

**Review of the Neotropical millipede genus *Onciurosoma* Silvestri, 1932, with the description of three new species from near Manaus, Central Amazonia, Brazil (Diplopoda, Paradoxosomatidae)**

by

Sergei I. Golovatch

Dr. Sergei I. Golovatch, Institute of Evolutionary Morphology and Ecology of Animals, Russian Academy of Sciences, 33 Leninsky prospekt, 117071 Moscow V-71, RUSSIA.  
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**Abstract**

The Neotropical millipede genus *Onciurosoma* currently comprises seven nominate species: *O. neotropicum* SILVESTRI, 1932 (the type-species), *O. cumbrense* (BROLEMANN, 1898), both from Venezuela, *O. acisternum* SILVESTRI, 1932, from British Guiana, *O. crassipes* JEEKEL, 1963, from Surinam, and also the newly described *O. adisi* sp. n., *O. alamellatum* sp.n. and *O. affine* sp. n. from Central Amazonia, Brazil. Interspecific relationships are briefly discussed, a modernized key has been prepared.

**Keywords:** Diplopoda, Paradoxosomatidae, Amazon, Neotropics, inundation forest.

**Introduction**

Since JEEKEL's (1963) excellent review of the Neotropical Paradoxosomatidae as a whole, the millipede genus *Onciurosoma* SILVESTRI, 1932, has been known to comprise only a few species encountered in Venezuela, British Guiana, and Surinam. These are *O. neotropicum* SILVESTRI, 1932 (the type-species) and *O. cumbrense* (BROLEMANN, 1898), both from Venezuela, *O. acisternum* SILVESTRI, 1932, from British Guiana, and *O. crassipes* JEEKEL, 1963, from Surinam. Also, based solely on the very poor original description and the highly inadequate sketch of a gonopod (see SILVESTRI 1896), JEEKEL (1963) suspected another species, viz. *Orthomorpha festae* SILVESTRI, 1896, from Panama, as actually belonging in *Onciurosoma*, although this allocation was later questioned by LOOMIS (1968). In addition, LOOMIS (1934) referred to yet another, unidentified Surinam *Onciurosoma* sp., obviously other than *O. crassipes* (see JEEKEL 1963). As a result, *Onciurosoma* has been considered as a genus

coherently restricted to northern South America (JEEKEL 1968, HOFFMAN 1979).

Prompted by the discovery of three new congeners deriving from near Manaus, Central Amazonia of Brazil, I focus here on their descriptions and provide another key to all seven currently recognizable *Onciurosoma* species. This is my second paper to the Neotropical diplopod list (see GOLOVATCH 1992), partly contributed to in the course of long-term field investigations of the arthropod fauna of floodplains at Manaus by PD Dr. Joachim ADIS, of the Max-Planck-Institut für Limnologie in Plön (MPI), Germany. Besides, I was privileged to incorporate a sample obtained by a team of collectors from the Smithsonian Institution, Washington, D.C. (SIW), and sent on loan to Dr. J. ADIS. The present paper deals solely with taxonomic problems, whereas ecological issues will be discussed elsewhere, especially from a viewpoint of survival strategies in the extreme conditions of an Amazonian inundation forest (see reviews by ADIS 1992b, c). The only other local paradoxosomatid more or less adequately studied in this respect appears to be *Mestosoma hylaeicum* JEEKEL, 1963 (see ADIS 1992a).

No fewer than three new members of this oligotypic genus, previously believed to be confined to northern South America and now quite unexpectedly revealed from the environs of Manaus alone, is perhaps evidence of many more *Onciurosoma* species still to be discovered in the entire Neotropical realm. This is supposed to hold true at least for areas north of and within Amazonia soundly believed to form a coherent fauna as opposed to that populating South America south of the Amazon basin (HOFFMAN in litt.). In this connection, it seems opportune to provide a new synopsis and outline the species composition of and interspecific variability within the genus concerned.

Holotypes and most of the paratypes of the new species have been deposited in the collection of the Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA), while some paratypes have been housed in the collections of the SIW, Zoological Museum of the State University of Moscow (ZMUM), and Dr. J. ADIS (CA), as indicated below.

