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STUDIES ON SPIROSTREPTOID MILLIPEDS. XVII. A THIRD CONTRIBUTION TO THE KNOWLEDGE OF THE GENUS *UROSTREPTUS SILVESTRI*, 1897¹

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ABSTRACT

The new species Urostreptus auritus (Brasil) and U. fallax (French Guiana) are described. New drawings of gonopod structure are given for the species U. paxillatus Hoffman, U. carvalhoi (Schubart), and U. travassosi (Schubart), from type material. A revised key to 13 species of the genus is presented, along with commentary on the status of several poorly-known forms, and speculation on relationships of some species. U. fallax provides the first record for this genus north of the Amazon Valley and suggests the occurrence of other species in the Guyana highlands.

The endemic South American milliped genus *Urostreptus*, which for decades suffered both nomenclatorial obscurity and taxonomic confusion, was the subject of a preliminary revision a decade past (Hoffman, 1968) with additional remarks being published by the same author (1974) and by J.-P. Mauriès (1976). The 13 currently recognized species range from central Argentina to French Guiana, and exhibit considerable structural variability; it seems likely that a partition of the genus may be found desirable at some future time.

Among Brazilian diplopods examined for nematode parasites by Dra. G. R. Kloss and sent to me for identification in 1963 were two species referable to *Urostreptus*. One was described as *U. paxillatus* in my 1968 paper, the other was unfortunately mixed in with material of Rhinocricidae and overlooked until recently. Additionally, the opportunity to examine material of several named species has resulted in the clarification of their status, and the accumulated information now at hand appears to justify a third contribution toward the knowledge of this interesting group of millipeds.

I should like at this point to express my appreciation to several colleagues who have made the pertinent specimens available: Mrs. Lícia Maria Neme (Museu de Zoologia, Universidade de São Paulo), Dr. John Ketheley (Field Museum of Natural History, Chicago), and M. J.-P. Mauriès (Muséum National d'Histoire Naturelle. Paris).

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Urostreptus Silvestri, 1897

- Urostreptus* Silvestri, 1897: 651; Hoffman, 1968: 68. Monobasic. Type species, *Archispirostreptus camerani* Silvestri, 1895, by original designation.
- Stenostreptus* Carl, 1917: 405. Proposed for four species, one of them new. Type species, *Stenostreptus hassleri* Carl, 1917, by subsequent designation of Hoffman, 1968 [but see commentary in a subsequent paragraph].
- Perizonopus* Verhoeff, 1941: 280, 290. Monobasic with a new species. Type species, *P. montanus* Verhoeff, by monotypy.
- Orthogoneptus* Chamberlin, 1941: 481. Proposed with two new species. Type species, *O. mineri* Chamberlin, by original designation.
- Alogostreptus* Attems, 1950: 201. Monobasic with a new species. Type species, *A. nattereri* Attems, by monotypy and original designation.
- Exospermastix* Verhoeff, 1951: 41. Monobasic with a new species. Type species, *E. robustus* Verhoeff, by monotypy.
- Urostreptus*: Hoffman, 1968: 68 et seq.; Hoffman, 1974: 78; Mauriès, 1976: 1259.

Diagnosis: epiproct with a prominent median carina. Postfemora and tibiae with ventral pads on most or all of the legs in the male sex. Coxae of posterior legpair of each segment enlarged, apically flattened and tricuspidate. Gonocoxae extended beyond exertion of telopodite, forming a distal cavity (metagonocoel); telopodites emerge toward median side, then curve proximo-laterad, torsate through two to four complete turns; femoral process moderate to large in size, originating within gonocoel. Telopodite simple, slender, unbranched, with a small subapical enlargement or modification. Coxae of 1st pair of legs of males with a row of five to twelve macrosetae along dorsal edge adjacent to base of sternal apodeme. Prefemora with only rudimentary process on the anterior side.

Distribution: the interior of South America, from central Argentina (Córdoba) north through the Paraná and Amazon basins as far as northeastern Peru (Loreto) and French Guiana. The majority of known species occur in Brasil. Known localities are shown on the map, Fig. 13.

