

# INDIAN EARTHWORMS.

## II. *SCOLIOSCOLIDES*, GEN. NOV.

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### INTRODUCTION.

On studying the descriptions of the Indian species of *Megascolides*, it was noted that one, *M. bergtheili* Michaelsen 1907, is distinguished from all other Indian species by a combination of characteristics that is also found in the genus *Eutyphoeus*. Examination of the types shows that *bergtheili* actually is marked by a complex of characteristics so distinctive as to necessitate generic separation.

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### **Scolioscolides**, gen. nov.

*Diagnosis.*—Setae lumbricine. Bithecal, spermathecal pores on 7/8. Male pores on xviii. One gizzard in a space formed by the disappearance of septa 6/7—7/8. Calciferous glands, intestinal caeca (both paired and unpaired) and supra-intestinal glands as in *Eutyphoeus*. Last hearts in xiii. Excretory organs (closed exonephric?) micronephridia. Holandric. Prostates tubular. Vasa deferentia pass into the entalmost portion of the prostatic duct. Spermathecal diverticula open into ental portion of the duct.

*Genotype* and only species, *Megascolides bergtheili* Michaelsen 1907.

*Distribution.*—Known only from the type locality. Especially noteworthy is the nearness of that locality to the central portion of the *Eutyphoeus* area.

*Remarks.*—The definition above is tentative and liable to modification if and when other species are found but for the present at least, adequately distinguishes the genus from all other Megascolecid genera.

### SYSTEMATIC RELATIONSHIPS OF *SCOLIOSCOLIDES*.

*Scolioscolides* is remarkably like the genus *Eutyphoeus* and especially certain holandric species of that genus. Similarities are as follows: muscularity of septa 4/5—5/6 and 8/9—10/11, absence of 6/7—7/8, close crowding of 8/9—10/11; location of the hearts of vi-viii with relation

to the gizzard, presence of hearts in xiii; presence of a single, large gizzard, of paired and unpaired intestinal caeca and of characteristic calciferous and supra-intestinal glands with associated modifications of the vascular system; closed, exonephric(?), micronephridial excretory organs; size and location of spermathecal pores and number and structure of spermathecae; tubular prostates. In addition, and in part at least of minor importance, may be mentioned: secondary annulation; paired female pores; the genital markings which are similar to those often found in *Eutyphoeus*; the number and location of the seminal vesicles; and the band of nephridial tubules in iii. Furthermore the median and unpaired, ventral intestinal caeca are known only from *Scolioscolides* and *Eutyphoeus*.

In contrast to the list above, a statement of differences between *Scolioscolides* and a considerable portion of the holandric section of *Eutyphoeus* comprises only the following: absence of penial setae, rudimentary condition of the typhlosole, location of the male pores on xviii, ental union of the vasa deferentia and the prostatic duct to open to the exterior by a common aperture. Of these, only the latter two now appear to be of especial importance.

*Scolioscolides* is Megascolecine (Stephenson 1930) or Megascolecid (Michaelsen 1921). *Eutyphoeus* is equally clearly Octochaetine (Stephenson 1930) or Acanthodrilid (Michaelsen 1921). But *Eutyphoeus* and *Scolioscolides*, if morphological similarity is valid evidence of relationship and if the extent of that similarity is an index of the closeness of relationship, are much more closely related to each other than either is to any other known genus. Transfer of either genus to the other subfamily or family will force the elimination from the definition of the subfamily or family of just those characteristics that alone distinguish it from the other subfamily or family. Union of the two subfamilies (or families) is undesirable as the group so produced cannot be defined morphologically.

Convergence, an explanation that might have been acceptable to Stephenson, permits the retention of the two genera within the Octochaetinae and Megascolecinae (or Acanthodrilidae and Megascolecidae) without modification of present definitions. But such retention is possible only by abandoning, almost entirely, morphological similarity in favour of hypothetical phyletic seriation as a basis for classification.

