

## The first troglobitic species of Scleropactidae from Brazil (Crustacea, Isopoda, Oniscidea)

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### ABSTRACT

*Amazoniscus eleonorae* new species is herein described on the basis of material from caves in the Amazonian forest, Northern Brazil. The new species shows a remarkable degree of troglomorphic traits, including anophthalmy and loss of pigmentation.

Key words: Crinocheta, troglomorphic isopods, cave life, Neotropics, new species

### INTRODUCTION

The Scleropactidae contain a number of species which are adapted to the life in caves or in the soil and has lost their eyes and pigment (Schmidt 2003). This family is represented in Brazil by four genera with twelve species (Souza-Kury 1998). None of them was so far recorded from caves, although troglobites are known from South America (Manicasterri 1991) and Central America (Schultz 1970). Schmidt (2003) gives the most complete set of high quality illustrations for a species of this family (*Scleropactes zeteki* Van Name, 1926).

As part of a comprehensive study on Brazilian cave-dwelling Oniscidea, material from caves in the Amazon forest, northern Brazil, was studied, revealing a hitherto undescribed species of scleropactid with troglomorphic traits. The species is allocated, with some doubt, in the hitherto monotypic genus *Amazoniscus* Lemos de Castro, 1967 and is described below.

Type specimens were deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP). The terminology adopted here for the general morphology, appendages and cuticular structures is partly based on Holdich et al (1984) and Schmidt (2002; 2003).

Acronyms for Brazilian states are: AP — Amapá; PA — Pará; TO — Tocantins.

### RESULTS

#### *Amazoniscus eleonorae*, new species

*Type material.* Brazil, state of Pará: Male holotype, 1 male 8 female paratypes (MZUSP 15061) Pedra da Cachoeira Cave, Altamira, 21 Oct 1988, leg. E. Trajano; 2 female paratypes (MZUSP 15062) Pedra da Cachoeira Cave, Altamira, 12 Oct 1988, leg. E. Trajano; 2 male

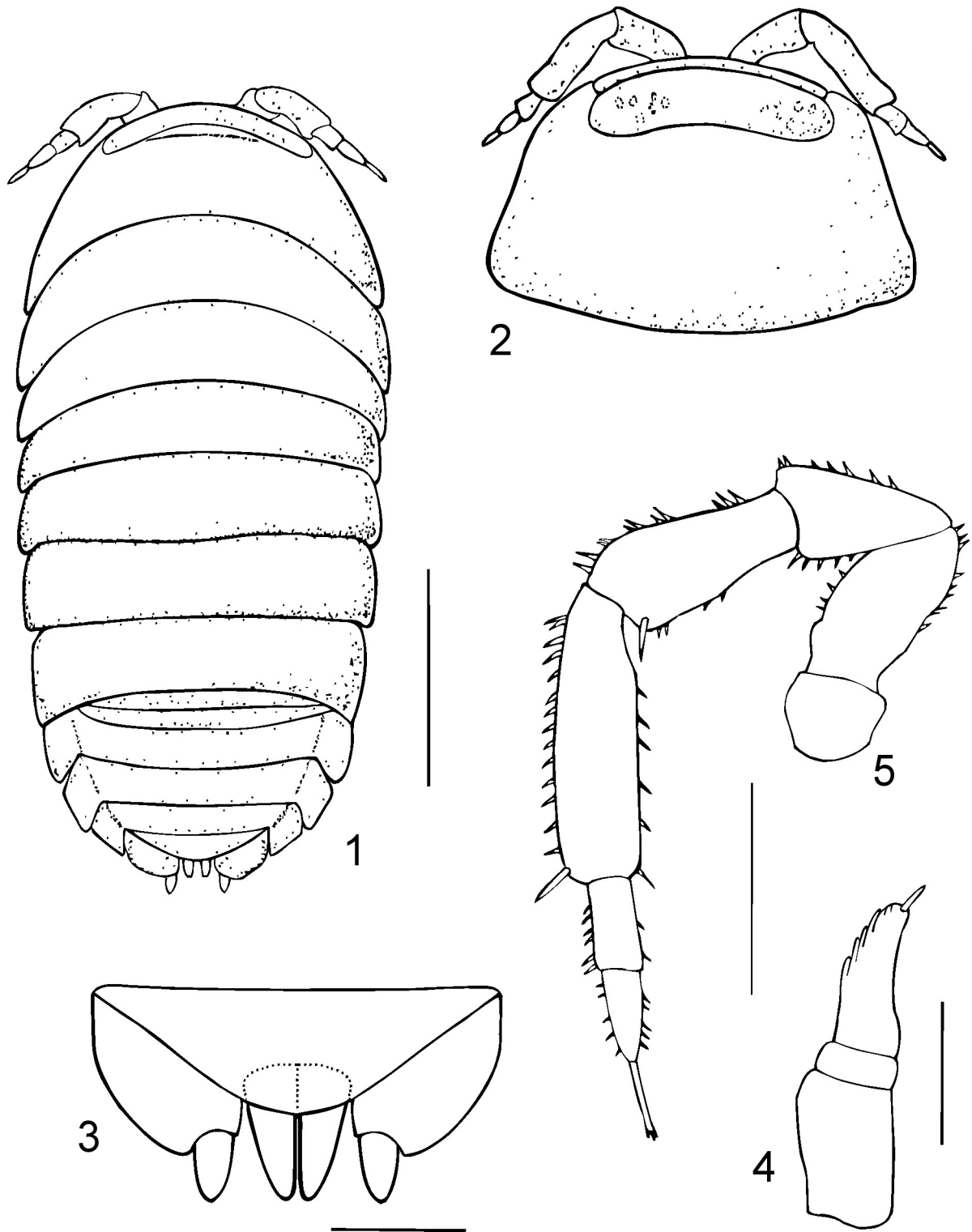
14 female paratypes (MZUSP 15063) Planaltina Cave, Medicilândia, 12 Oct 1988, leg. E. Trajano; 2 male 2 female (MZUSP 15064) Limoeiro Cave, Medicilândia, 17 Oct 1988, leg. E. Trajano.