## Systematics

### *Onciurosoma adisi* n. sp. (Figs. 1-11)

Holotype: ♂ (INPA), Brazil, Edo. Amazonas, Igapó of Rio Tarumã Mirim (= blackwater inundation forest) ca. 20 km NW of Manaus, tributary of Rio Negro (3°2' S, 60°17' W), under log: 21.X.1980; leg. J. ADIS. -

Paratypes: 1 ♂, 3 ♀♀ (INPA), same data, together with holotype. - 1 ♂ (CA), same data, soil extraction, 24.III.1977. - 1 ♂, 1 ♀ (ZMUM), same data, pitfall traps, 6.I.1977. - 1 ♀ (CA), same data, under bark of *Aldina latifolia* ca. 2 m above water-level, 12 II.1981. - 1 ♀, 1 juv. (19 segm.) (INPA), same data, in rotten wood on forest floor, 11.IX.1981. - 1 ♀, 1 juv. (19 segm.) (INPA), same data, under bark, 21.X.1980; all leg. J. ADIS and collaborators.

Other material: Rather numerous juveniles of various instars from the same locality, mostly taken on tree trunks, under the bark of trees and on/in the soil from March 1976 to February 1982. All leg. J. ADIS and his collaborators.

Etymology: This interesting species is named in honour of my colleague Dr. Joachim ADIS who also collected it.

Diagnosis: Particularly close to *O. neotropicum*, but differs from all congeners by the peculiar shape of both the sternal lamina between the male coxae 4 and the gonopod tip, combined with the development of both the middorsal line and the anteriormost male leg-pairs. [See also key below.]

Description: Length ca. 15 (♂) to 16-17 mm (♀), width of midbody somites 1.4-1.5 (♂) and 1.9-2.0 mm (♀). Holotype ca. 15 mm long and 1.5 mm wide. Colour from entirely pallid, (cream-)whitish to (reddish-)brown, with legs and ventrum yellowish to pale brown. Anterior body half coloured somewhat more brightly, sometimes with an annulated pattern due to both somewhat darker caudal tergal edge and suture between pro- and metazona (alcohol material).

Body strongly somoid, especially distinctly moniliform in ♂. Antennae in situ slightly surpassing somite 3 (♂) or 2 (♀), rather clavate (Fig. 1). Head rather densely setose, especially so on frons, in width subequal to somite 7, very considerably (♂) to moderately (♀) broader than collum. Collum in width subequal to somite 5 (♂), slightly broader than subequally narrowest somites 2-4. Body parallel-sided on somites 7-17, onward rapidly but regularly tapering. Surface moderately shining, smooth to sometimes very slightly rugulose behind metatergal sulcus. Suture between pro- and metazona very deep, finely longitudinally striate at bottom. Paraterga almost wanting, set very low (at about midbody height), on somite 2 well below both collum and somite 3 (Fig. 1), never reaching to rear tergal contour, caudally always rounded, in lateral aspect rather thin (on poreless terga) to very wide (on pore-bearing somites) ridges demarcated longitudinally dorsally and arcuately ventrally, in dorsal view inconspicuous (Fig. 4), missing on somite 19. Ozopores rather large, located near paratergal caudal corners. Tergal setae better preserved on anterior body half, relatively long, simple, not mounted on knobs, tending to become a bit shorter toward caudal body end, arranged in a single 2+2 transverse row in front of sulcus in addition to 1+1 on paraterga. Transverse sulcus on metaterga linear, starting from somite 5 and absent from somites 18-19, far from reaching to base of paraterga (Fig. 4). Middorsal line largely equally deep to somewhat deeper, but broader as a rule, than sulcus expressed only on caudal halves of sulciferous metaterga (Fig. 4). Both sulcus and middorsal line generally thinner and poorer in ♀ as compared to ♂. Pleurotergal carinae quite evident, as thin arcuated ridges carrying no teeth (Fig. 1), gradually becoming absent towards somite 18. Epiproct typical for the genus, straight, broad, quite long, flattened dorsoventrally, caudally terminating in a pair of in-decurved unci (Figs. 2-3). Subanal scale trapeziform, with a paramedian pair of setiferous knobs at rear corners.

