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Research article

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Taxonomic revision of *Brasiloniscus* (Oniscidea, Pudeoniscidae) with description of a new species

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Abstract. The Neotropical genus *Brasiloniscus*, erected by Lemos de Castro (1973), is revised and validated herein. The genus was originally described including two species, *B. maculatus* and *B. verrucosus*, but no type species was designated. According to § 13 of ICZN (1999) the name of the genus is therefore unavailable. Both species are redescribed, and *B. maculatus* is designated as the type species of the genus. The genus name will thus be available for the systematics of Oniscidea. In addition, a new species, *B. littoralis* gen. et sp. nov., is described based on material from the Brazilian Atlantic Forest from the state of Rio de Janeiro.

Keywords. Terrestrial isopods, Atlantic forest, Neotropical, diversity.

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Introduction

In the last years, our knowledge of the diversity of terrestrial isopods from Brazil has increased considerably and, to date, ca 200 species are known, including species from the subterranean environment (Schmalfuss 2003; Araujo & Quadros 2005; Souza *et al.* 2006, 2010, 2011, 2015; Araujo & Taiti 2007; Sokolowicz *et al.* 2008; Campos-Filho & Araujo 2011a, 2011b; Campos-Filho *et al.* 2012, 2013a, 2013b, 2014, 2015a, 2015b, 2016, 2017a, 2017b, 2017c; Costa *et al.* 2014; Zimmermann *et al.* 2015; Cardoso *et al.* 2016).

To date, the family Pudeoniscidae Lemos de Castro, 1973 includes eight species in four genera distributed in the Brazilian Atlantic Forest (Vandel 1963; Lemos de Castro 1973; Campos-Filho *et al.* 2017c, 2018): *Oxossioniscus* Campos-Filho, Lisboa & Cardoso, 2018, *Iansaoniscus* Campos-Filho, Araujo & Taiti, 2017, *Pudeoniscus* Vandel, 1963, and *Brasiloniscus*. The latter was erected by Lemos de Castro (1973) to accommodate two species, *B. maculatus* and *B. verrucosus*, but no type species was designated. According to § 13 of the ICZN (International Commission on Zoological Nomenclature 1999) the name *Brasiloniscus* is therefore unavailable (see also Schmidt & Leistikow 2004). Following the recommendation of the ICZN, § 69.1, *B. maculatus* is here designated as the type species of the genus.

The aim of this study is to revise the genus *Brasiloniscus* and to describe a new species from the state of Rio de Janeiro.

Material and methods

Specimens were stored in 75% ethanol and identifications were based on morphological characters. Species were illustrated with the aid of a camera lucida mounted on Wild M5, M20 and Olympus CX31 microscopes. The final illustrations were prepared as in Montesanto (2015, 2016). Respiratory structures were classified as in Paoli *et al.* (2002).

The material used in this study is deposited in Museu Nacional, Universidade Federal do Rio de Janeiro, Brazil (MNRJ), the Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP) and the Coleção de Crustáceos do Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil (UFRGS).

Results

Order Isopoda Latreille, 1817
Suborder Oniscidea Latreille, 1802
Family Pudeoniscidae Lemos de Castro, 1973

Genus *Brasiloniscus* gen. nov.
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Brasiloniscus Lemos de Castro, 1973: 3. [unavailable name]

Brasiloniscus – Leistikow & Wägele 1999: 42. — Schmalzfuss 2003: 57. — Schmidt 2003:79. — Schmidt & Leistikow 2004: 17. — Campos-Filho *et al.* 2017c: 70.

Brasiloniscus [sic] – Souza-Kury 1998: 665 [catalogue].

Type species

Brasiloniscus maculatus (Lemos de Castro, 1973), by present designation.

Diagnosis

Exoantennal conglobation; pereonite 1 with dorsal v-shaped median depression on anterior portion, epimeron with schisma and dorsolateral furrow to fit antennae during conglobation; pereonites 1–3 epimera with ventral lobes slightly developed; pleon outline continuous with that of pereonite 7, neopleurae 3–5 well developed and rectangular; telson triangular, proximal portion wider than distal one; antenna partially covering eyes during conglobation, flagellum of three articles, second and third divided by slender suture, sometimes inconspicuous; uropod protopod subrectangular, exopod inserted on outer distal groove, distally; pleopod exopods with respiratory areas *Atracheodillo*-type.

Remarks

The characters used by Lemos de Castro (1973) to define the genus, such as cephalon with large frontal shield, pereonite 1 epimeron with well-developed dorsolateral furrow, pereonites 2 and 3 epimera with ventral lobes, and neopleurae 3–5 with distal portion not narrowed, are in fact characteristics observed at the family level, since these are also present in *Pudeoniscus*.

The genus *Brasiloniscus* gen. nov. differs from *Pudeoniscus* in having the pereonite 1 epimeron with lateral schisma and ventral lobe well developed, cephalon with frontal shield larger and antennal flagellum with articles subequal in length.

Brasiloniscus maculatus (Lemos de Castro, 1973) gen. et comb. nov.
Figs 1–2, 7A

Brasiloniscus maculatus Lemos de Castro, 1973: 6, figs 3–4.

Brasiloniscus maculatus – Leistikow & Wägele 1999: 42. — Schmalzfuss 2003: 57. — Schmidt & Leistikow 2004: 17.

Material examined

Paratypes

BRAZIL: 4 ♂♂, 3 ♀♀, state of São Paulo, Ilha da Vitória, 30 Mar. 1965, K. Lenko leg., on tree bark (MNRJ 6212).

Redescription

MEASUREMENTS. Maximum body length: 15 mm.

BODY. Habitus in lateral view as in Fig. 1A. Material depigmented due to long preservation in ethanol 70% (Fig. 7A). Dorsum covered by fan-shaped scale-setae and polygonal pattern scales (Fig. 1B), schisma with overlapping scales (Fig. 1C), ribs slightly developed on median and paramedian areas of pereonites, more evident on pereonites 1–5; *noduli laterales* 1–7 short, inserted at same distance from lateral margins and in each pereonite progressively near to posterior margin.

