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XX.—*Preliminary Account of Aspidodrilus, a remarkable Epizoic Oligochaete.* By H. A. BAYLIS, B.A.

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ELEVEN specimens of a very remarkable little worm, collected in Sierra Leone by Major H. Kelsall, R.A., were recently presented to the British Museum by the Imperial Bureau of Entomology.

According to Major Kelsall's account, they were found living as "external parasites" on a large earthworm common in the district. In the absence of specimens of the host it is impossible to state at present to what genus it belongs; but as the "parasite" is of considerable interest, it is proposed to give a brief account of it, leaving a more complete study of it until further well-preserved material is available.

Major Kelsall's account, as given in a letter to the Bureau of Entomology, is interesting, and I quote the following passage from it:—

"The worm [*i. e.* the host] is terrestrial, and about 12 or 13 inches long, in general appearance very like the ordinary large earthworms of this country [*sc.* Great Britain]. Many that I noticed were infested with the small whitish parasites (or what appeared to be parasites). I usually found the worms crawling on the roads or paths, and the parasites

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were plainly visible, being, as far as I recollect, 2 to $2\frac{1}{2}$ mm. in length, flattish in shape, and moving about on the slimy surface of the worm.

"The worms, when irritated by touching with a stick, used to squirt out a clear liquid from a number of pores, as far as I recollect, arranged in transverse rings about half an inch apart. The liquid was squirted to a distance of a couple of inches, and the natives disliked touching [the worms], believing them, I think, to be poisonous."

Aspidodrilus kelsalli, gen. et sp. n.

The worms are found at various stages of growth, and are not all alike as regards sexual maturity.

The largest specimens measure about 5 mm. in length, and have a maximum width of about 1.40 mm. Small individuals, showing no signs as yet of genital organs, measure only 2 mm. in length.

In shape they are somewhat flattened dorso-ventrally—less so in the anterior half of the body than posteriorly. At first sight it was impossible to avoid the impression that they were some peculiar kind of Trematode, showing not a little resemblance to forms such as *Aspidogaster*. On further study, however, it soon became clear that they must be referred to the Chætopoda.

The anterior half of the body is nearly cylindrical, tapering in front, and shows distinct segmentation. The inter-segmental grooves, however, are only faintly marked on the dorsal surface, and scarcely visible at all on the ventral surface. It was only when a specimen was stained, cleared, and mounted, that positive evidence of segmentation was found, in the shape of delicate septa and segmentally arranged internal organs.

There is a small prostomium, which forms the dorsal lip of the mouth, as in a typical earthworm, and this is succeeded by ten segments in front of the clitellum. Each of these ten segments bears ventrally, towards either side, a pair of simple, short, pointed chætæ, directed backwards, and having their inner ends embedded in special sacs, with muscles attached to the body-wall.

Behind the tenth segment there is a distinct band of thickened glandular skin, containing large clear cells, and extending across the dorsal surface and on to the sides of the body. There can be little doubt that this represents a clitellum; it appears to occupy only one segment.

Opposite this glandular patch, on the ventral surface, there is a large, nearly circular, sucker-like organ, having a diameter of 0.55 mm. in a transverse direction, but slightly less than this antero-posteriorly. This sucker is composed of muscular tissue, the muscles running partly vertically, and partly concentrically and parallel with the circular edge. At the sides of this organ, and somewhat behind its transverse diameter, there open a pair of ducts surrounded by thick muscular tissue: these are, I believe, the male ducts, and may be capable of evagination, though they have not been seen in an extruded condition.

Immediately behind the sucker the body becomes much flattened, and at the same time expanded laterally, so as to form a large, oblong, or somewhat oval disc, in length equal to half that of the whole animal. This disc, or "shield," is bordered by a delicate frilled membrane, which takes its origin beneath the posterior and lateral projecting parts of the sucker, and extends round on either side to the anus, which is placed at the posterior end of the "shield."

The hinder part of the intestine can be seen running down the middle line of the shield, even in a specimen which has not been artificially cleared.

On either side of the shield, on the ventral surface, there is a series of transverse rows of simple chætæ, each chæta being embedded in its own sac with special muscles. Presumably, though this has not yet been definitely ascertained, each row corresponds to a segment. In an adult specimen the anterior rows are about 0.12 mm. apart, but the distance between each row and the succeeding one diminishes gradually on passing backwards, the rows nearest to the anus being very closely crowded together. Conversely, the number of chætæ in the rows steadily increases from before backwards. Thus, in a mature example, which had about 37 rows on either side, there were four bristles in the first row, five in the second, and so on up to twenty or more in the last six fully-formed rows.

The first row on either side, situated immediately behind and to the side of the sucker, seems invariably to contain four bristles, which are directed backwards, while the succeeding rows have their bristles more or less inclined forwards—very markedly so in the most posterior rows.

All this armature, consisting of sucker, frilled disc, and chætæ, serves doubtless as a very efficient means of attachment to, or locomotion on, the slimy surface of the earthworm.