Recent classifications (Michaelsen 1921 and Stephenson 1930) have been marked by limitation of reference, especially in generic diagnoses, to a few organs, structures or characteristics, and with more attention to, and greater emphasis on, phyletic seriation than morphological similarity. Such procedures have produced families and genera admittedly polyphyletic or under suspicion of polyphyly; groups in which morphologically dissimilar forms are closely related while morphologically similar groups are only distantly related; in one case at least, a generic definition that "is so indefinite as to be meaningless" (Stephenson, 1930, p. 867); and have led Stephenson (1921) to argue for morphologically identical though phylogenetically distinct genera. In these circumstances, as might be expected, some of the family and (or) subfamily definitions are little more than statements of assumed evolutionary development.

Thus the only morphological distinction between the subfamilies *Megascolecinae* and *Octochaetinae* (Stephenson, 1930) is the union of the male and prostatic apertures in the former and the lack of such union in the latter, a characteristic that has been denied even generic value at times by both Stephenson and Michaelsen.

This discussion will be continued and also concluded, for the present, in the section on phylogenetic relationships of the next article in this series, "Indian earthworms. III. The genus *Eutyphoeus*."

### ***Scolioscolides bergtheili* (Michaelsen).**

1907. *Megascolides bergtheili*, Michaelsen, *Mitt. Mus. Hamburg*, XXIV, p. 150. (Type locality, Sandakphu in Darjiling district, Eastern Himalayas. Types in the Indian and Hamburg Museums).
1909. *Megascolides bergtheili*, Michaelsen, *Mem. Ind. Mus.* I, p. 159.
1910. *Megascolides bergtheili*, Michaelsen, *Abh. Nat. Ver. Hamburg*, XIX, (5), p. 9.
1916. *Megascolides bergtheili*, Michaelsen, *Mjöberg's Austral. Exp.* p. 48. (Prostates).
1923. *Megascolides bergtheili*, Stephenson, *Oligochaeta*, in *F. B. I. Series*, p. 196.

*Material examined.*—From the Indian Museum; 2 clitellate, undissected specimens labelled, "*Megascolides bergtheili* Michaelsen. Sandakphu, B. Sikkim. Messrs. Bergtheil and Burkill. Types. ZEV 2951/7." One of the specimens is ruptured in a postclitellar region.

*Not examined.*—3 specimens from the type series in the Hamburg Museum.

*External characteristics.*—There is a well developed secondary annulation similar to that found in species of *Eutyphoeus* and *Tonoscolex*. On iv there is a single, deep, postsetal secondary furrow; on v, a slight presetal and a deep postsetal furrow; on vi, a slight presetal, a deep postsetal and a slight postsetal; on vii, as on vi; on viii, a slight presetal, a deep presetal, a deep postsetal and a slight postsetal; on ix, a slight presetal, a deep presetal and two slight postsetal furrows; on x, a deep presetal, a deep postsetal, a slight postsetal; on xi and xii, a deep presetal and a deep postsetal (listed in anteroposterior order).

The setae begin on ii and are small. On x,  $ab < cd < aa < bc$  while on xxii  $ab < cd < bc$  but  $bc$  is only very slightly greater than  $cd$ , while  $ab$  and  $cd$  are nearly equal; at the middle of the body  $cd$  is very slightly smaller than  $bc$  which is smaller than  $aa$ . Setae  $a$  and  $b$  of xviii are lacking or invisible.

The first dorsal pore is on 11/12 (2), a pore-like but apparently non-functional marking on 10/11 (one specimen).

The clitellum is reddish brown, conspicuously protuberant (except on xiii), extending from 12/13 to 17/18 and possibly very slightly onto xviii. Intersegmental furrows and dorsal pores (except on 12/13 and 17/18) are lacking but the sites of the pores are indicated by tiny depressions, setae present but deeply retracted, the tips visible only as minute black dots at the bottom of tiny crater-like depressions.

The spermathecal apertures are on 7/8, in  $ab$ , slightly median to  $b$ .

