INDIAN EARTHWORMS. VIII—XI.

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VIII. *PRIODOCHAETA*, GEN. NOV.

INTRODUCTORY NOTE.

Perichaeta pellucida Bourne 1894 has been included in the Australian genus *Diporochaeta* since 1900 in spite of morphological and geographical evidence indicating that the Indian worm probably "is not phyletically related to the Australian species" (Stephenson 1923, p. 317). Bourne's form is a ghost species, unembodied in a material type, and even the locality from which the worms were secured is unknown. It is possible that the types of *pellucida* were found at or near Coonoor. Dr. F. H. Gravely of the Madras Museum very kindly arranged for the collection of earthworms from Coonoor.

Among the worms thus secured are several individuals which are possibly, if not probably, conspecific with the types of *pellucida*. Study of these worms shows that the excretory system comprises micro- as well as meganephridia. Accordingly *pellucida* cannot be retained in a purely meganephridial genus (*Diporochaeta*) and in the absence of an appropriate genus to which the species can be transferred erection of a new genus becomes necessary.

The author's thanks are extended to Dr. F. H. Gravely for arranging for the collection of specimens at Coonoor and to Colonel Iyengar for the care taken in the preservation of material as well as for his efforts to obtain representative collections from the various habitats in his locality.

Priodochaeta, gen. nov.

Diagnosis.—Quadrithecal, spermathecal pores on viii and ix. Male pores on xviii. Female pores paired on xiv. Setae perichaetine. Clitellum mainly annular ; on development of clitellar glandularity intersegmental furrows disappear and dorsal pores are occluded but setae are retained. Unpigmented. All septa from 4/5 present. Gizzard in v. Calciferous glands three pairs, in xiv-xvi ; markedly protuberant, constricted off from the gut dorsally and ventrally but opening widely into gut lumen by high, vertically placed, slit-like apertures. Intestine begins in xix, typhlosole rudimentary. Hearts three pairs (latero-oesophageal ?), in x-xii. Excretory organs : one pair of closed (?) exonephric (?) nephridia (or clusters ? of reduced micronephridia ?) vertically placed on the anterior faces of septa 5/6-13/14 : one pair of clusters of four to six (?) large, closed, transversely placed, parietal, exonephric micronephridia per segment from xiv to (?) ; one pair (?) of small exonephric (?) meganephridia with preseptal funnels per segment from ? to posterior end. Holandric ; seminal vesicles in xi and xii. Prostates tubular.

Genotype and only species.—*Perichaeta pellucida* Bourne 1894, as described and defined below.

Distribution.—Known only from two localities in the Nilgiri Hills, South India.

Remarks.—The generic definition above is only tentative, as the excretory and circulatory systems, and in particular the former, cannot be adequately characterized. Furthermore it is impossible at present in any monospecific Megascolecid genus to determine which characteristics are of generic or merely specific rank.

Priodochaeta pellucida (Bourne).

1894. *Perichaeta pellucida,* Bourne, *Quart. J. Mic. Sci.* XXXVI, pp. 13, 20, 27. (No types. Type locality unknown.)
1900. *Diporochaeta pellucida,* Michaelsen, *Das Tierreich,* X, p. 207.
1903. *Diporochaeta pellucida,* Michaelsen, *Geogr. Verbr. Olig.,* p. 88.
1909. *Diporochaeta pellucida,* Michaelsen, *Mem. Ind. Mus.* I., p. 107.
1910. *Diporochaeta pellucida,* Michaelsen, *Abh. Nat. Ver. Hamburg,* XIX, (5), p. 9.
1923. *Diporochaeta pellucida,* Stephenson, *Oligochaeta,* in *F. B. I. Series,* p. 317.
1925. *Diporochaeta pellucida,* Stephenson, *Rec. Ind. Mus.* XXVII, p. 63.

Material examined.—From the Madras Museum : 7 aclitellate and 6 clitellate specimens labelled, " Earthworms collected from water channel. Coonoor. 1936. Major Iyengar.", and 6 juvenile, 3 aclitellate and 1 clitellate specimens in another tube but with same label.

External characteristics.—Length 180-205 mm. ; of the clitellate specimen in second batch, 330 mm. Diameter four mm. (in clitellar region, elsewhere $3\frac{1}{2}$-$3\frac{3}{4}$ mm.) ; of the clitellate specimen in second batch, $4\frac{1}{2}$ mm. The clitellate specimen of the second batch is contracted in such a manner that an anterior portion containing the gizzard has a bulbous

shape. Unpigmented. Prostomium prolobous or almost so, usually retracted. The anterior portion of each clitellate specimen is " hooked " as the result of a ventral bend in the clitellar region. Aclitellate specimens are not hooked.

Setae begin on ii and are more closely crowded ventrally, occasionally so much so that the setal arcs have a slightly zigzagged appearance. A wide midventral gap is present from ii posteriorly; *aa* =4-6 *ab* or about one mm. wide. The mid-dorsal gap is about twice the width of the midventral gap anteriorly and may about =¼ C but gradually decreases in size posteriorly until it is of about the same width as *yz* or even smaller. No regular pairing of setae is recognizable and in the posterior portion the setae are quite irregularly distributed (not in straight longitudinal ranks). Some of the ventral setae of xviii are lacking. Setal numbers are shown below.

Setal Formulae.

ii	iii	viii	xi	xii	xx	xxi	
33	36	35	37	..	..	35	Clitellate specimens from first batch.
27	31	35	36	..	..	30	
35	39	32	39	..	..	33	
35	33	34	33	..	..	34	
29	33	34	38	..	..	31	
..	34	38	..	36	35	..	
..	34	39	..	39	29	..	Second batch.
..	36	39	..	40	34	..	
..	40	38	..	38	36	..	

The first dorsal pore is on 8/9 (1, from second batch) or 9/10 (11), usually with a pore-like though unperforate marking near the anterior margin of ix on the mid-dorsal line.

The clitellum is dark red or purple, protuberant and extends from the presetal or postsetal furrow of xii onto xix, to 19/20, occasionally with a slight reddening of an anterior portion of xx, annular on xiii-xvii; intersegmental furrows and dorsal pores (except on 12/13 and 18/19) lacking, setae present.

Quadrithecal, spermathecal pores small, transversely placed slits on the anterior margins of viii and ix just behind 7/8 and 8/9 and anterior to a tertiary furrow on the presetal secondary annulus, one to two intersetal intervals wide, in *bd* or *be*. Each pore has a fairly sharply demarcated circumferential lip that is slightly tumescent.

Female pores are paired (9), on *a* or in *ab*, just in front of the setal circle.

Male pores are minute, transversely placed slits, in *be*, usually on *c* or in *cd*, each pore at or near the centre of a small, transversely placed

area of shortly elliptical outline. On the youngest aclitellate specimen there is on xviii a transversely placed area of epidermal thickening and rather spindle-shaped outline, reaching laterally into *ef* and antero-posteriorly to 17/18 and 18/19 except towards the lateral ends. Each male pore is at the centre of an opaque area with regularly convex surface that is surrounded except laterally by a depressed marginal band of greyish translucence. On larger aclitellate specimens all of the male porophore is greyish translucent except for an extreme lateral portion which is opaque and depressed, the depression slightly deeper mesially. On clitellate specimens the appearance is much the same, the areas containing the male pores always depressed, the depression always deepest mesially though even here not especially deep. A median portion of xviii about in *aa* is white and may be slightly depressed but not as much so as the median portions of the male porophores.

No genital markings.

Internal anatomy.—All septa are present at least from 4/5 posteriorly ; 7/8-9/10 thickly muscular, 6/7 or 5/6-6/7 and 10/11-11/12 slightly muscular.

The gizzard is in v (9), large, and may reach a length of 3+mm. The oesophagus in vi-xiii is small and moniliform, slightly wider in xiii, the inner wall provided with irregular, white longitudinal ridges which are thickened in xii-xiii. Calciferous glands are three pairs, in xiv-xvi (6). Each gland is a vertically placed sac definitely constricted off from the gut dorsally and ventrally and markedly protuberant laterally, with flat anterior and posterior faces, reaching above and slightly below the levels of the dorsal and ventral faces of the gut, and dorsally into contact with the gland of the opposite side beneath the dorsal blood vessel. Glands of xiv are usually slightly smaller than those in xv and xvi. Each gland opens into the gut by a vertically placed, slit-like aperture that is of about the same height as the oesophageal lumen. Lamellae are rather thick, longitudinally placed, continuous from one pocket to the next around the region of septal attachment, and are not high. The intestine begins in xix (7), the valve anteriorly in xix or in a middle portion of the segment. The typhlosole is represented by a very low but definite, rather zigzagged ridge which begins in xxiii-xxv (3) and is unrecognizable behind ci (1). Supra-intestinal glands and intestinal caeca are lacking.

