thoracic segments. The second abdominal segment is still longer, and is the longest segment of the body. The succeeding eight segments diminish only very slightly in length, but the three posterior segments are much shorter, especially the two last. The anal segment is conical. All the abdominal segments are provided with dorsal capillary setae and ventral hooks. The capillary setae are 1–5 in number. The proximal part of the seta is smooth, the distal part spinous, but the spines are so small that even under a magnification of 1300 diameters they are indistinct. The thoracic setae are slightly thicker than those of the abdomen.

In the ventral tori the hooks are arranged in irregular transverse rows. The anterior segments contain 25–35 in each torus, the middle segments sometimes 55–65, the posterior segments as few as 5–10. The hook (fig. 30E) has a straight tapering shaft, a distinctly constricted neck, and above this a boldly curved bifid tip. The teeth at the tip vary considerably in thickness, the two represented in fig. 27E being the extremes. One hook is placed above the other, so that when seen from above (fig. 30F) only a single tooth is visible. In the anterior abdominal segments the setae are near the front part of the segment, but in the posterior segments they are at the back.

The head and buccal segment are almost entirely occupied by the buccal mass (figs. 30C, 30D). Passing backwards from the mouth, and lying beneath the buccal mass, is a clavate diverticulum, probably homologous with the "Lippen-organ" described by von Drasche in *Owenia fusiformis*, D. Chiaje, and later by Watson, but not previously noted in *Myriochele*. The narrow oesophagus lies in the two anterior thoracic segments. In the third thoracic segment it passes into a somewhat swollen 'pharynx. This is succeeded by the swollen intestine, which, in the first abdominal segment, is composed of a mosaic of flattened granular cells, and differs markedly in appearance from the succeeding and narrower part, though the transition in the second abdominal segment is gradual. The intestine is full of organic debris, and contains numerous diatoms, but no sand is present. A septum divides the buccal from the first thoracic segment, and another lies between the second and third thoracic segments. No septa could be distinguished in the anterior abdominal segments, but they are present in the posterior segments, just behind the bundle of setae. In *Owenia fusiformis* all the segments, except the three thoracic, are separated by septa.

Five pairs of 'thread glands are present (fig. 30D), a pair in each of the three thoracic segments and in the two anterior abdominal segments. The thoracic glands are small, those in the third segment being the largest, whilst those in the abdominal

segments are very long. The thoracic glands open to the exterior by minutes pores near the setae, the abdominal glands between the dorsal and ventral setae. In *Owenia* there are 6 or 7 pairs of glands in the anterior segments, those of the third thoracic segment being sometimes small or absent. In *Myriochele heeri*, according to Hansen (1882, pp. 41, 42), there is a pair of glands in each of the long segments, and he shows 14 such segments (*tom. cit.* T. vi, fig. 6). Fauvel (1914, p. 264) says that in *M heeri* there is a pair of glands in each segment. McIntosh (1885, p. 410) refers a form dredged in 2975 fathoms, east of the Antilles, to the same species. The great depth at which it was taken, the large size of the specimens, and the fact that both extremities were missing when McIntosh examined the material, make the identification more than doubtful. McIntosh quotes the statement of Dr. v. Willimoes-Suhm, who examined the specimens when they were captured, that " there is a pair of glands in each of the segments, from the second to the seventh." This agrees more closely with the present form, in which they occur in segments 2–6.

The *Psammocollus australis* of Grube (1867, p. 30) from St. Paul, appears to differ from the present species, so far as one can tell from the rather imperfect description and figures, in a few points, such as the size, position of the thoracic setae, shape of the hooks, which have only a single hook at the tip, and the larger number of capillary setae per bundle. Glands were observed to accompany the first and three following girdles of hooks, that is to say, in the four anterior abdominal segments.

Habitat.—This species was found on 6 occasions, in the southern part of the lake, between Kalidai I. and Rambha. Five occasions were during the salt-water season and one during the freshwater period, but the specific gravity of the water only varied between 1·005–1·01. The specimens were taken on a muddy bottom, in a fine-meshed net attached to the trawl.

Family CAPITELLIDAE.

Heteromastus similis, sp. nov.

(Plate XXIX, figs. 23A–23H.)

In addition to two very small specimens, one complete individual and a number of fragments are available for study. The description is drawn up from the complete individual (the type specimen). It is 55 mm. long, composed of 212 segments. Some of the other fragments apparently belong to rather larger individuals, and as no trace of sexual products was found, the mature individual is doubtless larger still. The body is long and slender, swollen at the anterior end, and tapering very gradually to the tail. In the preserved specimens the thoracic segments are pale buff colour, the abdominal segments greyish brown with a tinge of purple.

The head (fig. 23A) is small and pear-shaped, consisting of a wide basal part and a much narrower tip. It usually projects freely, but may be partly contracted beneath the anterior border of the peristomium. No eyes were observed. The basal part of the proboscis is thin-walled, and is covered regularly with mammillate papillae. The walls are full of clear oval refringent bodies. The anterior five seg-

ments are usually swollen, and the inter-segmental grooves are faint. Behind the 5th (the 4th setigerous) and the succeeding segments the grooves are deeper, and there are faint transverse grooves in line with the setae. Beginning on the 1st setigerous segment there is on each side of the body a shallow groove, and these, combined with the broad and shallow ventral groove, produce two ventro-lateral ridges, carrying the ventral setae, somewhat in the manner of *Ammotrypane*. The ridges fade away in the middle of the body.

The thorax consists of 12 segments, the 1st being achaetous. The 5 anterior setigerous segments have rather short capillary setae in both dorsal and ventral bundles. The dorsal setae (fig. 23F) have broad tapering wings. The ventral setae are very similar, except that the wings are rather narrower, more elongate, and proximally do not taper so gradually. There are 7–15 setae in the dorsal bundles, 4–14 in the ventral bundles. In the 1st and 2nd feet the dorsal setae are in two rows, in the other bundles only in a single row. In the 7th–12th segments all the bundles are composed of long crochets (fig. 23G). The distal quarter is widened, and enclosed in a sheath. The shaft narrows beneath the tip, which has a large tooth, with two small and indistinct spines on the crest. The shaft is long, doubly curved, and has no nodular swelling.

In the 1st setigerous segment the dorsal bundles of setae are separated by a space rather greater than that which separates the dorsal and ventral setae on each side. In the subsequent thoracic segments this interval is only slightly reduced, but in the 12th setigerous segment—the 1st abdominal—the dorsal bundles lie close together near the median line. The setae in the abdominal segments are surrounded by tumid lips, which are absent in the thoracic segments.

In the thoracic segments the setae lie in the middle of the segment, but in the abdominal region the setae are near the posterior border. Furthermore, in the anterior region the segments are as long as broad, but they gradually shorten, till in the mid-region they are three or four times as wide as long. The length again increases in the posterior region till it equals half the width. In the middle of the body the constrictions between the segments are very deep, especially in the dorsal region. The abdominal setae are all very short crochets (fig. 23H), and have a nodular swelling in the middle of the shaft. There are 10–15 of them in each bundle.

The structures which, in this genus, are supposed to have a branchial function, consist of a number of lobes projecting from the posterior part of each segment. There are two of them on the dorsal surface (fig. 23C), carrying the dorsal setae, two in the latero-ventral region (figs. 23D, 23E) carrying the ventral setae, and one in the mid-ventral region, overlying the nerve-cord. The dorsal lobes, which make their appearance near the 100th segment, are by far the most conspicuous. The ventral lobes appear near the 140th segment, and are smaller and more rounded than the dorsal pair. In the last few feet the branchial lobes are small and inconspicuous. In other specimens the branchiae are on fewer segments, but this may be due to regeneration of the posterior region.

The anal segment bears ventrally a slender clavate tail, ·33 mm. long (fig. 23B).

The type of this genus is *Heteromastus filiformis* (Clap.). It is known from the Mediterranean, the west coast of France, and Belgium (Ostend), and from several localities on the east coast of North America (Eisig, 1887, p. 839). The two forms are apparently so closely related that it is difficult to distinguish them. The Chilka Lake species is the smaller (55 mm. as against 100 mm.), but has more segments (212 against 140). The head, arrangement and structure of the setae, the branchiae and tail are almost identical. Eisig's figures of the branchiae (1887, Taf. 27, fig. 18) shows a lobe on each side, between the dorsal and ventral lobes, which is absent in the Chilka Lake specimens (fig. 23E). In *H. filiformis* the anterior abdominal segments are much longer than the thoracic segments, whereas in *H. similis* the lengths do not differ. Moreover, though considerable work has been done in the intervening area of the Red Sea and Persian Gulf, *Heteromastus* has not been found there. I have not been able to examine specimens of *H. filiformis*, but it is probable that a comparison of the two species would reveal other differences, whilst possibly reducing the importance of those mentioned above.

Habitat.—This species was taken at three localities in the Chilka Lake, between Nalbano and Berhampur, that is, near the inner end of the outer channel. Two of these stations were worked in March and one in September. The specific gravity of the water ranged from 1·000–1·0261. The species was taken once on the shore, twice in a few feet of water.

Genus **Barantolla**, gen. nov.

Capitellidae having 12 thoracic segments, of which the 1st is achaetous. Segments 2–7 have only capillary setae, segments 8–12 only elongate crochets. The abdominal segments have short crochets only. The anterior thoracic segments have reticulate markings on the skin, and the sculpture of the thoracic segments is rather elaborate. Branchiae in the form of short finger-shaped lobes behind the dorsal setae of the middle and posterior segments. These segments are provided each with a membranous collar, produced into four shallow parapodial lobes.

This genus shows marked affinities with *Heteromastus* and *Mastobranchus*, and it is evident that the three genera are closely related. They all possess 12 thoracic segments, of which the 1st is achaetous. *Barantolla* agrees with *Heteromastus* in having capillary setae on the anterior, long hooks on the posterior thoracic segments, and only short hooks on the abdominal segments, but differs in having capillary setae on the segments 2–7, whereas *Heteromastus* has them only on segments 2–6. *Mastobranchus* is peculiar in having capillary setae only, on the thoracic segments, and in the dorsal bundles of a number of the anterior abdominal segments. On the other hand, *Barantolla* agrees with *Mastobranchus* in having finger-shaped branchiae, situated behind the dorsal setae of the middle and posterior segments. The parapodial lobes (branchiae) of *Heteromastus* are very like those of *Barantolla*. *Heteromastus* and *Mastobranchus* are peculiar in having finger-shaped appendages on the anal segment, and it is unfortunate that no information is available on this point for *Barantolla*. The general appearance of the abdominal segments is very similar in all three

genera. The affinity between *Barantolla* and *Mastobranchus* is also indicated by the crenulated skin of the anterior thoracic segments, and by the discovery in the species of *Mastobranchus* described below of two elongate crochets in the ventral bundle of the 12th segment (*vide* p. 646).

A comparison of these three genera, based on a much more ample supply of material, would probably lead to considerable modifications.

The form described by Stephenson (1908, p. 39) from brackish ponds at Port Canning, Lower Bengal, as *Matla bengalensis* may be related to one of the above genera. The specimens examined were very young, 1·5–4·5 mm. in length, and there is little in the description to indicate what the adult would be like.

Barantolla sculpta, sp. nov.

(Plate XXIX, figs. 24A–K.)

This species is represented by a number of fragments, including the anterior ends of four individuals. Unfortunately the posterior end is not present in any specimen.

The largest fragment is 117 mm. long, composed of 135 segments. Judging from the appearance of the last few segments, the missing portion of the tail is quite short. The body is widest near the 4th or 5th setigerous segment (1·7 mm. wide), and gradually tapers till near the 30th segment. It then remains fairly uniform in diameter for a long distance, expanding again a little near the posterior end. The length of the segments varies considerably, according to their position. In the type-specimen the approximate ratio of the width to the length is in segments 1–5, 3 to 1; segments 6–14, 4 to 1; segments 15–20, 3 to 1; segments 21–35, 2 to 1; segments 36–43, 1½ to 1; segments 44–55, 1 to 1; segments 56–70, a little less than 1 to 1; segments 71–80, 1 to 1. The segments then gradually become shorter towards the tail, and the last segments are 6–8 times as wide as long.

The head in all the specimens is contracted, and withdrawn under the peristomium, and hence it is difficult to describe accurately. It is conical, composed of two rings, a wide basal, and a narrower terminal. The latter, in its contracted condition, is rounded. No eyes could be seen, but behind the basal ring of the head is an irregular transverse row of deeply embedded black pigment spots, which, however, may have no optical function.

The proboscis is partially extruded (fig. 24A), and this part is covered with very minute papillae.

The thorax consists of 12 segments, of which the first is achaetous. In the first four segments, and to a lesser degree, in the anterior part of the 5th, the skin is distinctly tessellated (figs. 24A–C), but on the succeeding segments it is smooth, except for ridges caused by unequal contraction of the skin.

Segments 2–7 have capillary setae only, segments 8–12 long crochets only, and the abdominal segments short crochets only. In the thoracic segments the setae are near the middle of the segment, but in the abdominal segments they are near the posterior end. Each of the abdominal segments is in two parts, an anterior narrow

smooth part, and an expanded posterior part, the latter bearing the swollen tori. The dorsal tori (fig. 24C) are widely separated in segments 2–4, and then gradually approach each other, till from the 12th segment backwards the tumid lips of the tori form a dorsal ridge.

The sculpturing of the integument of this species is very characteristic. On the ventral surface (fig. 24A) there is, in the median line of segments 2–5, a row of hexagonal areas, 2 or 3 in each segment. These are replaced in segments 6–12 by raised areas not clearly marked off except by a median transverse groove. In segments 5–12, on each side of the raised median areas, are narrow hexagonal areas, the outer ends of which reach to the ventral setae. In side view (fig. 24B) the lateral organs are clearly shown in segments 5–12, less clearly in segments 2–4, and are very indistinct on the abdominal segments. Dorsally (fig. 24C) there are median hexagonal areas on segments 6–11. A shallow lateral groove runs backwards on each side from the 13th segment, but occasionally it begins near the anterior end. It is probably due to the contraction of the specimens, and the presence of very powerful longitudinal latero-ventral bands of muscle.

The branchiae commence between the 55th and 60th segments. They lie under the dorsal parapodial lobes (figs. 24D–E). The anterior branchiae consist of 3 or 4 short rounded lobes, hidden by the parapodial lobes. Towards the tail the branchiae increase in number and length. The largest, near the posterior end, have 9–11 finger-shaped lobes, attached to the underside of the dorsal parapodial lobes (fig. 24E). The latter structures are part of a thin membrane which surrounds the segment like a collar, the anterior margin being fixed, the posterior one free and produced into four rounded lobes, the two larger carrying the dorsal setae, the two lateral, which are not so pronounced, carrying the ventral setae. The collar is attached to the body-wall near the middle or the beginning of the posterior third of the segment. The appearance of this part of the body is very like that of *Heteromastus*.

