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## NEW SPECIES AND NEW RECORDS OF *BENTHANA* BUDDE-LUND, 1908 (ISOPODA: ONISCIDEA: PHILOSCIIDAE) FROM SOUTHERN BRAZIL

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### ABSTRACT

*The genus Benthana includes 25 species with distribution in Brazil and Paraguay. In this paper we describe a new species from the state of Santa Catarina, southern Brazil, and provide new records for Benthana cairensis Sokolowicz, Araujo & Boelter, 2008, Benthana longicornis Verhoeff, 1941, Benthana moreirai Lemos de Castro, 1985, Benthana picta (Brandt, 1833), Benthana serrana Araujo & Lopes, 2003, and Benthana taeniata Araujo & Buckup, 1994.*

KEY-WORDS: Crustacea; Terrestrial isopods; Neotropical; Atlantic forest.

### INTRODUCTION

The family Philosciidae Kinahan, 1857 includes almost 600 species in about 114 genera with a wide distribution (Ahyong *et al.*, 2011). The genus *Benthana* Budde-Lund, 1908 includes 25 species: 22 recorded from Brazil, one (*Benthana picta* (Brandt, 1833)) from Brazil and Paraguay, and two dubious species from Chile (*B. angustata* (Nicolet, 1849) and *B. bilineata* (Nicolet, 1849)) (Andersson 1960; Schmalfuss 2003; Leistikow & Araujo, 2006; Sokolowicz *et al.*, 2008; Campos-Filho & Araujo, 2011; Campos-Filho *et al.*, 2013). In southern Brazil eight species of *Benthana* are recorded: *B. araucariana* Araujo & Lopes, 2003, *B. guayanas* Campos-Filho, Costa & Araujo, 2013, *B. itaipuensis* Campos-Filho & Araujo, 2011, *B. longicornis* Verhoeff, 1941, *B. serrana* Araujo & Lopes, 2003, *B. taeniata* Araujo & Buckup, 1994,

*B. trinodulata* Araujo & Lopes, 2003 and *B. picta* (Brandt, 1833).

The genus is characterized by the presence of the dentiform protrusion on the pleopod 1 exopod of male (Leistikow, 2001); additionally, in order to distinguish the species, two methods were proposed to analyze the appendage: the z:y ratio (see Araujo & Lopes, 2003), which classifies the exopod as elongated or rounded, and the levels of indentation (see Campos-Filho *et al.*, 2013), which categorizes the indentation of the distal margin of the dentiform protrusion as low, medium or high.

Recently we examined material collected during expeditions in southern Brazil and material deposited in the Coleção de Carcinologia, Universidade Federal do Rio Grande do Sul, Porto Alegre and Museu de Zoologia, Universidade de São Paulo (MZUSP) and identified one new species from the state of Santa Catarina, and new records for six species of *Benthana*.

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## MATERIAL AND METHODS

Specimens were stored in 70% ethanol and descriptions were based on morphological characters. The specimens were dissected and the appendages and pereonites were mounted on slides. Drawings were prepared using a camera lucida. The *noduli laterales* were measured and illustrated as in Vandel (1962). The z:y ratio of the male pleopod 1 exopod was defined according to Araujo & Lopes (2003) and the indentation level of the dentiform protrusion was defined according to Campos-Filho *et al.* (2013).

The material was deposited in the Museu Nacional (MNRJ), Universidade Federal do Rio de Janeiro, Rio de Janeiro; Museu de Zoologia (MZUSP), Universidade de São Paulo, São Paulo; and Coleção de Carcinologia (UFRGS), Universidade Federal do Rio Grande do Sul, Rio Grande do Sul.

## SYSTEMATIC ACCOUNT

### Family Philosciidae Kinahan, 1857

### Genus *Benthana* Budde-Lund, 1908

*Type species: Philoscia picta* Brandt, 1833 by subsequent designation (Van Name 1936).

*Diagnosis:* See Araujo & Leistikow (1999) and Leistikow (2001).

