

## ECHIUROIDEA.

By N. ANNANDALE and STANLEY KEMP.

The Gephyrea are represented in the fauna of the Chilka Lake by a single Echiuroid belonging to the genus *Thalassema*, Gaertner. The species, which appears to be undescribed, is of interest on account of its close relationship to *T sabinum*, Lanchester, from the Talé Sap in lower Siam (a lagoon that closely resembles the Chilka Lake in many respects) and of the fact that a third closely related species occurs in canals of brackish water on the outskirts of Calcutta.

These three forms belong, in a sense, to the group typified by *T neptuni*, Gaertner (the type species of the genus) and characterized by the comparatively simple nature of the anal trees, by the possession of two pairs of nephridia and by the undivided sheath of longitudinal muscles. They have, however, certain very noteworthy peculiarities—especially in the structure of the proboscis—that may ultimately be considered to be of generic importance. The following key to the species of the *neptuni* group, to which we assign provisionally those described here, may be useful:—

- I. Proboscis long and slender, pointed or bifid at the tip, extremely extensile, without dendritic or finger-shaped outgrowths.
  - A. Proboscis when expanded much longer than body, pointed *T neptuni*, Gaertner.
  - B. Proboscis when expanded not much longer than body, expanded and bifid at tip *T semoni*, Fischer.
- II. Proboscis short and stout, truncate at tip, not very extensile, with dendritic or finger-shaped outgrowths.
  - A. Proboscis tubular, (the lateral margins being fused together), and containing internal finger-shaped outgrowths *T sabinum*, Lanchester.
  - B. Proboscis with the lateral margins not fused together, though capable of close apposition, bearing dendritic marginal outgrowths.
    - i. Dendritic outgrowths of proboscis small, less than half as long as it is wide *T dendrorhynchus*, sp. nov.

2. Dendritic outgrowths gill-like, nearly as long as the proboscis is wide *T. branchiorhynchus*, sp. nov.

We have to thank Dr. A. E. Shipley and Mr. Forster Cooper for sending us the two type specimens of *T. sabinum* for comparison with those of our new species.

Genus **THALASSEMA**, Gaertner.

1913. *Thalassema*, Wharton, *Philippine Journ. Sci.*, VIII, p. 243.

***Thalassema dendrorhynchus***, sp. nov.

Like all Echiuroids this species is contractile; but the body is much more so than the proboscis (though the latter is capable of undergoing considerable change of form) and neither region appears to be so extensile as in many other species.

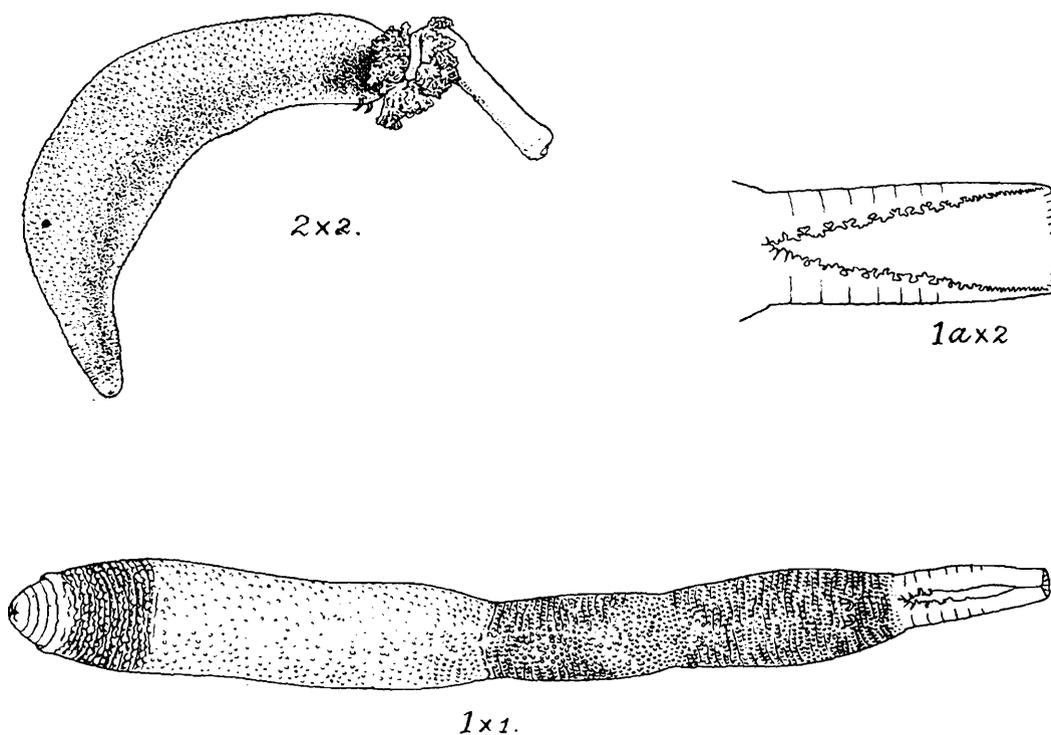


FIG. 1.—*Thalassema dendrorhynchus*, sp. nov. (nat. size); 1a, ventral view of proboscis with lateral margins separated ( $\times 2$ ).

