*Papéis Avulsos de Zoologia*

PAPÉIS AVULSOS ZOOL. S. PAULO, VOL. 21, ART. 7: 67-85 5.III.1968

# STUDIES ON SPIROSTREPTOID MILLIPEDS. VII.

## A SYNOPSIS OF THE SPECIES OF *UROSTREPTUS* SILVESTRI[1]

RICHARD L. HOFFMAN[2]

ABSTRACT

The genus *Urostreptus* Silvestri is revised in the present paper. Comments are made on the complex situation of other generic names proposed by later authors. Generic concepts and characters are discussed. A key to the ten valid species is presented. *Urostreptus paxillatus,* sp. n. (type-locality, Brazil, Goiás, Jataí), is described.

Among the South American diplopod material in the U. S. National Museum are three related species of spirostreptids obtained through exchange with Filippo Silvestri, who had identified them as members of a genus *Urostreptus.* Inasmuch as this generic name is conspicuously absent from all standard reference works on millipeds, I became curious about its status and was soon able to discover the circumstances regarding its unseeming neglect. At a later time, it was possible for me to study the type material of several genera proposed by European workers, and so bring these names into the synonymy of *Urostreptus.* Most recently, examination of rich collections of Brazilian diplopods submitted for identification by Dr. G. R. Kloss revealed the presence of a singular new species of the genus, and so compelled the synthesis of my accumulated data into a summary treatment of this genus insofar as is possible with my resources.

*Urostreptus* has lurked in obscurity for 70 years because of two unfortunate conditions affecting its proposal. The name was introduced along with many other new generic names in a mere list of diplopod families and genera without a word of diagnosis; furthermore, it was based upon a rather inadequately described species. This paper was overlooked by most of Silvestri's colleagues, whether deliberately I cannot say, but I suspect that in any case his new names would have been regarded as *nomina nuda.*

Although the proposal of new generic names in such a manner resulted in untold uncertainty and vexation, they were certainly

1. A contribution from studies supported by grants (G-21519, GB-3098) from the National Science Foundation, Washington, D.C. Previous parts of this series of papers were published in Lloydia, vols. 16-24, 1953-1961.

2. Radford College, Radford, Virginia, U.S.A.

legally validated, and there can be no defensible reason for continued failure to admit their existence! In previous parts of this general series, I have endeavored to account several such names (*Isoporostreptus, Plusioporus, Heteropyge,* and *Trachystreptus*), and although the facts in each case seemed clear enough, the proposed revalidations were strongly opposed by my late colleague Otto Schubart. I believe however that Dr. Schubart's rejection of the Silvestrian generic names resulted largely from a personal dissatisfaction with the way in which they were originally established.

## Genus **Urostreptus** Silvestri

*Urostreptus* Silvestri, 1897b: 651. Proposed with one species, *Archispirostreptus camerani* Silvestri, 1895, the type by monotypy and original designation.

*Stenostreptus* Carl, 1917: 405. Proposed with a new species, and, by implication, three established species. Type: *S. hassleri* Carl, 1917, by present designation (but see discussion in a following paragraph).

*Perizonopus* Verhoeff, 1941: 280 (in figure caption), 290 (in text). Proposed with a new species, *Perizonopus montanus,* type by monotypy and original designation ("n. g., n. sp.").

*Orthogoneptus* Chamberlin, 1941: 481. Proposed for two new species, of which *O. mineri* is type by original designation.

*Alogostreptus* Attems, 1950: 201. Proposed with a new species, *Alogostreptus nattereri,* type by monotypy and original designation.

Diagnosis: An American genus of moderate-sized spirostreptids characterized superficially by the prominent median carina of the epiproct. Body slender, of normal proportion for the family; metazonites very slightly elevated and normally densely punctate. Post-femora and tibiae of males with prominent ventral pads on most of the legs. Antennae relatively long and slender, articles 5 and 6 with prominent rounded-oval sensory pits. Ozopores beginning on segment 6.

First legs of male rather primitive in form, the sternum small but distinct, with prominent stigmata on the oral side; coxae transversely elongated, distinct from sternum, and in contact medially; coxal macrosetae restricted to a narrow cluster or single basal series adjacent to stigmal openings; prefemora with only moderately produced basal lobes, sometimes with a smaller secondary, porose lobe (Fig. 2).

Gonopods with small but distinct sternum; coxal processes moderate; paracoxites semicircular; telocoxite elongate, distinctly rotated toward the midbody axis so that the inner paragonocoel is nearly medial in orientation, and the paracoxites are definitely cephalolateral instead of lateral as usual in the family; telecoxite extended distally beyond opening of gonocoel and thus forming a prominent metagonocoel. Telopodite with a prominent slender femoral process, distad of which the long and slender tibiotarsus is twisted through three or four complete turns; no branches or processes but usually there is a subterminal enlargement and a minute "parasolenomerite" lobe.

Synonymy: *Urostreptus* was proposed merely in a list of generic names, with *Archispirostreptus camerani* Silvestri cited as the type species. Although this method of introduction is entirely correct under the Rules, many European workers felt that unless a new generic name was diagnosed *per se,* it was a *nomen nudum* no matter how wellknown its type species might be. Insofar as I know, the name *Urostreptus* was never subsequently treated by other workers; it is not even listed as "unsicher" in Attems' "Afrikanische Spirostreptiden" of 1914.

That *camerani* represents a distinct generic type is certainly attested, however, by the fact that no less than three generic names have subsequently been based upon species congeneric with it!

The original diagnosis of *Stenostreptus* concisely stated the major characters of the genus as shown in the species *hassleri* Carl. With his usual perspicuity, Dr. Carl noted the similarity of Silvestri's several related species: "Plusieurs espèces de l'Argentine et du Paraguay, décrites par Silvestri..., semblent appartenir également a notre nouveau genre". The use of the word "appartenir" introduces a point of difficulty, as some nomenclatorists might contend that *Stenostreptus* was proposed with four species (*hassleri* Carl, and *borelli, camerani,* and *compressicauda* Silvestri), and that *hassleri* therefore can not be considered as the haplotype of the genus. I do not know of any subsequent typification, and herewith secure Dr. Carl's obvious intention by (perhaps redundantly) designating *S. hassleri* as the type of *Stenostreptus.*

In the same year that *Urostreptus* was proposed, but in a paper appearing earlier in a different journal (1897:6) Silvestri referred his species *camerani* to the West African genus *Urotropis,* apparently on the basis only of the carinate epiproct. This generic allocation was, of course, only very transitory and was soon corrected by Silvestri himself by the proposal of *Urostreptus.*

*Perizonopus* was erected in the usual Verhoeffian style — on the assumption that if the morphological features that he observed and defined in a species were not accounted by previous workers in exactly the same terms, the species automatically represented a new genus! It must be admitted that Verhoeff did compare *Perizonopus* with the description of *Stenostreptus,* but since Carl's figure of the gonopods of *S. hassleri* does not show the metagonocoel clearly (due to the distal third of the coxite being rotated medially), Verhoeff assumed that the cavity did not occur in *Stenostreptus.* The other characters cited in his "contrast" of the two genera are only of specific importance at best. Verhoeff's erroneous interpretation that the gonocoel is widely opened on the anterior side of the coxite is the result of a faulty observation of the gonopod-preparation with transmitted light, as discussed in a later paragraph.

