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FAUNA

OF THE

CHILKA LAKE.

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No. I.

JULY, 1915.

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FAUNA OF THE CHILKA LAKE

OLIGOCHAETA.

By J. Stephenson, *M.B., D.Sc., Lieut.-Col., I.M.S., Professor of Zoology, Government College, Lahore.*

(Plate X).

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OLIGOCHAETA.

By J. Stephenson.

The Oligochaeta of brackish water are few, and do not form an independent ethological group. They seem to be forms belonging to the freshwater or littoral groups which possess the power of resisting a certain amount of admixture of salt or fresh water respectively.

Though the Oligochaeta have long been recognized as capable of contributing valuable results to zoogeography, these results have been gained almost entirely from a study of the terrestrial forms, to the exclusion of those of aquatic and littoral habit. Nor in view of the modes of dispersal can it be expected that it will be otherwise in the future. The following few remarks may serve briefly to illustrate this statement.

In the case of freshwater forms, it seems probable that birds are one of the chief agents of dispersal; the mud which adheres to the feet of waders offers an easy means of transport to small worms or their cocoons; and it is well known that small animals, such as Nematodes and Rotifers, have been cultivated from such mud after a prolonged flight, while small molluscs have also been found to be conveyed in this way. Speaking of the probable introduction of Australian worms into New Zealand in this way, Benham (" A note on the Oligochaeta of the New Zealand Lakes ", *Trans. N. Z. Inst.*, XXXVI, 1903) calculates that a strong flier with the wind behind it could cover the distance in 36 to 48 hours The comparative valuelessness for zoogeography of the data of distribution of freshwater Oligochaeta may be exemplified by the fact that *Nais paraguayensis*, first found, as the name implies, in material from Paraguay, has since been discovered in Lahore; that *Nais communis*, described first from Switzerland, has been found both in North and South India; *Stylaria lacustris*, also found at Lahore, occurs all over Europe, in the Baikal Sea, and in North America; while the genus *Chaetogaster*, represented by several species in India, is found throughout Europe, in North America, in the Baikal Sea, and in Australia, and is indeed probably absolutely cosmopolitan.

The littoral Oligochaeta are unfortunately capable of furnishing no more valuable results. " The animals usually lay their cocoons underneath and amongst the masses of detritus on the shore, often attaching them firmly to these.....When at more than usually high tides these masses are again washed into the sea, they may be taken up by currents, carried far away, and thrown up with the cocoons they bear on to the shore at some distant point. In this way littoral Oligochaetes may spread not only along a continuous coast-line but over considerable stretches of

ocean. Probably shore-birds also contribute to their dispersal by carrying away cocoons which adhere in a chance manner to their feet. That such a trans-oceanic dispersal of littoral Oligochaeta is a fact may be seen from the case of geologically recent and isolated oceanic islands; these contain (apart from forms demonstrably introduced by man) no terrestrial Oligochaeta, but are colonized by littoral species, *e.g.* the small coral island Laysan of the Hawaiian Archipelago by a species of *Pontodrilus*" (Michaelsen, *Die geographische Verbreitung der Oligochaeten*, 1903). So the genus *Pontodrilus* is apparently distributed over the coasts of all the warmer portions of the globe; while *Enchytraeus albidus* is found from Nova Zembla and Greenland to South Patagonia and Kerguelen Is.

Family ENCHYTRAEIDAE.

Genus **ENCHYTRAEUS**, Henle.

Enchytraeus barkudensis, sp. nov.

(Plate X, figs. 1-4.)

Types.—Barkuda Island, Chilka Lake, Ganjam Dist., Madras Presidency. In sand at edge of lake; 16-vii-1914. Five specimens (Reg. No. ZEV 6545/7, *Ind. Mus.*).

Length 15 mm. Filiform, breadth about ·3 mm. Colour light brown. Segments 57-64.

The prostomium is rounded and very short.

The *setae* are of the same type (*Enchytraeus* type) in both lateral and ventral bundles; they are blunt rods, straight except for a curve at the inner or proximal end. In both lateral and ventral bundles they are three per bundle in segments ii—xi; segment xii has lateral bundles consisting each of two setae, but no ventral bundles; from segment xiii onwards the setae are two per bundle, both laterally and ventrally.

The *clitellum* is not distinguishable.

Not much of the anatomy of the worms could be observed with accuracy in the entire specimens, and most of the following account is based on the examination of longitudinal sections.