Remarks: I have previously (1968: 69) noted some ambiguity about the typification of the name *Stenostreptus*, that in addition to the newly described *S. hassleri*, Carl implied that three species named by Silvestri also belonged to the genus: "Plusieurs espèces de l'Argentine et du Paraguay décrites par Silvestri (Boll. Mus. Zool. Torino, X, no. 203, p. 9, 1895), semblent appartenir également à notre nouveau genre", and then referred to *Archispirostreptus borellii*, *A. camerani*, and *A. compressicauda*. In my view, these remarks are sufficient to show Carl's intent to include the three Silvestrian species in the original context of *Stenostreptus*, and for this reason I designated *hassleri* as logotype of the genus in my 1968 paper.

In the same paper, I expressed reservations about the status of *Archispirostreptus borellii* Silvestri, 1895, not even being sure it was congeneric with the others. Subsequently I found material (U. S. Nat. Mus.) identified as *borellii* by Silvestri (who incorrectly labeled them as "paratypi") and illustrated the gonopod structure in a later note (1974). My colleague J.-P. Mauriès (1976: 1259) has likewise discussed and illustrated material (Lab. Ent. Portici) with the same background as that which I examined (coming from Formosa, Argentina), his figure 1 corresponding almost exactly with figure 5 of my 1974 paper which was made from the lectotype of *hassleri*. There can be no doubt whatever that the populations at Formosa and at San Bernardino, Paraguay, are conspecific, but the point which neither M. Mauriès nor myself settled is, what are the gonopod characters of *borellii* in the strict sense, i.e., from its type locality? The name was based upon material from Tucumán, Argentina, 600 km to the west of the *hassleri* populations, and until strictly topotypical specimens can be studied, there is no justification for considering the two names as synonyms.

Although several additional forms have been added to the genus beyond those treated in my 1968 synopsis, there has been little improvement in the possibility of defining species groups. In only a few cases is it possible to see clearcut lines of affinity, a situation perhaps reflecting considerable antiquity for the genus, as well as the obvious limitation of inadequate collecting throughout most of its known range.

The three taxa *tampiitauensis*, *paxillatus*, and *auritus* appear to be closely related and occupy a discrete geographic area in Mato Grosso. A second group is composed of *carvalhoi* and *fallax*, and a third, *cultratus* and *mundurucensis*. Beyond these, most species appear to be structurally isolated and not easy to relate to each other.

Species: 13 nominal species are now referred to this genus, some of them still of uncertain status. I provide here a revised key to replace that published in my 1968 synopsis.

Key to the species of *Urostreptus*

1. Lateral surface of telocoxite, just proximad to opening of gonocoel, with a digitiform paxillus, about which the femoral process describes a complete tight loop (Figs. 5, 6, P)2
 Telocoxite without a paxillus5
2. Large species, length to 120 mm; telopodite of gonopod torsate through four complete turns; telocoxite apically flattened and simple*robustus* (Verhoeff)
 Moderate-sized species, length to about 90 mm; telopodite of gonopod torsate 2 1/2 to 3 complete turns; telocoxite apically concave and/or lobed3
3. Apical half of telocoxite rotated medially so that the metagonocoel opens on the medial side; femoral process short, its apex not much removed from vicinity of paxillus *tampiitauensis* (Schubart)
 Femoral process long, running distad more or less parallel to course of telopodite; apical half of telocoxite less rotated, the metagonocoel thus opening anteriorly (Fig. 6)4
4. Distal half of femoral process curved in between telopodite and side of coxal fold (Fig. 4); posterior coxal fold prominently lobed medially (Fig. 6); basal row of setae of 1st pair of legs weak and inconspicuous, prefemur relatively short (Fig. 2) *auritus*, sp. n.
 Distal half of femoral process running posterior to telopodite, not confined by it (Fig. 5); posterior fold of telocoxite not laminately expanded mesad (Fig. 5); setae of basal series of 1st pair of legs robust and conspicuous, prefemur relatively long (Fig. 3) *paxillatus* Hoffman
5. Apex of telocoxite bent mesad and turned caudad, the metagonocoel therefore opening on the aboral side and visible only from that direction; femoral process of telopodite long and slender, basally forming a complete loop around torsate region of postfemur; anterior side of telocoxite with a distinct secondary oblique ridge (Fig. 8, 9, CF)6
 Apex of telocoxite not strongly bent mesad nor curved caudad, the metagonocoel opening at most mesally, usually anteromesally so it is visible from the oral side; anterior side of coxite usually without secondary oblique fold or ridge; femoral process usually short and C-shaped, if longer then not forming a loop around base of postfemoral region7