CEPHALON (Fig. 1D–E). Lateral lobes slightly bent upwards, frontal shield with lateral sides almost straight; eyes consisting of 20–25 ommatidia.

PEREON. Pereonite 1 epimeron with inner lobe of schisma rounded. Pereonites 2 and 3 with ventral lobes rounded, more conspicuous on pereonite 2 (Fig. 1F).

PLEON (Fig. 1G–H). Neopleura 5 not reaching distal margin of uropod protopod; telson with shallow dorsal depression, lateral sides concave.

ANTENNULA (Fig. 1I). Distal article with subapical aesthetascs.

ANTENNA (Fig. 1J–K). Fifth article of peduncle twice as long as flagellum. Flagellum with second and third articles subequal in length.

MOUTH. Mandible with molar penicil with about eight branches, left mandible (Fig. 1L) with 2+2 penicils, right mandible (Fig. 1M) with 1+1 penicils. Maxillula (Fig. 1N) inner endite bearing two hairy penicils; outer endite of 4+6 teeth, five of them with cleft apex. Maxilla (Fig. 1O) bilobate, strong suture line, outer lobe wider than inner lobe, both covered with setae. Maxilliped (Fig. 1P) palp with two long

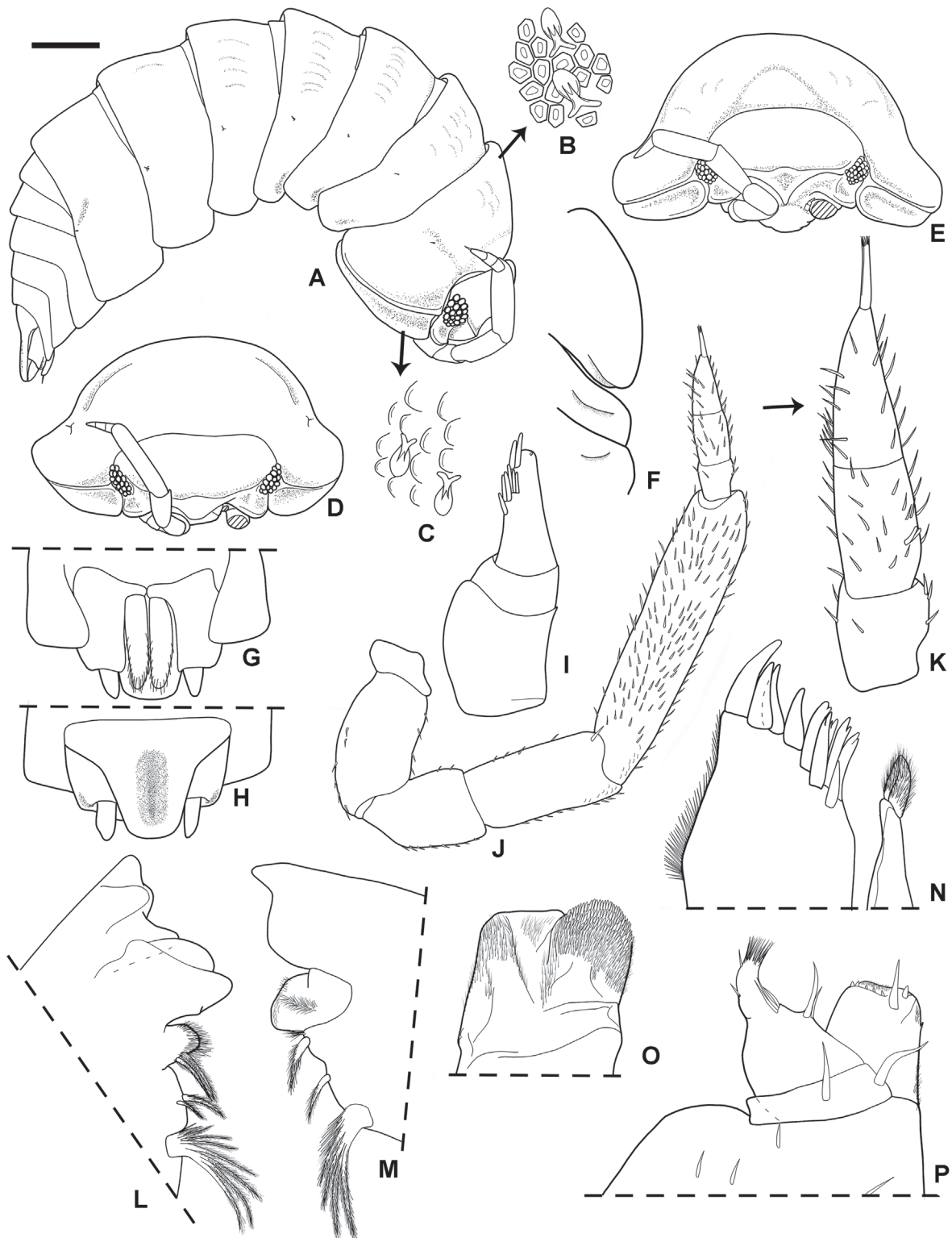


Fig. 1. *Brasioniscus maculatus* (Lemos de Castro, 1973) gen. et comb. nov., paratype, ♂ (MNRJ 6212). A. Habitus, lateral view. B. Details of dorsal scales, setae and polygonal pattern scales. C. Details of overlapping scale setae on schisma. D. Cephalon and pereonite 1, dorsal view. E. Cephalon and pereonite 1, frontal view. F. Pereonites 1–3, ventral view. G. Pleonite 5, telson and uropods, ventral view. H. Pleonite 5, telson and uropods, dorsal view. I. Antennula. J. Antenna. K. Antennal flagellum. L. Left mandible. M. Right mandible. N. Maxillula. O. Maxilla. P. Maxilliped. Scale bar: 1 mm.

