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Further new Fuhrmannodesmidae from the environs of Manaus, Central Amazonia, Brazil, with a revision of *Cryptogonodesmus* SILVESTRI, 1898 (Diplopoda, Polydesmida)

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 fauna of the millipede family Fuhrmannodesmidae in the environs of Manaus is currently known to comprise 13 species (all keyed) from seven genera, including *Phaneromerium minutum* n.sp., *P. distinctum* n.sp., *P. latum* n.sp., *Fuhrmannodesmus rhinoceros* n.sp., *Schizotelopus amazonicus* n.sp., *Brachycerodesmus latior* n.sp., *Adisia hilaris* n.gen., n.sp., and *Moojenodesmus wellingtoni* n.sp. Reassessment of the generic classification of the family within the Neotropical realm, made possible in part through a revision of type material of *Cryptogonodesmus clavidives* SILVESTRI, 1898, the type-species of *Cryptogonodesmus* SILVESTRI, 1898, from Venezuela, has allowed to rectify some generic diagnoses and species transfers. The genera *Brachycerodesmus* CARL, 1914, *Giustoella* KRAUS, 1960, and *Schizotelopus* VERHOEFF, 1941, are revalidated, and the genus *Olmodesmus* KRAUS, 1954, is synonymized under *Phaneromerium* VERHOEFF, 1941 (syn.n.!). A brief classificatory and phylogenetic outline is provided for all nine acknowledged fuhrmannodesmid genera (all keyed) populating South America south of Panama.

Keywords: **Diplopoda, Fuhrmannodesmidae, Amazon, Manaus.**

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Introduction

The Fuhrmannodesmidae as conceived by HOFFMAN (1980) has been adopted chiefly as a replace name for the older, commodious, highly heterogeneous Vanhoeffeniidae. However, having no strong supporting apomorphies, Fuhrmannodesmidae remains a yet unproven taxon. Nevertheless, it seems to represent a natural group widely distributed throughout the globe's tropical and subtropical regions. Its usefulness for the present topic is the more so evident as the name is based on *Fuhrmannodesmus lividus* CARL, 1914, a Colombian species.

This family is currently known to be represented in the Neotropical region south of Panama at least by 33 species from at least six acknowledged genera. In my recent review of Neotropical Fuhrmannodesmidae performed in connection with the description of a few new species from the vicinity of Manaus, Brazil, the need was emphasized for a thorough revision of lots of old types in order to stabilize the nomenclature of the family concerned within the entire Neotropical realm, let alone worldwide (cf. GOLOVATCH 1992).

Being one of the oldest generic names available in the Fuhrmannodesmidae as a whole, *Cryptogonodesmus* SILVESTRI, 1898, has hitherto remained as one of such crucial enigmas. Described far too briefly and supplied with no illustrations, the type-species *Cryptogonodesmus clavidives* SILVESTRI, 1898, from Venezuela (cf. SILVESTRI 1898), has never been adequately restudied. Based on type material, only HOFFMAN (1980) has noted once in passing that *Cryptogonodesmus* seems a genus close both to *Giustoella* KRAUS, 1960, from Peru, and to *Hemisphaeroparia* SCHUBART, 1955, from West Africa.

Again prompted by the discovery of further new fuhrmannodesmids in the environs of Manaus, all collected in the course of a long-term project aimed at revealing the survival strategies of various arthropod groups in the extreme conditions of Amazonian inundation forests (see reviews by ADIS 1992a, b), the concepts of several genera are reassessed here, in particular of *Cryptogonodesmus* upon type material of *C. clavidives*.

Neotropical Fuhrmannodesmidae

Based solely on gonopod conformation, as few as six genera populating the Neotropical region south of Panama have been considered valid, all representing various evolutionary trends in relative structural complexity of the gonopods (GOLOVATCH 1992). In the stage of least modification the gonocoxae are relatively small, non-globose, devoid of strong apophyses, whereas the telopodite is strongly exposed, quite simple. Two genera, *Phaneromerium* VERHOEFF, 1941, and *Olmodesmus* KRAUS, 1954, have been believed to correspond to such a stem lineage, with the main differences between both of them lying in the degree of expression of the solenomerite branch.

This pattern could have given rise to further two lineages. One of these implies the development of a strong lateral apophysis on the gonocoxa to protect an otherwise relatively simple and strongly exposed telopodite. The genus *Fuhrmannodesmus* CARL, 1914, has been considered as the sole representative of this lineage. The opposite trend in protecting the telopodite could have lain in the gonocoxa becoming strongly enlarged and distinctly excavate for the accomodation of an increasingly transverse and stout

telopodite. The constituent genera *Cutervodesmus* KRAUS, 1957, *Cryptogonodesmus* SILVESTRI, 1898, and *Moojenodesmus* SCHUBART, 1945, seemed to display various stages of such a transition (GOLOVATCH 1992).

However, based on a rather limited material and representing a critical regional review, not revision, the above outline was quite rough and far from exhaustive.With new evidence at hand, revealing a surprisingly species- and genus-rich Manaus faunule as well as knowledge of the gonopod structure of *Cyptogonodesmus*, that scheme can now be considerably improved and refined. One of the most important outcomes of the present reassessment is the size of the solenomerite which can no longer be considered as genus-characteristic. Indeed, a free solenomerite branch is lacking only in most, not all, *Cutervodesmus* KRAUS, 1957, as recently proved in a highly disjunct congener deriving from Venezuela (TABACARU 1993). The same can be applied to *Phaneromerium*, as seen in several new species described herein, this allowing merger of that genus with *Olmodesmus* (see below). In other words, my earlier (GOLOVATCH 1992) ideas on the generic classification of the Neotropical Fuhrmannodesmidae, although basically correct in approach, are in need of certain amendments.

Below, I provide revised diagnoses and a key to all currently known Neotropical (s.str.) fuhrmannodesmid genera, most of which being exemplified with the description of one or even several new species discovered from near Manaus. As a result, the entire fuhrmannodesmid fauna of South America south of Panama currently comprises at least 42 species from nine genera (see review by GOLOVATCH 1992 and below).

However, one must keep in mind that a real breakthrough in the comprehension of the family's system and evolutionary trends within the entire Neotropical (s.l.), let alone global, scope can be achieved only upon a thorough revision of type material of numerous species described from Central America and the Caribbean. Consisting of further 59 species from as many as 29 genera, that fauna requires revisionary work, especially the names proposed by LOOMIS and CHAMBERLIN.

List of Central American and Caribbean Fuhrmannodesmidae and some allied dubiosities

1. *Aetheandra multiplex* LOOMIS, 1934 (Tobago)
2. *Agenodesmus reticulatus* LOOMIS, 1934 (Haiti, St. Kitts, St. Lucia, Dominica, Grenada)
3. *A. nullus* SHEAR & PECK, 1987 (Galápagos Islands)
4. *Barathrodesmus inflatus* LOOMIS, 1975 (Jamaica)
5. *Caramba delburro* SHEAR, 1977 (Mexico)
6. *C. enbecausius* SHEAR, 1982 (Mexico)
7. *C. grandeza* SHEAR, 1977 (Mexico)
8. *Chirrepeckia lyncilecta* HOFFMAN, 1976 (Guatemala)
9. *Chilaphrodesmus rubellus* LOOMIS, 1934 (Haiti)
10. *Cryptogonodesmus clarus* CHAMBERLIN, 1950 (Puerto Rico)
11. *C. darlingtoni* LOOMIS, 1941 (Dominican Republic)
12. *Cyclopsodesmus geniculatus* LOOMIS, 1964 (Panama)
13. *C. octosetosus* LOOMIS, 1964 (Panama)
14. *C. scaurus* LOOMIS, 1964 (Panama)
15. *Cylindrogonus copiosus* LOOMIS, 1964 (Panama)
16. *C. tumidus* LOOMIS, 1974 (Costa Rica)

17. *Dasyodontus hispaniolus* LOOMIS, 1936 (Haiti)
18. *Enantiogonus fragilis* LOOMIS, 1961 (Panama)
19. *Eutynellus flavior* CHAMBERLIN, 1940 (Panama)
20. *Harpogonopus confluentus* LOOMIS, 1960 (California, Baja California)
21. *Hexadesmus lateridens* LOOMIS, 1933 (Cuba, St. Kitts, Curação, Haiti, Carriacou, Galápagos Islands)
22. *Hypsiloporus erosus* LOOMIS, 1964 (Panama)
23. *H. montanus* LOOMIS, 1964 (Panama)
24. *H. proclivis* LOOMIS, 1961 (Panama)
25. *H. serratus* LOOMIS, 1964 (Panama)
26. *Hystrichodesmus cubensis* LOOMIS, 1938 (Cuba)
27. *Irazunus chiriquensis* LOOMIS, 1964 (Panama)
28. *I. minusculus* ATTEMS, 1933 (Costa Rica)
29. *I. ovatus* LOOMIS, 1964 (Panama)
30. *I. penicillatus* LOOMIS, 1964 (Panama)
31. *I. reimoseri* ATTEMS, 1933 (Costa Rica)
32. *I. uncus* LOOMIS, 1964 (Panama)
33. *I. velaripes* LOOMIS, 1964 (Panama)
34. *Irogonus reniformis* LOOMIS, 1964 (Panama)
35. *Leiogonopus echinus* LOOMIS, 1964 (Panama)
36. *L. bidentatus* LOOMIS, 1964 (Panama)
37. *Mesethodesmus haitianus* CHAMBERLIN, 1918 (Haiti)
38. *Oodedesmus variabilis* LOOMIS, 1960 (Arizona)
39. *Pachygonopus apiculatus* LOOMIS, 1964 (Panama)
40. *Phreatodesmus torreyanus* LOOMIS, 1960 (California & Baja California)
41. *P. cooki* LOOMIS, 1960 (California)
42. *P. dentatus* LOOMIS, 1960 (California)
43. *P. hastingsus* (CHAMBERLIN, 1941) (California, originally described in *Brachydesmus*)
44. *Pozodesmus poco* SHEAR, 1986 (Mexico)
45. *Salvadoria alata* KRAUS, 1954 (El Salvador)
46. *S. alata propinqua* KRAUS, 1954 (El Salvador)
47. *S. argentea* KRAUS, 1954 (El Salvador)
48. *S. beliza* SHEAR, 1982 (Belize)
49. *S. furcata* KRAUS, 1954 (El Salvador)
50. *S. mexicana* SHEAR, 1982 (Mexico)
51. *S. sagittalis* KRAUS, 1954 (El Salvador)
52. *Sumidero pecki* (SHEAR, 1973) (Mexico, originally described in *Speodesmus*)
53. *S. sprousei* SHEAR, 1982 (Mexico)
54. *S. sumidero* SHEAR, 1982 (Mexico)
55. *Tichodesmus micrus* CHAMBERLIN, 1940 (Panama)
56. *Trematodesmus setiger* LOOMIS, 1936 (Haiti)
57. *Tylogoneus delnegro* (SHEAR, 1977) (Mexico, originally described in *Caramba*)
58. *T. minus* CAUSEY, 1973 (Mexico)
59. *T. oyamel* SHEAR, 1982 (Mexico)

The above list is provided to facilitate future efforts in a reclassification of all New World Fuhrmannodesmidae. The poor state of the art can be easily exemplified by the fauna of Panama alone, which currently comprises 21 species from as many as ten genera, virtually all being badly in need of revision.

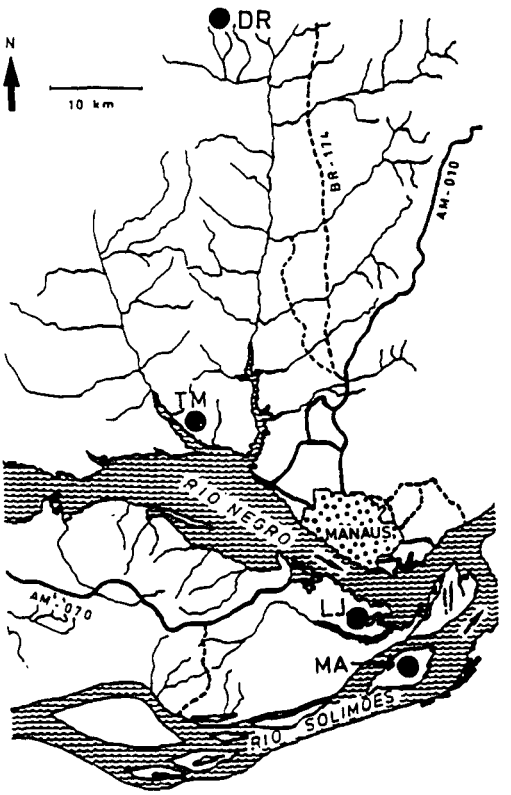
The present paper, however, is confined solely to the South American fuhrmannodesmid fauna. The purpose of the descriptions below is not only to enrich our

knowledge of a still very poorly known Central Amazonian faunule, but also to substantiate and illustrate some of the new ideas below.