### *Benthana carijos* sp. nov.

#### Figures 1-3

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*Type material: Holotype* male, Brazil, Santa Catarina, Anitápolis, road SC-407, between Anitápolis and Santa Rosa de Lima, 27°59'33"S, 49°06'48"W, open vegetation cover, impacted area, 25/VI/2012, leg. P.B. Araujo and B.L. Zimmermann (MZUSP 30092). *Paratypes* 1 ♂, 2 ♀♀ same data as holotype (MNRJ 23311); São Paulo: 2 ♂♂, 5 ♀♀, 3 manca, Cananéia, Ilha do Cardoso, 25°07'54"S, 47°57'59"W, n° 110, I/1979 (MZUSP 24285), 2 ♂♂, 1 ♀, 2 manca, Cananéia, Ilha do Cardoso, n° 106, 1979 (MZUSP 24289), 1 ♂, 1 ♀, 1 ? (without pleon), Cananéia, Ilha do Cardoso, n° 057, 1979 (MZUSP 24290).

*Diagnosis:* Antennule with 13+2 aesthetascs; male pleopod 1 exopod elongated, with low indentation,

not prominent dentiform protrusion, and narrow distal third.

*Description:* Maximum body length 14 mm, cephalothorax width 2.5 mm.

Light brown color. Cephalon with irregular unpigmented spots. Antenna with unpigmented proximal portion of the fourth article and distal portion of fifth article. Pereon with two lines of unpigmented longitudinal spots paramedially, a central line of unpigmented spots from the first pereonite to the fifth pleonite; epimera with large unpigmented spots. Telson with three unpigmented spots.

Body (Fig. 1A) convex; dorsal surface smooth and bright, bearing few long piliform scale-setae (Fig. 1B); pleon narrower than pereon with developed epimera; pereonites 1-4 with postero-lateral corners right-angled with rounded apices and posterior margins straight; pereonites 5-7 with postero-lateral corners gradually more acute and posterior margins gradually more arched; pleon epimera 3-5 developed, triangular, acute, and directed backwards. Cephalon (Figs. 1C, D) with *linea supra-antennalis* sinuous; *linea frontalis* and lateral lobes lacking; clypeus and labrum similar in length; eyes with 21 ommatidia arranged in four rows. Pereonites (Fig. 1E) with sulcus marginalis and glandular pores along the lateral margin. One line of *noduli laterales* per side (Figs. 1E-G) with d/c coordinates reaching a maximum on pereonite 4; b/c coordinates gradually decreasing. Telson (Fig. 1H) triangular with lateral margins slightly concave and right-angled apex.

Antennule (Fig. 1I) triarticulate, distal article the longest, with 13 aesthetascs plus apical pair. Antenna (Fig. 1J) when extended posteriorly reaches fifth pereonite, flagellum triarticulate, first article longest, second and third subequal in length; apical organ short, one sixth of the length of the distal article, free sensilla inserted near the base.

Mandibles (Figs. 1K, L) with molar penicil consisting of at least 14 branches, *pars intermedia* with dense tuft of coniform setae, left mandible with three penicils, and right mandible with two penicils. Maxillule (Fig. 1M) medial endite with two penicils, inserted transversely, distal portion rounded; outer endite with 4+6 teeth, five teeth of inner set pectinate (inner tooth bearing 16 denticles), one short and simple. Maxilla (Fig. 1N) lateral lobe twice as wide as medial lobe with distal margin sinuous, covered with trichiform setae; medial lobe rounded, covered with trichiform setae. Maxilliped (Fig. 1O) with rectangular base, cuticle scaled proximally, sparse piliform setae, and outer distal corner

