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TWO NEW SPECIES OF THE GENUS *NOTOSCOLEX* (*OLIGOCHÆTA*) FROM ULLADULLA, NEW SOUTH WALES.

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(Figures 1-6.)

The two new species described below were collected by the author from the bank of a small creek at Ulladulla, south coast of New South Wales, on 9th December, 1928.

Genus *Notoscolex* Fletcher, 1886.

Notoscolex ulladullæ, sp. nov.

(Figures 1-3.)

External Characters.

Length 160 mm.; diameter 3 mm. Colour in alcohol yellowish grey. Segments about 185 but posterior end regenerated; commencing about midbody and continuing to the posterior end the segments are triannular. On the ventral surface there is a longitudinal, shallow, flat-bottomed groove extending from xix to xxv; the edges of the groove follow line of setæ *b* and the flat bottom lies on *aa*.

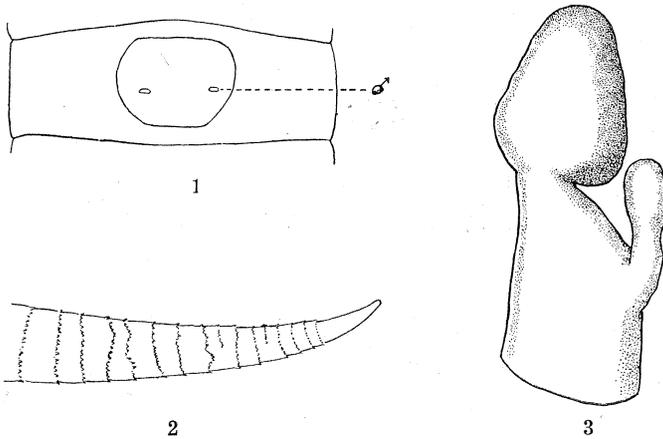
Prostomium combined pro- and tanylobous.

Dorsal pores commence in furrow 7/8.

Setæ widely paired. In front of the clitellum $ab = \frac{2}{3}aa = \frac{3}{5}bc = \frac{6}{13}cd$ (or $ab:aa:bc:cd = 6:9:10:13$); behind the clitellum $ab = \frac{8}{15}aa = \frac{3}{5}bc = \frac{12}{25}cd$ (or $ab:aa:bc:cd = \frac{44}{5}:9:8:10$); at midbody $ab = <\frac{1}{2}aa = \frac{10}{17}bc = \frac{1}{2}cd$ (or $ab:aa:bc:cd = 5:10\frac{3}{4}:8\frac{1}{2}:10$); dd is less than half the circumference. The lines of setæ *a* and *b* converge towards the male pores.

The clitellum extends from $\frac{2}{3}xiv - \frac{1}{3}xxii$ (= 8) but is not strongly developed and has the boundaries poorly defined; setæ (except *a* and *b* on xviii) and dorsal pores present.

The ventral surface of segment xviii has its anterior boundary curved outwards a little making it larger than its neighbours. The male field is in the form of a glandular patch having its anterior and posterior boundaries parallel with, and well clear of, the intersegmental furrows; nearer the anterior than the posterior furrow. The posterior edge of the field is only a little more than half the length of the anterior; the lateral boundaries are curved and the corners of the figure so formed rounded. The field extends to half-way between *a* and *b* on each side. The male pores are paired and are situated on the field in line with the setæ ring and just ventral of *a*.



FIGURES 1-3.—*Notoscolex ulladulle*, sp. nov.

1. Male genital area. 2. Distal end of a penial seta showing portion of ornamentation as seen under microscope \times ca. 350 diameters. 3. Spermatheca, from paratype, \times 34.

The female pores are paired on xiv, about in line with *a* and just anterior to the setæ ring.

The spermathecal pores are two pairs placed at the anterior edge of viii and ix and are slightly ventral to *a*.