6. Telocoxite as in Fig. 8, setose region of inner paragonocoel not bowed inward; apical region relatively narrow, its anterior surface convex and pustulose *carvalhoi* (Schubart)
 Telocoxite as in Fig. 9, setose region of inner paragonocoel strongly convex; apical region broader and flatter, surface not pustulose *fallax*, sp.n.
7. Body with 55 to 60 segments; femoral process of telopodite short forming a "C" or "J" shaped branch *camerani* (Silvestri)
 Body with 48 to 52 segments; femoral process variable in size 8
8. Femoral process short, less than half length of exospermite, bent into an arc or loose coil 9
 Femoral process longer, at least half as long as exospermite, usually looped or coiled at its base and often distally curling around lateral side of telocoxite 10
9. Telocoxite distally broadened, with a prominent lateral projection and a retrorse median lobe; paragonocoel distally produced into an angular lobe overlapping torsate region of telopodite *cultratus* (Humbert & DeSaussure)
 Telocoxite only slightly broadened distally, the profile evenly rounded and lacking lateral or median lobes; paragonocoel without the large distal lobe of the preceding species, and much less bent medially so that the gonocoel is partly open on anterior side *mineri* (Chamberlin)
10. Telocoxite broadened distally, suggesting that of *U. cultratus*, but the median and lateral lobes are continuous as a transverse ridge; lobe at base of gonocoel very large and projecting *mundurucensis* (Schubart)
 Telocoxite not or but slightly enlarged distally, usually forming a tapering, hood-like closure of the metagonocoel 11
11. Small species, length 50 mm or less, body diameter 4.0 mm or less; telocoxite not produced medially as a subtriangular process *?borellii* (Silvestri) and *hassleri* (Carl)
 Larger species, length more than 50 mm, diameter greater than 4.0 mm, telocoxite, apically produced a medially directed subtriangular projection (Fig. 11) *travassosi* (Schubart)

***Urostreptus auritus*, sp. n.**

(Figs. 1, 2, 4, 6, 7)

Type specimen: male holotype (MZUSP) from Chapada dos Guimarães [15.26 S, 55.45 W], Mato Grosso, Brasil, 16-25 November 1963 (M. Alvarenga, S. J. de Oliveira, W. Bokermann).

Diagnosis. A member of the group of species in which the femoral process of the gonopod forms a loop around a paxillus on the base of the parametagonocoel; differing from the other known forms of the group by the characters cited in the foregoing key, particularly the prominent mesal distal lobe of the inner paragonocoel.

Holotype: adult male with 55 segments; length about 80 mm (specimen broken into pieces); average diameter 6.4 mm. Body segments basically dark slate gray, prozona light gray, posterior edge of metazona narrowly ferruginous-reddish; legs, labrum, and antennae reddish-orange.

