

FAUNA OF THE CHILKA LAKE

OLIGOCHAETA.

*(Supplementary Report).*

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(With 1 text-figure).

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OLIGOCHAETA.  
(*Supplementary Report*).

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A number of small worms, which proved to be of the above species, were kindly sent to me for examination a short time ago by Dr. Annandale. The species has hitherto been recorded, so far as I have been able to discover, by only two observers,—Ditlevsen, who found it in Denmark, and Moore, in the United States. The genus to which it belongs, however, has also been found in England, Japan, the Kermadec and Auckland Islands, and the Transvaal (I include the identical or closely allied *Rhizodrilus*), and thus is cosmopolitan. From a zoogeographical point of view therefore the present record is not of much importance. The worm is however interesting, inasmuch as the fusion of the originally paired genital apertures in the middle line has here been followed by the disappearance of the spermatheca of the right side.

**Monopylephorus parvus**, Ditlevsen.

Baikuda I., Chilka Lake, Ganjam Dist., Madras Pres.; among rotting water-weeds at edge of lake (*Annandale and Gravelly*); 15—22-vii-1916. Numerous specimens.

Two short accounts of the anatomy of this worm have already been given (Ditlevsen, 3; Moore, 6). The following description is fairly complete, and adds a number of particulars, more especially with regard to the setae and genital apparatus.

The maximum length of the specimens was half an inch, or about 12 mm., and their thickness about .35 mm. They were whitish or grey in colour (pink during life). The external segmentation was very well marked, the segments being divided by very distinct constrictions, and bulging out between these. The number of segments counted in a good-sized specimen was 64; there were no secondary annulations.

The prostomium is large, prominent, and triangular in shape with rounded tip.

The clitellum embraces about the posterior two-fifths of segment x, and the whole of xi and xii.

The setae are of two forms, single-pointed and double-pointed curved needles (crotchets); both kinds occur in both dorsal and ventral bundles. There are no hair-setae.

The double-pointed needles (fig. 1a) are  $80\mu$  in length,—those of the anterior bundles perhaps a trifle longer; in thickness they are about  $3\mu$ . The nodule is somewhat distal to the middle of the shaft. The prongs are equal in length, or the outer may sometimes seem to be slightly the longer, and both are comparatively short; anteriorly, the rule is that the prongs are nearly equal in thickness, but the

relation varies, so that in some cases the outer prong is only two-thirds as thick as the inner, while towards the posterior end it may be only half as stout.

The single-pointed needles (fig. 1b) are about  $70\mu$  or a little more in length, and  $3\mu$  in thickness. They have the usual double curve, the distal curve however being more marked than the proximal. They end in a single sharp point; and the nodulus is slightly distal to the middle of the shaft.

A certain number of double-pointed setae are found in which the outer prong is small. Thus they present an intermediate character; and the single-pointed setae may be conceived as originating from the double-pointed by the diminution and ultimate loss of the outer prong.

The ventral setae begin in segment ii, and are absent in xi. They are usually three per bundle throughout the body, including the hinder end, but in the anterior segments four and five are met with. The bundles are composed of only double-pointed setae throughout the anterior half of the body; single-pointed setae are found behind the middle, and at first only occasionally; they are

commoner at the hinder end, but even there are outnumbered by the double-pointed.

The dorsal setae begin in segment ii; the number per bundle is here also three, four, or five;—three in one or two of the most anterior segments, then four or five as far as the clitellum, and thenceforward three or four,—more usually three, at any rate in the hinder part of the body. In the most anterior segments only double-pointed setae are found; these soon begin to be replaced by the single-pointed, and the change is completed shortly behind the clitellum, or, in another specimen, by about the middle of the body. The dorsal thus differ from the ventral bundles in the much greater proportion of the single-pointed setae.

The alimentary tube is but little differentiated into distinct regions. Chlorogen cells begin in segment vi, and thereafter the characters of the canal remain much the same throughout the body. The pharynx is remarkable for the height of the epithelium on the roof; an area of columnar cells, with an abrupt margin, forms a plate-like or sucker-like projection into the cavity, and exactly resembles the structure called the "pharynx" in the Enchytraeidae. The "pharyngeal gland cells" are arranged in four cords which are applied dorsally and dorso-laterally to the pharynx, as described and figured for *M. limosus* by Nomura (7). Numerous similar cells are found on the body-wall, where they form considerable masses at the level of the hinder part of these cords, as well as for some distance behind this, as far as segment vi; a number are also seen on each side of the ventral nerve cord in the oesophageal region.

The body-cavity corpuscles have the characters described by Moore (6); a fairly large one is  $10\mu$  in diameter.