The dorsal blood vessel (single) is continued anteriorly onto the pharyngeal bulb. The ventral trunk divides into several branches in the region of the sub-pharyngeal ganglia. A supra-oesophageal trunk, adherent to the gut, is usually recognizable in vii-xiv. Extra-oesophageal trunks are first recognizable just behind the circumpharyngeal nervous commissures where they pass ventrally and then posteriorly for a short distance almost parallel to the nerve cord, passing dorsally on the anterior face of 4/5 and into v high in the coelomic cavity, occasionally reaching up to the level of the dorsal face of the gizzard. In vi the trunks pass, close to the median line, onto the ventral face of the gut to which they adhere, anteriorly in x or posteriorly in ix apparently passing into the ventral face of the gut and from thence posteriorly unrecognizable or perhaps represented by the lateralmost of a series of longitudinal vessels

in a well developed plexus that may cover the ventral face of the gut. A lateroparietal trunk on each side passes from a postprostatic region (behind xxx in one specimen) into xiii and on the anterior face of 13/14 is continued upwards to join the lateralmost longitudinal vessel in the ventral plexus (2 specimens). In one worm a second lateroparietal vessel from an anterior region passes into the posterior vessel just as the latter rises from the ventral parietes in xiii. In still another specimen the anterior lateroparietal is not continued into xiii but passes up on the anterior face of 12/13 to the lateral face of the gut. In another specimen the anterior lateroparietal passes into xvi at least without connection with the posterior lateroparietal on the right side while the left posterior lateroparietal passes into xii and then on anterior face of 12/13 up to a point above the level of the dorsal face of the gut where it turns ventrally to pass into the gut wall ventrolaterally. No subneural. The last pair of hearts is in xii (6). Hearts of x-xii open dorsally into the supra-oesophageal trunk. In xii a thread-like posterior cord passes from the heart to the dorsal trunk but no blood has been seen in this cord in any of the specimens. Similar cords have been identified rather dubiously in x-xi. If these cords are functional vessels the hearts of x-xii are latero-oesophageal. Hearts of ix open into the dorsal trunk. All hearts of ix-xii open into the ventral trunk. Paired vessels opening into the ventral trunk on the anterior faces of the septa are present in v-viii but have not been traced to the dorsal trunk.

Nephridia have not been found in the anteriormost segments. In v-xiii the excretory organs are represented by a pair of (single ?) tubules vertically placed on the anterior faces of the septa, the size increasing posteriorly but small even in xiii. In xiii the ducts of these organs apparently pass, close to the ventral parietes, across the coelomic cavity to the posterior face of 12/13 near to the region of attachment of the ovary. Nephrostomes were not found on the anterior face of 12/13. In xii the ducts apparently pass to the parietes at *j* and then laterally. In the anterior segments the ducts have been traced to the ventral parietes just in front of the septa but no further. These small anterior nephridia are usually poorly preserved and often with an appearance suggesting that portions are lacking. From xiv (6) posteriorly there is in each segment a pair of transversely placed excretory structures which appear at first glance to be meganephridia, (reaching from *a* to or beyond the midlateral line) the size increasing gradually from xiv to xix and from then on for some distance fairly uniform. Nephrostomes were not found though careful search was made in each specimen dissected. When preservation is favourable each of these structures appears to consist of four to six (or more ?) closely crowded, transversely placed, large micronephridia with very slender ducts that pass to the parietes and then run for varying distances mesially or laterally on the integument. In xix of one specimen five ducts pass into the parietes a short distance median to the margin of the cluster, but the duct of the sixth micronephridium passes to the parietes slightly behind the others and then runs laterally instead of mesially and for a longer distance before penetrating into the body wall. Clusters of transversely placed, large micronephridia are present, so far as can be determined, posteriorly to

the region of xcv. From thence posteriorly excretory structures appear to be less well preserved and any characterization is impossible. In the posteriormost segments there is a pair of excretory structures just behind each septum, each organ adherent to the septum or attached to the septum or the parietes by a mesentery, and reaching laterally to or beyond the midlateral line. Mesially from each organ a very slender and rather long neck passes to and through the septum with a small funnel on the anterior face near to the nerve cord. Nephrostomes have been definitely identified as far forward as in the sixty-fifth (1) or one hundred and third (1) segment from the hind end but from this region anteriorly are usually unrecognizable or only doubtfully so as a result of poor preservation and inclusion within masses of coelomic coagulum. The nephridia however appear to be meganephric for some distance anteriorly, *i.e.*, they are similar in appearance to the meganephridia behind even though funnels are not seen, occasionally a funnel or funnel-like structure can be recognized and one such was seen as far forwards as segment cxxxiv.

The male funnels of x and xi are characterized by a brilliant spermatozoal iridescence even in aclitellate specimens but there is little coagulum in the coelomic cavities. Seminal vesicles are vertically placed, acinous bodies on the posterior faces of 10/11 and 11/12. The vasa deferentia of a side come into contact in a posterior portion of xiii and apparently unite under 13/14, in xviii passing into the ental end of the prostatic duct. Prostates are tubular, looped, with small central lumen, the glands shortly elliptical in transverse section, restricted to xviii or with ental end reaching slightly into xix. The prostatic duct is small, 1½-2 mm. long, with muscular sheen, straight or looped, occasionally slightly thickened ectally.

Penial setae are lacking. In the smallest aclitellate specimens separation of the longitudinal musculature median to the prostatic duct reveals in what may be a setal gap, a vertically placed column of tissue that appears to be a degenerate setal follicle. This contains no setae in the specimens examined.

The spermathecal duct is much shorter than the ampulla but is definitely coelomic in part and clearly marked off from the ampulla (occasionally slightly bulbous), circular in cross section, the wall fairly thick and with slight muscular sheen, the lumen fairly large and approximating to circular in section entally but slit-like ectally. When the spermathecal duct is dissected out from the parietes a transversely placed, elliptical aperture with smooth margin is left in the epidermis and the annular lip of the spermathecal pore remains on the ventral end of the duct. The single diverticulum is digitiform to very slightly club-shaped, only very slightly narrowed just prior to its entrance into the median face of the duct (28). A stalk can scarcely be said to be present although the lumen is slightly narrowed prior to passing into the duct, the spermatozoal iridescence within the apparently simple lumen continued to or almost to the duct.

Remarks.—Juvenile specimens are 80-120 mm. long, 1-1½ mm. thick except at the gizzard region which may be a trifle thicker. Spermathecal pores are unrecognizable or are minute and about on *c*. Male pores

were not identified. The *a* setae on xviii may be present but *b-d* or *e* are lacking, pits representing apertures of follicles from which setae have dropped out may be recognizable. A minute pit about on *b* of specimens on which other pits are unrecognizable may be a rudiment of the male pore. Specimens referred to as aclitellate are longer, with definite male pores and markings and are either presexual or postsexual.

In x and xi on each side and attached to the gut midlaterally there is a horizontally placed, shelf-like protuberance of white tissue with an iridescent appearance. Somewhat similar but non-iridescent ridges are present at the sides of the gut in vii-ix.

Perichaeta pellucida Bourne 1894 was rather briefly characterized in an introductory portion of a paper on the development of setae and nephridia. The types were not preserved and the type locality was not mentioned. Later it was discovered (oral communication, *vide* Stephenson 1923, p. 250) that the types of *Megascolex imperatrix* (the other species with which the paper just mentioned is primarily concerned) were obtained at Coonoor. It is possible that types of *pellucida*, apparently studied at about the same time, were also secured from Coonoor. In 1925 Stephenson gave a more extended description of two "sexually mature worms" from Ootacamund, also in the Nilgiris, that were identified as *pellucida*, in spite of certain small differences. Aside from these two accounts nothing further has been made available hitherto with regard to the species.

Bourne's worms are distinguished, so far as can be determined from the limited information available, from the Coonoor worms described above as follows: (1) greater length, (2) location of the first dorsal pore on 5/6 instead of 9/10, (3) presence of dorsal pores on the clitellum, (4) intestinal origin in xix rather than xviii, (5) absence of a typhlosole, and (6) absence of micronephridia. (1) Difference in length of specimens cannot be considered at present as valid evidence for specific distinctness in this connection, especially in view of the fact that Bourne sometimes gave measurements of living and fully extended specimens. (2) Difference in location of first dorsal pore is of minor importance at most and may be of little if any value in the present discussion. (3) This is of no importance at present, Bourne's specimens may not have been fully clitellate. (4) Probably of little value even if correct,—an anterior extension of the first portion of the intestine may conceal the oesophageal valve and the posteriormost portion of the oesophagus from casual inspection. (5) This may be more of a difference in interpretation or definition than a valid distinction. The typhlosole in the Coonoor worms is admittedly rudimentary and in a small, softened and possibly somewhat macerated intestinal portion of one specimen is actually unrecognizable. (6) If real this is of taxonomic value but of sufficient importance to warrant generic rather than specific distinction. Bourne however failed to describe the excretory organs of adult specimens, merely noting that "There are no micronephridia" It is fairly obvious that Bourne thought micronephridia were lacking in both adult and embryonic stages of *pellucida* though the embryonic nephridial tubules of vii-xi especially mentioned and figured are probably not meganephridia, at least in the ordinary sense. With regard to the embryonic forms all that Bourne

says is that nephrostomes in *pellucida* embryos " become better developed up to a certain stage " than in *imperatrix* embryos. We do not know to what region of the body this statement applies or to what stages in development or even whether the nephrostomes were thought to persist throughout development and into adult life along the whole axis of the animal. The clustered micronephridia described above are certainly not of the *imperatrix* type and if present in Bourne's worms might well have been mistaken for meganephridia as in Stephenson's specimens. To summarize : the Coonoor worms cannot be distinguished from Bourne's *pellucida* by any important characteristics of specific value and the single apparent distinction of real taxonomic significance is of sufficient importance to warrant generic separation. At present it scarcely seems possible that two species belonging to two distinct genera and probably from the same place would be so much alike. It would appear to be more probable that Bourne like Stephenson failed to perceive the micronephridial characteristics of the excretory structures. The Coonoor worms have accordingly been referred to *pellucida*. To fix the species Coonoor is designated the type locality and the specimens described above are designated as types (neotypes).

