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Studies on spirostreptoid millipeds. XIII. *Adiaphorostreptus*, a remarkable new genus from India, type of a new family in the Spirostreptoidea[1])

by Richard L. Hoffman[2])

(With 6 figures)

In his well-known monograph on the Diplopoda of India, Attems (1936) set up a new genus *Leptostreptus* to accomodate two small new harpagophorid species from Ceylon and the west coast of India.

Actually, these species seemed to have very little in common aside their small size and presence of ozopores on the 5th segment, most of the other generic characters cited by Attems being more or less common to many herpagophorid groups. The heterogeneity of *Leptostreptus* was emphasized in 1941 by the Swiss specialist J. Carl, who added another new species from Ceylon with the comment „Während die nahe Verwandtschaft der beiden ceylonischen Arten *L. fuscus* and *L. caudatus* durch den Gonopodenbau genügend erwiesen scheint, ist bei der dritten Art, *L. leviventer* Att., vom kontinentalen Indien (Bombay Presidency), der Bau der Gonopoden im Coxit und Telopodit recht abweichend. *L. leviventer* wird offenbar nähere Verwandte und besser begründete Gattungsgemeinschaft unter noch unbekannten indischen Harpagophoriden finden."

Some years ago, on becoming interested in the Harpagophoridae, I was likewise impressed by the anatomical disjunctions indicated by Attems' figures for *leviventer*, and in fact considered some of them to be so improbable as to suggest errors of observation or malformations occurring during preparation. However, in April 1975 it was my good fortune to discover fresh material of this species in the collection of the Hamburg Zoological Museum, and to be able to verify the accuracy of Attems' illustrations.

It became abundantly obvious, also, that the mere removal of *leviventer* to a separate genus of its own does not adequately reflect the really disjunct nature of the species, and it is my conviction that it can not be referred to either the Spirostreptidae or Harpagophoridae.

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[2]) Address of the author: Prof. Dr. Richard L. Hoffman, Radford College, Radford, Virginia 24142, U.S.A.

Indeed, many of the characters of this singular animal suggest the possibility that it may represent a grade of organization that may have existed prior to the time of divergence of the two families just named, rather than merely being a specialized small harpagophorid with reductive tendencies in several character-systems.

Adiaphorostreptus n. gen.
(Gk. *adiaphoros*, neutral, indifferent + *streptus*)

Diagnosis: Small species with long, distally clavate antennae; unmodified collum; no sigilla; mentum of gnathochilarium in close contact with praebasilare plate; mandible of ♂ with prominent triangular lobe; 1st pair of legs of ♂ with coxae suturate from each other and from sternum, latter relatively large, prefemora without projecting basal lobe; anterior legs of ♂ with postfemoral and tibial pads; stigmata small, triangular. — Gonopods with enormous, well-sclerotized sternum, widely separating coxae and extending behind them; paracoxites absent, telopodite articulating only with tracheal apodeme; telopodite simple, without torsion, emerging on posterior side of coxal folds but recurved cephalad between coxae; no separate solenomerite formed, prostatic groove extending out into a large laminate distal plate with a fringed edge.

Type species: *Leptostreptus leviventer* Attems, 1936, from India.

Distribution: So far this species (and genus) is known only from the vicinity of Bombay, on the northwestern coast of India.

Adiaphorostreptus leviventer (Attems) comb. nov. (Figs. 1—6)

Leptostreptus leviventer Attems, 1936, Mem. Indian Mus., **11**: 293, figs.
Carl, 1941, Rev. Suisse Zool., **48**: 647—648.

Previous record: „Peninsular India, Bombay Presidency, Matheran near Bombay" (Attems, 1936, the type locality).