Attems' nominal genus *Alogostreptus* was based upon essentially the same basic misconception of structure: "Das Gonocoel öffnet sich vorn gegen die Lateralseite zu, indem sich der mediale Teil des Coxites lateralwärts über das Gonocoel legt". A restudy of the type species of this genus shows that the gonocoel actually opens medially, as normal in spirostreptoids.

It would be easy to compile a long list of generic names based by both Verhoeff and Attems on a single anatomical detail in the structure of a single species. This taxonomic philosophy, it seems to me, endows a disproportionate importance to trivial departures and tends to obscure fundamental similiarities that may be manifest in virtually every other tangible character. For instance, reliance upon such details as the presence or absence of ozopores upon the 5th segment in spirostreptoids results in the wide separation of closely related species into "genera" such as *Diaporus* and *Orthoporus, Alloporus* and *Doratogonus,* etc.; the same could be said for Count Attems' favorite, although quite nebulous character, the presence or absence of a "Tarsalrest". I have little doubt that Verhoeff would have erected a new genus for the new *Urostreptus* described in this paper because of the modification of the femoral process, but the totality of its characters collectively seems beyond question to compel its inclusion in a genus with *camerani, hassleri,* and the various other forms listed here.

There seems to me to be little doubt that *Orthogoneptus* is likewise based upon a species belonging to this group. The type material of *O. mineri* is at present on loan to Dr. Kraus (Frankfurt am Main), but on the basis of two good drawings of the telocoxite, kindly sent to me by Dr. Kraus, I feel reasonably confident in regarding *Orthogoneptus* a junior synonym of *Urostreptus.* The metagonocoel appears to be much like that of *U. hassleri* (Carl). But I defer further treatment of the nominal two species *mineri* and *caudifer* in the anticipation that both will be redescribed by Dr. Kraus in a forthcoming paper on the diplopods of Peru. In any event, it seems that the establishment of a special subfamily Orthogoneptinae (Chamberlin, 1941) is scarcely justified on the basis of the morphological characters of the genus it contains. Schubart (1958) alters the rank to the level of tribe, a more realistic status, and assigns two genera to the Orthogoneptini without saying what the second genus is.

Gonopod morphology: The structure of the telocoxite in this genus is somewhat unusual and has been discussed by Attems (1950) and Verhoeff (1941). Unfortunately the interpretation given by both of these anthors is entirely incorrect, as can be easily shown.

In his account of gonopod morphology in *Perizonopus montanus* (=*Urostreptus camerani* Silv., see p. 76), Verhoeff remarked the presence of a deep broad groove on the oral side of the telocoxite (Gonocölspalt) which he regarded as an opening directly into the gonocoel: "Während der letzere bei *Metagonocoelius* eng ist, wie wir das bei den meisten Spirostreptiden beobachten, so dass man von aussen her vom Endospermit nichts erkennen kann, finden wir ihn bei *Perizonopus* in ungewöhnlicher Weise so weit geöffnet, dass man von aussen her etwa die Hälfte des im Gonocöl eingelagerten Endospermit erkennen kann". Verhoeff's illustration (Fig. 2) shows clearly a considerable part of the endospermite extending up through this open "Gonocölspalt".

Attems (1950:190) distinguished *Perizonopus* in his key to the genera of Spirostreptinae by the statement "Gonocoel weit offen, so dass das Femur sichtbar ist", as opposed to the other genera in which the "Gonocoel nur mit schmälerem Spalt sich öffnend". The next genus accounted in Attems' key was his new *Alogos-*

*treptus,* diagnosed by the statement "Das Gonocoel öffnet sich lateralwärts, indem die Medialseite des Coxite sich lateralwärts umschlägt, das Gonocoel bedeckend."

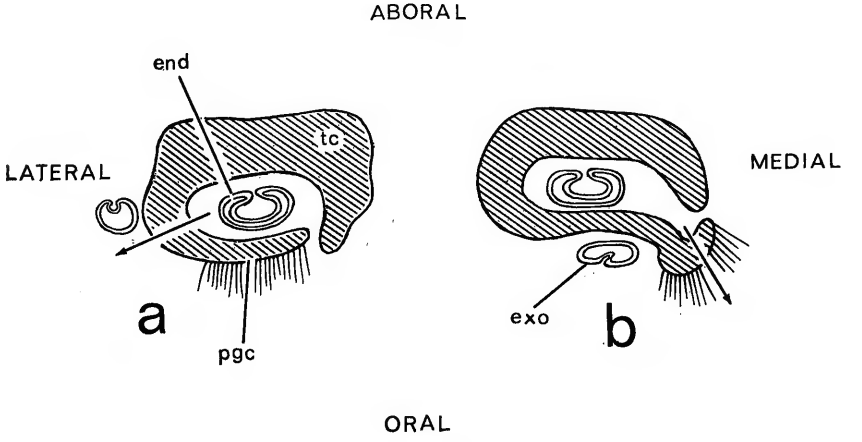
I have been able to restudy the original material upon which the nominal genera *Perizonopus* and *Alogostreptus* were based, and present here new drawings from the type gonopods. Those of *P. montanus* were mounted in the usual Verhoeffian fashion in a thick and awkward Canada-balsam preparation, and are of course partially transparent in transmitted light. I could however assure myself that a thin sheet of chitin completely covered the endospermite. The latter structure is quite visible and distinct but on a lower focal plane.

The case of *Alogostreptus nattereri* is just the same. The groove on the oral side of the telocoxite is not an opening into the gonocoel! It results from the obvious torsion of each telocoxite cephalomedially, so that normally lateral areas are brought around to the anterior side. As shown in fig. 11 in this paper, the actual distal opening of the gonocoel faces directly medially just at the apex of the setose paragonocoel. This opening normally faces either anteriorly or laterally in most spirostreptoid genera.

In *Urostreptus,* the gonocoel is formed in the usual way, by a continuous enveloping action, the paragonocoel on the anterior side merely representing a continuation of the larger part of the telocoxite on the posterior side. Where the free edges of these two are juxtaposed, an elongated narrow slit is formed, usually on the anterior-medial side (fig. 1, a, b). The gonocoel is open at its ends, but in the majority of spirostreptids the distal opening faces either orally or laterally, so that the exospermite projects outward toward the side. In *Urostreptus,* as a result of the entire telocoxite being rotated medially, the distal opening faces inwardly, and the exospermite must bend very strongly laterad in order to pass in front of and eventually behind the coxa. The position of the distal gonocoel opening, and the coincident development of a prominent metagonocoel, bear a striking resemblence to the formation of the coxae in Odontopygidae. The tendency for the exospermite to be spirally twisted on itself is likewise a common feature of odontopygids that is quite rare in the Spirostreptidae. There are, however, no additional odontopygoid traits to be found in *Urostreptus,* in particular there is no trace remaining of the sternum of the posterior appendages of the 7th segment.