*Diagnosis.* Scleropactidae capable of endoantennal conglobation, body strongly convex; tegument covered with minute scale-setae; unpigmented, eyeless; pereonite I without schisma and other special features; antennal flagellum with two subequal joints, apical sensory organ shorter than distal article; outer endite of maxillule with a slenderer tooth; merus of pereopod VII in male with a lateral ridge; ischium of pereopod VII in male without ventro-apical projection; exopod of pleopod I of male cordiform with rounded apex; uropodal protopod making part of body outline.

*Description.* Measurements. Male holotype 7.0 mm long, 4.0 mm wide; female paratype 7.0 mm long, 3.0 mm wide. Colour. Unpigmented.

Cuticular surface. Covered with minute scale-setae; dorsal integument smooth. Somatic characters (Figs 1-3). Body strongly convex. Cephalothorax with the frontal shield projected upwards, continuing with lateral margins of pereonite I which are slightly curved to the outside. Linea supraantennalis not well marked. Eyes entirely absent. Pereonite I without schisma and twice as long as pereonite II. Pleon and uropodal protopods continuing outline of pereon.

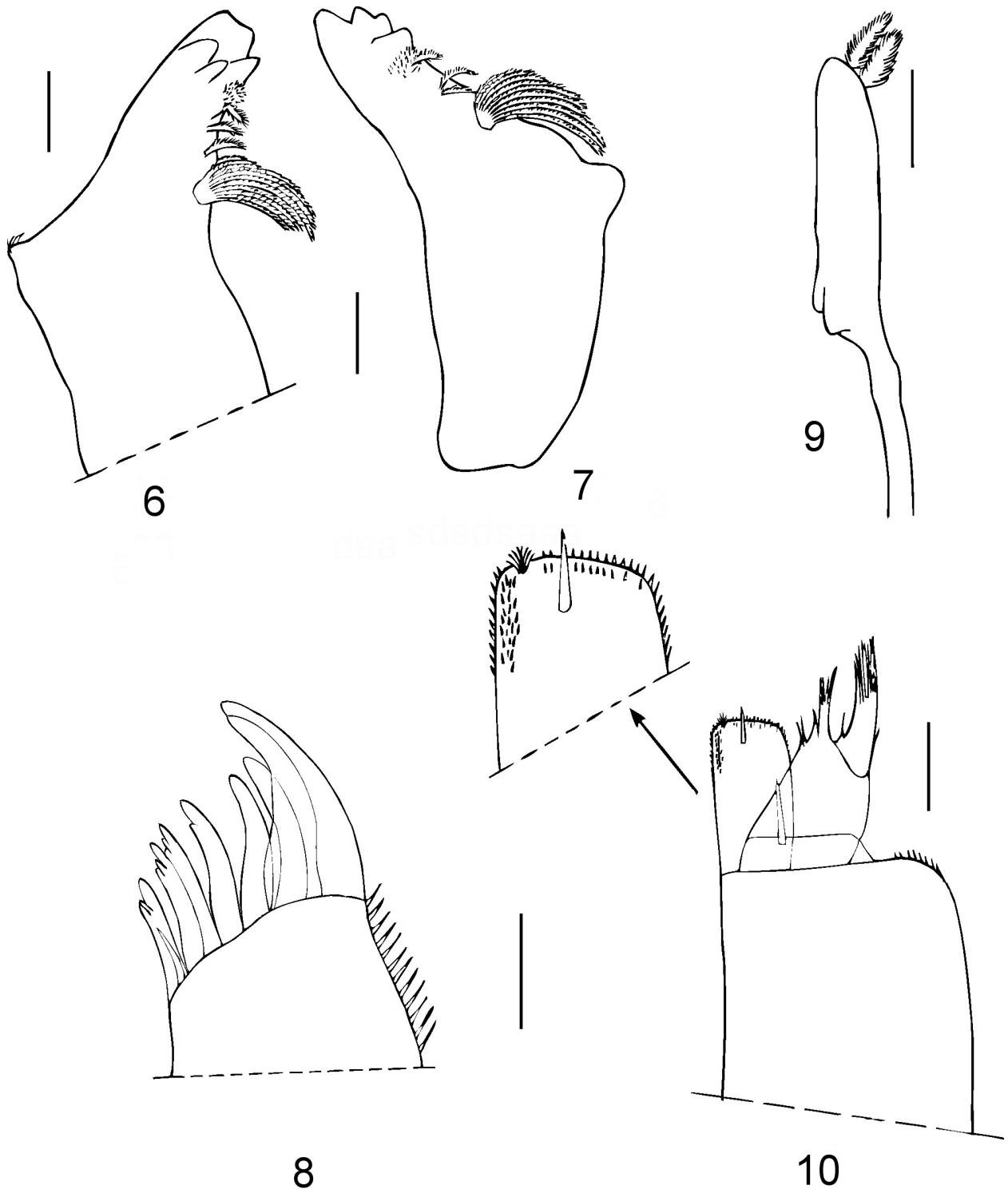