In segments 2–7 the dorsal and ventral tori contain only capillary setae. They have narrow wings (fig. 24F), and taper to a slender tip. The bundles of the 2nd segment (1st setigerous) have about 16 setae in each, the 3rd–7th segments have 20–40 setae in each bundle. In segments 8–12 the bundles contain only long crochets (fig. 24G), which closely resemble the similar setae of *Heteromastus*. The tip (fig. 24H), which is enclosed in a long narrow sheath, is not expanded as in *Heteromastus*. It terminates in a strong tooth, with 5 or 6 slender spines on the crest. There is a very slight nodulus where the seta pierces the skin. The nodulus lies just within the proximal half of the seta. Each bundle contains 20–40 of these setae.

The transition between the thoracic crochets and the typical abdominal crochets is not so abrupt as in other species of the family. The typical abdominal crochets are much smaller than those of the thorax (fig. 24K), they have a more distinct swelling below the neck, the sheath over the tip is relatively shorter, and the nodulus is more distinct, and is in the distal half of the seta. On the anterior abdominal segments, the setae (fig. 24J) are intermediate in size, rather more like the thoracic

than the abdominal crochets in shape, with only a slight expansion below the neck, but they have short wings over the tips, and the nodulus is in the distal half, though only slightly developed. The length of these crochets is as follows:—

On the 8th segment, ·33 mm.
,, ,, 13th ,, ·25—·26 mm.
,, ,, 14th ,, ·15—·17 mm.
,, ,, 60th ,, ·05—·06 mm.

Passing towards the tail the abdominal setae become fewer and smaller. In the 13th foot there are 25 in a bundle, on the 60th foot 10, and on some of the posterior feet 2 or 3, or none at all. The spines on the crest of the crochets form a transverse curved row, the concavity facing the terminal tooth.

Habitat.—This species was collected in some brackish pools near the salt lake at Barantolla, near Calcutta, in November. The salinity of the water is very variable, but never high, probably never exceeding 1·015.

Mastobranchus indicus, sp. nov.

(Plate XXX, figs. 25A–F.)

This description is founded on a single specimen from brackish pools, near Barantolla. Unfortunately only the anterior end is available, in a very contracted condition. It is 46 mm. long, and consists of 90 segments. The widest part is near the anterior end, where it is 3 mm. wide. The fragment evidently belongs to an individual considerably larger than the specimens of *Barantolla sculpta*.

The head (fig. 25A) consists of a small rounded lobe, withdrawn under the buccal segment. No trace of eyes or nuchal organs could be found. The skin of segments 1–6 and the anterior part of 7 is tessellated, the grooves being deeper in the anterior segments. The thorax consists of 12 segments, of which the 1st is achaetous. The sculpturing of the thorax recalls that of *Barantolla sculpta* (compare fig. 25A and fig. 24A), but is not so distinct or general. On the ventral surface hexagonal areas occupy the median line in segments 5–8 and the anterior part of 9. The ventro-lateral narrow hexagonal areas are clearly differentiated on segments 6–9, less clearly on segments 3–5. In segments 10–13 these areas gradually coalesce with the tumid tips of the ventral tori. The lateral organs are not very distinct, but narrow hexagonal areas, clearly marked off by grooves, lie between the dorsal and ventral setae in segments 5–8. They probably exist in other adjacent segments, but are not distinctly differentiated in this specimen. On the dorsum narrow transverse hexagonal areas occur between the dorsal bundles of setae in segments 5–11. As is the case with all the other areas, lateral and ventral, it is the posterior groove which disappears first, the anterior grooves remaining on many posterior segments, forming a complete groove round each segment. Four pairs of genital pores were observed, behind segments 8–11. In the lateral region there is a deep groove on each side, commencing in the 6th segment, and these, combined with a shallow

ventral groove, help to form two ventro-lateral ridges, containing the stout longitudinal neural muscle bands.

The tori in segments 2–4 are very short, containing about 20–30 setae. Segment 5 has rather longer tori, and on the 6th and subsequent segments the tori are 3–4 times as long, and contain 50–60 setae. There is no very obvious external difference between the posterior thoracic and the anterior abdominal segments. The latter are divided into two rings, a smooth anterior and a slightly enlarged posterior ring, the latter bearing the tori with their tumid lips.

The setae of segments 2–4 are rather short, with pointed tips, bilimbate, with narrow wings. The ventral setae closely resemble the dorsal setae (fig. 25B), and they are very similar to the capillary setae of *Barantolla sculpta*. The thoracic setae are all capillaries with the exception of two in the right ventral bundle of the 12th segment (11th foot). This bundle contains 45 setae, of which 43 are normal capillaries. The other two are elongate hooks, very similar to those in the posterior thoracic segments of *Barantolla sculpta*. The nodulus is only slightly indicated. It is well in the distal half of the shaft, thus differing somewhat from the similar setae of *Barantolla sculpta*. The shaft is widest near the lower end of the wing, and narrows gradually towards the neck, beneath the hooked tip. In the absence of any marked widening of the shaft below the neck, these setae resemble those of *Barantolla sculpta* and differ from those of *Heteromastus similis* (compare figs. 23G, 24G and 25C). The tooth at the tip is rather slender, and makes an obtuse angle with the shaft. Behind the tooth the crest bears 5 or 6 slender spines. These setae are ·52 mm. long, a little shorter than the capillaries of the same bundle, which are ·6 mm. long. Except for the hooked tip, they greatly resemble the capillary setae in general appearance. No other crochets were found in the thoracic tori. The setae of the corresponding ventral bundle on the left side of the body were all broken, except a few, which had capillary tips. In the 11th segment all the setae were capillaries. Owing to the lack of material it is impossible to elucidate the significance of the presence of these two elongate crochets. The resemblance they exhibit to the similar setae in the posterior thoracic segments of *Heteromastus* and *Barantolla* indicates the close affinity existing between these three genera, and their presence in this specimen may represent a reversion to an ancestral type which possessed them normally in the posterior thoracic segments. On the other hand it is possible that these setae occur normally in the young and immature stages of *Mastobranchus indicus*, and are replaced by capillaries as the individuals approach maturity.

The dorsal bundles of the 13th and 14th segments each contain about 40 capillary setae, similar to those in the thoracic feet, and there are no crochets accompanying them. The ventral bundles contain only crochets, about 40 in each bundle. These differ considerably from those in the last thoracic ventral bundle (figs. 25D, 25E). The nodulus is distinct, in the distal part of the shaft. The shaft shows a distinct swelling below the neck. These setae are only ·28 mm. long. The wing, enclosing the tip, is relatively short. The terminal tooth makes rather a wide angle with the shaft, and on the crest behind it are two transverse rows of spines. In the

dorsal bundle of the 15th segment there are only crochets, ·33 mm. long, in shape like those of the ventral bundles. In the 20th segment the dorsal crochets are ·174 mm. long, the ventral crochets ·108 mm. long. The nodulus is very distinct, but the swelling below the neck is not so evident. In the 50th segment the dorsal crochets are ·12 mm. long. In the ventral bundle there are 63 crochets, ·1 mm. long (fig. 25F). The nodulus is very distinct, in the middle of the shaft.

From Garia, near Calcutta, in December 1910, were obtained two fragments of a Capitellid, which may belong to the present species or to *Barantolla sculpta*. They are both from the middle of the body, but one is evidently from a more posterior region than the other. Both fragments have very powerfully developed ventro-lateral muscles, which are more prominent than those of *Barantolla sculpta*. One fragment has branchiae on each segment, behind the dorsal setae. They are very similar to those of *Barantolla*, but rather longer, consisting of 5–7 finger-shaped lobes. The dorsal tori are more elongate and the setae more numerous than those of *Barantolla*. In the absence of any knowledge of the structure of the middle and posterior regions of *Mastobranchus indicus*, it is not possible to assign these fragments to any species at present.

The present species is assigned to the genus *Mastobranchus* by virtue of the structure of the thorax and anterior segments of the abdomen. A knowledge of the structure of the anal appendages, and branchiae (if any are present) is necessary to modify or confirm this conclusion.

In view of the great resemblance between this species and *Barantolla sculpta*, and the presence of both forms in the brackish ponds near Barantolla, the question arises whether the latter does not represent a stage in the growth of the former. All the specimens of *Barantolla* available are immature. In the sculpture of the skin, shape of the anterior end, and the form of the setae there is close resemblance. On the other hand, all the specimens of *Barantolla sculpta* agree in having capillary setae on segments 2–7, long crochets on segments 8–12, and only short crochets on the anterior abdominal segments. *Mastobranchus indicus* has capillary setae only, on the thoracic segments 2–12, with the exception of the two long crochets noted above, and capillary setae in the dorsal bundles of the two anterior abdominal segments. If *B. sculpta* is only a stage in the development of *M. indicus*, then the completion of the metamorphosis has been postponed to an unusually late period, as the specimens are at least 120 mm. long. On the whole I am inclined to regard the two forms as distinct, but the question can only be definitely settled by the examination of more material, at different stages of growth.

Habitat.—A single imperfect specimen from brackish pools, salt lakes, Barantolla, near Calcutta. The specific gravity of the water is very variable, but never high, probably never exceeding 1·015.

Family MALDANIDAE.

Euclymene annandalei, sp. nov.

(Plates XXVIII, figs. 22A–G, and XXIX, figs. 22H–K.)

This species is represented by numerous specimens, collected at 11 stations, all in the south-western end of the Chilka Lake. Apparently they live in tubes, but these are so brittle that only a few fragments remain, composed of sand grains. The body varies from 40–80 mm. in length, and each complete individual is, without exception, composed of the head, buccal segment (achaetous), 21 setigerous segments, 2 posterior achaetous segments, a funnel-shaped ring, and the caudal ring.

The preserved specimens are almost colourless, except for the ocelli. Epidermal glands were diffusely scattered on the head and anterior segment (fig. 22A). On the 1st, 2nd and 3rd setigerous segments there is a narrow ring of glands in the anterior part, in front of the setae, the 3rd also having scattered glands over the whole skin. The 4th setigerous segment has bands of glands in front of and behind the setae. In the 5th–8th setigerous segments the epidermis in front of the setae is thickly covered with glands, as well as the parapodial pads. In the subsequent segments there is a strong longitudinal mid-dorsal band of glands and the parapodial pads are thinly covered. There are also narrow diffuse longitudinal bands running in the line of the dorsal setae. Beginning in the 7th setigerous segment there is a conspicuous double band of glands on the mid-ventral surface, lying over the ventral nerve-cord, and running back to the caudal ring.

The head (figs. 22A–C) has a large and concave dorsal cephalic plate. The frontal process is fairly large and rounded. The sides are thin and broad, divided by indentations into two lateral smooth areas with entire borders, and a posterior (dorsal) crenate portion of eight rounded lobes. The nuchal grooves are rather long, almost parallel, and are separated by a narrow high keel. On the tip of the ventral side of the prostomium (fig. 22D), in front of the mouth, are 4 elongate patches of very numerous reddish-brown ocelli. The two median patches lie partly under the frontal process, and in some cases are fused in the median line. The two other patches are more lateral in position. The proboscis is partly extruded in several specimens. Its proximal portion is covered with low conical papillae, which are largest near the mouth, and the distal region is smooth.

The buccal segment and prostomium combined are rather longer than the 1st setigerous segment. Setigerous segments 1–6 are approximately equal in length, the proportions varying greatly in different individuals, according to the degree of contraction. The 7th setigerous segment is rather longer, and the 8th is the shortest of all. The following segments are considerably longer, diminishing a little towards the tail, the last setigerous segment—the 21st—being rather short. Then follow two achaetous segments, the second of which is very short. The latter is prolonged into a bell-shaped ring, which has no parapodial pads. The caudal segment is funnel-shaped (figs. 22E–F), with a deep posterior depression, at the bottom of which lies the anal cone. The height of the latter varies according to the degree of contraction

of the intestine. It is folded, especially round the anus. The caudal ring is fringed with short bluntly rounded cirri. The median ventral cirrus is stouter than the rest, and 2–4 times as long. In 15 specimens examined, the number of cirri, including the large ventral one, is as follows:—24, 20 (2), 19 (2), 18, 17 (3), 16 (3), 15, 14 (2). Sometimes several of the cirri are fused together, forming a flat plate.

In setigerous segments 1–3 the parapodia are in the anterior half of the segments, in 4–8 in the middle, and in the subsequent segments near the posterior end.

The three anterior setigerous segments have dorsally a double row of capillary setae. They are longitudinally striated, with two narrow wings and slender tips. Ventrally there is a single uncinus (fig. 22H) with a simple boldly curved tip. In the two anterior bundles the setae are rather more numerous than in the 3rd. In the 4th setigerous segment the dorsal setae are similar, but fewer in number. Ventrally there is a row of uncini, each with 5 teeth above the main fang (fig. 22K). In the 8th foot several of the dorsal capillaries have plumose tips (fig. 22J), the spinelets being rather long. These setae are much shorter than the smooth capillaries. There is a ventral row of 14 uncini. In the 10th segment there are 17 uncini, in the 17th segment 14 uncini. In the anterior segments the row of dorsal capillary setae gradually shortens as the setae become fewer in number, and at the same time the papilla from which they emerge increases in length. It is low and insignificant on the 1st setigerous segment, but on the 5th or 6th it forms a distinct swelling. In segments 1–9 the capillary setae form a transverse row. At the 10th segment the row tends to be oblique, and this tendency increases till at the 15th segment the setae form an arch above the uncini (fig. 22G). The latter are embedded in a long narrow slit surrounded by prominent tumid lips. The uncini (fig. 22K) have 5 or 6 diminishing teeth above the main fang. Beneath the latter there is on each side a bundle of bristles, but their point of attachment is not indicated by a prominent boss, as in many other species. The uncini of segments 4–21 are all similar, and there is no obvious difference between the uncini of the same foot.

Habitat.—This species was taken in large numbers at 11 stations, all in the south-west end of the lake, south of a line drawn from Patsahanipur to Nalbano. Usually they were obtained by digging in mud or sand at the water's edge, but on three occasions they were taken some distance off the shore, on a muddy bottom. As might be expected from the habitat of this species, it was usually taken in the salt-water season, when the water level was low, but on one occasion it was taken in the dredge in the freshwater season. The specific gravity of the water ranged from 1·002–1·011.

Family STERNASPIDAE.

Sternaspis costata, Marenzeller.

(Plate XX, figs. 5A, 5B.)

1879. *Sternaspis costata*, Marenzeller, p. 34, taf. vi, fig. 4.

1890. *Sternaspis costata*, Sluiter, p. 108.

It is with some hesitation that the numerous specimens of *Sternaspis* from the Chilka Lake are referred to the species from Japan, described by Marenzeller, and rediscovered at Batavia by Sluiter. According to Marenzeller, it agrees closely with the widely distributed *S. scutata* (Ranzani) of European seas, the most marked difference being in the shape of the posterior ventral shield. In the latter respect the Chilka Lake specimens show a fairly close agreement with the description and figures given by Marenzeller.