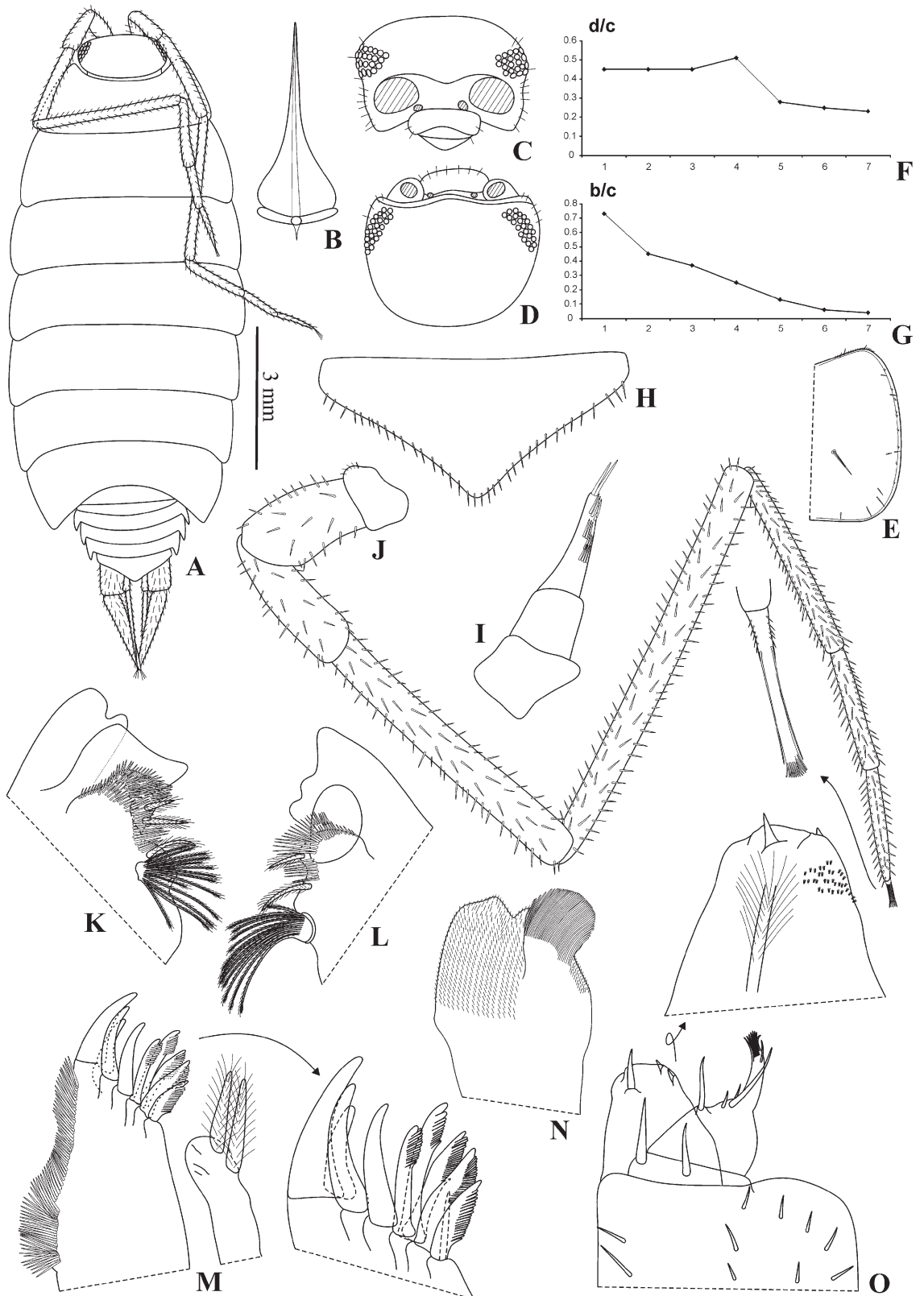


FIGURE 1: *Benthana carijos* sp. nov. (male paratype). A: habitus; B: piliform scale-seta; C: cephalon, frontal view; D: cephalon, dorsal view; E: pereon epimeron 3; F: coordinates d/c of *noduli laterales*; G: coordinates b/c of *noduli laterales*; H: telson; I: antennule; J: antenna; K: left mandible; L: right mandible; M: maxillule; N: maxilla; O: maxilliped.