Diagnosis.—Male pores minute, transversely placed slits in *be*, each pore at or near the centre of a transversely placed area of shortly elliptical outline, the male porophores slightly depressed, the depression deepest mesially. Spermathecal pores on the anterior margins of viii and ix slightly behind 7/8 and 8/9, in *be*. Clitellum annular on xiii-xvii but extending laterally and dorsally onto xii and xix or xx. First dorsal pore on 9/10. Setae : 27-35/ii, 13-40/iii, 32-39/viii, 33-39/xi, 31-35/xxi, a few lacking ventrally on xviii. Length 180-330 mm. Diameter 4-4½ mm.

Spermathecal diverticulum shortly digitiform to slightly club-shaped, into median face of a duct that is much shorter than the ampulla.

Distribution.—Coonoor and Ootacamund, the Nilgiri Hills, South India.

IX. *PRIODOSCOLEX*, GEN. NOV.

INTRODUCTORY NOTE.

In a collection of earthworms received in exchange from Prof. C. R. N. Rao of Bangalore in 1924 were two representatives of an undescribed species belonging to a new genus. One of the specimens had been dissected. Some time ago permission to describe this as well as certain other portions of the material obtained from him was requested of Prof. Rao. Unfortunately no reply has ever been received to the request. As the new genus is of some interest because of certain similarities to *Priodochaeta* the writer has taken the liberty of presenting the account below without the desired permission. The author's thanks are extended to Prof. Rao for the specimens.

Priodoscolex, gen. nov.

Diagnosis.—Quadrithecal, spermathecal pores on viii and ix. Male pores on xviii. Female pores paired on xiv. All reproductive apertures

minute and superficial. Setae perichaetine. Clitellum saddle-shaped; on development of the clitellar glandularity intersegmental furrows disappear, dorsal pores are occluded and most of the setae are lost. (Unpigmented ?) All septa from 4/5 present. Gizzard in v. Calciferous glands reniform, vertically placed, six pairs, in xv-xvii; stalks from the two glands of a side in each segment unite midsegmentally, the common stalk opening through gut wall midlaterally by a minute aperture. Intestine begins in xix; typhlosole simple, lamelliform. Hearts latero-oesophageal, in x-xii. Subneural trunk present, joining a (right) latero-parietal trunk in the region of xiii-xvi. Excretory organs: two pairs of closed, exonephric (?) micronephridia (or clusters of micronephridia) on the parietes of iii (?), one pair of larger clusters on the parietes of iv (?), two pairs of large clusters close to the ventral parietes in iv and v, paired clusters of micronephridia on the anterior faces of the septa in vi-ix (and x-xi ?) and xii-xiii; from xiv posteriorly a transversely placed, presetal band of closed, exonephric micronephridia on each side, the band of two rows; in the posteriormost segments a single transversely placed row of 10-12 small, exonephric micronephridia on each side with a corresponding row of preseptal funnels. Holandric; seminal vesicles in xi and xii. Prostates tubular.

Genotype and only species.—*Priodoscolex montanus*, sp. nov.

Distribution.—Known only from the type locality of the type species, Nandydroog, Mysore State.

Remarks.—The generic definition is only tentative, much remains to be done by way of working out important taxonomic characteristics of the excretory system and possibly also of the vascular system. Furthermore, ascription of generic or specific value to taxonomic characteristics in a monospecific genus rests on analogy with polyspecific and unrelated genera. Finding of a second species is likely to necessitate modifications in both generic and specific diagnoses.

Priodoscolex montanus, sp. nov.

Material examined.—From Prof. C. R. N. Rao: 1 aclitellate (dissected) and 1 clitellate specimens labelled, " Nandydroog, S. I.".

External characteristics.—Length 255 mm. (clitellate specimen). The last segment is setigerous probably indicating that a posterior portion had been autotomized. The aclitellate specimen is 230 mm. long. Diameter *ca.* 3½ mm. Unpigmented (? alcoholic preservation). Intersegmental furrow 1/2 is quite unrecognizable and probably lacking. The united segments i-ii of about the same length as iii, the setae of the first apparent segment slightly nearer the posterior than the anterior boundary. Prostomium retracted.

On certain anterior segments, near the anterior margins there are minute pores or pore-like depressions that look like nephropores. These are located as follows: on iii, at *e*, *m* (and possibly also *i* ?) on the right side, *k* and *t* left side; on iv, *k* and *p* on the left side, at *h* and *l* on the right side; on v, at *h* on the left side; on vi, at *h* and *l* on the left side.

Setae are small, closely spaced anteriorly, especially so ventrally where some of the ventralmost setae may be displaced anteriorly or posteriorly so as to produce a zigzagged appearance of the transverse

setal line. Posteriorly the spacing is about the same on the dorsal and ventral sides. Anterior to the clitellum the midventral gap is small, only about 2-3 times the width of *ab*, the mid-dorsal gap larger. Posteriorly the mid-dorsal gap becomes smaller and may practically disappear but a definite midventral gap is retained to the last segment. Setae are lacking ventrally on xviii. Formulae : 2/i-ii, 64/viii, 80/xii 79/xxi (clitellate specimen) ; 10/i-ii, 70/viii, 84/xii, 81/xxi (aclitellate specimen).

The first dorsal pore is on 10/11 (2).

The clitellum is dark red, protuberant, saddle-shaped, with sharply demarcated ventral margin, extending from 12/13 to 19/20, with a faint reddening of the posterior portion of xii and an anterior portion of xx ; intersegmental furrows and dorsal pores lacking, setae invisible and probably mostly lacking though setal gaps in regular series are visible in the longitudinal musculature of xix from the coelomic face of the parietes. The midventral region between the margins of the clitellum is about 32 intersetal intervals wide, 33 setae present on xvi. Intersegmental furrows are clearly indicated midventrally on both specimens. On the aclitellate individual intersegmental furrows are only faintly indicated across the site of the clitellum, dorsal pores are occluded though sites are indicated and most of the setae appear to be lacking, although pit-like depressions of many of the former setal follicles are still recognizable.

Quadrithecal, spermathecal pores minute, superficial, diagonally placed, closely paired slits, on or close to *a* and slightly behind 7/8 and 8/9. Each pair of pores is located on an indistinctly demarcated and transversely placed area of epidermal modification (slight thickening ?) of shortly elliptical outline, the porophores apparently extending across the intersegmental furrows. The latter are lacking midventrally.

The female pores are on or close to *c*, and slightly nearer to the setal circle than to 13/14, on an area of slight epidermal modification that extends from 13/14 to the setal arc.

The male pores are minute and superficial, diagonally placed slits, about in *cf*, both pores towards the posterior margin of an indistinctly demarcated, transversely placed genital shield (area of epidermal thickening ?) of shortly and broadly elliptical outline, extending from 17/18 onto the posterior half of xviii and laterally on each side to a point about four intersetal intervals median to the ventral margin of the clitellum. The pores are about in line with the setal arcs of xviii (aclitellate specimen). From each male pore a slight groove runs anterolaterally for a short distance and then divides into two grooves, the lateral continued anterolaterally for a short distance and then turning mesially to unite with the corresponding groove of the other side at the midventral line. The median groove again opens into the other groove slightly lateral to the midventral line. On the aclitellate specimen there are seven or eight setae on each side between the lateral margins of the male shield and the sites of the ventral margins of the clitellum. These setae are lacking on the clitellate specimen though one or two setae are recognizable on each side on the ventralmost portion of the clitellum.

No genital markings.

Internal anatomy.—Septum 4/5 is transparent, membranous; 5/6-7/8 slightly muscular; 8/9-11/12 muscular.

The gizzard is in v and is tubular, about three mm. long. The oesophagus is slender, the inner wall in x-xviii provided with low, longitudinally placed, rather regular, white ridges. Calciferous glands are six pairs, two pairs in each of xv-xvii (2). The glands are large, reaching above the gut into contact with the dorsal blood vessel, reniform, the concave side mesially. Short stalks from each of the two glands of a side in a segment unite midsegmentally and the common duct then passes to the oesophagus midlaterally, opening into the gut lumen by a minute aperture. Lamellae are well developed and high, the lumen of each gland small. The intestine begins in xix, the oesophageal valve apparently relaxed but probably slightly behind 18/19. The typhlosole is first recognizable as a low but definite ridge, hemicircular in cross section in xxvii-xxxi, abruptly enlarged in xxxii from whence posteriorly it is lamelliform. Passing posteriorly the height decreases very gradually, the typhlosole unrecognizable behind cxcviii. Caeca and supra-intestinal glands are lacking.

The dorsal blood vessel (single) is continued onto the pharyngeal bulb. In xii-xiii there are paired supra-oesophageals, a single, median supra-oesophageal in x-xi. Extra-oesophageals were not seen. A subneural trunk is present (2) and is large and filled with blood posteriorly, but small anteriorly though still red and clearly visible. In one worm the subneural passes laterally in xix (right side) and then anteriorly into xiii where it turns dorsally and on the anterior face of 13/14 passes into the lateroparietal trunk. In the other specimen the subneural passes laterally in xvi (right side), thence into xv and into the lateroparietal trunk just in front of 15/16. The lateroparietal trunks are well lateral to the ectal end of the prostatic duct, large and filled with blood, unrecognizable posterior to xix, in xiii turning dorsally and passing upwards on the anterior face of 13/14 to the gut (into an extra-oesophageal ?). In one specimen the lateroparietal trunks apparently pass into the supra-oesophageals. The last pair of hearts is in xii (2). The hearts of x-xii bifurcate dorsally, the posterior branch passing into the dorsal trunk, the anterior bifurcation into the supra-oesophageal.

