

***Notoscolex equestris*, an Earthworm from the
Poor Knights Islands.***

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DURING November, 1940, I received from Mr. R. G. Turbott, of the Auckland Memorial Museum, two phials containing earthworms—one phial from the Chatham Island Group, the other from the Poor Knights Group, which is situated off the north-east coast of the North Island of New Zealand.

The smaller of the two phials contained those collected by him in leaf mould and loose soil on the South-east Island of the Chatham Group. In it are four earthworms. The two largest belong to the species *Rhohodrilus huttoni* (Benham)†—formerly placed in the genus *Microscolex*, this species was removed by Michaelsen (1907, p. 142), as it possesses a gizzard, which is absent in the former genus. The two other worms are much smaller, and are some species of the introduced genus *Allolobophora*, but owing to the state of immaturity and to the poor condition of preservation, it is impossible to be more precise.

It is with the contents of the larger phial from the Poor Knights that the present article is concerned. This phial contained two large earthworms collected in leaf mould by Majors G. A. Buddle and R. A. Wilson, on Tawhiti Rahi, the northern island of the group. They are excellently preserved in strong alcohol, and are now in the Auckland Museum.

***Notoscolex equestris* n.sp. (Pl. 17.)**

External Features: The length of the larger of the two, which forms the subject of this article, is 210 mm., with about 150 segments, all of which are practically of the same length. The diameter is almost uniform throughout the length, the worm being thus almost cylindrical, scarcely tapered posteriorly; for at a distance of 20 mm. from the anterior end its diameter is 14 mm., and at the same distance from the posterior extremity it is 10 mm. The greatest diameter at a short distance in front of the clitellum is 16 mm.

The pigmentation, or rather the plan of pigmentation, is very striking. A broad band of dark chocolate brown crosses the dorsum of each segment, and is separated from its neighbours by a narrower, pale cream-coloured intersegmental band. The appearance is thus somewhat zebriform. Such a scheme of colouration is unusual, but not unknown in earthworms from other parts of the world, and

* *Equestris*—according to Smith's Latin-English Dictionary, "belonging to the order of Knights."

† BENHAM, 1900. On some Earthworms from the Islands around New Zealand. *Trans. N.Z. Inst.*, vol. 33, p. 140.

belonging to different genera—the European “Brandling” *Eisenia foetida* has purplish-brown segmental bands with paler intersegmental bands, and *Pheretima*, for instance, various species of which are found in the Melanesian Islands, as I described many years ago. (Benham 1895–1896.) But in those species the position of the band is reversed—it is the dark band that is intersegmental.

This is the first case of such ornamental colouration to be recorded from this country. It resembles the pattern on the abdomen of certain large species of *Deinacrida*, amongst the Orthopterous insects.

This colour scheme is continued forwards to the fourth segment, though in front of the clitellum the intersegmental pale bands get narrower till they cease. In these four segments the dark pigment is continued round to the ventral surface, where the light intersegmental band is, however, visible. Except in these anterior segments and in the region of the clitellum the ventral surface is a pale buff or cream colour, the dark pigment ceasing at about the lateral line as indicated by the chaeta (*c*).

In addition to this striking colouration, another noticeable character is afforded by the small white circular spots or papillae on the dark bands on the post-clitellar segments. These mark the position of the chaetae, “*c*” and “*d*,” that is the latero-dorsal and the dorsal couples. (Pl. 17, Figs. 1 and 2.)

There are two such spots on each side of each segment; the uppermost spot is not in a straight line along the body, but occurs at different levels in successive segments; that is, in no two successive segments are the dorsal chaetae at the same level, at the same distance from the mid-dorsal line. This irregularity in the position of the chaetae is unusual, but in some species of *Notoscolex* described by Fletcher from Australia, this aberration from the linear arrangement occurs. With these few exceptions, in all the hundreds of species described, these chaetae form continuous straight lines. These wandering spots indicate, as I say, the position of the dorsal chaetae: the other spot, nearer the edge of the dark band, is likewise somewhat irregular, but none wander so far from the normal position as do these containing the dorsal chaetae.

The occurrence of white spots around the chaetae is not unknown; for instance, I described this condition for a little worm named *Plagiochaeta punctata* (Benham, 1892, p. 294), in which, however, there are many chaetae in a segment instead of the more usual eight.

