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STUDIES ON SPIROSTREPTOID MILLIPEDS. XII. A NEW SPECIES OF *GYMNOSTREPTUS* FROM SÃO PAULO, WITH NOTES ON THE COMPOSITION OF THE GENUS

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ABSTRACT

The name Gymnostreptus acuticollis *is proposed for an apparently undescribed milliped occuring in the coastal region of São Paulo and Rio de Janeiro, and obviously related to* G. subsericeus *Brölemann and some other species currently located in other genera. The occasion is taken to present a relatively broad concept of* Gymnostreptus *as a variable genus that can include species now covered by such generic names as* Conchostreptus, Caicarostreptus, Kochliogonus, *and* Paulistostreptus. *It is proposed that six species-groups can be defined within this revised concept, as there is really no major anatomical discontinuity in gonopod structure. In addition to the new combinations resulting from the above generic synonymy, two additional species are brought into* Gymnostreptus *for the first time:* Archispirostreptus punctiporus *Silvestri, 1897, which is perhaps a senior synonym of* G. subsericeus; *and* Tibiozus armatus *Attems, 1950, which is almost certainly a junior synonym of* "Paulistostreptus digitalis" *Schubart.*

The interesting species which forms the subject of the following remarks was represented among material studied for helminth parasites and subsequently sent to me for identification by Dr. G. R. Kloss, Museu de Zoologia, Universidade de São Paulo. Although the immediate purpose of this paper is to validate a name for the host animal for the benefit of Dr. Kloss's studies, the occasion is taken to register a few notes and comments about the generic position of the milliped concerned.

The recognition of groups of obviously related species amongst the Neotropical Spirostreptidae is not really difficult as a rule, and the delimitation of such ensembles as those known by the names *Urostreptus, Orthoporus, Anethoporus,* and *Nanostreptus* is fairly satisfactory. On the other hand, there exist a number of species groups, or isolated disjunct species, which have been assigned generic names the actual validity of which is somewhat problematical. One such group is the *Plusioporus-Trichogonostreptus-Oreastreptus* complex, another consists of the nominal genera *Gymnostreptus, Kochliogonus,* and *Conchostreptus.* I have been for some years accumulating material

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for a revision of the first-named group which is now under study. Of the second aggregation, however, I have seen very little material and must confine myself here to what may be safely deduced from the literature.

There has been in the past (and in some quarters, right into the present) a tendency to base generic concepts upon a single anatomical feature of gonopod structure (such as the occurrence of marginal fimbriae on the telopodite) or the presence of ozopores on the 5th body segment. I have already expressed several times the opinion that overall similarity of gonopod form, even if totally subjective in nature, provides a more desireable basis for the grouping of species.

Gymnostreptus acuticollis, sp. n.

(Figs. 1-5)

Type material: Holotype male (MZSP) and two paratype females from Est. Biol. Boracéia, mun. Salesópolis, São Paulo; 23 July 1970 (E. Coelho & G. R. Kloss leg.).