Appendages. Antennule (Fig. 4) 3-jointed, the medial article much smaller, apical article with five aesthetascs. Antenna (Fig. 5) short, barely reaching half length of pereonite I; flagellum 2-jointed, about half as long as terminal joint of peduncle; apical article with the sensory hairs enclosed by a common sheath forming an "apical cone" (see Schmidt, 2002:291). Both mandibles (Figs 6-7) with two penicils between the hairy lobe and



Figs 1-5 - *Amazoniscus eleonora*, sp. nov., male holotype: 1. Habitus, dorsal view; 2. Cephalon and first pereonite, dorsal view. Female paratype: 3. Telson and uropods, dorsal view; 4. Antennule; 5. Antenna. Scale bars Figs 1-2, 5 = 1.0 mm; Fig. 3 = 0.2 mm. Fig. 4 = 0.1mm.

the pars molaris, pars molaris with about eleven penicils on a common socket. Outer endite of maxillule (Fig. 8) with 9 teeth: inner group with three trifurcated, one bifurcated and one simple, smaller and more slender; outer group with four simple teeth, two smaller. Inner endite

of maxillule (Fig. 9) with two penicils and a rounded laterodistal corner. Maxilla apically bilobate, provided with many sensilla. Endite of maxilliped (Fig. 10) hairy, rectangular, with a short penicil and a stout seta. Maxilliped palp (Fig. 10) with a stout seta in basal article, distal