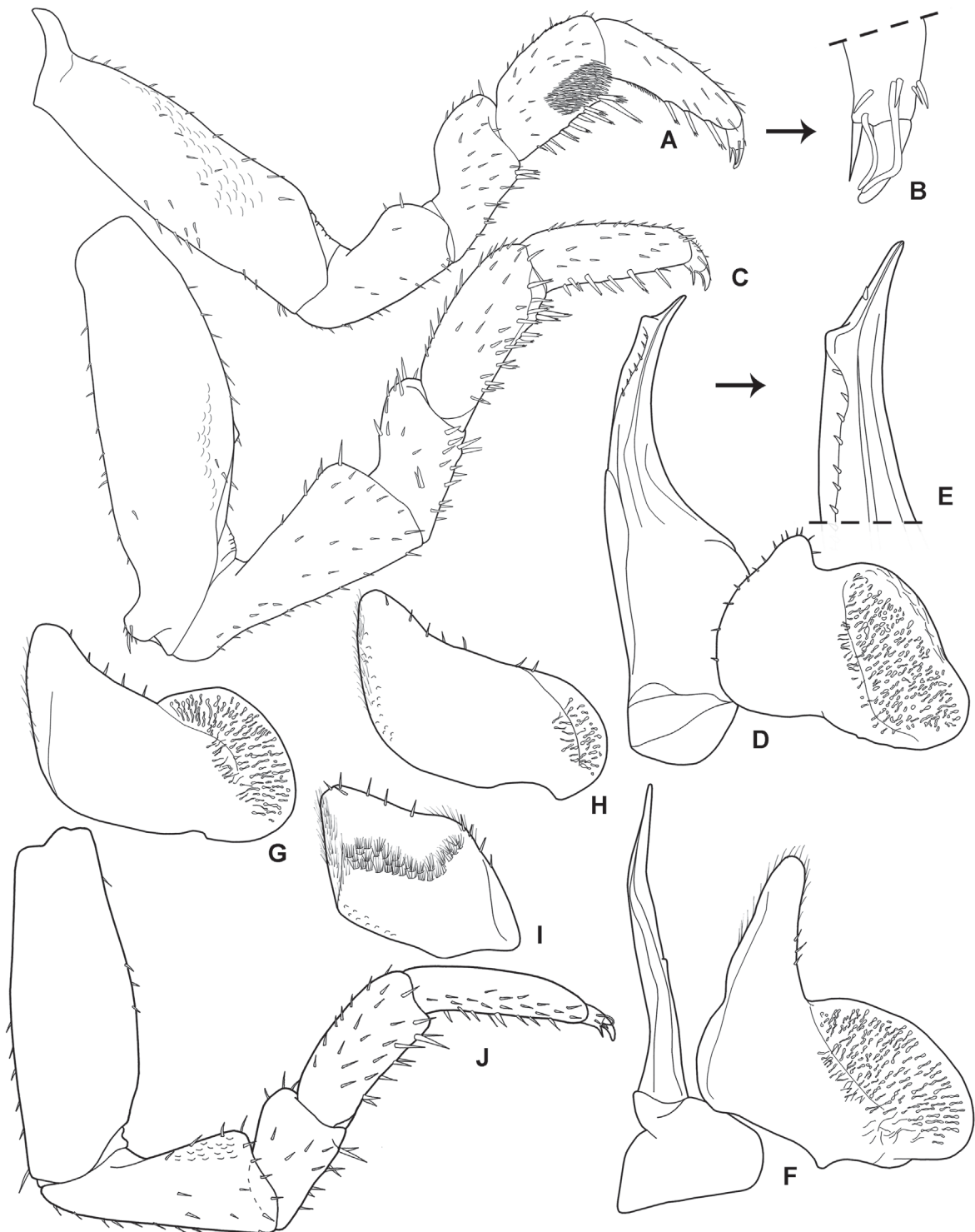


Fig. 2. *Brasiloniscus maculatus* (Lemos de Castro, 1973) gen. et comb. nov. A–I. Paratype, ♂ (MNRJ 6212) A. Pereopod 1. B. Pereopod 1 dactylus. C. Pereopod 7. D. Pleopod 1. E. Details on pleopod 1 endopod. F. Pleopod 2. G. Pleopod 3 exopod. H. Pleopod 4 exopod. I. Pleopod 5 exopod. J. Paratype, ♀, pereopod 1.

setae on proximal article; endite subrectangular, median seta strong, surpassing distal margin, distal portion bearing many small setae.

PEREPODS (Fig. 2A–C, J). With sparse setae on sternal margin, pereopod 1 carpus with distal seta serrate at apex and longitudinal antennal grooming brush; dactylus with inner claw not surpassing outer claw, dactylar and unguis setae simple.

UROPOD (Fig. 1G–H). Endopod about twice as long as exopod.

PLEOPOD EXOPODS. Respiratory areas as in diagnosis, exopods 1–4 with well-developed respiratory areas, reduced on exopod 5.

Male

PEREPOD 7 (Fig. 2C). Base with lobe on distal sternal margin.

PLEOPODS. Pleopod 1 (Fig. 2D–E) exopod with deep re-entrancy on distal margin, inner margin rounded, inner and distal margin bearing setae; endopod twice as long as exopod, distal portion directed outwards with small inner lobe and narrow apex. Pleopod 2 (Fig. 2F) exopod triangular bearing setae; endopod slender, longer than exopod, reaching pleopod 4. Pleopod 3–5 exopod (Fig. 2G–I) rhomboid bearing small setae on outer margin; exopod 5 with transverse fringe of thin setae.

Remarks

Lemos de Castro (1973) mentioned the absence of respiratory area on pleopod exopods. However, the examination of the type material revealed the presence of uncovered respiratory areas in all pleopod exopods. New illustrations are provided here along with characters that were not mentioned in the original description.