Not one of the 316 specimens which I examined showed any trace of an elongate proboscis such as Sluiter found in *S. spinosa*, and it is obvious that the latter species should be removed to a new genus. The prostomial lobe is small and rounded, exactly as in *S. scutata*. The largest specimens were 8 mm. long, and the greatest width was 3–3·5 mm. The largest specimen examined by Marenzeller was 12 mm. long and 5 mm. wide. Sluiter examined three specimens, 18 mm., 22 mm., and 35 mm. long respectively. In the smallest of these, the ventral shield closely resembled that of *S. costata* in shape and colour, but the largest individual varied considerably in the direction of *S. scutata*, the other specimen being intermediate in size and structure. European specimens of *S. scutata* which I have been able to examine were larger than those from the Chilka Lake, and differed in the shape of the ventral shield. Some of the specimens, taken in the outer channel in September, had the body cavity full of ripe eggs, so that apparently the Chilka Lake species does not attain a much greater size than 8 mm.

The body as a whole is brownish yellow in colour. The yellow pigment is specially marked on the gills, the intersegmental areas, and in the area surrounding the mouth and prostomial lobe. The wide posterior part of the body is more deeply coloured than the narrow anterior part, and the body-wall of the former is also thicker and less transparent. The prostomial lobe is quite transparent. The ventral shield (fig. 5A) is brightly coloured, the colour ranging from rusty red to scarlet. There is a narrow colourless margin on the lateral and posterior borders. It easily separates into two halves, and each half is slightly longer than broad. It has a series of ridges radiating from the centre, each ridge forming a groove over one of the bundles of setae, which emerge from the body-wall beneath the shield. A series of concentric markings is also obvious. The anterior and posterior borders are apparently deeply indented, the indentations, which are not so rounded as in Marenzeller's figure, being occupied by paired triangular plates. The anterior pair, which Marenzeller calls accessory plates, and which are absent in *S. scutata*, really form part of the large plates, being only differentiated by their delicate transparency and smoothness, and by the conspicuous ridge which separates them from the large plates. They only occupy part of the anterior concavity. The posterior triangular plates make the posterior border almost straight. They show the same ridges and concentric markings as the large plates, and five pairs of bundles of setae emerge from beneath them. From beneath the large plates 9–11 pairs of bundles of setae emerge. There are thus 14–16 pairs altogether, those at the outer posterior angles being the largest and longest. All

these setae are longitudinally striated, and some are smooth, whilst others have the terminal part of the shaft covered with fine short hairs.

The three anterior segments of the body have two bundles of setae each. There are 14–26 setae in each bundle, the youngest being on the ventral margin of the bundle. The setae have a double curvature, and are longitudinally striated the striations being in the superficial layer. The core of the seta is abruptly truncated some distance from the tip (fig. 5B). This appearance is not caused by injury, as it was observed in cases where the seta tapered to a fine point.

Distribution.—Miya Bay, Japan; Bai von Batavia, in mud, 10–12 fms.

Habitat.—316 specimens were taken at four stations in the outer channel near Mahosa, in September, when the water was quite fresh. The bottom here is sand and sandy mud. Mr. Kemp says *in litt.*: "As regards the *Sternaspis*, we only found it in the outer channel at the season when the water was quite fresh. But our observations in March were a little incomplete, for the water was too shallow to permit the passage of the launch across the bar separating the main area from the outer channel, and we had only a dinghy to work from. The species is doubtless present all the year round in salinities varying from 1·000 to 1·027."

Family SABELLIDAE.

Potamilla leptochaeta, sp. nov.

(Plate XXXI, figs. 28A–N.)

A number of small specimens of this species were found in masses composed of Entoproct Polyzoa (*Loxosomatoides colonialis*, Annandale), accompanied by *Bowerbankia caudata*, Hicks, and by a number of Nematode worms (*Oncholaimus indicus*, von Linstow, *Rec. Indian Museum*, Vol. I, 1907, p. 45).

The *Potamilla* lives in rather brittle membranous tubes, coated with fine mud, very like those of *P. torelli*, but not quite so hard and hyaline. The stolons of the Polyzoan are attached to the worm tubes, the whole forming a tangled mass.

Most of the specimens are incomplete, the posterior extremity usually being absent. A moderate sized individual, not the largest, measured 4·5 mm. in length, of which the branchiae were 1·3 mm., the thorax 1·2 mm., and the abdomen 2 mm.

The branchiae are marked by two broad bands of reddish brown pigment. The total number of setigerous segments is about 33 or 34, of which 6 compose the thorax, and 27 or 28 the abdomen. The thorax is of uniform width, but the abdomen tapers gradually towards the anal segment. The latter is rather flattened, and heart-shaped, with rounded posterior border. No eyes were observed, either on the anterior or anal segments or on the branchiae.

In all specimens examined, there were 9 branchiae, 4 on the right side, 5 on the left. Each branchia has 40–50 filaments. The latter are nearly all of the same length, decreasing slowly in size towards the tip. In most of the specimens the tip is short, bare, and blunt (fig. 28C), but one specimen was found in which all the branchiae had rather long bare tips (fig. 28D). A more careful examination then showed that branchiae with long tips were by no means uncommon, even in speci-

mens where the majority had short tips. Moreover the left ventral branchia, which was always much shorter than the others, always had an elongate tip. It seems probable, therefore, that the long tip is the normal condition, and that the short tips are due to accidents.

Dorsally the front margin of the collar slopes backwards, and the two ends are attached near the median line (fig. 28A). Ventrally the collar inclines forward (fig. 28B), and in the ventral region it is deeply cleft and bilobed.

The thorax is composed of 6 setigerous segments. The faecal groove is narrow shallow, and very indistinct, and can hardly be seen on the abdomen. Ventral gland shields are very inconspicuous. On the mid-dorsal area there is a slightly elevated ridge (fig. 28A), especially distinct at the anterior end, where it narrows, and lies between the ends of the collar. The first thoracic segment bears only dorsal bundles of setae. Each bundle contains 7 setae, the 3 upper being long and bilimbate, as in the succeeding thoracic segments (fig. 28F). The 4 lower setae are shorter (fig. 28E), with wider and shorter bilimbate blades and filiform tips. They are intermediate in shape between the elongate capillaries and the spatulate setae. In the remaining thoracic segments, the dorsal bundles contain two types of setae, capillary and spatulate. The capillary setae (fig. 28F) have elongate narrow wings and very long filiform tips. There are 3–6 in each bundle. Beneath and behind them are the spatulate setae, 5–10 in number. They have pear-shaped blades (fig. 28G) with finely pointed tips. The ventral bundles also contain two types of setae. The anterior row (figs. 28H, 28J) consists of 7–10 cuspidate setae (soies en pioche). The posterior row contains 7–9 avicular uncini (fig. 28K). The anterior part of the base is large and swollen, and the posterior process is rather short.

In the anterior abdominal segments the ventral bundles contain 5–7 capillary setae, with short blades and very long filiform tips. They vary in length (figs. 28L, 28M), but are all bilimbate, and the blades are shorter and wider than those of the thoracic setae. The dorsal bundles contain 9 or 10 avicular uncini (fig. 28N), differing very slightly from those of the thorax. The posterior process is shorter, and the spinose crown is higher and narrower. The uncini vary much in size in each bundle, the largest being ventral, the smallest dorsal. In the posterior part of the abdomen the setae are similar, but fewer and smaller. The ventral bundles contain 1–3 capillary setae, the dorsal bundles 1–3 uncini.

The most remarkable feature about the setae of this species is the great length and extreme slenderness of the tips of the capillary setae, from which character the specific name is derived.

Habitat.—From a brackish pool, Port Canning, Lower Bengal, December 1908. The water here is of very variable salinity (Annandale, 1907, pp. 35 and 197).

Laonome indica, sp. nov.

(Plate XXX, figs. 26A–H.)

Only a single individual of this species is available. It is 28 mm. long, the trunk being 26 mm., and the unusually short gills only 2 mm. The body is slender,

composed of the 110 segments, and the anal segment is large and conical. The posterior 15 segments are much shorter than the preceding ones, and may have been regenerated.

There are seven pairs of branched gills, unconnected by a membrane (fig. 26A). Each gill is penetrated by a single blood-vessel (fig. 26C), which sends off a single branch to each barbule. The barbules are rather short, and the distal quarter of each gill is devoid of them. In addition there are two smooth unbranched ventral tentacles, or palps.

The upright collar is equal in length to the 1st setigerous segment. On the dorsal side (fig. 26A) the two halves of the collar are simply folded inwards, and attached to the body wall. On the ventral side (fig. 26B) the collar projects forwards in two peculiar lobes, each pointed at the tip. Between these two lobes and the palps is a median lobe rounded at the tip. No eyes or otocysts were observed.

The thorax is composed of six setigerous segments. Along the median dorsal line there is a narrow groove, which passes to the ventral side in the 6th setigerous segment, and runs to the posterior end. Ventral thoracic gland plates are inconspicuous or absent. The 1st thoracic segment bears only dorsal bundles of setae, which lie nearer the median line than those of the succeeding segments (fig. 26A.) The setae are all capillaries, mostly long and slender, with narrow bilimbate blades. A few are shorter, with relatively broader blades. In the 2nd segment the dorsal setae are of two kinds. The upper setae are long slender capillaries (fig. 26D), 6 or 8 in number, with narrow wings and long tapering tips. Below these are 9–11 setae with spatulate tips (fig. 26E) terminating in a long fine point. The ventral setae consist of a row of 20 uncini (fig. 26G). Each of the latter has a stout rounded base. In front view (fig. 26G, *a*) there are 4 or 5 rows of teeth on the crest above the main fang. The side view (fig. 26G, *b*) shows that the main fang is very acute, with 4 teeth above it. The remaining thoracic segments, 3–6, have similar setae.

Of the abdominal setae those on the 8th setigerous segment may be taken as typical. The dorsal division consists of 17 uncini (fig. 26H) differing only very slightly from those of the thorax. The rounded base is rather more oblique, and the gap between it and the main fang is larger. The ventral group contains 4 or 5 capillary setae (fig. 26F). The expansion formed by the wings is shorter and broader than in the thoracic setae, and the tip is long and slender.

In the posterior segments the setae are similar in shape, but the capillaries are rather longer. Nothing is known about the tube of this species.

Habitat.—A single specimen was taken in the south-western extremity of Chilka Lake, 1–8 miles N.W. by N. of Sanad Point. The specific gravity of the water was 1·009 during the salt-water season.

Fabricia (Manayunkia) spongicola, sp. nov.

(Plate XXXI, figs. 29A–E.)

A number of specimens of this species are available, in a rather contracted condition. They inhabit tubes, consisting of a delicate membrane covered with

flocculent mud. The length of the animal varies from 1·5–3 mm. In a specimen 1·65 mm. long, the branchiae constituted ·44 mm., the thorax 1 mm., and the abdomen ·25 mm. In a second specimen 2·3 mm. long, the branchiae were only ·33 mm. in length.

The branchiae (fig. 29A) consist of about 18–20 slender unbranched filaments on each side (i.e. about 36–40 in all). Occasionally they present the appearance of being arranged in groups attached to a short common stem, but this is probably due to the contraction of the basal membrane. In appearance and structure they closely resemble those of *Manayunkia speciosa*, as described and figured by Leidy (1883, p. 206, pl. ix, fig. 1). Within the circle of branchiae are two short clavate processes, the "palps" or "prostomial tentacles." The body (fig. 29A) is cylindrical, and consists of 13 segments, the first and last being without setae. The head is conical in front, and bears two black eyes. There is a prominent collar, with an entire convex border ventrally. Dorsally the ends of the collar are rounded and folded inwards. The thorax consists of 8 setigerous segments, the anterior three being short, but gradually increasing up to the 8th, which is the largest in the body. No otocysts are present. There are 3 setigerous abdominal segments, and an achaetous anal segment, the latter being usually spatulate, sometimes pear-shaped, and bearing two black eyes.

The 1st thoracic segment has a bundle of 4 slender capillary setae on each side, but no crochets. On the succeeding 7 segments there are on each side 2–4 dorsal capillary setae, and 2–5 ventral crochets in a single row. The capillary setae (fig. 29B) have short flattened blades and long slender tips. The crochets (fig. 29C) are rather stout, with three teeth above the main hook. In the abdominal segments the ventral bundles contain one or two very slender capillary setae (fig. 29D), which show only very slight flattening of the blade and no wings. The dorsal bundles contain 9–11 crochets of peculiar form (fig. 29E). They are rather small, with elongate shafts, and with numerous very fine long teeth, in several rows, at one end. Beneath the teeth there is a slight swelling of the shaft or base of the crochet. These setae closely resemble those of *Haplobranchus aestuarinus*, described and figured by Bourne (1883, p. 171, pl. ix, fig. 14), and in a lesser degree, those of *Manayunkia* and *Fabricia*. They are obviously intermediate in shape between the elongate crochets of the thorax and the avicular uncini such as are found in *Potamilla* and other genera (fig. 28K).

The species agrees closely with the three genera *Fabricia*, *Manayunkia*, and *Haplobranchus*. The characters held in common are: (1) the possession of 11 setigerous segments, 8 thoracic and 3 abdominal; (2) the shape of the dorsal and ventral setae in the thoracic segments; (3) the peculiar elongate crochets in the abdominal segments; (4) the presence of eyes on the first segment; (5) and the absence of otocysts. The present species agrees with *Manayunkia* in having a well-developed collar and unbranched branchiae, and differs in the presence of caudal eyes. It resembles *Fabricia* in having caudal eyes, and differs in having unbranched branchiae and a well-developed collar. It agrees with *Haplobranchus* in having unbranched

branchiae, though in much larger number, in the presence of a well-developed collar, and in the shape of the abdominal crochets, and differs in the presence of caudal eyes and in the shape of the abdominal capillary setae. Leidy (*tom. cit.*) figures but does not describe the collar of *Manayunkia speciosa*, and his figures are not decisive as to the presence or absence of the dorsal indentation. Bush, however (1905, p. 188), in a generic diagnosis of *Manayunkia*, says that the collar is entire, without incisions or clefts. If this is the case it resembles *Haplobranchus* and differs from *F. spongicola*. The latter reduces the gap between *Manayunkia* and *Haplobranchus* on the one hand, and *Fabricia* on the other, and it has as much or as little right as these forms to generic rank. All the characters cited above, which differentiate the various forms, are probably only of specific rank, with the possible exception of the simple or branched branchiae. In the latter respect the Chilka species agrees with *Manayunkia*. The latter title has priority over *Haplobranchus* (1883), having been described by Leidy in 1858, and it may itself be regarded as a sub-division of the genus *Fabricia*.

Habitat.—Taken on two occasions, in the extreme south-west end of the Chilka Lake. On one occasion it occupied tubes embedded in the sponge *Laxosuberites lacustris*, Annandale; on the other, it was living amongst algae on the lower surfaces of rocks on the shore. It was taken both in the fresh and salt-water seasons, but the specific gravity of the water only varied from 1·006–1·011.

Family SERPULIDAE.

Genus **Ficopomatus**, gen. nov.

This genus may, for the present, be defined by the following combination of characters:—

Modified setae present on the first thoracic segment, having blades provided with very stout teeth. Beneath the blades is a transverse row of more than two teeth. Uncini with relatively few teeth, the lowest of which is in the form of an elongate bifid spine. Ventral abdominal setae geniculate. Operculum fig-shaped, without any outgrowths.