Material

The materials treated here have been collected in four localities (Map), with **TM** standing for Rio Tarumã Mirím, **MA** for Ilha de Marchantaria, **LJ** for Lago Janauarí, and **DR** for Km 10 of ZF-02 road, near KM 51 of BR-174 road.

Holotypes and the bulk of paratypes of the new species, as well as most of non-types, have been deposited in the collection of the Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA), while some paratypes and duplicates have been housed in the collections of the Zoological Museum of the State University of Moscow (ZMUM), Senckenberg Museum, Frankfurt/M. (SMF), Zoologisk Museum, University of Copenhagen (ZMUC), Muséum d'Histoire Naturelle, Geneva (MHNG), and Dr. J. ADIS (CA), as indicated hereinafter. In addition, type material of *Cryptogonodesmus clavidives* SILVESTRI, 1898, kept at the ZMUC, has been revised.



Map.:
Study area near Manaus (from ADIS 1992b): **MA** = Ilha de Marchantaria (3°15'S, 58°58'W), **TM** = Rio Tarumã Mirím (3°2'S, 60°17'W), **LJ** = Lago Janauarí (3°20'S, 60°17'W), **DR** = Km 10 of ZF-02 Road, near Km 51 of BR-174 road (2°34'S, 60°6'W).

Genus *Cryptogonodesmus* SILVESTRI, 1898

Cryptogonodesmus SILVESTRI, 1898, type-species *C. clavidives* SILVESTRI, 1898.
non *Cryptogonodesmus* sensu CARL 1914,
nec *Cryptogonodesmus* sensu VERHOEFF 1941a, b, CHAMBERLIN 1950, LOOMIS 1941, 1961, GOLOVATCH 1992,
nec *Chilaphrodesmus* LOOMIS, 1934, synonymized by LOOMIS 1941,
nec *Brachycerodesmus* CARL, 1914, synonymized by GOLOVATCH 1992, revalidated here.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a moderately excavate but strongly enlarged gonocoxite devoid of apophyses combined with a voluminous, more or less strongly sacciform, latero-parabasal, protecting outgrowth (w) on a relatively strongly exposed and simple gonopod telopodite, and by a sublateral solenomerite.

Remarks: Due to the very poor original description of the type-species (SILVESTRI 1898), this genus has hitherto been treated very freely by various authors. No fewer than 12 named species have heretofore been attributed to *Cryptogonodesmus*: *C. clavidives* SILVESTRI, 1898 (the type-species), from Venezuela, *C. angulifer* (PETERS, 1864), *C. brevicornis* CARL, 1914, *C. fuhrmanni* CARL, 1914, *C. obtusangulus* CARL, 1914, *C. petersi* (CARL, 1914), all from Colombia, *C. oxapampaensis* (KRAUS, 1960), *C. peruvianus* KRAUS, 1954, *C. tarmaensis* (KRAUS, 1959), all from Peru, *C. rubellus* (LOOMIS, 1934), from Haiti, *C. clarus* CHAMBERLIN, 1950, from Puerto Rico, and *C. darlingtoni* LOOMIS, 1941, from Dominican Republic (CARL 1914; LOOMIS 1941; CHAMBERLIN 1950; KRAUS 1954; GOLOVATCH 1992). In addition, a closer unidentified *Cryptogonodesmus* sp. had been reported from Panama (LOOMIS 1961), but later referred to a different genus (LOOMIS 1964).

Some of the above named forms have long been removed from *Cryptogonodesmus*, *C. brevicornis* and *C. obtusangulus* having become the type-species of *Schizotelopus* VERHOEFF, 1941 and *Phaneromerium* VERHOEFF, 1941, respectively (cf. VERHOEFF 1941a, b). *C. angulifer* was originally described in *Polydesmus* (cf. PETERS 1864), *C. rubellus* was first introduced as the type-species of *Chilaphrodesmus* (cf. LOOMIS 1934), while both *C. oxapampaensis* and *C. tarmaensis* were originally treated within *Brachycerodesmus*; all these taxa have been transferred into *Cryptogonodesmus* (CARL 1914; LOOMIS 1941; GOLOVATCH 1992). Finally, both *Chilaphrodesmus* and *Brachycerodesmus* have been synonymized under *Cryptogonodesmus* (LOOMIS 1941; GOLOVATCH 1992). It is remarkable that none of the above taxonomic manipulations has been based on a restudy of *C. clavidives*. Only HOFFMAN (1980) has implied that *Cryptogonodesmus* is monotypic.

Re-examination of type material of *C. clavidives* (courtesy of Dr. H. ENGHOFF) has finally allowed clarification of the identity of *C. clavidives* and confirmation of HOFFMAN's (1980) opinion. Below are some remarks on the type-species.

Cryptogonodesmus clavidives SILVESTRI, 1898 (Figs. 1-5)

Type material: 1 ♂ (lectotype, designated herewith, fragment of body comprising only somites 4-10, left gonopod mounted on slide), 3 ♀♀, 1 juv. (ZMUC), Venezuela, Rio Catuche (Carácas), 3.VIII.1891, leg. MEINERT. - 1 ♂ (fragments, both gonopods mounted on slide), 2-3 fragmented specimens of which one is certainly an adult female (ZMUC), Venezuela, La Moka (Carácas), 900' alt., 1-12.VIII.1891, leg. MEINERT.

It was due to Dr. H. ENGHOFF (in litt.) that the localities were precised as actually lying within Carácas. All the specimens were designated by SILVESTRI as cotypes, while the current designation of the lectotype gives the other type specimens the status of paralectotypes. All type material is in poor condition. Surprisingly enough, La Moka was mentioned in the original description as the sole provenance of material, while SILVESTRI's own handwritten labels 'cotipi' refer in fact to both series.

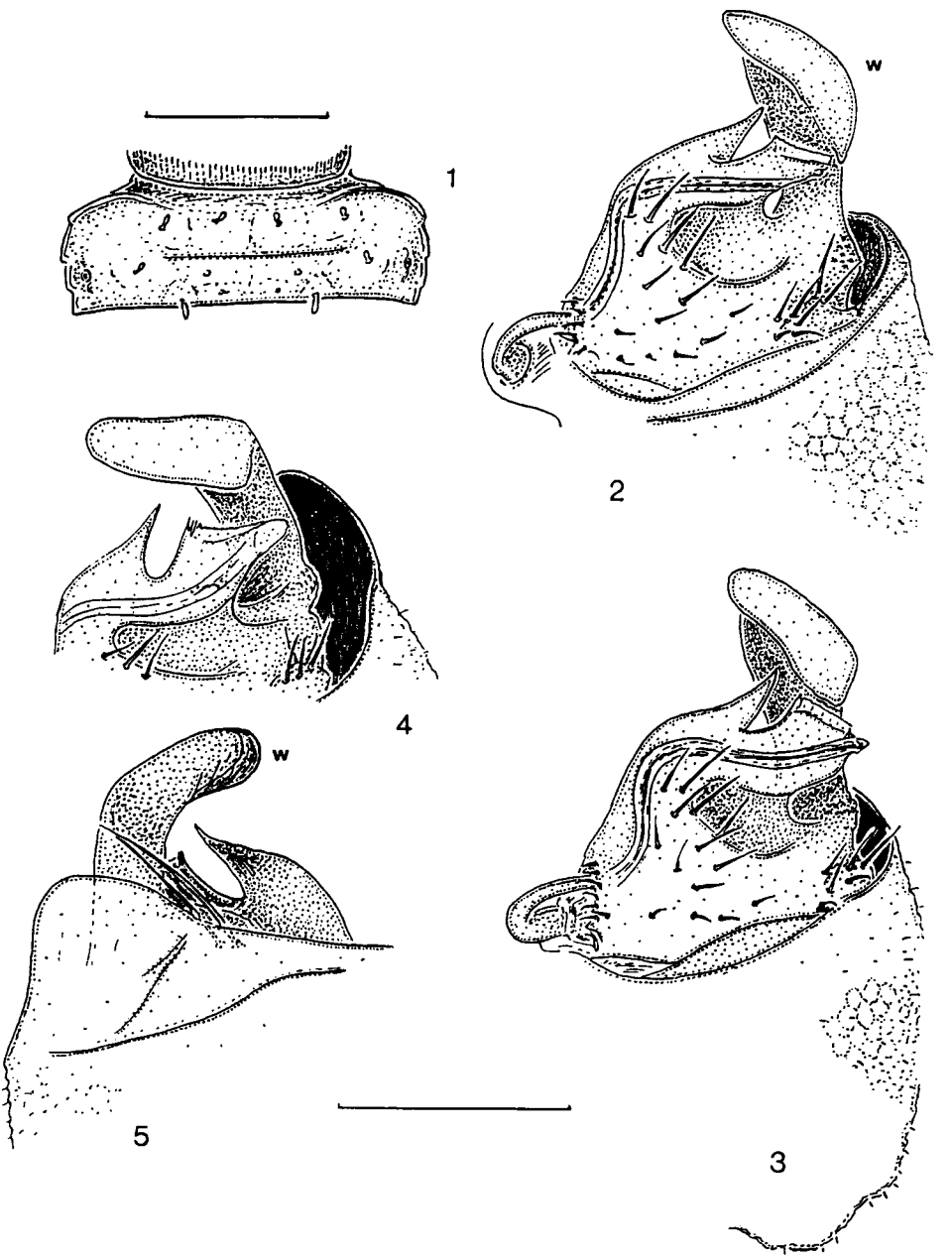
Examination of the gonopods has confirmed their conspecificity.

As one can see from Fig. 1, the paranota of this relatively small species (6-7 mm in length, 0.9-1.1 mm in width) are relatively well-developed, and the tergal setae are short, largely subbacilliform to slightly clavate. The metatergal macrosculpture is poorly developed, the usual bosses being very flat, often almost wanting.

The gonopods (Figs. 2-5) exhibit a relatively strongly enlarged coxite devoid of both a protecting apophysis and an excavation for the accomodation of the telopodite. The latter is strongly exposed, relatively simple, with an unusually strong, sacciform, lateral outgrowth (w) protecting the remaining telopodite which is divided distomesally into a strong apical tooth and a more or less clearly cariniform branch, this branch supporting much of the seminal groove and apicolaterally supplied with a vestigial solenomerite.

A similar, although somewhat less strongly developed, sacciform, latero-parabasal outgrowth on the gonopod telopodite seems to be observed only in three Neotropical species: *Giustoella crypta* KRAUS, 1960 (the type-species of *Giustoella* KRAUS, 1960), *G. minutissima* KRAUS, 1960, both from Peru, and *Adisia hilaris* n.gen., n.sp., from Central Amazonia of Brazil (see below). In other words, the close relationship between *Cryptogonodesmus* and *Giustoella* perceived by HOFFMAN (1980) is now confirmed. However, their affinities with the West African *Hemisphaeroparia* are far from clear-cut, it is the main body of the gonopod telopodite that is swollen in the latter genus (cf. SCHUBART 1955). To the best of my knowledge, amongst geographically remote forms, a gonopod conformation to some extent similar to that of *Cryptogonodesmus* is observed only in some *Sholaphilus* CARL, 1932, a genus confined to the Indian subcontinent and the Himalaya (cf. GOLOVATCH 1986, 1990).

In the present, highly stringent scope, *Cryptogonodesmus* appears to comprise only the type-species *C. clavidives*, whereas all the erstwhile formal congeners must be transferred elsewhere. Moreover, as regards the South American fauna, at least *Brachycerodesmus* deserves revalidation as an independent genus (see below).



Figs. 1-5:
Cryptogonodesmus clavidives SILVESTRI, 1898, ♂ lectotype.
1: somite 10, dorsal; **2-5**: left gonopod, caudal, subcaudal, caudolateral, frontomesal, resp. - Scales 0.5 (1) and 0.1 mm (2-5).

Genus *Giustoella* KRAUS, 1960

Giustoella KRAUS, 1960, type-species *G. crypta* KRAUS, 1960, synonymized under *Moojenodesmus* by GOLOVATCH 1992, revalidated here.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a very strongly transverse and excavate gonocoxite devoid of lateral apophyses, as well as by a highly elaborate, deeply retracted telopodite supplied with several outgrowths. including a rather voluminous, sacciform, protecting, lateral one.

Remarks: As noted above, this genus seems especially closely related to *Cryptogonodesmus*. On the other hand, the highly transverse and deeply excavate gonocoxa in *Giustoella* strongly resembles that of *Moojenodesmus*, the reason why both have been synonymized (cf. GOLOVATCH 1992). However, the presence of a rather strong, sacciform, lateral outgrowth on the gonopod telopodite makes *Giustoella* easily distinguishable from *Moojenodesmus*, perhaps representing a taxon somewhat annectent between *Cryptogonodesmus* and *Moojenodesmus*. At the present *Giustoella* comprises solely two species: *G. crypta* KRAUS, 1960, and *G. minutissima* KRAUS, 1960, both from Peru.