In the present worm six of the eight chaetae are visible from the ventral surface, and are practically equidistant (apart from the divergences of “*c*”). Using the ordinary symbols, and starting from the most ventral chaetae, *a-a* equals *a-b* equals *b-c*, though the position of the last varies slightly. Measured on the stretched body wall, the distances are:—*a-a* 4 mm., *a-b* 3 mm., *b-c* 4 mm. (usually), *c-d* 5 mm. at the least as in segment XXV, but may rise to 6, 7, 8, or even 9 mm. in succeeding segments.

One small detail may be mentioned, that, owing to the thickness of the body wall and to its contracted condition, the ventral and ventro-lateral chaetae “*a*” and “*b*” are not visible anteriorly to segment X.

The above may seem a lot of talk about a small detail, but the arrangement is so unusual that it must be excused.

The *Prostomium* is epilobic.

I was unable to detect the dorsal pores owing to the strongly contracted state of the body.

The *Clitellum* occupies segments XIV, XV, XVI, and XVII. It is a complete girdle of dark brown lacking the pale intersegmental bands, and the dark tint is only interrupted ventrally in XVII.

Genital Markings: On the ventral surface of each of the two segments XVII and XIX is a pale-tinted, transversely elongated, sucker-like structure with a rounded raised margin and a slightly depressed centre. Its length is about equal to one-third of the diameter of the worm, extending nearly as far as chaeta "b" on each side.

There is nothing unusual about this feature. It is almost exactly like the "genital markings" figured, for instance, for *Megascolex tripartitus* by Stephenson (1930, p. 420), and somewhat similar markings occur in various genera.

Genital Apertures: The male pores are in XVIII, in a similar transverse furrow though much narrower antero-posteriorly. The actual pores are in rather deep depressions close to the outer ends of this furrow, in line with chaeta "a." The oviducal pores are in the usual segment XIV, close together in a very short transverse depression in the median line between the chaetae "a" and "a." (Pl. 17, Fig. 3.)

I am unable to detect the spermathecal pores, though at the anterior margin of VII there is apparently a transverse impress in line with "a" which is probably one pore. But there are, as dissection shows, three pairs of spermathecae in VII, VIII and IX, hence their pores will be at the anterior margin of these segments.

Internal Anatomy: The worm is micronephric, the minute tufts of tubules forming a dense velvety lining to the body wall, extending even to the dorsum. These micronephridia are continued to the hinder end of the body. There are no meganephridia.

Reproductive System: The testes and ciliated funnels are in the usual segments X and XI. They are concealed, however, by a horizontal membrane extending from septum to septum, reminding one of the median sperm sacs in *Lumbricus* and other genera. The two pairs of sperm sacs lie in IX and XII; ovate to subspherical and smooth walled.

The prostate in XVIII is rather long, narrow and tongue-shaped, with a rough surface, the margins being somewhat indented at intervals. It has a short muscular duct. The organ extends through four segments in the specimen dissected, reaching to the hinder septum of XXII. (Fig. 4.)

I am unable to trace the sperm duct owing to the hard condition of the body wall, so am unable to locate its actual connection with the prostate duct (which, according to Gates, seems to have some importance).

The ovary and oviduct are in the normal segments, XIII and XIV respectively.