The modified setae of the first thoracic segment are very peculiar. They differ from those of *Serpula*, *Hydroides* and *Crucigera*, in having teeth on the blade, and in having more than two stout teeth below the blade. In these genera the stout teeth are paired, whilst in *Ficopomatus* the largest tooth is median and unpaired. These setae also differ markedly from those of *Spirorbis*, *Chitinopoma*, etc., which have a crenulated wing below a finely serrated blade. The uncini resemble those of *Pomatoceros*, *Spirobranchus* and *Pomatostegus* in having few teeth, of which the lowest is bifid, but *Ficopomatus* differs markedly from these genera in the shape of the operculum and the modified setae of the first thoracic segment.

Ficopomatus macrodon, sp. nov.

(Plate XXX, figs. 27A–M.)

Two small pieces of wood from the Cochin Backwater were covered with the interlacing tubes of this species. The tubes form masses as in *Hydroides norvegica*,

Gunn., or *Pomatoceros triqueter*, L. When free or erect the tube is circular in section, with a single dorsal ridge, which is usually worn away in the older part of the tube (fig. 27M, *a* and *b*). The ridge terminates over the orifice in a small sharp tooth. Where the tube is attached, it tends to flatten on the ventral surface, and spreads out two latero-ventral ridges (fig. 27M, *c*). This flattening of the attached tube is due to the thickening of the walls in the latero-ventral region, the bore remaining almost circular in section.

A rather elongate specimen is 11 mm. in length, of which the abdomen is 8 mm., the thorax 2 mm., and the branchiae ·5–1 mm. The width of the body is ·5–·75 mm. The thorax is composed of 7 setigerous segments, the abdomen of 43–57 segments and in addition there are 6 or 7 narrow rings forming the tapering posterior end.

The specimens are all stained a deep reddish brown by pigment extracted by the preservative spirit from the wood to which they are attached, and the original colour pattern is obscured. Traces of deep blue pigment bands remain on the branchiae and thorax, and other pigment is present, so that probably the living animals were coloured rather after the manner of *Pomatoceros triqueter*, L.

The branchiae are 13–17 in number, 7–9 on the right side, 6–8 on the left. In addition, the left dorsal branchia forms the operculum. Each branchia has 3–5 diffuse bands of dark pigment, which spread on to the adjacent filaments. There are 18–20 pairs of rather long filaments on each branchia. The naked tip varies greatly in length, and may be longer or shorter than the filaments. The longest filaments are attached just above the middle of the stem, and those at each end are shortest. The stem of the branchia bears no other appendages.

The operculum usually exceeds the branchiae in length. The stem is rather flattened (figs. 27A, 27C), and passes more or less abruptly into the swollen head. The latter varies in shape according to the manner in which it is compressed within the tube, the two extreme forms being shown in figs. 27A and 27C. It is rather fig-shaped, and tends to spread out over the branchiae, so as to protect them when withdrawn into the tube. The distal end is almost flat in some specimens, as in fig. 27C, in others it is markedly convex. There are no outgrowths either on the stem or the head of the operculum. Usually there are patches of pigment, a narrow band just beneath the swollen head being rather constant.

The thorax (fig. 27A) is composed of 7 setigerous segments. The free margin of the thoracic membrane is entire, except for adventitious lobes.

The 1st setigerous segment bears dorsal bundles only. They are much nearer the mid-dorsal line than those of the succeeding segments, and are lodged in small depressions, the setae being directed forwards. There are two kinds of setae in these bundles. The stouter kind, usually 3 in a bundle (figs. 27D, 27E), have very slender tips, with a series of very coarse teeth, diminishing in size towards the smooth tip. For some distance beneath these teeth the shaft is smooth. Then comes a transverse row of teeth, varying in number, but there is always present a large median tooth, with a smaller one on each side. In addition there are usually 2–4 smaller teeth on each side, but sometimes these are indistinct. These setae are

obviously homologous to the peculiar setae found in the 1st thoracic segment of many other genera of Serpulidae. They are accompanied by a number, usually four, of slender setae (fig. 27F), with finely tapering tips and minutely hispid edges.

The dorsal setae of the 2nd–7th bundles are all capillary, in two rows, the anterior row composed of 8 slender setae resembling those in the 1st bundle (fig. 27F), the posterior row of 7 shorter capillaries, not winged, but with slightly flattened blades (fig. 27G). Sometimes these setae appear quite smooth, but in other cases the blades are minutely hispid, the edge easily fraying, so as to appear serrated.

The ventral bundles are composed of uncini (fig. 27H, *a* and *b*), having 7, rarely 8 teeth. The lowest tooth is widely bifid.

The abdomen is traversed by a ventral groove, shallow in front, but large and deep behind. The posterior end, in most specimens, narrows abruptly to a conical tail, terminating in two rounded lobes, between which the anus lies (fig. 27B). The abdominal parapodia project prominently as flat lobes (fig. 27J) bearing a row of uncini on the upper external margin, whilst the ventral capillaries project beneath the lower edge. The ventral capillaries are usually two or three in a bundle, one or two in the posterior segments. They project from the parapodium so far that the exposed part of each seta is usually twice as long as the part embedded in the tissues. The shaft expands suddenly towards the tip (fig. 27K), and then bends abruptly, the bent portion being serrated.

In the anterior abdominal segments there are about 26 uncini in each parapodium. They resemble those in the thoracic segments, but have 11–12 rather slenderer teeth (fig. 27L). They are also thinner and larger than the thoracic uncini, and when viewed on edge the forks of the bifid spine are smaller. In the mid-abdominal region there are 45 uncini in each foot, each with 12–14 teeth. In the posterior segments there are 6–10 uncini in each foot, and they are smaller, with fewer and finer teeth.

Habitat.—Two pieces of wood, covered with the interlacing tubes of this species were found in the Cochin Backwater, near Ernakulam, on the south-west shore of the Madras Presidency, in September 1914. The masses of tubes resemble in general appearance those of *Pomatoceros triqueter*, L., or *Hydroides norvegica*, Gunn. They were accompanied by several specimens of *Balanus amphitrite*. The salinity of the water is probably very variable, but no precise information is available.

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EXPLANATION OF PLATE XIX.

Ancistrosyllis constricta, sp. nov.

FIG. 1A.—Anterior end, dorsal view. × 40.
,, 1B.—1st right foot. × 100.
,, 1C.—2nd right foot. Setae not shown. × 100.
,, 1D.—40th right foot. × 100.
,, 1E.—Part of dorsal lobe of 80th right foot, posterior view. × 330.
,, 1F.—Anterior short seta from 1st foot. × 560.
,, 1G.—Intermediate type of seta from 4th foot. × 560.

Lycastis indica, sp. nov.

FIG. 2A.—Anterior end, dorsal view. × 40.
,, 2B.—1st right foot, anterior view. × 140.
,, 2C.—10th right foot, anterior view. × 56.
,, 2D.—70th foot. × 100.
,, 2E.—100th right foot, posterior view. Setae not shown. × 100.
,, 2F.—Falcate heterogomph seta from upper part of 50th foot. × 560.
,, 2G.—Hemigomph seta with long finely serrated tip, from upper part of 10th foot. × 560.
,, 2H.—Heterogomph seta with long coarsely serrated tip, from middle of 10th foot. × 560.
,, 2J.—Tip of shaft of hemigomph seta from dorsal division of 10th foot. Specimen from Cochin Backwater. × 560.

Tylonereis fauveli, sp. nov.

FIG. 3A.—Anterior end, dorsal view. × 30.
,, 3B.—Posterior end, dorsal view. × 27.
,, 3C.—1st right foot, anterior view. × 56.
,, 3D.—7th right foot, anterior view. × 56.
,, 3E.—30th right foot, anterior view. × 56.
,, 3F.—Tip of dorsal aciculum and gland, in 30th foot. × 330.
,, 3G.—70th right foot, anterior view. × 56.
,, 3H.—150th foot. × 56.
,, 3J.—Seta from dorsal division of 30th foot, front view. × 560.

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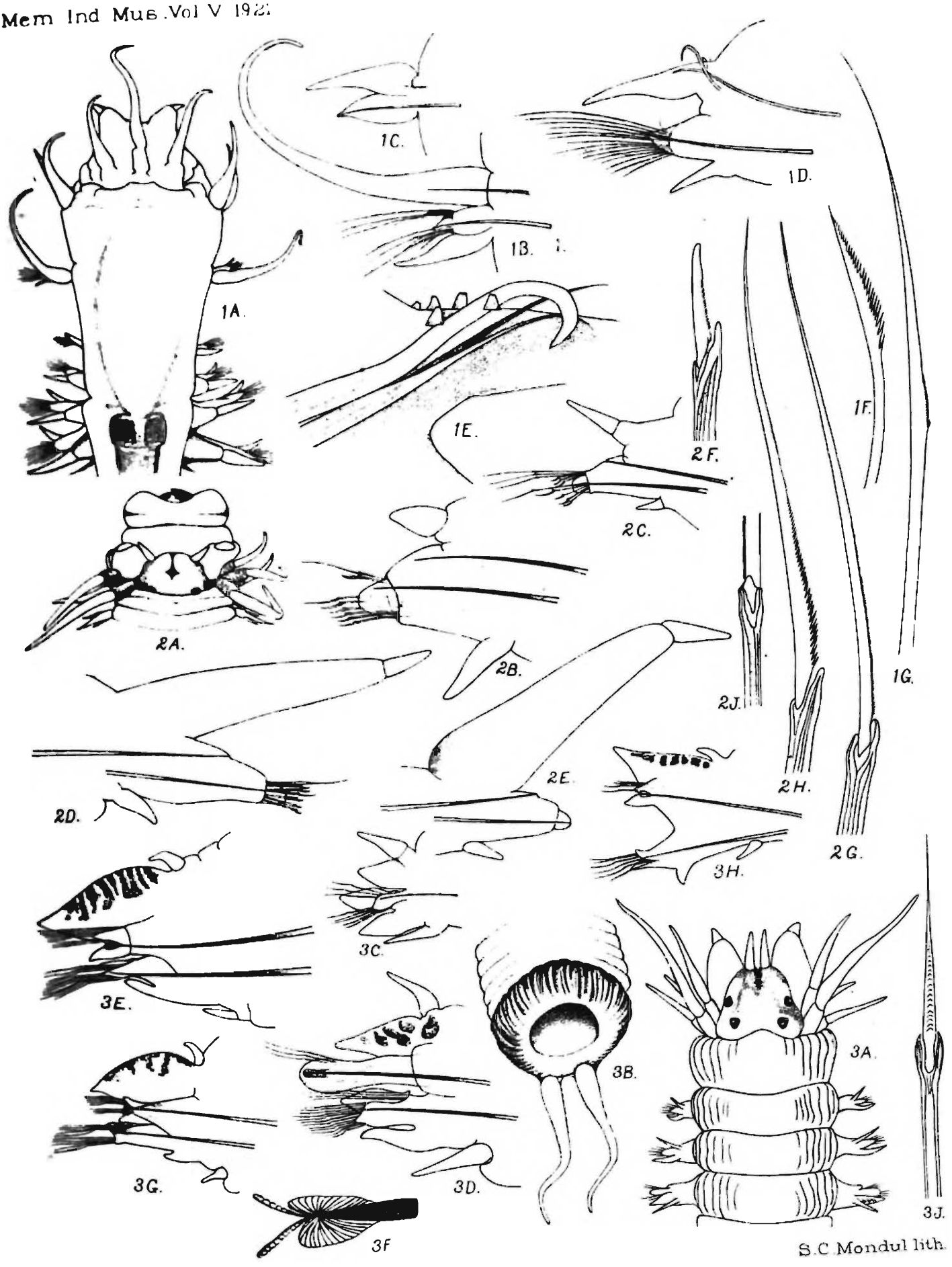


S.C Mondul lith.

R. Southern del.

POLYCHAETA OF THE CHILKA LAKE, ETC.

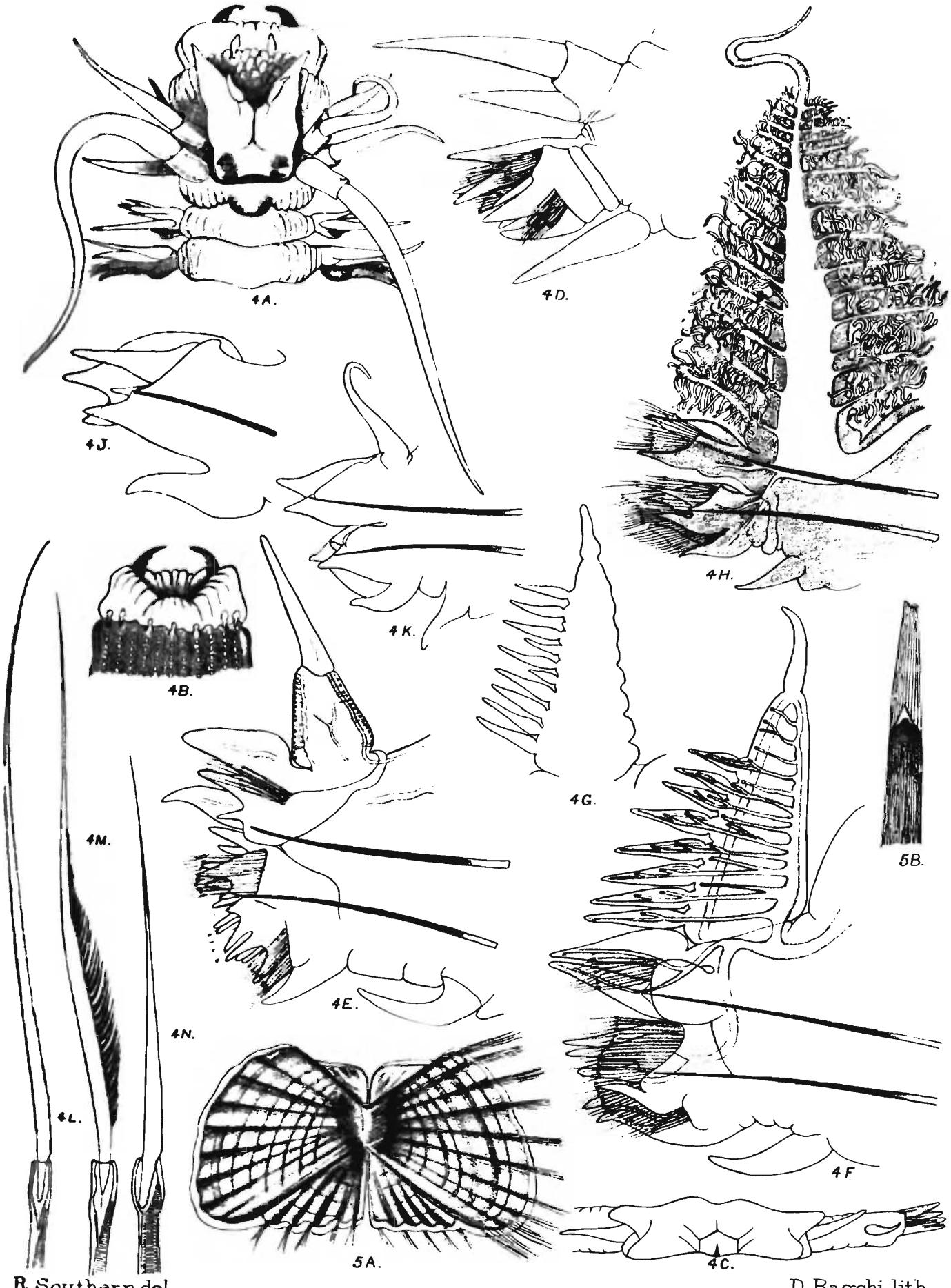
EXPLANATION OF PLATE XX.