Genus *Cutervodesmus* KRAUS, 1957

Cutervodesmus KRAUS, 1957, type-species *C. niger* KRAUS, 1957.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a relatively strongly enlarged and excavate gonocoxite combined with a more or less slender, simple, strongly exposed telopodite; solenomerite from large to virtually missing.

Remarks: As noted earlier (GOLOVATCH 1992), on account of a strongly swollen and excavate gonocoxa combined with a relatively strongly exposed telopodite, *Cutervodesmus* seems to represent an evolutionary stage somewhat annectent between *Phaneromerium* and *Moojenodesmus*. In some congeners, the ♂ legpair 2 is drastically modified, sometimes coupled with greatly expanded genae or greatly enlarged collum and metatergite 2. The genus concerned is left here in its original scope as comprising *C. niger* KRAUS, 1957, *C. similis* KRAUS, 1959, both from Peru, and *C. adisi* GOLOVATCH, 1992, from Central Amazonia of Brazil (cf. GOLOVATCH 1992). At least one more, yet undescribed congener has been encountered in Venezuela (TABACARU 1993).

Genus *Phaneromerium* VERHOEFF, 1941

Phaneromerium VERHOEFF, 1941, type-species *Cryptogonodesmus obtusangulus* CARL, 1914. *Olmodesmus* KRAUS, 1954, type-species *O. laticeps* KRAUS, 1954, syn.n.!

Diagnosis: A genus of Fuhrmannodesmidae characterized by a relatively little enlarged gonocoxa lacking both a cavity and lateral apophyses combined with a virtually fully exposed, relatively simple telopodite supplied with at least one, largely two distofemoral outgrowths; solenomerite from eventually missing to large.

Remarks: This seems to be the most generalized (= with simplest gonopods) fuhrmannodesmid genus in the entire Neotropical fauna. Since the degree of development of the solenomerite can no longer be considered as genus-characteristic (cp. GOLOVATCH 1992), *Olmodesmus* is regarded as a junior synonym of *Phaneromerium*, syn.n.! In addition to the type-species *P. obtusangulum* (CARL, 1914), *Phaneromerium* now comprises also *P. laticeps* (KRAUS, 1954), *P. longipes* (KRAUS, 1954), *P. minimum* (KRAUS, 1954), *P. robustum* (KRAUS, 1955), *P. taulisense* (KRAUS, 1954), all from Peru and all comb.n. ex *Olmodesmus*, as well as *P. distinctum* n.sp., *P. latum* n.sp., and *P. minutum* n.sp., all from Central Amazonia of Brazil (see below).

Genus *Fuhrmannodesmus* CARL, 1914

Fuhrmannodesmus CARL, 1914, type-species *F. lividus* CARL, 1914. *Gyrophallus* CARL, 1914, type-species *G. imitans* CARL, 1914, synonymized by GOLOVATCH 1992. *Phylacomerium* VERHOEFF, 1941, type-species *P. album* VERHOEFF, 1941, synonymized by GOLOVATCH 1992.
non *Schizotelopus* VERHOEFF, 1941, synonymized by GOLOVATCH 1992, revalidated here.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a comparatively small, relatively poorly excavate gonocoxite provided with a strong lateral apophysis protecting a more or less strongly exposed and elaborate telopodite supporting a small to big solenomerite.

Remarks: This seems a genus representing perhaps a direct derivative of the *Phaneromerium* lineage (see above), with the development by the gonocoxa of a strong, lateral, protecting apophysis more or less adjacent to a relatively elaborate but strongly exposed telopodite. This *Fuhrmannodesmus* lineage seems to be composed solely of *Fuhrmannodesmus*, with the following constituent species: *F. lividus* CARL, 1914, *F. funiculus* (PETERS, 1864) sensu CARL 1914, *F. imitans* (CARL, 1914) and *F. simillimus* (CARL, 1914), all from Colombia, *F. albus* (VERHOEFF, 1941a), *F. carli* KRAUS, 1955, and *F. esperanza* (KRAUS, 1960), all from Peru (cf. GOLOVATCH 1992), as well as *F. rhinoceros* n.sp., from Central Amazonia of Brazil (see below). On account of the presence of a strong gonocoxal apophysis, the recent reallocation of *F. carli* KRAUS, 1955, within *Cryptogonodesmus* (cf. GOLOVATCH 1992), appears wrong, so herewith I return this species to *Fuhrmannodesmus*.

Genus *Schizotelopus* VERHOEFF, 1941

Schizotelopus VERHOEFF, 1941, type-species *Cryptogonodesmus brevicornis* CARL, 1914, synonymized under *Fuhrmannodesmus* by GOLOVATCH 1992, revalidated here.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a very strongly excavate gonocoxite for accomodation of an elaborate, deeply sunken telopodite supplied with a strong, dactyloid, more or less frontolateral, parabasal process perforating coxital wall with its distal part; when present, lateral apophysis on coxite inconspicuous; solenomerite central to medial in position.

Remarks: Apparently, this is yet one more lineage of its own deriving from a *Phaneromerium*-like ancestor. The deep excavation of a not too voluminous gonocoxa coupled with the development on the telopodite of a strong, more or less frontolateral, parabasal process perforating the coxital wall seem very strong apomorphies of *Schizotelopus*, a genus currently encompassing only *S. brevicornis* (CARL, 1914), from Colombia, and *S. amazonicus* n.sp., from Central Amazonia of Brazil (see below).

Genus *Brachycerodesmus* CARL, 1914

Brachycerodesmus CARL, 1914, type-species *B. petersi* CARL, 1914, synonymized under *Cryptogonodesmus* by GOLOVATCH 1992, revalidated here.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a very considerably enlarged, simple coxite lacking a particularly deep cavity for accomodation of a not very voluminous, rather strongly exposed and simple to elaborate telopodite; solenomerite variable, from evident to strong, lateral or central in position.

Remarks: Apparently, this genus represents a stage somewhat intermediate between *Phaneromerium*, on the one hand, and *Cutervodesmus* and *Moojenodesmus*, on the other, with the gonocoxa being already strongly enlarged, moderately deeply excavate, but the telopodite remaining relatively well-exposed and moderate in size, far from transverse. In the present scope, *Brachycerodesmus* more or less fully coincides with my earlier concept of *Cryptogonodesmus* (cf. GOLOVATCH 1992), encompassing *B. petersi* CARL, 1914, *B. fuhrmanni* (CARL, 1914) (comb.n. ex *Cryptogonodesmus*), both from Colombia, *B. peruvianus* (KRAUS, 1954) (comb.n. ex *Cryptogonodesmus*), *B. oxapampaensis* KRAUS, 1960, *B. tarmaensis* KRAUS, 1959, all from Peru, and *B. latior* n.sp., from Central Amazonia of Brazil (see below), but neither *Cryptogonodesmus angulifer* (PETERS, 1864) sensu CARL 1914, nor *Fuhrmannodesmus carli* KRAUS, 1955 (see above and below).

Genus *Adisia* n.

Type-species *Adisia hilaris* n.sp.

Diagnosis: A genus of Fuhrmannodesmidae characterized by a rather strongly enlarged gonocoxite concealing much of telopodite in its cavity and devoid of lateral apophyses combined with a rather voluminous, more or less strongly sacciform, latero-parabasal, protecting outgrowth (w) on a relatively strongly exposed and simple telopodite; seminal groove making a characteristic loop, first running mesally, then turning abruptly laterad near base of a distofemoral process before passing onto solenomerite.

Remarks: Based on the presence of a relatively prominent, sacciform, latero-parabasal outgrowth on the gonopod telopodite, this genus seems to be especially closely related to both *Cryptogonodesmus* and *Giustoella* (see above), differing strikingly by the conspicuous course of the seminal groove displaying no parallel perhaps among the entire Fuhrmannodesmidae. At the present, only a single species is known, *A. hilaris* n.sp., from Central Amazonia of Brazil (see below).

Genus *Moojenodesmus* SCHUBART, 1945

Moojenodesmus SCHUBART, 1945, type-species *M. pygmaeus* SCHUBART, 1945. *Pichitaria* KRAUS, 1959, type-species *P. armata* KRAUS, 1959, synonymized by GOLOVATCH 1992. *Esperanzella* KRAUS, 1960, type-species *E. polydesmoides* KRAUS, 1960, synonymized by GOLOVATCH 1992. non *Giustoella* KRAUS, 1960, synonymized by GOLOVATCH 1992, revalidated here.

Diagnosis: A genus of Fuhrmannodesmidae characterized by an extremely deeply excavate and strongly enlarged gonocoxite devoid of lateral apophyses combined with a strongly subtransverse, low, medially swollen, retracted, simple to a rather elaborate gonopod telopodite supporting a variable, mesal to central solenomerite.

Remarks: This genus seems to represent an evolutionary summit within the lineage displaying an increasingly enlarged and excavate gonocoxa for the accomodation of an increasingly subtransverse, sunken, medially swollen gonopod telopodite. The current scope of *Moojenodesmus* remains almost unchanged (cf. GOLOVATCH 1992) as encompassing *M. pygmaeus* SCHUBART, 1945, *M. pumilus* SCHUBART, 1944, *M. bethaniae* GOLOVATCH, 1992, *M. irmgardae* GOLOVATCH, 1992, *M. susannae* GOLOVATCH, 1992, *M. wellingtoni* n.sp., all from Brazil, *M. angulifer* (PETERS, 1864) sensu CARL 1914 (comb.n. ex *Cryptogonodesmus*), from Colombia, *M. armatus* (KRAUS, 1959), and *M. polydesmoides* (KRAUS, 1960), both latter species from Peru.

Notes on phylogeny

The above classificatory outline allows to introduce certain amendments into my recent (cf. GOLOVATCH 1992) phylogenetic scheme designed for Neotropical Fuhrmannodesmidae. Moreover, some of the new ideas have already been expressed under each genus. However, it seems reasonable to reiterate them in a more strict evolutionary context.

What remains unchanged is that only gonopod structure provides basic information about the phylogenetic relationships between the genera concerned. In addition, forms with simple gonopods are generally regarded more primitive, whereas certain cases of supposedly secondary simplification are treated as such only when annectent taxa are available, e.g. within *Moojenodesmus* (cf. GOLOVATCH 1992).

The most simple gonopod plan seems to be represented in *Phaneromerium* considered here as a stem group for further complifications. Indeed, a non-globose, only slightly enlarged and simple gonocoxa supporting a very strongly exposed, more or less elaborate telopodite could have given rise to several lineages. One of such lineages appears to be represented by *Fuhrmannodesmus* in which the gonocoxa could have developed a strong, lateral, protecting apophysis well separated from to highly adjacent to a basically strongly exposed, high, more or less strongly elaborate telopodite. A similar, protecting function might have been carried out by a large, more or less lateral outgrowth arising from the base of the gonopod telopodite. In the genera *Cryptogonodesmus*, *Adisia*, and *Giustoella* this outgrowth has become especially voluminous and sacciform, with the result of obviously preventing the telopodite's drastic retraction and leaving it rather strongly exposed even against the background of a very considerably enlarged gonocoxa. This is particularly true for *Cryptogonodesmus*, less so clear-cut in

Adisia with its sacciform outgrowth being not too voluminous (thus preventing retraction of the acropodite into the gonocoel to a supposedly far lesser extent), and the gonofemorite is torsate as evidenced by the course of the seminal groove. Finally, within the same lineage, the gonocoxa in *Giustoella* has become so considerably enlarged and transversely expanded (like in *Moojenodesmus*) that the entire telopodite together with the sacciform outgrowth have found sufficient room within the gonocoel. On the other hand, when such a parabasal protecting outgrowth on the telopodite remained slender and sclerotized, it might not have prevented the latter's sinking too much, with the evolvement of a *Schizotelopus* lineage in which, however, this strong, digitiform outgrowth perforates the gonocoxital wall with its distal part.

Yet one more lineage immediately derivable from the stem could have achieved the same protecting function through the development of a particularly deep gonocoel for the acropodite to hinge into. A stage obviously closer to the stem can be observed in both *Brachycerodesmus* and *Cutervodesmus* in which the gonocoxa is already very considerably enlarged, but is either not too deeply (*Brachycerodesmus*) or already quite deeply (*Cutervodesmus*) excavate for the accomodation of a still strongly exposed, largely slender telopodite. Ultimately, in *Moojenodesmus* the gonocoel is particularly deep, the telopodite is strongly sunken, subtransverse, medially swollen.