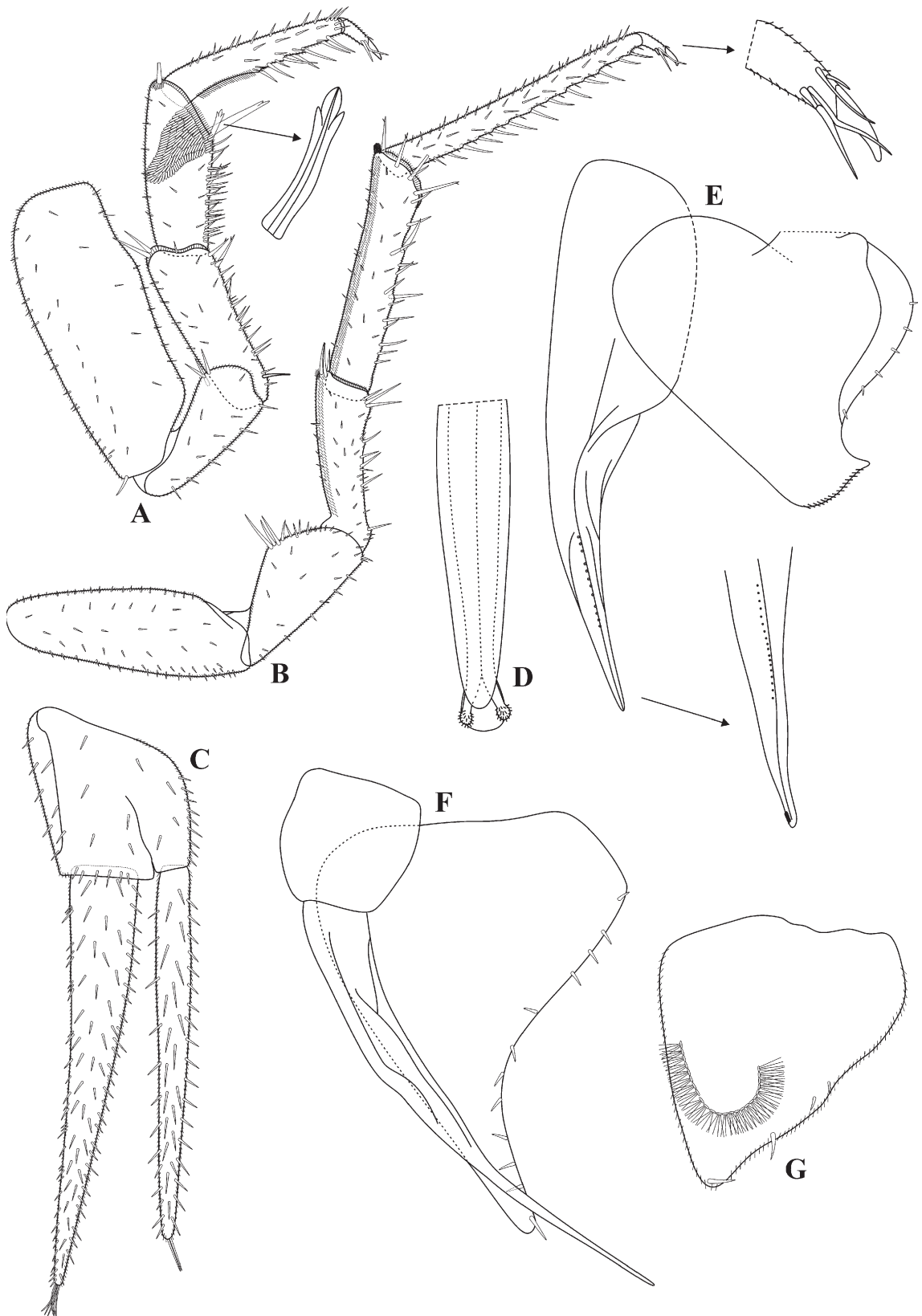


FIGURE 2: *Benthana carijos* sp. nov. (male paratype). **A:** pereopod 1; **B:** pereopod 7; **C:** uropod; **D:** genital papilla; **E:** pleopod 1; **F:** pleopod 2; **G:** pleopod 5 exopod.

slightly prominent; endite rectangular, outer margin sinuous, distal margin rounded with two hook-like setae and medial seta overpassing distal margin, setose ventral sulcus ending in one strong tooth-like seta.

Pereopods (Figs. 2A, B) rather slender, piliform setae on all articles, hyaline fringe and sparse setae on merus and carpus; carpus 1 with transverse antennagrooming brush and one seta with hand-like apex; ischium 7 triangular, bearing four long setae; dactylus 1-7 with inner claw reaching distal margin of outer claw, dactylar seta long and simple, unguis seta simple, not surpassing inner claw.

Uropod (Fig. 2C) with protopod grooved on outer margin, endopod and exopod inserted almost at the same level, with few long setae along inner and outer margins; exopod slightly longer than endopod, with six setae on apex; endopod with three setae on apex.