In segments iv and v on each side and close to the ventral parietes there is a large nephridial cluster. Anteriorly on each side three tubules or clusters are recognizable on the parietes, two in a transverse row (possibly) in iii, the third which is much larger than the others posterior and possibly in iv. In vi-ix and xii-xiii on the anterior faces of the septa and just lateral to the gut there are vertically placed tubules or clusters of tubules. From each of these clusters a duct (?) passes ventrally but can only be traced to the parietes behind the setal circles. Nephridia were not recognized in x-xi but may have been present in a sticky testicular coagulum adherent to the anterior faces of the septa. From xiv posteriorly on each side there is on the parietes anterior to the setal circle a transversely placed band of closed (?), exonephric (?), micronephridial tubules, possibly in two transverse rows (10-15 anteriorly ?). In the last ten to fifteen segments, on the anterior face of each septum and close to the ventral parietes, there is on each side a transverse row of about

ten (12 noted once) very small, iridescent, funnel-like structures. Necks from these funnels to the nephridia in the segments behind have not been found and if present must be very slender.

Male funnels are free in x and xi and iridescent in both specimens. Seminal vesicles are small, acinous, vertically placed on the posterior faces of 10/11 and 11/12. Prostates are tubular, with small but obvious lumen, central or slightly asymmetrical, the glands somewhat flattened and elliptical in transverse section, the surface with a finely granular appearance, confined to xviii or reaching into xix, brittle and easily fragmenting, five to six mm. long. The duct is slender, but with muscular sheen, about two mm. long, looped into an S-shape, slightly thickened ectally. The deferent duct passes into the ental half of the prostatic duct about one half mm. from the ental end.

Spermathecal ampullae possibly are much contracted though filled with a granular material and certainly are not sharply marked off externally from the ducts, recognizable only as slight swellings of the ental ends of the main spermathecal axes, the widened part much shorter than the apparent duct portions. Ectally the lumen is very small, gradually widened entally. (In an ental portion of the main axis which appears externally to be duct, the thickness of the wall is about the same as that of the ampulla.) The diverticulum which passes into the median face of duct just ental to the parietes, is less than half the combined lengths of duct and ampulla and comprises three regions: an ental, shortly ellipsoidal to ovoidal, simple seminal chamber, filled with sperm, a middle region in which the lumen gradually narrows ectally and which contains an opaque material that may have a spermatozoal iridescence and a stalk with a very narrow central lumen and thick wall.

Remarks.—Each of the types is somewhat distorted as a result of having been stretched and then pinned out before killing and hardening. Most of the internal organs had been removed from the anterior end of the aclitellate specimen prior to receipt here. The nephridia are imbedded in a sticky coelomic coagulum which is adherent to septa or parietes and are poorly preserved. Removal of the especially massive coagulum in the posteriormost segments may have resulted in destruction of necks leading from the funnel-like preseptal structures to the nephridia in the segment behind. Determination of characteristics of the excretory system under these circumstances and with only two specimens which must be preserved as types, is a matter of considerable difficulty and hence the uncertainty with regard to so many points of taxonomic importance.

In the Oligochaeta the first segment is usually not setigerous and setae may even be lacking on one or more additional segments. The presence of setae on the first segment would accordingly be very unusual though not to be ruled out of consideration on this account. If the first setigerous segment is to be considered the first segment the male pores would then be on xvii and the female pores on xiii, an unusual location in the Megascolecidae. There is some slight evidence to indicate that the first and second segments of an occasional species may be fused so that the first segment appears to be setigerous. For the present it is assumed that a similar process has occurred in *montanus* with the

fusion of i-ii by the disappearance of 1/2 and the retention of a few of the setae belonging to ii. The status of the species as a genotype of a new genus is not effected whichever happens to be the correct interpretation of the segmentation.

The aclitellate specimen with spermatozoal iridescence in the seminal chambers of the spermathecae and on the male funnels is regarded as in a postsexual aclitellate condition.

Diagnosis.—Male pores towards posterior end of a transversely placed genital shield of shortly and broadly elliptical outline extending from 17/18 onto the posterior half of xviii. A rather C-shaped groove with concave side posteriorly, on the anterior portion of the shield, connects the male pores, a short diagonally placed groove on each side opening anteriorly into the main groove just lateral to the midventral line and posteriorly slightly in front of the male pore. Spermathecal pores closely paired, on viii and ix, slightly behind the levels of 7/8 and 8/9 and on or close to *a*, each pair of pores on a transversely placed area of epidermal modification on which the intersegmental furrow is lacking. Female pores on or close to *c*, slightly nearer to the setae than to 13/14. Clitellum saddle-shaped, 12/13-19/20. First dorsal pore on 10/11. Setae lacking ventrally on xviii; 2-10/i-ii, 64-70/viii, 80-84/xii, 79-81/xxi. Length 230-255+ mm. Diameter 3½ mm.

Distribution.—Known only from the type locality, Nandydroog, a mountain about 1,475 feet high, about 40 miles north east of Bangalore. Elevation at which worms were secured unknown.

X. CONTRIBUTION TO A REVISION OF THE INDIAN SECTION OF THE GENUS *MEGASCOLIDES*.

INTRODUCTORY NOTE.

The Indian section of the Indo-Australasian-American genus *Megascolides* is a heterogeneous aggregate of seven species lacking that morphological unity which characterizes better known genera. The distribution is peculiar; four species in the extreme south (Travancore and Cochin), one in the northern portion of the Madras Presidency, one in Bombay Presidency, and one in the extreme north-east in Assam.

One species, *bergtheili* from the Himalayas, suspected of Octochaetine[1] affinities has been transferred recently to a new genus closely related to *Eutyphoeus* (Gates 1937). During a course of a study of the worms formerly included in the Octochaetine *Eudichogaster* it was noticed that two species of *Megascolides* have certain characteristics suggesting a possibility at least of some sort of relationship to the Octochaetine *Barogaster*. In addition it was found that no information is available with regard to the place of junction of male deferent and prostatic ducts in any of the Indian species of *Megascolides*. In absence of this information there is a possibility that some of these inadequately described species with tubular prostates might have Octochaetine affinities even though male pores are located on xviii, as for instance in *Barogaster*.

[1] Octochaetin is here used very loosely and merely to refer to that group of Indian worms formerly included in the Octochaetinae by Michaelsen and Stephenson. As has already been pointed out (Gates 1937 and 1939) the Octochatinae and Megascolecinae can no longer be recognized, at least as hitherto defined.

As much of the material as could be secured, again only types, has been examined and the results of this study may be briefly summarized as follows. Two species (from Bombay and Madras Presidencies) definitely suspected of having Octochaetine affinities are actually Barogasters and, for the present at least, only doubtfully distinguishable from the genotype, *B. barodensis*. At least three, if not all, of the species from the extreme south (Travancore and Cochin) can be isolated generically but here again specific distinctions are dubious. The single remaining species (from Assam) is almost certainly not a *Megascolides*. The prostates and distribution perhaps indicate affinities with the *Tonoscolex-Nelloscolex* group.

The author's thanks are extended to Dr. B. Prashad for the loan of specimens that made this study possible, and to Miss Chapman for the description and measurements of penial setae of *B. annandalei*.

Genus **Megascolides** McCoy.

Megascolides antrophyes Stephenson.

1924. *Megascolides antrophyes* Stephenson, *Rec. Ind. Mus.* XXVI, p. 130. (Type locality, Siju Cave, Garo Hills, Assam. Type in the Indian Museum.)

Material examined.—From the Indian Museum, 1 clitellate, dissected specimen labelled, " *Megascolides antrophyes* sp. nov. Siju Cave, 2,000 feet from entrance. Garo Hills, Assam. S. K. and B. N. C. February 1922. W 1151/1."

External characteristics.—The setae begin on ii and are fairly readily visible under the highest power of the binocular and with brilliant illumination. On viii, ix and some of the post clitellar segments recognition of setae is difficult because of the presence of equatorial circles of elevations that look like the tips of the setae, a ventral portion of each circle coinciding with the setal arc. Setae are mostly lacking (or invisible ?) on the clitellum and ventrally on xviii and xix.

The clitellum is annular, protuberant, reddish brown and extends from just in front of the setae of xiii to (probably) 17/18 ; intersegmental furrows lacking, dorsal pores lacking except for that of 13/14, one or more of the ventral setae of xvii possibly present.

Female pores have not been found, probably a single median pore.

The lateral margin of the narrow but high rim around the male field is at or near mid *bc*. The area within the rim appears to be slightly depressed. The " two low transversely oval papillae " are separated from each other except at the midventral line by a transverse furrow which is in line with 18/19. A narrow bridge at the midventral line connects the two papillae. At the lateral margin of the bridge is a fine, greyish translucent, crescent shaped line in the epidermis, the concave side facing laterally (no groove visible). At the posterior end of each line is a definite aperture. A marking at the anterior end of each line doubtless represents the male pore but an opening is not clearly visible, the male pores definitely smaller than the apertures on xix. The male pores as well as the pores of xix are about on *a*.

The spermathecal apertures are in *aa*, on the anterior margins of viii and ix, between a presetal secondary furrow and the anterior inter-

segmental furrow, each pore perhaps a trifle nearer to *a* than to the other pore of its segment, surrounded by a narrow, slightly raised, annular lip.

