

On a New Species of Littoral Oligochæta (*Pontodrilus matsushimensis*).

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With Plate II.

During a short excursion to Matsushima Bay, Province of Rikuzen, last August I collected, among other annelids, an oligochæte referable to the genus *Pontodrilus*, of which only five species* have been recorded from other parts of the world, but as yet none from our coasts. As the species in question presents some remarkable points of difference from any of the known members of the genus, I think it worth while to publish its description.

It is found burrowing in sand, under the half decayed leaves of *Zostera marina*, along the shores of Matsushima Bay, from low tide mark to a certain distance farther up, beyond, as it seems to me, high tide mark. There is no indication of its presence on the surface of the sand, so that it can only be obtained by indiscriminate digging. I myself have obtained only a few specimens, but Mr. B. ONODERA of Shiwogama, a small town on the western side of the bay, has been able to send me a large number of them living in kind compliance with my request.

Most of the specimens before me are sexually mature.

* (1) *Pontodrilus littoralis*, Grube from the shores of the Mediterranean. (2) *P. bermudensis*, Beddard from Brazil, Bermuda, and Jamaica. (3) *P. hesperidum*, Beddard from Jamaica. (4) *P. insularis*, Rossi from the Aru Islands. (5) *P. phosphoreus* Dugès from North France.

A. Characters of the adult animal.

In the living state, the annelid in question is of a white color with a light pinkish tint; a single dorsal blood vessel is seen through the more or less transparent wall of the body, as a bright red line running antero-posteriorly and giving off lateral branches.

The body (fig. 1) is long and slender, measuring 90-110 mm. in length, by 3-3.5 mm. in breadth. The number of segments varies from 100 to 105 according to individuals. The breadth of the body increases from the first to about the sixth segment, and then remain nearly the same until the seventeenth. The eighteenth segment has a pair of pad-like longitudinal ridges, on which account it is wider than any other segment. From the next succeeding segment (19th) the body tapers gradually towards the last, or anal, segment.

The *præstomium* (fig. 2, pr.) is present, but small, being separated from the first segment or the *peristomium* (fig. 2, per.) by two curved grooves, which converge posteriorly.

The *clitellum* (fig. 2, cl.) is well developed all around the body, occupying segments XII-XVII.

A pair of pad-like longitudinal ridges (figs. 1 & 3, p.) is developed on the ventral side of the eighteenth segment. They hang out on each side somewhat like the pads of a saddle. Its free edge is bent inwards, *i.e.* mediad, so as to overhang the male pores which open on that segment. The genital papilla (figs. 1 & 3, g.p.) occupies the ventral median portion of segments XIX and XX, both of which contribute to its formation. It is elliptical in outline, with the major axis disposed transversely and has a central depression.

The *setæ* are short and simple, arranged in eight series longitudinally, or in four pairs in each segment. The two *setæ* composing each ventral pair are nearer each other than those of the dorsal pair. From segment XXI posteriorly, each seta is furnished at its side with a shorter accessory one. No penial *setæ* are found in the neighborhood of the genital apertures.

The dorsal pores are absent.

The dorsal longitudinal blood vessel is single, giving off numerous lateral branches, or ventro-dorsal commissures. The two pairs of the latter, situated in segments XII and XIII are dilated (hearts), and are very conspicuous. A subneural blood-vessel does not exist in the present species.

The septa between the segments V–XIII are much thickened.

In the alimentary tract the calciferous glands are absent. The gizzard is but very feebly developed. The intestine begins in the fourteenth segment.

The *nephridia* are paired and commence in segment XIII. Their pores open in front of the outer of the ventral pair of setæ, and their funnels lie in the segment preceding that which contains the main mass of the organ. In segment XIV, the nephridia serve as oviducts.

The *spermathecæ* (fig. 4, sp.) occur in two pairs, in segments VIII and IX. Each spermatheca has a diverticulum in the same segment.

The *spermathecal pores* (fig. 1, sp.p.) are situated between segments VII/VIII and VIII/IX. They lie in front of and outside the outer of the ventral pair of setæ, surrounded by a conspicuous elevation of the body surface, so that they may easily be recognized at a glance. The elevations just mentioned as well as the two pads in segment XVIII, and also the genital papilla, are not well developed and therefore difficult to find in young specimens of 40 mm. or so in length.

The *ovaries* (fig. 4, o.), present in one pair, lie in segment XIII, and are connected with the peritoneal epithelium on the posterior side of the septum between segments XII and XIII. The ova are of various sizes but even the largest are furnished with little yolk, and they are never of considerable size. I have also observed some detached eggs in the cavity of segment XIII.

The *oviducal pores* (fig. 1, od.p.) open on segment XIV, in front and a little outside, of the inner of the ventral pair of setæ. The funnels of the oviducts are situated in segment XIII.

The *testes* (fig. 4, t.) are present in two pairs, in segments X and XI.

The *sperm-sacs* (fig. 4, sp.s.) likewise in two pairs, are racemose and lie in segments XI and XII. The spermatozoa are in various stages of development. Almost fully developed spermatozoa have also been observed in the body cavity.

The funnels (fig. 4, f.) of the spermducts are, as usual, provided with long cilia and lie in two pairs in segments X and XI. The *vas deferens* (fig. 5, v.d.) runs posteriorly, on each side as far as segment XVIII, where it enters the mass of the *spermiducal gland* (fig. 5, sp. gl. g.) in the neighborhood of the junction of the glandular and muscular portions of the latter, eventually to open into the lumen of the gland (figs. 5 & 6, sp. gl. c.)