Brasiloniscus verrucosus (Lemos de Castro, 1973) gen. et comb. nov.
Figs 3–4, 7B

Brasiloniscus verrucosus Lemos de Castro, 1973: 9, fig. 5.

Brasiloniscus verrucosus – Leistikow & Wägele 1999: 42. — Schmalfuss 2003: 57.

Material examined

Paratypes

BRAZIL: 1 ♀, state of Rio de Janeiro, Fazenda Cachoeirinha do Cedro, Rubião, 3 Feb. 1959, Lemos de Castro and A. Coelho leg. (MNRJ 6214); 1 ♀, Parque Nacional da Serra dos Órgãos, Teresópolis, 1000 m, Apr. 1947, P. Wygod leg. (MNRJ 6215).

Redescription

MEASUREMENTS. Maximum body length: 8 mm.

BODY. Habitus in lateral view as in Fig. 3A. Material depigmented due to long preservation in ethanol 70% (Fig. 7B). Dorsum (Fig. 3A) with well-developed ribs and tubercles on median and paramedian areas of pereonites; *noduli laterales* short, inserted far from lateral margin and in each pereonite progressively near to posterior margin.

CEPHALON (Fig. 3B–C). Lateral lobes slightly bent upwards, frontal shield with lateral sides concave; eyes consisting of 15 ommatidia.

PEREON. Pereonite 1 epimeron with strong dorsolateral furrow with posterior margin elongated, ventral lobe of schisma narrow, directed backwards, dorsal lobe subrectangular slightly directed outwards, surpassing lateral margin of inner lobe. Pereonites 2 and 3 with ventral lobes rounded, more conspicuous on pereonite 2 (Fig. 3A, D).

PLEON (Fig. 3E). Neopleura 5 not surpassing distal margin of uropod protopod; telson with shallow dorsal depression, lateral sides concave.

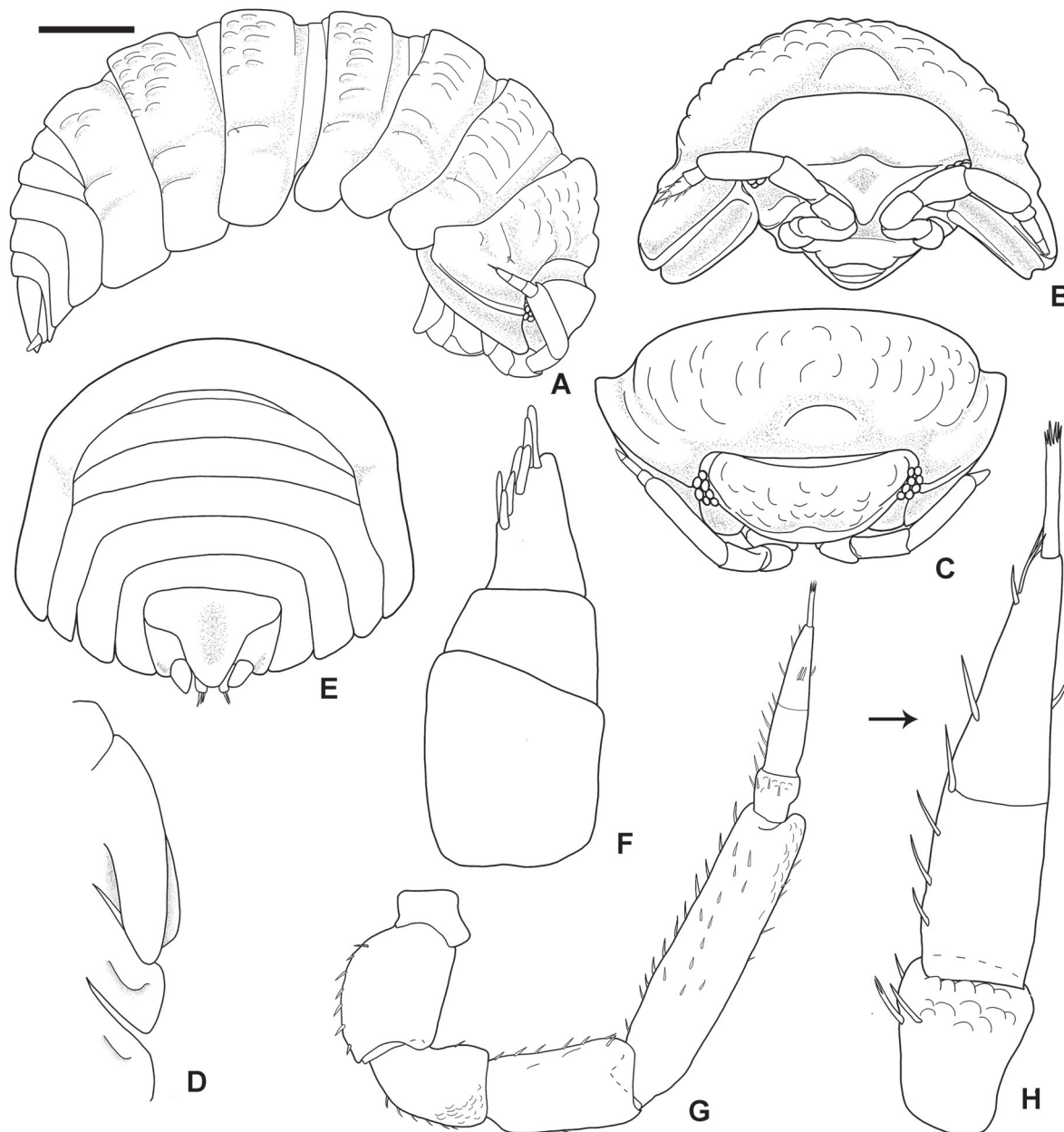


Fig. 3. *Brasiloniscus verrucosus* (Lemos de Castro, 1973) gen. et comb. nov., paratype, ♀ (MNRJ 6214). **A.** Habitus, lateral view. **B.** Cephalon and pereonite 1, frontal view. **C.** Cephalon and pereonite 1, dorsal view. **D.** Pereonites 1–3, ventral view. **E.** Pereopod 7, pleon, telson and uropods, dorsal view. **F.** Antennula. **G.** Antenna. **H.** Antennal flagellum. Scale bar: 1 mm.