The above reconstruction is certainly far from final and exhaustive, with a lot of new traits to appear with further progress in the knowledge of New World (and not only) Fuhrmannodesmidae. As noted before, much of the Mesamerican (s.l.) list requires a thorough revision, whereas luckily nearly all South American forms described earlier (cf. CARL 1914; VERHOEFF 1941a; SCHUBART 1944, 1945; KRAUS 1954, 1955, 1957, 1959a, b, 1960; GOLOVATCH 1992) and herewith are sufficiently well-documented. Only the types by PETERS (1864) as revised by CARL (1914) actually demand re-examination, this being reflected by the qualifications above (see also review by GOLOVATCH 1992). In addition, alpha-taxonomy is still topical, as evidenced by the Manaus faunule (see below) and some already available materials from Venezuela (cf. TABACARU 1993), Ecuador, Colombia, Panama, etc. (ZMUC collection, ENGHOFF in litt.).

Key to South American fuhrmannodesmid genera

1(2) Gonocoxa with a strong, lateral, protecting apophysis (**a** in Figs. 22-23) . . . . . *Fuhrmannodesmus*

2(1) Gonocoxa with a small lateral spine at best (**d** in Figs. 30-31)

3(4) Gonopod telopodite with a prominent latero-parabasal outgrowth (**w** in Figs. 2, 5, 40-41, **f** in Figs. 30-31) . . . . . 5.

4(3) Gonopod telopodite without latero-parabasal outgrowths . . . . . 11.

5(6) Parabasal outgrowth more or less strongly digitiform, heavily sclerotized (**f** in Figs. 30-31) . . . . . *Schizotelopus*

6(5) Latero-parabasal outgrowth big, sacciform, not very strongly sclerotized

7(8) Parabasal outgrowth relatively modest (**w** in Figs. 40-41), seminal groove with a distinct loop . . . . . *Adisia*

8(7) Parabasal outgrowth great (**w** in Fig. 2), seminal groove without loop

9(10) Gonopod telopodite largely exposed (Figs. 2-5), gonocoxa not too greatly excavate ..... *Cryptogonodesmus*

10(9) Gonopod telopodite distinctly sunken in gonocoel, gonocoxa strongly enlarged transversely ..... *Giustoella*

11(4) Gonocoxa relatively small, at best only slightly enlarged laterally, leaving telopodite virtually fully exposed (Figs. 7-8, 11-13, 16-18) ..... *Phaneromerium*

12(11) Gonocoxa relatively strongly enlarged, telopodite largely exposed to deeply sunken in gonocoel

13(14) Gonocoxa very strongly enlarged and excavate, telopodite strongly subtransverse, deeply sunken, swollen medially (Figs. 42-43) ..... *Moojenodesmus*

14(13) Gonocoxa usually not so greatly enlarged, much of telopodite exposed

15(16) Gonocoxa moderately deeply excavate (Figs. 35-36), ♂ legpair 2 without drastic modifications ..... *Brachycerodesmus*

16(15) Gonocoxa relatively deeply excavate, sometimes ♂ legpair 2 and also ♂ genae or both ♂ collum and metatergite 2 strongly modified ..... *Cutervodesmus*

Description of new species

Phaneromerium minutum n.sp. (Figs. 6-8)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, 60°06'W, 02°34'S, Km 10 of ZF-02 road, near Km 51 of BR-174 road, secondary forest (= capoeira), soil extraction, 7.XI.1990; leg. O. DE A. RIBEIRO. - Paratypes: 1 ♂, 2 ♀ (INPA), same data, together with holotype, 28.VIII.1990. - ♀ (INPA), same data, 6.XII.1990; all leg. O. DE A. RIBEIRO.

Name: Emphasizes the munite size of the creature.

Diagnosis: Differs from congeners by its extremely small size combined with the peculiar gonopod structure.

Description: Length ca. 2.7-2.8 (♂) to 3.3-3.7 mm (♀), width of midbody somites 0.25 (♂) to 0.32-0.4 mm (♀). Holotype ca. 2.8 mm long and 0.25 mm wide on midbody somites. Colour entirely pallid, whitish to pale yellowish.

Body with 20 segments (♂, ♀). Head with a flattened frons and a low, rounded or somewhat truncate, medial tubercle above level of antennae like in *Schizotelopus amazonicus* n.sp. (♂), or unmodified, with frons more convex, densely and rather delicately setose (♀). Antennae short, rather strongly clavate, also like in *S. amazonicus* n.sp., in situ scarcely reaching to end of somite 2. Collum a bit narrower than head, with three usual rows of setae. Head subequal in width to somites 2-4, onward body slightly broadening, parallel-sided on somites 5-17, further on rapidly tapering. Surface largely dull, shagreened, microreticulate. Disregarding collum, metaterga with modestly well-developed (a bit less so in ♀) lateral paranota, latter like in *S. amazonicus* n.sp., set rather low (at about 1/3 midbody height, with dorsum a bit more convex in ♀), laterally virtually not incised at insertion points of tergal setae, anteriorly more broadly, posteriorly quite narrowly rounded, caudal corner invariably within rear tergal contour. Tergal setae in three transverse rows, usually very short (♂) to short (♀), usually strongly clavate to subclavate, filiform, a little longer and yet relatively short only in fore row on collum and, to a lesser extent, in rear row on somite 19. Metatergal sculpture/bosses virtually wanting, only a very modest transverse sulcus. Ozopores vague, lying dorsolaterally. Pleurosternal keels missing. Epiproct short, straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 low, blade-like, scarcely traceable. Legs a bit longer and more strongly incrassate in ♂ as compared to ♀, only tarsi invariably

slender and long, with neither tarsal papillae nor other evident modifications except for ♂ legpair 4 (Fig. 6), latter being particularly strongly incrassate, with a shortened tarsus virtually represented by a bunch of setae. Particularly long, dorsal, tactile setae on tibiae.

Gonopods (Figs. 7-8) with modestly enlarged coxites. Each coxite moderately densely setose laterally. Telopodites rather complex, exposed, each with a couple of high fingers apically. Solenomerite digitiform, rather evident, caudomesal in position.

Phaneromerium distinctum n.sp. (Figs. 9-13)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Lago Janauarí, 60°17'W, 03°20'S, mixedwater inundation forest, on tree trunk, 15.IX.1987; leg. J. ADIS et al.

Name: Emphasizes its distinctness.

Diagnosis: Differs from congeners by the relatively strongly developed paranota combined with the peculiar gonopod structure.

Description: Length ca. 5, width of midbody somites 0.65 mm. Colour entirely pallid, whitish to pale yellowish.

Body with 20 segments (♂). Head without modifications, densely pilose. Antennae relatively long, only slightly clavate, in situ surpassing somite 3; fields of sensillae on antennomeres 5-6 equally poorly developed; antennomere 7 with a minute midway dorsal knob. Collum narrowest, with three usual rows of setae. Head subequal in width to somites 5-16, body onward gently tapering. Surface largely dull, shagreened, microreticulate. Disregarding narrowest collum, metaterga with well-developed (a bit less so in ♀) lateral paranota, latter set not too high (at about 1/3 midbody height), laterally incised at insertion points of tergal setae, with two or three small incisions on poreless and pore-bearing somites respectively, anteriorly angulate, posteriorly more or less strongly beak-shaped (Figs. 9-10), caudal corner within rear tergal contour until somite 12, onward increasingly surpassing the contour until somite 17, further on less so. Tergal setae as usual in three transverse rows (Figs. 9-10), filiform throughout, medium-sized to relatively short, evidently longer only in fore row on collum and, to a lesser extent, in rear row on somite 19. Metatergal sculpture/bosses well-developed (Figs. 9-10). Ozopores vague, lying dorsolaterally. Pleurosternal keels missing, traceable only on somite 2. Epiproct rather short, straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 virtually wanting. Legs rather long and strongly incrassate, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Distodorsal, tactile setae on tibiae not particularly long.

Gonopods (Figs. 11-13) with modestly enlarged, simple, virtually naked coxites. Telopodites rather complex, exposed, each with a couple of big, spiniform, apical processes. Solenomerite small, inconspicuous, virtually vestigial, mesal in position, carrying short filaments subapically.

Remarks: Based on gonopod structure, this new taxon is particularly closely related to the erstwhile *Olmodesmus* species, which probably deserves promotion to a separate species group, the *laticeps*-group, characterized by one or two slender and particularly long distogonofemoral processes.

Phaneromerium latum n.sp. (Figs. 14-18)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Terra firme (= nonflooded upland forest), Rio Tarumã Mirím, 60°17'W, 03°02'S, secondary forest (= capoeira), soil extraction, 23.XI.1982; leg. J.M. RODRIGUES, J. ADIS et al. - Paratypes: 4 ♂, 2 ♀ (INPA), same data, together with holotype. - 1 ♀, 1 juv. (CA), same data, 25.VIII.1982. - 1 ♀ (ZMUM), 1 ♂, 1 ♀ (SMF), same

data, 26.X.1982. - 1 ♂, 1 ♀ (INPA), same data, 28.III.1983. - 1 ♀ (INPA), 2 ♂ (CA), same data, 25.IV.1983. - 1 ♀, 2 juv. (INPA), 2 ♂, 1 ♀ (ZMUC), same data, 26.VI.1983. - 1 ♂ (MHNG), 2 ♂, 3 juv. (ZMUM), 1 ♀, 2 juv. (INPA), same data, 26.VII.1983. - 2 ♂, 1 ♀ (INPA), same data, 24.VIII.1983; all leg. J.M. RODRIGUES, J. ADIS et al.

Name: Emphasizes the broad paranota.

Diagnosis: Differs from congeners by the very broad paranota combined with the peculiar gonopod structure.

Description: Length 4.0-4.7 (♂) to 4.4-5.4 mm (♀), width of midbody somites 0.60-0.70 mm (♂, ♀). Colour entirely pallid, whitish to pale yellowish, sometimes with translucent patches (alcohol material).

Body with 20 segments (♂, ♀). Head without modifications, densely pilose. Antennae very short, strongly clavate, in situ hardly surpassing collum (♂) or only reaching it (♀); fields of sensillae on almost transverse antennomeres 5-6 equally well-developed; antennomere 7 with a minute midway dorsal knob. Collum a bit broader than to subequal to head, with three usual rows of setae. Somites 2-4 subequal in width, either a bit narrower than somite 5. Body parallel-sided on somites 5-16, onward rather rapidly tapering. Surface largely dull, shagreened, microreticulate. Disregarding narrowest collum, metaterga with very well-developed (a bit less so in ♀) lateral paranota, latter subhorizontal, set not too high (at about 1/3 midbody height, leaving dorsum quite convex), laterally weakly incised at insertion points of tergal setae, usually with two or three small incisions on poreless and pore-bearing somites respectively, anteriorly obtusangularly rounded, posteriorly more or less acutangular but always narrowly rounded (Figs. 14-15), caudal corner within rear tergal contour until somite 16, a little beyond the contour on somite 17, distinctly beyond it on somite 18, more poorly projecting on somite 19. Tergal setae as usual in three transverse rows (Figs. 14-15), short, bacilliform, a little longer only in fore row on collum and, to a lesser extent, in rear row on somite 19. Metatergal sculpture/bosses well-developed, especially on midbody somites (Fig. 15). Ozopores vague, lying dorsolaterally. Pleurosternal keels missing, traceable only on somite 2. Epiproct rather short, straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 very low, hardly traceable. Legs somewhat more long and strongly incrassate in ♂ as compared to ♀, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Particularly long, distodorsal, tactile setae on tibiae present at least on some legs.

Gonopods (Figs. 16-18) with modestly enlarged, simple, relatively sparsely setose coxites. Telopodites rather simple, exposed, each with a smaller spiniform process crowning a lobular outgrowth (k) laterally of a very prominent, apically bi- or trifid solenomerite.

Fuhrmannodesmus rhinoceros n.sp. (Figs. 19-26)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Lago Janauarí, 60°17'W, 03°02'S, mixedwater inundation forest, on tree trunks, 16.V.1988; leg. J. ADIS, J.W. DE MORAIS. - Paratypes: 2 ♂ (INPA), ♂ (ZMUM), ♂ (CA), same data, together with holotype. - 1 ♂, 1 ♀ (INPA), same data, soil extraction, 12.IV.1988; all leg. J. ADIS, J.W. DE MORAIS. - ♂ (incomplete) (INPA), Rio Solimões, Ilha de Marchantaria, 59°58'W, 03°15'S, Várzea (= whitewater inundation forest), soil extraction, 21.III.1986; leg. J. ADIS et al.

Name: Emphasizes the great hump on the head.

Diagnosis: Differs from congeners by the extremely prominent hump on the ♂ head combined with the peculiar gonopod structure.

Description: Length ca. 4.5-4.7 (♂) to 4.9 mm (♀), width of midbody somites 0.35-0.45 (♂) to 0.5 mm (♀). Holotype ca. 4.7 mm long and 0.4 mm wide on midbody somites. Colour entirely pallid,

whitish to pale yellowish, often with translucent patches (alcohol material).