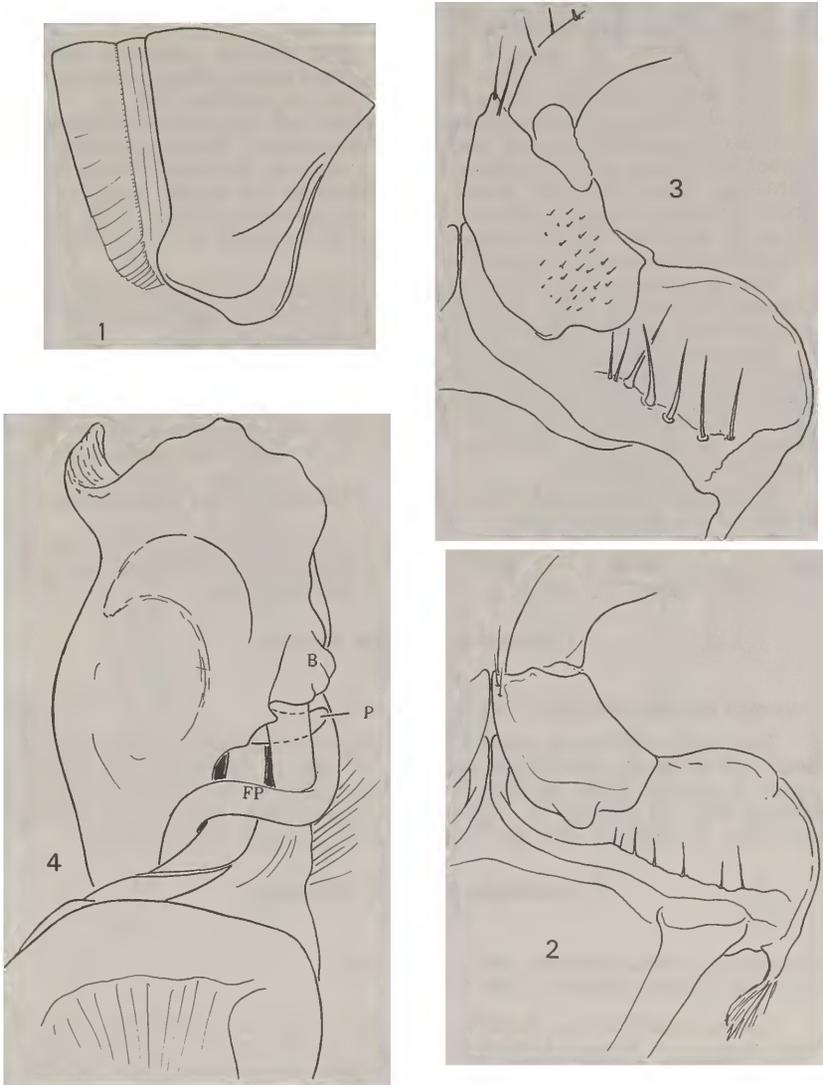


Fig. 1. *Urostreptus auritus*, sp. n., right side of collum, from holotype; fig. 2, *U. auritus*, left side of 1st pair of legs of holotype, oral aspect; fig. 3, *U. paxillatus* Hoffman, left side of first pair of legs of male, from paratype; fig. 4, *U. auritus*, left gonopod of holotype, lateral aspect. (Fig. 1 drawn x 15, the others x 45.)

Structural details agreeing very closely with those described for *U. paxillatus*, with the following exceptions:

Outer surface of mandibular stipes with distinct subapical median convexity. Lateral ends of collum lacking the two upper oblique grooves, and posterior corner somewhat more produced than in *paxillatus* (Fig. 1).

Dorsal surface of metaterga coarsely pitted and longitudinally rugostriate [true also for *paxillatus* but not noted in its description]. Stricture crossed by a number of sharply defined ridges down to level of ozopores, below which alternating ridges continue across metazonum to its caudal edge. Dorsal carina of epiproct slightly shorter, margins of paraprocts visible from above. Coxae of posterior legpairs tricuspidate as in *paxillatus* but the tubercles relatively smaller and less projecting.

First pair of legs (Fig. 2) similar to those of *paxillatus* (Fig. 3) except coxae somewhat narrower, coxal setae shorter and smaller, and prefemora less elongated and not prolonged apically on the median side.

Gonopods (Figs. 4, 6) generally similar to those of *paxillatus*, except median edge of inner paragonocoel strongly produced into a large rounded distal lobe, lateral edge not produced into a projecting lobe at level of paxillus, and femoral process curving over lateral side of telopodite (Fig. 4) instead of coursing generally parallel to it. Differences in shape of the parametagonocoel are shown in Figs. 5 and 6.

Etymology: *Auritus*, Lat. "long-eared" in reference to the large median distal lobe of the gonopod coxa.

Remarks: as implied in the preceding description this species finds its closest known relative in *U. paxillatus*, described from Jataí, Goiás. The type localities for these two forms thus lie about 500 km distant.

***Urostreptus paxillatus* Hoffman**

(Figs. 3, 5)

Urostreptus paxillatus Hoffman, 1968: 81, figs. 12-16.

