Papéis Avulsos de Zoologia

Museu de Zoologia da Universidade de São Paulo

Volume 52(8):103-110, 2012 **www.mz.usp.br/publicacoes** **ISSN impresso: 0031-1049**
http://portal.revistasusp.sibi.usp.br **ISSN *on-line:* 1807-0205**
www.scielo.br/paz

New genera for two poorly-known millipeds from Bahia (Polydesmida: Chelodesmidae)

Richard L. Hoffman[1]

ABSTRACT

Two chelodesmid millipeds described by Brölemann (1903) from the interior of Bahia have not been reported for over 100 years despite their large size and bright coloration. Originally described as Leptodesmus gounellei *and* Leptodesmus carminatus, *neither species is referable to* Leptodesmus *as currently defined nor any other established genus. Both have been studied from the type specimens, and are here designated the type species of two new genera,* Plectrogonodesmus *for* gounellei *and* Baianassa *for* carminatus. *Diagnostic characters are illustrated for both taxa. Intergeneric relationships are at present not evident, and are not suggested pending better understanding of the chelodesmid fauna of eastern Brazil.*

Key-Words: Diplopoda; Polydesmida; Chelodesmidae; New genera; Brazil: Bahia.

INTRODUCTION

Prior to about 1934, when Otto Schubart emigrated to Brazil from Germany and began to study the diverse fauna of Neotropical millipeds, the great majority of species now referred to the family Chelodesmidae had been described in a genus *Leptodesmus,* an ensemble of appalling heterogeneity. As he studied numerous collections from many parts of Brazil, Schubart quickly appreciated the great variety of the endemic chelodesmid fauna, and proposed no fewer than 23 new generic names to reflect the structural variability of these animals.

During this period of taxonomic refinements, Schubart was generally concerned with the placement of new species that came to his attention, and less involved with clarification of species described in *Leptodesmus* by European authors as far back as 1859 (nor was it always easy to borrow type specimens from European museums). As a result, a substantial number of enigmatic taxa were by default more or less bypassed and continued to infest the literature.

One major fundamental problem unresolved during Schubart's investigations concerned the characteristics and status of *Leptodesmus* itself. The name was originally proposed (DeSaussure, 1859) as a subgenus of *Polydesmus,* and contained five species only two of which were chelodesmids. One of them, *P. (L.) carneus* DeSaussure, 1859, was designated type of *Leptodesmus* by Pocock in 1909, but how the genus was to be defined in the light of future information was not addressed until Hoffman (1971) on the identity of *Leptodesmus.* At that time my provisional diagnosis admitted 21 species sharing several traits in gonopod structure.

The consequence of that exclusive delimitation was to leave the great majority of names proposed in *Leptodesmus* (*ante* Schubart) "homeless" in the sense

1. Virginia Museum of Natural History, Martinsville, Virginia 24112, USA. E-mail: richard.hoffman@vmnh.virginia.gov

of not being referable to any established generic taxon. Having had the opportunity to study type material of many such orphans in the Brazilian fauna, I have on several occasions been able to clarify their identify and status, and now wish to call attention to two species described by Brölemann (1903) from Bahia, and to my knowledge not reported, aside from inclusion in lists, for 108 years. Since the abundance of unstudied material now available is offset by the paucity of qualified taxonomists, progress can only be piecemeal and opportunistic. While such an approach is certainly not the optimal way to an adequate comprehension of any taxon or faunal unit, the two species involved are not relevant to any generic or tribal revisions currently in progress and, being large and conspicuous elements in the Bahian fauna, deserve to be entered in the mainstream of ongoing knowledge.

RESULTS

Taxonomy

Family Chelodesmidae

Chelodesmidae Cook, 1895, Ann. New York Acad. Sci., 9:4. – Hoffman, 1980, Classification of the Diplopoda, p. 151 (list of genera proposed to 1978).

Leptodesmidae Attems, 1938, Das Tierreich, 69:1. – Schubart, 1946, An. Acad. Brasileira Cienc., 18:165 (and many subsequent papers on the Brazilian fauna).

Plectrogonodesmus gen. nov.

Type species: Leptodesmus gounellei Brölemann, 1903.

Name: A neologism composed of the Greek elements *plektron* (a spur) + *gonos* (denoting the male reproductive appendage) + *-desmus* (a combining suffix widely employed throughout the order, from the original *Polydesmus*). Masculine.

Diagnosis: Body size large, length to near 70 mm. Among the known genera with enlarged gonopod aperture and prominent sclerotized median gonosternal sclerite, this new genus is characterized by the elongated paramedian processes of the 4th segment in males, by small paramedian sternal lobes on segments 13-17 in males, by the greatly extended lateral prolongation of the gonopod coxa, and especially by the unusually long and etiolated elements of the telopodite. The efferent groove, visible for its entire length in mesal aspect, terminates on a long, slender subterminal solenomere.

Species: Only the type species is known.

Distribution: The genus is known only from the type locality of the single included species, in the interior of the state of Bahia.

