NORTH-WESTERN JOURNAL OF ZOOLOGY 13 (2): 227-233
Article No.: e161305

http://biozoojournals.ro/nwjz/index.html

Description of a new species of *Cylindroniscus* Arcangeli, 1929 (Isopoda: Oniscidea) from Brazil, with considerations on the family placement of the genus

Ivanklin Soares CAMPOS-FILHO[1,2], Maria Elina BICHUETTE[3], Paula Beatriz ARAUJO[4] and Stefano TAITI[1]

1. Istituto per lo Studio degli Ecosistemi, Consiglio Nazionale delle Ricerche, Via Madonna del Piano 10, 50019, Sesto Fiorentino (Firenze), Italy. E-mail: ivanklin.filho@gmail.com (corresponding author), stefano.taiti@ise.cnr.it.
ISC-F ORCID ID: orcid.org/0000-0001-6139-8241; ST ORCID ID: orcid.org/0000-0002-4909-6037.
2. Programa de Pós-Graduação em Recursos Naturais, Universidade Federal de Campina Grande, Av. Aprígio Veloso 882, Bairro Universitário, 58429-140, Campina Grande, Brazil.
3. Universidade Federal de São Carlos, Departamento de Ecologia e Biologia Evolutiva, Rodovia Washington Luis, Km 235, 13565-905, São Carlos, São Paulo, Brazil. E-mail: lina.cave@gmail.com. ORCID ID: orcid.org/ 0000-0002-9515-4832.
4. Universidade Federal do Rio Grande do Sul, Programa de Pós-Graduação em Biologia Animal, Departamento de Zoologia, Av. Bento Gonçalves, 9500, Agronomia, 91501-970, Porto Alegre, Rio Grande do Sul, Brazil. E-mail: pabearaujo@gmail.com. ORCID ID: orcid.org/0000-0002-7587-3936.

Received: 21. April 2016 / Accepted: 01. August 2016 / Available online: 22. October 2016 / Printed: December 2017

Abstract. The new species *Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti is described from several caves in the Açungui karst area, Iporanga, state of São Paulo, Brazil. This discovery considerably enlarges the distribution of the genus, previously known from Cuba and Mexico. The genus *Cylindroniscus* is placed in the family Styloniscidae in consideration of the muscle disposition of the first pleopods.

Key words: new species, terrestrial isopods, Styloniscidae, *Cylindroniscus*, Brazil.

ZooBank: urn:lsid:zoobank.org:pub:0F1B5129-3233-439E-AF50-E41C9CCC7EE9

Introduction

To date, more than 170 species of terrestrial isopods (Oniscidea) in 20 families are known from Brazil (Schmalfuss 2003, Souza et al. 2011, Campos-Filho et al. 2014, 2015a, 2015b, 2016, Cardoso et al. 2016; Costa et al. 2014).

The genus *Cylindroniscus* was erected by Arcangeli (1929) to include *C. seurati* from Guayabal, Cuba. The author included the genus in the family Trichoniscidae and described the species only on female specimens. Verhoeff (1938) erected the family Cylindroniscidae on the basis of Arcangeli's description of *C. seurati* without examining any specimens. Vandel (1953) observed that *Cylindroniscus* was similar to *Finaloniscus* Brian, 1951 in the shape of the inner endite of maxillula and the propodus of the pereopods 6 and 7 with a distal tuft of setae on the tergal margin and returned the genus back to Trichoniscidae. Rioja (1957) described a second species of the genus, also on female specimens, *C. maya* from Yucatán, Mexico. Mulaik (1960) erected the genus *Antroniscus* to allocate three new species from Mexico: *A. balamensis* (type species), *A. cavicola* and *A. yucatanensis*. The author included *Antroniscus* and *Cylindroniscus* in Styloniscidae. When describing the *Antroniscus* species he mentioned the presence of male holotypes but no male characters are described; moreover, the illustrations provided do not specify the gender, but probably the pereopod 7 corresponds to a male specimen. Vandel (1965) considered *Antroniscus* as a junior synonym of *Cylindroniscus* mainly based on a note by F. Bonet in Mulaik (1960:118) who mentioned that no characters distinguished *A. balamensis* from *C. maya*. Later, Schutz (1970) revised the genus *Cylindroniscus*, described the new species *C. vallensensis* from Cueva Pinta, San Luis Potosi, Mexico (once more only on female specimens), considered *A. balamensis* as a junior synonym of *C. maya*, and kept the genus in the family Trichoniscidae. While dealing with the terrestrial isopods from Cuba, Vandel (1973) recorded *Cylindroniscus seurati* from Sierra de Gran Piedra, Rio Indio Valley, and maintained the genus in Trichoniscidae. Later Vandel (1981), in his second paper on Cuban Oniscidea, redescribed *C. seurati* on the basis of new material from the Rio Yumurí and Represas cave, and moved the genus to the family Philosciidae. This abscription is certainly incorrect, since it is obvious from the redescription and the figures provided (Figs 22-24) that he misidentified his specimens, certainly belonging to a philosciid, as *C. seurati*.