The *septa* in the anterior region are much bulged backwards, especially 7/8, 8/9, and 9/10, which form deep pockets filled with coelomic corpuscles. These three septa are also considerably thickened as compared with the others, and form stout sheets of muscular fibres (*cf.* septum 9/10 in fig. 2).

The *coelomic corpuscles* (fig. 2) are numerous and conspicuous even in the entire animal; they are nucleated flattened plates, oval or broadly spindle-shaped, of an average length (in the fixed and stained condition) of 28μ; the maximum length observed was 41μ.

The *pharynx* (fig. 1) occupies segments ii and iii; it has the usual constitution, the epithelium of the roof being markedly columnar and forming a sucker-like plate. The *oesophagus* is a narrow and uniform straight tube, ciliated throughout, and showing no differentiation; it passes fairly suddenly into the *intestine*, distinguish-

able by its greater width, in segment xv (in one specimen), xvi or perhaps xvii (in a second).

The *salivary glands* (fig. 1) are apparently represented by a pair of short club-shaped backwardly directed evaginations of the pharynx; these take origin from the hinder part of the pharyngeal roof, behind the sucker-like epithelial plate, and are situated one on each side near the middle line.

The *septal glands* are situated on the anterior faces of septa 4/5, 5/6, and 6/7, causing these to bulge backwards. Those of each pair are continuous dorsally over the oesophagus; and each gland is continued forwards by an anteriorly projecting lobe situated ventro-laterally to the oesophagus. In entire specimens the glands appear to be in segments v, vi, and vii, and perhaps to be more than a single pair per segment; but the appearances are explained by the backward bulging of the septa, and the presence of the anterior lobes, as just described.

The *dorsal vessel* is certainly distinct as far back as segment xv,—probably further, as far as xvi, if not xvii.

The *nephridia* have a short ante-septal portion,—perhaps a quarter the length of the postseptal; the post-septal portion is elongated, narrow, and gives off the duct from its under surface at about one-third of its length from the posterior end; the duct is short, passes vertically downwards, and ends in front of the ventral setae.

The *cerebral ganglion* is in segment i; its shape could not be determined.

The description of the male genital organs (figs. 2, 3, 4) is most conveniently begun with the *sperm-sacs*. These are two in number, quite distinct from each other, of large size and ovoid shape (figs. 2, 3); they are continuous with and suspended by septum 10/11; they project forwards into segment x, and, still more, backwards into xi, so that they occupy the whole length of the latter segment; their walls are quite thin, but complete. Contained within this sac is a large mass of sperm-morulae, in various stages of development; but, in the two specimens which were sectioned, there were no wisps of fully developed spermatozoa. What is to be considered as the *testis* is a mass of cells (figs. 2, 3), adherent to the inner face of the sac-wall at its lower part, *i.e.* to the floor of the sac, approximately in the region where septum 10/11 joins it. This mass of cells may project not inconsiderably into the interior of the sac; or it may constitute merely a flattened plate, perhaps divided up into a number of smaller masses. The morulae within the sac are evidently developed from cells which are proliferated from the cell-mass or cell-plate; indeed there is a gradual transition from the one to the other. The *funnel* (fig. 4) is in segment xi; it is two or three times as long as broad; it has the usual cylindrical shape, but the cells of which it is composed have not the usual clear mucous appearance in stained sections; this might possibly be due to the specimens being in a rather early stage of sexual maturity. The *vas deferens* is situated in segment xii; it is long, thin, 16μ in diameter, and coiled; fig. 4, sketched from an entire specimen in cedar oil, will give an idea as to its disposition and course. The *penial body* is a small hemispherical mass of cells round the termination of the *vas*

deferens, which latter pierces through it without interruption and reaches the surface at the position of the (absent) ventral setae of xii.

The *ovaries*, and masses of *ova*, are contained in segment xii. Funnels and oviducts were not observed.

The *spermathecae* are in segment v, and communicate with the oesophagus. The ampulla is small, ovoid in shape, 50μ in diameter; the duct is a narrow tube, 14μ in diameter, of considerable length and with a few slight bends in its course. There were no spermatozoa in the ampullae.

This little worm is stated to be practically colourless in life, but rather opaque.

The discovery of the present species is of interest in several ways. Though (like the Tubificidae) occurring in such abundance in the temperate regions of Europe, the Enchytraeidae seem to be very rare in India; the present is the fourth species which has been completely investigated. This rarity is probably partly apparent, partly real; and the same may be said of the Tubificidae also, of which too only four species have been recorded.