Comment: The large black and yellow milliped named *Leptodesmus gounelli* by Brölemann in 1903 from a single male collected in the "Sertão" of Bahia, has apparently not been subsequently documented nor represented in museum collections normally holding these arthropods. The species was described in great detail and amply illustrated, with sufficient information to preclude its accommodation in *Leptodesmus* as currently defined, nonetheless it has remained an enigmatic, unplaced waif in the Brazilian fauna. Study of the holotype has disclosed additional structures not specified by Brölemann that confirm separate generic status for this striking species.

The unusually large gonopod aperture and sclerotized, bilobed, median sternal element suggest the form characteristic of the genera *Eucampesmella* Schubart, 1955, *Leiodesmus* Silvestri, 1987, and *Euthydesmus* Silvestri,1902, and it is perhaps to this last genus that we may look for a near relative despite the disparity in their ranges (*E. acicarina* Silvestri occurs in Mato Grosso do Sul). Structure of the undescribed female genitalia in all these chelodesmids may be decisive in developing a classification.

Plectrogonodesmus gounellei (Brölemann) comb. nov. Figures 1-7

Leptodesmus Gounellei Brölemann, 1903, Ann. Soc. Entom. France, 71:665, text figs. 17, 18, pl. 7, figs. 16-18. Male holotype (Mus. Hist. Nat. Paris) from "Santo Antonio da Barra, Sertão de Bahia", E. Gounelle, leg.

Pseudoleptodesmus (Pseudoleptodesmus) gounellei: Attems, 1931, Zoologica, 30(79):27.

Leptodesmus (Pseudoleptodesmus) gounellei: Attems, 1938, Das Tierreich, 69:40, fig. 43.

Leptodesmus gounellei: Schubart, 1946, An. Acad. Brasileira Cienc., 18:195 (listed only).

Material: The holotype has been examined.

Diagnosis: With the characters of the genus, further specific characters may be distinguished in the configuration of the gonopods when additional species are discovered.

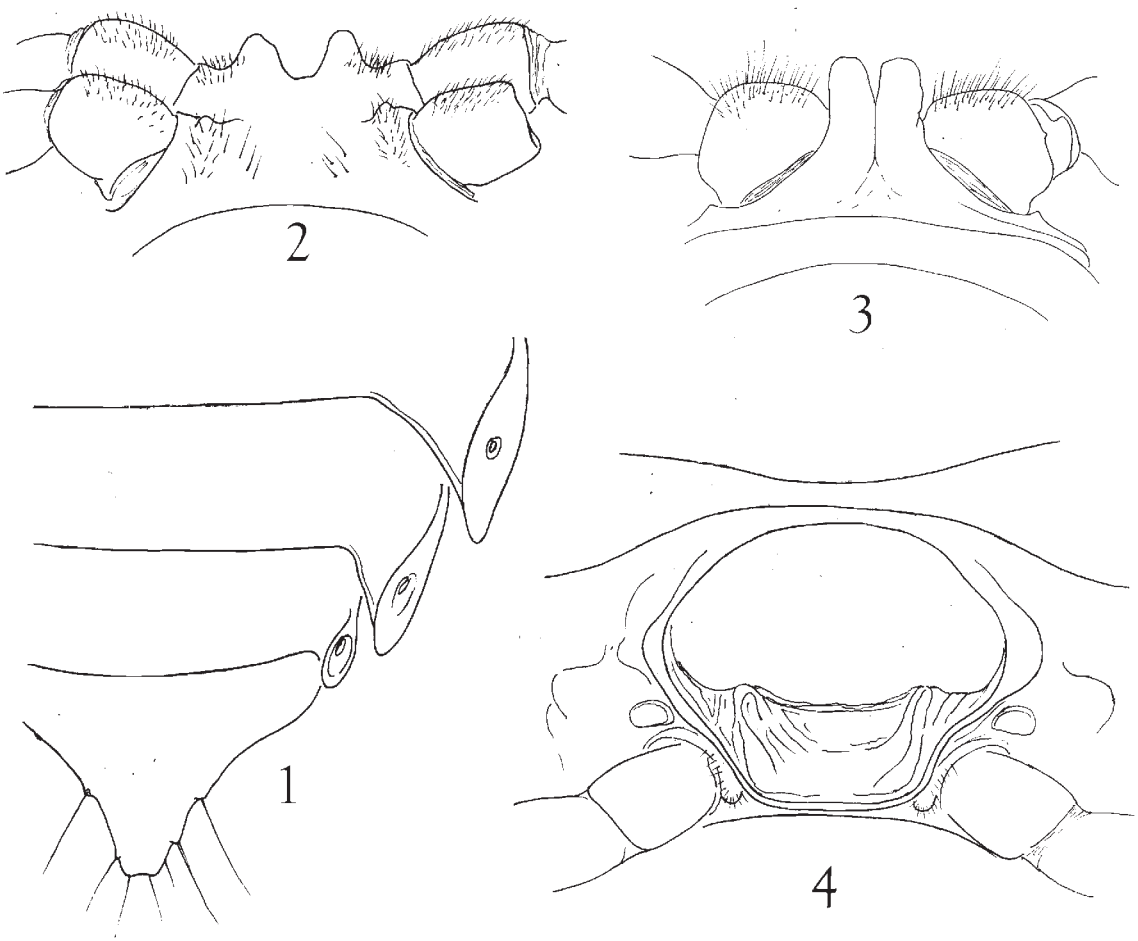
Description (abstracted from original text): Body large, length 68 mm, width of 3rd tergum, 10.8 mm, of 9th tergum, 10.8 mm (prozonal diameter 6.8 mm) sides of body parallel, abruptly narrowed posteriad.