*Male:* Genital papilla (Fig. 2D) with triangular frontal shield distally rounded and two subapical orifices. Pleopod 1 (Fig. 2E) exopod heart-shaped, elongated (ratio z:y 2.56), dentiform protrusion not prominent, rounded apex and distal margin with low indentation, outer lateral margin of respiratory area with six setae, and narrow distal third; endopod stout with median row of short setae on distal portion. Pleopod 2 (Fig. 2F) exopod triangular, outer margin concave with about 12 setae; endopod slender and long. Pleopod 5 exopod (Fig. 2G) triangular, outer margin slightly sinuous with four setae and transverse plumose fringe.

*Etymology:* The new species is named after the Carijós people native of southeastern and southern Brazil.

*Remarks:* The male pleopod 1 exopod of *Benthana carijos* sp. nov. is similar to that of *B. bocainensis* Lemos de Castro, 1958, *B. santosi* Lemos de Castro, 1958 and *B. schubarti* Lemos de Castro, 1958, by the not prominent dentiform protrusion and low indentation, but can be distinguished by the absence of lobe on the inner margin (*vs.* present in *B. bocainensis*), and presence of setae on outer margin (*vs.* absent in *B. santosi* and *B. schubarti*). *Benthana carijos* sp. nov. can also be distinguished by the number of aesthetascs on the antennule (16+2 *vs.* 8+2 in *B. bocainensis*, 9+2 in *B. santosi*, and 6+2 in *B. schubarti*), uropod exopod slightly longer than endopod (*vs.* exopod twice as long as endopod in all three species), and the shape of the male pleopod 1 exopod with narrow distal third, an unique characteristic of this species.

***Benthana cairensis* Sokolowicz,  
Araujo & Boelter, 2008  
Fig. 3**

*Material examined:* Brazil: Paraná: 1 ♂, 6 ♀♀, Curitiba, Parque Barigui, 25°25'01"S, 49°18'29"W, leg. P.B. Araujo and B.L. Zimmermann, 28/VI/2012 (UFRGS 5369); 1 ♀, Morretes, 25°26'46"S, 48°46'52"W, leg. P.B. Araujo and B.L. Zimmermann, 10/VIII/2012, forest close to the road (UFRGS 5511); 1 ♂, 2 ♀♀, Matinhos, Parque Saint Hilaire Lang, Road PR-508, 25°38'39"S, 48°36'04"W, leg. P.B. Araujo and B.L. Zimmermann, 10/VIII/2012, leaf litter (UFRGS 5501); 2 ♀♀, Lapa, Parque Estadual do Monge, 25°46'55"S, 49°41'49"W, leg. P.B. Araujo and B.L. Zimmermann, 11/VIII/2012, in forest, (UFRGS 5503); 1 ♂, Lapa, Parque Estadual do Monge, leg. P.B. Araujo and B.L. Zimmermann, 11/VIII/2012, impacted area, site with restaurants and kiosks (UFRGS 5556); 20 ♂♂, 32 ♀♀, Quintandinha, Campina road, 26°01'33"S, 49°25'39"W, leg. P.B. Araujo and B.L. Zimmermann, 26/VI/2012, alt. 850 m (UFRGS 5373); 3 ♂♂, 3 ♀♀, União da Vitória, Clube de Campo, 26°12'34"S, 51°01'09"W, leg. P.B. Araujo and B.L. Zimmermann, 12/VIII/2012 (UFRGS 5507). Santa Catarina: 2 ♂♂, 10 ♀♀, Corupá, Reserva Particular do Patrimônio Natural (RPPN) Rota das Cachoeiras, 26°24'08"S, 49°20'40"W, leg. P.B. Araujo and B.L. Zimmermann, 28/VI/2012 (UFRGS 5368); 2 ♂♂, 3 ♀♀, Corupá, near Hotel Ecológico, behind a church, leg. P.B. Araujo and B.L. Zimmermann, 27/VI/2012, under palm leaves (UFRGS 5365); 1 ♂, 4 ♀♀, Gaspar, 26°59'25"S, 48°54'28"W, leg. P.B. Araujo and B.L. Zimmermann, 26/VI/2012 (UFRGS 5386); 2 ♂♂, 2 ♀♀, Brusque, 27°10'19"S, 48°53'42"W, leg. P.B. Araujo and B.L. Zimmermann, 26/VI/2012 (UFRGS 5384); 1 ♂, Rancho Queimado, Pousada Bauer, 27°40'57"S, 49°02'41"W, alt. 885 m, leg. P.B. Araujo and B.L. Zimmermann, 25/VI/2012, many roots, dense vegetation cover, impacted area, in woods and garden, near pasture (UFRGS 5569).

