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THE ENTEROPNEUSTA OF FUNAFUTI.

PART I.

BY JAS. P. HILL,

*Demonstrator of Biology in the University of Sydney.*

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[IX.]

THE ENTEROPNEUSTA.

PART. I.

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[Plate IX.]

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THE Collection of Enteropneusta brought by Mr. Charles Hedley from Funafuti, and which I have had the privilege of examining through the kindness of Mr. R. Etheridge, Junr., Curator of the Museum, comprises two distinct and widely separated species belonging to the genus *Ptychodera*.

One of these species is identical with a species found by Dr. Arthur Willey at three distinct localities in the New Caledonian Archipelago, and of which he has already communicated an account to the "Quarterly Journal of Microscopical Science."\* Dr. Willey has most kindly sent me his collection for comparison with that made by Mr. Hedley, together with an account of his observations. I am thus enabled to speak definitely on the identity of these two forms. Willey has referred the species concerned provisionally to *Ptychodera flava*, Eschscholtz,† recorded from the Romanzoff Group of the Marshall Archipelago in 1825, and has suggested that until the Marshall Islands' form is re-examined it might be advisable to call the New Caledonian form *P. flava caledonica*, or simply *P. caledonica*. Now, however, that the same form has been found to occur at such a distinct and widely separated, but intermediate locality as Funafuti, Willey proposes (*in litt.*) to drop the name *caledonica*, and to regard the species, provisionally at least, as *P. flava*, Eschsch., in the amended sense.

The specimens of this species obtained by Mr. Hedley do not exceed 3 inches in length. Willey gives  $2\frac{1}{2}$  inches as the maximum length of unextended specimens obtained at the islet of Amédée, close to Noumea, while specimens found by him later at

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\* In the press.

† J. W. Spengel—Die Enteropneusten des Golfes von Neapel, etc. Fauna u. Flora des Golfes von Neapel, 1893. pp. 190-1, fig. P.

Lifu, in the Loyalty Islands, were much larger, extending to 7 or 8 inches in length, (*in litt.*).

The other species in the Funafuti collection is new to science. I propose to associate it with the name of Mr. Hedley.

FAMILY PTYCHODERIDÆ.

PTYCHODERA, *Spengel.*

PTYCHODERA HEDLEYI, sp. nov.

DESCRIPTION.

*Mode of Occurrence and External Characters.*—Mr. Hedley has supplied me with the following field notes: "The centre of the principal islet of Funafuti Atoll is occupied by a large bare flat, surrounded by a hedge of *Rhizophora*—this locality is described (*ante* p. 10) as the Mangrove Swamp. At the north end of this, near the holes through which the tide ebbs and flows, are numerous, shallow, sandy or muddy puddles covered at half tide; the most prolific being some under the shade of the mangroves. In such a puddle, 3 inches deep and 2 feet across, a dozen specimens might be found. The animals were best secured by taking up a handful of wet mud and combing the fingers carefully through it. The primrose yellow of the *Ptychodera* distinguished the least exposure of its body, and it was carefully washed off the fingers into a vessel of water. Even with care many specimens were torn. The two species were found associated together."

The external characters alone suffice to mark off this species from all the described species of the genus *Ptychodera*.

*P. flava*, as Willey has shown, is at once characterised by the great development and extreme ventral origin of the genital wings (or better, genital pleura, as Willey has suggested), and thus belongs to Spengel's provisional subgenus *Chlamydothorax*, of the family Ptychoderidæ. *P. hedleyi*, on the contrary, is entirely devoid of genital pleura, and is hence to be associated with *P. minuta* and *P. sarniensis*, in the subgenus *Ptychodera* (*sensu stricto*). The complete specimens of this species at my disposal vary in length from about 6 to 14 cm.

Mr. Hedley supplies the following notes on the mode of preservation: "On arriving at the camp, the tube containing the take of *Ptychodera* was emptied into a photographic dish filled with sea water; a little cocaine was added, which seemed to induce the animals to crawl about freely. After four or five hours they had rid themselves of mud and mucus, and were killed by a weak solution of chromic acid. Having remained in this for twelve hours, they were finally transferred to three per cent. solution of formol."