Very dark reddish brown, almost black, with the peritreme and adjacent surface of the paranotum yellow.

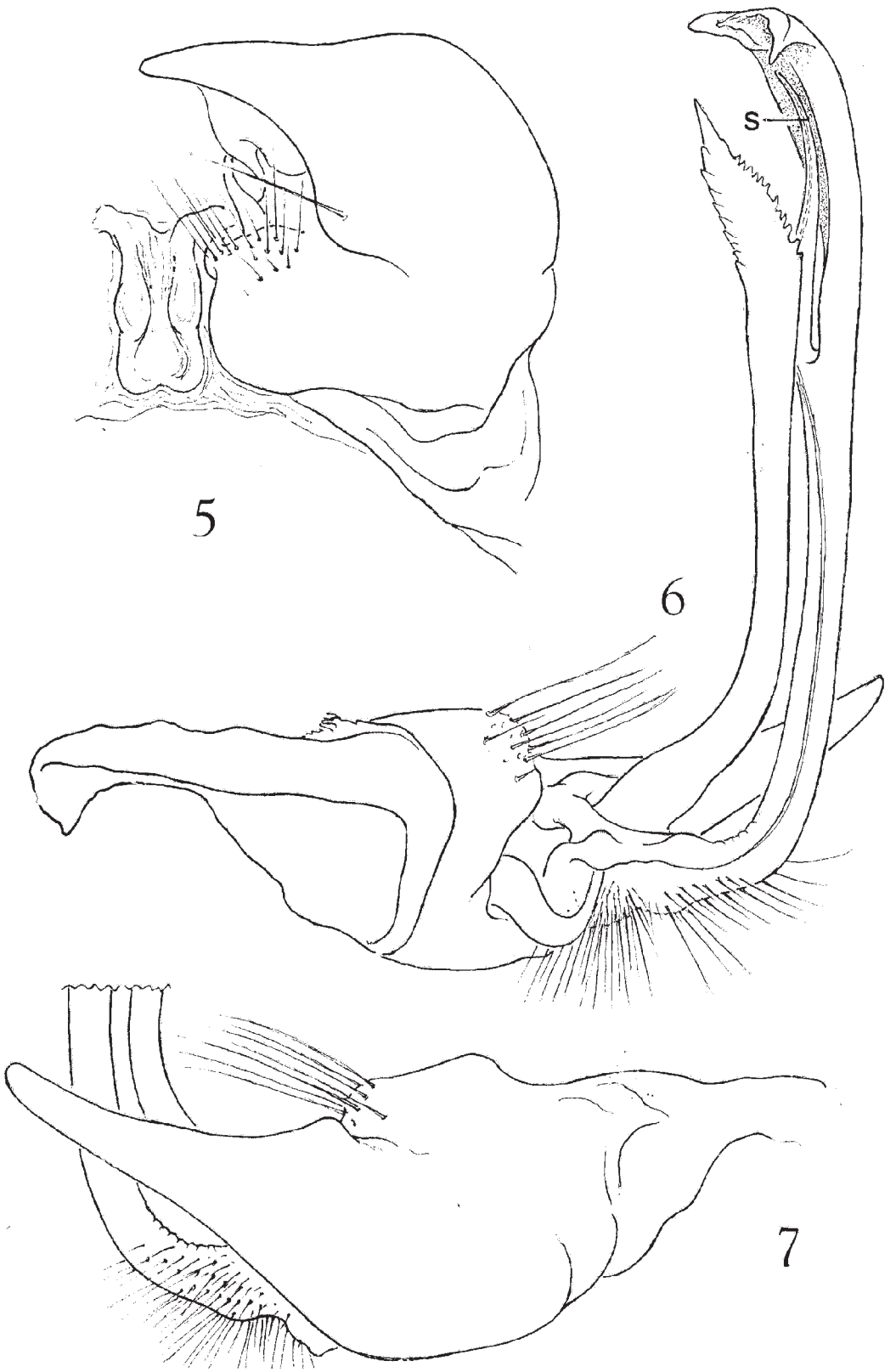
Head somewhat shiny, divided by a well-defined suture extending between the antennae, and bearing up to their level a weak subtriangular depression. Antennae very long (12 mm) and slender, exceeding the posterior border of the 3rd paranotum, not reflexed distally, antennomeres long and slender.

Collum much wider than the head, almost as broad as the following tergum, anterior border weakly arcuate medially, lateral ends narrowed to acute angle. Surface of metaterga dull, without transverse sulcus or seriate tubercles. Paranota well developed, placed at midheight of segments, a little declivous, continuing convexity of metaterga. Anterior corners broadly rounded, posterior obtusely rounded on anterior segments, becoming right-angled at midbody and increasingly acutely produced in going posteriad. Ozopores located in the posterior third of marginal peritremata, which form the posterior paranotal corner on all segments, and virtually the entire paranotum on segment 19 (Fig. 1).