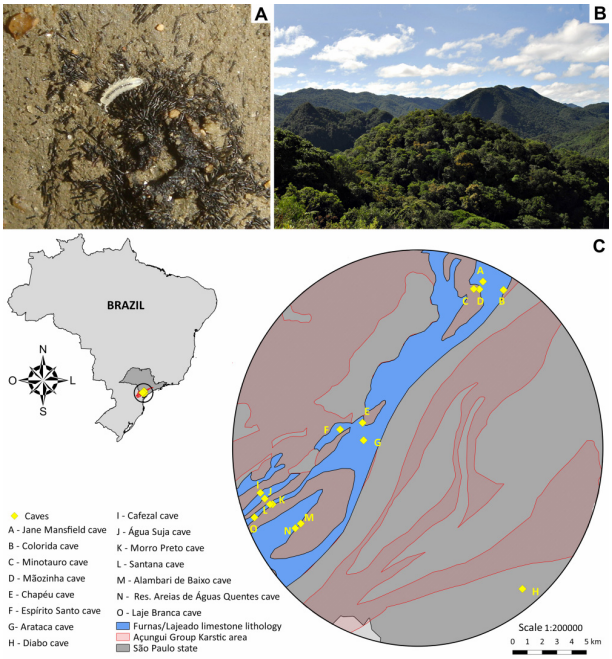

Figure 1. A: Specimen of *Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti n. sp. feeding on guano; B: formation of Parque Estadual Turístico do Alto Ribeira - PETAR; C: Distribution map of *Cylindroniscus flaviae*.

The discovery of a new species of *Cylindroniscus* from the Brazilian caves in the Açungui karst area, Iporanga, state of São Paulo, with the examination of male specimens, enables us to include the genus in the family Styloniscidae. This record considerably enlarges the genus distribution, previously known only from Cuba and Mexico.

Material and methods

Specimens were collected from different caves in southern Brazil. The caves are rich in organic matter such as guano piles (Fig. 1A) and dead wood. The material was stored in 75% ethanol and identifications were based on morphological characters. The species has been illustrated with the aid of a camera lucida mounted on Wild M5 and M20 microscopes. The material used in this study is deposited in the Natural History Museum of the University, Zoology Section 'La Specola', Florence, Italy (MZUF), and the Museu de Zoologia, Universidade de São Paulo, São Paulo, Brazil (MZUSP).

Study Area

Açungui Group, Iporanga, southeastern Brazil

The Açungui Group is located in the southern part of the state of São Paulo and eastern part of the state of Paraná and is defined geologically by the presence of metasediments, deposited in a Pre-Cambrian tectonically active environment. The lithology consists of crystalline limestones, quartzites, phyllites, metaconglomerates and metabasites (Auler & Farrant 1996). This karst region is inserted in the Atlantic, Araucaria Forest and Paraná Forest Provinces, Chacoan Subregion (Morrone 2014), with warm temperate climate, fully humid with hot summer (Cfa) according to the classification by Kottek et al. (2006), and with Atlantic Forest vegetation (Fig. 1B,C) (Colombo & Joly 2010). Two conservation units protect the area; the Parque Estadual Intervales - PEI, and the Parque Estadual Turístico do Alto Ribeira - PETAR. The Caverna do Diabo cave is located in another conservation unit, the Parque Estadual de Jacupiranga, contiguous to the former ones, and represents the northernmost record of the species in the Açungui Group.

Systematic Account

Styloniscidae Vandel, 1952

Cylindroniscus Arcangeli, 1929

Type species. *Cylindroniscus seurati* Arcangeli, 1929 by monotypy.