Body with 20 segments (♂, ♀). Head with a flattened frons and a very big, flattened on sides, rounded, medial hump above level of antennae (♂) (Figs. 19-20), or unmodified, with frons more convex, densely and rather delicately setose (♀). Antennae short, rather strongly clavate, in situ at best hardly surpassing somite 2; antennomere 5 distodorsally distinctly sloping to support a rather prominent group of bacilliform sensillae; antennomere 6 larger, with a similar but less conspicuous distodorsal group of sensillae; antennomere 7 with a minute midway dorsal knob. Collum narrowest, with three usual rows of setae. Head subequal in width to somites 2-3 (♂) or 4 (♂, ♀). Body parallel-sided on somites 5-17, onward rapidly tapering. surface largely dull, shagreened, microreticulate. Disregarding collum, metaterga with rather well-developed (a bit less so in ♀) lateral paranota, latter set not too high (at about 1/3 midbody height, with dorsum a bit more convex in ♀), laterally virtually not incised at insertion points of tergal setae, anteriorly more broadly, posteriorly quite narrowly rounded, caudal corner invariably within rear tergal contour. Tergal setae in three transverse rows (Fig. 21), usually clavate to subclavate, filiform and evidently longer only in fore row on collum and, to a lesser extent, in rear rows on both somites 18 and 19. Metatergal sculpture/bosses virtually wanting, only a very modest transverse sulcus. Ozopores vague, lying dorsolaterally. Pleurosternal keels missing. Epiproct short, straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 very low, blade-like, scarcely traceable. Legs a bit longer and more strongly incrassate in ♂ as compared to ♀, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Particularly long, dorsal, tactile setae at least on most tibiae.

Gonopods (Figs. 22-26) with modestly enlarged coxites. Each coxite moderately densely setose and carrying a very distinct, slender, lateral apophysis (a) tightly adpressed to femorite. Telopodites rather complex, exposed, each with a couple of lobe-like apical outgrowths. Solenomerite small, inconspicuous, rather mesal in position.

Schizotelopus amazonicus n.sp. (Figs. 27-32)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, 60°06'W, 02°34'S, Km 10 of ZF-02 road, near Km 51 of BR-174 road, secondary forest (= capoeira), soil extraction, 6.XII.1990; leg. O. DE A. RIBEIRO. - Paratypes: ♂ (INPA), same data, 28.VIII.1990. - ♀ (INPA), same data, 7.XI.1990. - ♀ (INPA), same data, 9.X.1990. - ♀ (INPA), same data, 6.X.1990; all leg. O. DE A. RIBEIRO.

Diagnosis: Differs from the only known congener, and type-species, *S. brevicornis* (CARL, 1914), from Colombia, by the hump of the ♂ head as well as the presence of a small lateral apophysis on the gonocoxite coupled with the peculiar shape and more frontal position of the parabasal process on the gonopod telopodite.

Description: Length ca. 4.5-5.0 (♂) to 5.5-6.0 mm (♀), width of midbody somites 0.45-0.50 (♂) and 0.55-0.60 mm (♀). Colour entirely pallid, whitish to pale yellowish, often with translucent patches (alcohol material).

Body with 20 segments (♂, ♀). Head with a flattened frons and a moderately big, evident, medial, rounded or somewhat truncate tubercle above level of antennae (♂) (Figs. 27-28), or unmodified, with frons more convex, densely and rather delicately setose (♀). Antennae very short, strongly clavate, in situ only somewhat (♂) or a bit (♀) surpassing somite 2; antennomere 5 distodorsally distinctly sloping to support a prominent group of bacilliform sensillae; antennomere 6 larger, with a similar distodorsal group of sensillae; antennomere 7 with a minute midway dorsal knob. Collum narrowest, with three usual rows of long, filiform setae. Head subequal in width to somites 2-3 (♂) or 5 (♀). Body parallel-

sided on somites 5-15, onward very gently and gradually tapering. Surface largely dull, shagreened, microreticulate. Disregarding collum, metaterga with moderately well-developed (a bit less so in ♀) lateral paranota, latter set quite high (at about 1/4 midbody height, with dorsum a bit more convex in ♀), laterally virtually not incised at insertion points of tergal setae, anteriorly more broadly, posteriorly rather narrowly rounded, surpassing rear tergal contour as rounded triangles only on somites 18 and 19. Tergal setae as usual three transverse rows (Fig. 29), usually filiform, more seldom very slightly subclavate, medium-sized on midbody somites (♂), evidently longer only in fore row on collum. Metatergal sculpture/bosses virtually wanting, only a very modest transverse sulcus. Ozopores vague, lying dorsolaterally. Pleurosternal keels missing. Epiproct short, straight, digitiform.

Sterna rather sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 rather low, blade-like, with even ventral margin due to elevated corners. Legs a bit longer and more strongly incrassate in ♂ as compared to ♀, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Particularly long, dorsal, tactile setae at least on a few anteriormost tibiae.

Gonopods (Figs. 30-32) with voluminous, ventrally deeply concave coxites. Each coxite rather densely setose laterally and carrying a small but distinct spine (d) apico-laterally. Telopodites complex, deeply sunken into coxites, each with a peculiar field of setae near base of a rudimentary and fully mesal solenomerite as well as with a very prominent, parabasal finger extremely densely microtuberculate at apex (f) and perforating coxital wall frontally.

Brachycerodesmus latior n.sp. (Figs. 33-36)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Terra firme (= nonflooded upland forest), Rio Tarumã Mirím, 60°17'W, 03°02'S, secondary forest (= capoeira), soil extraction, 26.VII.1983; leg. J.M. RODRIGUES, J. ADIS et al. - Paratypes: 3 ♂, 1 ♀, 2 juv. (INPA), 2 ♂, 3 ♀, 5 juv. (ZMUM), 2 ♂, 1 ♀, 2 juv. (ZMUC), same data, together with holotype. - 1 ♂, 1 ♀, 9 juv. (INPA), 1 ♂ (MHNG), same locality, 25.VIII.1982. - 1 ♂, 5 ♀, 5 juv. (INPA), 29.IX.1982. - 1 ♂, 3 ♀ (INPA), 26.X.1982. - 1 ♂, 2 ♀ (CA), same locality, 23.XI.1982. - 1 ♂ (INPA), same locality, 29.XII.1982. - 1 ♂ (INPA), 1 ♀ (MHNG), same locality, 30.I.1983. - 1 ♀ (INPA), same locality, 25.IV.1983. - 1 ♂ (INPA), same locality, 26.V.1983. - 1 ♂, 1 ♀, 2 juv. (SMF), same locality, 26.VII.1983. - 5 ♂, 3 ♀, 5 juv. (INPA), same locality, 24.VIII.1983; all leg. J.M. RODRIGUES, J. ADIS et al. - Other material: 16 juv. (INPA), same locality, 25.VIII.1982. - 1 juv. (INPA), same locality, 29.XII.1982. - 4 juv. (INPA), same locality, 27.VI.1983. - 1 juv. (INPA), same locality, 24.VIII.1983; all leg. J.M. RODRIGUES, J. ADIS et al.

Name: Emphasizes the extremely broad paranota.

Diagnosis: Differs from congeners by the very broad paranota combined with the peculiar, most simple gonopod structure.

Description: Length ca. 6.5-7.5 (♂) to 7.0-9.0 mm (♀), width of midbody somites 1.0-1.25 (♂) to 1.2-1.35 mm (♀). Colour entirely pallid, whitish to pale yellow, often with translucent patches (alcohol material).

Body with 20 segments (♂, ♀). Head with a slightly flattened (♂) or relatively convex (♀) frons, without further modifications, delicately setose. Antennae relatively short, not too strongly clavate, in situ reaching up to end (♂) or midway (♀) of somite 3; antennomere 5 distodorsally distinctly sloping to support a rather large group of bacilliform sensillae; antennomere 6 larger, with a somewaht smaller distodorsal group of sensillae; antennomere 7 with a minute, midway, dorsal knob. Head narrowest, considerably narrower than collum, latter with three usual rows of setae. Body gradually but rather rapidly broadening until somite 5 (Fig. 33), parallel-sided on somites 5-16, onward rapidly but gently tapering. Surface largely dull, shagreened, microreticulate. All metaterga including collum with

extremely well-developed lateral paranota, latter over 1/2 as broad as prozona (Fig. 34), set relatively high (at about 1/4 midbody height, with dorsum a bit more convex in ♀), subhorizontal, laterally faintly incised at insertion points of tergal setae, with 2-3 incisions on poreless and pore-bearing somites respectively. Paranota rather poorly obtusangular anteriorly, slightly acutangular posteriorly, with both front and caudal corners invariably more or less narrowly rounded, within rear tergal contour until somite 15, onward increasingly strongly protruding beyond the contour. Tergal setae in three transverse rows, small, invariably bacilli- to slightly claviform, evidently longer only in fore row on collum and, to a lesser extent, in middle row on collum and in rear row on somite 19. Metatergal sculpture/bosses flat but relatively well-developed. Ozopores vague, lying dorsolaterally. Pleurosternal keels entirely wanting. Epiproct rather short, almost straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 blade-like, laterally very low, medially as a relatively high and rounded lobe. Legs relatively long and evidently incrassate due to all podomeres but tarsi, longer and more strongly incrassate in ♂ as compared to ♀, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Long, dorsal, tactile setae on tibiae.

Gonopods (Figs. 35-36) with strongly enlarged coxites, yet not concealing telopodites. Each coxite rather vaguely squamate laterally and rather densely pilose frontally and laterally. Telopodites relatively small, very simple, sacciform, without any outgrowths except for a small, lateral solenomerite. A distinct, oblique, frontal groove below solenomerite.

Adisia hilaris n.sp. (Figs. 37-41)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Terra firme (= nonflooded upland forest), Rio Tarumã Mirím, 60°17'W, 03°02'S, secondary forest (= capoeira), soil extraction, 28.III.1983; leg. J.M. RODRIGUES, J. ADIS et al. - Paratypes: 2 ♂, 1 ♀, 4 juv. (INPA), 3 ♂, 4 ♀, 6 juv. (ZMUM), same data, 25.VIII.1982. - 2 ♂ (INPA), same data, 29.IX.1982. - 6 ♂, 5♀, 3 juv. (INPA), same data, 26.X.1982. - 4 ♂, 2 juv. (INPA), same data, 23.XI.1982. - 2 ♂, 1 ♀ (INPA), 2 ♂, 1 ♀, 1 juv. (ZMUC), 29.XII.1982. - 2 ♂, 1 ♀ (INPA), same data, 30.I.1983. - 2 ♂, 3 ♀, 4 juv. (INPA), same data, 25.IV.1983. - 2 ♂, 1 ♀, 6 juv. (INPA), 3 ♂, 2 ♀ (CA), same data, 27.VI.1983. - 19 ♂, 6 ♀, 11 juv. (INPA), 2 ♂, 3 ♀ (MHNG), 2 ♂, 1 ♀ (SMF), 5 ♂, 6 ♀ (CA), same data, - 26.VII.1983. - 6 ♂, 5 ♀ (INPA), same data, 27.VIII.1983. - 1 ♂ (INPA), same data, on tree trunk, 20.IV.1982; all leg. J.M. RODRIGUES, J. ADIS et al.

Name: Honours Dr. Joachim ADIS and his personality.

Description: Length ca. 3.8-4.2 (♂) to 4.3-4.7 mm (♀), width of midbody somites 0.38-0.42 (♂) to 0.42-0.47 mm (♀). Colour entirely pallid, whitish to pale yellowish, often with translucent patches (alcohol material).

Body with 19 segments (♂, ♀). Head usual, without modifications, densely and rather delicately setose. Antennae very short, strongly clavate, in situ reaching up to end (♂) or midway (♀) of somite 2; antennomere 5 distodorsally distinctly sloping to support a rather modest group of bacilliform sensillae; antennomere 6 larger, with a similar distodorsal group of sensillae; antennomere 7 with a minute, almost wanting, midway, dorsal knob. Collum narrowest, considerably narrower than head, with three usual rows of setae. Head a bit broader (♂) than to subequal in width (♂, ♀) to somites 2 and 5-14, postcollar constriction very poorly developed due to subequal somites 3-4. Somite 2 a bit narrower than somite 3, but a little broader than collum. Body virtually parallel-sided on somites 5-14, onward extremely delicately tapering until somite 17, further on caudally attenuating very rapidly on somites 18-19. Surface largely dull, shagreened, microreticulate, only some patches shining. Metaterga with relatively poorly developed lateral paranota, latter (Figs. 37-38) set relatively low (at about 1/2-1/3

midbody height, with dorsum strongly convex in ♀), slightly sloping down, laterally virtually not incised at insertion points of tergal setae, with 2-3 lateral setae on poreless and pore-bearing somites respectively. Paranota more or less strongly obtusangular and rounded anteriorly; caudal corner drawn back increasingly well from somite 5 as a relatively small and relatively narrowly rounded triangle, always within contour until somite 13, reaching the contour from somite 14, a bit surpassing the contour on somites 17-18. Tergal setae as usual in three transverse rows, invariably filiform to modestly bacilliform, largely relatively short, medium-sized and evidently longer only in fore rows on collum and laterally. Metatergal sculpture/bosses moderately almost missing, with traces of a transverse sulcus between rows 1 and 2. Ozopores rather vague, lying dorsolaterally, often traceable as pinkish dots. Pleurosternal keels wanting. Epiproct rather short, almost straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 relatively high, blade-like, straight due to elevated lateral corners. Legs relatively long and evidently incrassate due to all podomeres but tarsi, somewhat longer and more strongly incrassate in ♂ as compared to ♀, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Particularly long, dorsal, tactile setae on tibiae.