Sterna moderately setose, broader in ♀ than in ♂, caudally at base of coxa with a very little cone or denticle tending to grow in size toward telson (♂, ♀), between ♂ coxae 4 with a very prominent, setose lamina directed ventrocephalad and supplied with a narrowly rounded tip (Fig. 7). Legs long and slender, without tarsal brushes, ♂ pairs 2-3 slightly incrassate (Fig. 5), caudally increasingly slender (Fig. 6).

Due to prominent lamina g, gonopods (Figs. 8-11) much like *O. neotropicum* or *O. crassipes*, but tip of tibiotarsus somewhat differently shaped.

Remarks: Judged from phenological observations, adults of this species in the locus typicus seem to be restricted to September-March, whereas juveniles of various instars are met with throughout the year.

#### *Onciuerosoma alamellatum* n. sp. (Figs. 12-19)

Holotype: ♂ (INPA), Brazil, Edo. Amazonas, 18.1 km E of Campinas Field Station ca. 60 km N of Manaus (2°30' S, 60°15' W), canopy fogging, 22.02.1979; leg. Montgomery, Erwin, Schimmel, Krischik, Date, Bacon. -

Paratype: ♂ (SIW), same data, together with holotype.

Diagnosis: Similar to *O. acisternum*, but differs from all congeners by the worst developed middorsal line, particularly strongly incrassate male leg-pairs 2-3, scapular sternal lamina between the male coxae 4, and slender gonopods. [See also key below.]

Description. Length 12 mm, midbody width 1.0 mm. Colour uniformly brown (holotype) to slightly annulated due to darker prozona and suture between pro- and metazona.

Body shape, proportions as well as all main characters as in *O. adisi*, but middorsal line relatively poorly developed to hardly traceable though sometimes extending to presulcus part of metaterga as well (Fig. 12); ♂ legs more incrassate, especially pairs 2-4 (Fig. 13) and, to a lesser degree, pairs 5-6 (Fig. 14);

sternal lamina between ♂ coxae 4 not especially slender and high, setose, scapular (Fig. 15). Sternal denticles also present.

Gonopods (16-19) particularly slender, lamina g poorly developed, hardly traceable.

Remarks: Judged from its provenance, this species is perhaps a forest canopy-dweller.

*Onciurosoma affine* n. sp. Figs. (20-26)

Holotype: ♂ (INPA), Brazil, Edo. Amazonas, Terra firme (= nonflooded upland forest), Reserva Florestal A. Ducke ca. 25 km N of Manaus (2°55' S, 59°59' W), on tree trunk (arboreal photo-elector), 28.XII.1981; leg. J. ADIS and collaborators. - Paratypes: 1 ♂ (ZMUM), same data, together with holotype. - 1 ♂ (INPA), soil extraction (Kempson apparatus), 9.VIII.1983. - 2 ♀♀ (INPA), same data, 12.II.1983; all leg. J. ADIS and collaborators.

Other material: Several juveniles of various instars met with from February 1982 to September 1983. All leg. J. ADIS and collaborators.

Diagnosis: Particularly close to *O. alamellatum*, but differs from all congeners by the conspicuous shape of the sternal lamina between the male coxae 4 and certain details of gonopod structure. [See also key below.]

Description: Length ca. 14 (♂) to 16 mm (♀), midbody width 1.0 (♂) and 1.0-1.3 mm (♀). Colour pale cream to pale brown, sometimes reddish on anterior body half. Sometimes (holotype) pattern annulated due to somewhat darker prozona and suture between pro<sup>an</sup> and metazona.

All somatic features as in *O. alamellatum*, but middorsal line much more distinct as a rule, often traceable in front of sulcus as well (Fig. 20); ♂ legs less incrassate (Figs. 21-22); sternal lamina between ♂ coxae 4 especially slender and high, setose, linguiform (Fig. 23).

Gonopods (24-26) somewhat less slender, apically subsecuriform, lamina g similarly poorly developed.