*Remarks:* *Benthana cairensis* has previously recorded from Taquara (29°39'02"S, 50°46'50"W) and Sapiranga (29°37'52"S, 51°00'34"W), state of Rio Grande do Sul, southern Brazil (Sokolowicz *et al.*, 2008). The present record from the states of Paraná and Santa Catarina indicates a wide distribution for this species.

***Benthana longicornis* Verhoeff, 1941  
Fig. 3**

*Material examined:* Brazil: Paraná: 1 ♂, 5 ♀♀, São João da Graciosa, Serra da Graciosa, 25°21'35"S,

48°53'01"W, alt. 389 m, leg. P.B. Araujo and B.L. Zimmermann, 10/VIII/2012, impacted area (UFRGS 5560). Santa Catarina: 1 ♂, 5 ♀♀, Corupá, Reserva Particular do Patrimônio Natural (RPPN) Rota das Cachoeiras, 26°24'08"S, 49°20'40"W, leg. P.B. Araujo and B.L. Zimmermann, 28/VI/2012 (UFRGS 5583); 1 ♂, Rancho Queimado, Pousada Bauer, 27°40'57"S, 49°02'41"W, alt. 885 m, leg. P.B. Araujo and B.L. Zimmermann, 25/VI/2012, many roots, dense vegetation cover, impacted area, in woods, near pasture (UFRGS 5568); 3 ♂♂, 3 ♀♀, Orleans, 28°21'17"S, 49°16'29"W, leg. P.B. Araujo, B.L. Zimmermann and A. Ferrari, 24/VI/2012, in bromeliads (UFRGS 5564).

*Remarks:* *Benthana longicornis* was previously known only from the type locality, Nova Teutônia, state of Santa Catarina (27°02'59"S, 52°24'01"W) (Araujo et al., 1996). The new records extend the knowledge of the occurrence areas for this species indicating a wide distribution in southern Brazil.

### *Benthana moreirai* Lemos de Castro, 1985

#### Fig. 3

*Material examined:* Brazil, Santa Catarina: 1 ♂, 1 ♀, Anitápolis, SC-407 Road, between Santa Rosa de Lima and Anitápolis, 27°59'33"S, 49°06'48"W, alt. 340 m, leg. P.B. Araujo and B.L. Zimmermann, 26/VI/2012 (UFRGS 5576).

*Remarks:* *Benthana moreirai* was known only from the type locality, Itariri (24°17'21"S, 47°10'28"W), south of the state of São Paulo, southeastern Brazil (Lemos de Castro, 1985; Schmalzfuss, 2003). The present record indicates that the species' natural range extends southwards.

### *Benthana picta* (Brandt, 1833)

#### Fig. 3

*Material examined:* Brazil: Paraná: 3 ♂♂, 4 ♀♀, Tibagi, Parque Estadual Guartelá, 24°34'10"S, 50°15'57"W, alt. 1098 m, leg. P.B. Araujo, B.L. Zimmermann, 12/VIII/2012, primary vegetation, Cerrado biome area, dry leaf litter (UFRGS 5538); 14 ♂♂, 52 ♀♀, Curitiba, Parque São Lourenço, 25°23'16"S, 49°15'58"W, leg. P.B. Araujo and B.L. Zimmermann, 13/VIII/2012, forest with many pieces of wood, area of a club (UFRGS 5502); 18 ♂♂, 16 ♀♀, Curitiba, Parque Barigui, 25°25'35"S, 49°18'39"W, alt. 908 m, leg. P.B. Araujo, B.L. Zimmermann, 13/VIII/2012, impacted area (UFRGS 5506); 1 ♂, Curitiba, Parque