Gonopods (Figs. 39-41) with rather strongly enlarged coxites concealing much of telopodite in their cavity. Each coxite setose laterally. Telopodites rather simple, each with a rather big, sacciform lobe (w) laterally; with a prominent, slightly serrate, mesal solenomerite; with a strong, similarly slightly curved process opposite solenomerite. Seminal groove with a peculiar loop, first running mesally, then turning abruptly laterad at base of apical process before passing onto solenomerite.

Moojenodesmus wellingtoni n.sp. (Figs. 42-43)

Holotype: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Lago Janauarí, 60°17'W, 03°20'S, mixedwater inundation forest, soil extraction, 10.XI.1987; leg. J. ADIS et al. - Paratypes: 4 ♀ (INPA), same data, ground emergence trap and soil extraction. - ♀ (ZMUM), same data, 15.IX.1987; all leg. J. ADIS, J.W. DE MORAIS et al.

Name: Honours M.Sc. J. WELLINGTON DE MORAIS, one of the collectors.

Diagnosis: Differs from congeners chiefly by the peculiar gonopod structure.

Description: Length ca. 6.5 (♂) to 7.3-9.5 mm (♀), width of midbody somites 0.7 (♂) to 0.8-0.95 mm (♀). Colour entirely pallid, whitish to pale yellowish, often with translucent patches (alcohol material), more seldom marble brownish, brighter on anterior body end.

Body with 20 segments (♂, ♀). Head with a flattened frons and a relatively low, rounded, medial hump above level of antennae (♂) (like in Figs. 27-28), or unmodified, with frons a bit more convex, densely and rather delicately setose (♀). Antennae relatively short, not too strongly clavate, in situ reaching up to midway of somite 3; antennomere 5 distodorsally distinctly sloping to support a rather modest group of bacilliform sensillae; antennomere 6 larger, with a similar distodorsal group of sensillae; antennomere 7 with a minute, almost wanting, midway, dorsal knob. Collum narrowest, with three usual rows of setae. Head subequal in width to somite 3 (♂) or 4(♀), either a bit narrower than somite 5. Somite 2 a bit narrower than somite 3, but a little broader than collum. Body parallel-sided on somites 5-16, onward rather rapidly but gently tapering. Surface largely dull, shagreened, microreticulate. Disregarding collum, metaterga with well-developed (a bit less so in ♀) lateral paranota, latter much like in *Phaneromerium distinctum* n.sp. (see Figs. 9-10), set relatively high (at about 1/4 midbody height, with dorsum a bit more convex in ♀), laterally incised at insertion points of tergal setae, with 2-3 incisions on poreless and pore-bearing somites respectively. Paranota more or less strongly obtusangular anteriorly, pointedly acutangular posteriorly, with caudal corner drawn back as a triangle already from somite 3, invariably within rear tergal contour until somite 13, onward increasingly

strongly protruding beyond the contour, especially well so on somites 16-17, especially poorly so on somite 19. Tergal setae in three transverse rows, invariably filiform, rather short to medium-sized, evidently longer only in fore row on collum and, to a lesser extent, in rear row on somite 19. Metatergal sculpture/bosses moderately well-developed. Ozopores vague, lying dorsolaterally. Pleurosternal keels as rather prominent lappets only on ♂ somite 2. Epiproct rather short, almost straight, digitiform.

Sterna sparsely setose, unmodified. Epigynal ridge behind ♀ legpair 2 very low, blade-like, straight, traceable mostly due to somewhat elevated lateral corners. Legs relatively long and evidently incrassate due to all podomeres but tarsi, a bit longer and more strongly incrassate in ♂ as compared to ♀, only tarsi invariably slender and long, with neither tarsal papillae nor other evident modifications. Particularly long, dorsal, tactile setae at least on most tibiae.

Gonopods (Figs. 42-43) with strongly enlarged coxites concealing much of telopodite in their cavity. Each coxite rather vaguely squamate laterally, rather densely setose laterally and, to a lesser extent, caudally. Telopodites complex, transverse, each with a big rounded lobe anteromesally; with a relatively short but strongly spiniform, mesal solenomerite; with a small caudolateral lobe supporting 3-4 strong setae and a digitiform membranous process near its base; and finally with a slender frontolateral process slightly denticulate near apex.

Moojenodesmus pumilus SCHUBART, 1944

Material: ♂ (INPA), Brazil, Edo. Amazônas, environs of Manaus, Lago Janauarí, 60°17'W, 03°20'S, mixedwater inundation forest, soil extraction, 15.III.1988. - ♀ (INPA), same locality, on tree trunk, 29.IV.1988. - ♀ (INPA), same locality, ground emergence trap, 16.V.1988. - ♀ (INPA), same locality, soil extraction, 10.XI.1987; all leg. J. ADIS, J.W. DE MORAIS et al.

Remarks: This interesting, obviously parthenogenetic species seems to be quite widespread in Brazil, in the environs of Manaus being restricted not only to várzea (= whitewater inundation forests) (cf. GOLOVATCH 1992), but also to mixedwater communities.

Moojenodesmus bethaniae GOLOVATCH, 1992

Material: numerous ♂♂ & ♀♀ (INPA), 2 ♂, 3 ♀ (ZMUM), Brazil, Edo. Amazônas, environs of Manaus, Terra firme (= nonflooded upland forest), Rio Tarumã Mirím, 60°17'W, 03°02'S, secondary forest (= capoeira), soil extraction, 25.VIII.1982-24.VIII.1983; all leg. J.M. RODRIGUES, J. ADIS et al.

Remarks: This species has hitherto been reported as taken solely from tree trunks and by means of soil extraction in a Terra firme forest of the Reserva Forestal A. Ducke near Manaus (cf. GOLOVATCH 1992).

Key to Manaus Fuhrmannodesmidae (mainly for males)

1(2) Body of adults with 18 somites (♂, ♀) ..... *Moojenodesmus pumilus*
2(1) Body of adults with 19-20 somites
3(4) Body of adults with 19 somites (♂, ♀) ..... *Adisia hilaris*
4(3) Body of adults with 20 somites (♂, ♀)

5(6) ♂ head with a more or less distinct, median hump above antennae (Figs. 19-20, 27-28) 7
6(5) ♂ head without modifications (Figs. 9, 14, 33, 37) 17
7(8) Hump on ♂ head relatively low, sometimes flattened (Figs. 27-28) 11
8(7) Hump on ♂ head exceptionally prominent (Figs. 19-20) 9
9(10) Tergal setae minute, strongly clavate even in ♀; hump on ♂ head more or less strongly sloping anteriorly ..... *Moojenodesmus susannae*
10(9) Tergal setae a little longer, bacilliform (Figs. 20-21); hump on ♂ head sloping neither anteriorly nor posteriorly ..... *Fuhrmannodesmus rhinoceros*
11(12) Body width 0.7-0.95 mm, tergal setae invariably filiform; gonopods as in Figs. 42-43 ..... *Moojenodesmus wellingtoni*
12(11) Body width up to 0.6 mm, tergal setae at best mostly filiform, more often more or less strongly bacilli- to subclaviform; gonopods different
13(14) Tergal setae mostly filiform, medium-sized (Figs. 28-29), gonopods as in Figs. 30-32 ..... *Schizotelopus amazonicus*
14(13) Tergal setae clavate to bacilliform; gonopods different
15(16) Tergal setae very short to short, usually strongly clavate to subclavate; ♂ legpair 4 strongly and conspicuously incrassate (Fig. 6); gonopods as in Figs. 7-8 ..... *Phaneromerium minutum*
16(15) Tergal setae a bit longer, usually subclavate to bacilliform; ♂ legpair 4 unmodified, like subsequent legs; gonopods different ..... *Moojenodesmus bethaniae*
17(18) Paranota extremely broad, even collum considerably broader than head (Figs. 33-34); gonopods as in Figs. 35-36 ..... *Brachycerodesmus latior*
18(17) Paranota not so broad, collum at best subequal to head; gonopods different
19(20) ♂ collum and somite 2 distinctly larger than in ♀; ♂ legpair 2 with extremely long coxal processes and strongly reduced telopodites ..... *Cutervodesmus adisi*
20(19) ♂ and ♀ collum and somite 2 similar in shape; ♂ legpair 2 unmodified, more or less like subsequent legs
21(22) Collum subequal in width to head, paranota relatively broad (Figs. 14-15); gonopods as in Figs. 16-18 ..... *Phaneromerium latum*
22(21) Collum considerably narrower than head, paranota relatively narrow (Figs. 9-10); gonopods different
23(24) Antennae in situ surpassing somite 3 only in ♂; caudal corner of paranota within rear tergal contour until somite 12, onward increasingly surpassing the contour until somite 17, further on less so; gonopods as in Figs. 11-13 ..... *Phaneromerium distinctum*
24(23) Antennae in situ surpassing somite 4 (♂) or 3 (♀); caudal corner of paranota within rear tergal contour until somite 15, onward increasingly surpassing the contour until somite 18, further on less so; gonopods different ..... *Moojenodesmus irmgardae*

Resumo

A fauna dos diplópodos da família Fuhrmannodesmidae nos arredores de Manaus atualmente compreende 13 espécis (todas com chave), representando 7 gêneros: *Phaneromerium minutum* n.sp., *P. distinctum* n.sp., *P. latum* n.sp., *Fuhrmannodesmus rhinoceros* n.sp., *Schizotelopus amazonicus* n.sp.,

Brachycerodesmus latior n.sp., *Adisia hilaris* n.gen., n.sp., e *Moojenodesmus wellingtoni* n.sp. Uma elaboração refundida da classificação genérica da família dentro da zona neotropical, sendo possível em parte pela revisão de material tipo de *Cryptogonodesmus clavidides* SILVESTRI, 1898, a espécie tipo de *Cryptogonodesmus* SILVESTRI, 1898, possibilitou a correção de algumas diagnoses genéricas e as transferências de espécies. Os gêneros *Brachycerodesmus* CARL, 1914, *Giustoella* KRAUS, 1960, e *Schizotelopus* VERHOEFF, 1941, são revalidados e o gênero *Olmodesmus* KRAUS, 1954, é sinonimizado sobre *Phaneromerium* VERHOEFF, 1941 (syn.n.!). Um curto perfil de classificação e filogenia é dado para todos os 9 gêneros confirmados dos fuhrmannodesmídeos (todos com chave) habitando a América do Sul a partir do sul do Panamá.

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References

ADIS, J. (1992a): How to survive six months in a flooded soil: strategies in Chilopoda and Symphyla from Central Amazonian floodplains. - Stud. Neotrop. Fauna Environment **27**(2-3): 117-129.

ADIS, J. (1992b): Überlebensstrategien terrestrischer Invertebraten in Überschwemmungswäldern Zentralamazoniens. - Verh. naturwiss. Ver. Hamburg **33** (N.F.): 21-114.

CARL, J. (1914): Die Diplopoden von Columbien nebst Beiträgen zur Morphologie der Stemmatoiuliden. - Mém. Soc. neuchât. Sci. nat. **5**(2): 821-993.

CHAMBERLIN, R.V. (1950): Some diplopods from Puerto Rico. - Proc. Biol. Soc. Washington **63**: 147-154.

GOLOVATCH, S.I. (1986): Diplopoda from the Nepal Himalayas: Polydesmidae, Fuhrmannodesmidae. - Senckenbergiana biol., Frankfurt/M. **66**(4/6): 345-369.

GOLOVATCH, S.I. (1990): Diplopoda from the Nepal Himalayas. Several additional Polydesmidae and Fuhrmannodesmidae (Polydesmida). - Spixiana **13**(3): 237-252.

GOLOVATCH, S.I. (1992): Review of the Neotropical fauna of the millipede family Fuhrmannodesmidae, with the description of four new species from near Manaus, Central Amazonia, Brazil (Diplopoda, Polydesmida). - Amazoniana **12**(2): 207-226.