A feature that is worthy of note is the presence of sperm-sacs. These are not invariably present in the genus *Enchytraeus*; out of the two other Indian species of the genus they are absent in one (*E. indicus*), present in the other (*E. harurami*). In the present species the sacs are of the same nature as those of *E. harurami*, and differ from those of the Naididae and of the genus *Mesenchytraeus*, the only other Enchytraeid genus in which they are found. In *Mesenchytraeus* and the Naididae the sacs are pocket-like backward extensions of the septum which forms the posterior wall of the testis segment; here they are closed bags, seated on or suspended from the anterior wall of the segment, and containing both testis and developing sperm-morulae. The sacs do not include the funnels of the vasa deferentia; and since they are, in the stages at which I have examined them, completely closed, it is not obvious how the spermatozoa escape (*cf.* remarks on *E. harurami*, in a previous paper: "On a collection of Oligochaeta, mainly from Northern India", *Rec. Ind. Mus.*, vol. x, p. 321, 1914).

Another point of interest is the condition of the salivary glands ("peptonephridia"). In the species in which they occur, they are found usually as narrow curling tubes extending back for a few segments behind the pharynx, from the posterior end of which they take origin. In the present case there are a pair of small club-shaped structures, quite short and inconspicuous, discovered in the series of longitudinal sections, though they would probably have escaped notice during life; these originate from the posterior end of the pharynx, and seem to correspond to the salivary glands of other forms. Similar rudimentary salivary glands appear to have been described by Ude ("Beiträge zur Kenntnis der Enchyträiden und Lumbriciden", *Zeit. f. wiss. Zool.*, vol. 61, 1895) in *Bryodrilus ehlersi*, though I have not seen the original paper.

The above characters, together with the setal distribution, are sufficient to distinguish the form as a new species.

E. barkudensis was found at only one spot in the Chilka Lake, namely in a small patch of sand at one side of the landing-stage on Barkuda Id., in the main area. It lives there, with *Pontodrilus bermudensis* f. *ephippiger*, some inches below the surface and well below water-level. The months in which specimens were obtained were July and November. In the former the specific gravity (corrected) of the water immediately off Barkuda Id. was 1·015, while in November it was 1·005. The species was taken in January at the edge of the Ennur backwater near Madras, also in wet sand and with *P. bermudensis*, the specific gravity of the water being about 1·0025. On all three occasions sexually mature worms were obtained.

Family MEGASCOLECIDAE.

Genus **PONTODRILUS**, E. Perrier.

Pontodrilus bermudensis, Bedd., forma **ephippiger** (Rosa).

1914. *Pontodrilus ephippiger*, Stephenson, *Rec. Ind. Mus.* X, p. 256.

In life this worm has a bright pink colour.

In the Chilka Lake specimens were obtained both in the main area and in the outer channel at all times of the year. They occurred at the extreme margin in wet sand or sand mixed with mud, sometimes under stones with the amphibious Isopoda *Hemiporcellio carinatus* and *Arhina barkulensis*, Collinge,[1] the water being either fresh, brackish or as salt as that of the Bay of Bengal. Probably, however, the species does not breed in fresh water, as no fully mature individuals were found in the fresh-water season (July to September). The chief breeding-time seems to fall in late winter and early spring, when the water of the lake varies in corrected specific gravity from 1·008 to 1·026. At the edge of the Ennur backwater near Madras the same form was found in January, 1915, in sand wetted by water of specific gravity of about 1·0025. Some of the specimens were mature.

The species is very widely distributed on the warmer coasts of both hemispheres. Following Michaelsen (*Mitt. aus dem Naturh. Mus. Hamb.*, xxvii, 1909) I now recognize *P. ephippiger*, Rosa, as one of the numerous forms of *P. bermudensis*, Bedd. The form *ephippiger* is recorded from Christmas I., Celebes, and the Hawaiian Archipelago; the form *insularis* of the same species (formerly *P. insularis*, Rosa) has been found, among other places, in Ceylon.

Family GLOSSOSCOLECIDAE.

Genus **CRIODRILUS** (Hoffmstr.).

Criodrilus lacuum, Hoffmstr.

1914. *Criodrilus lacuum*, Stephenson, *Rec. Ind. Mus.* X, p. 256.

The identification of this worm is, as stated in the above paper, not absolutely certain, since the specimens were not fully mature.