*Proboscis*.—The proboscis of this species, like that of the *P. minuta* and *P. sarniensis*, is relatively short. It has a greatest length of 9 mm., and a breadth of 5 mm., *i.e.*, its length is not quite double its breadth. In form it is somewhat egg-shaped, or more accurately, its outline may be compared with that of the human tongue. A distinct median sulcus is present, on its dorsal surface, in some specimens, but not in all, and may simply be due to contraction in preservation.

*Collar*.—The collar appears about as broad as long, with a greatest length and breadth each of 5 mm. It is considerably shorter than the proboscis, in the proportions of 5 : 9 and 4 : 7 in two individuals.

The five regions of the collar are distinct, and in their relations are characteristic for the species. The first region includes the anterior free part of the collar, and occupies about a third of its entire extent. Its free margin is slightly crinkled, but is not markedly expanded frill-like, as in *P. australiensis*.<sup>\*</sup> This free part of the collar narrows posteriorly, and passes over into the second region, occupying the middle third of the collar.

This second region appears of a darker colour than the first, and is somewhat broader than the latter. It forms a distinct circular cushion, narrowing anteriorly where it joins the first, and broader posteriorly where it adjoins the third region. The posterior third of the collar, constituting its broadest portion, includes the third, fourth, and fifth regions.

The third and fifth regions are formed by two prominent circular ridges of about equal size, and are separated from each other by a circular groove constituting the fourth region. The circular rim of the fifth region forms the posterior margin of the collar, and has a distinctly greater transverse diameter than the succeeding branchio-genital section of the trunk, so that the collar appears distinctly marked off from the latter.

In the specimens the collar shows distinct longitudinal grooves, no doubt produced by the contraction of the collar musculature.

#### TRUNK.

(1.) *Branchio-genital Region*.—This region is characterised by the great length of the branchial area, and the absence of genital pleura, the latter however being represented in the genital region proper by genital cushions (*cf. infra*).

It may be subdivided into a branchio-genital region, co-extensive with the gill area, and into an exclusively genital region behind the point of termination of the gills. In the largest

<sup>\*</sup> J. P. Hill—On a New Species of Enteropneusta (*P. australiensis*), from the Coast of New South Wales. Proc. Linn. Soc., N.S.W. (2), x., 1894.

specimen in the collection the gill area has a total length of 3.3 cm. It is thus relatively much longer than in *P. minuta* and *P. sarniensis*, and is also of a different shape. In these forms the gill area, when viewed from above, presents, as Spengel describes it, the appearance of an elongated narrow triangle with its apex pointing posteriorly. In *P. hedleyi*, however, the gill area, viewed from above, appears long and band-like, and is not pointed at its posterior end. The gill pores open on each side into a narrow longitudinal groove, which runs parallel with the deep median groove, marking the position of the dorsal nerve cord. The narrow bands of epidermis lying, one on each side, between the median groove and the branchial grooves, and hardly .5 mm. in width, are divided up by transverse lines into a definite and fairly regular series of oblong or squarish areas, characteristic for the species. The openings of the gill cavities into the branchial grooves can only be made out in sections.

Laterally to the branchial grooves, the epidermis is irregularly, but very markedly annulated, the annulations being interrupted below by the median ventral groove marking the course of the ventral nerve cord. This ventral groove is much shallower than the dorsal. In the branchial region the trunk is almost quite cylindrical, measuring in greatest breadth 4.75 mm. It is not possible, in this region, to speak of genital cushions, such as Spengel\* describes and figures for *P. minuta* (taf. 2, fig. 10), and *P. sarniensis* (taf. 6, fig. 7). Indeed, sections through the branchial region of *P. hedleyi* more closely resemble in general form the section, figured by Spengel, through the branchial region of *Glandiceps talaboti* (fig. 13, taf. 19), than similar sections of *P. minuta* and *P. sarniensis*.