**Key to the currently known *Onciurosoma* species**

1. Epiproct very long, in lateral view straight, without a pair of apical unci. Sterna with neither cones nor teeth. Sternal lamina between male coxae 4 extremely high, as in Fig. 23, but somewhat more narrowly rounded. Gonopod lamina g moderately developed, about half as long as solenomerite (Figs. 33-34) . . . . . *O. cumbrense* (BROLEMANN, 1898).
- Epiproct relatively short, apically with a pair of unci directed ventrocaudally (Figs. 2-3). Sterna with either cones or teeth near coxae. Sternal lamina between male coxae 4 differently shaped, usually shorter. Gonopod lamina g either poorly developed or about only 3/4 as long as solenomerite. . . 2.
2. Gonopod lamina g poorly developed (Figs. 19, 25, 32). . . . . 3.
- Gonopod lamina g very prominent (Figs. 8, 11, 27, 30). . . . . 5.
3. Midbody paraterga caudally spiniform and slightly surpassing rear tergal contour. Male legs 2-3 not significantly enlarged. Gonopod as in Figs. 31-32. . . . . *O. acisternum* (SILVESTRI, 1932).
- Paraterga caudally largely obsolete or small, never spiniform and never surpassing rear tergal contour. Male legs 2-3(4) more or less incrassate. Gonopods different. . . . . 4.
4. Gonopods particularly slender (Figs. 16-19). Middorsal line poorly developed (Fig. 12). Lamina between male coxae 4 shorter and broader, scapular (Fig. 15). . . . . *O. alamellatum* sp. n.
- Gonopods stouter (Figs. 24-26). Middorsal line well-developed (Fig. 20). Lamina between male coxae 4 much longer, linguiform (Fig. 23). . . . . *O. affine* sp. n.
5. Lamina between male coxae 4 widening distally. Gonopod tip securiform, as in Figs. 27-28. . . . . *O. neotropicum* SILVESTRI, 1898.
- Lamina between male coxae 4 never widening distally. Gonopod tip different. . . . . 6.

6. Lamina between male coxae 4 subtriangular (Fig. 7). Gonopod tip broadened and bifid as in Figs. 10-11. . . . . *O. adisi* sp. n.  
 - Lamina between male coxae 4 linguiform. Gonopod tip slender (Figs. 29-30). . . . .  
 . . . . . *O. crassipes* JEEKEL, 1963.

**Analysis of interspecific relations within *Onciurosoma***

Among the seven currently known species of *Onciurosoma*, two more or less distinct groupings are evident, both reflected in the second couplet in the above key. The major difference between them lies in the degree of development of the gonopod postfemoral lamina g. In *O. acisternum*, *O. alamellatum* and *O. affine*, this lamina g is yet very poorly developed. On the other hand, g in *O. neotropicum*, *O. crassipes* and *O. adisi* is very prominent, while *O. cumbrense* appears to be intermediate. This feature seems to represent an autapomorphy displaying an evolutionary trend from the more plesiomorphic condition of a poorly developed g to the more advanced state of a particularly prominent g. Another apparent autapomorphy of almost the entire genus (except for *O. cumbrense*) so far seems to be the peculiar shape of the epiproct accounting for the generic name. The lamina g combined with the tortuous course of the seminal groove, the reduced gonofemorite, the solenomerite more or less considerably sheathed by the solenophore, and especially due to the lamina lateralis, as well as the largely uncigerous epiproct and often the presence of sternal cones/denticles in both sexes seem to be very strong diagnostic features of *Onciurosoma*. The somewhat more variable degrees of development of paraterga, pleurotergal carinae, leg modifications, etc., appear to be only species-characteristic.

Although the male type of *Strongylosomum cumbrense* (BROLEMANN, 1898), kept at the Paris Museum and recently restudied by me through the kind assistance of Dr. J.-P. MAURIES, has neither unciform epiproct nor sternal cones (both plesiomorphic), the strongylosomoid shape of the body (with the paraterga like in, e. g., *O. adisi* sp. n.), the very well-developed sternal lamina between the male coxae, the typically enlarged male legs 2-3 and, to a lesser degree, pairs 4-5 (again like in, e. g., *O. adisi* sp. n.), and particularly the gonopod conformation leave no doubt we face a somewhat disjunct *Onciurosoma*. This fully supports JEEKEL's (1963) opinion on the generic allocation of *S. cumbrense* within *Onciurosoma*. Like in numerous other examples of Paradoxosomatidae, most if not all somatic characters show no correlation with gonopod features (e. g. GOLOVATCH & ENGHOFF, 1993). This means that the above, intermediate, i. e. quite an advanced, position of *O. cumbrense* as regards the degree of development of the gonopod lamina g, which is a clear apomorphy, does not mean that the species could not have retained certain plesiomorphic somatic traits occurring amongst no other congeners known as yet.