The natural colour of this worm is tinged with a peculiar ochraceous shade.

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[1] *Rec. Ind. Mus.* XI, pp. 145, 147, pls. vi, viii (1915).

The species is apparently common on the shore of the Chilka Lake somewhere near Satpara, where the beach is for the most part sandy. It is dug for bait by fishermen. Specimens obtained from them in March, 1914 were not quite mature. The corrected specific gravity of water from the lake at Satpara was in this month 1·026. In Palestine the worm lives in wet earth under stones at the edge of water.

This is a well-known European species, which occurs throughout Central Europe, in S. Russia, Syria and Palestine. It is interesting to find it in brackish water, since it is a typically limnic form, and so far as I know has not hitherto been recognized as littoral. That it can support a considerable amount of salt is, however, shown by its occurrence on the margin of the Lake of Tiberias, the water of which is markedly saline; and this being the case, it is perhaps remarkable that it has not so far definitely established itself as a littoral form.

EXPLANATION OF PLATE X.

Enchytraeus barkudensis, sp. nov.

Fig. 1. Longitudinal section through pharynx and part of oesophagus, a little to one side of the median plane, and cutting the club-shaped salivary gland; × 145.

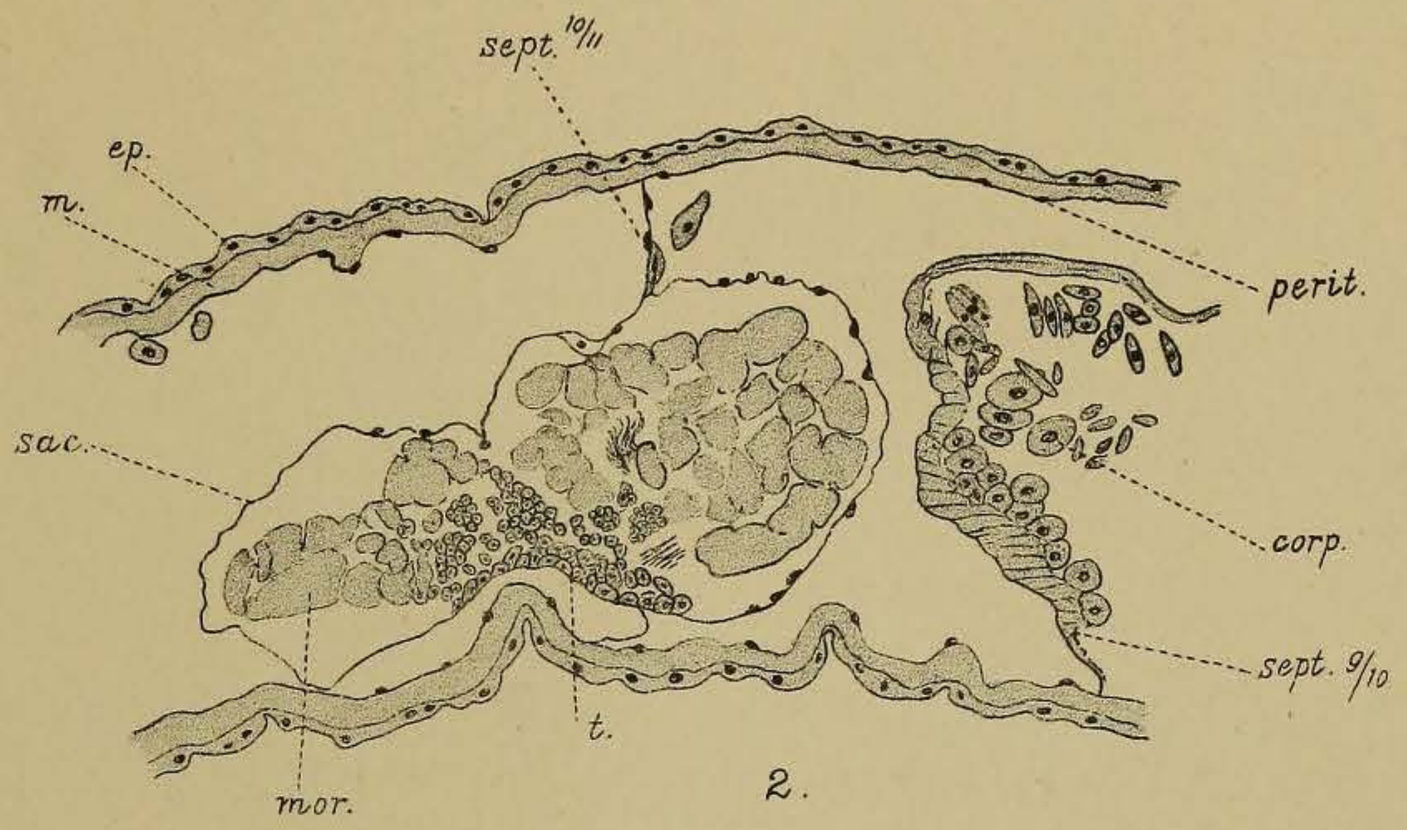
Fig. 2. Longitudinal section passing to one side of the alimentary canal in segments x and xi, and showing the sperm-sac suspended by septum 10/11, the testis being constituted by a proliferation of cells on its inner wall; × 190.