Sterna broad, slightly elevated, with two paramedian projections between the posterior legpair of each postgonopodal segment (Fig. 2), anterior surface sparsely setose. Legs long and slender, the tibiae without apical subtarsal pads; pregonopodal legs without



FIGURES 1-4: *Plectrogonodesmus gounellei* (Brölemann), peripheral structures. **1.** Posterior end of body, right side, segments 17-20. **2.** Sternum of segment 16, anteroventral aspect. **3.** Sternal region of segment 4 and coxae of 3rd pair of legs. **4.** Gonopod aperture and sternal region of segment 7.



FIGURES 5-7: *Plectrogonodesmus gounellei* (Brölemann), male genitalia. **5.** Coxa and median sternal sclerite of right gonopod, anterior aspect. **6.** Left gonopod, mesal aspect. S, solenomere. **7.** Coxa and base of telopodite of left gonopod, lateral aspect.

modifications. Sternum of segment 4 with two contiguous long processes (Fig. 3), sternum of segment 6 deeply concave for accommodation of the gonopodal apices. Gonopod aperture (Fig. 4) large, transversely oval, extending nearly to anterior edge of segment 7, and caudad between the 8th pair of legs, posterior edge of aperture extended shelf-like into the cavity, this surface with several ridges in front of each coxa.

Gonopods notably large, coxae extended outside aperture rims, a large heavily sclerotized mesosternum; coxosternal apodeme elements nearly straight, elongated, apically a little enlarged. Coxa strongly prolonged on the lateral side (Fig. 7); a dorsal field of setae; no paracannular setae. Base of telopodite (prefemur) continuing main coxal axis, thence curved anteriad into a long very slender acropodite region, with small triangular apical lobe; efferent duct visible for its entire length in mesal aspect, carried by a slender acuminate solenomere. Acropodite region paralleled by a long slender prefemoral process, slightly broadened distally, with serrate edges. Neither acropodite nor prefemoral process with cingulum.

Comments: When visited by Gounelle in 1889, Santo Antonio da Barra was the name used for the city now called Condeúba in southwestern Bahia (14.53.35S, 41.59W).

Baianassa gen. nov.

Type species: Leptodesmus carminatus Brölemann, 1903.

Name: A fanciful feminine neologism composed of the elements "Bahia" + *anassa* (Gk., a female ruler), loosely "Empress of Bahia".

Diagnosis: Distinguished from all known chelodesmid genera by the following combination of characters: size large (L to 70 mm), paranota well-developed, stricture costulate, prefemoral knobs and tibial pads absent, femora of legs 4th-6th pairs somewhat more incrassate than the others, those of 2nd and 3rd pairs with small but prominent ventrobasal lobe; anterior sternal processes of 5th segment originating at coxal condyles long, acuminate, directed mesad with the apices in contact.

No sclerotized gonosternal sclerite present; coxa large and robust, with elongated coxosternal apodeme, dorsal coxal apophysis enlarged, with a field of setae on its lateral side, no paracannular setae present. Telopodite slightly smaller than coxa, lacking torsion, efferent groove conducted on a small laminate solenomere terminating the acropodite; prefemoral process large, calyciform, enveloping the acropodite. Neither element of telopodite with cingulum.

Species: Only the type species is known.

Comment: Like the foregoing species, the following has apparently never been recollected (or recorded) in over 100 years, and apparently mentioned only once, in 1938. In his 1903 paper, Brölemann sorted the various new species of *Leptodesmus* into several species groups, placing *carminatus* in the "Groupe du *Leptodesmus plataleus*" which corresponded to the taxon currently recognized as *Chondrodesmus.*

Attems (1938) formally made the new combination *Chondrodesmus carminatus* although with considerable reservation, writing "Die Stellung dieser Art in der Gattung *Chondrodesmus* ist sehr zweifelhaft, die Gonopoden, die bei den anderen Arten sehr einheitlich sind, weichen bei dieser Art stark vom Typus ab, jedoch ist es schwer, sie zwanglos in einer Gattung unterzubringen." Lacking personal experience with the situation, Schubart accepted this assignation and did not include *carminatus* in his 1946 list of Brazilian species of *Leptodesmus.* Although Brölemann's perception was reasonable for its time, our better knowledge of chelodesmids associates *Chondrodesmus* and some closely related taxa in a discrete tribe Chondrodesmini endemic to the northern Andes and Middle America (Hoffman, 1978). The large gonosternum in *Baianassa* alone is sufficient reason to exclude it from that tribe.