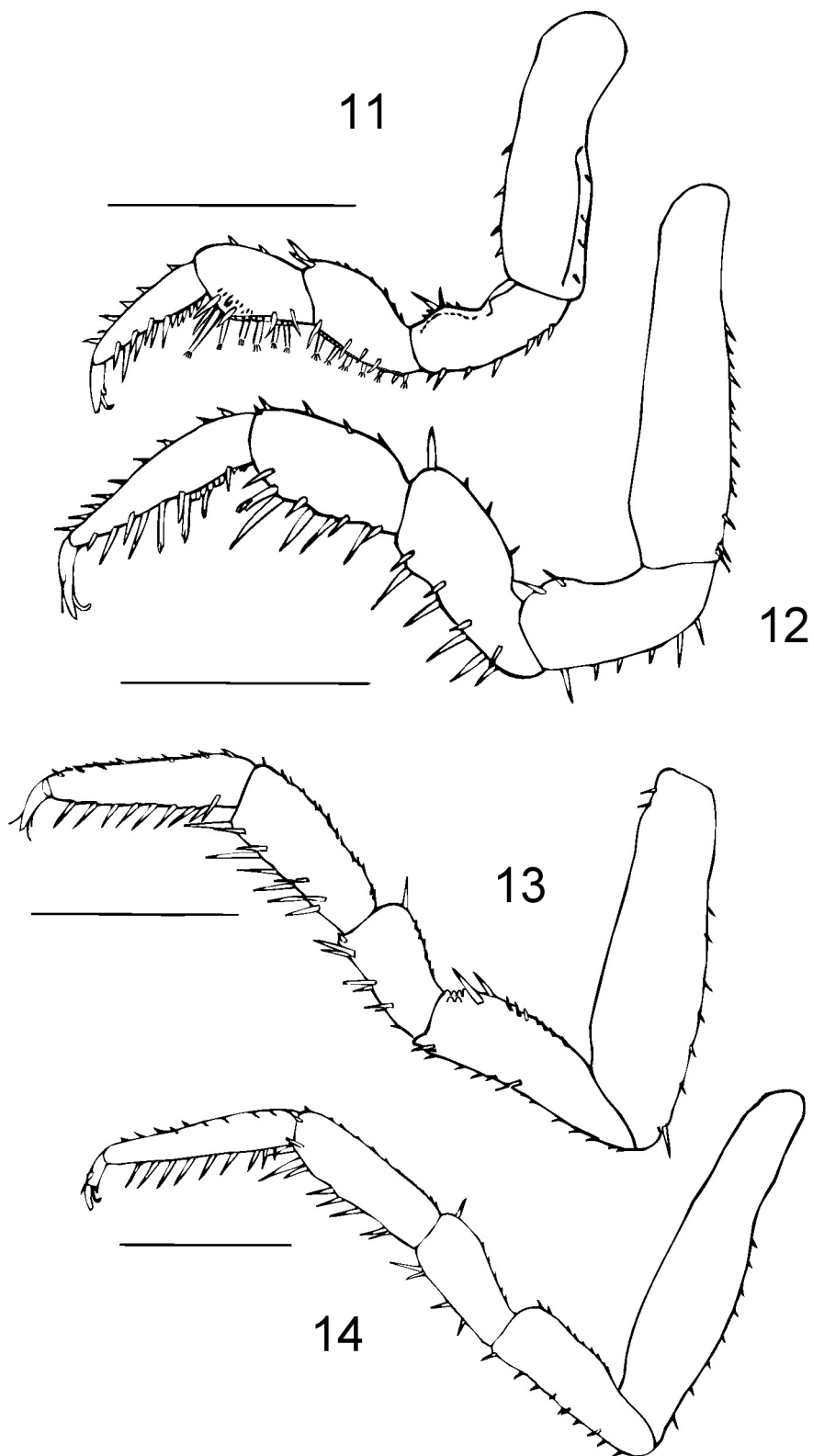


Figs 6-10 - *Amazoniscus eleonora*, sp. nov., female paratype: 6. Left mandible; 7. Right mandible; 8. Outer endite of maxillule; 9. Inner endite of maxillule; 10. Maxilliped. Scale bars = 0.1 mm.

article with apical tuft of setae. Dactylus of pereopods I-VII with larger outer claw and smaller inner claw; dactylar and unguis setae simple. Exopods of pleopods I and II provided with dorsal respiratory areas.