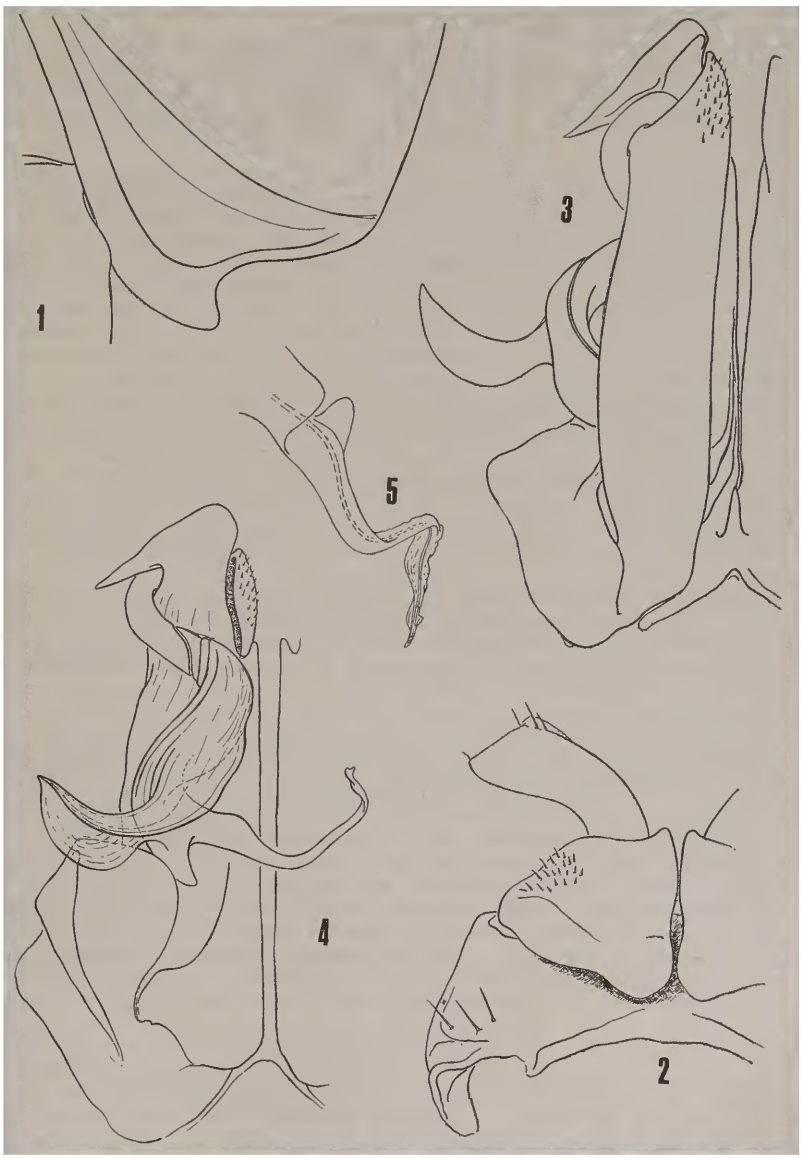
Diagnosis: A member of the species-group in which the telopodite is provided at about its midlength with a prominent, laterally-directed lobe, but no femoral process is developed. Within this group apparently closest to *G. flavipes* (Schubart) in having anterior lateral region of collum acutely produced, but differing from that species in coloration (annulate instead of solid black), in having the apical end of the anterior coxal fold shorter and setose, and in having an additional triangular projection from the telopodite distad to origin of the major process.

Holotype: Adult male (DZ autop. no. 3531); length about 73 mm (specimen broken), greatest diameter 5.4 mm, body with 50 segments.

Coloration superficially rufous brown with darker annuli and a yellow head; in detail (after three years in alcohol): anterior half of prozonite whitish gray, with distinct darker reticulation (muscle insertion patterns); posterior half of prozonite and anterior half of metazonite light brown or flavous. Legs, paraprocts, antennae, and entire head below level of ocelli clear yellow. Top of head yellowish-gray, a light brown transverse band between ocellaria.

Head convex; front surfaces smooth and polished, minutely punctate; epicranial median suture distinct, interocellarial suture not evident; four prominent equally spaced clypeal setae, about 12 + 12 labral setae. Ocelli about 9-9-8-6-5-3, much larger toward sides of head, their surface flattened, each appearing somewhat hexagonal; surface of head behind ocelli rugose-striate. Interantennal space equal to greatest length of an ocellarium (2.4 mm). Antennae moderately short (4.4 mm) not exceeding posterior edge of collum. First antennomere subglobose, glabrous, 2nd elongate, clavate, 3d-5th short, abruptly clavate, slightly curved, much more setose than 1st and 2nd; 6th flattened ovate, 7th small, discoidal, with four sensory cones; articles 5 and 6 with transverse terminal sensory pits. Lenght values: $2 < 3 = 4 = 5 = 6 < 1 < 7$.

Mandibular stipe prominently lobed distally, the lobe slightly curved downward, apically truncate; entire lateral edge of stipe margined. Mentum of gnathochilarium with the usual discal depression, basally set off by a sharply defined overhanging margin; stipes with about



Gymnostreptus acuticollis, sp. n.: 1, lower side of collum; 2, base of first pair of legs, oral aspect; 3, right side of gonopods, oral aspect; 4, left side of gonopods, aboral aspect; 5, apex of telopodite. Drawings from the type specimen, made to different scales.

10 marginal setae, a central field of 5-7 short stout setae, and a row of about 8 setae paralleling edge of mentum.