There is a pair of female pores anteriorly on xiv, each just anterior and median to  $a$ , the pores located in paired or unpaired transversely slit-like depressions.

The male pores are small, transversely crescentic, the concave side of the crescent facing anteriorly, the centre about on line *b*, each pore on the ventral face of a slightly protuberant, almost circular, rather soft papilla, the anterior half of which is very slightly more protuberant than the posterior half, the papilla in *ab* but extending slightly median to or nearly to *a* and laterally into *bc*. Each tubercle is surrounded by a thick, conspicuously raised rim that is sharply demarcated peripherally and separated from the male pore tubercle by a narrow but fairly deep groove. As a result of the presence of this groove the male pore tubercle has a rather shortly penis-like appearance. Rim and tubercle together constitute a porophore that is shortly elliptical in outline, transversely placed, extending mesially nearly to the mid-ventral line, laterally nearly to mid *bc*, anteriorly to the presetal secondary furrow and posteriorly to 18/19. The porophores are connected mid-ventrally by a low, wrinkled ridge that is restricted to the middle (setal) annulus of xviii.

The genital markings are unpaired and segmental, on xii, xiii, xx, a half-marking on xxi on the left side. The markings extend anteriorly to the intersegmental furrow, posteriorly to the postsetal secondary annulus or to or nearly to the intersegmental furrow, setae *a* and *b* on the marking and always nearer to or actually on the posterior margin. The markings extend laterally into the median portion of *bc*. Each marking has a sharply demarcated, conspicuously protuberant, narrow rim. The area within the rim appears to be depressed but actually is about at the general epidermal level, the surface smooth and flat. This central portion has a greyish translucent appearance, with a faint indication at the mid-ventral line of being marked off into two distinct portions. The marking of xxi is on the left side but extends mesially slightly onto the right side. On the second specimen the markings are on xi, xii, xiii and xx. The marking of xi has the anterior and posterior portions of the rim united at the mid-ventral line to separate completely two central areas.

*Internal anatomy.*—Septa 4/5—5/6 are thickly muscular, 6/7—7/8 lacking; 8/9—10/11 muscular and fairly close together behind the gizzard; 11/12 delicate and transparent but apparently complete. The last five segments are filled with a brownish, granular material in which are embedded parasitic cysts.

The gizzard is large, in the space between 5/6 and 8/9. The intestine begins in xv (2). The calciferous glands are in xii and are of the *Eutyphoeus* type. More than 50 vertical partitions were counted in one gland. The intestinal caeca are in xxi, pointed, small but quite definite, arising from the dorsal side of the gut and directed dorsally, except that in the second specimen the left caecum though rising dorsally is bent anteriorly. There are five mid-ventral, unpaired intestinal caeca, in xxiv-xxviii. Each of these caeca is fairly large, about 1 mm. long, with pointed tip, gradually widened passing posteriorly and dorsally to the gut. The apertures into these caeca on the floor of the gut are oval, large and readily visible, a viscid slime in which are flocculent brownish particles passing through the aperture into the caecal lumina. The typhlosole is represented only by a low ridge that terminates posteriorly with the supra-intestinal glands. The supra-intestinal glands are two pairs located either in lix-lx or lx-lxi the anterior pair less than half the

size of the posterior. These glands have an internal structure and attachment to the gut similar to that in *Eutyphoeus*.