Barigui, leg. P.B. Araujo and B.L. Zimmermann, 28/VI/2012, dense vegetative cover, forest edge (UFRGS 5604); 6 ♂♂, 6 ♀♀, Lapa, Parque Estadual do Monge, 25°46'55"S, 49°41'49"W, leg. P.B. Araujo, B.L. Zimmermann, 11/VIII/2012, in forest, dense vegetation cover (UFRGS 5505); 9 ♂♂, 2 ♀♀, Lapa, Parque Estadual do Monge, alt. 1009 m, leg. P.B. Araujo, B.L. Zimmermann, 11/VIII/2012, impacted area, site with restaurants and kiosks, (UFRGS 5541); 1 ♂, 1 ♀, Piên, 26°06'58"S, 49°25'25"W, leg. P.B. Araujo, B.L. Zimmermann, 28/VI/2012, dense vegetation cover, few roots, on *Araucaria angustifolia* leaves (UFRGS 5603). Santa Catarina: 1 ♂, 1 ♀, Joinville, 26°19'19"S, 48°51'49"W, leg. G.M. Cardoso, 8/IX/2013 (UFRGS 5766), 3 ♀♀, Blumenau, Parque das Nascentes, 27°03'27"S, 49°05'10"W, leg. P.B. Araujo, B.L. Zimmermann and A. Ferrari, 26/VI/2012, open vegetation cover, in bromeliads (UFRGS 5566); 2 ♂♂, Blumenau, Parque das Nascentes, leg. P.B. Araujo and B.L. Zimmermann, 26/VI/2012, open vegetation cover, in bromeliads (UFRGS 5577); 1 ♂, 1 ♀, Blumenau, Parque das Nascentes, leg. P.B. Araujo and B.L. Zimmermann, 26/VI/2012, open vegetation cover, in bromeliads (UFRGS 5584); 9 ♂♂, 4 ♀♀, Orleans, behind Hotel Nob, 28°21'17"S, 49°16'29"W, leg. P.B. Araujo and B.L. Zimmermann, 24/VI/2012, dense vegetation cover, primary vegetation (UFRGS 5594). Rio Grande do Sul: 2 ♂♂, 2 ♀♀, Carazinho, 28°17'53"S, 52°56'34"W, leg. G.M. Cardoso, 27/VIII/2013 (UFRGS 5728); 5 ♂♂, 4 ♀♀, Fontoura Xavier, 29°00'17"S, 52°21'01"W, leg. G.M. Cardoso, 27/VIII/2013 (UFRGS 5727).

*Remarks:* *Benthana picta* has records in Brazil from the state of Espírito Santo to the state of Rio Grande do Sul (Araujo & Lopes, 2003), and in Paraguay from Villarica (Andersson, 1960).

### *Benthana serrana* Araujo & Lopes, 2003

#### Fig. 3

*Material examined:* Brazil: Santa Catarina: 1 ♂, Anitápolis, between Santa Rosa de Lima and Anitápolis, 27°59'13"S, 49°05'44"W, leg. P.B. Araujo and B.L. Zimmermann, 25/VI/2012, dense vegetation cover, soil with many roots, forest edge (UFRGS 5605).

*Remarks:* *Benthana serrana* had previous records from São Francisco de Paula, Maquiné, Terra de Areia and Morrinhos do Sul, state of Rio Grande do Sul (Araujo & Lopes, 2003). As for *B. moreirai*, the present record indicates a wider distribution.

***Benthana taeniata* Araujo & Buckup, 1994**

**Fig. 3**

*Material examined:* Brazil: Paraná: 10 ♂♂, 7 ♀♀, 3 juveniles, Antonina, near Nunes river, 25°20'48"S, 48°46'05"W, leg. P.B. Araujo and B.L. Zimmermann, 10/VIII/2012, impacted area, camping site, urban zone (UFRGS 5513); 39 ♂♂, 34 ♀♀, Piên, 26°06'58"S, 49°25'25"W, leg. P.B. Araujo and B.L. Zimmermann, 28/VI/2012, dense vegetation cover, few roots, on *Araucaria angustifolia* leaves (UFRGS 5372). Santa Catarina: 8 ♂♂, 11 ♀♀, Corupá, Reserva Particular do Patrimônio Natural (RPPN) Rota das Cachoeiras, 26°24'08"S, 49°20'40"W, leg. P.B. Araujo and B.L. Zimmermann, 28/VI/2012 (UFRGS 5371); 1 ♀, Blumenau, Parque das Nascentes, 27°03'27"S, 49°05'10"W, leg. P.B. Araujo and B.L. Zimmermann, 27/VI/2012, open vegetation cover, in bromeliads (UFRGS 5585); 4 ♀♀, São João Batista, 27°15'52"S, 48°51'12"W, leg. P.B. Araujo and B.L. Zimmermann and A. Ferrari, close to Fernandes waterfall, soil with many roots (UFRGS 5385); 19 ♂♂, 43 ♀♀, Rio Fortuna, 28°06'09"S, 49°07'36"W, alt. 229 m, leg. P.B. Araujo and B.L. Zimmermann,