ANTENNULA (Fig. 3F). Proximal and distal articles similar in length, distal article with subapical aesthetascs.

ANTENNA (Fig. 3G–H). Fifth article of peduncle longer than flagellum. Flagellum with third article slightly longer than second.

MOUTH. Buccal pieces (not drawn) as in *B. maculatus*.

PEREPODS 1–7 (Fig. 4A–C). With sparse setae on sternal margin, carpus 1 with distal seta serrate at apex, longitudinal antennal grooming brush; dactylus with inner claw not surpassing outer claw, dactylar and unguinal setae simple.

FEMALE PLEOPOD 1–5 EXOPODS. As in Fig. 4D–H. Uropod (Fig. 3E) endopod about twice as long as exopod.

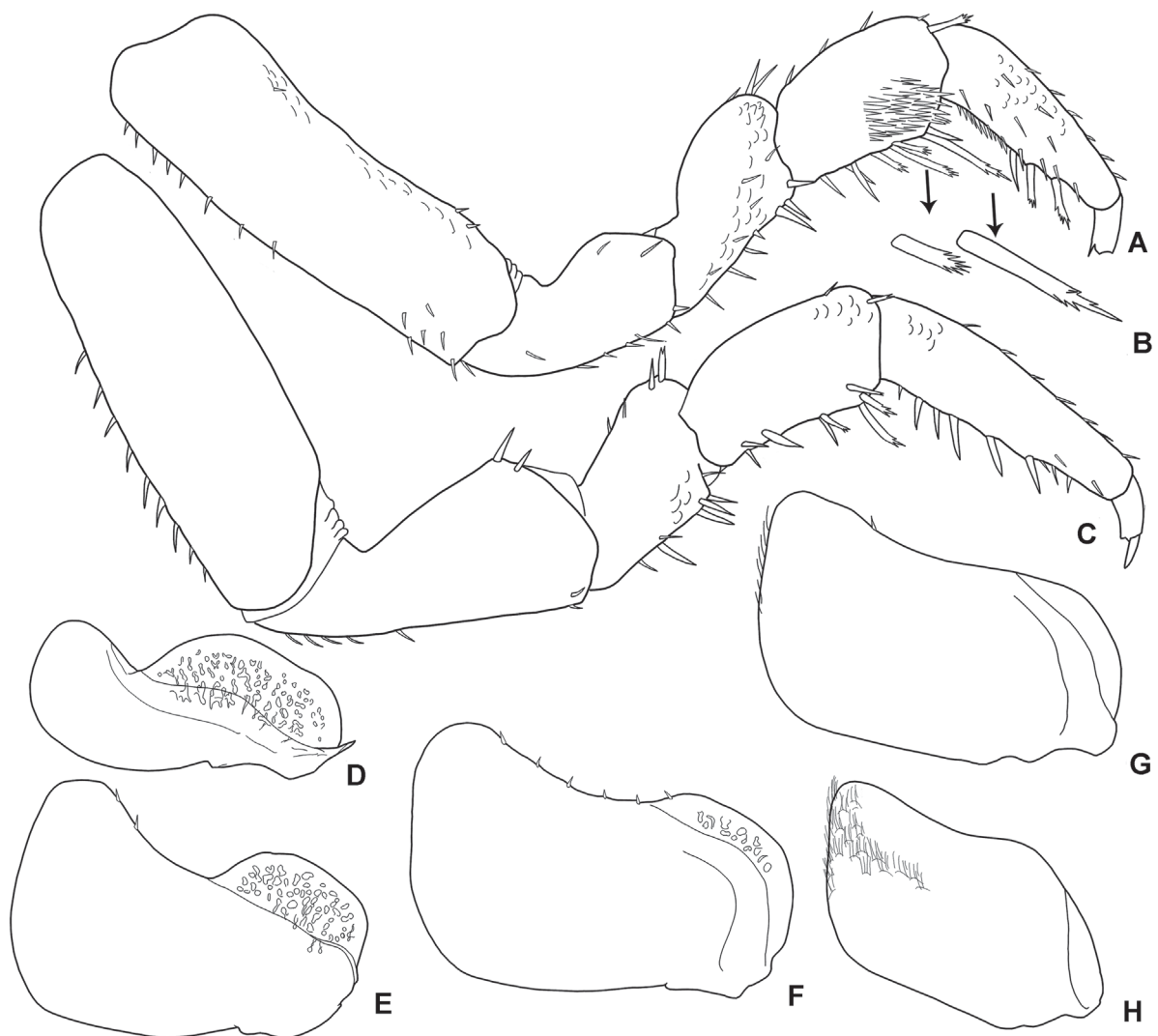


Fig. 4. *Brailoniscus verrucosus* (Lemos de Castro, 1973) gen. et comb. nov., paratype, ♀ (MNRJ 6214). A. Pereopod 1. B. Pereopod 1 carpus, type of setae. C. Pereopod 7. D. Pleopod 1 exopod. E. Pleopod 2 exopod. F. Pleopod 3 exopod. G. Pleopod 4 exopod. H. Pleopod 5 exopod.

Remarks

Lemos de Castro (1973) provided the description of this species based on females. Even though the respiratory area can be seen, it is not possible to compare the male characters. Also, as mentioned by Lemos de Castro (1973), *B. verrucosus* gen. et comb. nov. differs from *B. maculatus* gen. et comb. nov. by the distinct dorsal tuberculation, the shape of telson with distal portion narrower, the shape of schisma on pereonite 1, and the shape of ventral lobes on pereonites 1 and 2. All these characteristics were confirmed here, however male characters remain unknown.

Brasiloniscus littoralis gen. et sp. nov.