Copulatory cushions are present on xii, xiii, xv, xvi, xvii, xix, xx and xxi all with the transverse axis anterior of the setæ ring. The cushion on xii is small and oval, lies anterior to the setæ ring and extends across the segment for $\frac{5}{7}$ of *aa*; that on xiii is also oval and similarly placed, but larger, extending almost to *a* on each side. Those on xv and xvi tend to be circular, particularly the one on xvi; both extend not quite to *a*. The one on xvii is similarly placed, almost circular and also extends almost to *a*. The cushions on xix and xxi tend to be circular but that on xx is semicircular in outline with the flattened edge anterior; all three extend not quite to *a*.

Internal Anatomy.

Septa 5/6–12/13 thickened, of which 6/7–9/10 are muscular and stout and about the same thickness; 10/11–12/13 progressively thinner and 5/6 about the same as 10/11.

Gizzard in vi, large and muscular.

Calciferous glands are three pairs in xiv–xvi, adjoin above the intestine. Large intestine commences in xviii.

Last heart in xii.

The excretory system is micronephric, the micronephridia being scattered; a meganephridium on each side in the hindermost segments. The scattered micronephridia are fewest in xi, xii, and xiii, the few present attached to the anterior face of the septa. In front of xi the nephridia are more numerous and mostly attached to the ventral portion of the anterior face of the septa; particularly

numerous in v and vi. Attached to the posterior face of septum $4/5$ there is a pair of compact, lightly coloured bodies which are probably peptonephridial tufts.

Testes and funnels paired and free in x and xi. Seminal vesicles two pairs in ix and xii, small. The anterior ones are the smaller and are placed low down on the anterior face of the septum; the posterior pair are placed higher up on the posterior face of the septum.

Prostates paired in xviii; the one on the right side broad and leaf-shaped, that on the left considerably narrower and thicker; both lobed slightly. The duct short, straight, shiny and in length less than one-third the length of the gland. I could not ascertain where the vas deferens joins the prostatic duct.

The penial setæ sacs are three times as long as the prostatic duct and unite with the duct at the body wall; two fully developed setæ present in the sacs. The figured penial seta is about 3.2 mm. long with a diameter of 21μ at the middle and 24μ at the proximal end. The shaft is curved and rather sharply pointed. Except at the extreme point the tip is ornamented with transverse, somewhat irregular rows of triangular teeth; the majority of the rows seem to form complete rings but a few only partially extend round the shaft.

Ovaries paired and with funnels in xiii.

The spermathecæ are two pairs in viii and ix. The duct is short and thick, being about twice as long as broad (considerably thicker in the figured example from a paratype, *viz.*, one and a half times as long as broad), and terminates in a pear-shaped ampulla; the ampulla is broader at the base where the duct runs into it and tapers to a blunt extremity. At the point of union of the duct and the ampulla the duct is slightly constricted. There is a single diverticulum, small and club-shaped, attached by a short stalk at a point on the main duct about half of its length along from the body wall.

Holotype in Australian Museum collection, registration no. W.2836.

Variation.

In addition to the holotype there are eight immature paratypes, the smallest of which is 106 mm. and the largest 159 mm. long; the number of segments varies from 158 to 217. Four of the paratypes have an additional copulatory cushion on xxii similar to the one immediately preceding it. Of these four one has no cushion on xvii and the epidermis glandular round setæ *a* on xix and to a lesser extent on xx, the edges of the areas so formed coalesced with the copulatory cushion between; one has the cushion on xvii very weakly developed and in another the cushion on xvii is also very weakly developed and no cushion on xii. One specimen has no cushion on either xxi or xxii.

Paratypes in Australian Museum collection, registration nos. W.2837-39.

Notoscolex attenuatus, sp. nov.

(Figures 4-6.)

External Characters.

Length 310 mm.; diameter 3 to 3.5 mm. behind the clitellum. Colour in alcohol a deep cream, here and there tinged with green. Segments 304; ix to xvi faintly triannular, vii and viii have only the second annular ring developed; behind the anterior third of the body annulation again commences, usually two distinct and three fainter alternating annular rings being present; the posterior quarter triannulate.