Dendronereis aestuarina, sp. nov.

FIG. 4A.—Anterior end, dorsal view. × 17.
,, 4B.—Everted proboscis, ventral view. × 17.
,, 4C.—10th segment, ventral surface. × 20.
,, 4D.—1st right foot, front view. × 40.
,, 4E.—10th right foot, front view. × 40.
,, 4F.—15th right foot, front view. × 40.
,, 4G.—Dorsal cirrus of 17th foot. × 30.
,, 4H.—18th right foot, front view. × 25.
,, 4J.—Ventral division of the 20th right foot, front view. Setae not shown. × 40.
,, 4K.—30th right foot, front view. Setae not shown. × 25.
,, 4L.—Homogomph seta with long finely serrated terminal piece, as found in all the feet. × 330.
,, 4M.—Homogomph seta with long coarsely serrated terminal piece, from the 3rd foot. × 560.
,, 4N.—Homogomph seta with moderately short smooth tip, from upper division of the 60th foot. × 330.

Sternaspis costata, Marenzeller.

FIG. 5A.—Ventral shield. Only the basal portion of the lateral bundles of setae shown. × 40.
,. 5B.—Tip of dorsal seta from 1st bundle. × 330.



R. Southern del.

D. Bagchi lith.

POLYCHAETA OF THE CHILKA LAKE, ETC.

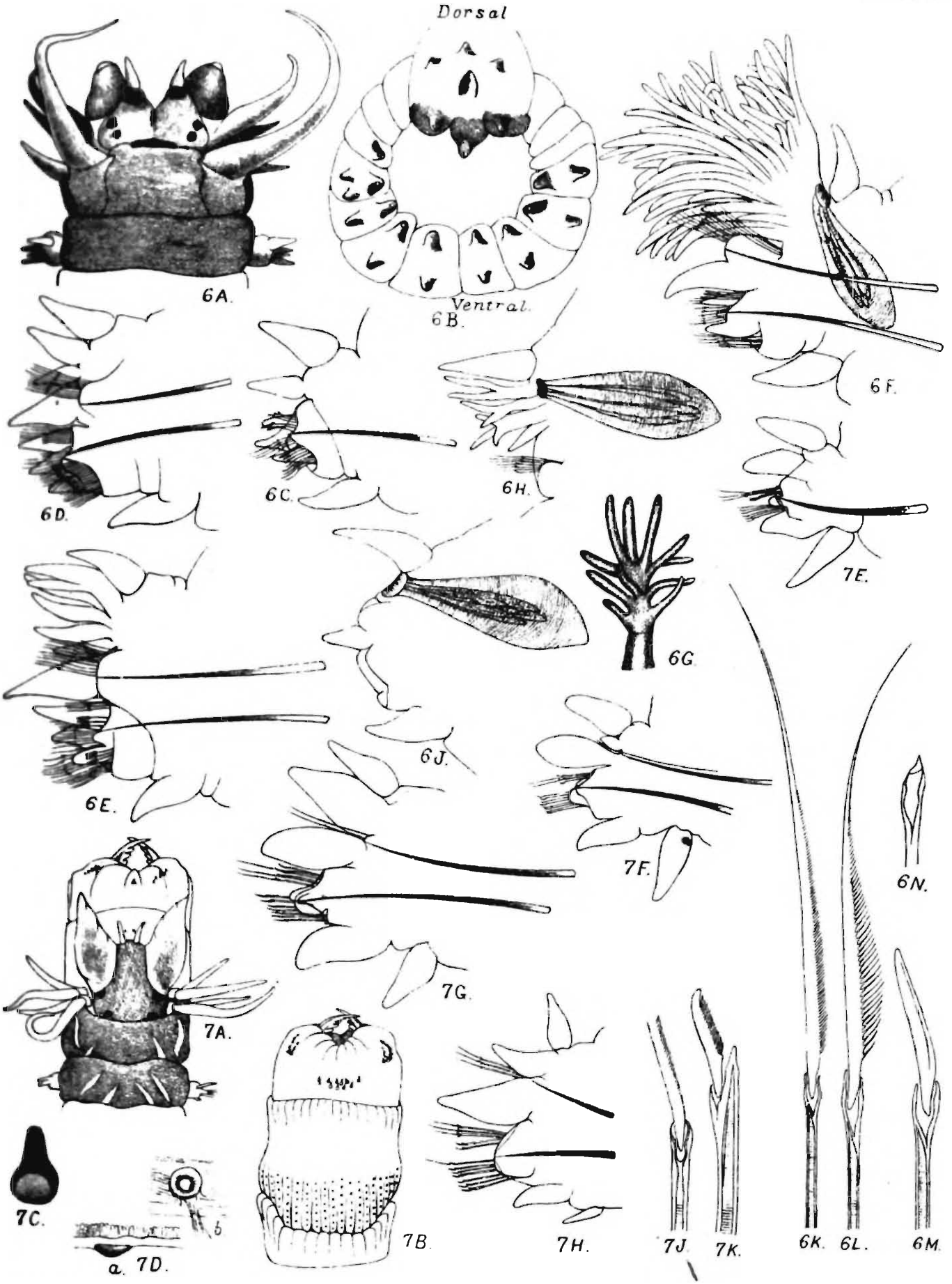
EXPLANATION OF PLATE XXI.

Dendronereides heteropoda, gen. et sp. nov.

FIG. 6A.—Anterior end, dorsal view. × 40.
,, 6B.—Front view of partially extruded proboscis, showing the basal ring of papillae.
,, 6C.—1st right foot, front view. × 100.
,, 6D.—4th right foot, front view. × 100.
,, 6E.—9th right foot, front view. × 100.
,, 6F.—21st right foot, front view. × 100.
,, 6G.—Single bunch of gill branches from the 25th foot. × 100.
,, 6H.—Dorsal division of 26th right foot, front view. × 100.
,, 6J.—30th right foot, front view. Setae not shown. × 100.
,, 6K.—Dorsal seta from the 14th foot. × 560.
,, 6L.—Ventral seta with long teeth, from 14th foot. × 560.
,, 6M.—Homogomph falcate seta from the ventral division of the 14th foot. × 560.
,, 6N.—Tip of shaft of seta from the ventral division of the 22nd foot, showing the 'hemigomph condition. × 560.

Nereis reducta, sp. nov.

FIG. 7A.—Anterior end, dorsal view. × 26.
,, 7B.—Anterior end, ventral view. × 26.
,, 7C.—Paragnath from Group I. × 330.
,, 7D.—Paragnath from Group VIII. *a*=side view; *b*=surface view. × 330.
,, 7E.—1st right foot, front view. × 100.
,, 7F.—3rd right foot, front view. × 100.
,, 7G.—10th right foot, front view. × 100.
,, 7H.—60th right foot, front view. × 100.
,, 7J.—Homogomph seta with long tapering tip, from dorsal division of 40th foot. × 560.
7K.—Heterogomph falcate seta from lower part of ventral division of 40th foot. × 560.



R. Southern del.

S.C.Mondul lith.

POLYCHAETA OF THE CHILKA LAKE E[illegible].

EXPLANATION OF PLATE XXII.

Nereis chilkaënsis, sp. nov.

FIG. 8A.—Anterior end, dorsal view. × 12.

,, 8B.—Anterior end, dorsal view, of a small male specimen, apparently commencing its metamorphosis, with partially extruded proboscis. The eyes are larger and the tentacular cirri relatively longer than in fig. 8A. × 26.

,, 8C.—Anterior end, ventral view, of a small specimen. × 12.

,, 8D.—Dorsal view of 26th and 27th segments. × 12.

,, 8E.—1st left foot, front view. × 56.

,, 8F.—10th right foot, posterior view. × 56.

,, 8G.—50th left foot, front view. × 56.

,, 8H.—60th right foot, posterior view, of small male specimen shown in fig. 8B. × 150.

,, 8J.—25th left foot, posterior view, of ♀ Heteronereis. × 40.

,, 8K.—40th left foot, posterior view, of same specimen. × 40.

,, 8L.—19th right foot, posterior view, of ♂ Heteronereis. × 56.

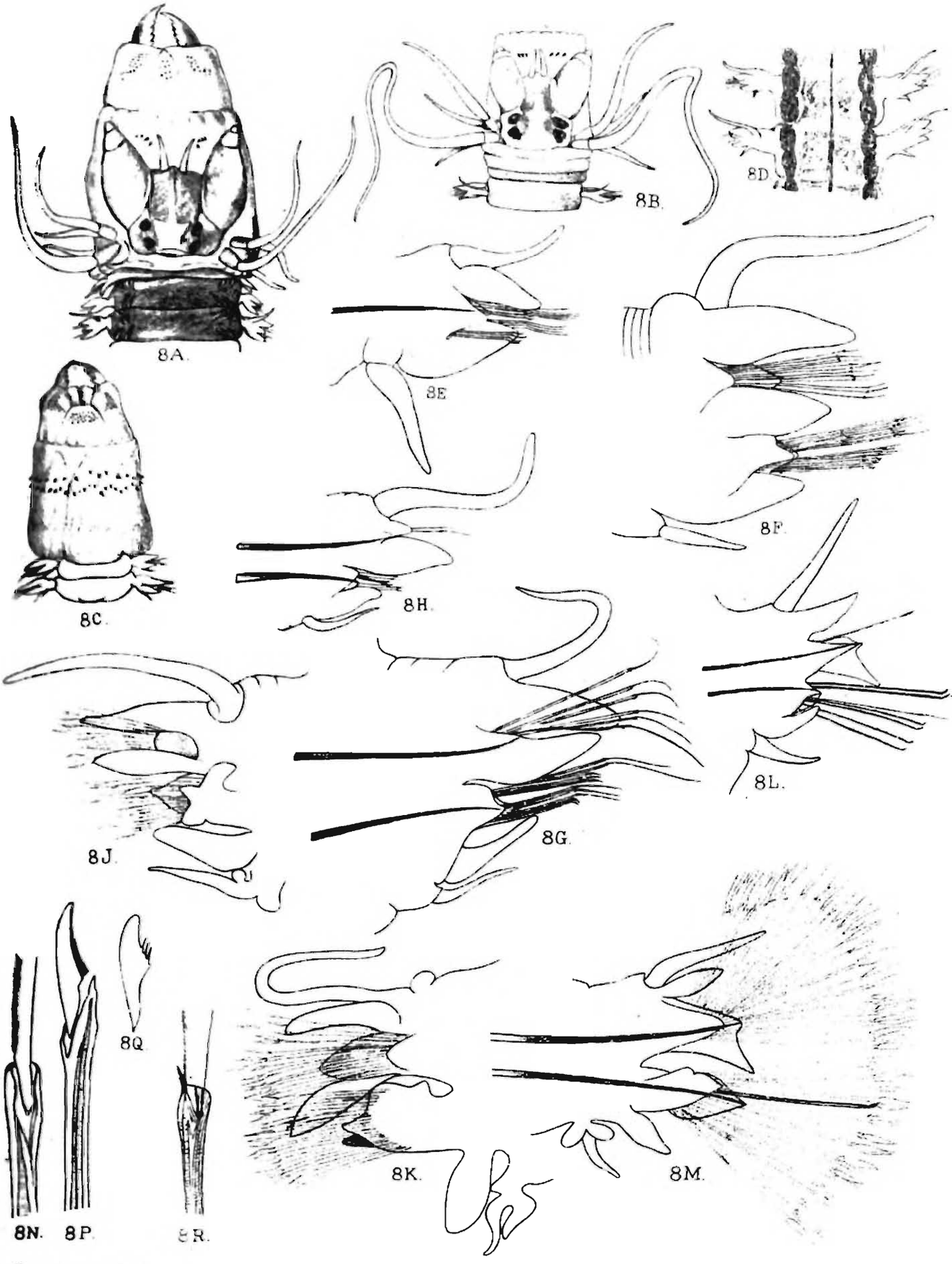
,, 8M.—30th right foot, posterior view, of same specimen. × 56.

,, 8N.—Homogomph seta with slender terminal piece, from the dorsal division of the 20th foot. × 560.

,, 8P.—Heterogomph seta with falcate terminal piece, from the ventral division of the 20th foot. × 560.

,, 8Q.—Terminal piece of one of the short thick heterogomphs from the upper part of the ventral division of the 65th foot. × 560.

,, 8R.—Tip of the shaft of one of the swimming setae of the Heteronereis, from the 30th foot. × 560.



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POLYCHAETA OF THE CHILKA LAKE Etc.

A.Chowdhary lith.

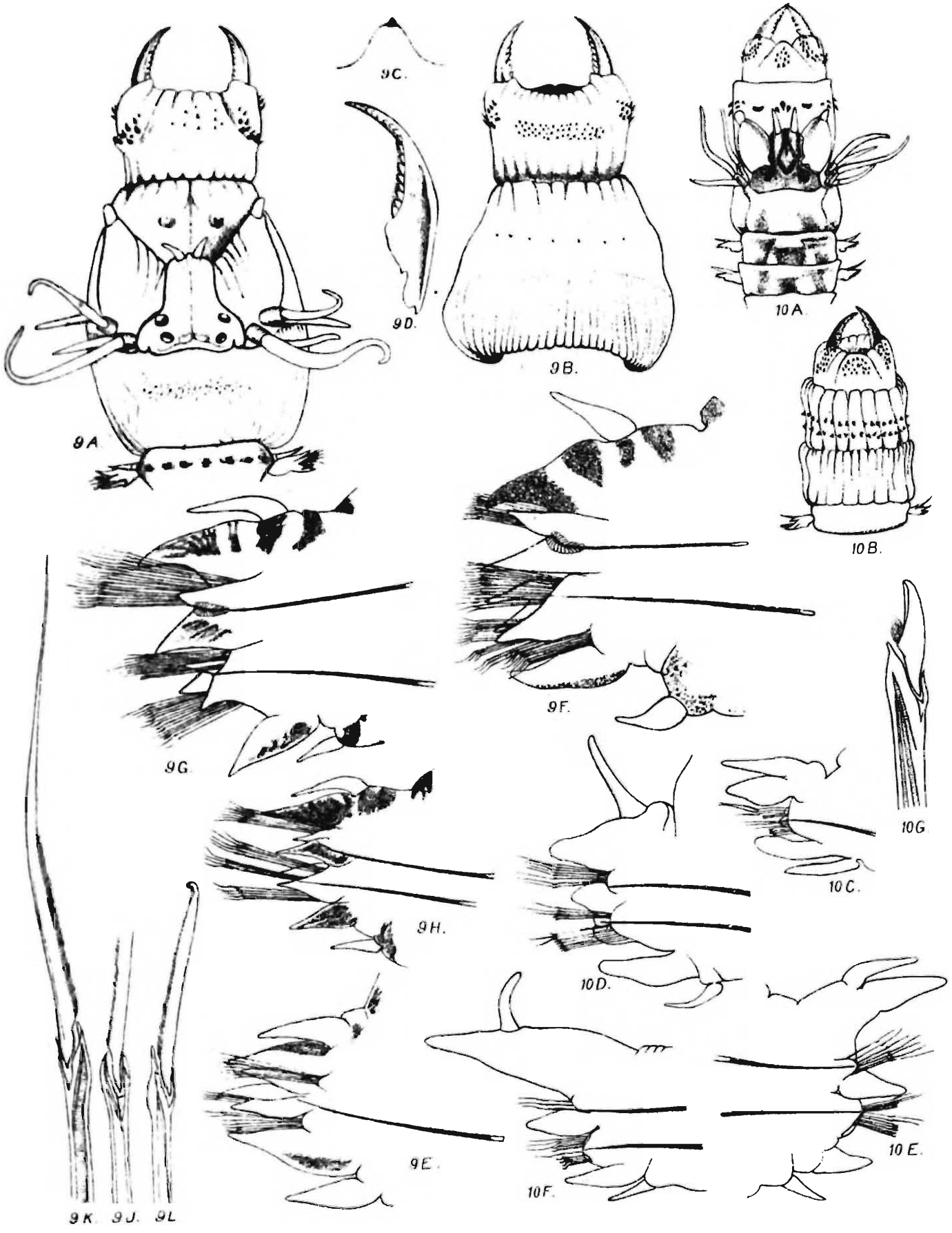
EXPLANATION OF PLATE XXIII.