The coxite of *Urostreptus* is variable within the genus, ranging from a fairly simple condition seen in *camerani, carvalhoi,* and others, to the elaborate modification found in *tampiitauensis* and *paxillatus.* Usually the lateral edge of the distal third (the parametagonocoel of Verhoeff), is produced only into a small lobe adjacent to the point of emergence of the exospermite (shown by the letter "a" on the drawings in this paper). In the two exceptional species just named, however, the lateral surface of the parametagonocoel is provided with additional lobes and processes, one of which ("p") forms a hook around which the long femoral process describes a complete loop (figs. 14-16). It is in fact difficult to see how the telopodite would be capable of much in-and-out movement in these more complex arrangements.

The inner side of the telocoxite, near its base, is produced into a distinct elongated lobe (fig. 4, cxp) which is here designated as the "coxal process". This structure recurs in a number of American spirostreptid genera (*Nanostreptus, Plusioporus, Oreastreptus, Anethoporus,* and *Heteropyge,* to name a few), and has already been designated specifically in my 1960 paper on *Heteropyge* (p. 112, fig. 3, cxp). Even earlier, in 1941, K. W. Verhoeff had noted the process in *"Perustreptus"* (*"=Nanostreptus"*) and there designated it as the "Kentron". It is, however, certainly not confined to that one genus, as Verhoeff implied. The coxal process seems absent from such genera as *Orthoporus, Ptenogonostreptus,* and *Conchostreptus,* as well as most of the African forms known to me.




**Diagrammatic cross-sections of the gonopods of two types of spirostreptids. Fig. 1a, the condition normal for the family. Fig. 1b, the configuration occurring in *Urostreptus*. The direction taken by the telopodite in leaving the gonocoel is shown by the arrows. Abbreviations: *end* endospermite, and *exo*, exospermite regions of the telopodite; *pgc*, paragonocoel lamella; *tc*, the main part of the telocoxite on the caudal side of the gonocoel. Anatomical relationships discussed in the text.**

The telopodite in *Urostreptus* is attached, basally, to an apodeme extending caudodorsally in segment 7, and which is attached by muscle to the dorsum of the pleurotergum. From the base of this apodeme are two muscles running to the telopodite, and presumably are retractors. Another, much larger muscle extends from the base of the telopodite to the reflexed distal edges of the paracoxite and presumably functions as a protractor. These three sets of muscles are shown on fig. 3. It must be remembered that the gonopods are conventionally drawn in a reversed orientation, so that dorsal on the drawings is actually ventral anatomically.

Both as regards the location and musculature, it seems to me that the so-called "paracoxites" may be a modification of the lateral ends of the original sternum.

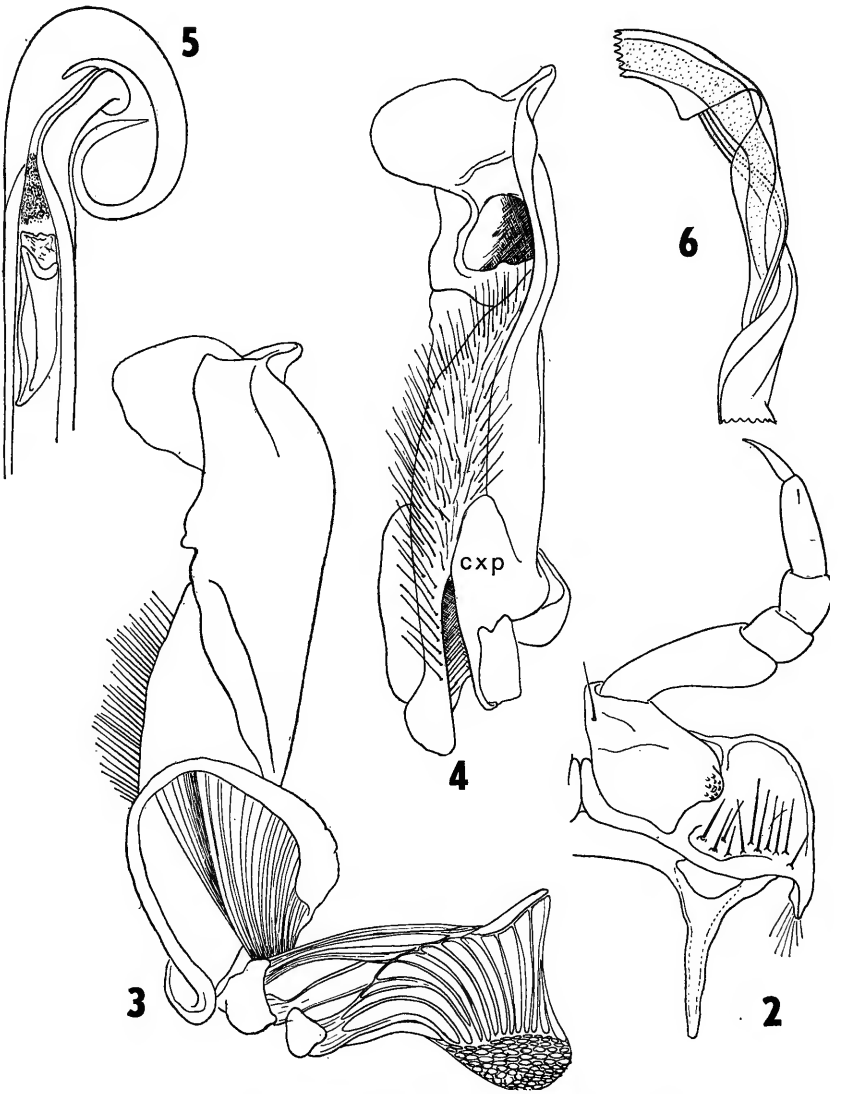
The concealed basal part of the telopodite (endospermite of Verhoeff) appears to be hollow, but I think this impression is due to an enormous enlargement of the usual seminal groove to occupy most of the interior. At the beginning of the "exospermite" division (the "Knie" of Attems), the internal cavity becomes abruptly smaller and merges into the normal telopodite groove. In the specimen of *U. camerani* that I studied, this area of reduction contained some granular material, presumably a hardened secretion from the coxal glands, as well as a spindle-shaped sclerotized structure (both shown in fig. 5), the latter fitting closely inside the endospermite cavity and capable of sliding freely up and down upon pressure applied by a disecting needle. I could not verify a similar object in the material of *paxillatus* at hand, and can not affirm whether it may be a type of "piston" for extruding the coxal secretion, or is only an artifact.

Distribution: The interior of South America, from central Argentine north through the Mato Grosso as far as northeastern Peru and the southern half of the Brazilian state of Pará.