Fig. 3. Ventral half of a similar section, nearer the middle line, showing the relations of the sperm-sac below the oesophagus (the portion of the section here shown is bounded above by the ventral wall of the oesophagus); × 190.

Fig. 4. Male deferrent apparatus, sketched from an entire specimen in cedar oil.

Cil. ep., ciliated epithelium of ventral wall of oesophagus; *d.v.*, dorsal vessel; *ep.*, surface epithelium; *f.*, male funnel; *m.*, muscular coat of body-wall; *mor.*, sperm-morulae; *m. ph.*, muscular bands of the pharynx, mostly retractors; *oes.*, oesophagus; *p.b.*, penial body; *perit.*, peritoneal cells or nuclei; *ph.*, pharynx; *sac.*, sperm-sac; *sal.*, salivary gland (so-called "peptonephridium"); *sept.* 9/10, 10/11, 11/12, septa; *t.*, testis; *v.d.*, vas deferens; *v.v.*, ventral vessel.

FIGS. 1, 2 and 3 drawn by Abbe's drawing apparatus (Zeiss).



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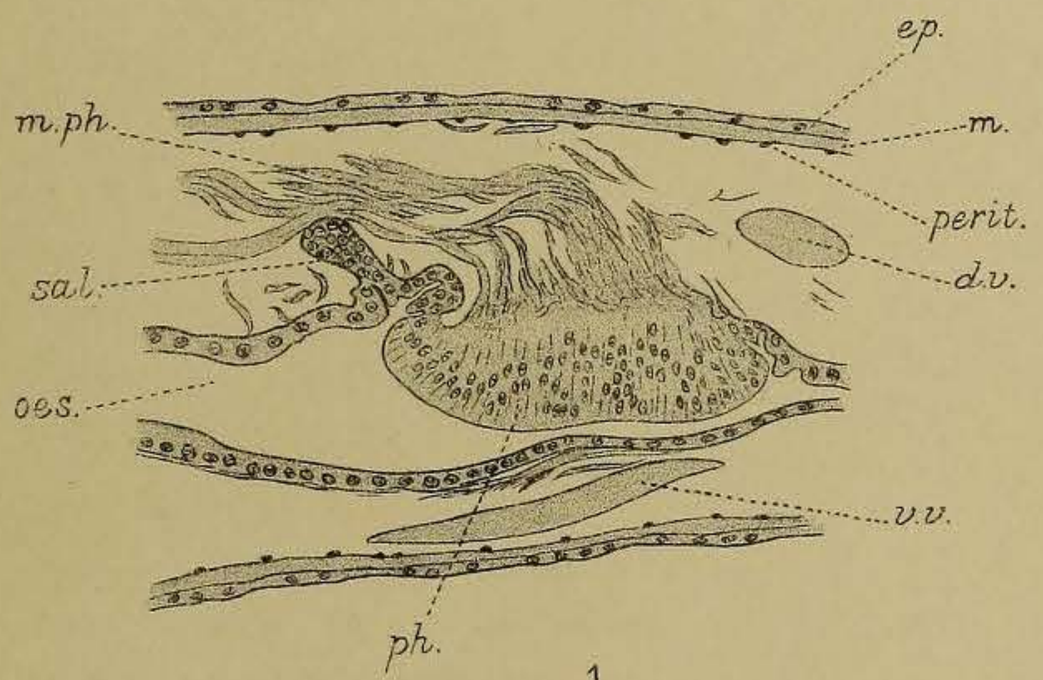