Male sexual characteristics. Merus and carpus of pereopod I (Fig. 11) provided with ventrofrontal scale-fields

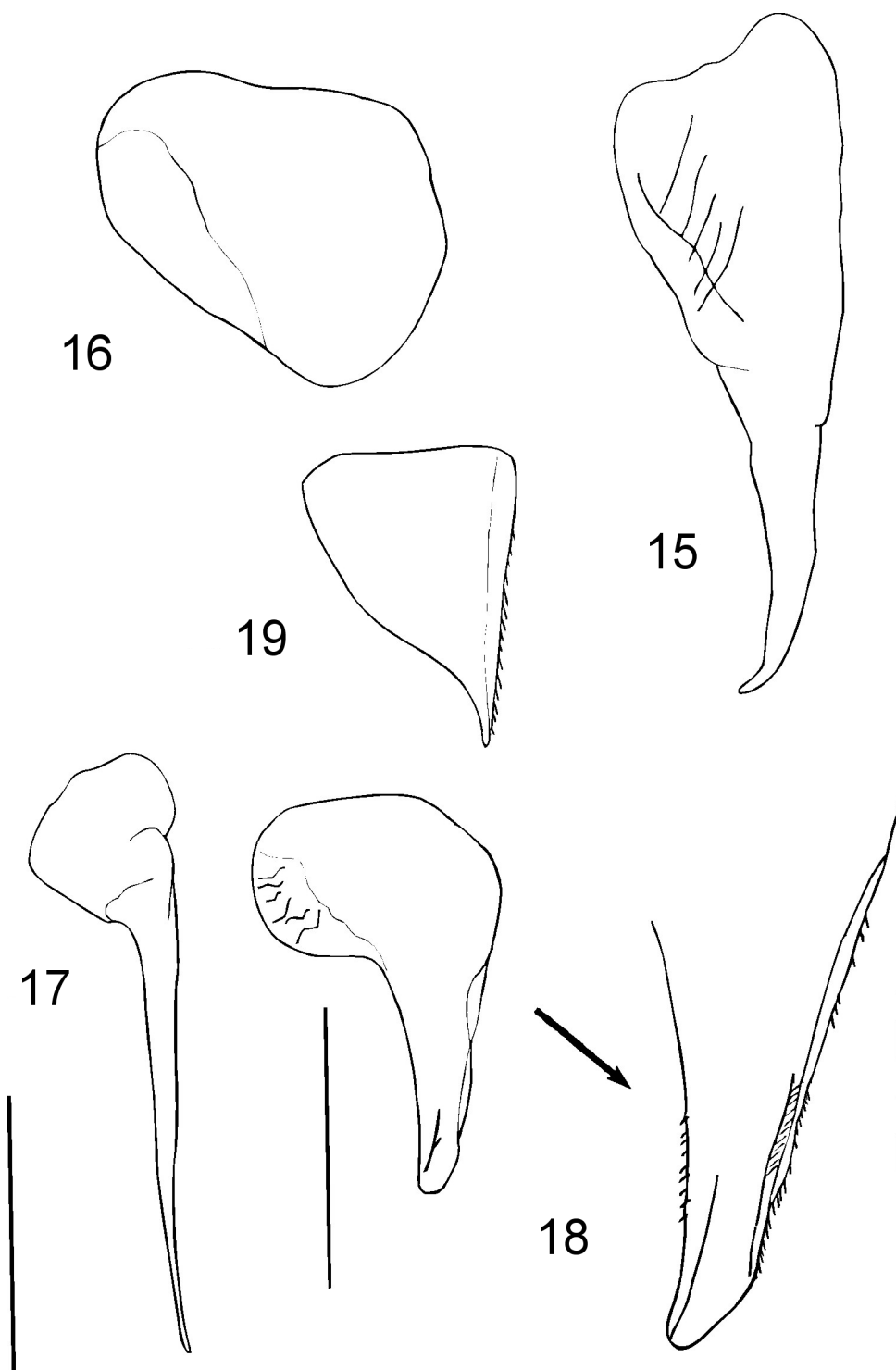
and conspicuous fringed setae; brush on the carpus not well developed (see Fig. 12 for female comparison). Pereopod VII (Fig. 13) with some scales on ischium distal part; merus with lateral ridge provided with setae (see Fig. 14 for female comparison). Endopod of pleopod I as in Fig. 15. Exopod of pleopod I (Fig. 16) cordiform with broadly



Figs 11-14 - *Amazoniscus eleonora*, sp. nov., paratypes. 11. Pereopod I of male; 12. Pereopod I of female; 13. Pereopod VII of male; 14. Pereopod VII of female. Scale bars = 1.0 mm.

rounded apex. Pleopod II as in Figs 17-18. Exopod of pleopod V (Fig. 19) triangular with narrow apex and a longitudinal furrow for receiving the pleopod 2 endopod.

*Etymology.* Species name honours Dr. Eleonora Trajano, who collected the type series, as well as many other interesting cave terrestrial isopods.