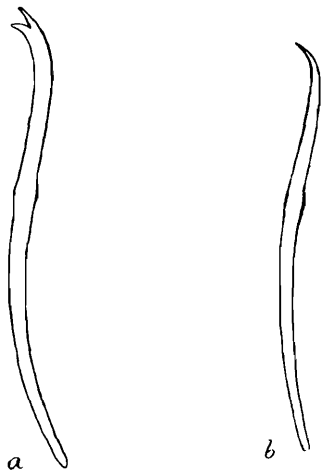


FIG. 1.—*Monopylephorus parvus*, Ditlevsen.

- a. Double-pointed seta from an anterior dorsal bundle.  $\times 760$   
 b. Single-pointed seta from a ventral bundle behind the middle.  $\times 760$ .

The dorsal vessel is ventro-laterally or laterally situated, on the left side of the alimentary tube, throughout the greater part of the body; it appears in a mount of the whole animal as a series of loops, the bend of each loop being at about the level of the lateral line of the body and the rest of the vessel below this level; it becomes altogether lateral in position about segment vii, and is only really dorsal at the anterior end of the body. Supra- and subintestinal vessels are absent. The parietal plexus is situated amongst the muscular fibres of the body-wall, well beneath the peritoneal layer. The valves in the larger vessels have been described in related species by previous authors (Goodrich, 4; Nomura, 7).

The Enchytraeid character of the nephridia in this genus is well known. The remarkable length of the upper lip of the funnel is not to be made out in preserved material.

The anterior lobes of the cerebral ganglion project forwards for some distance,—about 30%—in front of the main mass; there are practically no posterior projections.

The testes are situated in segment x, along with the cup-shaped funnels and a quantity of sperm-morulae. The vas deferens is at first, immediately behind the septum, 25 $\mu$  in diameter, and without any covering of high peritoneal cells; but this uncovered portion is of very small extent, —scarcely even as long as the width of the tube.

The second portion of the duct, or the part which is covered with elongated peritoneal cells, passes backwards for some distance ventrally in the segment, and then rises towards the dorsal body-wall. The investment of high cells ceases just before the tube reaches the highest point of its course. In this part of its extent the canal with its investment has a diameter of 90 to 120 $\mu$  by 50 $\mu$ ; the central tube is about 35 $\mu$  thick, the peritoneal covering accounting for the remainder. The cells composing the wall of the tube are columnar, about twice as high as broad, and furnished with long cilia; the peritoneal cells are apparently only one layer thick, and very much elongated,—sometimes as much as 40 $\mu$  in length; where they appear to be more than one layer thick the section is probably oblique; their cytoplasm stains darkly and equably, and the nucleus is at about half the height of the cell.

The third portion of its course, which is free from the tall peritoneal investment, comprises the summit of the curve and the downward course of the canal until it joins the atrial chamber. Its total length is about 100 $\mu$ , and its diameter at first 35 to 40 $\mu$ , but it becomes narrower before joining the atrial chamber, measuring at its end 23 $\mu$ ; from the bend downwards it is heavily ciliated.

The atrial chamber is of an elongated pear-shape, the narrower end below; the lower ends of both converge to unite in the middle line, and forming there a narrow tube, discharge, as described by Moore, on the summit of a low papilla on the roof of the spermiducal chamber; the union of the atrial chambers takes place below the ventral nerve cord and ventral vessel. Each atrial chamber is 145 $\mu$  long and 70 $\mu$  in diameter at its thickest part; its upper end is at about half the height of the segment; it is lined by a very high non-ciliated columnar epithelial layer, so that the clear lumen in the middle is not more than about 20 $\mu$  across. There are well-marked circu-

lar (inner) and longitudinal (outer) muscular investing layers; and the covering of peritoneal cells cannot be described as either tall or flat.

The spermiducal chamber is a median depression on the ventral surface, squarish in shape as seen in a transverse section of the animal, its depth and width about  $40\mu$ . It is lined by cubical epithelium.

A single sperm-sac, an anterior evagination of septum 9/10, is situated in segment ix; and a posterior sperm-sac, also single, extends backwards through several segments from septum 10/11.

The ovary and ovisac have the usual positions; but I did not see any trace of oviduct or ovarian funnel.

The spermatheca is single, in segment x. Its external opening is in the middle line in furrow 9/10; but the organ belongs to the left side. It lies near the ventral body-wall, and takes up nearly the whole of the segment in an antero-posterior direction. It may be described as a somewhat twisted cylinder, whose diameter reaches  $80\mu$ , narrowing towards the external aperture to form a short duct which bends downwards. The spermatozoa, which form an amorphous mass, not spermatophores, are contained in the most posterior (ental) part of the chamber. Here the epithelial lining is cubical; the middle portion of the organ, much larger than the former, but not separated from it by any distinct constriction, is lined by a columnar epithelium with the nuclei basal; the duct has a lining of approximately cubical cells.

