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A new troglobitic *Pseudochthonius* (Pseudoscorpiones: Chthoniidae) from Minas Gerais State, south-east Brazil

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Abstract

A new pseudoscorpion species of the genus *Pseudochthonius* Balzan, 1892 is described from a limestone cave of the Bambuí geomorphological group in southeast Brazil. This new species is only known from a single cave in a karst region with more than two hundred caves. It may be threatened by pasture, gas extraction, large scale exotic *Eucalyptus* plantations, and small hydroelectric power plants. The new species should be classified as critically endangered (CR). However, this species is regarded as data deficient data (DD), to fit on the different criteria of the IUCN Red List. That indicates the need for more studies on the Presidente Olegário area due to the occurrence of this new species and other specialized subterranean fauna.

Keywords: cave dwelling • new species • Presidente Olegário • taxonomy

Introduction

The Brazilian pseudoscorpion fauna comprises 176 species in 15 families (Harvey 2013; Schimonsky & Bichuette 2019b; Benavides *et al*. 2019; Viana & Ferreira 2020; Assis, Schimonsky & Bichuette 2021) of which the family Chthoniidae is represented in Brazil by 30 valid species in eleven genera (*Austrochthonius* Chamberlin, 1929a, *Lagynochthonius* Beier, 1951, *Pseudochthonius* Balzan, 1892, *Tyrannochthonius* Chamberlin, 1929a, *Lechytia* Balzan, 1892, *Compsaditha* Chamberlin, 1929a, *Cryptoditha* Chamberlin & Chamberlin 1945, *Heterolophus* Tömösváky, 1884, *Neoditha* Feio, 1945, *Soroditha* Chamberlin & Chamberlin, 1945, and *Tridenchthonius* Balzan, 1887) (Harvey 2013; Benavides *et al*. 2019). In the last decade, only seven new pseudoscorpion species have been described from Brazil: *Pseudochthonius ramalho* Assis, Schimonsky & Bichuette, 2021 (Chthoniidae), *Maxchernes kapinawai* Bedoya-Roquelme, Tizo-Pedroso, Barbier & Lira 2021, *Spelaeochernes popeye* Schimonsky & Bichuette, 2019a (Chernetidae); *Spelaeobochica iuiu* Ratton, Mahnert & Ferreira, 2012, *Spelaeobochica goliath* Viana, Souza & Ferreira, 2018, *Spelaeobochica mahnerti* Viana & Ferreira, 2020 (Bochicidae); and *Iporangella orchama* Harvey, Andrade & Pinto-da-Rocha, 2016 (Feaellidae). Since Mahnert (2001) no new chthoniid species was reported until recently, when *P. ramalho* was described, although this is a family of abundant and common pseudoscorpions in all tropical forest habitats and are often found in caves.

The genus *Pseudochthonius* is characterized by the presence of coxal spines on coxae I and II, the absence of an intercoxal tubercle, and usually strongly curved fingers of the pedipalp chela (Muchmore 1986). Among other genera that also occur in Brazil, *Austrochthonius* (Chthoniini) and the genera *Lagynochthonius* and *Tyrannochthonius* (both Tyrannochthoniini) differ from *Pseudochthonius* by the presence of coxal spines exclusively on coxa II and the chelal characteristics, i.e. the dentition. Moreover, *Tyrannochthonius* and *Lagynochthonius* have a single, spine-like seta on the prolateral side of the palpal chela near the base of the fixed finger, but in *Lagynochthonius* the seta is smaller. To date, *Pseudochthonius* includes 31 species (Harvey 2013; Mahnert, Sharaf & Aldawood 2014; Assis, Schimonsky & Bichuette 2021), from South and Central America (seven countries), sub-Saharan central Africa (five countries), and the Middle East in the Arabian Peninsula (one country). Of these, ten species occur in Brazil, eight of which are endemic, with five occurring inside caves and three considered troglobites: *P. ramalho*, *P. biseriatus* Mahnert, 2001, and *P. strinatii* (Beier, 1969) (Mahnert 2001; Harvey 2013; Assis, Schimonsky & Bichuette 2021). In addition to these three Brazilian troglobites, there are two other troglobitic species: *P. arubensis* Wagenaar-Hummelinck, 1948 from Aruba, and *P. troglobius* Muchmore, 1986 from Mexico. In Brazil, the genus occurs widely throughout caves and forest systems across the country, in four different biogeographical provinces (Atlantic, Caatinga, Cerrado, and Parana Forest Provinces) (Schimonsky & Bichuette 2019b).

In this paper, we describe *Pseudochthonius olegario* n. sp., a new troglomorphic species which is found in a single cave of the Bambuí geomorphological group, in Presidente Olegário municipality, state of Minas Gerais. Like other troglobitic *Pseudochthonius*, this species lacks eyes or eyespots and has attenuated appendages. We also discuss the conservation status and threats to the new species.