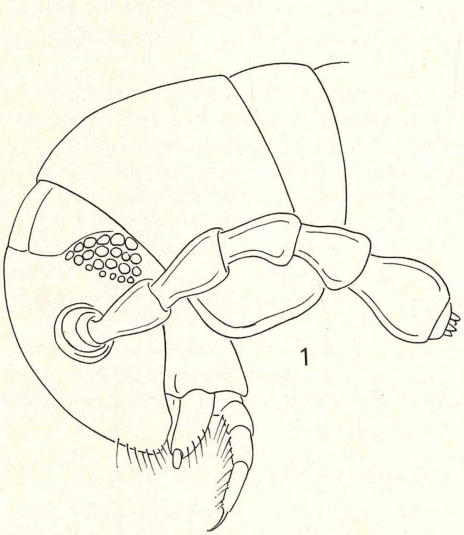
Material examined: ♂ & ♀, Alibag, ± 20 km S of Bombay, 29 November 1955, G. A. von Maydell leg. [Z.M.H.].

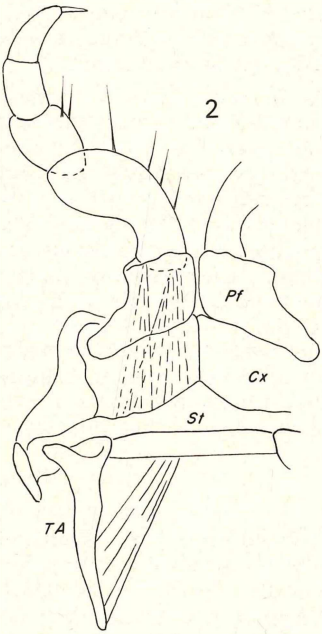
Remarks: Externally these specimens agree closely with the original description given by Attems. I give here an illustration (Fig. 1) of the head, antenna, and first two body segments seen from the left side, to show the enlarged and angular form of the mandibular process and the long, distally clavate antenna. The collum is of similar form in both sexes, laterally truncate with only a thin marginal groove.

Attems' figure of the 1st pair of legs is not entirely adequate. My Fig. 2 is made from a glycerin preparation and shows somewhat more detail. In particular, it is to be noted that the coxae are medially suturate and large in size, both are clearly separated from the narrow, transverse sternum, unlike the condition in any of the harpagophorids known to me. The prefemora are transversely elongated basally, but the lateral prolongation is not a projecting lobe and its proximal edge is continuous with the surface of the coxa.

The gonopod structure is correctly shown by ATTEMS, except that his Fig 82 b shows the ends of the sternum to be connected to the base of the telopodite, which I could definitely find not to be the case. Actually the most remarkable anatomical feature of this species is the absence of the usual spirostreptoid paracoxites, to which the basalmost end of the telopodite normally attaches. Here only the tracheal apodeme (TA) is present. The large lateral muscle shown in Fig. 5, extending from basal corner of outer coxal fold to end of tracheal apodeme, presumably is the muscle *tc* g_1 in the system of DEMANGE (1967). Regrettably most of the other gonopodal musculature was damaged during dissection, and a complete study based on fresh material remains a very high desideratum.

The median sternal element is larger in this species than in any other spirostreptoid known to me, extending back between the coxae and readily visible b e h i n d them in lateral aspect (Fig. 5). In most spirostreptids and harpagophorids the sternum is reduced in size and confined to the anterior basal region of the coxae. In *Adiaphorostreptus* the posterior edge of the sternum is the point of attachment for large muscles originating at the ends of the tracheal apodemes.





Adiaphorostreptus leviventer (ATTEMS). Fig. 1: Lateral aspect of head and first two body segments. — Fig. 2: Sternum and first pair of legs of male, anterior aspect. Abbreviations: Cx, coxa; Pf, prefemur; St, sternum; TA, tracheal apodeme.

The anterior (medial) coxal fold (Fig. 3, MC) overlaps only very slightly on the lateral fold in front, the gonocoel thus is virtually open on the anterior side for most of its length. Nonetheless, the telopodite emerges in a posterior direction, whereupon it immediately describes an even semicircle mediad and cephalad, and extends forward between the coxae (unique for the spirostreptoids). There is a small, straight, 'femoral' spine, but no trace anywhere of torsion, a primitive character for this order. Distally the telopodite is divided into two laminate processes of unequal size, the larger medial process bearing the termination of the prostatic groove (Fig. 6).