FIG. 2.—*Thalassema branchiorhynchus*, sp. nov. ( $\times 2$ ).

Our largest specimen (fig. 1), preserved fully expanded, is 120 mm. in total length, of which 18 mm. is occupied by the proboscis. The greatest breadth is 12 mm., the point at which this measurement was taken being near the posterior extremity. The animal is, however, able to contract its body at different points and the position of the greatest breadth differs from time to time. In our smallest specimen, preserved in a contracted condition, the length is 46 mm., of which about 8 mm. is occupied by the proboscis; the greatest breadth, situated near the centre of the body, being again about 12 mm. In general form this specimen may be described as sausage-shaped.

The proboscis, the length of which is thus about one-sixth or one-seventh that of the entire animal, is shovel-shaped; the distal extremity is truncate and the lateral (ventral) margins are capable of being applied together in such a way as to form a cylindrical tube. When separated the space between them is narrowly V-shaped. The dorsal surface is smooth or nearly so. There is no longitudinal ridge on the ventral surface and the ciliated groove is inconspicuous. A striking feature of the margins is that they are distinctly serrated, the serrations towards the proximal end gradually taking the form of dendritic outgrowths, which, however, are always shorter than half the width of the whole organ (fig. 1a).

In certain conditions of expansion the basal part of the proboscis has the appearance of being annulated and the distal extremity is marked by short parallel longitudinal grooves.

The body is covered with papillae which are most numerous towards the two extremities, where they tend to be arranged in concentric rings emphasized by corresponding circular folds in the integument. This is more marked in the posterior region, where the papillae are also larger, than in the anterior. There is a considerable area in the posterior half of the body where they are scattered and comparatively small. The ventral hooks are of a bright golden colour but in two of our specimens the tips appear to have been broken off. Even when complete they are small and only conspicuous on account of their colour. They are situated close together and their distance from the base of the proboscis is considerably shorter than its length. The exact point at which they occur is not, however, constant.

The circum-anal region is devoid of papillae, but surrounded in a more or less definite manner by several concentric folds, the most conspicuous of which separates it from the densely papillate region immediately in front. As a whole it is conical, but the part actually bordering the anus can be thrust out to form a short tubular process.

The longitudinal muscles form a continuous sheath.

There are two pairs of nephridia, both of which open behind the level of the ventral hooks. The internal funnel of each is provided with a pair of very long, fine, spirally-twisted filaments which arise at either side of its orifice. The vesicle is narrow and finger-shaped, tapering to a blunt apex which points inwards.

The anal trees are short and simple, nearly half the length of the body in a contracted specimen. They have a slight brownish tinge and the walls are very thin; the distal part is narrowly cylindrical, but the apex is blunt; the basal or proximal part is somewhat swollen, but there is no definite vesicle. No funnels are visible with the aid of a hand-lens and there are no muscular strands attaching the organs to the body-wall. Examined under the microscope, each tree is seen to possess two longitudinal rows of minute ciliated funnels, the mouth of which does not exceed 0.047 mm. in breadth, while the length is not greater than 0.168 mm. The two trees open separately into the intestine close to the anus.

The alimentary canal is extremely long and intricately but irregularly coiled. Its calibre is small at all points and the walls are thin and transparent. For a

considerable part of its length it is closely packed with small oval pellets of mud. The canal is joined to the body-wall by numerous slender muscular strands which are very easily detached.

The natural colouration is much less conspicuous than in some species of the genus. The body-wall is translucent in life with a pale vinous tinge; but the mud in the alimentary canal makes it seem much darker, sometimes nearly black. The circum-anal region is dead white, the proboscis cream-coloured, with the free edges and the dendritic outgrowths tinged with brown. There are several opaque longitudinal streaks on the body which simulate muscle-bands. Specimens become opaque in spirit and lose their colour completely.

Apart from the Gangetic species (which we describe as *T. branchiorhynchus*) *T. dendrorhynchus* is most nearly related to *T. sabinum*, Lanchester.<sup>1</sup> The only published description of the latter is very incomplete; but, as has already been stated, we have been able to examine the type-specimens. The most important diagnostic character is the fact that the lateral margins of the proboscis are fused, so that the organ is tubular. Comparatively long finger-shaped processes arise from its internal surface and protrude at the opening of the tube. Otherwise, except for its small size and comparatively smooth external surface, the species closely resembles *T. dendrorhynchus*.