Baianassa carminata (Brölemann) comb. nov.
Figures 8-15

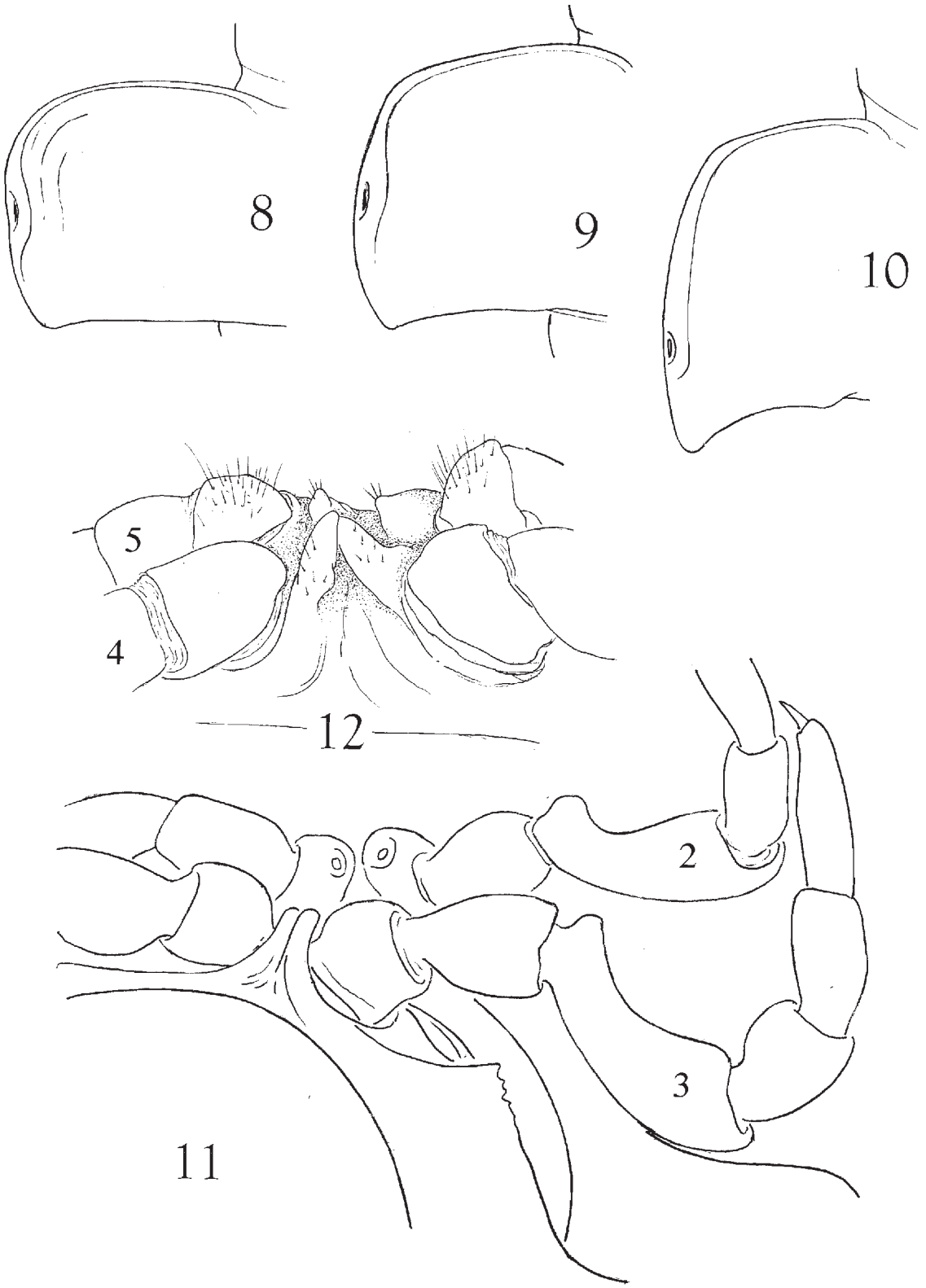
Leptodesmus carminatus Brölemann, 1903, Ann. Soc. Ent. France, 71:670, text fig. 21, 22, pl. 7, figs. 19-21. Male holotype (Mus.Nat. Hist. Nat. Paris), from "Santo Antonia da Barra, Sertão de Bahia", E. Gounelle leg.

Chondrodesmus carminatus: Attems, 1938, Das Tierreich, 69:85, fig. 98.