Nereis glandicincta, sp. nov.

FIG. 9A.—Anterior end, dorsal view. × 17.
,, 9B.—Everted proboscis, ventral view. × 17.
,, 9C.—Papilla, with paragnath, from Group VI. × 100.
,, 9D.—Jaw. × 26.
,, 9E.—1st right foot, front view. × 56.
,, 9F.—10th right foot, front view. × 56.
,, 9G.—50th right foot, front view. × 56.
,, 9H.—100th right foot, front view. × 56.
,, 9J.—Homogomph seta with long finely serrated terminal piece, from the dorsal division of the 10th foot. × 560.
,, 9K.—Hemigomph seta with shorter, more coarsely serrated terminal piece from the ventral division of the 10th foot. × 560.
,, 9L.—Hemigomph seta with falcate terminal piece, from the lower part of the ventral division of the 20th foot. × 560.

Nereis (Perinereis) marjorii, sp. nov.

FIG. 10A.—Anterior end, dorsal view. × 12.
,, 10B.—Anterior end, ventral view. × 12.
,, 10C.—1st left foot, posterior view. × 56.
,, 10D.—10th left foot, posterior view. × 56.
,, 10E.—50th left foot, front view. × 56.
,, 10F.—70th right foot, front view. × 56.
,, 10G.—Heterogomph seta with falcate terminal piece, from the 10th foot × 560.



A Chowdhary lith.

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POLYCHAETA OF THE CHILKA LAKE, ETC

EXPLANATION OF PLATE XXIV.

Nephthys polybranchia, sp. nov.

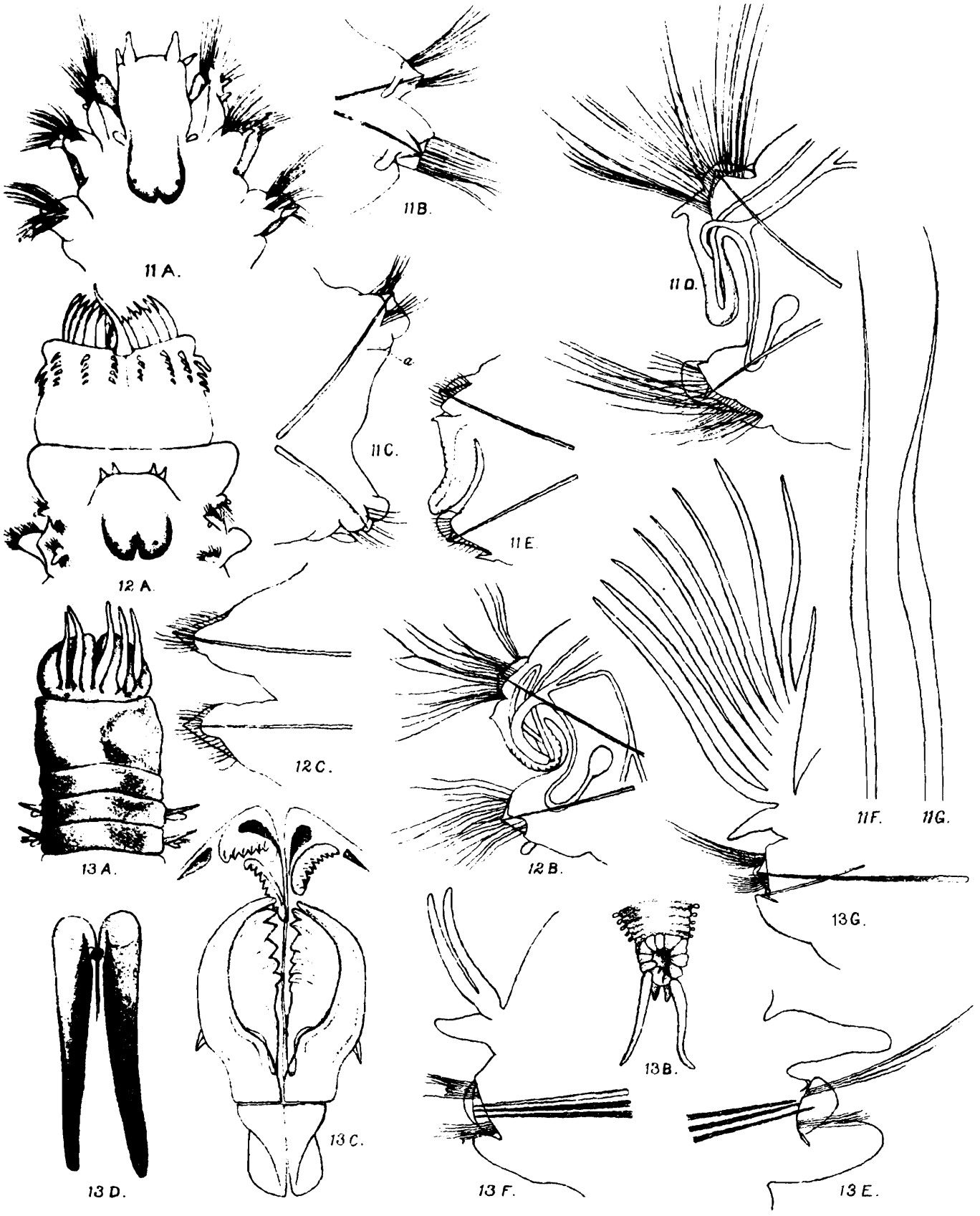
FIG. 11A.—Anterior end, dorsal view. × 56.
,, 11B.—1st right foot, posterior view. × 100.
,, 11C.—2nd right foot, posterior view, setae not fully shown. *a*=rudiment of branchia. × 100.
,, 11D.—10th right foot, front view. × 70.
,, 11E.—30th right foot, front view. Setae not fully shown. × 56.
,, 11F.—Seta from posterior row of 20th foot. × 330.
,, 11G.—Seta from anterior row of 20th foot. × 560.

Nephthys oligobranchia, sp. nov.

FIG. 12A.—Anterior end, dorsal view. The head is distorted by the extruded proboscis. × 38.
,, 12B.—10th right foot, front view. × 70.
,, 12C.—21st right foot, front view. Setae not fully shown. × 70.

Marphysa gravelyi, sp. nov.

FIG. 13A.—Anterior end, dorsal view, of a small individual. × 18.
,, 13B.—Posterior end, dorsal view, of a small individual. × 25.
,, 13C.—Maxillae. × 25.
,, 13D.—Mandibles. × 25.
,, 13E.—1st left foot, front view. × 100.
,, 13F.—30th right foot, front view, of a small individual, equivalent to the 40th foot of a large individual. × 56.
,, 13G.—240th right foot, front view, of a large individual. × 38.



R. Southern del. A. Chowdhary lith.

POLYCHAETA OF THE CHILKA LAKE, E ♀

EXPLANATION OF PLATE XXV.

Marphysa gravelyi, sp. nov.

FIG. 13H.—Dorsal capillary seta from the 20th foot. × 560.
,, 13J.—Ventral compound seta from the 20th foot. × 560.
,, 13K.—Brush seta from the 160th foot. × 560.
,, 13L.—Ventral hook from 50th foot. *a*=side view; *b*=front view. × 560.

Diopatra variabilis, sp. nov.

FIG. 14A.—Anterior end, dorsal view. × 8.
,, 14B.—Anterior end, ventral view. × 6.
,, 14C.—Maxillae. × 18.
,, 14D.—Mandibles. × 18.
,, 14E.—1st right foot, front view. × 25.
,, 14F.—10th right foot, front view. × 18.
,, 14G.—150th left foot, front view. × 40.
,, 14H.—Dorsal winged capillary seta from 6th foot. × 166.
,, 14J.—Ventral seta, without wing, from 5th foot. × 166.
,, 14K.—Capillary seta from the dorsal group of the 56th foot, side view. × 166.
,, 14L.—Front view of the same seta. × 166.
,, 14M.—Ventral seta from 1st foot. × 560.
,, 14N.—Ventral hook from 28th foot. × 166.
,, 14P.—Ventral hook from 100th foot. × 166.
,, 14Q.—Brush seta from the 5th foot. × 560.
,, 14R.—10th right foot, front view, of a small individual. × 18.

R Southern del.

A.Chowdhary lith.

POLYCHAETA OF THE CHILKA LAKE, E [illegible]

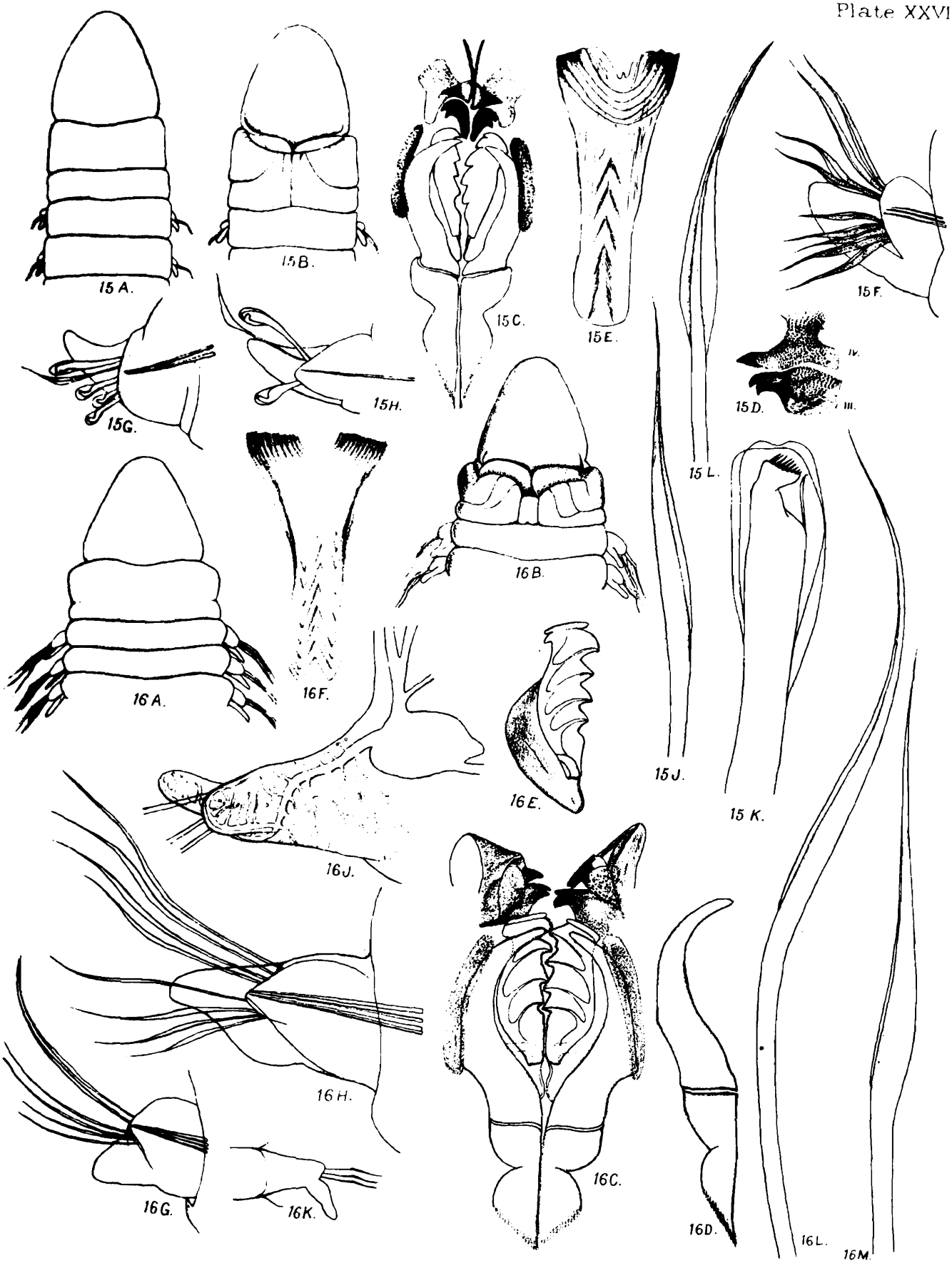
EXPLANATION OF PLATE XXVI.

Lumbriconereis polydesma, sp. nov.

FIG. 15A.—Anterior end, dorsal view. × 26.
,, 15B.—Anterior end, ventral view. × 26.
,, 15C.—Maxillae. × 56.
,, 15D.—3rd and 4th pairs of jaws, flattened. × 56.
,, 15E.—Mandibles. × 56.
,, 15F.—10th right foot, front view. × 100.
,, 15G.—80th right foot, front view. × 100.
,, 15H.—300th right foot, front view. × 100.
,, 15J.—One of the shorter capillary setae from the 10th foot. × 330.
,, 15K.—Tip of crochet from ventral part of the 60th foot. × 560.
,, 15L.—Capillary seta from the upper part of the 350th foot. × 330.

Lumbriconereis simplex, sp. nov.

FIG. 16A.—Anterior end, dorsal view. × 26.
,, 16B.—Anterior end, ventral view. × 26.
,, 16C.—Maxillae. × 56.
,, 16D.—Left half of 1st pair of maxillae, with more elongate base than that shown in fig. 16C. × 56.
,, 16E.—Left half of 2nd pair of maxillae. × 56.
,, 16F.—Mandibles. × 40.
,, 16G.—1st right foot, front view. × 86.
,, 16H.—10th right foot, front view. × 86.
,, 16J.—100th right foot, front view, showing blood-vessels. Setae only partly indicated. × 86.
,, 16K.—Foot from mid-body, seen from above.
,, 16L.—Short capillary seta from lower part of the 10th foot. × 330.
,, 16M.—Seta from a posterior foot. × 330.