HOFFMAN, R.L. (1980): Classification of the Diplopoda. - Mus. Hist. nat. Genève, 237 pp. (for 1979).

KRAUS, O. (1954): Myriapoden aus Peru, II. - Senckenbergiana biol. **35**(1/2): 17-55.

KRAUS, O. (1955): Myriapoden aus Peru, III. - Senckenbergiana biol. **36**(3/4): 173-200.

KRAUS, O. (1957): Myriapoden aus Peru, V. - Senckenbergiana biol. **38**(1/2): 95-114.

KRAUS, O. (1959a): Myriapoden aus Peru, VII. - Senckenbergiana biol. **40**(3/4): 191-208.

KRAUS, O. (1959b): Myriapoden aus Peru, VIII. - Senckenbergiana biol. **40**(5/6): 263-281.

KRAUS, O. (1960): Myriapoden aus Peru, IX. - Senckenbergiana biol. **41**(3/4): 241-264.

LOOMIS, H.F. (1934): Millipeds of the West Indies and Guiana collected by the Allison V. Armour Expedition in 1932. - Smithson. Misc. Collect. **89**(14): 1-69.

LOOMIS, H.F. (1941): Millipeds collected in Puerto Rico and the Dominican Republic by Dr. P.J. Darlington in 1938. - Bull. Mus. Comp. Zool. **88**(2): 17-80.

LOOMIS, H.F. (1961): New and previously known millipeds of Panama. - Proc. U.S. Natn. Mus. **113**(3454): 77-124.

LOOMIS, H.F. (1964): The millipeds of Panama (Diplopoda). - Fieldiana: Zool. **47**(1): 1-136.

PETERS, W. (1864): Uebersicht der im Königl. zoologischen Museum befindlichen Myriopoden aus der Familie der Polydesmi, sowie Beschreibungen einer neuen Gattungen *Trachyjulus*, der Juli, und neuen Arten der Gattung *Siphonophora*. - Monatsber. Preus. Kgl. Akad. Wiss. Berlin **1864**: 529-551, 617-627.

SCHUBART, O. (1944): Os Diplópodos de Pirassununga. - Acta Zool. Lilloana **2**: 321-440.

SCHUBART, O. (1945): Os Proterospermophora do Distrito Federal (Myriapoda, Diplopoda). - Arq. Mus. Nac. **38**: 1-156.

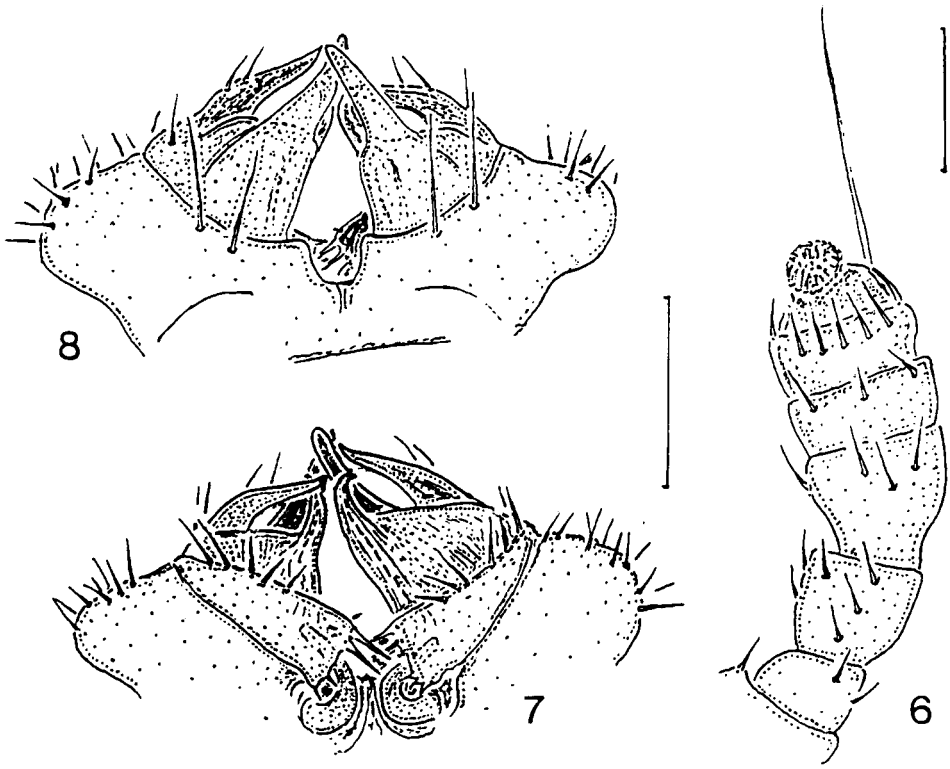
SCHUBART, O. (1955): Proterospermophora oder Polydesmoidea von Französisch West-Afrika (Diplopoda). - Bull. Inst. franç. Afr. Noire **17A**(2): 377-443.

SILVESTRI, F. (1898): Diagnósticos de nuevos Diplópodos sudamericanos. - Anal. Mus. Nac. Buenos-Aires **6**: 53-79.

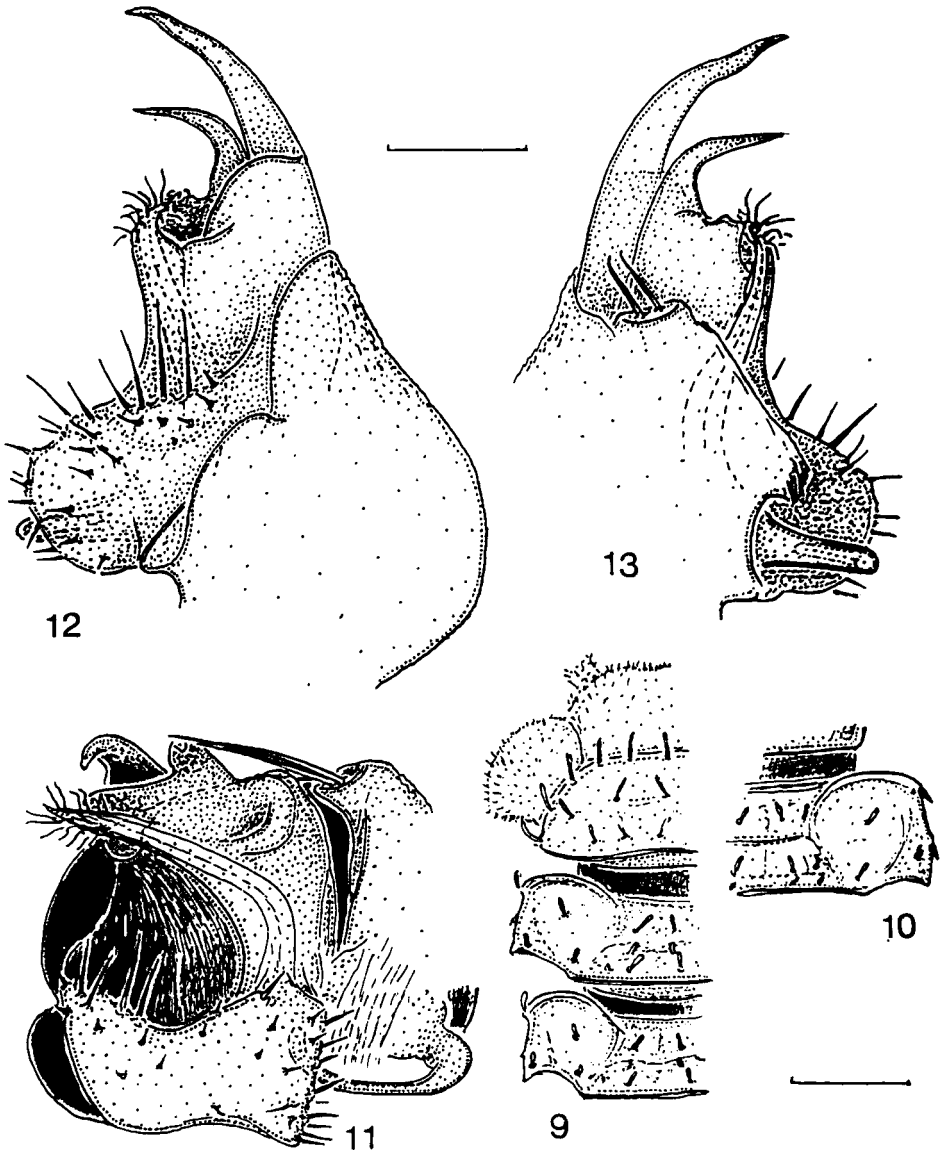
TABACARU, I. (1993): Sur la rémarquable conformation des apophyses génitales mâles chez un polydesmide néotropical. - Abstr. 9th Int. Congr. Myriapodol., Paris, July **1993**: 77.

VERHOEFF, K.W. (1941a): Chilopoden und Diplopoden. - In: TITSCHACK, E. (ed.): Beiträge zur Fauna Perus **1**(2): 5-80, Hamburg.

VERHOEFF, K.W. (1941b): Myriapoden der Insel Fernando Po. - Zool. Anz. **136**(5/6): 89-98.



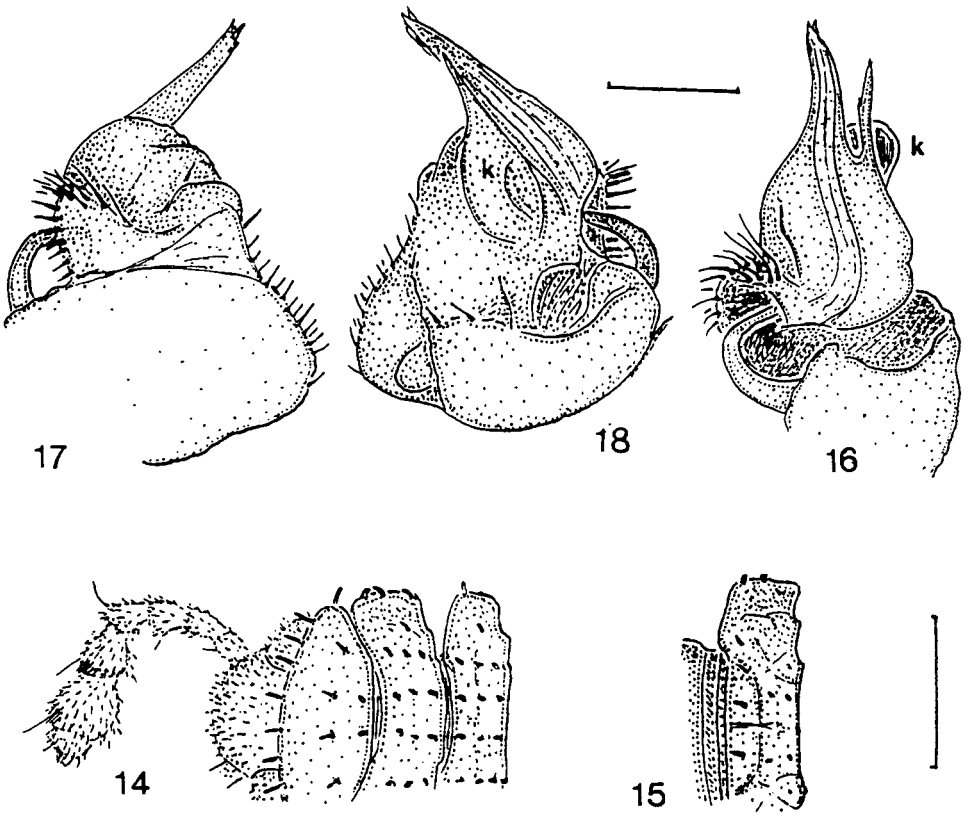
Figs. 6-8:
Phaneromerium minutum n.sp., ♂ paratype.
6: leg 4; 7-8: gonopods, caudal and frontal, resp. - Scales 0.05 mm.



Figs. 9-13:

Phaneromerium distinctum n.sp., ♂ holotype.

