

Crustacea, Isopoda, Oniscidea Latreille, 1802: New continent record and distribution extension in Brazil

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ABSTRACT: Terrestrial Isopods were sampled in four protected Atlantic Forest areas located in Serra do Mar, state of São Paulo, southeastern Brazil. A total of 2,217 individuals of six species (*Atlantoscia* sp., *Benthana wernerii*, *Pseudodiploexochus tabularis*, *Pudeoniscus obscurus*, *Styloniscus spinosus* and *Trichorhina* sp.) were captured in pitfall traps. The exotic species *S. spinosus* is recorded for the first time for the Americas. Another introduced species, *P. tabularis*, previously recorded only from the state of Rio Grande do Sul, had its geographic distribution extended to the state of São Paulo. The most abundant isopods in this study belong to an undescribed species of *Atlantoscia*.

The suborder Oniscidea (terrestrial isopods) includes more than 3,600 worldwide species (Schmalfuss 2003) that occur in almost all terrestrial habitats, from deserts to forests, rangelands, agroecosystems, mountains, bromeliads, ant nests, and caves. A survey of American Oniscidea listed 254 species (van Name 1936; 1940; 1942) and subsequent publications led to an increase to up to 521 described nominal species in 1997 (Leistikow and Wägele 1999). Moreover, every expedition to the tropical rain forests reveals new species and even genera (Ferrara and Taiti 1989). Since a detailed taxonomy requires careful dissections, there is a lack of reliable guides for identifying tropical woodlice and many of the tropical Oniscidea fauna remains to be described. Leistikow and Wägele (1999) present a species checklist for the Americas and their quotation in the literature. The authors provide a historical approach through prior records in the province/state, habitat data for each species and indicate which species were probably introduced by human activities. Although these records are available for woodlice species in the American continent, data on their native distribution remains scarce.

Terrestrial isopods were sampled in four protected Atlantic Forest areas located in Serra do Mar, state of São Paulo, southeastern Brazil: Núcleo Santa Virgínia (Parque Estadual da Serra do Mar), Estação Biológica de Boracéia, Parque das Neblinas (a Natural Patrimony Private Reserve) and Reserva Biológica de Paranapiacaba. The vegetation comprises montane ombrophilous forest interspersed to some degree with secondary forest in all sites. The soil composition is predominantly red-yellow Argisol and Inceptisol. The altitude varies from 700 m to 1,100 m, and the distance from coast is about 10 to 20 km. Climate in the region is humid, with absence of a dry season (DNMet 1992).

Samplings were undertaken in each protected area with 60 pitfall traps distributed in 12 sampling units within forest areas. Each sampling unit was comprised of five

pitfall traps, arranged in a line and placed approximately two meters apart. The pitfall traps were made up with 500-mL plastic containers with 8.5 cm diameter, buried so the opening would be flush with the ground, and protected from rain and falling leaves by a styrofoam cover. A mixture of 69.9 % water, 30.0 % propylene glycol, 0.1 % formaldehyde and some drops of detergent (to break the surface tension and facilitate arthropod collection) was used as preserving liquid. The traps were left open in the field for six days per month. Sampling at Núcleo Santa Virgínia was done from November 2004 to May 2005. Likewise, Estação Biológica de Boracéia and Parque das Neblinas were sampled from November 2005 to May 2006, and collections at Reserva Biológica de Paranapiacaba took place from November 2006 to May 2007. The woodlice collected were preserved in 70 % ethanol and stored in the Museu de Zoologia - Instituto de Biologia/Unicamp, Campinas, São Paulo, and in the Departamento de Zoologia do Instituto de Biociências da Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul.