Internal anatomy.—The gizzard at first appears to be just anterior to 6/7 and hence in vi, but 5/6 appears to be represented by an exceedingly delicate, funnel-shaped membrane closely adherent to the gizzard but attached to gut just at or behind the posterior end of the gizzard. The gut in xi-xiii is unusually slender and rod-like. Calciferous glands of xiii are vertically ovoidal. From the dorsal extremity of each gland a very fine and short stalk (?) passes into the dorsal wall of the gut just lateral to a mid-dorsal line. These stalks are fragile and may be blood vessels but no blood is present while the large blood vessels carrying blood to and from the glands are filled with blood and quite readily recognizable. No other connection to the gut was found. The glands of xii are lobed, a fairly large, horizontally ovoidal dorsal lobe, a nearly spheroidal smaller ventral lobe, and possibly a third even smaller and still more ventral lobe. In xi, on one side, and attached by a delicate stalk to the dorsal face of the gut just in front of 11/12 is a moniliform body of three, nearly spheroidal lobes, possibly a rudimentary calciferous gland. The intestine begins in xiv. No intestinal caeca or glands found, but the gut is lacking in a region extending from about xxx to xlvi or xlvii. A pair of large, blood filled vertical commissures is present in xii and xiii in addition to the hearts. A large mass of nephridial tubules is present at each side of the gizzard (in v ?). In each of the clitellar segments just lateral to the nerve cord on each side there is a conspicuous rather rosette-like cluster of tubules. In the post-clitellar region excretory organs, when visible, are one pair per segment of (parietal ?) micronephridial (?) tubules.

The male funnels in x and xi are represented by small spots of iridescence on the ventral parietes of x and xi. Seminal vesicles were not found. The prostates are flattened, band or strap-like, the margins deeply incised mesially (ventrally) but with only one deep lateral (dorsal) incision. A central lumen is unrecognizable in sections exposed by fragmentation of the brittle gland. The duct is about 1 mm. long and nearly straight. From the parietes just in front of the ectal end of the duct a fine blood vessel (?) passes along the duct to the prostate gland but a vas deferens was not seen.

The prostatic ducts pass into a shortly elliptical transversely placed thickening of the body wall that projects slightly into the coelomic cavity. In xix there is a somewhat similar but more conspicuous protuberance which is slightly grooved midventrally, the nerve cord within the groove.

Remarks.—The difficulty of determining important taxonomic characteristics of digestive, circulatory and excretory systems from a single individual one mm. thick, poorly preserved, damaged as a result of previous dissection, with the restrictions imposed by the value of the specimen as a type, can only be appreciated by one who has attempted something of the sort. These circumstances explain the incompleteness of the account above and the indefiniteness and qualifications of certain statements.

Ovaries were not found and enumeration of segments internally proved difficult. Determining the segmental numbers by positions of the spermathecae enabled recognition of the first muscular septum as 6/7, in agreement with Stephenson. A delicate membrane which appears to be 5/6 is, however, present and apparently attached to the gut behind the gizzard. The coelomic cavities of postclitellar segments are partially filled with a rather sticky coagulum. Removal of this coagulum may have resulted in damage to or loss of excretory organs.

The prostates are friable and broken. As a central lumen is unrecognizable in the sections thus exposed the glands probably are racemose. The elongately flattened, strap-like shape is similar to that of certain South Indian species of *Notoscolex* as well as of the North Indian *Tonoscolex.*

The distribution, seminal grooves, calciferous glands and several other characteristics of minor importance appear to be more suggestive of affinities to the *Nelloscolex-Tonoscolex* group than to any South Indian form.

Genus **Barogaster** Gates.

1939. *Barogaster*, Gates, *Rec. Ind. Mus.* XLI, p. 160. (Genotype *Eudichogaster barodensis* Stephenson 1914.)

The three species of *Barogaster* can be distinguished from each other at present only somewhat doubtfully, and chiefly by characteristics of the penial setae.

With the discovery of a *Barogaster* in a northern portion of the Madras Presidency it would appear as if the distribution of the genus may be of a horizontally band-like type straight across the Indian Peninsula like that of *Eutyphoeus* but further south.

Key to species of **Barogaster**

1.	*a.* Penial setae present	2.
	b. No penial setae	*prashadi.*
2.	*a.* Penial setae ornamented near tip with transverse rows or circles of fine spines ..	*barodensis.*
	b. Penial setae with no ornamentation of circles of fine spines	*annandalei.*

Barogaster annandalei (Stephenson).

1921. *Megascolides annandalei* Stephenson, *Rec. Ind. Mus.* XXII, p. 757 (Type locality Dowlaishweram, Godaveri district, Madras Presidency. Types in the Indian Museum.)

1923. *Megascolides annandalei*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 196.

Material examined.—From the Indian Museum : 5 clitellate specimens labelled, "*Megascolides annandalei* Steph. Types. Dowlaishweram, Godaveri district 29.viii.18. Dr. N. Annandale. W 562/1."

External characteristics.—Length 95-115 mm. Diameter four to five mm. The prostomium is retracted, prolobous, the posterior end marked off from i by a definite transverse groove. A slight but equally distinct groove extends across the whole length of i along the mid-dorsal line.

Setae begin on ii ; on xxii $ab<cd<bc<aa$.

The clitellum is annular, extending from 12/13 to 17/18, (possibly lacking ventrally on a portion of xvii on one or two specimens); intersegmental furrows and dorsal pores lacking, setae present. Transversely placed groove-like depressions ventrally on two specimens at approximate sites of intersegmental furrows may be contraction artefacts or may indicate incompleteness of development or slight regression of clitellar glandularity.

Spermathecal pores are minute and superficial, on *b*. Intersegmental furrow 7/8 is usually lacking ventrally (in *aa*) and certainly appears, on some of the specimens at least, to be dislocated anteriorly (region of *ab*) just in front of the spermathecal pores. The apertures are in line with the undislocated portion of 7/8 as well as the midventral portion when the latter is recognizable.

The single female pore is median, just in front of the setal arc of xiv.

Male pores are minute and superficial, about on *b*, each pore on a small and slight elevation which may have the appearance of a rather flattened cone. Between the male pores segment xviii is slightly depressed.

Genital markings are probably as in *barodensis* but on these specimens are represented by tiny, transversely placed, opaque and white patches of shortly elliptical to spindle-shaped outline. The margins of the markings are rather indistinct but the opacity of the patches, after removal of the cuticle, is rather conspicuous against the yellowish background of the rest of the worm. Postclitellar markings are in two transverse rows on xviii between the male pore lines, one row presetal, and one postsetal, the numbers approximately as follows: 6-5, 4-4, 3-4, 4-3 or 4, 4-5 (the first number presetal, the other postsetal in each case). In addition, on the last specimen there are two further presetal markings on xviii nearer to 17/18 than the usual row and one or possibly two markings just in front of 17/18 in the left half of *aa*. Further (but slightly smaller ?) markings are probably present on two or possibly three of the specimens in the region between the spermathecal pore lines, on the posterior margin of vii and the anterior margin of viii.

Internal anatomy.—The oesophagus is rather wide in iv. The two gizzards are in v-vi (3). In vii-ix the oesophagus is narrow, widened from x posteriorly. The inner wall in vii through x is provided with numerous low, white, longitudinal ridges, in xi-xiv with fewer and larger but also longitudinal ridges. Calciferous glands are paired in xi and xii, each gland a vertically placed, rather ovoidal sac, constricted off from the oesophagus, pendent well below the level of the ventral face of the gut and not reaching above the level of the dorsal face of the gut. A very short stalk passes from the dorsal pole into the dorso-lateral aspect of the oesophagus, the opening roughly circular, the openings of a side about one half mm. apart. The lamellae are few, mostly horizontal, small, but rather thick, attached mesially and to the anterior and posterior walls of the sac, the lateral wall without such attachments. The valve is at the region of attachment of septum 14/15 but the portion of the intestine in xv is slightly narrower than that behind and deeply constricted off posteriorly by 15/16. The typhlosole begins abruptly in xxvii (?, 1) or the region of xxviii-xxix (?, 1) and is continued through

the last grid segment. From xv to the beginning of the typhlosole there is a very low but definite white ridge. The typhlosole is zigzagged rather regularly and in one specimen the ventral margins of the folds appear to be united alternately as in *Eutyphoeus*. The grid begins in lxi (1) or lxxxvi and extends through six+(posteriorly damaged specimen) or ten segments. On the ventral face of the grid there are visible on each side of the typhlosole several ridges rather regularly zigzagged in a longitudinal direction, the height of the ridges decreasing gradually in a lateral direction, the medianmost ridge on each side not as high as the typhlosole. At fairly regular intervals the ridges come into contact with each other and unite, producing a grid-like or honey-comb appearance when the grid is stretched laterally. In at least the type the grid region is recognizable, without opening the gut, as a whitening of the dorsal wall. As a result of septal constrictions the whitened area has an appearance of being marked off into supra-intestinal glands.

The dorsal blood vessel (single) is continued anteriorly to the pharyngeal bulb. A supra-oesophageal vessel is present between 7/8 and 12/13 or 13/14. Extra-oesophageals are first recognizable just anterior to 4/5 and pass posteriorly ventrolateral to the gut, and in xi onto the ventral face of the gut where they turn onto the median faces of the calciferous glands of that segment. A short vessel passing on the ventral face of the gut from the median face of the anterior gland to the median face of the posterior gland and in the form of an arc of a parenthesis with the concave side laterally, may be a posterior continuation of the extra-oesophageal. No subneural trunk. Lateroparietal trunks not found. Hearts of x-xii bifurcate dorsally, one branch of each heart passing into the dorsal trunk, the other branch (in xi and xii), after uniting with a vessel from the dorsal pole of the calciferous gland, opening into the supra-oesophageal trunk. The anterior branches of the hearts of x open directly into the supra-oesophageal. Hearts of ix join the dorsal trunk only. Hearts of ix-xii open into the ventral trunk.