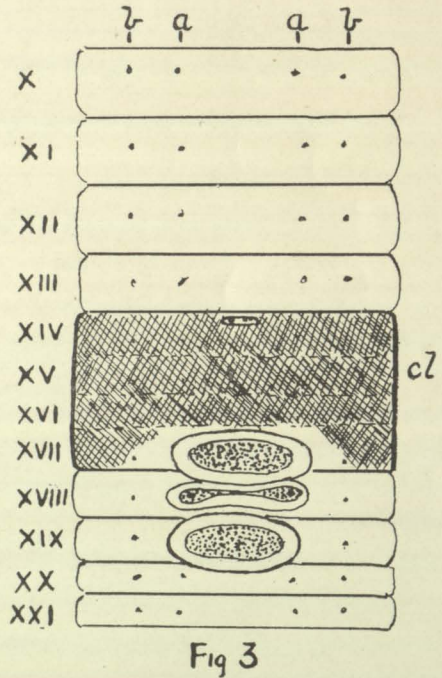
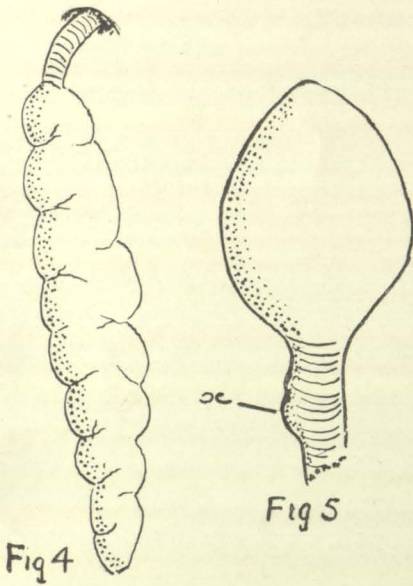
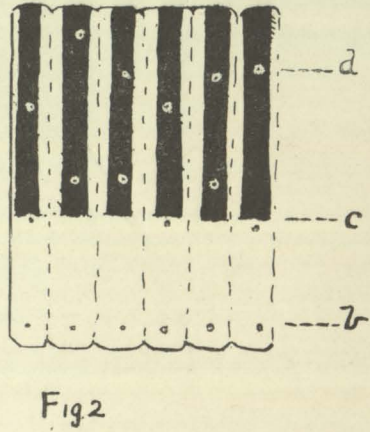
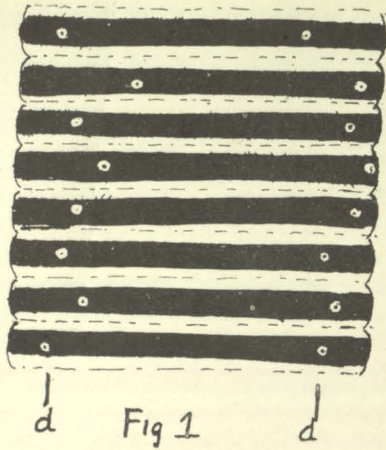


FIG. 1—Dorsal view of a portion of the mid-body, showing the colour pattern and the white chaetal spots, and the irregularity of the dorsal chaetae ($\times 2$).

FIG. 2—Side view of a more posterior portion ($\times 2$).

FIG. 3—Ventral view of the region of the clitellum and genital markings, etc. ($\times 2$) *a, b, c, d*, the four chaetae.

FIG. 4—A prostate ($\times 4$).

FIG. 5—A spermatheca ($\times 4$). *x* The slight excesses on the duct.



There are three pairs of *spermathecae*, progressively increasing in size, in VII, VIII and IX, opening near the anterior boundary of their segments. The last organ lay transversely, and was hidden by the first sperm sac, so that it was at first overlooked. Each spermatheca is an ovate sac without recognisable diverticulum, and with a comparatively long duct, that of the first one being as long as the sac itself. (Fig. 5.)

Removed from the body and examined microscopically (but not in section), the duct presents two low, rounded excrescences on one side near the proximal (extal) end. Whether these play the part of a diverticulum I cannot say. But such excrescences are scarcely worthy of being termed "diverticula," as Stephenson apparently so calls them, for in *Megascolides annandalei* (now placed by Gates in his genus *Barogaster*) and in *B. prashadi* Gates, and in one or two other species these "diverticula" are described as "flattened" and "adherent to the duct."

On the floor of the body in XVII and XIX, corresponding to the external structures, are glandular thickenings.

Many of the anterior *septa* are thickened, namely 6/7 to 12/13, and those in the latter part of the series are especially thick.

Alimentary Tract: The gizzard is in VI, its wall is not very hard. The anterior and posterior *septa* of this segment are quite distinct and have not suffered a backward shift as in so many earthworms.

The oesophagus is thick walled, cream coloured and cylindrical. There are no special "glands" or enlargements. The lining is, however, thrown into a number of longitudinal folds with rough edges.

The intestine commences in XVII. It is thin walled and sacculated, but the hinder region in the last ten segments is, as in *Megascolides napiereus* Benham (1941), a straight, thick-walled "rectum." Neither Beddard nor Stephenson in their Monographs of the Oligochaeta mention the existence of a "rectum," or any modification in these hinder segments. In a general way zoologists do not seem to have dissected the posterior region, as all the really diagnostic characters are to be found in the anterior segments.