Anterior curvature of collum with acutely produced lobe (Fig. 1), anterior edge up to level of ocellaria set off by wide and prominent margin, inward a short, poorly defined, oblique ridge and groove and a much more prominent inner groove which attains caudal edge of collum.

Body segments subequal in diameter: metazonites not perceptably larger than prozonites; sculpture very fine, anterior half of prozonites with 8 to 10 minute, sporadically beaded transverse striae, posterior half and entirety of metazonites microscopically vermiculate-rugulose, the rugae tending to form longitudinal ridges middorsally; sides with longitudinal ridges up to level of ozopores; segmental sulcus distinct entirely around body. Sterna smooth. Last segment without distinct epiproct; paraprocts prominent, curved outward in profile, their margins thickened but not set off by distinct grooves or submarginal depressions; hypoproct small, transverse, discrete from preceeding segment.

Legs moderately long, tibiae and tarsi visible from above when extended laterally; coxae dissimilar, the anterior smaller and compressed, the posterior larger and somewhat expanded posteriorly. Postfemoral and tibial pads present, traceable back as far as legs of 40th segment, thereafter becoming very small and obscure. Tarsus with two parallel series (3 + 3) of ventral setae and single macroseta above base of tarsal claw, the latter large, stout, about 2/3 length of tarsus.

First pair of legs (Fig. 2) typical for the genus, prefemoral lobes small and only slightly projecting free from surface of syncoxosternum, the latter with a few macrosetae near the lateral ends; sternal remnant distinct medially but not distinctly continuous with the tracheal apodemes. Prefemora with a discrete field of small short setae near the outer distal margin.

Gonopods (Figs. 3-5) similar to those of other members of the group: a smoll but distinct median sternum present, with an acute median projection, coxal folds elongate and slender, the anterior (paragonocoel) not as long as apex of telocoxite and minutely setose. Telopodite *in situ* curved around to aboral side of gonopods, the torsus[1] located on the posterior side at some distance from the point of exsertion, forming a 180° rotation, no trace of femoral spine present; beyond torsus the postfemoral region becomes broader and laminate, the median edge projecting strongly laterad to form a large, thin, partly folded lateral process, at the base of which originates a small triangular lobe formed from the lateral margin of the postfemoral region; distad to this lobe telopodite becomes abruptly smaller; terminal region minutely

1. The term *torsus* [< Med. Lat. *torsus*, var. of *tortus*, pp. of *torquere*, to twist] is here proposed as a descriptive noun designating that part of the gonopod telopodite, presumably between femur and postfemur, which in many genera is rotated through as much as 360° of torsion. It is felt that a short name of classical origin is more convenient and meaningful than the term "sinus de la rainure seminale" which was proposed to cover exactly the same situation by Brölemann. An adjectival derivation might be "torsate", an improvement over the present term "rotated" or "twisted".

lobed (Fig. 5) but without any conspicuous branches or modifications, the prostatic groove running directly to the terminus.

Discussion: Female specimens agree closely in sculptural detail with the male, except for lacking the acute angulation of the collum. In both paratypic females there is the suggestion that the first three or four body segments have been suffused with reddish coloration in life.

Specimens in a second sample (Rio de Janeiro: Barra de São João, 1♂, 2♀, Aug. 1963, Alvarenga & Bokermann leg.) agree closely with the type material, but the male has 54 segments, and in all three the entire head and collum is yellow, causing the black ocellaria to stand out in a striking contrast.

Gymnostreptus

Gymnostreptus Brölemann, 1902: 153. Type species, *Spirostreptus* (*Gymnostreptus*) *perfidus* Brölemann, subsequent designation of Pocock, 1909.

Conchostreptus Schubart, 1945: 75. Type species, *C. bahianus* Schubart, by original designation.

Caicarostreptus Schubart, 1950: 155. Type species, *C. flavipes* Schubart, by original designation.

?Kochliogonus Attems, 1950: 245. Type species, *Spirostreptus ventralis* Porat, 1876, by original designation.

Paulistostreptus Schubart, 1945: 80. Type species, *P. digitalis,* by original designation.

Definition: Medium-sized (50-100 mm) South American spirostreptids of generally normal appearance, the collum not appreciably enlarged, the epiproct only slightly developed and never dorsally carinate; number of segments in the referred species ranging from 45 to 55, with the great majority centered around 50 ± 2.