The gonopod drawings given with the original description showed only the distal half of these appendages and Fig. 14, said to be made from anterior aspect, is actually from an oblique anterior-median view. I give here a new drawing (Fig. 5) showing an entire left gonopod made from a true anterior aspect for comparison with the corresponding gonopod of *U. auritus*.

***Urostreptus carvalhoi* (Schubart)**

(Fig. 8)

Stenostreptus carvalhoi Schubart, 1947: 19, figs. 18-21.

Urostreptus carvalhoi; Hoffman, 1968: 78.

Among miscellaneous material submitted to me for identification by the Field Museum of Natural History (Chicago) I found a specimen of this species taken by Borys Malkin at Barra do Tapirapés, Mato Grosso, and therefore topotypic. As Schubart's original figure 20 appears to be drawn from an oblique anterolateral direction, I give here a new drawing of the left gonopod for comparison with those of the other four urostreptids figured in this paper. Slight differences shown between Schubart's specimen and my topotype are probably due to disparity in orientations, although some variation can certainly be expected in form of the distal median lobe of the telocoxite.

To be noted particularly for this species is the strong antero-posterior compression of the telocoxite apex into a thin flattened medially oriented

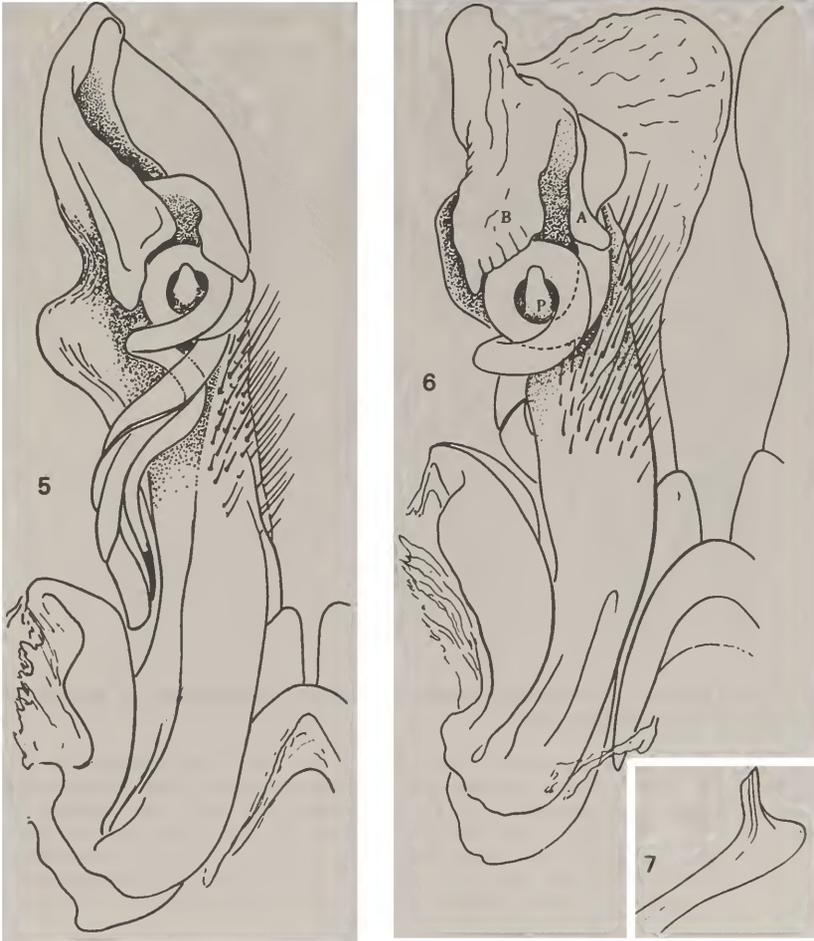


Fig. 5, left gonopod of *Urostreptus paxillatus* Hoffman, oral aspect, from paratype; fig. 6, left gonopod of *U. auritus*, sp. n., oral aspect, from holotype. Abbreviations: A, B, laminae, of outer paragonocoel, P, paxillus; fig. 7, *U. auritus*, apex of telopodite, greatly enlarged.