Fischer's description of *T. semoni*,<sup>2</sup> which was based on specimens that had lost their proboscis, shows that the internal anatomy is similar in most respects to that of the Chilka species; but Shipley's figure of a living individual<sup>3</sup> proves that a wide difference exists in the structure of the missing organ. Wharton, in the paper cited above, has recently redescribed *T. semoni*, which is an Indo-Pacific form.

So far as published figures of the entire animal are concerned, *T. dendrorhynchus* most closely resembles *T. kokotoniense*, Fischer,<sup>4</sup> another form widely distributed in the Indo-Pacific region, but in the latter species the longitudinal muscles are divided into bands and the body-wall is apparently much stouter.

Specimens from the Chilka Lake were very sluggish when removed from the mud in which they were taken. The only movements exhibited were quite unrhythmic contractions, both transverse and longitudinal, of the body-wall and proboscis; the latter showed no signs of great extensibility or of readiness to break off, and its movements did not suggest that it was employed in burrowing.

A female killed in February contained immature ova.

We found only three specimens of *T. dendrorhynchus*, all in the southern part of the main area of the Chilka Lake. They were living, probably rather deeply buried,

<sup>1</sup> *Proc. Zool. Soc. London*, 1905 (I), p. 40, pl. ii, fig. 5.

<sup>2</sup> In Semon's *Zool. Forsch. Australien*, V, p. 338, fig. 4 (1896).

<sup>3</sup> In Gardiner's *Faun. Geogr. Maldives and Laccadives* I, p. 129, pl. vi, fig. 4 (1903).

<sup>4</sup> See Shipley in Willey's *Zool. Res. New Britain and New Guinea*, p. 337, pl. xxxiii, fig. 3 (1898-1902).

in dense mud. The largest of the three was brought up on the anchor of the launch between Barkuda Id. and the mainland in April; the other two were taken out in the lake between Barkuda and Chiriya Ids. in February; the specific gravity of the water varying from 1.006 on the former occasion to 1.009 01 the latter. The species is doubtless a permanent inhabitant of the southern part of the lake and must at times be brought in contact with water that is almost fresh. The habits of the species render it unlikely to be captured except occasionally and we have no means of ascertaining whether it is actually scarce.

Our specimens of *T dendrorhynchus*, the types of the species, are numbered Z.E.V 6800-6803/7 in the register of the Indian Museum collection.

### ***Thalassema branchiorhynchus*, sp. nov.**

This species (fig. 2, p. 58) is closely related to *T dendrorhynchus*, but differs in the following characters:—

- (1) The proboscis is relatively longer and more slender, its length when fully expanded being more than one-third that of the body.
- (2) The dendritic outgrowths of its margin are much more highly developed, having a gill-like appearance (fig. 3) and being of a blood-red colour in life; they are confined to the proximal third of the margin, the distal part of which is quite smooth.
- (3) There is a conspicuous longitudinal ridge (in place of the ordinary ciliated groove) on the proximal part of the ventral surface of the proboscis between the two rows of dendritic outgrowths. These it resembles in colour.
- (4) The external (dorsal) surface of the proboscis is minutely tubercular instead of being smooth.
- (5) The integument of the body remains translucent even in spirit, the nerve cord being visible externally as an opaque white line.
- (6) The surface papillae of the body are less prominent than in *T dendrorhynchus*; they are, as a rule, distinctly of two kinds, large and small, the large papillae being most numerous towards the two extremities. Near the posterior end they are conical and show some tendency to be arranged in transverse rings. There is, however, no smooth circum-anal region.

The length of the body in the type-specimen (fully expanded) is about 32 mm. and the greatest breadth about 7 mm.; the length of the proboscis nearly 15 mm.

In the living animal the whole body was of a deep reddish vinous tint, translucent, but not markedly so. The posterior extremity was somewhat paler than the remainder and the colour seemed to be due mainly to the fluid of the body-cavity. The proboscis was purplish pink, contrasting notably with the bright red colour of its dendritic outgrowths and the ridge on the ventral surface. The hooks were golden yellow tipped with black.

The internal structure of this species agrees closely with that of *T dendrorhyn-*

*chus*, the only differences detected being that the processes of the nephridial funnels were less distinctly coiled and the anal trees possibly longer. In the fully expanded specimen the latter are about half as long as the body but it was noticed in the living animal that their relative length varied with the state of general expansion and that they were not so extensile as the body as a whole. The arrangement and form of the minute funnels on the trees seem to be identical in the two species.