First pair of legs of the male very characteristic in form, the prefemoral lobe broad and short, hardly projecting free from the syncoxal surface; latter with a small field of setae near the lateral ends in the majority of species, and the prefemora with a field of smaller and denser setae toward the outer margin (as shown in Fig. 2).

Gonopods somewhat variable in structure, but in general the coxal folds are elongated and slender, apically acuminate and often finely setose; telocoxite (posterior fold) only slightly, if at all, longer than paragonocoel, and in the great majority of species is produced laterally into a slender, acuminate, proximally-directed lobe. Telopodite variable in form, but always with torsion well distad to point of exsertion ("Knie") and tibiotarsus apically slender and simple, the prostatic groove running out to the apex of the structure. In some species a small, moderate, or very large femoral spine is present, and in many the postfemoral region is broadened and modified into one or more projecting lobes.

Distribution: All of the species referred here to *Gymnostreptus* are endemic to the faune of southeastern Brazil, from Bahia and

eastern Mato Grosso south to eastern Paraguay and northern Rio Grande do Sul.

The union of the above-listed names is here suggested with considerable diffidence, as it opposes the views of the careful and conservative Schubart, himself certainly no "splitter" at the generic level. But taking in account the everall basic similarity of all of the referred species in terms of the apex of the gonopod coxa, as well as of the 1st pair of male legs, one must rely largely upon modifications of the telopodite for diagnostic characters. Because of what appears to me great variability in telopodite structure, I find it difficult to establish sharp discontinuities and think that for the present, at least, maybe a better picture is gained by regarding these so-called "genera" as just species-groups. Realizing that still some work remains to be done in assigning some known species to a particular group (usually because the gonopod characters are not clearly published), I propose the following groups each with a brief characterization. It must be emphasized that such verbal definitions can not substitute for actual comparison of the entire gonopod structure. Pertinent literature references are supplied for this purpose.

Group I. Telopodite simple, slender and attenuated, without lateral lobes or processes, a very small femoral spine proximad to the torsus.

Gymnostreptus perfidus Brölemann, 1902. São Paulo (Paranapiacaba).

Gymnostreptus perfidelis Schubart, 1944. São Paulo (Pirassununga).

Group II. Telopodite with a small lateral lobe or process; femur without a spine proximad of the torsus.

Gymnostreptus iheringi Brölemann, 1902. São Paulo (Paranapiacaba).

Gymnostreptus olivaceus Schubart, 1944. São Paulo (Pirassununga).

Group III. Telopodite with a long, slender, acuminate subterminal process; no femoral spine.

Gymnostreptus ventralis (Porat), sensu Brölemann, 1902. São Paulo (widespread). There remains some doubt that the species going by this name in current literature is really the same as that represented by the original type specimen. Until this matter can be eventually resolved, the status of the name *Kochliogonus,* based by Attems upon the name *ventralis,* must remain in doubt.

Group IV. Telopodite with a long, prominent process near its midlength, but not strongly clavate as in the preceeding group; no femoral process present.

Gymnostreptus subsericeus Brölemann, 1902. São Paulo (southeastern).

Gymnostreptus punctiporus (Silvestri, 1897), comb. nov. (from *Archispirostreptus*). Rio Grande do Sul (Porto Alegre).

Gymnostreptus vulgatus (Porat, 1889), *sensu* Schubart, 1950. Rio de Janeiro (Serra dos Órgãos).

Gymnostreptus flavipes (Schubart, 1950), comb. nov. (from *Caicarostreptus*). São Paulo (Mun. Itanhaém).

Gymnostreptus roseopygialis (Schubart, 1969), comb. n. (from *Caicarostreptus*). São Paulo (Ilha de São Sebastião).

Gymnostreptus acuticollis, sp. nov. São Paulo (Mun. Salesópolis). This and the two preceeding taxa are quite likely geographic races of one species.

Group V. Telopodite with a small, spiniform femoral process just proximad to the torsus; postfemoral region broadened, with a moderate lateral lobe.

Gymnostreptus goyanus (Schubart, 1950), comb. nov. (from *Conchostreptus*) Goiás (Mun. Cavalcante).

Gymnostreptus bahianus (Schubart, 1945), comb. nov. (from *Conchostreptus*) Bahia (Baranal).

Group VI. Telopodite with very long and prominent femoral process; postfemoral region broadened along much of its length, but the distal third abruptly narrower and acuminate, median lateral lobe of moderate size.