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Figs 5–6, 7C

Diagnosis

Body with dorsal surface slightly tuberculate, telson triangular with lateral sides concave and distal portion narrow, dactylar seta with fringe of small setae on apex, male pleopod 1 exopod as long as wide with deep re-entrance on distal portion, and male pleopod 1 endopod with distal portion acute bearing a slight lobe on inner margin.

Etymology

The new specific epithet refers to the Latin adjective ‘littoralis’, used to describe the seashore/coast, in reference to the locality where the specimens were collected.

Material examined

Holotype

BRAZIL: 1 ♂, state of Rio de Janeiro, Trindade, 23°19'47.71" S, 44°42'20.59" W, on tree bark, 6 Dec. 2013, G.M. Cardoso and I.S. Campos-Filho leg. (MZUSP 36181).

Paratypes

BRAZIL: 1 ♂, 2 ♀♀, same data as for holotype (MZUSP 36182).

Description

MEASUREMENTS. Maximum body length: ♂ 7 mm.

BODY. Habitus in lateral view as in Fig. 5A. Color dark brown with yellow spots, one line on epimera (Fig. 7C). Dorsum (Fig. 5A) with ribs on pereonites, covered by fan-shaped scale-setae (Fig. 5B); *noduli laterales* short, inserted at same distance from lateral margin and in each pereonite progressively near to posterior margin.

CEPHALON (Fig. 5C–D). Lateral lobes slightly bent upwards, frontal shield with lateral sides concave; eyes consisting of 15–20 ommatidia.

PEREON (Fig. 5A, C–E). Pereonite 1 epimeron with strong dorsolateral furrow, schisma with inner lobe rounded and not surpassing outer lobe on posterior margin. Pereonite 2 with ventral lobe well developed.

PLEON (Fig. 5F–G). Neopleura 5 shorter than distal margin of uropod protopod; telson with shallow dorsal depression and apex rounded.

ANTENNULA (Fig. 5H). Proximal and distal articles similar in length, distal article with subapical aesthetascs and distal tip.

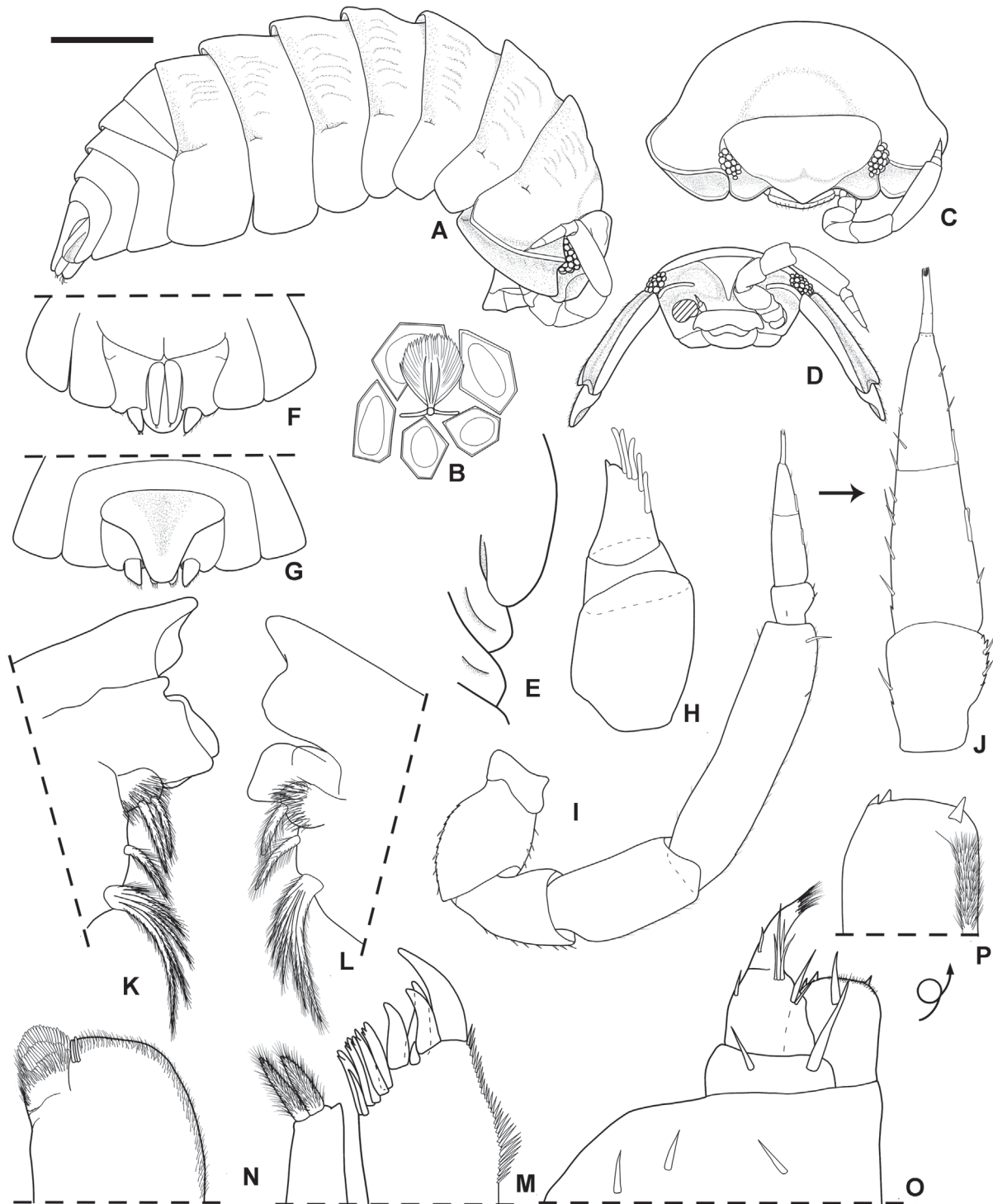


Fig. 5. *Brasiloniscus littoralis* gen. et sp. nov., paratype, ♂ (MZUSP 36182). **A.** Habitus, lateral view. **B.** Dorsal scale-setae. **C.** Cephalon and pereonite 1, dorsal view. **D.** Cephalon, frontal view. **E.** Pereonites 1–3, ventral view. **F.** Pleonites 4 and 5, telson and uropods, ventral view. **G.** Pleonites 4 and 5, telson and uropods, dorsal view. **H.** Antennula. **I.** Antenna. **J.** Antennal flagellum. **K.** Left mandible. **L.** Right mandible. **M.** Maxillula. **N.** Maxilla. **O.** Maxilliped. **P.** Maxilliped endite. Scale bar: 1 mm.