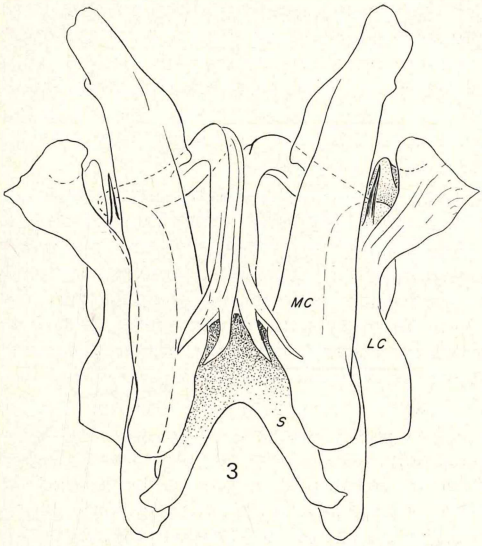
ATTEMS did not illustrate the gnathochilarium of *leviventer*. In general form it agrees closely with the usual harpagophorid pattern except that all of the individual sclerites are in close contact. In the harpagophorids known to me (about seven genera examined) there is a transverse, unsclerotized zone between base of mentum and praebasilare, most conspicuous in males. In this respect, the gnathochilarium is more similar to that of spirostreptids.

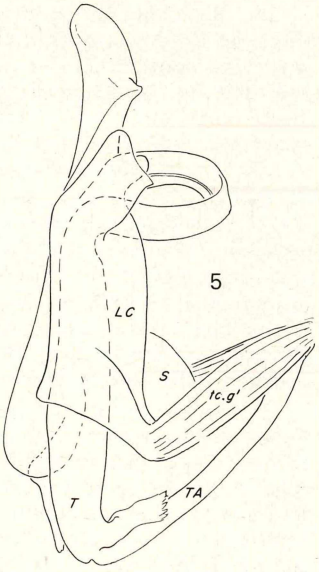
T a x o n o m i c p o s i t i o n. — It may be deemed reckless to speculate on the systematic status of a species known from so little material, and even that not completely studied. Yet the species at hand differs in so many important ways from typical members of the family to which, geographically, it should be assumed to belong, that its claims to attention may not be overlooked.

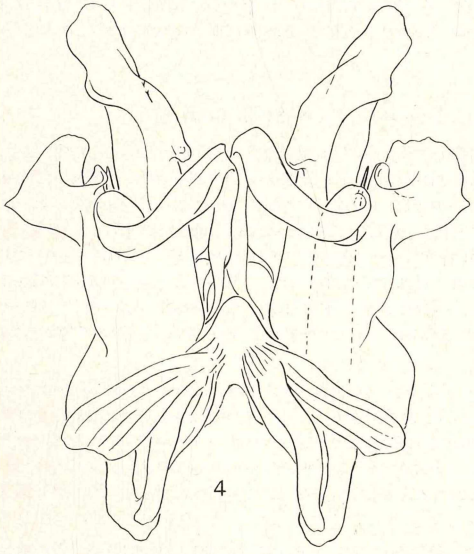
In some respects *Adiaphorostreptus leviventer* appears more like a spirostreptid than a harpagophorid, in others it seems to have characters not shared with either group. It is difficult to determine whether, for instance, the rather simplified gonopods and prefemora of the 1st male legs represent reduction through specialization, or a pristine state prior to elaboration. The combination of so many such characters leads me to a preference for the second alternative. Obviously a large number of other small spirostreptoids must remain to be discovered on the Indian peninsula, and this probability imposes some jeopardy upon the arrangement I wish to suggest here as their characters may highly modify or discredit the present arrangement. Yet a start must be made, and if for no other reason than to compel the attention of other specialists, I propose for *Adiaphorostreptus* a hierarchial position not inferior to that presently enjoyed by the spirostreptids and harpagophorids.