A vertically placed mass of closely crowded parietal nephridia is present on each side of iii. Preseptal funnels on the enlarged median nephridia of posterior segments were not found in two specimens probably as a result of poor condition. In the third specimen preseptal funnels are definitely present.

Male funnels of x and xi are large but have practically no spermatozoal iridescence. Seminal vesicles were not found in x and if present were imbedded in hardened coagulum that filled the coelomic cavity. The male deferent ducts after dropping to the parietes in xi and xii pass straight laterally for a short distance before turning, almost at right angles, to pass posteriorly again, the posterior duct crossing the anterior duct in xii and turning posteriorly only some distance lateral to the anterior duct. Passing through xiii the ducts of a side gradually approach each other and come into contact but do not unite, opening into the anterior face of the prostatic duct within the parietes, one just above the other. The prostates extend through xviii-xix. The duct is slender, with muscular sheen, about $1\frac{1}{2}$ mm. long. Two penisetal follicles are present on each side, one passing into the parietes on the

median face of the prostatic duct, separated from the median follicle by a thin vertical band of (muscular ?) tissue. Discrete openings of penisetal follicles externally have not been found and presumably are lacking, the united prostatic and deferent ducts opening to the exterior together with the follicles.

The shaft of the penial seta is curved in a wide arc. An ectal portion is slightly widened and flattened and tapers to a bluntly squared ending. Ornamentation, at least of an ordinary toothed type, is lacking though a few very slight notches may be visible at the margins near the ectal end. On rolling the seta over these notches are found to correspond to transversely placed, very fine ridges that look as if they might be slight wrinkles. Measurements in mm. of the setae are shown below.

PENIAL SETAE.

—	Side.	Seta.	Stage.	Length.	Thickness at a level 10 micra from ectal margin.	Thickness at neck (1).	Maximum thickness.	Distance of level of maximum thickness from ectal margin.	Thickness at base.
Specimen 1		..	f	0·58	0·007	..	0·016	0·032	0·021
		..	r	0·46	0·010	..	0·019	0·015	0·015
		..	r	0·47	0·006	..	0·014	0·015	0·028
		..	f	0·63	0·007	..	0·015	0·030	..
		..	r	0·16	(3)	..	..	..	..
		..	f	0·58	0·009	..	(4)	..	0·020
		..	r	0·50	(3)	..	..	..	..
Specimen 2	r	*a*	f	0·59	0·007	0·012	0·017	0·035	0·010
		a	r	0·37	0·015	0·015	0·019	0·040	0·020
		b	f	0·63	(2)0·009	0·015	0·019	0·030	0·012
	l	*a*	f	..	(3)	..	..	..	..
		a	r	0·47	0·010	0·013	0·022	0·040	0·017
		b	f	0·62	(2)0·009	0·014	0·022	0·040	0·014

(*f*) functional seta.
(*r*) reserve seta.
(1) narrowest region behind thickened portion.
(2) no reserve seta in this follicle.
(3) tapering gradually from base to tip, no thickened ectal portion.
One follicle was lost, two follicles apparently have no reserve seta, one follicle has two reserve setae, and one seta, apparently functional (4) has no ectal widening.
(4) Measurements and description by Miss Chapman.

The spermathecal ampulla is slightly longer than the duct from which it is clearly demarcated. The duct has a muscular sheen and is slightly widened entally, elliptical in transverse section but shortening ectally to become almost circular within the parietes. The lumen is irregular due to the presence of several fairly high longitudinal ridges. One of these ridges may be higher than the rest and practically or completely cleft by a deep furrow. The diverticulum may be anteroposteriorly flattened or rather berry-shaped and is adherent to the median face of the duct, reaching nearly to the parietes to which it is connected by a short cord. The diverticulum opens into the entalmost portion of the duct by a single aperture, the ridged wall fairly thick for a diverticulum and containing spermatozoa in an arborescent mass, the ends of the branches enlarged as if contained within small, ellipsoidal chambers.

The longitudinal musculature is uninterrupted over sites of the genital markings.

Remarks.—Although two specimens are characterized as " dissected " above, only one referred to as the type, had been dissected anterior to the clitellum. The other although opened by a mid-dorsal incision had never been pinned out from the clitellar region anteriorly. This specimen was so brittle that an attempted dissection was most unsatisfactory. A third specimen was soaked in water for several hours and then dissected completely. (An ordinary museum specimen of earthworm is often in poor condition even for taxonomic study. Strongly contracted so that external structures are distorted, the cuticle firmly adherent in such a way that certain important external characteristics are unrecognizable, the integument discoloured yellow or brown by the alcohol which often makes the bodywall transparent so that other important external characteristics are unrecognizable even after removal of the cuticle. Often with the appearance of good preservation externally a specimen may be brittle and extremely difficult to dissect. Though the integument is hard the intestine may be macerated. As a result even careful handling results in rupture of the bodywall. Use of formalin obviates some of these difficulties. Specimens in the author's collection are still in good condition after fifteen years of formalin preservation though somewhat softened. Some slight softening is advantageous and certainly preferable to brittleness.)

B. annandalei is distinguished from *B. barodensis* by the restriction of the postclitellar genital markings to xviii, the arrangement of those markings in a presetal and postsetal row, and by the absence of ornamentation of circles of teeth on penial setae.

Diagnosis.—Male pores on *b*. Spermathecal pores on *b*, on anterior margin of viii (?). Genital markings tiny transversely placed areas of translucence, in one presetal and one postsetal transverse row on xviii in *bb*. Additional markings occasionally present in *bb* on the posterior margin of vii and the anterior margin of viii. Clitellum 12/13 to 17/18. Setae : $ab<cd<bc<aa$, $dd>\frac{1}{2}$ C. First dorsal pore on 12/13. Prostomium prolobous, a mid-dorsal groove across the whole length of i. Length 95-115 mm. Diameter 4-5 mm.

Holandric, seminal vesicles in ix and xii. Penial setae 0·58-0·66 mm. long, thickness 10 micra from tip 0·007-0·009, maximum thickness

(at 0·032-0·040 mm. from ectal end) 0·016-0·022, at neck 0·012-0·015, at base 0·010-0·021 mm. shaft curved in a wide arc, an ectal portion slightly widened, flattened and tapering to a bluntly squared ending. Spermathecal duct shorter than the ampulla and with longitudinal ridges on inner wall, diverticulum opening into median face of duct entally by a single aperture, lumen arborescent with several small seminal chambers. Longitudinal musculature uninterrupted over sites of genital markings.

Distribution.—Known only from the type locality, Dowlaishweram, Godaveri district, Madras Presidency.

Barogaster prashadi (Stephenson).

1920. *Megascolides prashadi*, Stephenson, *Mem. Ind. Mus.* VII, p. 202. (Type locality Sakawari, Satara district, Bombay Presidency. Type in the Indian Museum.)

1923. *Megascolides prashadi*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 201.

Material examined.—From the Indian Museum: 1 clitellate specimen labelled, "*Megascolides prashadi* Steph. Type. Sakawari, on the way to Mahableshwar, Satara district, Bombay. 4.vii.17. Dr. B. Prashad. W 291/1".

External characteristics.—A short posterior portion of four to six segments is unusually slender, and with an appearance of being a regenerate, possibly not normal.

Setae begin on ii; lacking or invisible ventrally on xvii-xviii. On the left side of xix *a* is present though retracted into the tissue of the genital marking and scarcely visible, *b* of the same side clearly visible at the anterior margin of the genital marking cushion, ventral setae of the right side unrecognized but possibly retracted and invisible. All ventral setae of xx are present.

The clitellum is annular, probably lacking ventrally on xvii; intersegmental furrows and dorsal pores lacking, setae present.

Spermathecal apertures are tiny, almost minute, transversely placed slits, probably on site of 7/8, just lateral to *b*. A flat and rather band-like circumferential lip is marked off and on this lip the intersegmental furrow is lacking. The inner margin of the band, around the aperture, is clear white and thus contrasted to the more creamy appearance of the peripheral portion of the lip.

The single female pore is median and on or perhaps immediately in front of the setal arc of xiv.

Male pores are minute, circular, open, at sites of *b*, on xviii, located on a transversely placed area of marked epidermal thickening. The area is narrowed mesially, widened laterally, reaching into *bc* but indistinctly delimited laterally.

Genital markings are probably, as in *barodensis*, tiny, transversely placed, slightly depressed areas of greyish translucence but all that can be definitely recognized now are rather indistinctly demarcated and transversely placed depressions. These are located on areas presumably of marked epidermal thickening, (papillae according to Stephenson). One such area with bluntly rounded lateral margins extends the whole length of xvii and laterally reaches slightly into *bc*. On this area and along the setal arc are seven markings. The cushion of xix is nearly symmetrical, reaching to *b* on the right side and slightly lateral to *b*

on the left side. With a *b* seta on its anterior margin this area may be regarded as primarily postsetal. A slight, transversely placed depression possibly contains five genital markings. Markings were not noted on the asymmetrical cushion of xx. Further markings, possibly four, are present on a posterior portion of viii just in front of 8/9.