There is no typhlosole, unless the slight ridge produced by the attachment of the dorsal blood-trunk is to be so designated. But the typhlosole of such a genus as *Lumbricus* has a definite structure and function which has not been allotted to such a feeble ridge as is present here and in many other genera, where "no typhlosole" is recorded.

Of the vascular system I can only record that the dorsal trunk is single, and that enlarged "lateral hearts" exist in X, XI, XII and XIII.

DISCUSSION.

I have recently (1941, p. 30) referred to the small differences which separate the two genera *Megascolides* McCoy and *Notoscolex* Fletcher, the only fundamental difference being the microscopic structure of the prostate.

So long ago as 1892, Beddard (p. 130) wrote: "The discrimination of the genera of the Cryptodrilidae is unfortunately the most difficult part of the classification of the Oligochaeta." And so it is to-day, 50 years later, as the number of species has been studied anatomically.

As an illustration of this uncertainty, mention may be made of my genus *Tokea* (1905). In 1907 Michaelsen (p. 161) regarded this genus as really included in *Megascolides*. In 1916 (according to Stephenson (1923, p. 193, and 1930, p. 835), for I have not access to the original paper, Michaelsen includes it in the genus *Notoscolex* on the ground of the microscopic structure of the prostate. Again, in 1910, Michaelsen (p. 36), in discussing the geographical distribution of these and related genera, refers repeatedly to the occurrence of *Megascolides* in New Zealand and Ceylon, but in 1916 comes to the conclusion that New Zealand earthworms formerly attributed to *Megascolides* must be removed from that genus to *Notoscolex*. Consequently New Zealand must be excluded from the geographical distribution of *Megascolides*. And so my *Tokea* has been shifted about, first as a subgenus of *Megascolides* in 1907 (p. 161), and then to *Notoscolex* in 1916. Now when our greatest authority on the Oligochaeta (unfortunately deceased) is so uncertain as to the limitation of the two genera, refers repeatedly to the occurrence, it is not surprising that Stephenson (who is likewise defunct), and who was, as his Monograph reveals, the next authority on the group, but who had followed Michaelsen, should have presented two opinions as to *Tokea*, for in 1930, p. 658, he refers to the edibility of "*Tokea (Megascolides)*," while on p. 837 he wrote: "*Tokea* must now go into *Notoscolex*." Confusion worse confounded!

As I have mentioned above, the fundamental difference between the two genera lies in the microscopic structure of the prostate, but many species have been described attributable to one or other of these two genera, in which, however, the internal structure of this organ is unknown; and Stephenson (1923, p. 194) remarks: "But to reduce the necessity of resorting to this procedure, it may be assumed that the flattened, tongue-shaped gland, especially if the boundaries have any trace of lobing, will have branched ducts; while glands which are definitely cylindrical in shape will quite possibly have a simple duct." This seems rather like guesswork, and can only be employed if the author of a species has described or figured sufficiently carefully the form and appearance of the prostate, and unfortunately this has not always been the case. But this illustrates the awful state of uncertainty that surrounds any attempt to distinguish these and some allied genera.

I have alluded to Stephenson's views in my former paper (p. 31). I have allotted the present worm to the genus *Notoscolex* rather than to *Megascolex* or to *Tokea* on the following grounds: There are only three pairs of spermathecae, and the prostate is tongue-shaped with lateral incisions and lobings along its margins, which suggest a branching system of canals. It differs in this respect from *Megascolides*, while from *Tokea* it differs in (a) the external and therefore probably the structure of the prostate; (b) the absence of recognizable diverticula on the spermathecal duct; (c) the gizzard is in VI instead of V; (d) absence of meganephridia in the posterior segments.

REPRESENTATIVES OF THE FAMILY CRYPTODRILIDAE IN NEW ZEALAND.

This family, which is characteristically Australian, is represented in the Dominion by the following species:—

1. Schmarda's "*Hypogaeon orthostichon*" (1861) placed by Beddard in *Megascolides* and by Michaelsen in *Notoscolex* (1916).

2 and 3. Ude's *Notoscolex reptans*, and *N. unipapillatus* transferred to *Megascolides* by Michaelsen in 1916.

4 to 11. Benham's *Tokea* with 8 species, transferred finally to *Notoscolex* in 1916 by Michaelsen, or perhaps a subgenus thereof.

12. *Megascolides napierensis* Benham, 1941.

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