Overall, we sampled six species from five Oniscidea families: *Benthana wernerii* Lemos de Castro, 1958 ("Philosciidae") and *Pudeoniscus obscurus* Lemos de Castro, 1973 (Pudeoniscidae), already recorded in the state of São Paulo (Lemos de Castro 1958 and 1973); *Atlantoscia* sp. ("Philosciidae"), probably an undescribed species; *Trichorhina* sp. ("Platyarthridae"), a genus with a worldwide distribution (Schmalfuss 2003); *Styloniscus spinosus* (Patience, 1907) (Styloniscidae); and *Pseudodiploexochus tabularis* (Barnard, 1932) (Armadillidae), an introduced species (see Leistikow and Wägele 1999; Schmalfuss 2003).

There is still controversy on terrestrial Isopoda systematics, and evidences suggest that many families are probably paraphyletic or polyphyletic (Schmidt 2008). Therefore, the species below are listed in alphabetical instead in systematic order.

"PHILOSCIIDAE"

Atlantoscia Ferrara and Taiti, 1981

Atlantoscia sp.

São Paulo, Núcleo Santa Virgínia (23°20'09" S, 45°08'45" W), Estação Biológica de Boracéia (23°39'10" S, 45°53'20" W), Parque das Neblinas (23°44'52" S, 46°09'44" W) and Reserva Biológica de Paranapiacaba (23°46'00" S, 46°18'20" W).

To the present, the genus *Atlantoscia* is represented in Brazil by two species. *Atlantoscia floridana* (van Name, 1940) is recorded from coastal regions of Florida (USA); Brazilian coastal states; La Plata (Argentina); Ascension and St. Helena islands (Ferrara and Taiti 1981; Taiti and Ferrara 1991; Araujo *et al.* 1996; Schmalfuss 2003). *Atlantoscia rubromarginata* Araujo and Leistikow, 1999 is recorded from Sergipe, northeastern Brazil (Araujo and Leistikow 1999).

The most abundant species in this study was *Atlantoscia* sp. showing a similar pattern of abundance of *A. floridana*, a species that is cited as dominant in different phytogeographic regions of Brazil (Lopes *et al.* 2005; Almerão *et al.* 2006). No quantitative data is available for *A. rubromarginata*.

Benthana wernerii Lemos de Castro, 1958

São Paulo, Núcleo Santa Virgínia (23°20'09" S, 45°08'45" W), Estação Biológica de Boracéia (23°39'10" S, 45°53'20" W), Parque das Neblinas (23°44'52" S, 46°09'44" W) and Reserva Biológica de Paranapiacaba (23°46'00" S, 46°18'20" W).

Benthana wernerii is known only from the state of São Paulo (Lemos de Castro 1958; Schmalfuss 2003) and occur jointly with *Atlantoscia* in Atlantic Forest sites (Lemos de Castro 1958; 1985).

ARMADILLIDAE

Pseudodiploexochus tabularis (Barnard, 1932)

São Paulo, Reserva Biológica de Paranapiacaba (23°46'00" S, 46°18'20" W).

Most species of *Pseudodiploexochus* have been recorded from the African continent (Taiti and Ferrara 1979; Schmalfuss 2003). *Pseudodiploexochus tabularis* is recorded from Cape Province (South Africa) and Brazil, where it was recently recorded in the coastline of the state of Rio Grande do Sul (Lopes *et al.* 2001; Lopes *et al.* 2005; Almerão *et al.* 2006). The only previous record of a species of *Pseudodiploexochus* from the state of São Paulo is *P. gibbus* (Lemos de Castro 1972; Schmalfuss 2003).

PUDEONISCIDAE

Pudeoniscus obscurus Lemos de Castro, 1973

São Paulo, Parque das Neblinas (23°44'52" S, 46°09'44" W).

Pudeoniscus Vandel, 1963 is an american genus with only two species described (Schmalfuss 2003). *Pudeoniscus obscurus* is known only from the state of São Paulo (Lemos de Castro 1973).

STYLONISCIDAE

Styloniscus spinosus (Patience, 1907).