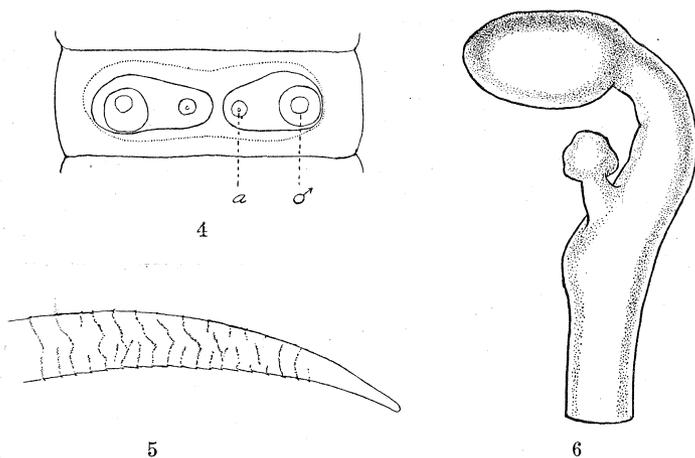
Prostomium tanylobous, tongue cut off behind.

Dorsal pores begin in furrow 7/8.

Setae paired in regular lines. In front of the clitellum $ab = \frac{1}{2}aa = \frac{1}{2}bc = \frac{2}{3}cd$ (or $ab:aa:bc:cd = 7:22:13:10$); behind the clitellum $ab = >\frac{1}{2}aa = \frac{1}{3}bc = \frac{1}{2}cd$ (or $ab:aa:bc:cd = 4:19:11:9$); the midbody reading is $ab = \frac{1}{3}aa = \frac{1}{2}bc = \frac{5}{7}cd$ (or $ab:aa:bc:cd = 5:15:9:7$); dd is greater than half the circumference.

The clitellum is not well developed and the limits are not clearly defined; it seems to extend from $\frac{2}{3}xiii-xviii (= 5\frac{1}{2})$ and possibly includes a small portion of xix as well. Setæ present.

The male field on xviii is mainly made up of two lateral, somewhat oval, glandular patches each extending from near the midventral line to just beyond b and almost as deep as the segment; they are well clear of the intersegmental furrows of which they are nearer the anterior than the posterior. The patches are connected by a glandular band of slightly greater depth, the anterior and posterior edges curved inwards a little. The male pores have tumid lips and are placed laterally and at the posterior edge of the glandular patches; they have a diameter almost equal to, and lie within ab . On or very near the inner edge of each patch and forming a bulge in its outline there is a well defined pore probably associated with a gland.



FIGURES 4-6.—*Notoscolex attenuatus*, sp. nov.
4. Male genital field; a , gland pores. 5. Distal end of a penial seta showing portion of ornamentation as seen under microscope \times ca. 300 diameters.
6. Spermatheca, from paratype, $\times 14$.

The female pores are paired and close together on xiv and slightly anterior of the setæ ring.

The spermathecal pores are two pairs placed at the anterior edge of viii and ix in furrows 7/8 and 8/9 respectively and just dorsal of a .

There are copulatory cushions on xi, xv, xvi, and xvii. On xvii the cushion is in the form of a transversely placed, elongate area shaped like a dumb-bell which lies along and just includes aa , its longitudinal axis anterior to the setæ

ring; especially on the anterior and posterior edges bordered by a lighter coloured glandular area giving the whole a somewhat oval outline. In a line along the axis of the portion shaped like a dumb-bell there are four pores approximately equidistant from each other and similar to those on the male field referred to as being presumably associated with a gland. On xvi there is a similar area extending not quite to *a* and also having four pores on the transverse axis, the left pair being fused. That on xv is not quite so large, extends nearly to *a* on each side, and has four pores of which the left two are also fused. The cushion on xi lies within *aa*, is not so well developed as those further back, being composed of three small, more or less circular glandular areas the edges of adjacent ones fused; each area bears a pore. In addition there is on xix a pair of roughly oval flattened papillæ placed immediately dorsal and anterior to *a*, extending laterally beyond *b* for a distance slightly greater than *ab* and forward to the anterior border of the segment; on each immediately lateral to *b* there is a pore similar to those on the other glandular patches and between the two papillæ is a narrower, connecting, less well developed glandular band lying along the setæ ring.