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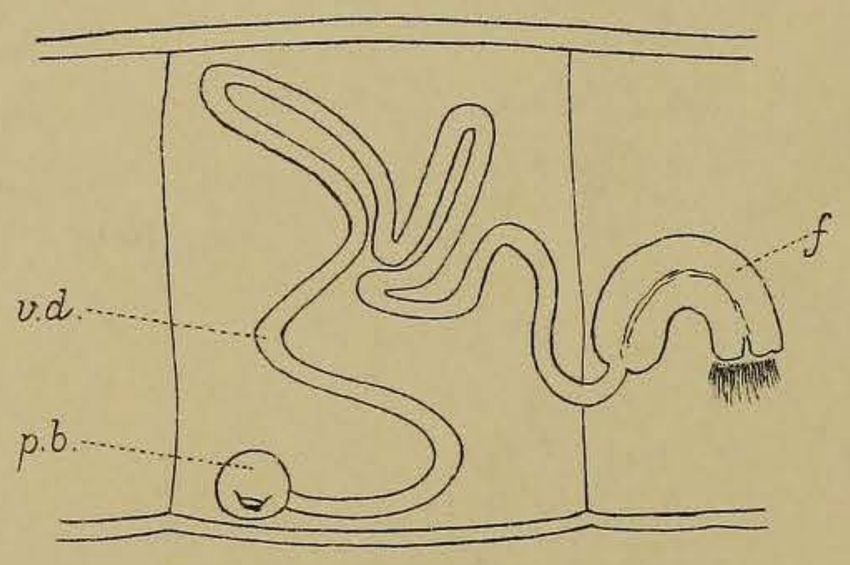

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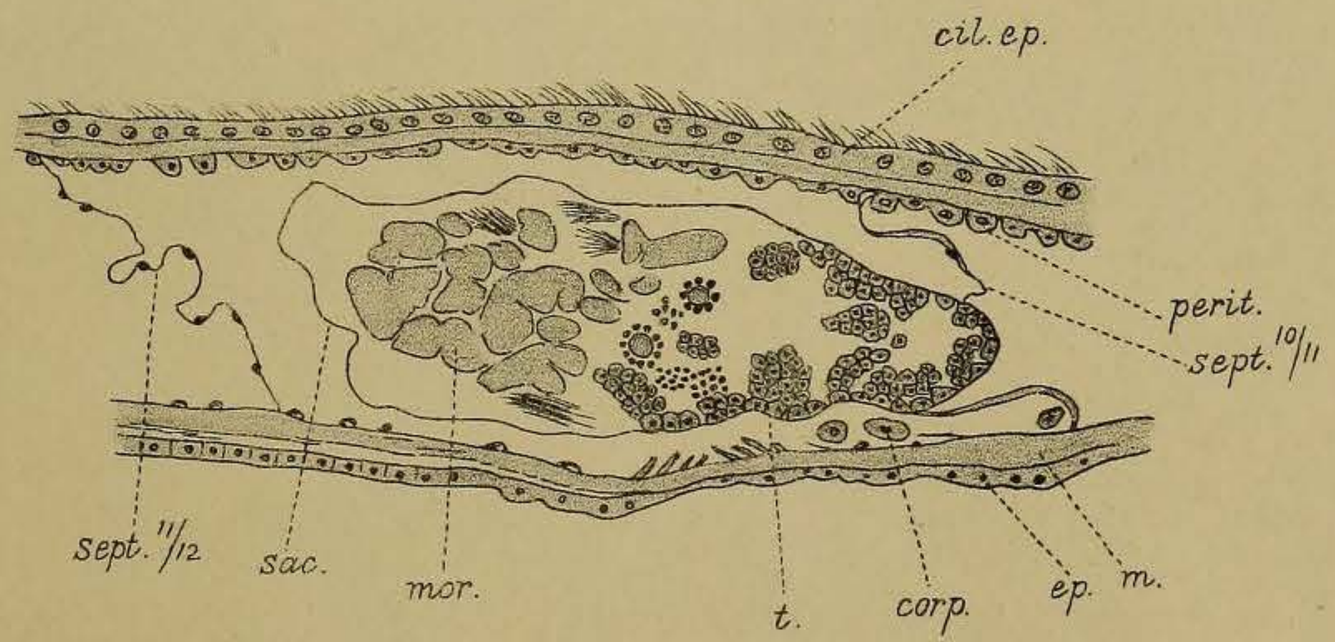

3.

A. Chowdhary, lith.

OLIGOCHAETA OF THE CHILKA LAKE.