Material and methods

The holotype and allotype are lodged in the Museu de Zoologia da Universidade de São Paulo (MZUSP, curator: Ricardo Pinto-da-Rocha) and a female paratype is lodged in the Laboratório de Estudos Subterrâneos, Universidade Federal de São Carlos (LES, curator: Maria Elina Bichuette). The specimens were prepared by immersing them in 85% lactic acid at room temperature for one week. They were examined by preparing temporary slide mounts with 10 mm coverslips supported by sections of nylon fish line, with a Nikon SMZ660 stereomicroscope and a Leica DMLS compound microscope and illustrated with the aid of a camera lucida. Some images were taken with a Leica DFC 295 video camera attached to a Leica M205C with a

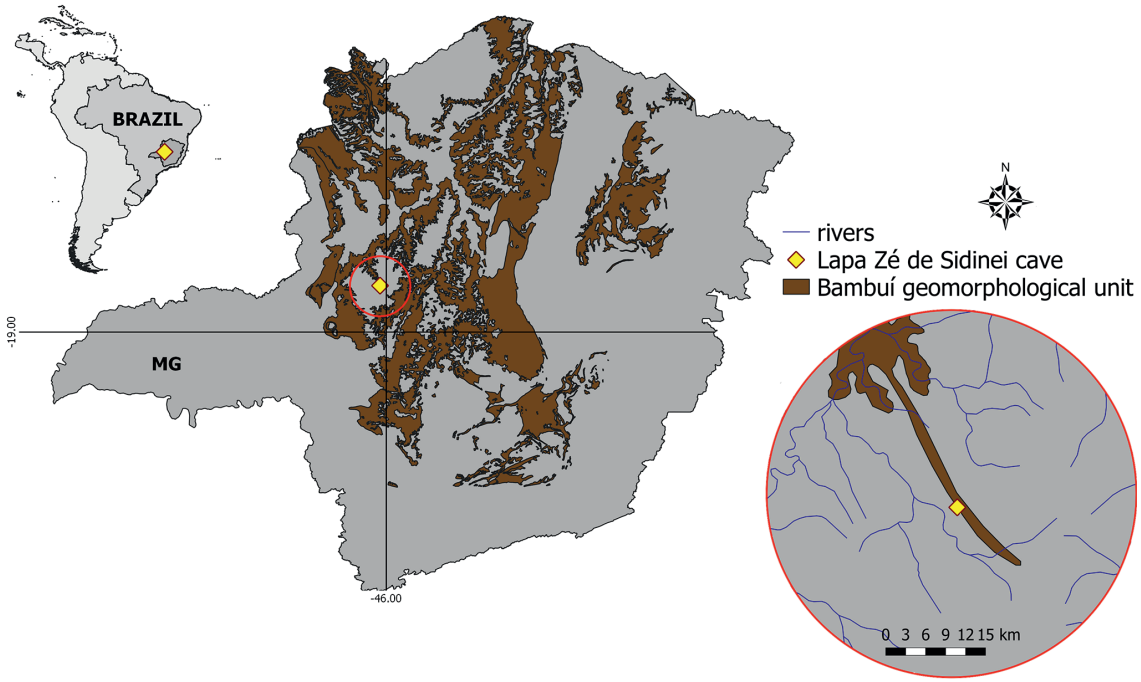

Fig. 1: Known occurrence of *Pseudochthonius olegario* n. sp., Lapa Zé de Sidinei cave, central-west region in Minas Gerais state, Brazil.

Planapo 1.0× objective, and figures were produced from stacks of images using LAS (Leica Application Suite) v3.7. Measurements were taken in millimetres (mm) at the highest possible magnification and using an ocular graticule. After study, the specimens were cleaned in water and returned to 70% ethanol with the dissected parts in the same glass vial, separated by pieces of cotton. The terminology and measurements mostly follow Chamberlin (1931) but that of the pedipalps, legs, and trichobothria follows Harvey (1992) and Judson (2018) and, for the chelicerae, Judson (2007). The ratios given are length/width, except in the chela and its hand, where length/depth is used, as in Mahnert (2001). The description is based both on males and females unless stated otherwise. The map was produced with the software QGis 3.4 (QGis Open-Source Geospatial Foundation), and the coordinates were obtained in the field using a GPS Garmin GPSMap 60CSx and they are presented in decimal degrees and datum WGS84.

Study area. The Lapa Zé de Sidinei cave is situated in the Presidente Olegário municipality, central western Minas Gerais state, southeastern Brazil (Fig. 1) and is part of a karst area named the Bambuí geomorphological group (Rubbioli *et al*. 2019). The region is situated in the Cerrado (savanna-like vegetation), according to Ab'Saber (1977) but there are some different vegetation enclaves, like portions of the Atlantic rainforest, especially surrounding watercourses. Biogeographically, it is situated in the Atlantic province (Morrone 2014) (Fig. 2). The climate is classified as sub-warm and semi-humid tropical, with a dry season that lasts four to five months (Nimer 1989) and, according to the Köppen-Geiger Climate Classification, it is Cwa (Santana, Silva & Silva 2009).