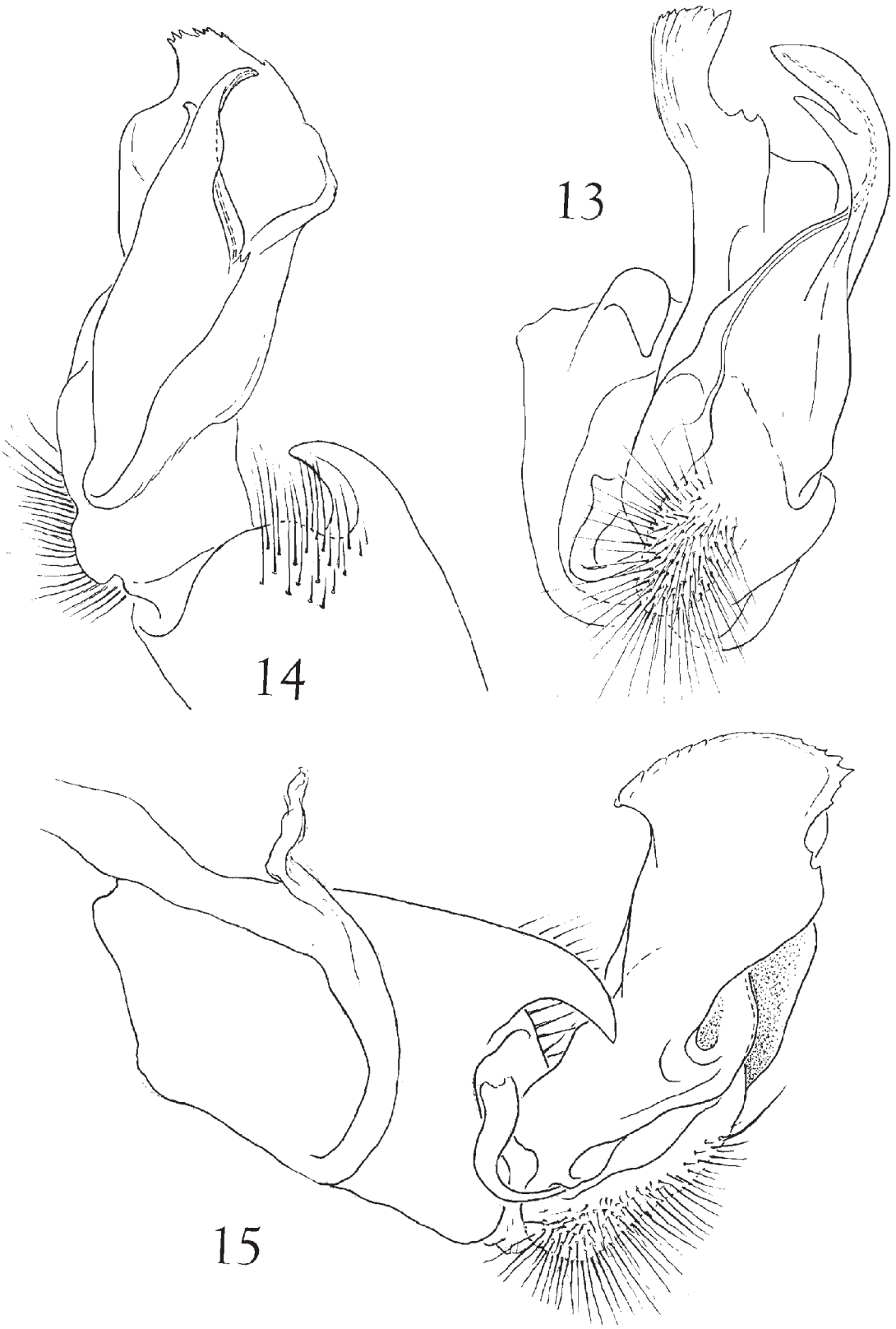
Material examined: The holotype.

Diagnosis: With the characters of the genus, further specific characters may be identified in gonopod structure when additional species are discovered.

Description (partly from Brölemann): Length of holotype 63 mm., width of 9th segment, 10.4 mm. Body robust, the anteriormost segment slightly the widest, parallel-sided except for the last three segments.



FIGURES 8-12: *Baianassa carminata* (Brölemann), peripheral structures. **8.** Left paranotum of 5th segment. **9.** Left paranotum of 10th segment. **10.** Left paranotum of 17th segment. **11.** Sternal region of 4th segment and legs of 2nd and 3rd pairs, posterior aspect. **12.** Sternal region of 5th segment, anterior aspect, showing sternal processes.



FIGURES 13-15: *Baianassa carminata* (Brölemann), male genitalia. **13.** Left gonopod, ventral (in situ) aspect. **14.** The same gonopod, lateral aspect. **15.** The same gonopod, mesal aspect.

Dorsum uniformly deep carmine, with a spot on each paranotum, a median spot on the caudal edge of the metaterga, antennae and legs yellow; ventral surfaces slightly paler red. Metaterga dorsally distinctly and densely coriaceous, from the 19th segment with a vaguely defined sulcus, no transverse series of tubercles. Stricture finely costulate. Paranota large, set high on sides, mostly subquadrate, anterior corners broadly rounded; ozopores located on side of peritremata, which persist only as far as pore, not continued to posterior corner (Fig. 8-10). Sterna broad, flat, not as wide as length of femora, without subcoxal spines. Legs robust, 9.5 mm at midbody, tibiae without apical ventral pads; ventral surfaces with dense setation. Femora of 2nd-4th pairs of legs incrassate, with small ventral basal lobe (?adenostyle) (Fig. 11). Sternum of segment 5 with two paramdian pairs of slender, acuminate, mesially-directed processes (Fig. 12).

Gonopods (Figs. 13-15) relatively short and compact, without mesosternal sclerite; coxosternal apodeme slender and nearly straight in the coxal axis. Coxae not prolonged on the lateral side, but with a large, acute apophysis on the dorsal; a small field of setae on the dorsolateral surface; no paracannular setae. Telopodite set against coxa at nearly a right-angle; acropodite continues direction of prefemur. Telopodite dominated by the large, shield-like prefemoral process which encloses the short, simple acropodite. Efferent duct carried by the acropodite termination. No cingulum present on either component of the telopodite.

Comments: Although a number of tribal groups have been proposed in the Brazilian chelodesmid fauna in recent decades, none share the combination of characters that would accomodate *Baianassa,* which occupies a somewhat disjunct position. A disposition of this genus is probably contingent upon a much better knowledge of the (probably numerous) native chelodesmids of Bahia and adjacent states to the north.

The location of Santo Antonio da Barra is specified in the account of the preceding species.