Internal Anatomy.

I will not attempt to give here a complete account of the internal organs, as the study of sections of thoroughly well-preserved material may clear up some points which at present

Fig. 1.

Aspidodrilus kelsalli. Dorsal view of a mature individual, as seen by reflected light. Magnified about 22 diameters.

An., anus; *Cl.*, clitellum; *Prs.*, prostomium.

could only be stated in a tentative manner. It may be said, however, that in most respects the animal shows a remarkable resemblance in its structure to an earthworm. The

mouth, placed rather on the ventral surface, is bounded dorsally by the prostomium, and ventrally and laterally by

Fig. 2.

Aspidodrilus kelsulli. Ventral view of another specimen, at a similar magnification.

An., anus; *Ch.*, rows of chaetae on "shield"; *Int.*, intestine (seen by partial transparency); *M*, mouth; *N*, ventral nerve-cord; *Sh.*, frilled margin of "shield"; *Su.*, sucker.

the first true segment or peristomium, which, however, does not appear to be separated by a definite septum from the

prostomium. There is a large pharynx with very muscular roof, and large muscles extending from it, mainly backwards, to the body-wall. Behind this there is a rather narrow œsophagus extending from the third to the fifth segment, while the sixth segment contains a lobed and saccular diverticulum of the œsophagus, lined with cilia, which is very probably the homologue of the calciferous glands of earthworms. Behind this the intestine becomes large and voluminous, and its contents appear to consist chiefly of earth and vegetable debris, suggesting that the animal is not in any sense a true parasite, but rather a commensal, of the earthworm "host," and that it avails itself of the latter as a means of transport to favourable feeding-grounds. The digestive portion of the intestine is covered externally with large flask-shaped cells, the expanded portion of which projects into the cœlom. These, perhaps, represent the chloragogen-cells of other oligochaetes.

The intestine runs directly to the anus, becoming narrow as it passes backwards. It shows a constriction at the point where it perforates each septum, and a slight expansion in each segment.

A pair of nephridia have been seen in each segment from the sixth to the ninth, and in some of the segments which compose the caudal "shield," but neither the occurrence nor the structure of the nephridia has been worked out in detail.

Large lobed sperm-sacs, containing clumps of sperm-mother cells similar to those of earthworms, and sperm in various stages of formation, are found arranged more or less symmetrically in segments viii.-x., and in the tenth segment they contain a pair of large ciliated funnels, connected, apparently, by long and much convoluted ducts with the apertures already mentioned at the sides of the ventral sucker.

The ovaries are very peculiar, and need further study. There appear to be on either side, in segments ix.-x., four small rounded clumps of ovarian cells, as well as large masses which appear to be ova with a very abundant supply of yolk. These eggs are very large in proportion to the size of the animal, and seem to be developed, one or two at a time, from the ovarian clumps, which are apparently floating freely in the cœlom. How the ova escape when ready for laying is at present unknown, no trace of female ducts having yet been found.

At the sides of the third segment there are a pair of openings with thickened fleshy lips, which lead into what appear to be the spermathecae. These are a pair of tubes

with thick muscular walls, containing spermatozoa in the lumen; after running inwards till they nearly meet in the middle line, the two organs turn backwards and outwards, and end in blind expansions just in front of the "calciferous glands."

Just in front of and behind the distal branch of the spermathecæ are two large crescentic organs of peculiar histological structure, lying across the body-cavity from side to side, dorsal to the œsophagus. Their nature is as yet mysterious, and it can only be said that they seem to receive an abundant nerve-supply from the visceral system, represented by a pair of ganglia lying just at the hinder and outer angles of the pharynx.

The nervous system, on the whole, is similar to that of any annelid, the cerebral ganglia being situated in the first segment, and connected by circum-pharyngeal connectives with a double nerve-cord which lies along the ventral side of the body, close to the body-wall, and is interrupted by a pair of ganglia in every segment.

The blood-vascular system has not yet been worked out, but some portions of branches of what would seem to be a subneural vessel have been detected near the head end of the worm.

The following is a brief generic diagnosis :—

ASPIDODRILUS, gen. nov.

Small *Oligochæta*, having the posterior half of the body flattened and expanded into an oval disc bearing numerous transverse rows of chætæ ventrally. Anterior segments each bearing two pairs of short, straight chætæ. Clitellum occupies segment xi. ; on the ventral side of that segment there is a muscular sucker, at the edges of which are the openings of a pair of sperm-ducts.

Ovaries, four pairs, situated in ix.—x., lying free in cœlom ; ova large, with much yolk.

Spermathecæ open in iii. Sperm-sacs in viii.—x., with large sperm-funnels in x. ; sperm-ducts long and coiled.

Species, *A. kelsalli*, sp. n.

With the characters of the genus.

Length 5 mm.

Living attached to the exterior of a large earthworm.

Hab. Sierra Leone, West Africa.

Type specimens in the British Museum (Natural History).