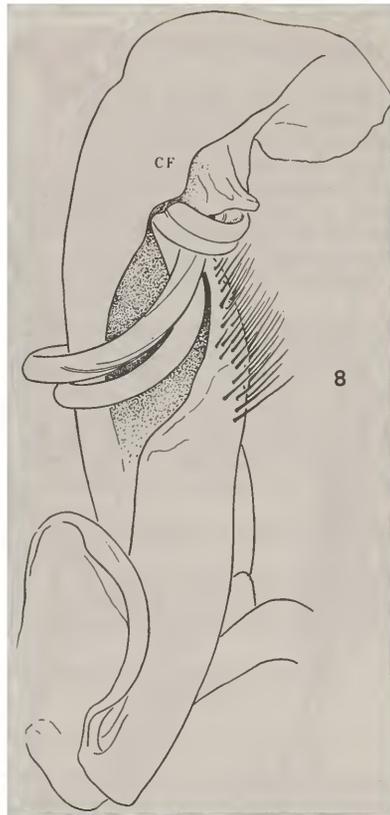


Fig. 8, left gonopod of *Urostreptus carvalhoi*, oral aspect, from topotype. CF, anterior fold or ridge of outer paragonocoele.

lamina; a thin edge proceeds proximad from the base of this region and then forms a small folded arch over the telopodite and femoral process where they emerge from the gonocoele (Fig. 8, P). Immediately lateral to this structure is a second and much larger fold that extends from the distal edge of the lamina down nearly to level of the paracoxite (Fig. 8, CF). A similar arrangement occurs also in the Guyanan species *U. fallax* (cf. Fig. 9, P & CF) and suggests that these two species are more similar to each other than either is to *travassosi*.

***Urostreptus fallax*, sp. n.**
(Figs. 9, 10)

Urostreptus travassosi Mauriès, 1976; Bull. Mus. natn. Hist. nat. Paris, ser. 3, n°. 333, p. 1259, fig. 3, 4 (*nec Stenostreptus travassosi* Schubart, 1957).

Material: gonopods of specimen (Mus. Hist. nat. Paris) labeled "Guyane française/juillet 1970/J.-P. Gasc".

Diagnosis: a moderate sized species of the genus (about as large as *U. carvalhoi* judged from gonopod size), genitalia most similar to those of *carvalhoi* (cf. Figs. 8 and 9), differing in the much larger apical region of the telocoxite, larger