Species: 13 specific names have been based upon millipeds referable to this genus as currently defined. Some of these names are now known or suspected to be junior synonyms of others, so that about 10 valid species are accounted in the following treatment. One additional form (*Archispirostreptus borelli* Silvestri, 1895) is tentatively included following the precedent of both Carl and Schubart, but I have not examined material and do not regard the original drawings of this species as adequate for a generic allocation.

So far only one attempt has been made toward arranging the species of this genus into groups. Schubart (1957:317) utilized the shape of the femoral process as a basic distinction of the five species of *"Stenostreptus"* known to him (*hassleri* was omitted) into two groups: "um com o espinho basal enrolado em forma de uma hélice e o outro com êste processo em forma de um S." The first category included *tampiitauensis* and *nattereri,* the second *carvalhoi, travassosi,* and *mundurucensis.* Personally I think that any present grouping is bound to be very premature, and if based on single characters, will be artificial as well. It is possible, by considering only the characters of the gonopods, to see several cases of obvious affinity. For instance, we can distinguish the following species-pairs: *mundurucensis* and *cultratus, travassosi* and *carvalhoi, tampiitauensis* and *paxillatus;* some of these may prove to be only subspecifically related.

The following key to species is admittedly very artificial at the beginning although some of the foregoing species-pairs come out together. Two species could not be included: *borelli* Silvestri and *caudifer* Chamberlin; I am not certain that *borelli* is referable to this genus.




*Urostreptus camerani camerani*, (Silvestri), specimen from Caiza, Bolivia. Fig. 2, right side of first sternum and legs, oral aspect. Fig. 3, right gonopod, lateral aspect, showing base of telopodite, its apodeme, and associated muscles. Fig. 4, left gonopod, medial aspect, showing coxal process at inner base of telocoxite, and medially opening gonocoel. Fig. 5, distal part of telopodite endospermite at origin of femoral process, with enlarged internal chamber and moveable structure discussed in text. Fig. 6, basal part of exospermite, showing torsion.

KEY TO THE SPECIES OF UROSTREPTUS

1. Body with 48 to 52 segments ..... 2
   Body with 55 to 60 segments ..... 7
2. Femoral process of gonopod short, less than half the length of the exospermite, bent into an arc or loose coil ..... 3
   Femoral process longer, at least half as long as the exospermite, usually looped or coiled at its base and distally curving around lateral side of telocoxite ..... 4
3. Telocoxite distally broadened, with a large "lateral cone" and a reflexed medial projection; paragonocoel distally produced into an angular lobe that overlaps the basal, twister part of the exospermite (fig.11) ... *cultratus* (Humbert & Saussure)
   Telocoxite only slightly broadened distally, the profile evenly rounded and lacking lateral or medial lobes; paragonocoel without the large distal lobe of the preceeding species, and much less bent medially so that the gonocoel is partly open on the anterior side .....*mineri* (Chamberlin)
4. Telocoxite considerably broadened distally, suggesting that of *U. cultratus,* but the medial and lateral lobes are here continous as a tranverse ridge or swelling; lobe at the gonocoel opening very large and projecting .... *mundurucensis* (Schubart)
   Telocoxite not or but slightly enlarged distally, usually forming a tapering, hood-like closure of the metagonocoel. 5
5. Small species, length about 50 mm, diameter of body 4.0 mm, gonopods short and massive, length of telocoxite little more than twice its greatest width ..... *hassleri* (Carl)
   Larger species, length greater than 50 mm, diameter more than 4.0 mm., gonopods longer and more slender, telocoxite at least 4 times as long as wide ..... 6
6. Apex of telocoxite directed mesad as an acute triangular projection; length of 55-60 mm, diameter about 4.5-5.5 mm. ..... *travassosi* (Schubart)
   Apex of telocoxite bent mesad but rounded, not a produced triangular lobe; length of body 60-70 mm, diameter about 5.0-6.0 mm. ..... *carvalhoi* (Schubart)
7. Femoral process of gonopod short, bent into a loose incomplete circle; tecoloxite without paxillus (figs. 7-8) ..... ..... *camerani* (Silvestri)
   Femoral process long and slender, basally forming a tight loop that encircles a paxillus projecting from lateral side of telocoxite. ..... 8
8. Telocoxite strongly rotated medially so that the metagonocoel opens the medial side; femoral process relatively quite short beyond its basal loop, latter not concealed by lobes from the telocoxite ..... *tampiitauensis* (Schubart)
   Telocoxite less strongly rotated, the metagonocoel opening toward the anterior side; femoral process relatively very long beyond the loop, the latter partly hidden by several flat lobes of the tecoloxite, (figs. 14-16). *paxilatus,* sp. n.

**Urostreptus camerani camerani** (Silvestri), n. stat.

**(Figs. 2-8)**

*Archispirostreptus camerani* Silvestri, 1895: 9, fig. 17 (type series: Mus. Zool. Comp. Anat. Univ. Torino, from Salta, Tucuman, Argentina; Alfredo Borelli leg.).
*Urotropis camerani;* Silvestri, 1897a: 6.
*Urostreptus camerani;* Silvestri, 1897b: 651.
*Stenostreptus camerani;* Carl, 1917: 406; Schubart, 1945: 64.
*Perizonopus montanus* Verhoeff, 1941: 290, figs. 2, 3 (holotype male: present location of body unknown; gonopod preparation, Zool. Mus. München, from Sierra Chica, Cordoba Prov., Argentina; Dr. C. Hesseus, leg. 1936), *n. syn.*

Material of this form was studied in the collection of the U. S. National Museum, it had been obtained from F. Silvestri who indicated on the hand-written label that the specimens were "paratypi". However, they were collected at Caiza, Bolivia, some time after the name *camerani* had been published and so are not paratypes in the current sense of that term. Comparison of the gonopods with the very diagrammatic sketch published by Silvestri in 1895, on the other hand, leaves little doubt that the species is correctly determined. The specimens in question would be more precisely regarded as "metatypes".

Verhoeff's mistaken interpretation of the gonopod structure in his "new" genus and species has been discussed previously. In restudying his gonopods-preparation, I could satisfy myself that the telocoxite structure is normal for the family, and that the gonocoel opens directly medially and not cephalolaterally as Verhoeff imagined. Furthermore, as is suggested by comparison of figs. 7 and 8, it seems that Verhoeff's species is the same as Silvestri's. The drawings were made at different times, but the outlines and proportions agree very closely. The type locality of *camerani* lies almost exactly between Caiza, Bolivia, and Cordoba, Argentina, whence came Verhoeff's material; see the map, fig. 17, numbers 4, 5, and 6.