RESUMO

Duas espécies de milípedes quelodesmídeos descritas por Brölemann (1903) e provenientes do interior do Estado da Bahia não foram registradas por mais de 100 anos, apesar de seu grande porte e coloração brilhante. Inicialmente foram descritas como Leptodesmus gounellei *e* Leptodesmus carminatus, *embora nenhuma delas pode ser referida para o gênero* Leptodesmus *tal como atualmente definido nem para qualquer outro gênero já estabelecido. As duas espécies foram estudadas a partir do material tipo e estão aqui designadas as espécies-tipos de dois novos gêneros* – Plectrogonodesmus *para* gounellei *e* Baianassa *para* carminatus. *Os carácteres diagnósticos são ilustrados para os dois táxons. As relações inter-genéricas estão hoje pouco evidentes, e aqui não são sugeridas pendente melhor conhecimento da fauna dos quelodesmídeos do Brasil oriental.*

Palavras-Chaves: Diplopoda; Polydesmida; Chelodesmidae; Novos generous; Brazil; Bahia.

ACKNOWLEDGEMENTS

Examination of the type material of Brölemann's species was made possible through the generosity of M. Jean-Paul Mauriès, Muséum National d'Histoire Naturelle, Paris, to whom I extend my warmest thanks. I am much indebted to Dr. Ubirajara Martins de Souza (MZUSP) for providing the modern name for Santo Antonio da Barra.

REFERENCES

Attems, C. 1931. Die Familie Leptodesmidae und andere Polydesmiden. *Zoologica,* Stuttgart, 30(79):1-245.

Attems, C. 1938. Myriopoda 3. Polydesmoidea II. Fam. Leptodesmidae, Platyrhachidae, Oxydesmidae, Gomphodesmidae. *Das Tierreich,* 69:1-487.

Brölemann, H.W. 1903. Myriapodes recueillis par M.E. Gounelle au Brésil. *Annales de la Société Entomologique de France,* 71:649-694.

Cook, O.F. 1895. Introductory note on the families of Diplopoda. *Annals New York Academy of Science,* 9:1-7.

DeSaussure, H. 1859. Note sur la famille des Polydesmides, principalement au point au view des espèces américaines. *Linnaea entomologica,* 13:318-327.

Hoffman, R.L. 1971. Chelodesmid Studies. V. Some new, redefined, and resurrected Brasilian genera. *Arquivos de Zoologia,* 20(4):225-277.

Hoffman, R.L. 1978. Chelodesmid studies. XI. A new genus and species from Venezuela, referable to the new tribe Chondrodesmini. *Revue Suisse de Zoologie,* 85:543-551.

Hoffman, R.L. 1980. *Classification of the Diplopoda.* Genève, Museum d' Histoire Naturelle. 237p.

Schubart, O. 1946. Contribuição ao conhecimento do genero *Leptodesmus* (Familia Leptodesmidae, Diplopoda). *Anais da Academia Brasileira de Ciências,* 18:165-202.

Recebido em: 29.07.2011
Aceito em: 24.02.2012
Impresso em: 30.03.2012

Publicado com o apoio financeiro do Programa de Apoio às Publicações Científicas Periódicas da USP

EDITORIAL COMMITTEE

INSTRUCTIONS TO AUTHORS - (April 2007)

General Information: *Papéis Avulsos de Zoologia (PAZ)* and *Arquivos de Zoologia (AZ)* cover primarily the fields of Zoology, publishing original contributions in systematics, paleontology, evolutionary biology, ontogeny, faunistic studies, and biogeography. *Papéis Avulsos de Zoologia* and *Arquivos de Zoologia* also encourage submission of theoretical and empirical studies that explore principles and methods of systematics.

All contributions must follow the International Code of Zoological Nomenclature. Relevant specimens should be properly curated and deposited in a recognized public or private, non-profit institution. Tissue samples should be referred to their voucher specimens and all nucleotide sequence data (aligned as well as unaligned) should be submitted to GenBank (www.ncbi.nih.gov/Genbank) or EMBL (www.ebi.ac.uk).

Peer Review: All submissions to *Papéis Avulsos de Zoologia* and *Arquivos de Zoologia* are subject to review by at least two referees and the Editor-in-Chief. All authors will be notified of submission date. Authors may suggest potential reviewers. Communications regarding acceptance or rejection of manuscripts are made through electronic correspondence with the first or corresponding author only. Once a manuscript is accepted providing changes suggested by the referees, the author is requested to return a revised version incorporating those changes (or a detailed explanation of why reviewer's suggestions were not followed) within fifteen days upon receiving the communication by the editor.

Proofs: Page-proofs with the revised version will be sent to e-mail the first or corresponding author. Page-proofs *must be returned to the editor, preferentially within 48 hours.* Failure to return the proof promptly may be interpreted as approval with no changes and/or may delay publication. Only necessary corrections in proof will be permitted. Once page proof is sent to the author, further alterations and/or significant additions of text are permitted only at the author's expense or in the form of a brief appendix (note added in proof).