ANTENNA (Fig. 5I–J). Fifth article of peduncle longer than flagellum. Flagellum with second article longer than third article, bearing one pair of lateral aesthetascs.

MOUTH. Buccal pieces (Fig. 5K–P) as in *B. maculatus* gen. et comb. nov., except left mandible with 2+1 penicils, maxillula inner branch with distal tip and maxilliped endite with two hooks on distal margin.

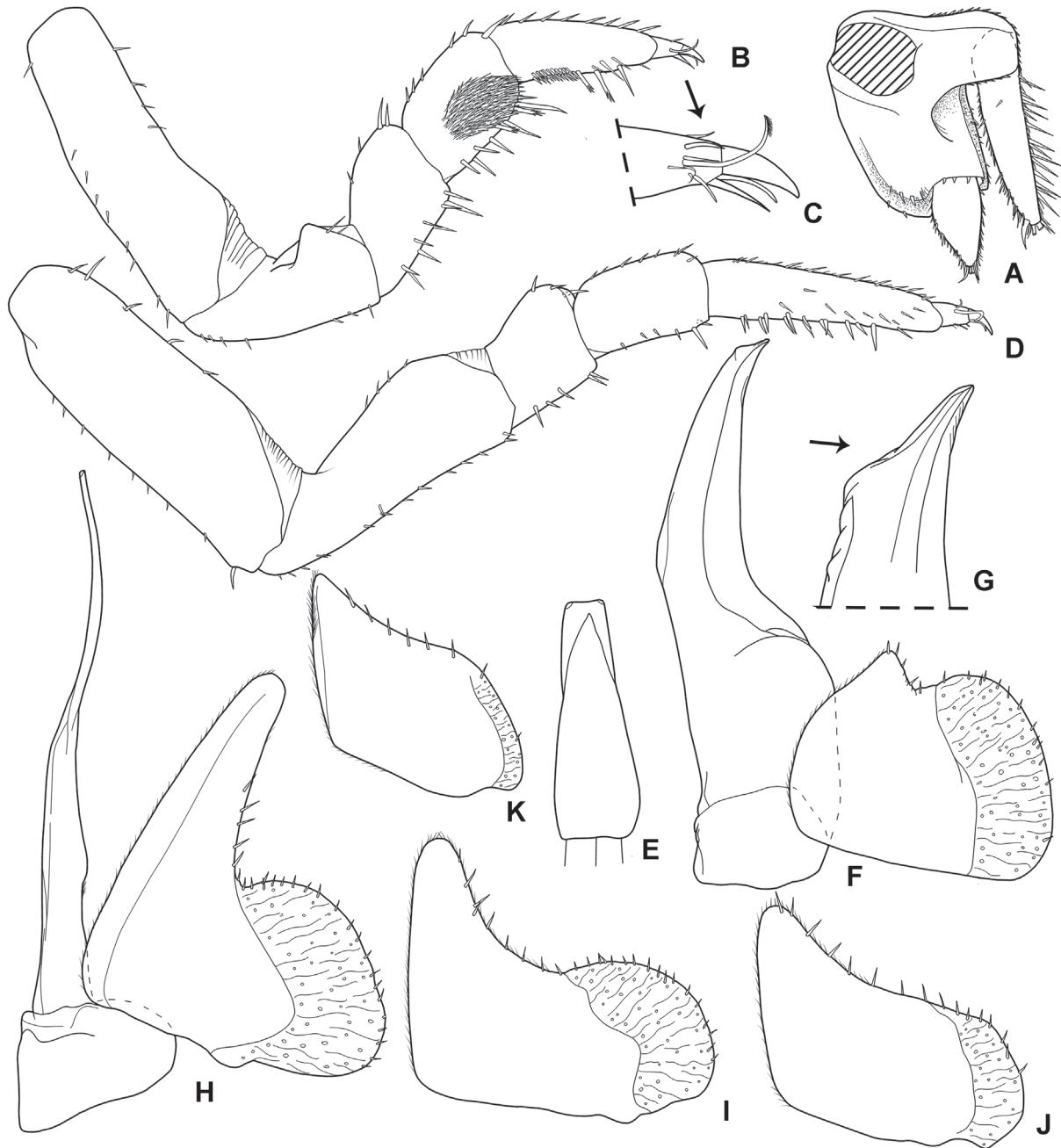


Fig. 6. *Brasiloniscus littoralis* gen. et sp. nov., paratype, ♂ (MZUSP 36182). A. Uropod. B. Pereopod 1. C. Pereopod 1 dactylus. D. Pereopod 7. E. Genitalia. F. Pleopod 1. G. Pleopod 1 endopod. H. Pleopod 2. I. Pleopod 3 exopod. J. Pleopod 4 exopod. K. Pleopod 5 exopod.

PEREPODS 1–7 (Fig. 6B–D). Merus and carpus with sparse setae on sternal margin; carpus 1 with distal seta serrate at apex and longitudinal antennal grooming brush; dactylus with inner claw not surpassing outer claw, dactylar seta simple with fringe of small setae on distal portion, unguis seta simple.

UROPOD (Fig. 6A). Protopod as long as endopod, endopod twice as long as exopod.

PLEOPOD EXOPODS. Respiratory areas as in diagnosis.