Diagnosis. Colourless; body with smooth dorsum; pereon with almost parallel sides conferring cylindrical shape; eyes absent; cephalon with suprantennal line, no antennary lobes and no frontal line; pleonites 3-5 with reduced epimera; telson triangular; antennula of three articles with distal article bearing line of stout aesthetascs, often apically cleft; antennal flagellum of 3-5 articles; mandibles with long seta near outer margin, left mandible with two penicils, right mandible with one penicil, sometimes one penicil on molar process;

maxillula outer branch with 3+4 or 5 teeth, inner branch with two stout apical penicils and a long seta; maxilliped endite with apical penicil; pereopod 6 and 7 propodus with distal tuft of setae on tergal margin; uropod exopod and endopod inserted at the same level. Male pleopod 1 endopod of two articles, distal article flagelliform; male pleopod 2 endopod stout, consisting of two articles.

Remarks. The family Styloniscidae differs from Trichoniscidae in the shape of the muscles of the male pleopod 1 and 2 endopods and their attachment to the pleonites (Erhard 1997). The two families also differ in their biogeography, the Styloniscidae mainly having a Gondwanan distribution and the Trichoniscidae a Holarctic distribution (see Vandel 1958, Erhard 1997, Souza et al. 2015). In the Styloniscidae the male pleopod 1 endopod is moved by a pair of long and strong muscles arising from pleonite 1 (Vandel 1952). Erhard (1997) named these muscles as M-48. In the Trichoniscidae the M-48 muscles of the male pleopod 1 endopod are short and connected to the sternite of pleopod 1. In *Cylindroniscus* these muscles are definitely like in Styloniscidae (see Fig. 5A) and the genus should be included in this family rather than in Trichoniscidae.

At present, the family Styloniscidae includes 93 species and 13 genera distributed in four subfamilies: Styloniscinae, Notoniscinae, Kuscheloniscinae and Iuiuniscinae (Schmalfuss 2003, Nunomura 2007, Souza et al. 2015, Taiti & Wynne 2015, Campos-Filho et al. 2014, 2016). According to the body shape without dorsal ribs and pleon narrower than pereon, *Cylindroniscus* belongs to the subfamily Styloniscinae.

Cylindroniscus resembles *Spelunconiscus* Campos-Filho, Araujo & Taiti, 2014 in the shape of the genital papilla and male pleopod 1 and 2 (see Fig. 8A-C in Campos-Filho et al. 2014); it differs in having no frontal lobes on the cephalon, the inner branch of the maxillula with two stout penicils and a long seta instead of three penicils, and in the presence of a distal tuft of long setae on the tergal margin of the propod of the pereopods 6 and 7. This character is present also in the genus *Brackenridgia* Ulrich, 1902, which comprises 9 species from southern United States and Mexico (Schmalfuss 2003, Lewis 2004). This characteristic probably evolved by convergence in *Brackenridgia*, since this genus is presently included in the family Trichoniscidae (Vandel 1965, Schultz 1984, Lewis 2004). However, its family position needs to be carefully checked.

***Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti n. sp.**
Figs 1C, 2-5

Type material examined. *Holotype*: São Paulo: 1 ♂ (MZUSP 34536), Iporanga, Parque Estadual Turístico do Alto Ribeira – PETAR (Turistic State Park Alto do Ribeira), Alambari de Baixo cave, Bairro da Serra, 24º33'25"S 48º39'54"W, 16-20/IX/2009, leg. F. Pellegatti-Franco. *Paratypes*: 2 ♂♂, 11 ♀♀: (MZUSP 34537), 3 ♂♂, 4 ♀♀ (MZUF 9654), same data as holotype; 1 ♀ (MZUSP 34538), same locality as holotype, 02/X/2012, leg. M.E. Bichuette; 2 ♀♀ (MZUSP 34539), Iporanga, Minotauro cave, 15º17'43"S 46º19'14"W, 26-30/III/2009, leg. F. Pellegatti-Franco; 1 ♂, 1 ♀ (MZUSP 34540), Iporanga, Parque Estadual Intervales – PEI (Intervales State Park), Bocaina/Lajeado, Jane Mansfield cave, 24º16'2"S, 48º26'42"W, 26-30/III/2009, leg. F. Pellegatti-Franco; 1 ♀ (MZUSP 34541), Iporanga, PEI, Bocaina/Lajeado, Mãozinha cave, 24º16'22"S 48º26'56"W, 14-16/IX/2009, leg. F. Pellegatti-Franco; Iporanga, PETAR, Colorida cave, 24º16'25"S 48º25'11"W, 26-30/III/2009, leg. F. Pellegatti-Franco: 1 ♂ (MZUSP 34542), 1 ♀ (MZUSP 34543); Iporanga, PETAR, Caboclos I, Chapéu cave, 24º26'5"S 48º35'25"W, 26-30/III/2009, leg. F. Pellegatti-Franco: 2 ♂♂ (MZUSP 34544), 1 ♀ (MZUSP 34545); 2 ♂♂, 1 ♀ (MZUSP 34546), Iporanga, Caboclos II, Espírito Santo cave, 24º26'34"S 48º37'3"W, 26-30/III/2009, leg. F. Pellegatti-Franco; Iporanga, PETAR, Caboclos II, Arataca cave, 24º27'24"S 48º25'23"W, 8-13/XI/2009, leg. F. Pellegatti-Franco: 1 ♂, 2 ♀♀ (MZUSP 34547), 1 ♂, 1 ♀ (MZUF 9655); São Paulo: Eldorado, Jacupiranga, Diabo cave, 24º27'53"S 48º35'2"W, 16-20/IX/2009, leg. F. Pellegatti-Franco: 5 ♂♂, 13 ♀♀, 3 juv. (MZUSP 34548), 2 ♂♂, 3 ♀♀ (MZUF 9657); Iporanga, PETAR, Santana, Cafezal cave, 24º31'11"S 48º42'50"W, 13-20/IV/2009, leg. F. Pellegatti-Franco: 5 ♀♀ (MZUSP 34549), 3 ♂♂, 4 ♀♀ (MZUF 9658); Iporanga, PETAR, Santana, Água Suja cave, 24º31'36"S 48º42'31"W, 13-20/IX/2009, leg. F. Pellegatti-Franco: 2 ♂♂ (MZUSP 34550), 1 ♀ (MZUSP 34551), 2 ♂♂ (MZUF 9656); 1 ♂, 1 ♀ (MZUSP 34552), Iporanga, PETAR, Santana, Morro Preto cave, 24º32'0.6"S 48º41'57"W, 13-20/IV/2009, leg. F. Pellegatti-Franco; 1 ♂, 3 ♀♀, 1 juv. (MZUSP 34553), Iporanga, PETAR, Santana cave, 24º32'0.6"S 48º42'8"W, 13-20/IX/2009, leg. F. Pellegatti-Franco; 1 ♀ (MZUSP 34554), Iporanga,

PETAR, Laje Branca cave, 24º32'58"S 48º43'16"W, 2/VIII/2013. leg. M.E. Bichuette; 1 ♀ (MZUSP 34555), Iporanga, Ressurgência das Areias de Águas Quentes cave, 24º33'45"S 48º40'18"W, 29/IX/2012, leg. M.E. Bichuette.

Description. Maximum length: ♂, 2 mm; ♀, 3 mm. Colourless body. Dorsal surface of cephalon and pereon minutely granulated, pleon smooth (Fig. 2A). Dorsal scale-setae tricorn-shaped in middle segments (Fig. 2B) and ovoidal on lateral margins (Fig. 2C). Cephalon (Fig. 2D, E) with no antennary lobes; profrons with suprantennal line bent downwards medially Eyes absent. Posterior corners of pereonites 1 and 2 right-angled, of