Internal anatomy.—Gizzards are in v and vi, both equally well developed. There are two pairs of calciferous glands, in xi and xii. Each gland is constricted off from the gut, shortly stalked, pendent below level of the ventral face of the gut and opening into gut lumen by a small dorsolateral aperture. The typhlosole is fairly well developed and zigzagged, terminating posteriorly with a " grid " as in *barodensis*. The grid is a thickening of the roof of the gut on the ventral face of which there are visible closely crowded, low, longitudinal ridges. The grid begins *ca.* in lxx.

The dorsal blood vessel (single) is continued onto the pharyngeal bulb. A supra-oesophageal has not been found. Extra-oesophageals are present but cannot be traced. A subneural trunk is lacking. Hearts of x-xii bifurcate dorsally, one branch passing to the dorsal trunk, the other to the dorsal aspect of the oesophagus.

Parietal nephridia of iii are massed into a band as in *barodensis*. In the posteriormost segments each enlarged, median nephridium is provided with a slender neck which can be traced to the septum in front close to the region of the nerve cord. On the anterior face of the septum, just in front of each neck, is a macerated protuberance that looks like and probably is a funnel.

Male funnels of x and xi have a brilliant pink and yellow iridescence. Testes were not found. Male deferent ducts have not been traced nor identified posteriorly with certainty but it is quite obvious that no deferent duct rises from the parietes to pass into an ental portion of the prostatic duct. On the contrary what appear to be deferent ducts pass into the anterior face of the prostatic duct within the parietes. The prostatic duct is $1\frac{1}{4}$ mm. long, slender, with muscular sheen.

Just median to the prostatic duct is a definite though small gap in the longitudinal musculature, a similar gap further mesially. These gaps are so distinct that presence of penial setae might be suspected but no traces of follicles are recognizable.

The longitudinal musculature is uninterrupted over sites of the genital markings.

The spermathecal ampulla is a flattened, nearly empty sac, irregularly wrinkled and folded. The duct which is sharply marked off from and only a trifle shorter than the ampulla is relatively rather slender, with slight muscular (?) sheen, shortly elliptical (almost circular) in transverse section. The lumen is fairly large and irregular in cross section due to the presence of longitudinal ridges on the inner wall of the duct. The diverticulum is anteroposteriorly flattened and vertically placed, adherent to the median face of the duct entally, slightly longer than half the length of the duct, connected to the parietes by a cord of tissue from the ectal end. The cavity is divided up into several chambers by ridges on the inner wall and opens into the duct by a single aperture at the ental end. There is no spermatozoal iridescence.

Remarks.—The type is in poor condition. The intestine is macerated and in part lacking, having been removed in the previous dissection from 14/15 posteriorly for a short distance and from lxxi or thereabouts posteriorly. As a result characterization of typhlosole and grid is incomplete. Fortunately the cut made in removing the posterior portion of the gut passed through the second " grid " segment so that recognition of this peculiar and generically characteristic structure is possible. The vascular system cannot of course be adequately characterized from a unique specimen that must be preserved as a type.

The type obviously is a *Barogaster* but determination of the status of the species, *prashadi*, is more difficult. Differences from *barodensis* mostly appear to be trivial. Genital markings which might provide clues for specific distinction are scarcely recognizable perhaps as a result of the method of preservation. If *prashadi* is really a penisetal this characteristic will satisfactorily distinguish the species from the penisetal *barodensis*. Although unknown from any Indian species, discharge of penial setae after sexual maturity has been recorded from certain South African forms by Pickford. The presence of distinct gaps in the longitudinal muscles just median to the prostatic duct at sites where penisetal follicles should be located if present as in *barodensis* may indicate that such discharge had taken place in the type of *prashadi* prior to collection. But in these circumstances should we not expect to find the follicles which are to produce the next season's functional setae ? Or does absence of these follicles indicate only that the gaps in the musculature mark sites of follicles of setae lost permanently prior to attainment of sexual maturity ?

XI. *TRAVOSCOLIDES, GEN. NOV.*

INTRODUCTORY NOTE.

A group of four south Indian species of *Megascolides* from Travancore and Cochin, with reservations as so one form, are distinguished from other Indian species hitherto included in the genus by important characteristics of excretory and digestive systems. The same characteristics probably also distinguish these species not only from the Australasian and American forms of *Megascolides* but also from other Indian *Megascolecid* genera. Thus distinguished the group appears to deserve generic status.

Travoscolides, gen. nov.

Diagnosis.—Male pores (combined apertures of prostatic ducts and penisetal follicles) on xviii, in or close to *ab*. Female pores paired on xiv. Quadrithecal, spermathecal pores on or close to *a*, on or near 7/8-8/9. All reproductive apertures minute and superficial. Clitellum annular (intersegmental furrows, dorsal pores and setae ?). First dorsal pore on 11/12. Setae lumbricine ; ventral setae of xviii penial and in closely paired follicles. Prostomium prolobous ? Pigmentation ?

Septa present from 5/6. Gizzard in v. Calciferous glands four pairs in x-xiii, rather reniform, concave side mesially, reaching below level of ventral face of gut and mesially, opening by short and slender stalks from ventral ends into gut slightly lateral to midventral line. Intestine begins in xv ? Typhlosole simple, lamelliform (from xxiv-xxv to lxiv-cl). Hearts latero-oesophageal in x-xiii. Supra-, extra-oesophageal and lateroparietal trunks ? Excretory organs : closed (?), (enteronephric or exonephric ?) micronephridia in vertically placed clusters on anterior faces of 5/6-13/14 ; from xv posteriorly closed (?), (enteronephric or exonephric ?) micronephridia on posterior faces of the septa. Holandric, seminal vesicles in xi-xii. Prostates tubular. Male deferent ducts opening into ental ends of prostatic ducts ? Spermathecae with elongately sausage-shaped ampullae and very short ducts, diverticulum disc-shaped, shortly stalked and with arborescent lumen.

Genotype.—Megascolides chengannures Aiyer 1929. This species is designated as the genotype in view of the fact that it alone is known from more than one specimen. Also the types are probably in better condition than those of other species.

Distribution.—Known only from two localities in Travancore and Cochin and up to elevations of perhaps 2,300 feet.

Remarks.—Negative characteristics not mentioned in the diagnosis are absence of a subneural trunk and of genital markings.

Relationships of the calciferous glands to the gut and the (apparent) restriction of the micronephridia to septal locations distinguish *Travoscolides* from all other Indian genera.

The Australasian and American sections of the genus *Megascolides* are heterogeneous aggregates of inadequately characterized species the relationships of which are most dubious. Not all of the literature is available locally (and in particular a recent paper on American Megascolecids of the Pacific Coast) but, so far as can be determined at present *Travoscolides* is distinguished from *Megascolides* by nephridial characteristics, the presence of calciferous glands or by the segmental location of those glands. Revision of Australasian and American forms will probably reveal additional differences of less importance.

The definition above is of course only tentative and contains several statements that usually are of specific value only.

Excretory organs are apparently always septal, in preseptal clusters in v-xiii, discrete and postseptal from xv posteriorly. The postseptal nephridia appear in part to be enteronephric and in part exonephric but condition of the worms is such as to prevent more than a guess at the nature of the endings of the tubules.

Pheretima, another purely micronephridial genus, also has septal nephridia but these are open, enteronephric and located on both sides of the septa. Numerous integumentary nephridia are also present.

At present the four species can be distinguished from each other, and somewhat doubtfully, only by the penial setae. Although adequate specific diagnoses are impossible a key, based on penisetal characteristics, is presented herewith.

Key to species of Travoscolides.

1.	*a.* Penial setae about 0·3 mm. long	2.
	b. Penial setae 0·57-0·82 mm. long	3.
2.	*a.* Shaft terminates ectally with a hair-like spine hooked to one side	*cochinensis.*
	b. Shaft does not terminate in a spine ..	*chengannures.*
3.	*a.* Ectal termination of shaft simple and bluntly rounded, ornamentation of scattered teeth ..	*duodecimalis.*
	b. Ectal termination " bayonet-shaped ", flattened and markedly hollowed, no ornamentation	*pilatus.*

Travoscolides chengannures (Aiyer).

1929. *Megascolides chengannures* Aiyer, *Rec. Ind. Mus.* XXXI, p. 54. (Type locality Chengannur, Travancore, South India. Types ? One cotype or paratype in the Indian Museum.)

Material examined.—From the Indian Museum: 1 aclitellate, undissected specimen labelled, " *Megascolides chengannures* Aiyer. Type. Chengannur. 15.xi.26. K. S. P. Aiyer. W 1514/1".

External characteristics.—The prostomium appears to be prolobous, broad, demarcated posteriorly by a fairly deep, transverse groove. From the groove forming the posterior margin of the prostomium several short furrows run posteriorly on i, two of these near the mid-dorsal line slightly better developed than the others.

Quadrithecal, spermathecal pores minute and superficial, on viii-ix, on or close to *a*, on very slight protuberances, on presetal secondary annuli and about equidistant from the intersegment furrows and the presetal secondary furrows.

The *a* setae of viii and ix, right *a* and *b* and left *a* of vii are lacking.

The first dorsal pore is probably on 11/12.

Paired female pores.

A transversely placed and slightly depressed, indistinctly demarcated area of translucence extends from 18/19 to just behind the setae of xvii and reaches laterally on each side about to mid *bc*. On this area are two slightly raised opaque patches extending anteroposteriorly between levels of 17/18 and 18/19 and reaching from a lateral portion of *aa* into a median portion of *bc*. Close to the median margin of each patch and about on the *a* line is a definite, (seminal ?) groove with anterior and posterior ends curved laterally. Male pores (combined openings of prostatic ducts and penisetal follicles) are probably represented by minute pits in *ab*, on the setal arc just lateral to the grooves and possibly connected with the grooves by slight furrows, the pits on tiny, rather conical but basally undemarcated protuberances.