Figs 15-19 - *Amazoniscus eleonorae*, sp. nov., paratype. 15. Endopod of male pleopod I; 16. Exopod of male pleopod I; 17. Endopod of male pleopod II; 18. Exopod of male pleopod II; 19. Exopod of male pleopod V. Scale bars = 1.0 mm.

*Remarks.* This species was previously identified by the senior author of this paper as “Scleropactidae gen sp.” and “*Amazoniscus* sp.” and referred by these determinations respectively in Trajano and Moreira (1991) and Trajano and Gnaspini-Netto (1991). *A. arlei* Lemos de Castro, 1967 resembles *A. eleonorae* sp. nov. and like the last one it also occurs in some areas

of Amazon forest (Amapá, Pará and Tocantins states), however it is not a cave-dwelling and it has eyes and pigmentation. Before the year 1988, Tocantins state did not exist and the region belonged to Pará state, so Lemos de Castro (1967; 1969) reported the localities where *A. arlei* was found in Tocantins as being located in the state of Pará.



Fig. 20 - Distribution of the two species of *Amazoniscus* in the Amazon forest, northern Brazil, with the localization of type-locality of *A. eleonora*, sp. nov. — Altamira city in the state of Pará (PA).

**Ecology.** The sandstone caves where *Amazoniscus eleonora* sp. nov. occurs, situated in the Altamira-Itaituba area, are among the largest ones in the Amazonian biome. The Pedra da Cachoeira Cave, 850 m long and with several conduits, is crossed by a shallow stream; it has two entrances (one of which is the stream resurgence) opening into a large room. In this cave, *A. eleonora* forms very large populations concentrating in the huge deposits of bat guano (mainly from insectivorous bats, the mormoopid *Pteronotus parnelli* (Gray, 1843) that cover the ground. The Limoeiro Cave, 1200 m long, has two main conduits joined as a Y, both crossed by shallow streams; there are four entrances. *A. eleonora* isopods also concentrate in the bat guano. The Planaltina Cave, 1300 m long, has a main stream with two affluents; there are three entrances, including the stream resurgence and two upper entrances. In this cave, *A. eleonora* was found at sediment banks without guano (see Trajano and Moreira 1991).

## DISCUSSION

There are some published cladistic analyses of Scleropactidae (Schmalfuss 1980, Taiti et al 1986, Schmalfuss 1986). A few comments, however, may be added on the relationships of *Amazoniscus* Lemos de Castro, 1967.

We could not find any undisputable synapomorphy for the two known species of *Amazoniscus*, thus they are united herein by symplesiomorphic similarity. The main differences between them are in the pereopod VII of male – two important characters which define groups of genera in the family. The merus VII of the males of many species of Scleropactidae bear a lateral ridge provided with setae as described above for *A. eleonora*, and illustrated for *Circoniscus* Pearse, 1917 (Andersson 1960, fig. 14), *Protosphaeroniscus* Schmalfuss, 1980 (Schmalfuss 1980, fig. 12), *Chileoniscus* Taiti, Ferrara & Schmalfuss, 1986 (Taiti et al 1986, fig.17) and *Sphaeroniscus* Gerstäcker, 1854 (Schmalfuss 1980, fig.15). This

ridge is absent in *Neosanfilippia* Brian, 1957 and *Spherarmadillo* Richardson, 1907 (Taiti et al 1986: 64), and supposedly also absent in *Amazoniscus arlei*, but the original illustration (Lemos de Castro 1969, fig. 11) cannot be used for definitely discarding the presence of this structure. The ventro-apical process of ischium VII, absent in *A. eleonora*, was first described by Brian (1957, figs 16-17) for *Neosanfilippia venezuelana* Brian, 1957, and illustrated with scanning electron micrographs for the two species of *Neosanfilippia* (Manicasteri 1991, figs. 20-23). This structure is also illustrated for *Amazoniscus arlei* (Lemos de Castro 1969, fig.11). It was first used by Taiti et al (1986) as a synapomorphy uniting *Amazoniscus* + *Neosanfilippia*. This feature may be alternatively regarded as a convergence between these two taxa, since a close relationship of *Amazoniscus* with *Circoniscus* Pearse, 1917 is reasonably well supported by two putative synapomorphies - the antennal flagellum with two subequal joints and inner group of outer endite of maxillule with a slenderer tooth. Likewise, *Neosanfilippia* appears to us, based in our previous studies, to be more closely related to *Colomboniscus* Vandel, 1972.