In addition, judged from the above evidence on the intrageneric consistency of *Onciurosoma*, JEEKEL's (1963) suspicion about the identity of *Orthomorpha festae* SILVESTRI, 1896, as a member of *Onciurosoma* can hardly be supported. Indeed, even the highly incomplete original description of the latter species (SILVESTRI 1896) is sufficient to see that its epiproct is largely uncharacteristic of *Onciurosoma*, same as the sketch of a gonopod. Moreover, LOOMIS (1968) believed that *Orthomorpha festae* is not at all a paradoxosomatid, actually representing a *Pseudamplinus*, junior synonym of

the prolific Central American genus *Amplinus* ATTEMS, 1898, family Platyrrhacidae (see HOFFMAN 1979). However, judging from the gonopod conformation, it is equally possible that this is an example of *Trichomorpha* SILVESTRI, 1897, a highly speciose Mesamerican genus of Chelodesmidae (HOFFMAN 1979). In other words, *Orthomorpha festae* requires restudy, with the predictable result that it will be allocated well outside *Onciurosoma*.

## Resumo

Os diplópodos neotropicais do gênero *Onciurosoma* compreendem atualmente 7 espécies nominais: *O. neotropicum* SILVESTRI, 1932 (o espécie-tipo), *O. cumbrense* (BROLEMANN, 1898), ambas da Venezuela, *O. acisternum* SILVESTRI, 1932, da Guiana Inglesa, *O. crassipes* JEEKEL, 1963, do Suriname, e também as espécies descritas neste trabalho, *O. adisi* sp. n., *O. alamellatum* sp. n. e *O. affine* sp. n., ambas da Amazônia Central, Brasil. Interações interespecíficas são brevemente discutidas e uma chave atualizada foi elaborada.