R. Southern del.

A. Chowdharylith.

POLYCHAETA OF THE CHILKA LAKE, ETC

EXPLANATION OF PLATE XXVII.

Glycera alba, Rathke, var. **cochinensis**, var. nov.

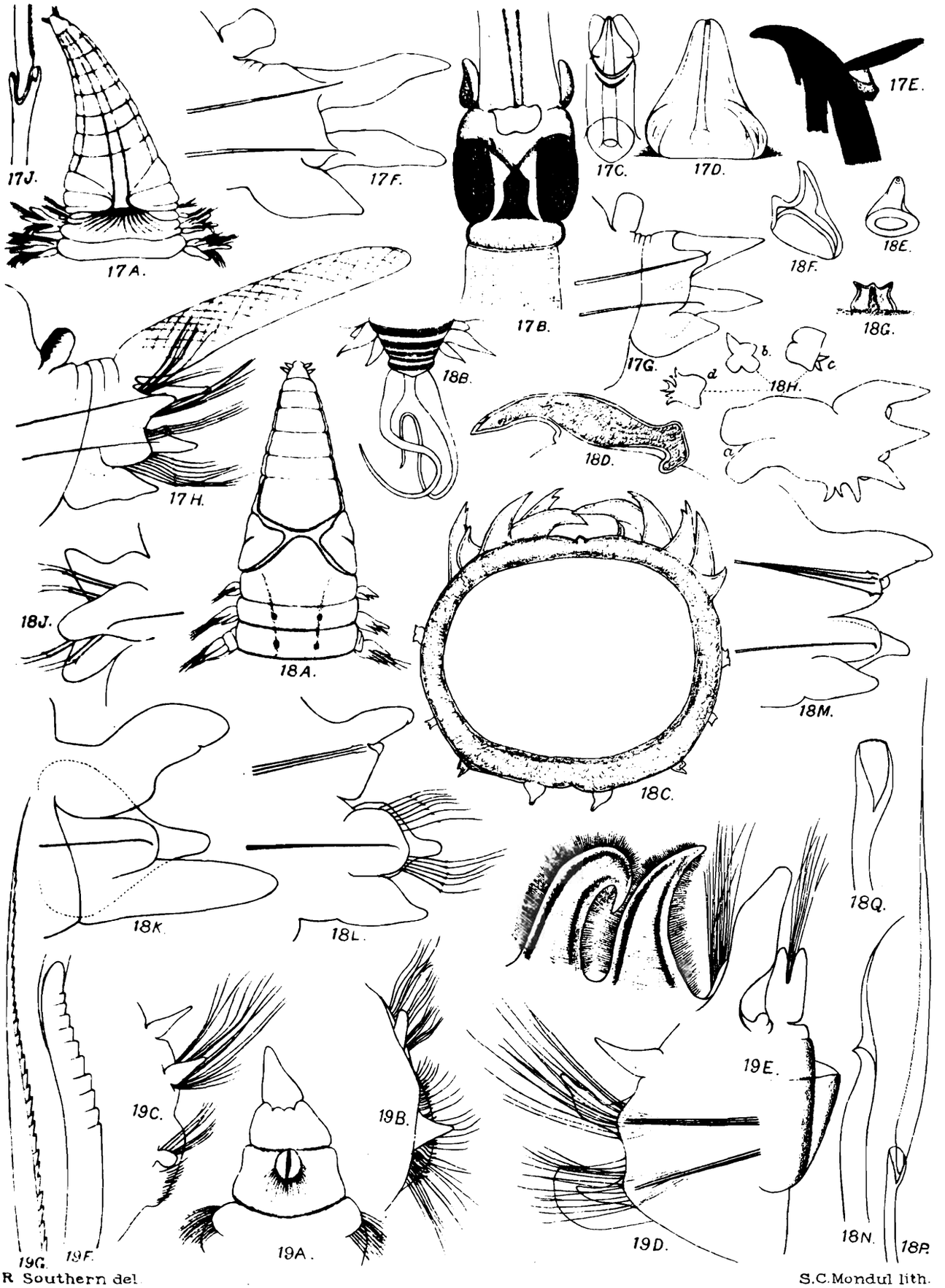
FIG. 17A.—Anterior end, ventral view. × 40.
,, 17B.—External aspect of inverted pharynx. × 18.
,, 17C.—Winged papilla of the proboscis. × 560.
,, 17D.—Conical papilla of the proboscis. × 560.
,, 17E.—Jaw. × 70.
,, 17F.—4th right foot, posterior view. × 150.
,, 17G.—10th right foot, posterior view. × 100.
,, 17H.—40th right foot, posterior view. × 100.
,, 17J.—Tip of shaft of compound seta from 40th foot. × 560.

Glycinde oligodon, sp. nov.

Fig. 18A.—Anterior end, ventral view. × 100.
,, 18B.—Posterior end, dorsal view. × 70.
,, 18C.—Transverse section of proboscis, mid-region. × 150.
,, 18D.—Paragnath from inner dorsal row of proboscis. × 230.
,, 18E.—Paragnath from inner ventral row, near base of proboscis. × 560.
,, 18F.—Paragnath from outer ventral row, near base of proboscis. × 560.
,, 18G.—Paragnath from transverse lateral ridge of proboscis. × 560.
,, 18H.—Jaws. × 330.
,, 18J.—1st right foot, anterior view. × 330.
,, 18K.—10th right foot, posterior view; setae omitted. × 330.
,, 18L.—30th right foot, posterior view. × 150.
,, 18M.—90th right foot, posterior view; setae omitted in part. × 1150.
,, 18N.—Dorsal seta from 90th foot. × 1120.
,, 18P.—Ventral seta from 20th foot. × 560.
,, 18Q.—Tip of shaft of same seta. × 1120.

Scoloplos marsupialis, sp. nov.

FIG. 19A.—Anterior end, ventral view. × 56.
,, 19B.—4th right foot, posterior view. × 100.
,, 19C.—17th right foot, posterior view. × 56.
,, 19D.—19th right foot, front view. × 56.
,, 19E.—30th right foot, posterior view. × 70.
,, 19F.—Short thick seta from 6th foot. × 1120.
,, 19G.—Tip of ventral seta from 150th foot. × 1330.



R Southern del.

S.C.Mondul lith.

POLYCHAETA OF THE CHILKA LAKE, ETC.

EXPLANATION OF PLATE XXVIII.

Polydora (Carazzia) kempi, sp. nov.

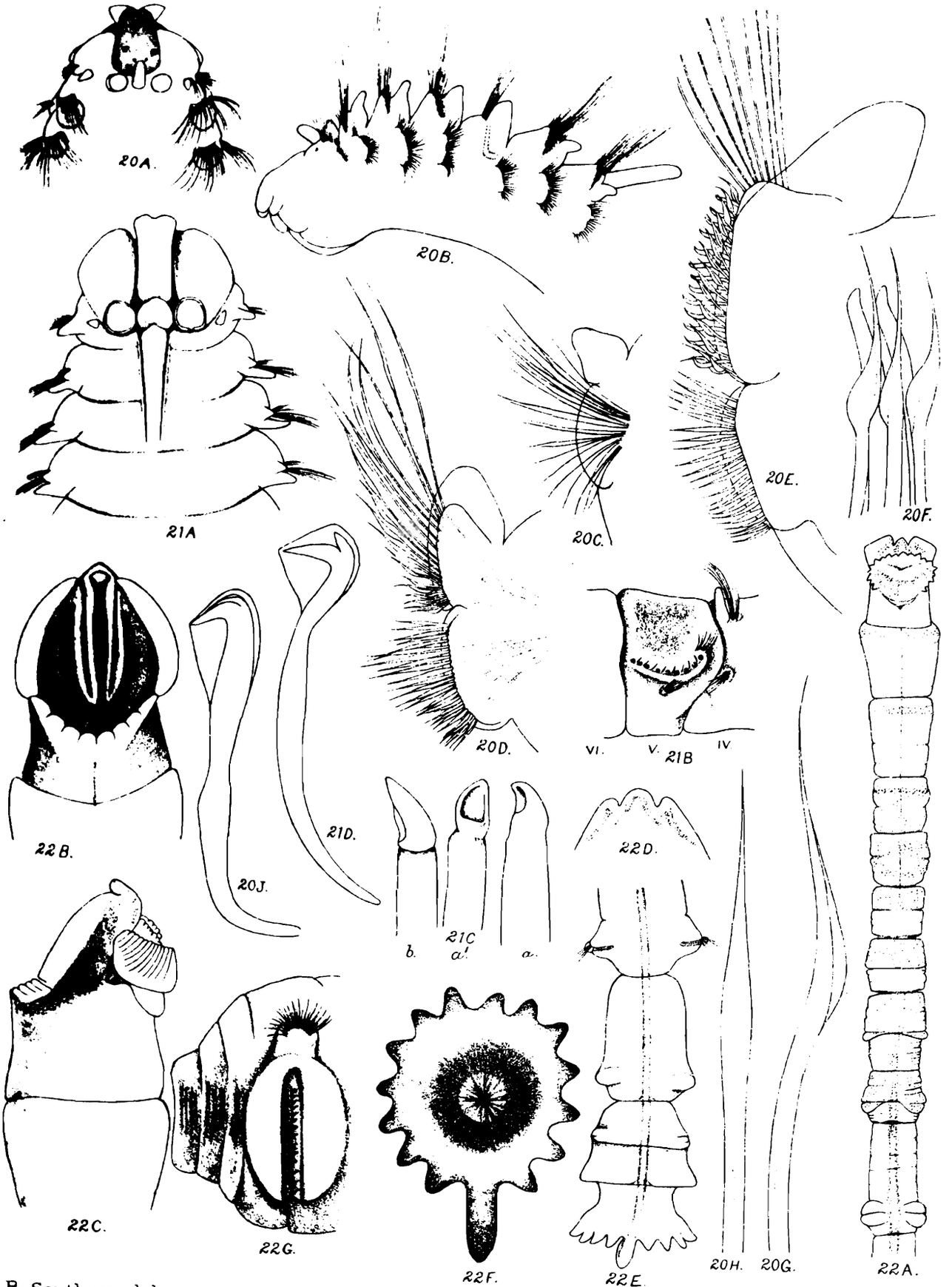
FIG. 20A.—Anterior end, dorsal view. × 56.
,, 20B.—Anterior end, lateral view. × 56.
,, 20C.—1st right foot, front view. × 230.
,, 20D.—4th right foot, front view. × 150.
,, 20E.—5th right foot, front view. × 230.
,, 20F.—Lower dorsal setae from 5th foot. × 560.
,, 20G.—Seta from the lower part of the dorsal bundle of the 4th foot. × 800.
,, 20H.—Seta from the middle of the ventral bundle of the 4th foot. × 800.
,, 20J.—Ventral crochet from the 8th foot. × 800.

Polydora hornelli, Willey.

FIG. 21A.—Anterior end, dorsal view. × 56.
,, 21B.—5th segment, lateral view, showing arrangement of setae.
,, 21C.—Modified setae from the 5th segment. × 360.
,, 21D.—Ventral crochet from the 38th foot. × 560.

Euclymene annandalei, sp. nov.

FIG. 22A.—Anterior end, ventral view. × 8.
,, 22B.—Anterior end, dorsal view. × 18.
,, 22C.—Anterior end, lateral view. × 18.
,, 22D.—Anterior border of the head, ventral view, showing the arrangement of the eyes. × 18.
,, 22E.—Posterior end, ventral view. × 12.
,, 22F.—Anal funnel, posterior view. × 25.
,, 22G.—Posterior part of the 16th setigerous segment, right side, showing arrangement of setae. × 40.



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S.C. Mondul lith.

POLYCHAETA OF THE CHILKA LAKE, Etc.

EXPLANATION OF PLATE XXIX.

Euclymene annandalei, sp. nov.

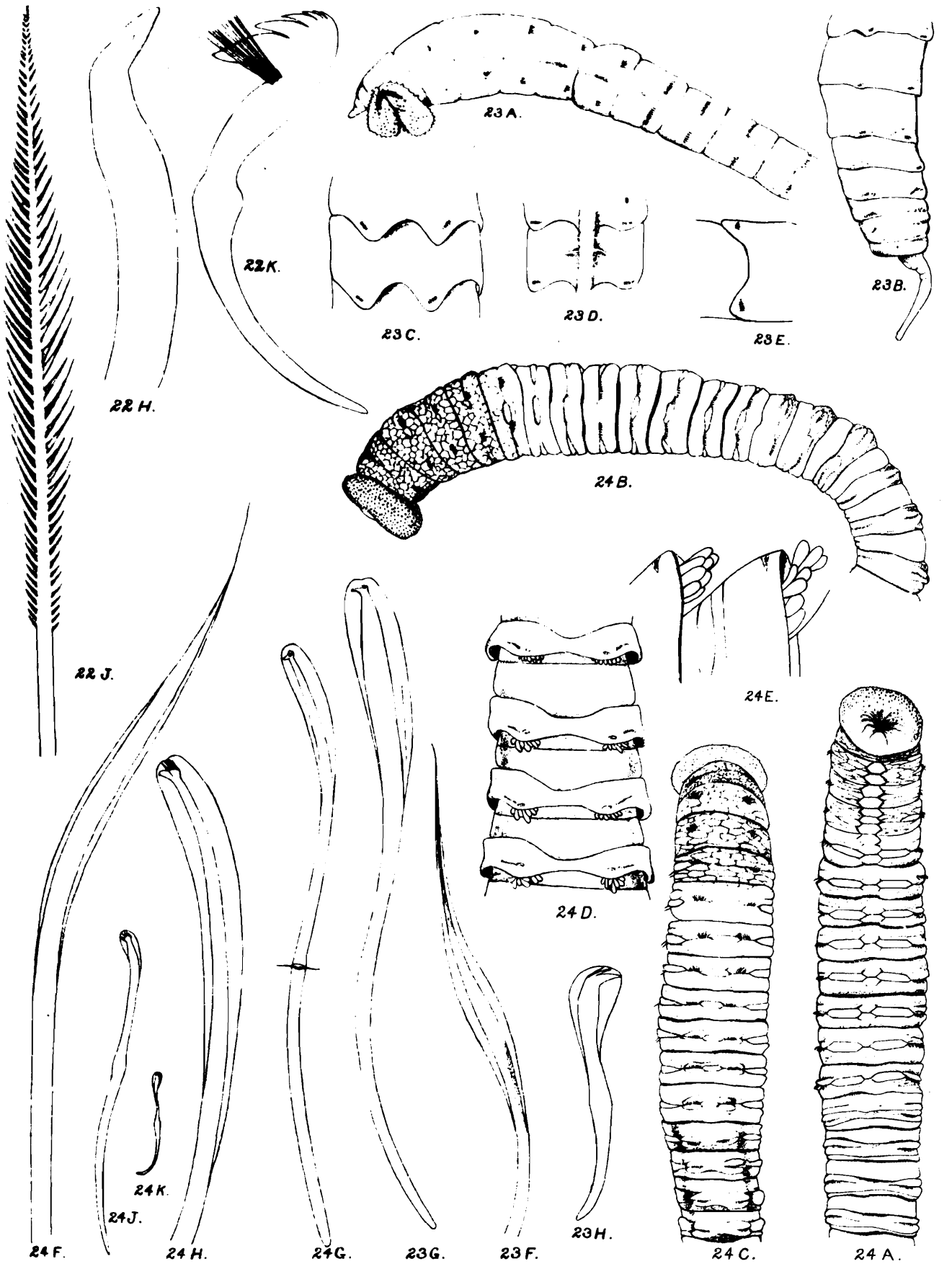
FIG. 22H.—Ventral hook from the 1st setigerous segment. × 230.
,, 22J.—Tip of a plume seta from the 10th setigerous segment. × 560.
,, 22K.—Ventral crochet from the 8th setigerous segment. × 560.