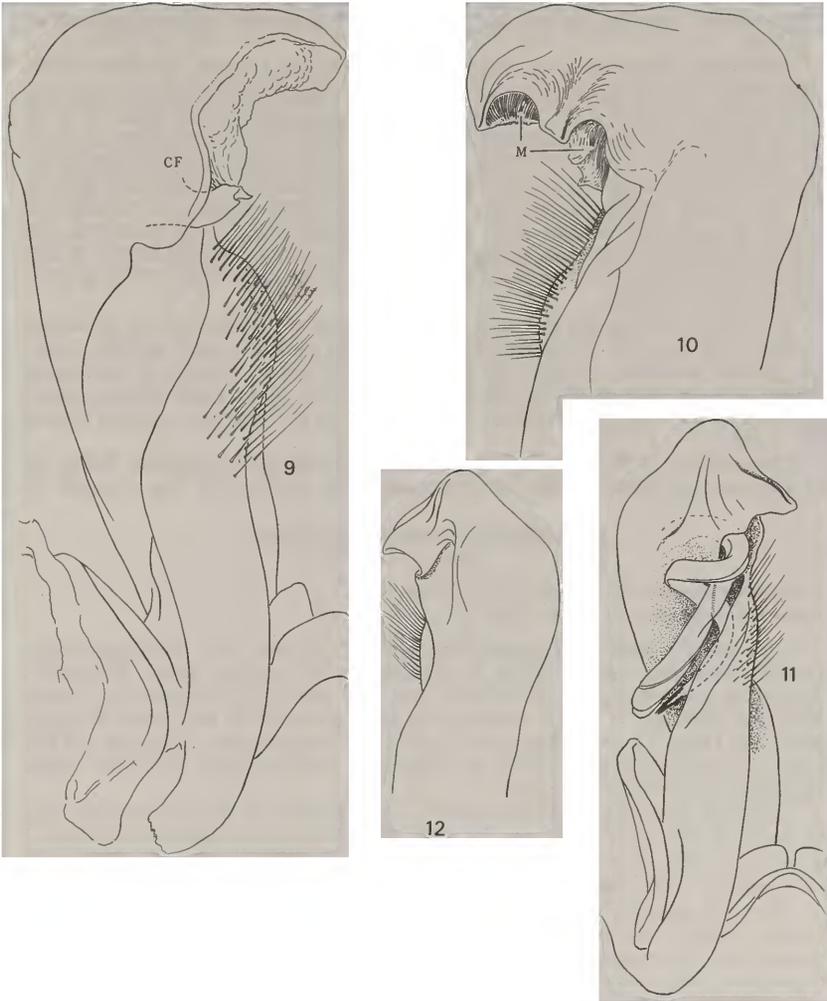


Fig. 9, *Urostreptus fallax*, sp. n., left gonopod of holotype, oral aspect, fig. 10, the same gonopod, apical third, aboral aspect showing posterior orientation of metagonococoeal opening (M) and its virtual closure at midlength; fig. 11, *U. travassosi* (Schubart), left gonopod of paratype, oral aspect; fig. 12, the same gonopod, distal half, aboral aspect.

lobe of the coxal fold adjacent to lobe P, and nearly complete median closure of metagonocoel opening by an indentation of the posterior parametagonocoel (Fig. 10).

Remarks: in reporting *U. travassosi* from French Guiana, Mauriès (1976: 1259) stated that his specimen was 160 mm in length and 10 mm in diameter, with a segment count of 62. Since Schubart's type series ranged from 53 to 58 mm in length, and gave a segment count of 48 to 51, my curiosity was aroused and I requested the loan of the Guiana specimen. This was promptly sent by M. Mauriès, but although the gonopods match his illustrations closely, the body is that of a large female spirostreptid, perhaps a *Gymnostreptus* or *Orthoporus lomonti*. It would thus appear that some kind of curatorial mix-up occurred, and perhaps the body of the male urostreptid was returned to another bottle. In any case, it could not, according to size of the gonopods, have been much greater than 90 mm in length.

It is my view that the gonopods differ sufficiently from those of *travassosi* (cf. Figs. 9 & 10, 11 & 12) to warrant forming the basis of a new specific name. The general similarity in body form amongst all known species of this genus renders the absence of the specimen itself a matter of no great consequence; eventually it may be recovered and the correct size and segment number placed on record.

Heretofore no *Urostreptus* has been found north of the Amazon Valley, so the discovery of *fallax* is a matter of considerable interest (cf. Fig. 13, spot 1).

***Urostreptus travassosi* (Schubart)**
(Figs. 11, 12)

Stenostreptus travassosi Schubart, 1957: 314, figs. 7-8.

Urostreptus travassosi: Hoffman, 1968: 85.

This small member of the genus remains known only from the original type material collected on the Serra do Cachimbo in southern Pará. Schubart's description and drawings are entirely accurate although the latter are rather small and indistinct in detail, and may be supplemented by the larger drawings given here (Figs. 11, 12), made from a paratype. In particular, Schubart did not show the characteristic torsion of the telopodite, and his figure is a little vague regarding the gonopod sternum.

Schubart postulated affinity with *U. carvalhoi* and in fact mentioned only the form of the telocoxite apex as providing differences between the two. I perpetuated this situation in my 1968 key, bringing the two species out in the same couplet and using the shape of the apicomedian lamina for distinction.

The two actually share an important characteristic: the way in which the femoral process makes a complete loop around the telopodite just as they emerge from the gonocoel (cf. Figs. 8 & 11). But in general overall form of the telocoxites, they appear to me rather dissimilar. In particular, *carvalhoi* is considerably larger in body size (as well as gonopod size), its apical median lamina is much larger and different in shape, and a conspicuous ridge runs down the anterior side of the telocoxite just lateral to the telopodite depression (Figs. 8 & 9, CF) which is not represented at all in *travassosi*. This ridge or fold is, however, present in *fallax*, *camerani*, and *hassleri* as well.