Behind the branchial region proper there is a short exclusively genital segment of the trunk, characterised by its greater transverse breadth and the presence of distinct genital cushions, similar to the much more extensive cushions described by Spengel for *P. minuta* and *P. sarniensis*. This region, in a fragment of a large and apparently sexually mature individual, has a length of 15 mm., with a transverse breadth of 6 mm. It not only exceeds the branchial region in breadth but presents in sections a very different outline—ventro-laterally it is rounded, while dorsally it is markedly concave on each side of the median ridge formed by the dorsal nerve cord. The genital cushions are the direct continuations of that portion of the epidermis forming the lateral boundary of the branchial grooves. They form low and thick lateral ridges, extending from the posterior end of the branchial region up to within a short distance of the most anterior liver sacs.

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\* *Loc. cit.*

Behind the branchial region the dorsal nerve cord no longer lies in the bottom of a groove but forms a median ridge, traceable to the posterior extremity of the tail. Just in front of the anus, however, it becomes much less marked, and may even fade away from view. The ventral cord similarly comes to the surface at the end of the branchial region and passes as a median whitish line up to the extreme posterior end of the tail.

The gonads extend throughout the whole extent of the branchio-genital region up to within a short distance of the anterior liver sacs.

(2.) *Hepatic Region*.—May reach a length of 27 mm., and a breadth of 5.5 mm. The number of liver sacs in the larger specimens varies from fifty to sixty on each side. The sacs are arranged in two distinct and uniform longitudinal rows. Anteriorly, they commence abruptly, just behind the point of fading away of the genital cushions, while posteriorly they gradually become smaller, and pass over without definite limit into the transverse annulations of the dorsal region of the tail. The most anterior and posterior sacs are colourless in the preserved specimens, while the remaining sacs, as well as the ventral portion of the body wall in the hepatic region, are of a light slaty brown colour. The three or four pairs of anterior liver sacs are somewhat smaller and thicker antero-posteriorly than the succeeding ones. The latter are simple, markedly compressed antero-posteriorly, and situated close together so that the anterior and posterior faces of the adjacent sacs touch. Each sac has a broad base of attachment corresponding in transverse extent with its free part. The outer ends of the sacs thus do not project freely so as to overhang the lateral body wall, though owing to the lesser transverse breadth of the ventral half of the hepatic region it is not visible when the region is viewed from above. The line of attachment of the outer ends of the sacs is marked on each side by a low longitudinal ridge, continuous in front with the genital cushion.

(3.) *Tail Region*.—In the largest complete specimen this region is about twice as long as the hepatic region, and measures 5.3 cm. in length, with a breadth of 5 mm. In this species, as in *P. australiensis*, the tail region is characterised by the presence of two dorso-lateral epidermal lines, corresponding to the two underlying ciliated grooves of the intestine. The lines extend from the hepatic region over the anterior two-thirds of the tail, running parallel with the dorsal nerve cord, and about .5 to .75 mm. distant from it. They enclose between them a band-like area of the dorsal body wall, with the dorsal cord running along its middle, and appearing like a direct backward prolongation of the hepatic region. On each side of the nerve cord the area often

appears slightly depressed, and thus stands out very distinctly. It is crossed by a numerous series of close set epidermal ridges, which may even extend continuously across the dorsal cord. Laterally, the ridges may either stop short at the epidermal lines, or may pass across them to become continuous with the annulations of the ventro-lateral body wall. These latter are invariably interrupted at the ventral nerve cord.

In *P. flava*, Willey has also recorded the existence of two dorso-lateral bands in the tail region, but as he describes them, these bands, which are visible externally do not cause any interruption in the annulations or islets of the integument, and in fact are probably only the ciliated bands of the intestine showing through the epidermis by transparency.

Behind the termination of the epidermal lines the tail gradually narrows to its posterior end. In this posterior region the epidermal annulations may, in some specimens, be partly broken up into small islands. The annulations of the tail region are, on the whole, more regular than those of the branchio-genital region.

In Part II. I propose to describe and figure the salient features in the internal anatomy of this species.