The last pair of hearts is in xiii (2). There is a pair of hearts in each of segments ix-xii. Posterior to the gizzard and just in front of 8/9 the dorsal blood vessel gives off two pairs of vessels (hearts of vii and viii) which pass ventrally and (apparently) into the ventral trunk. These commissures are not filled with blood, are covered by a furry sort of tissue and in addition are bound to the ventrolateral trunks near the ventral blood vessel by tough, opaque connective tissue. The dorsal blood vessel is continued anteriorly into iv. Just anterior to the gizzard the dorsal blood vessel gives off a pair of vessels (hearts of vi) which pass ventrally and possibly into the ventral trunk though this connection has not been identified definitely. Heart-like commissures are visible in iv and v. The ventrolateral trunks were noted only in vi-viii. In xii-xiii a supra-oesophageal trunk is present (second specimen). This vessel bifurcates in xii, each of the two branches passing laterally at right angles to the trunk and at the margin of the gut breaking up into three branches which pass into the gut wall. Posteriorly the supra-oesophageal is not visible behind 13/14 and in xiii gives off on each side several branches to the dorsal face of the gut. From segment lxi or lxii posteriorly for several segments there is protuberant into the lumen of the gut from the floor at the midventral line a conspicuous, blood-filled longitudinal vessel. Anteriorly this vessel divides into two branches that are visible on the coelomic wall of the gut as they pass dorsally in lx or lxi into the supra-intestinal gland of the segment. No subneural has been found in the posterior portion of the body.

In iii, on each side, there is a transversely placed band of nephridial tubules on the parietes. The excretory organs are micronephridia. From xii posteriorly there is usually a nephridium on each side just dorsal to *d*, another in, just dorsal or ventral to line *c*, and several closely crowded in the median portion of *bc*. In the posteriormost 60 segments the median nephridium on each side in each segment is quite obviously larger than the other nephridia but just as obviously is a micronephridium.

The testicular coagulum in each of segments x and xi is compacted into a hard mass; that in x U-shaped, that in xi annular and completely surrounding the gut. The mass in xi very much resembles a testis sac such as is found in certain species of *Eutyphoeus* but it was not possible to separate off from the testicular coagulum anything in the way of a bounding membrane although such may have been present. The hearts of xi are imbedded at least in part in the coagulum but slip out on slight manipulation leaving a definite groove. The male funnels are characterized by a brilliant iridescence. The seminal vesicles of xii are medium sized, not reaching up to the dorsal blood vessel but pushing 12/13—13/14 back into contact with 14/15. Each of these vesicles is tough, the margin incised. The vesicles of ix are vertically placed on the anterior face of 9/10.

The prostates are confined to xviii-xix, tubular, the lumen small, slit-like, central or nearly so. The duct is about  $1\frac{3}{4}$  mm. long, whitish, with a slight sheen, the ectal 1 mm. slightly thicker and straight, the

ental portion looped. The vasa deferentia pass into the duct shortly after the latter emerges from the prostatic gland.

The spermathecal duct is shorter than the ampulla, not abruptly narrowed within the parietes, rather flattened antero-posteriorly, the relatively large lumen irregular due to a vertical ridging of the wall. The diverticula which pass into the duct on the right and left sides are practically sessile and are characterized by a spermatozoal iridescence. Each diverticulum is shortly ellipsoidal or more or less definitely marked off into two or three lobes.

The longitudinal musculature is uninterrupted above the genital markings.

*Remarks.*—The diagnosis, admittedly tentative, is similar in form to that developed in course of a revision of the Indian species of *Eutyphoeus*.

*Diagnosis.*—Male pores small, transversely crescentic, centres about on *b*, each pore on the ventral face of a small, rather penis-like papilla at the centre of a porophore of transversely and shortly elliptical outline that extends from the presetal secondary furrow to 18/19 and from just lateral to the mid-ventral line into mid *bc*. Genital markings unpaired, on (xi) xii-xiii, xx (xxi), primarily presetal(?) but extending posteriorly to or nearly to the intersegmental furrow and laterally into mid *bc*. Female pores paired. Spermathecal pores in *ab*. First dorsal pore on 11/12. Unpigmented(?). Length 100-120 mm. Diameter  $4\frac{1}{2}$ -5 mm.

Lateral intestinal caeca in xxi; ventral caeca in xxiv-xxviii. Supra-intestinal glands in lix or lx to lx or lxi. Dorsal blood vessel continued into iii with hearts in iv-vi. Holandric; testis sac annular(?). Spermathecal diverticula paired, median and lateral. Longitudinal musculature uninterrupted above the genital markings.

*Distribution.*—Known only from the type locality, Sandakphu, Darjiling district, Bengal.

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