There is only one pair of spermiducal glands. They belong to the tubular type (figs. 4 & 5) and occupy segments XVII-XIX, being much convoluted. Each gland consists, as already mentioned, of a glandular and a muscular portion, the latter leading to the exterior. At first, on dissecting the worm, it appeared to me as if the vas deferens opened at the junction of the two portions of the gland; but a close examination of serial sections has shown that this is not the case. The vas deferens is continued without interruption after joining the gland, and runs in the midst of the glandular cells towards the posterior blind end of the gland, tracing in general, the convolutions of the latter. It is at this end that the vas deferens really opens into the lumen of the gland. In other words the spermiducal gland is not a blind diverticulum but a direct continuation of the course, of the vas deferens. The glandular portion passes at the anterior end into the strongly muscular portion. The latter gradually tapers towards, and finally opens externally at, the male pore inside the pad-like ridge on segment XVIII.

The wall of the vas deferens is composed of a single layer of distinctly nucleated cells, and its inner surface is provided with long cilia (fig. 6, c. and w.v.d.) The glandular portion of the spermiducal gland consists of two distinct layers, the inner columnar epithelial layer, and

the outer thicker layer of more granular pear-shaped cells. The lumen is not ciliated. The part of the vas deferens enclosed in the spermiducal gland traverses the outer layer of the wall, so that in sections of the gland there appear two cavities, one that of the spermiducal gland and the other that of the vas deferens.

The ciliated epithelial wall of the vas deferens passes rather abruptly into the inner wall of the gland (fig. 6)

B. Systematic position of the new species.

From the above description, it is evident that this annelid belongs to the family Cryptodrilidæ, as defined by F. E. BEDDARD in his "Monograph of the Order of Oligochæta." The generic determination however offers some difficulty. The genus to which the present annelid comes very closely in several respects is undoubtedly *Pontodrilus*,* to which I refer it after all. But the one, by no means unimportant discrepancy consists in the fact that that genus has the "vasa deferentia opening at the junction of the glandular and muscular parts," whereas in the present species, the vas deferens distinctly opens into one end of the glandular portion of the spermiducal gland, the other end leading to the male pore,—a condition which obtains in the genera *Moniligaster* and *Ilyodrilus*, which however belong to families quite distinct from *Cryptodrilidæ*. In all other points the present species tallies well with the definition of *Pontodrilus* as given by BEDDARD. As the exact relation of the vas deferens and the spermiducal gland in *Pontodrilus* has probably never been subjected to careful examination by means of serial sections, the existing statement concerning it may be considered as open

* BEDDARD's definition of *Pontodrilus* :—

"Slender worms with eight setæ per segment, in pairs, the setæ of the dorsal pair being usually further apart than those of the ventral. No dorsal pores. Clitellum complete XIII–XVII. Male pores XVIII. Spermiducal gland tubular, vasa deferentia opening at junction of glandular and muscular parts. No penial setæ. Spermathecæ in VIII, IX, with single diverticulum. Gizzard absent or rudimentary; no calciferous glands. Nephridia commence in segment XIII or XV. No subnervian blood-vessel."

to doubt. I hold it highly probable that should known species of *Pontodrilus* be subjected to renewed investigations, the same condition as ascertained by me in the Japanese species will be revealed. With this belief I have preferred to refer my specimens to *Pontodrilus* rather than to create a new genus for its reception.

The species is certainly an undescribed one, so that I propose to call it *Pontodrilus matsushimensis*.

In conclusion I wish to offer my thanks to Prof. IJIMA for his kind supervision of my work.

November 23rd, 1897.

EXPLANATION OF PLATE II.

c.	Ciliation in vas deferens.
cl.	Clitellum.
f.	Spermduct funnels.
g.p.	Genital papilla.
m.	Male pore.
n.	Nuclei of the wall of vas deferens.
o.	Ovary.
od.	Oviduct.
od.p.	Oviducal pores.
op.	Opening of vas deferens into the spermiducal gland.
p.	Pad-like ridges.
per.	Peristomium.
pr.	Præstomium.
sp.	Spermathecæ.
sp.gl.	Spermiducal gland.
sp.gl.c.	Cavity of the glandular part of spermiducal gland.
sp.gl.g.	Glandular part of the spermiducal gland.
sp.gl.m.	Muscular part of the same.
sp.p.	Spermathecal pores.
sp.s.	Spermsacs.
t.	Testes.
v.d.	Vas deferens.
w.v.d.	Wall of vas deferens.

Fig. 1. Ventral view of *Pontodrilus matsushimensis*, nov. sp. 2/1.

Fig. 2. Dorsal view of the anterior end. $a_1 \times 1$ Zeiss.

Fig. 3. Ventro-lateral view of the region succeeding the clitellum, showing the pad-like ridges and the genital papilla. $a_1 \times 1$ Zeiss.

Fig. 4. Diagram showing the positions of sexual organs.

Fig. 5. The left spermiducal gland seen from the left side, reconstructed from serial sections. 50/1.

Fig. 6. A section of a spermiducal gland showing the opening of vas deferens into the cavity of the glandular part of the spermiducal gland. $\frac{1}{12}$ hom. $\times 2$ Zeiss.



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