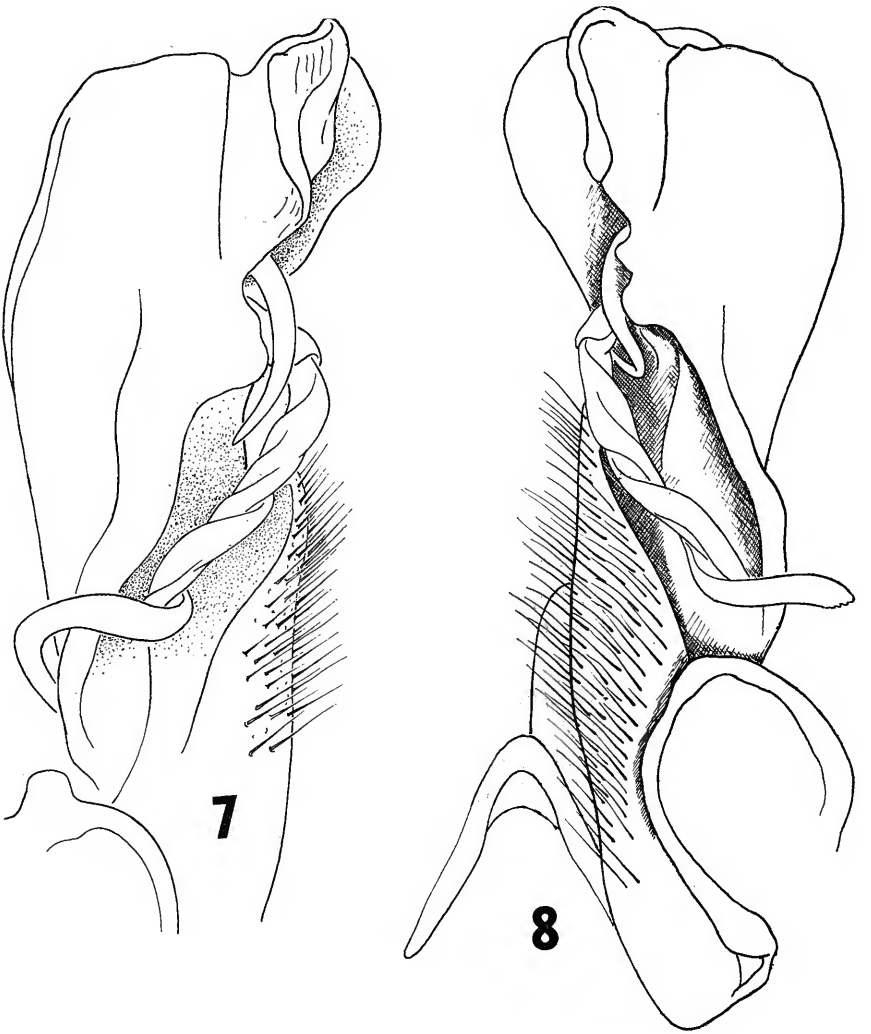
Various aspects of gonopod morphology mentioned in a previous section relate to the structure in this species. Another taxonomic character worthy of note concerns the first pair legs of the male (fig. 2); the prefemur has a small secondary lateral lobe which is perforated by several conspicuous pore-canals. I have not seen such a development in *paxillatus* nor in the illustrations of these legs in other species.

**Urostreptus camerani compressicauda** (Silvestri), n. comb., n. stat.

**(Figs. 9-10)**

*Archispirostreptus compressicauda* Silvestri, 1895: 9, fig. 16 (type series: Mus. Zool. Anat. Comp. Univ. Torino, from Assunción, Paraguay; A. Borelli leg.).
*Stenostreptus compressicauda;* Carl, 1917: 406; Schubart, 1945: 64.

The U. S. National Museum likewise contains specimens obtained from Silvestri who designated them on the manuscript




*Urostreptus c. camerani* (Silvestri). Fig. 7, left gonopod of specimen from Cordoba, Argentina (holotype of *P. montanus* Verhoeff). Fig. 8, right gonopod and sternum of specimen from Caiza, Bolivia. Drawings made at different times but with same magnification, and showing essential agreement in structural details.

label as "Paratypi" of *compressicauda*. These specimens are from Arequa, Paraguay, and are probably not paratypes. However, they are virtual topotypes, and agree closely with the very primitive gonopod sketches published by Silvestri; there seems no doubt they are correctly determined.

I find no impressive differences between this taxon and *camerani* aside from slightly smaller size of the body and a somewhat more slender gonopod telocoxite. It seems probable to me that *compressicauda* represents no more than a lowland subspecies and it is so here regarded. Both names were published on the same page, *compressicauda* is first in sequence but I prefer to regard *camerani* as the senior synonym inasmuch as it is the name upon which *Urostreptus* was based.

**Urostreptus carvalhoi** (Schubart), n. comb.

*Stenostreptus carvalhoi* Schubart, 1947: 19, figs. 18-21 (type series, Mus. Nac. Rio de Janeiro, from Barra do Tapirapé [ca. 10.35 S, 50.30 W], Mato Grosso, Brazil; A. L. de Carvalho leg.); Schubart, 1957: 314, 317.

**Urostreptus caudifer** (Chamberlin), n. comb.

*Orthogoneptus caudifer* Chamberlin, 1941: 481, figs. 32, 35-38 (holotype ♀, Amer. Mus. Nat. Hist., from ? Suhuaya, Rio Ucayali, Dept. Loreto, Peru; H. Bassler leg.).

The original description of this species contains — aside from differences peculiar to the two sexes — nothing to distinguish it from *O. mineri* except a difference in the color pattern of the long-preserved specimens. Whether *caudifer* is in fact a separate species cannot be established until male topotypes are forthcoming.