Our specimen from the Gangetic delta was active. When placed in a dish of mud and water, the animal formed for itself, by irregular movements of the body and proboscis, a shallow groove on the surface of the mud. It made no attempt to burrow downwards, but lay on one side in this groove. When first removed from the water it writhed vigorously and changed its shape rapidly in diverse regions, sometimes extending itself to a considerable length and assuming a worm-like form, sometimes

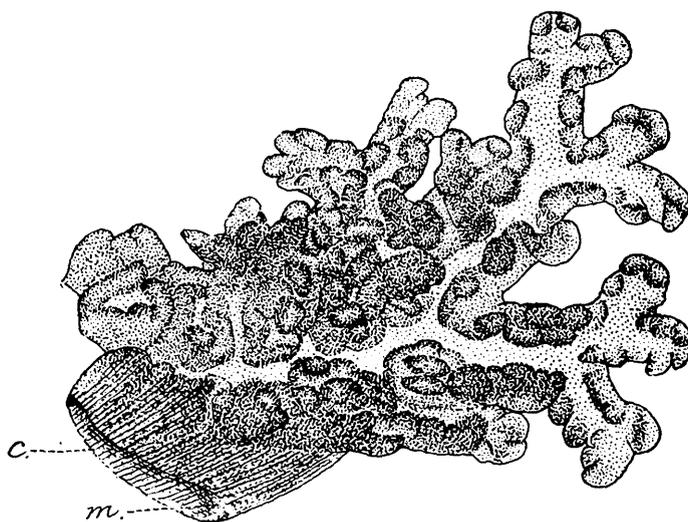


FIG. 3.—*Thalassema branchiorhynchus*, sp. nov.

Gill-like outgrowth from base of proboscis, seen from ventral surface,  $\times 30$ .

*c* = lumen of base of outgrowth, which is cut off a little obliquely; *m* = muscles entering base.

expanding the extremities or other parts of the body into bulbous or annular swellings. When it was replaced in its natural element these movements continued for a short time, but soon became less vigorous, though without ceasing completely. The natural attitude of the proboscis appeared to be flexed backwards, so that its dorsal surface was in contact with that of the body. The distal parts of the lateral borders were applied together so as to form a complete tube; but the proximal parts were everted (fig. 2, p. 58), the dendritic outgrowths being thus displayed. They were somewhat contractile and, when fully extended and spread out, formed a double series of short feathery tentacles. The whole proboscis was, however, sometimes twisted spirally, as is shown in the figure.

The only known specimen of *T. branchiorhynchus* was taken in about 3 feet of water in a small tidal creek connected with a canal near Chingrighatta on the outskirts of Calcutta in December, 1914. The specific gravity of the water was then 1.006.

We have failed to obtain further specimens, but this does not necessarily mean that the species is scarce, for, from the point of view of the collector, the Gangetic mud is very difficult to deal with in a satisfactory manner.

The specimen bears the number Z.E.V 6807/7 in the Indian Museum books.

*T dendrorhynchus*, the Gangetic species, and *T sabinum*—despite the specific name of the last—all live in peculiarly dense mud, and we believe that the unusual structure of the proboscis in the three species is correlated with this fact. It is noteworthy that the gill-like outgrowths are better developed in the species from the Gangetic delta than in that from the Chilka Lake, for the mud of the former region is extremely fine and therefore forms a peculiarly dense and sticky mass.

In most species of *Thalassema* the proboscis seems to be the most active agent in burrowing or in insinuating the body into crevices, but apparently this is not the case in the three mud-living species just discussed. In these species the excavations are formed by movements of both the body and the proboscis, and the latter has probably a respiratory as well as a muscular and a nutritive function, for the dendritic outgrowths of its margins or ventral surface have much the appearance and structure of gills and are situated in such a position that all water which enters the mouth must first pass over them. Externally, in *T dendrorhynchus* and *T branchiorhynchus*, they are covered with ciliated epithelium; they contain spacious lumina that communicate with the body-cavity by means of a longitudinal canal at their base. The other parts of the proboscis are highly muscular, the bulk of the organ consisting of a gelatinous substance that contains numerous bundles of longitudinal muscle-fibres. In *T dendrorhynchus* these are most numerous towards the ventral surface, from which they proceed outwards, in transverse section, in somewhat irregular bands that become gradually attenuated. Single transverse fibres run in the opposite direction among the bundles and shorter fasciae also occur in the ventro-dorsal axis between the bands. Immediately below the ectoderm on both ventral and dorsal surface, there is a relatively broad horizontal muscle running across the proboscis.