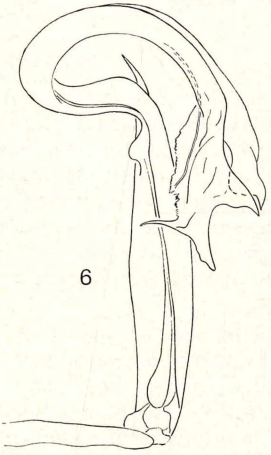
S u b o r d e r S p i r o s t r e p t i d e a

In terms of the latest classification of these forms, this suborder is divided into two superfamilies of supposedly coordinate evolutionary status (Schwester-Gruppen): Spirostreptidae (Ethiopian and Neotropical Regions) and Harpagophoridae (Ethiopian and Oriental Regions). The original distinctions between them announced by ATTEMS (1909) have become somewhat blurred in recent decades with the discovery of some genera in both families which partly contravert the definitions as based on presence or absence of specialized setae at end of the prostatic canal and on the form of the coxal folds.









Adiaphorostreptus leviventer (Attems). Fig. 3: Gonopods, anterior aspect. — Fig. 4: Gonopods, posterior aspect. — Fig. 5: Lateral aspect of gonopods from right side. — Fig. 6: Telopodite and part of tracheal apodeme, medial aspect. Abbreviations: LC, lateral coxal fold; MC, median coxal fold; S, sternum; T, telopodite; TA, tracheal apodeme; tc. g_1, tracheocoxal retractor muscle.

In addition, there are two African genera (*Obelostreptus* and *Camaricoproctus*) which, in overall appearance of the gonopod structure, might be considered as intermediate between the two or, in fact, even referable to the Harpagophoridae as well as to the Spirostreptidae in which both have been traditionally placed. In my view, the traditional characters distinguishing these two families are no longer adequate and should be supplemented or replaced if at all possible.

The coordinate superfamily Odontopygoidea was established by KRAUS (1966) to accomodate the families Odontopygidae and Omopygidae, the first with 39 genera and more than 350 species, the second with one genus and three species. Within the Odontopygidae there is enormous variability in gonopod structure, from extremely simple in *Atopogestus* and *Archepyge* to the highly complex form typical of the more specialized genera, and the pattern of the former category (with non-torsate telopodite) invites comparison with that of *Adiaphorostreptus*.

If it be argued in the light of modern tectonic theory that much of the fauna of peninsular India was originally derived from the region of modern South Africa (reflected amongst diplopods by the distribution of sphaerotheriids and pachybolids, for example), some credence may be found for the present opinion that *Adiaphorostreptus* may to some degree represent the survival of a lineage ancestral to „typical" spirostreptids and harpagophorids.

In any event, the characters of this unusual genus taken e n s u i t e are certainly as fundamental as those relied upon to separate the other two families mentioned.

A d i a p h o r o s t r e p t i d a e fam. nov.

Small, presumably primitive spirostreptoids, with the following characters: antennae long and slender, distally clavate, in both sexes; collum simple and unmodified, with only a thin marginal ridge; basal segment of mandible with a large, acute triangular projection in the ♂ sex; ozopores beginning on the 5th segment; segmental suture sharply defined, punctate dorsally; no sigilla present; limbus not modified; epiproct blunt; sterna smooth, without striation, stigmal grooves short and triangular; postfemora and tibiae of anterior legs of ♂ with ventral pads.

First legs of male with most of the components distinct and separated by sutures; sternum relatively broad, medially triangular; coxae large and completely separated at the midline; prefemora somewhat transverse basally but without projecting proximal processes engaging praebasilare of gnathochilarium; base of tracheal apodeme not completely fused with sternum.

Gonopods with enormously large, well-sclerotized sternum located between coxae and widely separating them instead of placed in front of coxal bases; coxal folds simple, no trace of paracoxite evident, telopodite articulating solely with tracheal apodeme. Gonocoel almost open anteriorly, but telopodite emerges posteriorly and recurves around

to the front between the coxal folds, without trace of torsion; no true solenomerite present, the prostatic groove ending near the edge of a flat marginally fimbriate lamina.

Type and only referred genus: *Adiaphorostreptus* gen. n. (Peninsular India).

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