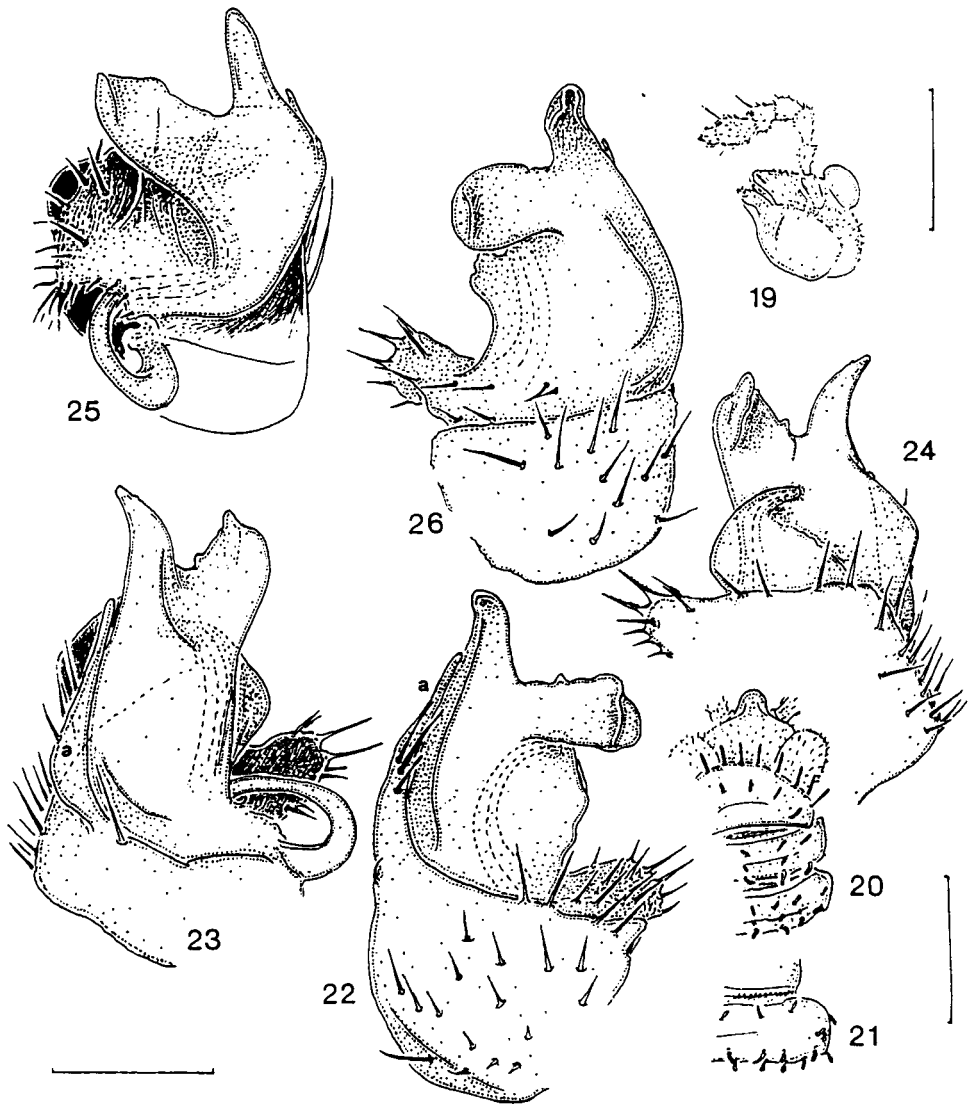
9: anterior body end, dorsal; **10**: right half of metatergite 10, dorsal; **11-13**: gonopods, ventral, sublateral, and submesal, resp. - Scales 0.2 (9-10) and 0.05 mm (11-13).



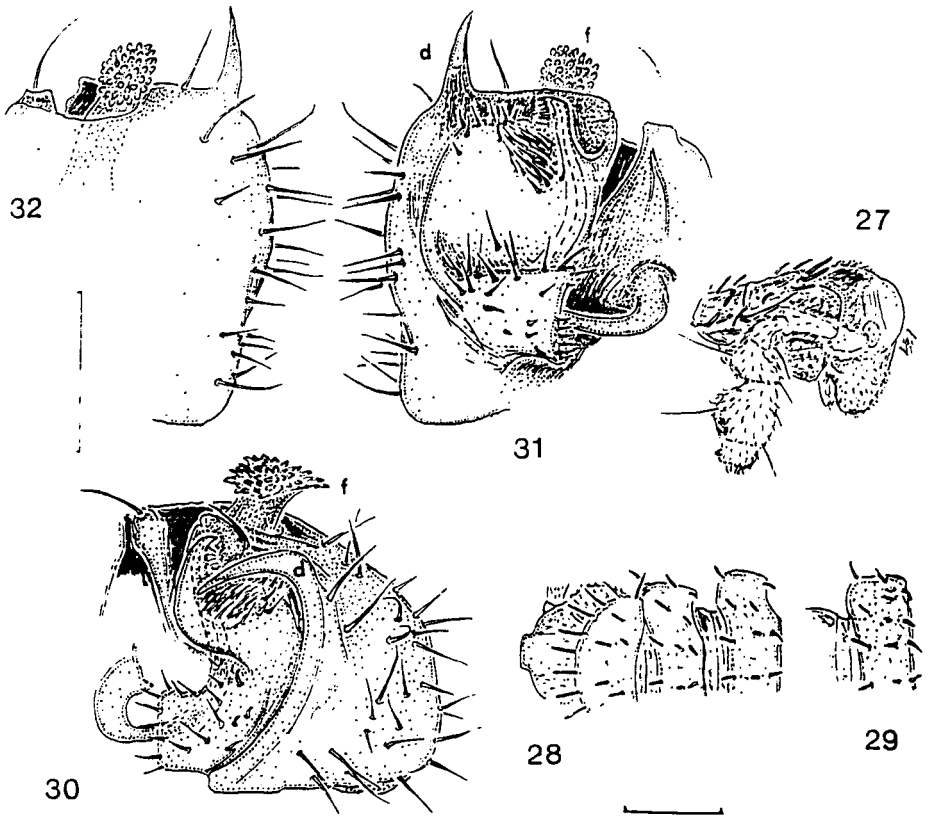
Figs. 14-18:

Phaneromerium latum n.sp., ♂ paratypes.

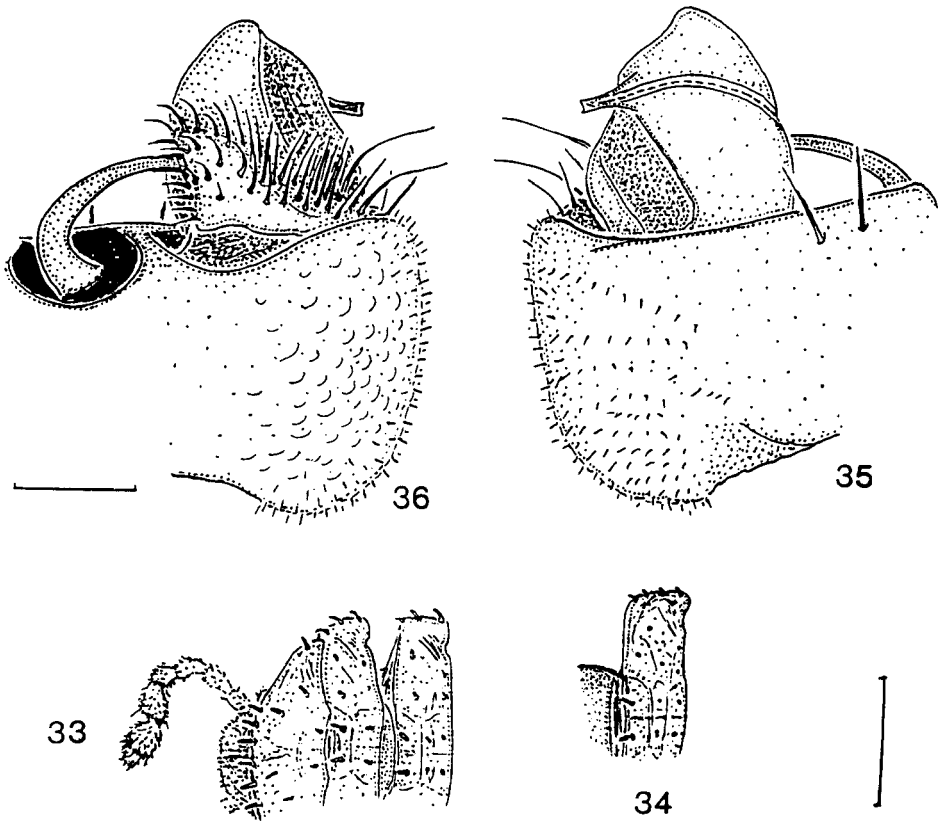
14: anterior body end, dorsal; **15**: right half of metatergite 10, dorsal; **16-18**: gonopods, caudal, submesal, and sublateral, resp. - Scales 0.3 (14-15) and 0.05 mm (16-18).



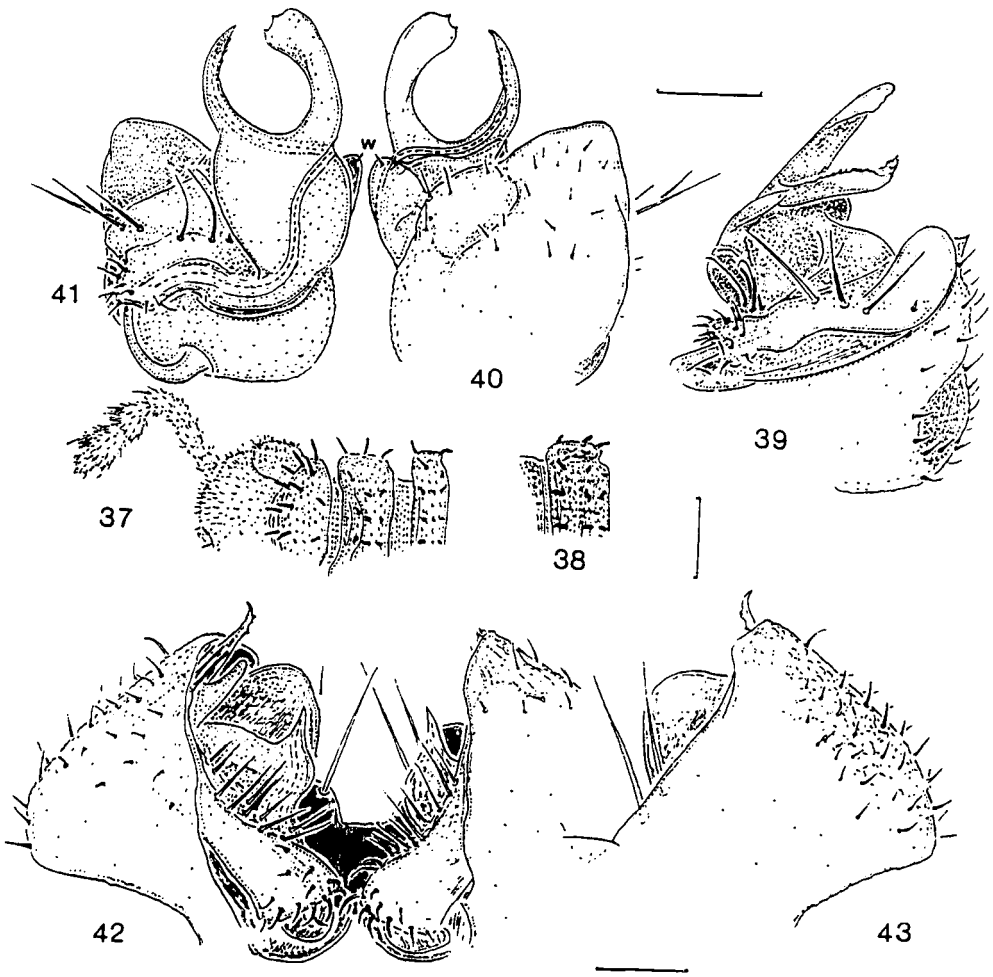
Figs. 19-26:
Fuhrmannodesmus rhinoceros n.sp., ♂ paratypes.
19: head, lateral; **20**: anterior body end, dorsal; **21**: right half of metatergite 10, dorsal; **22-26**: gonopods, frontal, subcaudal, mesal, ventrocaudal, and caudal, resp. - Scales 0.3 (19-21) and 0.05 mm (22-26).



Figs. 27-32:
Schizotelopus amazonicus n.sp., ♂ paratype.
27-28: anterior body end, lateral and dorsal, resp.; **29**: right half of metatergite 10, dorsal; **30-32**: gonopods, ventral, caudal, and frontal, resp. - Scales 0.2 (27-29) and 0.05 mm (30-32).



Figs. 33-36:
Brachycerodesmus latior n.sp., ♂ paratype.
33: anterior body end, dorsal; **34**: right half of metatergite 10, dorsal; **35-36**: left gonopod, caudal and frontal, resp. - Scales 0.5 (33-34) and 0.05 mm (35-36).



Figs. 37-43:

Adisia hilaris n.gen., n.sp., ♂ paratypes (37-41), and *Moojenodesmus wellingtoni* n.sp., ♂ holotype (42-43).

37: anterior body end, dorsal; **38**: right half of metatergite 10, dorsal; **39-43**: gonopods, caudal, submesal, sublateral, caudal, and frontal, resp. - Scales 0.2 (37-38) and 0.05 mm (39-43).