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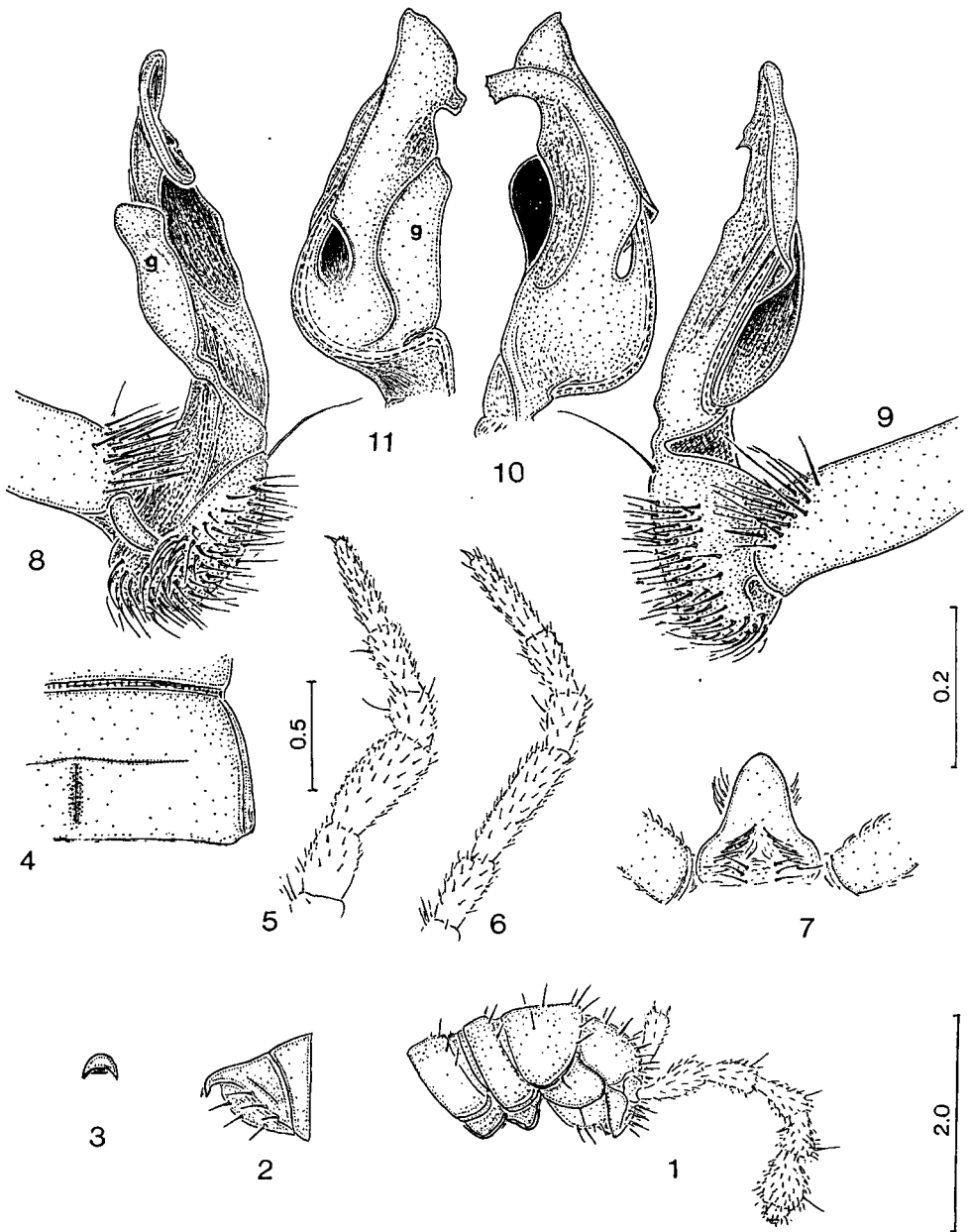
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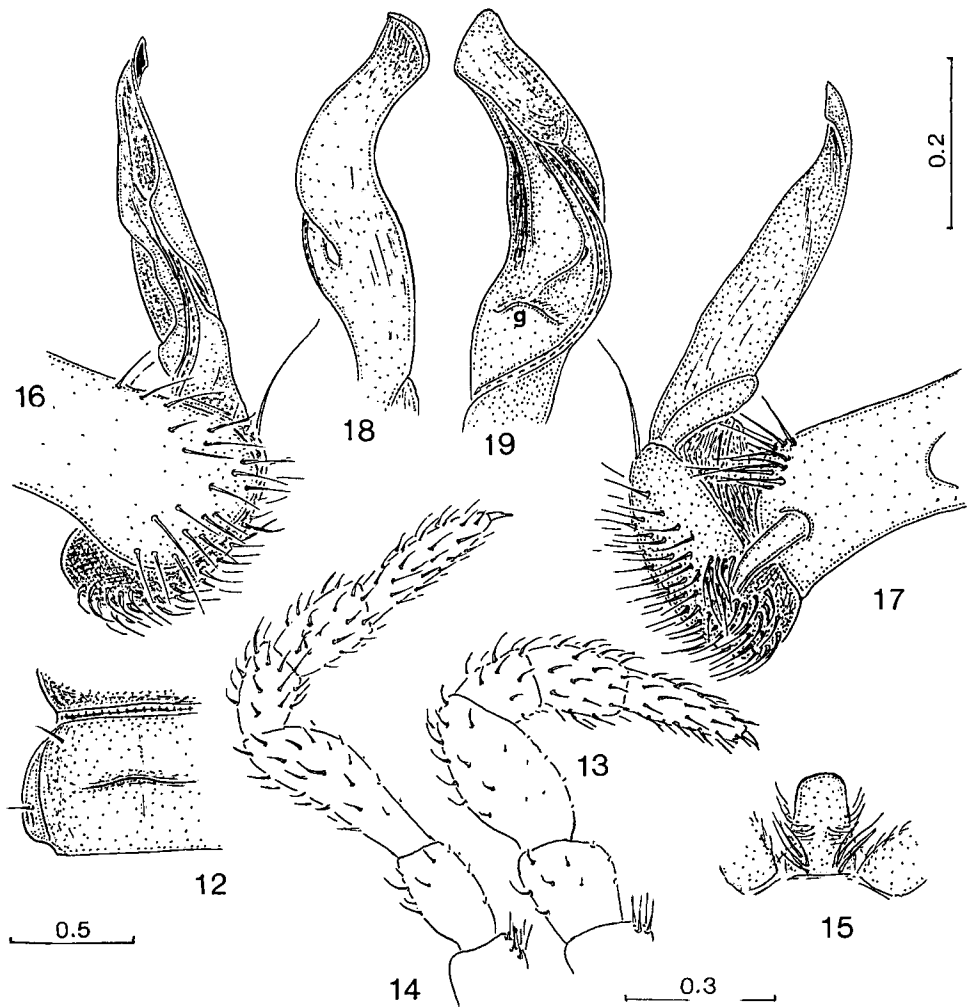
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Figs. 1-11:  
*Onciurossoma adisi* sp. n., ♂ paratype.  
 1: anterior body end, lateral; 2: telson, lateral; 3: tip of epiproct, caudal; 4: metatergum 10, dorsal; 5: leg 3; 6: leg 6; 7: lamina between coxae 4, caudal; 8-11: left gonopod, mesal, lateral, ventral, and dorsal respectively. - Scales in mm.