Gymnostreptus pictus (Schubart, 1945), comb. nov. (from *Conchostreptus*). Mato Grosso (Barra do Tapirapé).

Gymnostreptus rusticus (Attems, 1950), comb. nov. (from *Mardonius*). Pernambuco (Penba) [Serra da Penha?].

Group VII. Telopodite without trace of femoral spine; moderately broadened beyond torsus, one edge of postfemur produced into two or three dentate lobes.

Gymnostreptus digitatus (Schubart, 1945), comb. nov. (from *Paulistostreptus*). São Paulo (Mun. Andradina).

Gymnostreptus armatus (Attems, 1950), comb. nov. (from *Tibiozus*). Paraguay (San Bernardino). Probably a synonym of the preceeding.

Those who prefer to formally designate species-groups with taxon names will observe that most of the above assemblages already have names available; these could be revived either as subgeneric or as generic names, in the latter case what I am calling *Gymnostreptus* would become a tribe Gymnostreptini. This purely subjective character-weighing will, I think, eventually be settled by the judgment of posterity.

Students of the Spirostreptidae now have two quite divergent treatments of *Gymnostreptus* to adjudicate. In a recent consideration of taxonomic characters in this family, my colleague J.-M. Demange (1970) has proposed to establish generic concepts solely upon modification of the gonopod telopodite, and has recognized a number of categories upon this basis. It is beyond the scope of this paper to enter into a detailed discussion of Demange's system, which requires examination in the original form, but I can observe at least the main points on which it departs from the schema outlined above.

(1) *G. subsericeus* is referred to the Andean genus *Cladodeptus* (Chamberlin, 1941). The gonopod characters of *C. iquitus* Chamb. are

known solely from a small and inadequate sketch in Chamberlin's 1941 paper, but it is clear that the postfemoral region of the telopodite is provided with a long, slender process. Whether or not this is really homologous with the large broad and laminate process of my Group IV species remains, I think, to be proven. In addition, *C. iquitus* has a moderately large femoral process proximad to the torsus, as in species of Group V. If Demange's belief that *subsericeus* and *iquitus* are related can be confirmed, then *Cladodeptus* can either become another synonym of *Gymnostreptus,* or a fairly large genus on its own containing all of the Group IV species. My personal preference is to disregard *Cladodeptus* until its type species can be carefully restudied.

(2) *G. ventralis* is referred to *Epistreptus* (Silvestri, 1897). The type species of this genus, *E. oscenus* Silv., has been figured by Demange himself (1970), and, in my opinion, is very closely related to *E. silvestri* Kraus (1955) making up thus a small genus confined to the northern Andes to which *ventralis* has little close affinity.

(3) *G. iheringi* is referred to *Hemigymnostreptus.* I cannot concur in this allocation. Species of the latter genus are characterized by a very large collum — reminiscent of that in the Harpagophoridae; by a singular form of the 1st pair of legs of the male; and by a high segment number (65-75 in all known species). According to Brölemann's original drawing, the collum of *iheringi* is of normal appearance, and the species has 47-50 segments. I think it is unlikely that the first legs, when studied, will contravert these conditions, and so I conclude that the similarity in gonopod form must be one resulting from parallel evolution.

(4) *Paulistostreptus* (=Group VII above) is considered to be probably a junior synonym of *Rhopalopoditius* Verhoeff, a view which I do not share.

(5) *Caicarostreptus* is admitted as a valid genus near *Obelostreptus.* Considering that gonopods of *C. flavipes* and of *Gymnostreptus subsericeus* are essentially identical in form, it is puzzling that the first is placed in a major category having "differenciations tibiotarsales" whilst the other goes into an equivalent group "sans differenciations tibiotarsales." The two forms are so closely allied that both must be placed in either one category or the other.

It seems possible to me, that in emphasizing single characters liable to entirely random suppression or elaboration, M. Demange's classification does not take sufficiently into account that gonopod structure is as susceptible to convergent or parallel evolution as other parts of the animal. One might wish for a classification taking into account other important sexual modifications such as structure of the first pair of legs, as well as peripheral characters of body form, and the confirmatory evidence of logical distributional patterns.

In any event, I think it is manifest that final resolution of spirostreptid classification is still a long way in the future!

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