São Paulo, Núcleo Santa Virgínia (23°20'09" S, 45°08'45" W), Parque das Neblinas (23°44'52" S, 46°09'44" W) and Reserva Biológica de Paranapiacaba (23°46'00" S, 46°18'20" W).

The genus *Styloniscus* has a widespread distribution in the Southern Hemisphere, occurring in Argentina, Chile, Tasmania (Australia), New Zealand, Africa (including Madagascar), and several islands from the subtropics to the sub-Antarctic (Schmalfuss 2003). Twelve out of 42 species on this genus occur in the American continent (Schmalfuss 2003). This is the first record of *S. spinosus* in Brazil. The species is considered adventive from Hawaii and has records from Mauritius, Réunion, Madagascar and greenhouses in Great Britain (Taiti and Howarth 1996; Schmalfuss 2003).

Styloniscus otakensis (Chilton, 1901) is recorded from the state of Rio Grande do Sul (Lopes *et al.* 2005).

"PLATYARTHRIDAE"

Trichorhina Budde-Lund, 1908

Trichorhina sp.

São Paulo, Núcleo Santa Virgínia (23°20'09" S, 45°08'45" W) and Estação Biológica de Boracéia (23°39'10" S, 45°53'20" W).

This genus has a worldwide distribution comprising 55 currently recognized species (Araujo and Almerão 2007). Many of the species described are from the Americas (Leistikow and Wägele 1999; Schmalfuss 2003).

Although no specific studies concerning the colonization of exotic woodlice in South America have been made, we believe that the introduction of species begun around year 1500, together with the arrival of ships from European explorers, whose holds were habitually ballasted with soil from the Europe, similarly to the process occurred in North America (Palmén 1951 *apud* Jass and Klaumeier 2000). The trade of agricultural supplies like plant vases might also have transported such edaphic fauna (Jass and Klaumeier 2000). In Brazil, species may also have been introduced from other major shipping routes, like commercial routes between Africa and Brazil.

Pseudodiploexochus tabularis, a species introduced in Brazil, has its native distribution in South Africa. The present record of the species enlarges its geographic distribution in Brazil, since it was recorded only from the state of Rio Grande do Sul, where it was also collected in the litter layer of Atlantic forests. Therefore, we expect that new records for *P. tabularis* would occur within remnants of this biome.

Styloniscus spinosus was not previously recorded in the Americas (Schmalfuss 2003). In our studies comparing disturbed and undisturbed sections of Atlantic Forest reserves, this species had greater abundance in areas with higher anthropogenic disturbance (Uehara-Prado *et al.* 2009; Magrini *et al.* unpublished data).

We also report here a new species of *Atlantoscia*, which remains to be described.

ACKNOWLEDGMENTS: M.U.-P. would like to thank all of the students who participated in the project "Artrópodes como indicadores biológicos de perturbação antrópica em Floresta Atlântica", especially Huang Shih Fang, J.O. Fernandes and C. Matavelli for field and laboratory assistance. We are indebted to the following persons and institutions for work permits: J.P. Villani (Instituto Florestal), Dr. H. Zaher (Museu de Zoologia - USP), G.R. Dias (Instituto Ecofuturo), Drs. R.S. Bianchini and C.J.F. de Oliveira Jr. (Instituto de Botânica) and H.K. Boscolo and S.A. Saccardo (Instituto Brasileiro do Meio Ambiente). We also acknowledge all employees in the protected areas for facilitating our fieldwork. R.B. Andrade kindly revised the English. This study was conducted as part of M.U.-P.'s doctorate project in Ecology (CNPq fellowship 140116 - 2004 - 4) and M.J.M. undergraduate project (CNPq / PIBIC) at Universidade Estadual de Campinas (Unicamp).

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RECEIVED: August 2009

REVISED: March 2010

ACCEPTED: March 2010

PUBLISHED ONLINE: April 2010

EDITORIAL RESPONSIBILITY: Ana Lúcia Tourinho