in pasture and woods, many roots, impacted area (UFRGS 5370); 1 ♂, 1 ♀, Orleans, close to Fire Department, 28°21'17"S, 49°16'29"W, leg. P.B. Araujo and B.L. Zimmermann, 24/VI/2012, dense vegetation cover, many roots, primary vegetation (UFRGS 5602). Rio Grande do Sul: 9 ♂♂, 7 ♀♀, Campina das Missões, 27°59'51"S, 54°51'41"W, leg. G.M. Cardoso, 16/IX/2013 (UFRGS 5765); 3 ♂♂, 4 ♀♀, Roque Gonzales, 28°07'59"S, 55°00'56"W, leg. G.M. Cardoso, 16/IX/2013 (UFRGS 5764); 5 ♂♂, 5 ♀♀, Carazinho near, road toll, 28°15'23"S, 52°44'15"W, alt. 511 m, leg. G.M. Cardoso, 26/VIII/2013 (UFRGS 5732); ♂♂ and ♀♀, Carazinho, near Rio da Várzea river, 28°15'25"S, 52°43'38"W, leg. G.M. Cardoso, 26/VIII/2013 (UFRGS 5735); 2 ♂♂, 3 ♀♀, Soledade, near road toll, 28°49'40"S, 52°57'21"W, alt. 694 m, leg. G.M. Cardoso, 27/VIII/2013 (UFRGS 5729).

*Remarks:* *Benthana taeniata* had few previous records in the Brazilian states of Rio de Janeiro (one locality), Santa Catarina and Rio Grande do Sul (Araujo & Lopes, 2003; Leistikow & Araujo, 2006).

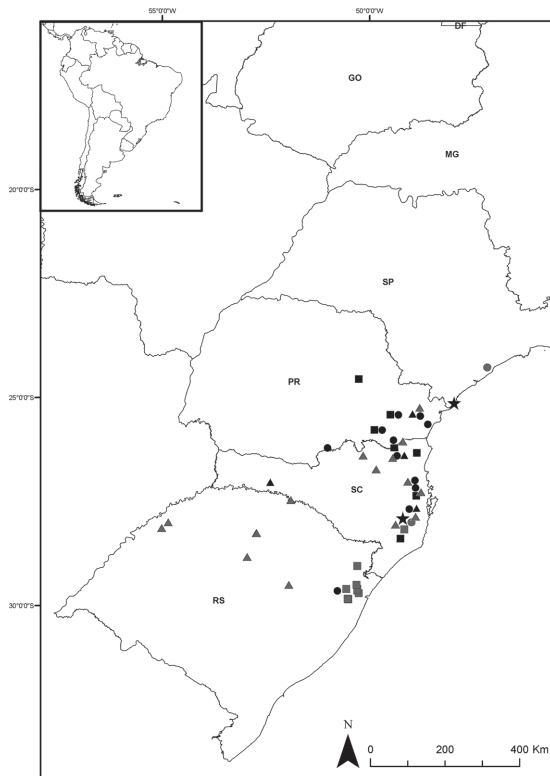
**RESUMO**

O gênero *Benthana* atualmente inclui 25 espécies com distribuição para o Brasil e Paraguai. Neste trabalho é descrita uma nova espécie para o estado de Santa Catarina, sul do Brasil e fornece novos registros para *Benthana cairensis* Sokolowicz, Araujo & Boelter, 2008, *Benthana longicornis* Verhoeff, 1941, *Benthana moreirai* Lemos de Castro, 1985, *Benthana picta* (Brandt, 1833), *Benthana serrana* Araujo & Lopes, 2003, e *Benthana taeniata* Araujo & Buckup, 1994.

**PALAVRAS-CHAVE:** Crustacea; Isópodos terrestres; Neotrópico; Mata Atlântica.

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**FIGURE 3:** Map distribution of the species of *Benthana* from southern Brazil. ★: *Benthana carijos* sp. nov.; ●: *Benthana cairensis*; ▲: *Benthana longicornis*; ○: *Benthana moreirai*; ■: *Benthana picta*; ■: *Benthana serrana*; ▲: *Benthana taeniata*.

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