Male

PEREPOD 7 (Fig. 6D). Ischium as long as base, propodus twice as long as carpus.

GENITAL PAPILLA. As in Fig. 6E.

PLEOPODS. Pleopod 1 (Fig. 6F–G) exopod slightly wider than long, deep re-entrancy on distal margin, inner and outer margins rounded, outer and distal margins bearing setae; endopod twice as long as exopod, distal portion directed outwards with small inner lobe and narrow apex. Pleopod 2 (Fig. 6H) exopod with outer margin sinuous bearing many setae; endopod longer than exopod. Pleopod 3 exopod (Fig. 6I) triangular, outer margin concave bearing many small setae. Pleopods 4–5 exopods (Fig. 6J–K) rhomboid, outer margin slightly concave bearing small setae along the margin.

Remarks

The new species resembles *B. maculatus* gen. et comb. nov. in the shape of body and male pleopod 1; it can be easily distinguished in the shape of the telson, pereopod 7 base without lobe on distal sternal margin, and dactylar seta with fringe of thin setae on the distal portion.

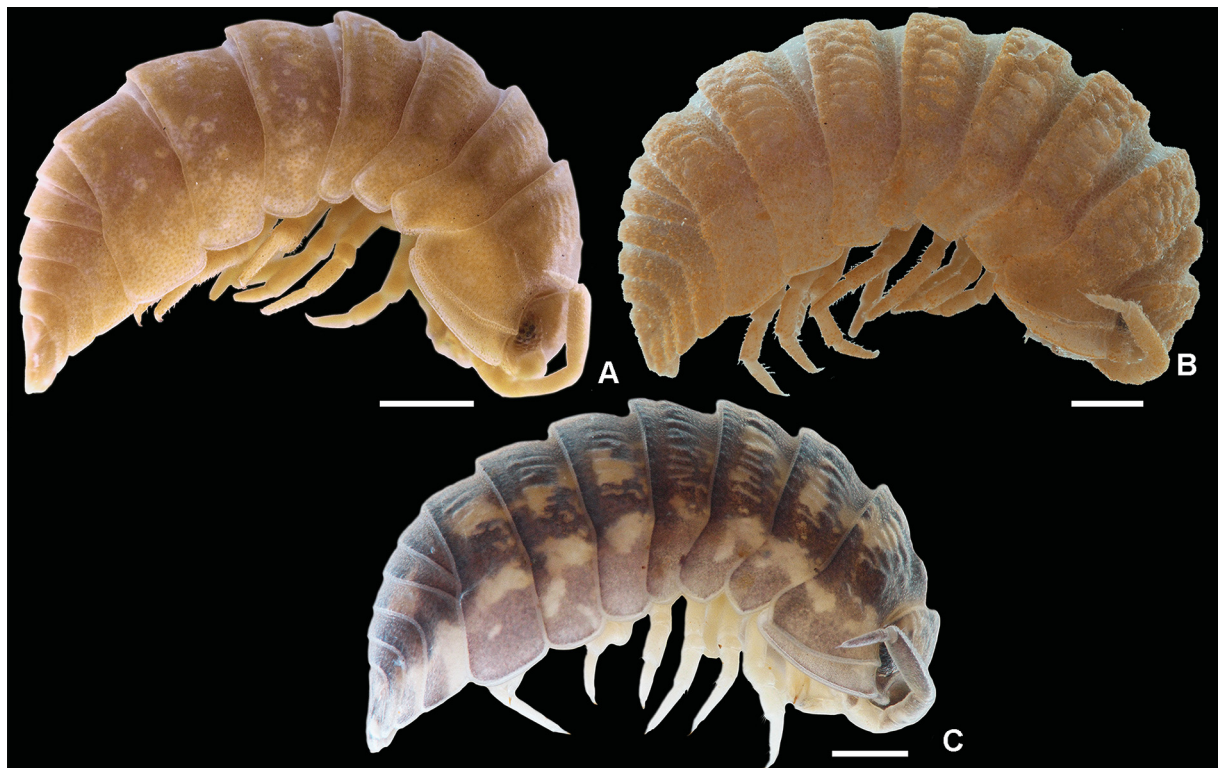


Fig. 7. A. *Brasiloniscus maculatus* (Lemos de Castro, 1973) gen. et comb. nov., paratype, ♂ (MNRJ 6212). – B. *Brasiloniscus verrucosus* (Lemos de Castro, 1973) gen. et comb. nov., paratype, ♀ (MNRJ 6214). – C. *Brasiloniscus littoralis* gen. et sp. nov., paratype, ♂ (MZUSP 36182). Scale bars: 1 mm.

As mentioned previously, the male of *B. verrucosus* gen. et comb. nov. remains unknown, which makes a comparison with the new species difficult. However, *B. littoralis* gen. et sp. nov. is distinguished from *B. verrucosus* gen. et comb. nov. in the absence of dorsal tuberculation (see also Fig. 7B–C).

Discussion

The phylogenetic relationships of Pudeoniscidae were discussed by Wägele (1989) and Schmidt (2003), both authors recovered the family with an uncertain position within the Oniscidea. Schmidt (2003) included Pudeoniscidae in a clade named ‘taxon 6’, without any synapomorphic characters. Based on *P. birabeni* Vandel, 1963, the author considered the respiratory fields *Oniscus*-type (= *Atracheodillo*-type, see also Paoli *et al.* 2002) or the Y- or T-shaped dorsal scale-setae as possible synapomorphies to the family. Yet no clear synapomorphic characters are known (Schmidt 2008), and despite all efforts the phylogenetic position of the family is still unknown.

Brasiloniscus gen. nov. and the characters of its species have been revised, and the genus validated herein. The genus is mainly recognized by the epimera of pereonite 1 with dorsolateral furrow to fit antennae during conglobation and a schisma on the postero-lateral corner, shape of the telson, antennal flagellum with three articles, uropod with the exopod inserted distally, and uncovered *Atracheodillo*-type respiratory lungs on pleopod exopods.

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