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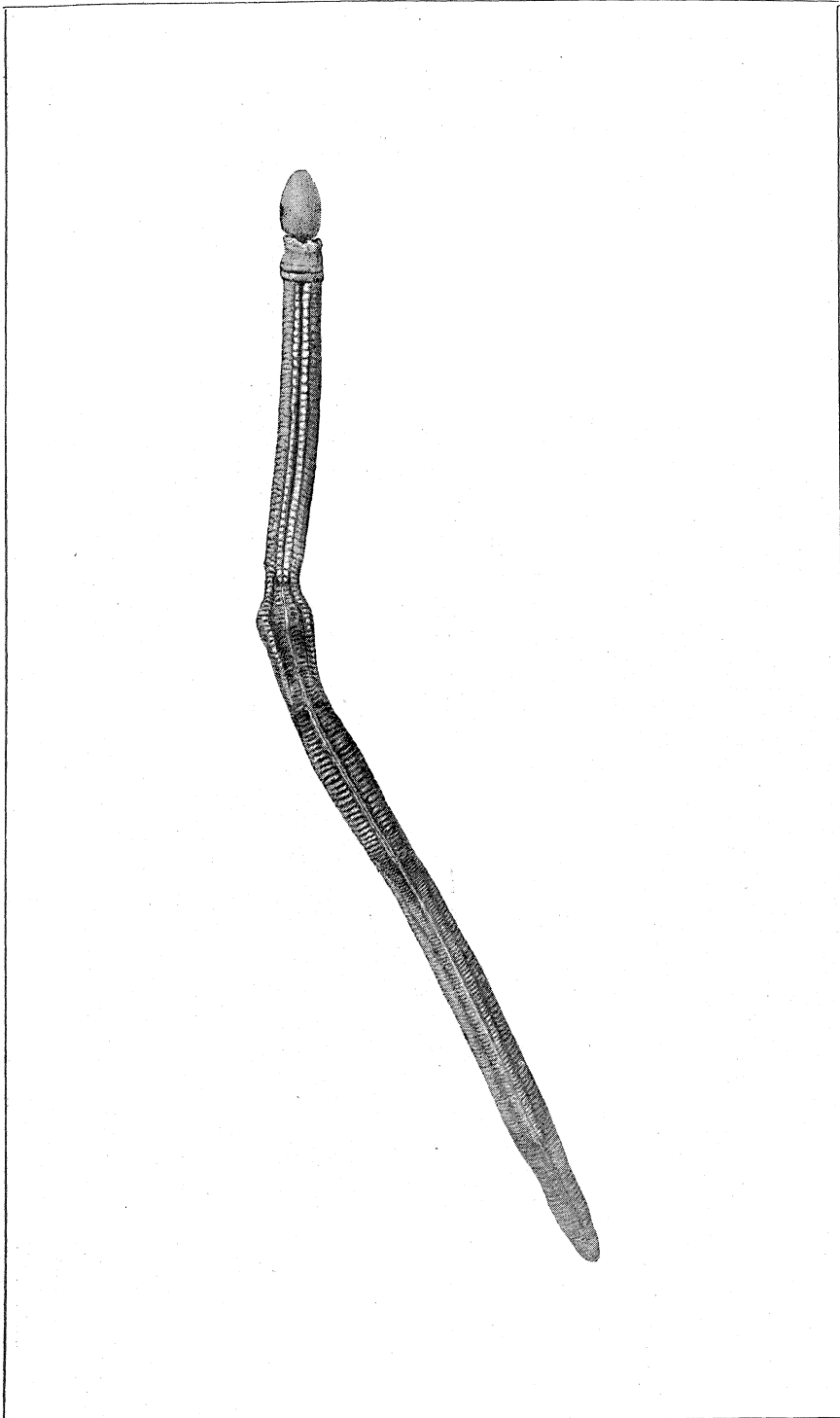


EXPLANATION OF PLATE IX.

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*Ptychodera hedleyi*, sp. nov.

Seen from the dorsal aspect. From a preserved specimen, x  $1\frac{1}{2}$ .



J. P. HILL, del.