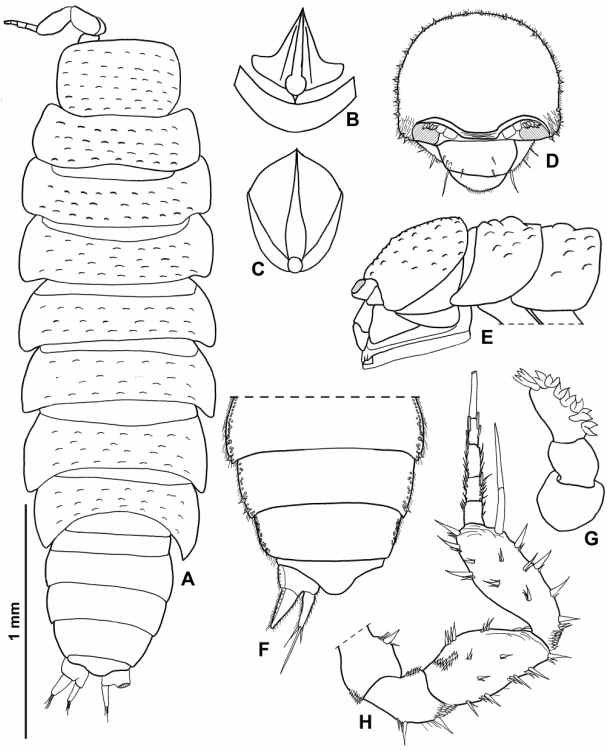

Figure 2. *Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti n. sp. Female paratype: A: habitus. Male paratype: B: dorsal scale-seta; C: lateral scale-seta; D: cephalon, frontal view; E: cephalon and pereonites 1 and 2, lateral view; F: pleonites 3-5, telson and uropod; G: antennula; H: antenna.

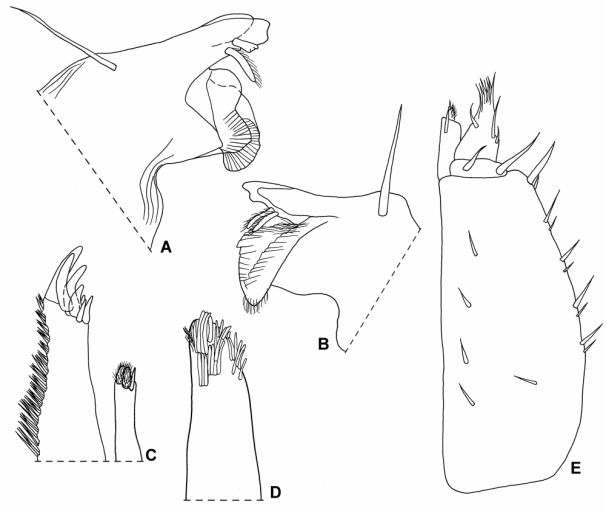

Figure 3. *Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti n. sp. Male paratype: A: left mandible; B: right mandible; C: maxillula outer endite; D: maxilla; E: maxilliped.

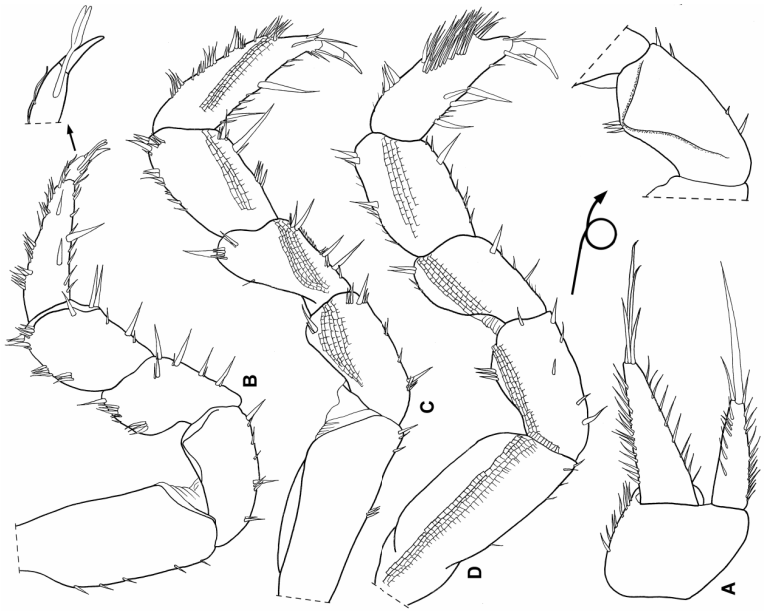

Figure 4. *Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti n. sp. Male paratype: A: uropod; B: pereopod 1; C: pereopod 6; D: pereopod 7.