Heteromastus similis, sp. nov.

FIG. 23A.—Anterior end, side view. × 18.
,, 23B.—Posterior end, side view. × 56.
,, 23C.—180th segment, dorsal view. × 56.
,, 23D.—190th segment, ventral view. × 56.
,, 23E.—190th segment, side view. × 56.
,, 23F.—Dorsal seta from 4th setigerous segment. × 560.
,, 23G.—Dorsal crochet from 7th setigerous segment. × 660.
,, 23H.—Ventral crochet from 86th segment. × 660.

Barantolla sculpta, gen. et sp. nov.

FIG. 24A.—Anterior end, ventral view. × 12.
,, 24B.—Anterior end, lateral view. × 12.
,, 24C.—Anterior end, dorsal view. × 12.
,, 24D.—Dorsal view of segments 115—118. × 40.
,, 24E.—Lateral view of branchiae and dorsal lobes in the posterior segments. × 100.
,, 24F.—Dorsal capillary seta from the 3rd foot. × 560.
,, 24G.—Dorsal crochet from the 7th foot. × 360.
,, 24H.—Tip of the same seta. × 870.
,, 24J.—Dorsal crochet from 14th foot. × 360.
,, 24K.—Dorsal crochet from 60th foot. × 360.



R. Southern del. D. Bagchi lith.

POLYCHAETA OF THE CHILKA LAKE, ETC.

EXPLANATION OF PLATE XXX.

Mastobranchus indicus, sp. nov.

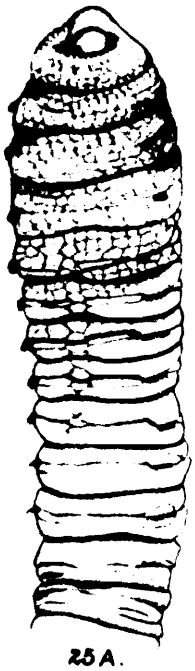
FIG. 25A.—Anterior end, ventral view. × 8.
,, 25B.—Dorsal capillary seta from the 12th segment (11th foot). × 485.
,, 25C.—Tip of long crochet from the ventral division of the 12th segment (11th foot). × 1120.
,, 25D.—Ventral crochet from the 13th segment (12th foot). × 360.
,, 25E.—Tip of the dorsal crochet from the 15th segment (14th foot). × 1120.
,, 25F.—Ventral crochet from the 50th segment. × 360.

Laonome indica, sp. nov.

FIG. 26A.—Anterior end, dorsal view. × 25.
,, 26B.—Collar segment, ventral view. × 56.
,, 26C.—Tip of a branchia. × 56.
,, 26D.—Dorsal capillary seta from the 2nd setigerous segment. × 660.
,, 26E.—Spatulate dorsal setae from the 2nd setigerous segment. × 560.
,, 26F.—Capillary seta from the 8th setigerous segment. × 660.
,, 26G.—Uncinus from the 2nd setigerous segment. *a*=front view; *b*=side view. × 800.
,, 26H.—Uncinus from the 8th setigerous segment. × 800.

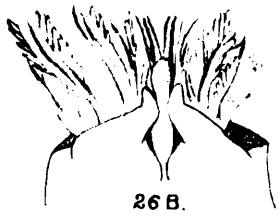
Ficopomatus macrodon, gen. et sp. nov.

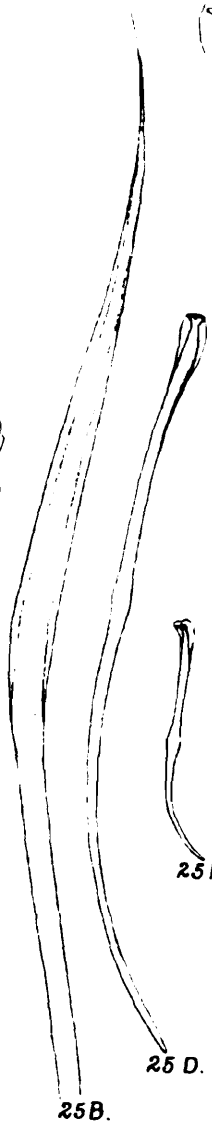
FIG. 27A.—Anterior end, dorsal view. × 26.
,, 27B.—Posterior end, ventral view. × 56.
,, 27C.—Operculum from the left side. × 40.
,, 27D.—Modified seta from the 1st setigerous segment, side view. × 560.
,, 27E.—The same seta, front view. × 560.
,, 27F.—Simple capillary seta from the 1st setigerous segment. × 560.
,, 27G.—Capillary seta as found in the dorsal bundles of segments 2—6. × 560.
,, 27H.—Uncinus from a thoracic segment. *a*=face view; *b*=side view. × 840.
,, 27J.—Anterior abdominal parapodial lobe.
,, 27K.—Ventral seta from an anterior abdominal segment. × 560.
,, 27L.—Uncinus from an anterior abdominal segment. × 840.
,, 27M.—Diagrammatic sections of the tube. *a*=old portion of a free tube; *b*=recent portion of a free tube; *c*=front view of the aperture of an attached tube.


25A.

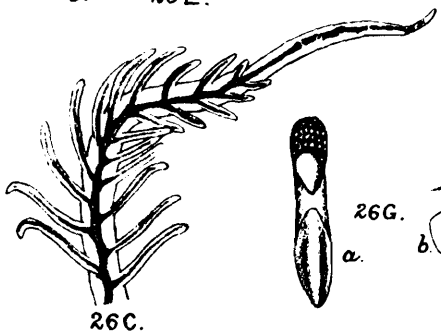

25C. 25E.


26A.


26B.

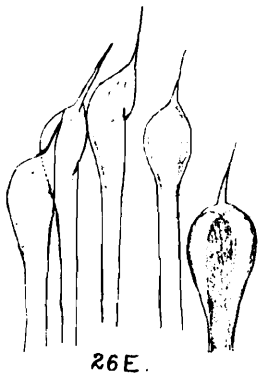

25B. 25D.

25F.


26C.

26G. a.


b.


26E.


26H.

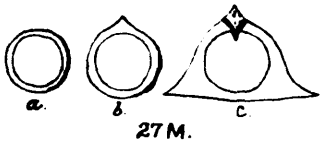

26D.


26F.

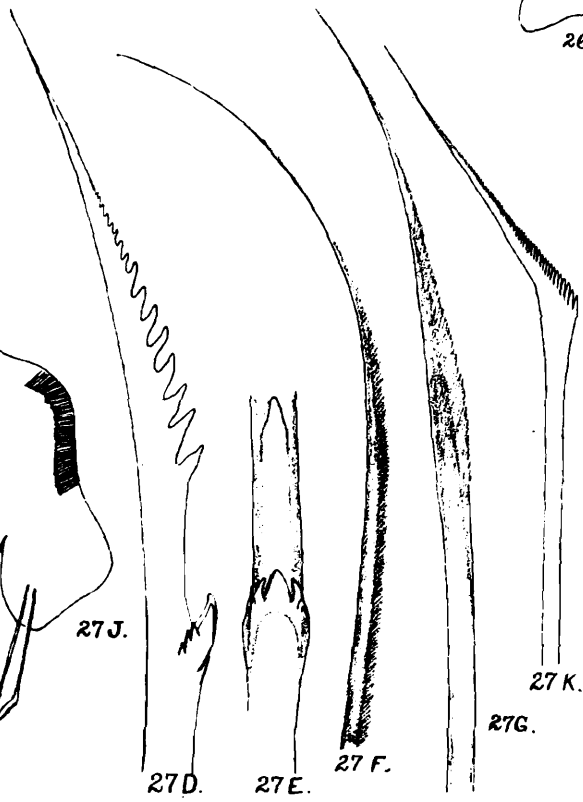

27A.

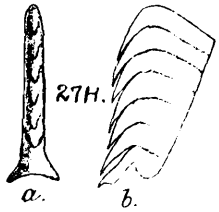

27B.

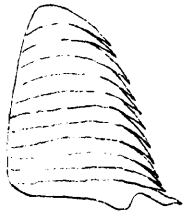

27C.


a. b. c. 27M.


27J.


27D. 27E. 27F. 27G. 27K.


27H. a. b.


27L.

R. Southern del. D. Bagchi lith.

POLYCHAETA OF THE CHILKA LAKE Etc

EXPLANATION OF PLATE XXXI.

Potamilla leptochaeta, sp. nov.

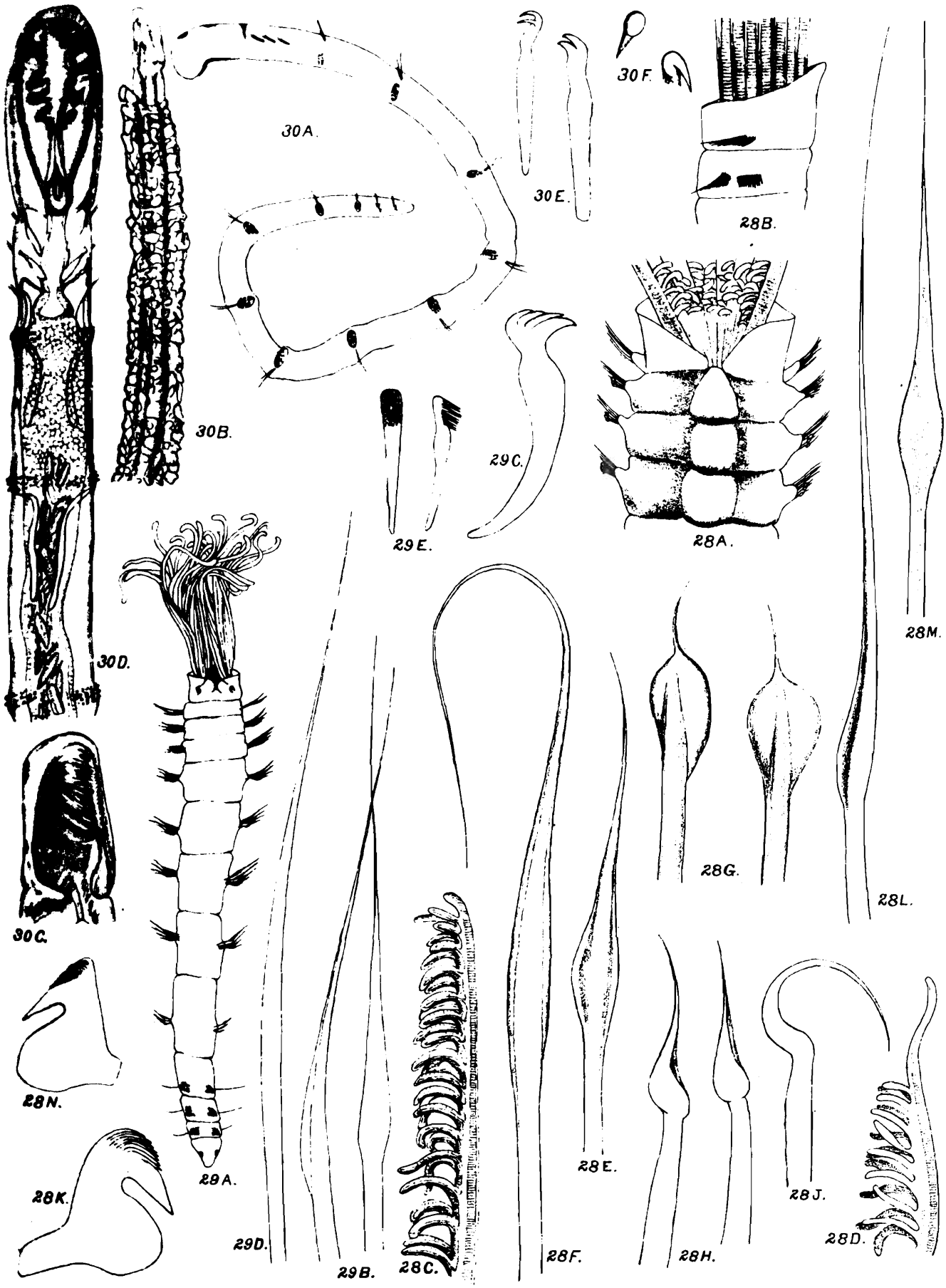
FIG. 28A.—Anterior end, dorsal view. × 70.
,, 28B.—Anterior end, lateral view. × 50.
,, 28C.—Branchia, almost entire. × 50.
,, 28D.—Tip of another branchia. × 50.
,, 28E.—One of the shorter setae of the 1st thoracic segment. × 840.
,, 28F.—A dorsal capillary seta from the 6th thoracic segment. × 840.
,, 28G.—Spatulate setae from the 6th thoracic segment. × 840.
,, 23H.—Cuspidate setae from the upper part of the anterior row of ventral setae of the 4th thoracic segment. × 840.
,, 28J.—Cuspidate seta from the lower part of the anterior row of ventral setae of the 6th thoracic segment. × 840.
,, 28K.—Avicular uncinus from the 6th thoracic segment. × 840.
,, 28L.—Side view of one of the longer capillary setae from one of the anterior abdominal segments. × 840.
,, 28M.—Face view of one of the shorter capillary setae from one of the anterior abdominal segments. × 840.
,, 28N.—Avicular uncinus from one of the anterior abdominal segments. × 840.

Fabricia (Manayunkia) spongicola, sp. nov.

FIG. 29A.—Entire animal, dorsal view. × 70.
,, 29B.—Capillary setae from a thoracic segment. × 1050.
,, 29C.—Ventral crochet from a thoracic segment. × 1700.
,, 29D.—Capillary seta from an abdominal segment. × 1050.
,, 29E.—Crochets from an abdominal segment. × 870.

Myriochele picta, sp. nov.

FIG. 30A.—Complete specimen (?). × 50.
,, 30B.—Anterior end, in tube. × 50.
,, 30C.—Lateral view of the anterior end. × 70.
,, 30D.—Ventral view of the anterior end, showing internal structure. × 90.
,, 30E.—Crochets. × 1730.
,, 30F.—Crochets viewed from above. × 2000.



R. Southern del. D. Bagchi lith.

POLYCHAETA OF THE CHILKA LAKE, Etc.