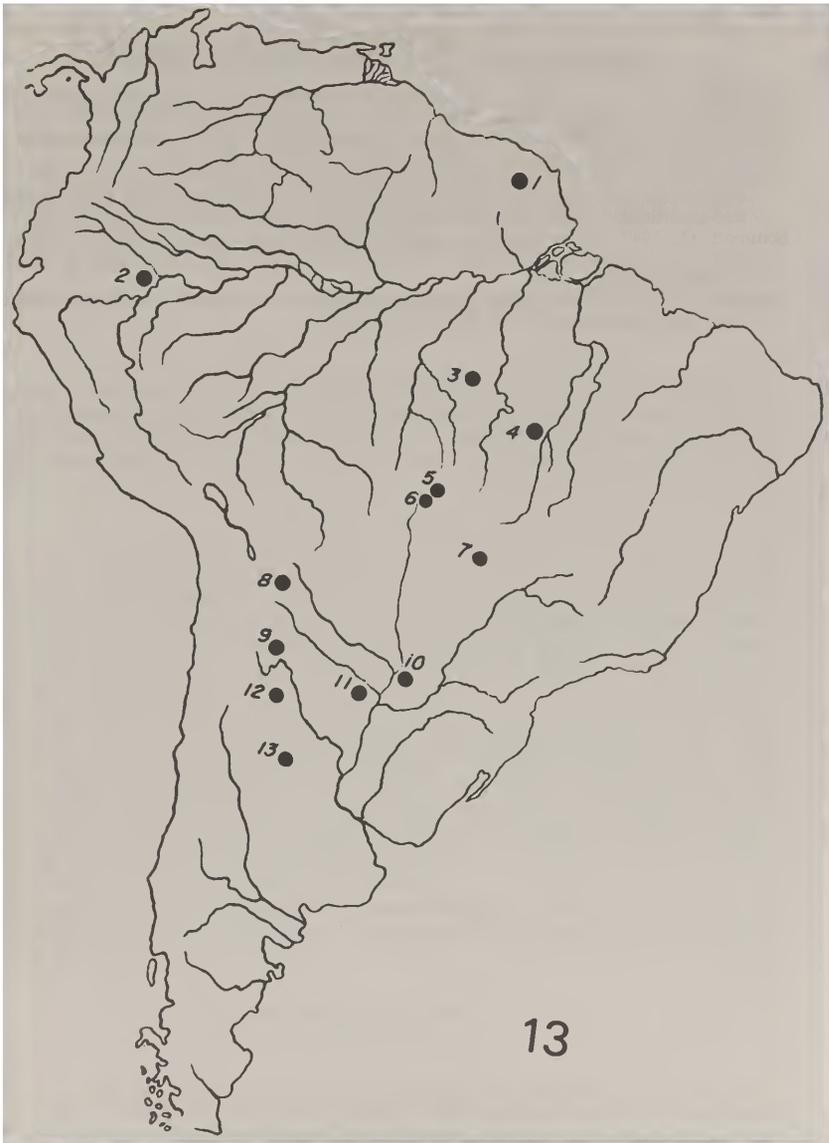


Fig. 13. Distributional records for species of *Urostreptus*. 1. "Guyane française" (*fallax*); 2. Iquitos, Peru (*mineri*); 3. Serra do Cachimbo, Pará, Brasil (*travassosi*, *mundurucensis*); 4. Barra do Tapirapê, Mato Grosso, Brasil (*carvalhoi*, *tampiitauensis*); 5. Chapada dos Guimarães, Mato Grosso, Brasil (*auritus*); 6. Rio Bandeira, Mato Grosso, Brasil (*robustus*); 7. Jataí, Goiás, Brasil (*paxillatus*); 8. Caiza, Bolivia (*camerani*); 9. Salta, Argentina (*camerani*); 10. Assunción, San Bernardino, Arequa, Paraguay (*hassleri*, *compressicauda*); 11. Formosa, Argentina (*hassleri*); 12. Tucumán, Argentina (*borellii*). 13. Córdoba, Argentina (*camerani*). The absence of this genus from eastern and southeastern Brasil is noteworthy!

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