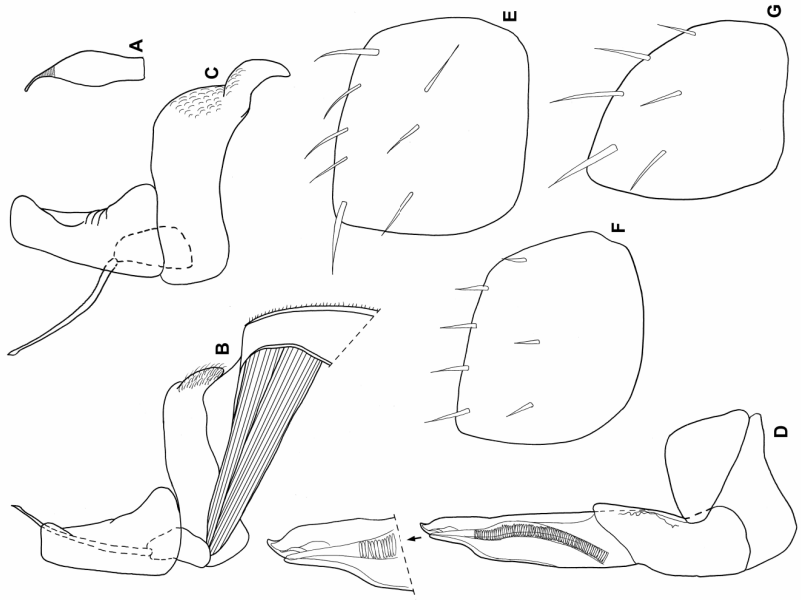

Figure 5. *Cylindroniscus flaviae* Campos-Filho, Araujo & Taiti n. sp. Male paratype: A: genital papilla; B: pleonite1 and pleopod 1; C: pleopod 1; D: pleopod 2; E: pleopod 3 exopod; F: pleopod 4 exopod; G: pleopod 5 exopod.

pereonites 3–7 progressively more acute (Fig. 2A). Pleonites 3–5 epimera with gland pores along margins (Fig. 2F). Telson (Fig. 2F) almost 4 times as wide as long, with slightly concave sides and broadly rounded apex. Antennula (Fig. 2G) with distal article slightly longer than second and first, and bearing seven short aesthetascs along inner margin and two at apex, all aesthetascs apically cleft. Antenna (Fig. 2H) with fifth article of peduncle as long as flagellum, bearing distal strong seta as long as flagellum; flagellum of four articles subequal in length, apical organ longer than distal article of flagellum. Mandibles, maxillula, maxilla and maxilliped as in Fig. 3A-E). Grooves and scales for water conductive system on ischium, merus, carpus and propodus of pereopod 6 (Fig. 4C), and on basis, ischium, merus, carpus of pereopod 7 (Fig. 4D). Uropod (Fig. 4A) exopod slightly

longer than endopod.

Male: Pereopods 1-6 (Fig. 4B) without any sexual modifications. Pereopod 7 (Fig. 4D) ischium with sternal margin slightly convex; propodus with tergal margin inflated subapically. Genital papilla (Fig. 5A) enlarged on median portion, apical part narrow and elongated. Pleopod 1 (Fig. 5B, C) exopod subtriangular, outer margin concave, distal part rounded and directed outwards; endopod slightly longer than exopod, basal article short, flagelliform distal article almost three times longer than basal one. Pleopod 2 (Fig. 5D) exopod triangular; endopod of two articles, thickset, second article almost twice longer than first, distal part narrower. Pleopod 3 exopod (Fig. 5E) very large, covering most of pleopod 2, quadrangular, bearing eight long setae in two rows. Pleopod 4 exopod (Fig. 5F) quadrangular, bearing seven long setae in two rows. Pleopod 5 exopod (Fig 5G) triangular, slightly longer than wide, bearing six long setae in two rows, outer margin concave.

Etymology. The new species is named after Dr Flávia Pellegatti-Franco, biospeleologist from São Paulo, Brazil, who collected most of the specimens.

Remarks. *Cylindroniscus flaviae* n. sp. is readily distinguishable from all the other species in the genus by the granulated dorsal surface of the cephalon and pereon (vs smooth and setose). It also differs in the number of the antennular aesthetascs (nine vs four in *C. seurati*, eight in *C. yucatanensis*, six in *C. cavivola* and *C. vallesensis*). In *C. maya* there are eight to ten aesthetascs on the antennula but they have apices entire instead of cleft. The male pleopod 1 and 2 of the new species seem also characteristic but a comparison with the other species is not possible since their male characters are not known.

Cylindroniscus flaviae n. sp. is widely distributed in several caves of the Açungui Group (Fig. 1C) which are not geologically connected (Bichuette & Trajano 2003). Considering its wide distribution in caves that are isolated, this species can be regarded as a troglophile rather than a troglobiont, and in all probability the species dispersed through endogean habitats. The caves where the new species occurs are inserted in conservation units, which provide them a legal protection (Campos-Filho et al. 2014, Fernandes et al. 2016).