Internal anatomy.—Calciferous glands are anteroposteriorly flattened, slightly reniform with the concave side mesially and against the gut, the dorsal poles not reaching above the level of the dorsal face of the gut, the ventral ends reaching well below the level of the ventral face of the gut and curved towards the median plane. From the ventral end of each gland a short, slender stalk passes to the ventral aspect of the gut slightly lateral to the median plane. Openings of the calciferous glands were not recognized and probably are small. The oesophagus has something of an appearance of a valve, the walls in contact mesially,

at 13/14. No valve is recognizable posteriorly and if present must have been so relaxed as to present an appearance like that of the intestine. The section of the gut in xiv is not quite as wide as that in xv. The typhlosole begins abruptly in xxiv-xxv and is low, simply lamelliform, in part zigzagged rather regularly, terminating abruptly in cxlix. A very slight ridge passes anteriorly from the typhlosole into xv. Intestinal caeca and supra-intestinal glands are lacking.

The dorsal blood vessel (single) is continued forwards at least to the front end of the gizzard. No subneural. Supra-oesophageal and extra-oesophageal trunks were not found but may be present. Hearts of x-xiii bifurcate dorsally, one branch passing to the dorsal trunk the other branch uniting with a large vessel from the calciferous gland, the united vessel passing mesially and midsegmentally across the gut to unite with a similar vessel from the other side. (After removal of the dorsal trunk and hearts there is visible a large blood filled vessel passing midsegmentally straight across the gut from the calciferous gland of one side to that of the other.) This apparently intercalciferous vessel may only represent a pair of branches from a supra-oesophageal trunk, but the latter is totally unrecognizable and in the median plane above the gut there is visible only colourless, transparent tissue with no resemblance to a blood vessel.

From vi-xiii nephridia are in paired, vertically placed clusters flattened against the anterior faces of the septa. In v the cluster on each side is much enlarged and alongside the gizzard, attached only to 5/6 by a short cord from the posterior (dorsal ?) pole. From xv posteriorly the nephridia are not clustered but are attached separately to the posterior faces of the septa. From the point of septal attachment of each tubule an opaque thread on or in the very delicate septum may pass mesially towards the gut. Occasionally these threads appear to run dorsally along the septum close to the intestine. Similar threads may however pass along the septum peripherally. In the posterior-most segments a cluster of nephridia is present on the parietes in region of *ab*. Ducts of some of these tubules apparently pass to and through the septum and to the parietes some distance in front of the septum.

In a sheet of connective tissue that passes from the parietes to the ental end of the prostatic duct there are two opaque, white, thread-like cords that probably are deferent ducts. On the median face of the prostatic duct within a slight gap in the longitudinal musculature there are two small penisetal follicles, the ental ends of the follicles just visible at the level of the coelomic surface of the integument, the two follicles probably separated by a longitudinal strand of tissue. A seta probably from the *a* follicle is about 0·33 mm. long, maximum thickness *ca.* 0·015 mm. Midway between base and tip the setal shaft is widest and at that region with a slight resemblance to a nodulus. Ental to the nodulus the shaft is curved but ectally is nearly straight. Near the ectal end one side is flattened, the opposite side convex and with a trace of a very slight, longitudinally placed groove at the tip. No terminal spine.

The spermathecae are elongately sausage-shaped. A very short portion just prior to entrance into the parietes slightly narrowed, with thick wall and narrow lumen probably is a duct. Attached to the

anterior face of the duct and in contact with the parietes is a flattened, disc-like diverticulum with slightly incised margin. No spermatozoal iridescence is recognizable. On microscopic examination the diverticulum appears to be incompletely separated into two lobes in which there are recognizable four and seven slightly brownish or yellowish (as contrasted to the white diverticular wall) translucent areas of shortly elliptical outline. With high power, striations are recognizable that indicate the presence of spermatozoa—in arborescent masses, the ellipsoidal chambers marked off by ridges or folds from the inner wall of the diverticulum.

In coelomic cavities of the last few segments there are several brown discs.

Remarks.—If spermatozoa are present in the spermathecal diverticula the worm is presumably in a postsexual aclitellate stage. If functional penial setae are discharged after sexual maturity the seta described above may not be fully developed.

As there are no other specimens of this species in the Indian Museum dissection was not completed, in particular the spermathecal and prostatic ducts were not traced through the parietes to the probable sites of the apertures.

Distribution.—Known only from the type locality, Chengannur, Travancore.

Travoscolides? cochinensis (Michaelsen).

1910. *Megascolides cochinensis* Michaelsen, *Abh. Nat. Ver. Hamburg*, XIX (5), pp. 9 and 56. (Type locality Foot of Nelliampathis Hills, Cochin State! Type in Hamburg Museum ?)

1923. *Megascolides cochinensis*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 198.

Remarks.—This species is known only from a " sehr stark erweichtes, im Innern fast mazeriertes Exemplar" Even if the specimen could have been obtained for study, after thirty years of further softening, it is possible if not probable that definite evidence as to the generic status of the species would be unobtainable.

Michaelsen notes that the gizzard is doubtfully in vii, calciferous glands " scheinen zu fehlen", excretory organs are micronephric " im Vorderkörper ", and that the first dorsal pore is on 9/10. Aside from this information of dubious value, there is nothing in the anatomy or distribution to contraindicate generic identity with other species now referred to *Travoscolides*. On the contrary an elongately sausage-shaped main spermathecal axis with little or no external demarcation of duct and ampulla (*vide* pl. fig. 5) at present seems to be characteristic of *Travoscolides* and therefore may be regarded as positive evidence for the generic identification just suggested.

No mention is made by Michaelsen of septa 5/6 and 6/7. If 6/7 were adherent to 7/8 as is actually the case in one of the specimens just examined it would then appear as if the gizzard were just in front of 7/8 for with maceration 5/6, which is membranous and delicate in better preserved specimens, would probably be unrecognizable. In one of the specimens just examined calciferous glands are rather fragile and ruptured even on careful manipulation. In a more advanced stage of

maceration it is possible that jolting incident on the trip from India to Germany would have been sufficient to destroy the glands so as to leave no recognizable evidence of their former presence.

In these circumstances provisional transfer of *cochinensis* to *Travoscolides* does not appear to be unreasonable. The small, unornamented penial setae suggest close relationship to *chengannures*.

Travoscolides duodecimalis (Stephenson).

1915. *Megascolides duodecimalis* Stephenson, *Mem. Ind. Mus.* VI, p. 65. (Type locality Parambikulam, Cochin State, South India. Type in Madras Museum ?)

1923. *Megascolides duodecimalis*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 198.

Remarks.—Apparently distinguished from *chengannures* by the intestinal origin in xvi, and the larger penial setae, from *pilatus* by the paired male porophores, the ornamentation and different shape of tips of the penial setae.

Distribution.—Known only from the type locality, Parambikulam, Cochin.

Travoscolides pilatus (Stephenson).

1915. *Megascolides pilatus*, Stephenson, *Mem. Ind. Mus.* VI, p. 68. (Type locality Parambikulam, Cochin, South India. Type in the Indian Museum.)

1923. *Megascolides pilatus*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 200.

Material examined.—From the Indian Museum : 1 aclitellate dissected specimen labelled, " *Megascolides pilatus* Steph. Type Parambikulam, 1,700-2,300 feet. Cochin State. 16-24.xi.1914. F. H. Gravely. ZEV 6919/7".

External characteristics.—Spermathecal pores are probably on *a* just behind 7/8 and 8/9.

Male pores are unrecognizable but are to be located on a transversely placed area of epidermal thickening (?) extending anteroposteriorly from 17/18 to 18/19 and laterally on each side nearly to *c*, slightly wider posteriorly than anteriorly. Penial setae of the right side are protuberant from the region of *ab* and presumably mark the site of the male pore.

Internal anatomy.—The typhlosole begins about in xxiv, is unrecognizable behind lxiv (at least 85 mm. from hind end) and is low, simply lamelliform. The typhlosole is continued anteriorly from xxiv as a very low white ridge.

No subneural vessel. Parietal nephridia posteriorly, if present, are not recognizable as such. In a strongly contracted specimen in poor condition as in the present worm septal nephridia might be adherent to the parietes with septal connection unrecognizable.

Prostates are juvenile. Seminal vesicles and male funnels not found. Male deferent ducts cannot be traced.

Spermathecae are probably juvenile. The ampulla and duct are of about the same length, the ampulla slightly wider, and distinguished from the duct by the greater width of the lumen. A disc-shaped body on the anterior face of the septum close to the parietes with a stalk that passes through the septum and into the anterior face of the duct ectally is almost certainly a diverticulum though gelatinized so that a structure

is unrecognizable. The diverticulum is practically invisible from the spermathecal side of the septum though readily visible anteriorly.

Remarks.—Until mature and preferably clitellate specimens have been studied the species cannot be satisfactorily characterized. For the present *pilatus* seems to be distinguished from *chengannures* by the unpaired male genital shield, possibly also by the intestinal origin in xvi and by the larger and ornamented penial setae. Further information is necessary as to development of the penial setae and variability in their length, shape and ornamentation before the latter characteristics can be safely used for discriminating between these two species.

Distribution.—Known only from the type locality, Parambikulam, Cochin.

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