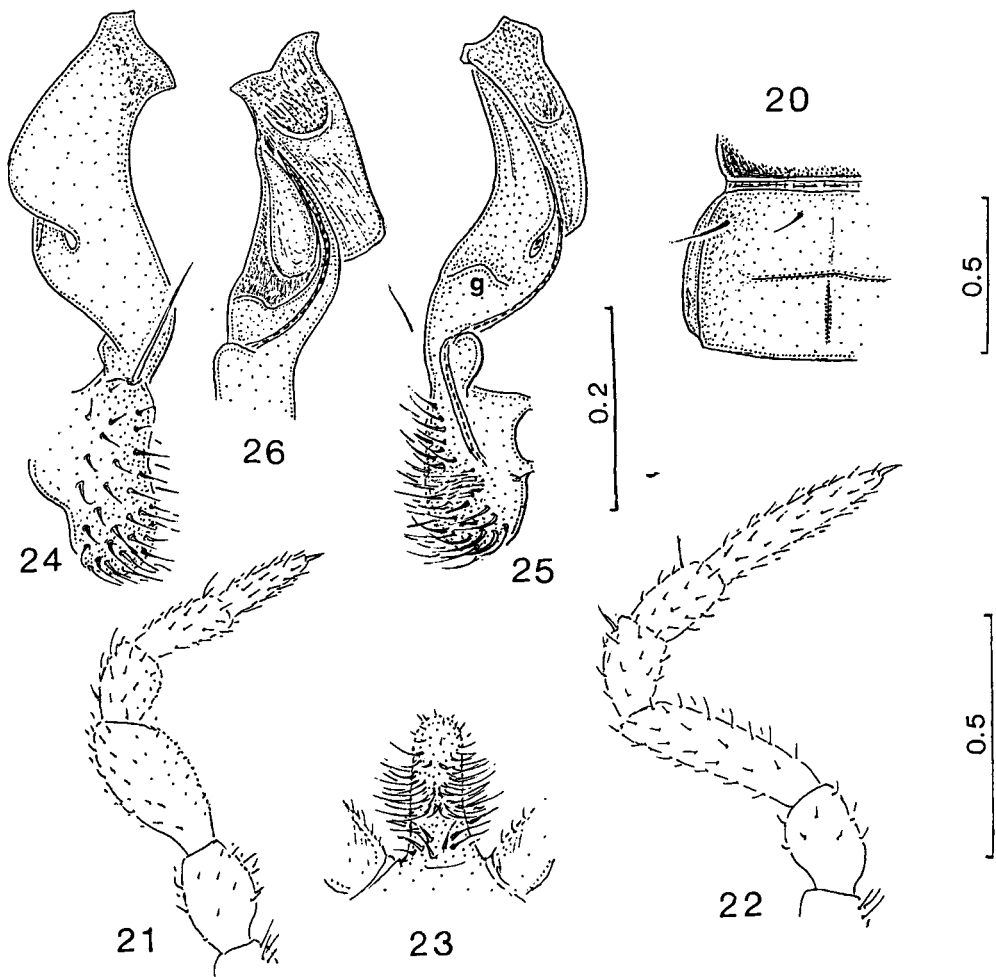




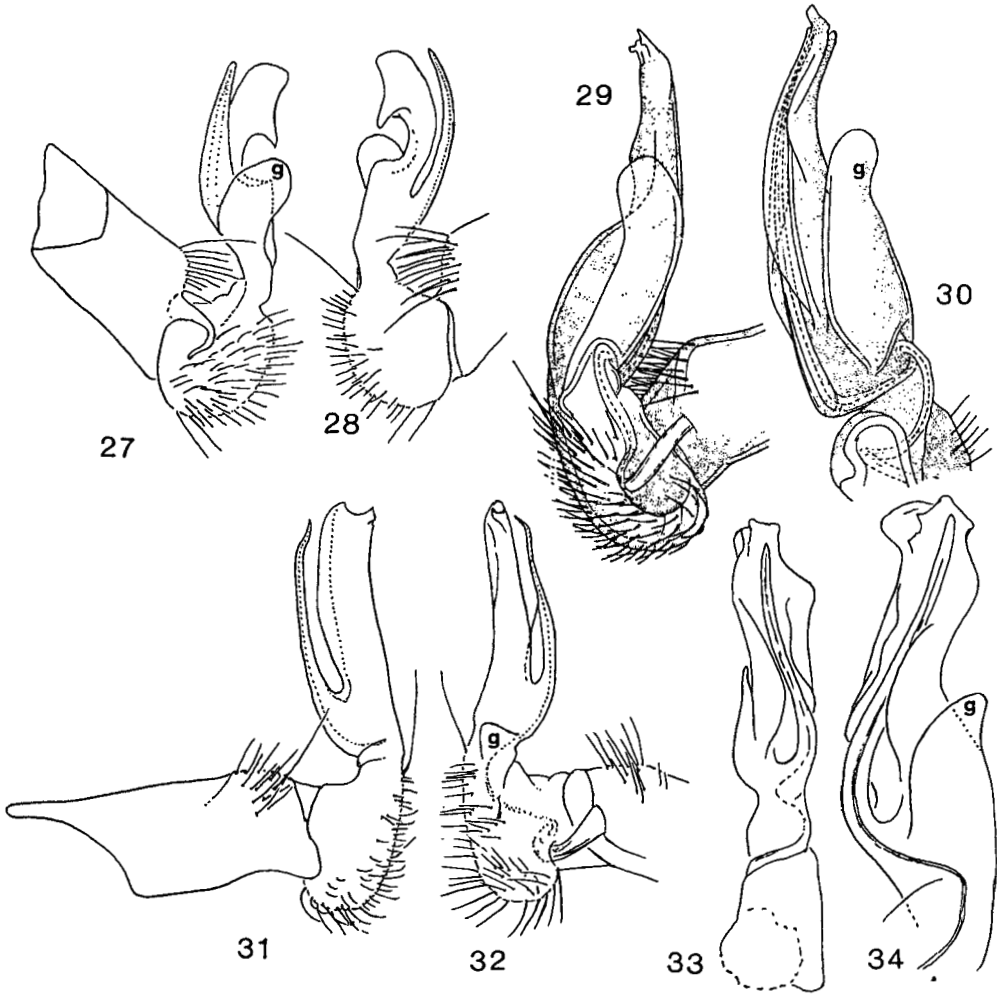
Figs. 12-19:

*Onciurosoma alamellatum* sp. n., ♂ paratype.

12: metatergum 10, dorsal; 13: leg 3; 14: leg 6; 15: lamina between coxae 4, caudal; 16-19: right gonopod, lateral, mesal, dorsal, and ventral respectively. - Scales in mm.



Figs. 20-26:  
*Onciurosoma affine* sp. n., ♂ paratype.  
 20: metatergum 10, dorsal; 21: leg 3; 22: leg 6; 23: lamina between coxae 4, caudal; 24-26: right gonopod, lateral, mesal, and ventral respectively. - Scales in mm.



Figs. 27-34:

*O. neotropicum* SILVESTRI, 1932, ♂ cotype (27-28) (after SILVESTRI 1932), *O. crassipes* JEEKEL, 1963, ♂ holotype (29-30) (after JEEKEL 1963), *O. acisternum* SILVESTRI, 1932, ♂ cotype (31-32) (after SILVESTRI 1932), *O. cumbrense* (BROLEMANN, 1898), ♂ cotype (33-34) (after BROLEMANN 1900). - Gonopods mesal, lateral, mesal, subdorsal, lateral, mesal, dorsal, and subdorsal respectively. - Redrawn not to scale.