Internal Anatomy.

Septum 6/7 slightly thickened, 7/8 and 8/9 progressively thicker, 9/10–12/13 stout and firm, 13/14 slightly thickened.

The gizzard in vi is well developed and barrel-shaped with its anterior end somewhat invaginated.

Calciferous glands are three pairs in xiv–xvi attached by a broad base to the intestine. The large intestine commences in xviii.

The last heart is in xii.

The excretory system is micronephric with a meganephridium on each side in the hindmost segments. Behind xii micronephridia plentifully scattered over the walls of the segments, in viii–xii rather sparsely scattered particularly in viii and ix; micronephridia on anterior face of several of the septa of the pre-clitellar region. Bushy tufts of peptonephridia present attached to the hinder portion of the pharynx.

Testes and funnels free in x and xi. Seminal vesicles two pairs, in xi and xii, grape-like, attached to the posterior face of 10/11 and 11/12 respectively; adjoin above the intestine.

Prostates lobed and paired in xviii with short, straight muscular duct. The vas deferens enters the prostatic duct at a point about $\frac{2}{3}$ along from its proximal end.

The penial setæ sacs, each of which seems to contain four penial setæ, are about twice as long as the prostatic duct and enter the duct at the body wall.

The figured example is about 3.2 mm. long; the diameter at the middle is 50 μ and at the proximal end of the curved portion about 55 μ . From just above a short, swollen, proximal end the shaft is curved slightly, the curve at the tip accentuated a little; the tip is bluntly pointed. Except at the extreme point the tip is ornamented with irregular rows of small triangular teeth. The general tendency of the longer rows (particularly those greater than the semi-circumference) is to be placed obliquely. At the proximal portion of the ornamented region the rows become more widely separated before finally ceasing.

The spermathecae are two pairs in viii and ix. The ampulla is large and spherical, having a diameter equal to about half the length of the duct; there is a general tapering of the duct towards the ampulla, but from the body wall to a point about one-third along the duct one side diverges and then forms a shoulder and from near the concavity so formed there arises a small almost spherical diverticulum attached by a short stalk to the main duct.

Holotype and mounts in Australian Museum collection, registration nos. W.2823-25.

Variation.

In addition to the holotype there are thirteen paratypes, of which six have the clitellum developed. The paratypes range from 190-270 mm. in length and the number of segments from 204-273 in the mature examples. In two specimens the dorsal pores commence in groove 6/7 and not 7/8 as in the holotype.

The setae formulæ of the paratypes show that $ab:aa$ varies considerably since ab may equal $>\frac{1}{2}-\frac{1}{2} aa$; what variation exists in $bc:cd$ tends towards making bc and cd more nearly the same, but when not equal bc is almost invariably the greater. The clitellum is distinctly marked in some of the paratypes and includes segments xiv-xviii, generally plus a small portion of xiii and xix ($= 5\frac{1}{n}$); it is saddle-shaped and extends as far ventrally as b .

The oval glandular patches which carry the male pores sometimes have the bulge caused by the gland pore projecting so far ventrally as to cause the ventral edges of the bulges to unite. The female pores are sometimes in a shallow, narrow, oval depression.

In addition to the copulatory cushions on xi, xv, xvi, and xvii most of the paratypes have a similar one on xii and one specimen has that on xi absent but one on xii; rarely specimens with cushions on xi and xii have one or the other extending to b on each side. A small papilla midventrally placed on x occurs on one specimen and another has an oval cushion on the same segment placed on the left side and extending from a to a short distance across the midventral line. The cushion on xv is sometimes only weakly developed. The number of gland pores on the cushions varies from 2-4; in one specimen there are three on each of the flattened papillae on xix and in another on the glandular band between these papillae there is an additional pair.

Paratypes in Australian Museum collection, registration nos. W.2826-35.

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Affinities.—The two species *Notoscolex ulladulla* and *N. attenuatus* seem to be more closely related to each other than to other members of the genus. Although easily separable the general anatomy of the two species, especially the arrangement of the nephridia, the form of the spermathecae and the ornamentation of the penial setae, suggests a decided relationship.