Acknowledgements. We are grateful to Profs Marcos Tavares and Maria José from MZUSP for assisting with depositing material; Mr Diego M. von Schimonsky for providing the map; CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) for the scholarship granted to ISC-F (PDE 204468/2014-0), Productivity Fellowship to PBA, and for grants to MEB; ISE-CNR (Consiglio Nazionale delle Ricerche, Istituto per lo Studio degli Ecosistemi, Florence, Italy) for hosting ISC-F during his Postdoctoral fellowship; FAPESP (Fundação de Apoio à Pesquisa do Estado de São Paulo) for financial support to MEB for collecting the material; and ICMBIO (Instituto Chico Mendes de Conservação da Biodiversidade) and Fundação Florestal do Estado de São Paulo for collecting permissions granted to MEB.

References

Arcangeli, A. (1929): Isopodi terrestri raccolti in Cuba dal Prof. F. Silvestri. Bollettino del Laboratorio di Zoologia Generale e Agraria del Regio Istituto Superiore Agrario di Portici 23: 129-148.

Auler, A.S., Farrant, A.R. (1996): A brief introduction to karst and caves in Brazil. Proceedings of the University of Bristol Spelaeological Society 20:187-200.

Bichuette, M.E., Trajano, E. (2003): A population study of epigean and subterranean *Potamolithus* snails from southeast Brazil (Mollusca: Gastropoda: Hydrobiidae). Hydrobiologia 505(1): 107-117.

Brandt, J.F. (1833): Conspectus Monographiae Crustaceorum Oniscodorum Latreillii. Byulleten moskovskogo Obshchestva Ispŷtateleĭ Prirodŷ 6: 171-193, pl. 4.

Brian, A. (1951): Descrizione di un nuovo genere di trichoniscide raccolto in una grotta ligure da Mario Franciscolo (isopodo cavernicolo). Bollettino della Società Entomologica Italiana 81: 22-25.

Campos-Filho, I.S., Araujo, P.B., Bichuette, M.E., Trajano, E., Taiti, S. (2014): Terrestrial isopods (Crustacea: Isopoda: Oniscidea) from Brazilian caves. Zoological Journal of the Linnean Society 172: 360-425.

Campos-Filho, I.S., Mise, K.M., Sessegolo, G.C. (2015a): A new species of *Trichorhina* Budde-Lund, 1908 (Isopoda: Oniscidea: Platyarthridae) from Paraná caves, southern Brazil. Nauplius 23(2): 112-119.

Campos-Filho, I.S., Taiti, S., Araujo, P.B. (2015b): Taxonomic revision of the genus *Benthana* Budde-Lund, 1908 (Isopoda: Oniscidea: Philosciidae). Zootaxa 4022: 1-73.

Campos-Filho, I.S., Bichuette, M.E., Taiti, S. (2016): Three new species of terrestrial isopods (Crustacea, Isopoda, Oniscidea) from Brazilian caves. Nauplius 24: e2016001.

Cardoso, G.M., Campos-Filho, I.S., Araujo, P.B. (2016): The genus *Dubioniscus* Vandel, 1963 (Oniscidea, Dubioniscidae) with descriptions of two new species from Brazil. Tropical Zoology 29(3): 111-133.

Colombo, A.F., Joly, C.A. (2010): Brazilian Atlantic Forest *lato sensu*: the most ancient Brazilian forest, and a biodiversity hotspot, is highly threatened by climate change. Brazilian Journal of Biology 70(3, suppl.): 697-708.

Costa, S.L.N, Campos-Filho, I.S., Araujo, P.B. (2014): New species and new records of *Benthana* Budde-Lund, 1908 (Isopoda: Oniscidea: Philosciidae) from southern Brazil. Papéis Avulsos de Zoologia 54(13): 169-176.

Erhard, F. (1997): Das pleonale Skelet-Muskel-System und die phylogenetisch-systematische Stellung der Familie Mesoniscidae (Isopoda: Oniscidea). Stuttgarter Beiträge zur Naturkunde, Serie A 550: 1-70.

Fernandes, C.S., Batalha, M.A., Bichuette, M.E. (2016): Does the cave environment reduce functional diversity? PLoS ONE 11(3): e0151958.