*Remarks.* I subjoin a comparison of certain features of this worm with the specimens described under the above name by Ditlevsen and Moore.

Ditlevsen gives no indication of the habitat of his worm. Moore's was a littoral form; "it appears to prefer more gravelly shores and the neighbourhood of beach grass, among the roots of which it may be found. In a few cases larger numbers were found living gregariously between stones at half-tide on the south shore of Naushton." The related species *M. glaber* (Moore, 6) flourishes best in brackish water; enormous numbers were found where the saltness of the water was just barely perceptible to the taste. Dr. Annandale informs me that the salinity where the present specimens were found was certainly low, but the water was distinctly brackish. At the same place on the same date in 1914 the specific gravity was 1.0145 (corrected).

The segments in the specimens here described were not, as in Moore's worm, quadriannulate.

The differences in the setae are more important. According to Ditlevsen, while the hinder dorsal bundles contain single-pointed setae, all the ventral setae are bifid. Moore finds the tips "curiously variable," and single-pointed tips seem to have been very much the exception ("in some the tips are deeply bifid and the points long and acute; others, especially in the posterior dorsal bundles, have the upper or distal point more or less reduced, and still others have a more apical notch or are apparently entire"). In the present specimens all the dorsal setae behind the middle of the body, and some in front of this, are single-pointed, while single-pointed setae are not uncommon in the posterior ventral bundles also; intermediate forms are comparatively rare.

The abnormal position of the dorsal vessel is not mentioned by either author; it is shown lying against the side of the intestine in Moore's figure. It is said to be on the *right side* in *M. limosus* by Nomura (7).

Ditlevsen implies, and his figure shows, that the two male ducts do not unite before entering the spermiducal chamber; nor is there any reference to the widening to the duct which I have called the atrial chamber; this latter, however, is visible in the figure.

There can, I think, be little doubt that Moore's specimens are specifically identical with those here described; but I am inclined to agree with him that further information may necessitate a separation between Ditlevsen's worm and his own. As to the generic name that should be employed; Benham (1, 2), uniting *Rhizodrilus* and *Monopylephorus*, uses the former; Michaelsen (5), while accepting the union, prefers the name *Monopylephorus*; Nomura (7) gives reasons for retaining the two genera as distinct. A revision of all the forms described under these two names is, as Michaelsen says (*loc. cit.*), required, along with that of related genera; for the present the most convenient course seems to be to retain the name under which the worm has already twice been described.

A thorough revision would also probably indicate the homologies of the various parts of the male efferent apparatus with the successive segments of the tube in other genera. At present there is an extraordinary amount of confusion: Ditlevsen calls the whole tube, from the funnel to its termination in the median pit on the ventral surface, "Samenleiter" (=vas deferens); the pit itself, following Goodrich, he names "spermiducal chamber" (using the English words). Moore uses the term "sperm reservoir" for the portion of the duct which is covered by high peritoneal cells, "ejaculatory duct" for the short succeeding portion, and "median bursa" for the pit on the surface; the term "penis sac" is employed for the dilatation which I have called "atrial chamber." There is, however, no such dilatation of the "sperm reservoir" as would lead one to suppose that it is capable of acting as such, nor did I find spermatozoa in this portion of the duct; while the epithelium of the "penis sac" is so high that the passage would be altogether obliterated by the eversion or even by any considerable protrusion of the terminal portion of the apparatus; the utmost that could happen, apparently, would be some slight protrusion of the papilla on the roof of the "median bursa," sufficient, perhaps, to bring this level with the surface of the body. Nomura, in describing *M. limosus*, uses the term "atrium" for the portion of the duct which is covered by high peritoneal cells, "atrial duct" for the short portion which succeeds, and "lateral horn of the spermiducal chamber" for what I have called the "atrial chamber." Michaelsen, in *M. africanus*, includes under the term "atrium" the atrial duct of Nomura; in this species there is apparently no separate "atrial chamber," the upper part of the deep "Kopulationstasche" (spermiducal chamber, median bursa) representing the united atrial chambers of such forms as *M. parvus*, *glaber*, *limosus*, etc.; but on other grounds (spermathecae in segment ix, presence of penial setae) it seems probable that *M. africanus* ought to be considered as belonging to another genus. Most authors seem to confine the term

“vas deferens” to that part of the duct in front of the covering of high peritoneal cells; in the present case the “vas deferens” would be almost, and in *Rhizodrilus kermadecensis* (Benham, 2), where the covering begins immediately behind the funnel, it would be altogether absent. Merely from a consideration of the present form, it would seem pretty obvious that the whole duct from funnel to atrial chamber corresponds to the “vas deferens” in the Tubificidae and Naididae generally; but, as I have said, comparative studies are necessary to settle the terminology. I hope the terms I have employed are sufficiently non-committal to obviate any further confusion.

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