**Urostreptus cultratus** (Humbert & Saussure), n. comb.

**(Fig. 11)**

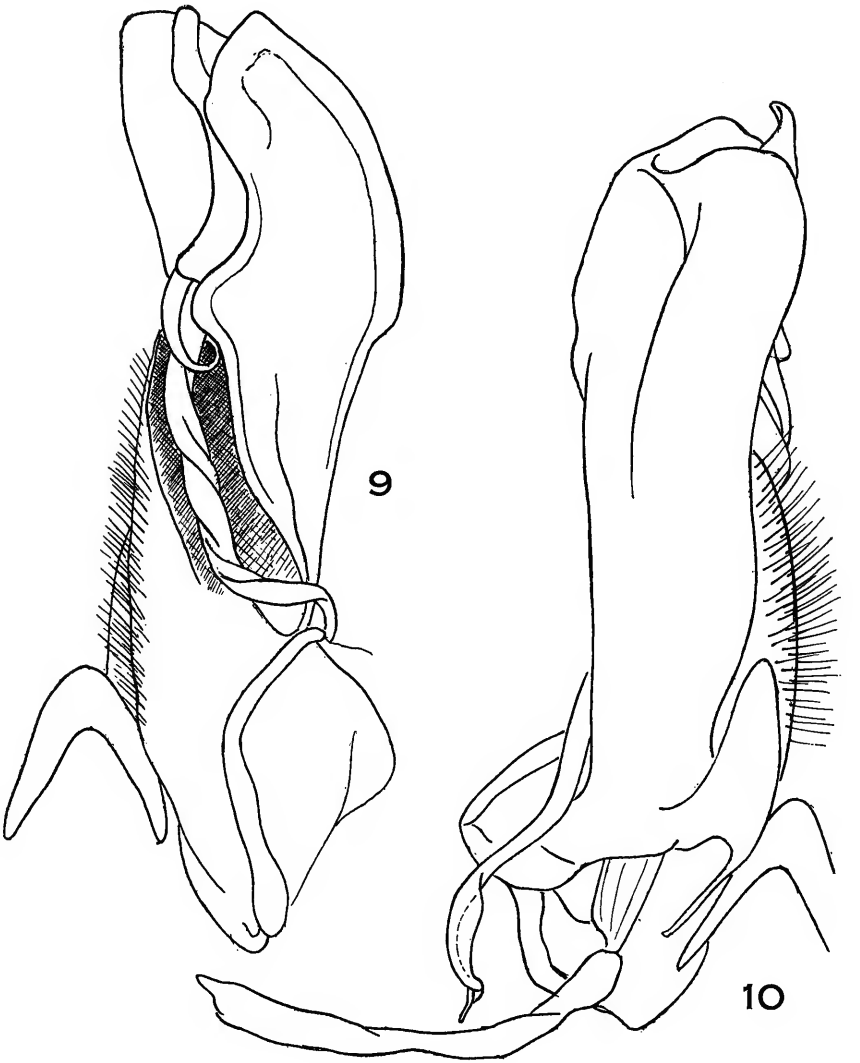
*Spirostreptus cultratus* Humbert & Saussure, 1870: 174 (type specimen, male, Naturh. Mus. Wien, from "Brazil", Johann Natterer leg.).

*Alogostreptus nattereri* Attems, 1950: 201, figs. 10-13 (type specimen, male, Naturh. Mus. Wien, from "Brazil" J. Natterer leg.), *n. syn.*

*Stenostreptus nattereri;* Schubart, 1957: 317; 1958: 245.

This small species is readily distinguished by the shape of the gonopod telocoxite, which bears a resemblence to that of *U. mundurucensis*.

The synonymy of the names *cultratus* and *nattereri* is objective. In 1960 I discovered that the bottle containing the male holotype of *"nattereri"* also carries a faded old label reading *"Spirostreptus cultratus* H & S; Brasil, Natterer". According to the original description, there was only one type specimen of *cultratus*, and the type of Attems' *nattereri* agrees with the description in all particulars. There seems to me to be no doubt whatever




*Urostreptus c. compressicauda* (Silvestri), specimen from Arequa, Paraguay, determined by Silvestri and virtually topotypic. Fig. 9, right gonopod, anterior aspect. Fig. 10, the same gonopod caudo-medial aspect showing sternum, coxal process, and apodeme of telopodite.

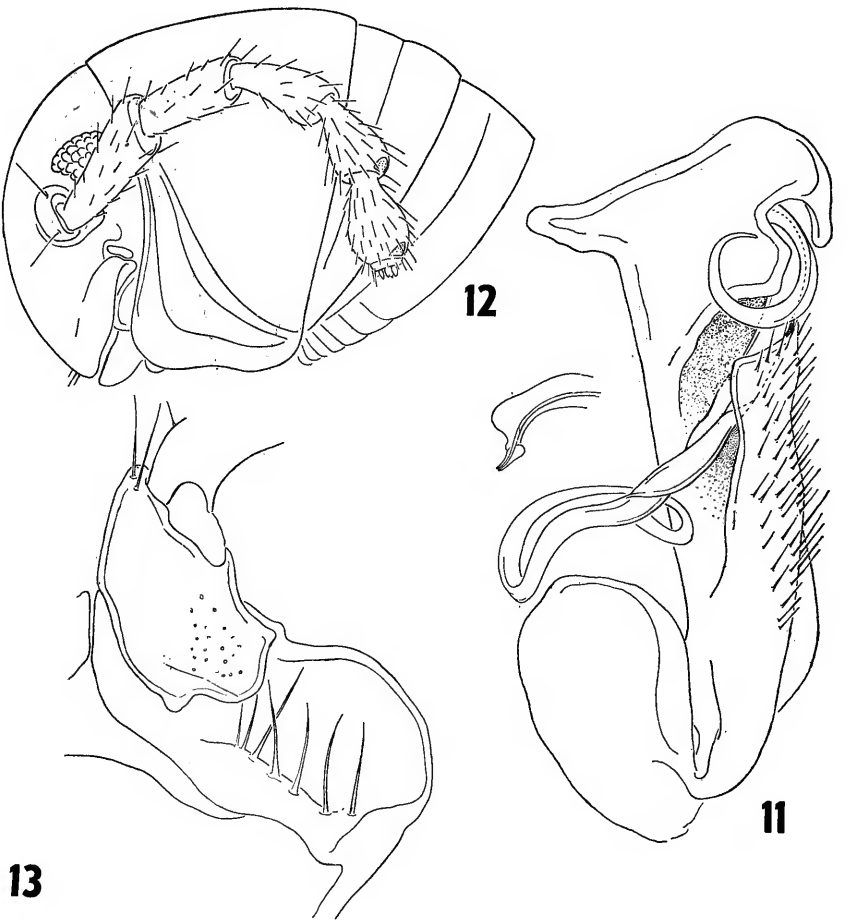



Fig. 11: *Urostreptus cultratus* (Humbert & Saussure), left gonopod, anterior aspect, of male holotype, the apex of the telopodite shown separately very much enlarged. *Urostreptus paxillatus,* sp. n., male holotype from Jataí, Goiás. Fig. 12, head and first three body segments, lateral aspect. Fig. 13, base of the left leg of the 1st pair, anterior aspect.

that Attems overlooked (or ignored) the original label, and that the two names *cultratus* and *nattereri* are in fact based upon one and the same specimen!

Unfortunately, the species has never been rediscovered and we do not have a clear idea about where Natterer found it. He collected in Brazil for 18 years and visited nearly all of the states, but unfortunately of the vast material he sent to the Naturhistorisches Museum in Wien, very little carried precise locality information (or if did, the labels were removed and lost).

**Urostreptus hassleri** (Carl), n. comb.

*Stenostreptus hassleri* Carl, 1917: 406, figs. 25, 26 (male syntypes, Mus. Hist. Natur. Genève, from San Bernardino and Assunción Paraguay); Schubart, 1945: 64; 1958: 245.

**Urostreptus mineri** (Chamberlin), n. comb.

*Orthogoneptus mineri* Chamberlin, 1941: 481, figs. 31, 33, 34 (male holotype, Amer. Mus. Nat. Hist., from Iquitos, Dept. Loreto, Peru; H. Bassler leg.).

The original description states that the "posterior gonopods" [=telopodites] are not sheathed by the anterior [=telocoxites], but are freely exposed to the base. This sounds at first like the same mistake made by Attems and Verhoeff in the diagnoses of their "genera" *Alogostreptus* and *Perizonopus*, but in this case the drawing indicates that the telopodite was merely dislodged from the medial opening of the gonocoel through some kind of accident. The drawings sent by Dr. Kraus show clearly that the telocoxite has a perfectly normal configuration, and is rather similar to that of *U. hassleri* (Carl).