Kottek, M., Grieser, J., Beck, C., Rudolf, B., Rubel, F. (2006): World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift 15(3): 259-263.

Lewis, J.J. (2004): *Brackenridgia ashleyi*, a new species of terrestrial isopod from Tumbling Creek Cave, Missouri (Isopoda: Oniscidea: Trichoniscidae). Proceedings of the Biological Society of Washington 117(2): 176-185.

Morrone, J.J. (2014): Biogeographical regionalization of the Neotropical Region. Zootaxa 3782(1): 1-110.

Mulaik, S. (1960): Contribución al conocimiento de los isópodos terrestres de México (Isopoda, Oniscoidea). Revista de la Sociedad Mexican de Historia Natural 21: 79-292.

Nunomura, N. (2007): Terrestrial isopod crustaceans from Hachijo Island, Izu Islands, middle Japan. Bulletin of the Toyama Science Museum 30: 17-36.

Rioja, E. (1957): Estudios Carcinológicos XXXVI. Descripción y studio de una especie nueva del género *Cylindroniscus* (Isópodo triconíscido) de Yucatán. Anales del Instituto de Biología, Universidad de México 28: 267-278.

Schmalfuss, H. (2003): World catalog of terrestrial isopods (Isopoda: Oniscidea). Stuttgarter Beiträge zur Naturkunde 654: 1-341.

Schultz, G. (1970): *Cylindroniscus vallesensis* sp. nov.: description with review of genus (Isopoda, Trichoniscidae). Transactions of the American Microscopical Society 89: 407-412.

Schultz, G. (1984): *Brackenridgia sphinxensis* n. sp. from a cave with notes on other species from Arizona and California (Isopoda, Oniscoidea). Southwestern Naturalist 29(3): 309-319.

Souza, L.A., Araújo, J.P., Campos-Filho, I.S. (2011): The genus *Trichorhina* Budde-Lund in Brazil, with description of seven new species (Isopoda, Oniscidea, Platyarthridae). Iheringia, Série Zoologia 101(3): 239-261.

Souza, L.A., Ferreira, R.L., Senna, A.R. (2015): Amphibious shelter-builder Oniscidea species from the New World with description of a new subfamily, a new genus and a new species from Brazilian Cave (Isopoda, Synocheta, Styloniscidae). PLoS One 10(5): e0115021.

Taiti, S., Wynne, J.J. (2015): The terrestrial Isopoda (Crustacea, Oniscidea) of Rapa Nui (Easter Island), with descriptions of two new species. Zookeys 515: 27-49.

Ulrich, C. (1902): A contribution to the subterranean fauna of Texas. Transactions of the American Microscopical Society 23: 83–100.

Vandel, A. (1952): Les trichoniscides (Crustacés - isopodes) de l'hémisphère austral. Leur place systématique, leur intérêt biogéographique. Mémoires du Muséum National d'Histoire Naturelle, Serie A 6: 1-116.

Vandel, A. (1953): Remarques systématiques, morphologiques et biogéographiques sur un groupe de Trichoniscidae nord-atlantiques (Crustacés; isopodes terrestres). Bulletin du Muséum National d'Histoire Naturelle, Paris, 2e Serie, 25: 368-375.

Vandel, A. (1965): Les "Trichoniscidae" cavernicoles (Isopoda terrestria; Crustacea) de l'Amérique du Nord. Annales de Spéléologie 20: 347-389.

Vandel, A. (1973): Les isopodes terrestres et cavernicoles de l'île de Cuba. In: Orghidan, T., Núñez Jiménez, A., Botosaneanu, L., Decou, V., Negrea, Ş., Viña Bayés, N. (eds), Résultats des expéditions biospéologiques cubano-roumaines à Cuba. Bucharest: Editura Academiei Republicii Socialiste România. pp. 153-188

Vandel, A. (1981): Les isopodes terrestres et cavernicoles de l'île de Cuba (second mémoire). In: Orghidan, T., Núñez Jiménez, A., Decou, V., Negrea, Ş., Viña Bayés, N. (eds), Résultats des Expéditions biospéologiques cubano-roumaines à Cuba. Bucharest: Editura Academiei Republicii Socialiste România. 3: 35-76.

Verhoeff, K. W. (1938): Weltstellung der Isopoda terrestria, neue Familien derselben und neues System. Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere 71: 253-264.