Firstly, it has been thought that *A. eleonora* should be included in a new genus, while *A. arlei* could be more closely related to *Circoniscus*. The incongruence between derived characters states present in *A. eleonora* and *A. arlei* and the lack of synapomorphies uniting both species obviously are not enough to grant a generic status for the former before a new cladistic analysis for the genera of Scleropactidae be published. If it is demonstrated that *A. arlei* is really closest to *Circoniscus*, then a new monotypic genus will have to be established to *A. eleonora* or the concept of *Circoniscus* will have to be largely expanded to include both species.

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#### REFERENCES

Andersson, A. 1960. South American terrestrial isopods in the collection of the Swedish State Museum of Natural History. *Arkiv för Zoologi* 12 (5-6): 537-570.

- Brian, A. 1957. Descrizione di un nuovo genere di Isopodo terrestre troglobio raccolto dal Prof. Silvestri in una Grotta di Cuba. *Bolletino del Laboratorio di Zoologia Generale e Agraria della Facoltà Agraria in Portici* 22: 188-197.
- Holdich, D. M., R. J. Lincoln, and J. P. Ellis. 1984. The biology of terrestrial isopods: Terminology and Classification. *Symposia of the Zoological Society of London* 53 (The biology of terrestrial Isopoda): 1-6.
- Lemos De Castro, A. 1969. Descrição complementar de *Amazoniscus arlei* Lemos de Castro (Isopoda Terrestria - Eubelidae). *Boletim do Museu Nacional Nova Série Zoologia, Rio de Janeiro* 269: 1-5.
- Manicasteri, C. 1991. A new species of terrestrial isopods from Ecuador: *Neosanfilippia zoiai* (Isopoda, Oniscidea, Scleropactidae). *Studies on Neotropical Fauna & Environment* 26 (1): 33-38.
- Schmalzfuss, H. 1980. Die ersten Landasseln aus Dominikanischem Bernstein mit einer systematisch-phylogenetischen Revision der Familie Sphaeroniscidae (Stuttgarter Bernsteinsammlung: Crustacea, Isopoda, Oniscoidea). *Stuttgarter Beiträge zur Naturkunde, Serie B* 61: 1-12.
- Schmalzfuss, H. 1986. Die Landisopoden (Oniscidea) Griechenlands. 8. Beitrag: Gattung *Kefalloniscus* nov. gen. (Scleropactidae). *Revue suisse de Zoologie* 93 (2): 279-289.
- Schmidt, C. 2002. Contribution to the phylogenetic system of Crinocheta (Crustacea, Isopoda). Part 1. (Olibrinidae to Scyphacidae s. str.). *Mitteilungen aus dem Museum für Naturkunde in Berlin, Zoologische Reihe*, 78 (2): 275-352.
- Schmidt, C. 2003. Contribution to the phylogenetic system of Crinocheta (Crustacea, Isopoda). Part 2. (Oniscoidea to Armadillidiidae). *Mitteilungen aus dem Museum für Naturkunde in Berlin, Zoologische Reihe*, 79 (1): 3-179.
- Souza-Kury, L. A. 1998. Malacostraca – Peracarida. Isopoda. Oniscidea. Pp. 653-674 in P. S. Young, ed. *Catalogue of Crustacea of Brazil. Museu Nacional, (Série Livros n. 6)*. Rio de Janeiro.
- Schultz, G. A. 1970. Disposition of species of terrestrial isopod crustaceans of the genera *Synuropus*, *Spherarmadillo*, *Sphaeroniscus* and *Scleropactes* (Oniscoidea, Sphaeroniscidae). *Proceedings of the Biological Society of Washington* 83 (10): 123-132.
- Taiti, S., F. Ferrara and H. Schmalzfuss. 1986. *Chilooniscus marmoratus* gen. et sp. n. from Chile (Oniscidea, Scleropactidae). *Annales Historico-Naturales Musei Nationalis Hungarici* 78: 63-69.
- Trajano, E. and P. Gnaspini-Netto. 1991. Composição da fauna cavernícola brasileira, com uma análise preliminar da distribuição dos táxons. *Revista Brasileira de Zoologia* 7 (33): 383-407.
- Trajano, E. and J. R. A. Moreira. 1991. Estudo da fauna de cavernas da província espeleológica arenítica Altamira-Itaituba, Pará. *Revista Brasileira de Biologia* 51 (1): 13-29.