Submission of Manuscripts: Manuscripts should be sent to the **SciELO Submission** (http://submission.scielo.br/index.php/paz/login), along with a submission letter explaining the importance and originality of the study. Address and e-mail of the corresponding author must be always updated since it will be used to send the 50 reprints in titled by the authors. Figures, tables and graphics **should not** be inserted in the text. Figures and graphics should be sent in separate files with the following formats: ".JPG" and ".TIF" for figures, and ".XLS" and ".CDR" for graphics, with 300 DPI of minimum resolution. Tables should be placed at the end of the manuscript.

Manuscripts are considered on the understanding that they have not been published or will not appear elsewhere in substantially the same or abbreviated form. The criteria for acceptance of articles are: quality and relevance of research, clarity of text, and compliance with the guidelines for manuscript preparation.

Manuscripts should be written preferentially in English, but texts in Portuguese or Spanish will also be considered. Studies with a broad coverage are encouraged to be submitted in English. All manuscripts should include an abstract and key-words in English and a second abstract and key-words in Portuguese or Spanish.

Authors are requested to pay attention to the instructions concerning the preparation of the manuscripts. Close adherence to the guidelines will expedite processing of the manuscript.

Manuscript Form: Manuscripts should not exceed 150 pages of double-spaced, justified text, with size 12 and source Times New Roman (except for symbols). Page format should be A4 (21 by 29.7 cm), with 3 cm of margins. The pages of the manuscript should be numbered consecutively.

The text should be arranged in the following order: **Title Page, Abstracts with Key-Words, Body of Text, Literature Cited, Tables, Appendices,** and **Figure Captions.** Each of these sections should begin on a new page.

(1) **Title Page:** This should include the **Title, Short Title, Author(s) Name(s)** and **Institutions.** The title should be concise and, where appropriate, should include mention of families and/or higher taxa. Names of new taxa should not be included in titles.

(2) **Abstract:** All papers should have an abstract in **English** and another in **Portuguese or Spanish.** The abstract is of great importance as it may be reproduced elsewhere. It should be in a form intelligible if published alone and should summarize the main facts, ideas, and conclusions of the article. Telegraphic abstracts are strongly discouraged. Include all new taxonomic names for referencing purposes. Abbreviations should be avoided. It should not include references. Abstracts and key-words should not exceed 350 and 5 words, respectively.

(3) **Body of Text:** The main body of the text should include the following sections: **Introduction, Material and Methods, Results, Discussion, Conclusion, Acknowledgments,** and **References at end.** Primary headings in the text should be in capital letters, in bold and centered. Secondary headings should be in capital and lower case letters, in bold and centered. Tertiary headings should be in capital and lower case letters, in bold and indented at left. In all the cases the text should begin in the following line.

(4) **Literature Cited:** Citations in the text should be given as: Silva (1998) *or* Silva (1998:14-20) *or* Silva (1998: figs. 1, 2) *or* Silva (1998a, b) *or* Silva & Oliveira (1998) *or* (Silva, 1998) *or* (Rangel, 1890; Silva & Oliveira, 1998a, b; Adams, 2000) *or* (Silva, *pers. com.*) *or* (Silva *et al.*, 1998), the latter when the paper has three or more authors. The reference need not be cited when authors and date are given only as authority for a taxonomic name.

(5) **References:** The literature cited should be arranged strictly alphabetically and given in the following format:

- **Journal Article** - Author(s). Year. Article title. *Journal name,* volume: initial page-final page. Names of journals must be spelled out in full.
- **Books** - Author(s). Year. *Book title.* Publisher, Place.
- **Chapters of Books** - Author(s). Year. Chapter title. *In:* Author(s) ou Editor(s), *Book title.* Publisher, Place, volume, initial page-final page.
- **Dissertations and Theses** - Author(s). Year. *Dissertation title.* (Ph.D. Dissertation). University, Place.
- **Electronic Publications** - Author(s). Year. *Title.* Available at: <electronic address>. Access in: date.

Tables: All tables must be numbered in the same sequence in which they appear in text. Authors are encouraged to indicate where the tables should be placed in the text. They should be comprehensible without reference to the text. Tables should be formatted with vertical (portrait), not horizontal (landscape), rules. In the text, tables should be referred as Table 1, Tables 2 and 4, Tables 2-6. Use "TABLE" in the table heading.

Illustrations: Figures should be numbered consecutively, in the same sequence that they appear in the text. Each illustration of a composite figure should be identified by capital letters and referred in the text as: Fig. 1A, Fig. 1B, for example. When possible, letters should be placed in the left lower corner of each illustration of a composite figure. Hand-written lettering on illustrations is unacceptable. Figures should be mounted in order to minimize blank areas between each illustration. Black and white or color photographs should be digitized in high resolution (300 DPI at least). Use "Fig(s)." for referring to figures in the text, but "FIGURE(S)" in the figure captions and "fig(s)." when referring to figures in another paper.

For other details of manuscript preparation of format, consult the CBE Style Manual, available from the Council of Science Editors (www.councilscienceeditors.org/publications/style).
Papéis Avulsos de Zoologia and *Arquivos de Zoologia* are publications of the Museu de Zoologia da Universidade de São Paulo (www.mz.usp.br).
Always consult the Instructions to Authors printed in the last issue or in the electronic home pages: www.scielo.br/paz or www.mz.usp.br/publicacoes.