**Urostreptus mundurucensis** (Schubart), n. comb.

*Stenostreptus mundurucensis* Schubart, 1957: 316, figs. 9, 10 (holotype ♂, DZSP, from Serra do Cachimbo, Pará, Brazil; L. Travassos & S. J. de Oliveira leg.).

In the original description of this species, Dr. Schubart expressed the opinion that "É provável que se trate de um representante de um gênero a par". In my opinion, however, *mundurucensis* is rather closely related to *U. cultratus* in nearly every respect except the length of the gonopodal femoral process, and that these two species merge into the other forms of the genus.

**Urostreptus paxillatus,** sp. n.

**(Figs. 12-16)**

Type specimens: Male holotype (DZ 1831) and three male paratypes (Hoffman colletion, originally DZ 1832-1834), from Fazenda Nova Orlândia, Jataí, Goiás; collected in January 1964 by a field party from the Departamento de Zoologia.

Diagnosis: A *Urostreptus* characterized in particular by the modification of the gonopod coxite (figs. 14-16); the base of the parametagonocoel with four distinct lobes, one of which forms a prominent upcurved paxillus about which the femoral process of the telopodite describes a complete coil; a second coil is partly concealed under two adjacent lobes.

Holotype: Length about 70 mm. (broken into several pieces); average body diameter, 6,0 mm, diameter of segments 6 and 7, 6.5 mm.

Coloration (after 1 year in alcohol) dark grayish-brown, caudal margin of metazonites narrowly reddish-brown; concealed part of prozonites and extreme lower ends of entire pleurotergites whitish; legs and antennae yellow.

Head convex, smooth, and polished (fig. 12); epicranial suture distinct, transverse occipital groove prominent and sharply defined, occipital surfact finely and irregularly striate. Ocellaria large, subreniform, the ocelli arranged in 7 horizontal rows as follows: 10 — 10 — 9 — 8 — 6 — 5 — 2 = 50. Length of ocellaria exactly equal to the distance between the two structures. Interantennal isthmus wide (2.1 mm.), evenly convex, with two obliquely placed, obverse pyriform, paramedian depressions, subtended by two smaller circular pits. Clypeal setae 3-3, labral setae about 12-12. Genae not margined, the edge bisinuate.

Antennae long (7.8 mm.) and moderately slender; length relationship of antennomeres: $2>3>4 = 5>6>1>7$. Ist article wider than long, smooth and glabrous except for two macrosetae on anterior side, and hemispherical; articles 2-4 subsimilar in shape, distally clavate, moderately compressed, each curved slightly caudad; articles 5 and 6 similar, much shorter than the preceding and more abruptly clavate, each with a prominent transversely oval sensory pit on the outer distal surface. Article 7 very short, cylindrical, unmodified, with four small widely-separated sensory cones.

Mandibular stripe largely concealed by collum, but with a prominent projecting ventrodistal corner. Antennal socket with a distinct prominent rim on the ventral, lateral, and dorsal sides; median side flush with surface of frons.

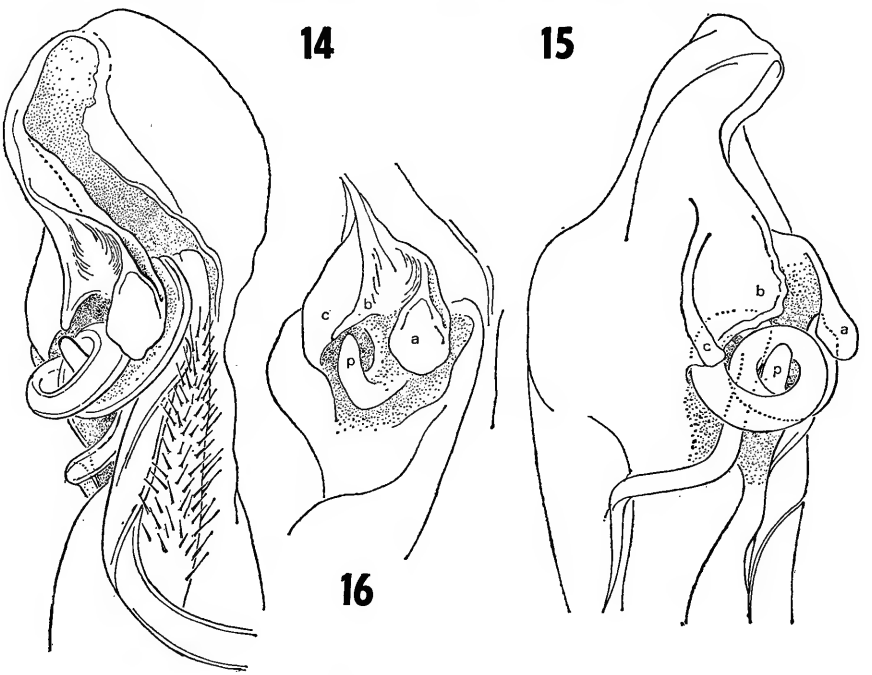
Collum smooth and polished, the anterior-lateral corner produced into a prominent lobe covering the mandible, the edge broadly thickened and subtendend by a deep oblique depression, this in turn set off from disk of collum by a distinct oblique lateral ridge (fig. 12).

Body segments essentially similar in appearance. Prozonites virtually smooth, but with a series of about 12 very fine encircling striae and seriate punctations, these striae becoming more widely separated posteriorly; prozonal surface behind the last striation with larger and elongated punctation; structure distinct entirely around pleuroterga, the anterior edge sharply defined, middorsally costulate and pitted, merging gradually into the slightly elevated and coarsely pitted metazonite surface. Lower sides of metazonites with prominent longitudinal grooves up to level of ozopores, latter small and opening flush onto the flat area between the two uppermost grooves.

Ozopores beginning on the 6th segment.

Segments of posterior third of body more strongly textured than those preceeding, and with a distinct middorsal groove or suture. Caudal half of epiproct compressed into a large, prominent median carina that equals but does not project beyond the paraprocts; surface of last segment smooth, very minutely punctate. Paraprocts with very strongly compressed margins, these set off from the smooth, convex discal surface by a shallow depression. Hypoproct transversely elongated, subtriangular, with a vaguely indicated median longitudinal carina.

Legs long and slender, the four distal podomeres visible beyond sides of body when viewed from above. Coxae of the posterior legs of each segment distinctly larger than those of anterior pair, the ventral surface flattened and bearing three small conical tubercules, one median, one on the caudal side, and the third on the anterior-distal corner of the coxa. Ventral side of prefemur of posterior leg pair also flattened, that of anterior leg more acutely-rounded ventrally. Post-femora and tibiae of all legs posterior to the 2nd with prominent eversible membranous pads, these apically projecting beneath the bases of the succeeding podomeres. Tarsal claws long and slender, without modifications.




*Urostreptus paxillatus,* n. sp., male holotype, left gonopod. Fig. 14, distal half of gonopod, anterior aspect. Fig. 15, the same in lateral aspect. Fig. 16, base of the parametagonocoel, the telopodite removed to show paxillus and adjacent lobes, anterior and slightly lateral aspect. Abbreviations: *a, b, c,* three basal lobes of the parametagonocoel, *p.* paxillus.

First pair of legs of the form characteristic of the genus (fig. 13).

Gonopods as illustrated in fig. 14-16, distally less rotated than in *tampiitauensis* so that the metagonocoel is partly visible in anterior view. The modifications of the telocoxite into a paxillus and adjacent lobes are more intricate than in other known members of the genus.

Variation: The individuals of the small type series are all broken so that no accurate length measurement can be made. The maximum diameter is 7.0 mm, the minimum 6.4 mm. The number of segments is 56, 57, 58, 58 in the four male specimens.

**Urostreptus tampiitauensis** (Schubart), n. comb.

*Stenostreptus tampiitauensis* Schubart, 1947: 23, figs. 22-26 (type series, Mus. Nac. Rio de Janeiro, from Barra do Tapirapé, Mato Grosso, Brazil; A.L. de Carvalho leg.); 1957: 317; 1958: 245.

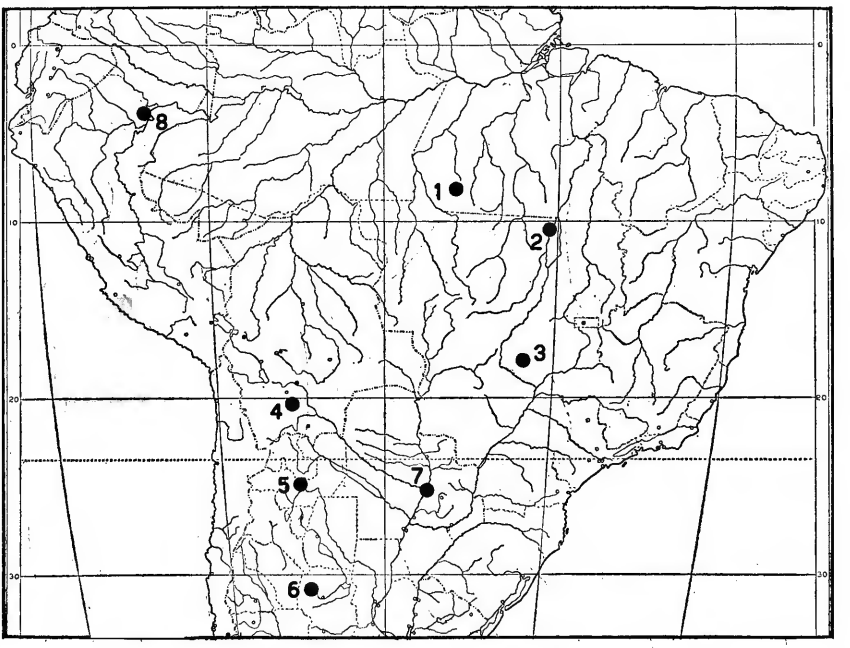



Fig. 17: distribution of the known species of *Urostreptus*. Localities and recorded species as follows: 1, Serra do Cachimbo, Pará, Brasil (*travassosi, mundurucensis*); 2, Barra do Tapirapé, Mato Grosso, Brasil (*carvalhoi, tampiitauensis*); 3, Jataí, Goiás, Brasil (*paxillatus*); 4, Caiza, Potosi, Bolivia (*camerani*); 5, Salta, Argentina (*camerani*); 6, Sierra Chico, Cordoba, Argentina (*camerani*); 7, Assuncion and Arequa, Paraguay (*hassleri, compressicauda*); 8, Iquitos, Loreto, Perú (*mineri*). Permission for use of the base map was granted by the University of Chicago Press.

**Urostreptus travassosi** (Schubart), n. comb.

*Stenostreptus travassosi* Schubart, 1957: 314, figs. 7, 8 (type series, Dept. Zool. São Paulo, from Serra do Cachimbo, Pará, Brazil; L. Travassos & S. J. de Oliveira leg.).

## References


Attems, Carl

1950: Über Spirostreptiden (Diplopoda). *Ann. naturh. Mus. Wien. 57*: 179-257, figs. 1-96.

Carl, J.

1917: Spirostreptides nouveaux ou peu connus du Museum de Genève. *Rev. suisse de Zool. 25*: 383-409, figs. 1-26.

Chamberlin, R. V.

1941: On a collection of millipedes and centipedes from northeastern Peru. *Bull. Amer. Mus. nat. Hist. 78*: 473-535, figs. 1-230.

Hoffman, R. L.

1960: Studies on Spirostreptoid Millipeds. V. A Synopsis of the Genus Heteropyge, with some notes on the Status of the Names Alloporus and Plusioporus. *Lloydia 23* (4): 109-114, 3 figs.

Humbert, Alois, & Henri de Saussure

1870: Myriapoda Nova Americana: Description de divers Myriapodes nouveaux du Musée de Vienne. *Rev. Mag. Zool.* (2) *22*: 172-177.

Schubart, Otto

1945: Sôbre os representantes Brasileiros da família Spirostreptidae. *An. Acad. bras. Ci. 17*: 51-87, figs. 1-16.

1947: Os Diplopoda da viágem do naturalista Antenor Leitão de Carvalho aos Rios Araguaia e Amazonas em 1939 e 1940. *Bol. Mus. Nac. Rio de Janeiro (NS) 82*: 1-74, figs. 1-75.

1957: Sôbre alguns Diplopoda de Serra do Cachimbo no sul do Estado do Pará. *An. Acad. bras. Ci. 29*: 309-318, figs. 1-10.

1958: Sôbre alguns Diplopoda de Mato Grosso e Goiás, Brasil e a Familia Spirostreptidae. *Arq. Mus. Nac. Rio de Janeiro 46*: 203-252, figs. 1-31.

Silvestri, Filippo

1895: Viaggio del dottor Alfredo Borelli nella Republica Argentina e nel Paraguay. XIV. Chilopodi e Diplopodi. *Boll. Mus. Zool. Anat. comp. Torino 10* (203): 1-12, figs. 1-22.

1897a: Viaggio del Dott. Alfredo Borelli nel Chaco boliviano e nella Repubblica Argentina. IV. Chilopodi e Diplopodi. *Bol. Mus. Zool. Anat. comp. Torino 12* (283), 11 pp., 27 figs.

1897b: Systema Diplopodum. *Ann. Mus. Stor. nat. Genova 38*: 644-651.

Verhoeff, Karl W.

1941: Über Spirostreptiden Südamerikas, vergleichend Morphologie und Mechanik der Gonopoden und eine neue Rhinocriciden-Gattung. *Arch. Naturg. esch., n.f. 10*: 278-302, figs. 1-11.