Chthoniidae Daday, 1889

Chthoniinae Daday, 1889

Pseudochthonius Balzan, 1892

Chthonius (*Pseudochthonius*) Balzan, 1892: 546.
Pseudochthonius Chamberlin, 1929b: 173–179.
Chthonius (*Sigmodactylus*) Hadži 1930: 140 (synonymized by Judson 1992: 2).

Type species: *Chthonius* (*Pseudochthonius*) *simoni* Balzan, 1892, by original designation.

Pseudochthonius olegario Schimonsky n. sp. (Figs. 3–5)

Type material: Holotype male. BRAZIL: Atlantic province, Lapa Zé de Sidinei cave, Galena village, Presidente Olegário municipality, Minas Gerais State, 18.30156°S 46.09462°W, 850 m, datum WGS84, on a rock block, 16 April 2014, T. Zepon, L. A. Resende, G. Damasceno (MZSP76522) (Fig. 1). Allotype (female): same locality as holotype, 10 July 2019, T. Zepon, J. E. Gallão, M. E. Bichuette, G. C. Rabello (MZSP76523). Paratype (female): same data as allotype (LES24872).

Etymology: The species epithet is a noun in apposition taken from the municipality of the type locality, Presidente Olegário, which harbours many caves and a diverse subterranean fauna.

Diagnosis: This species most closely resembles other Brazilian species of *Pseudochthonius* that lack eyes, *P. strinatii*, *P. biseriatus*, and *P. ramalho*, but differs from them as follows: *P. olegario* n. sp. has 25–31 teeth on the fixed chelal finger (33–43 in *P. strinatii*, 37–41 in *P. biseriatus*,

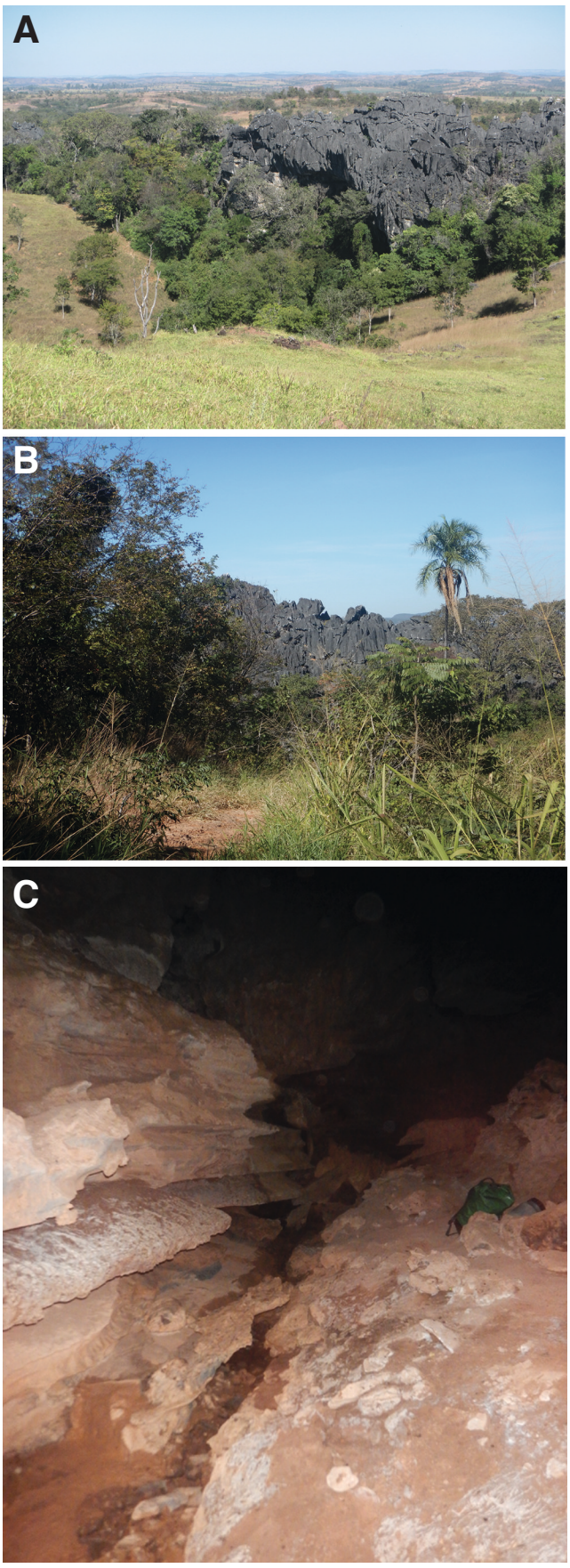

Fig. 2: Views of the Presidente Olegário region, showing the karst, the difference in vegetation preserved around the karst, and pasture on the surroundings. **A** top view; **B** bottom view, near the cave entrance; **C** view of the inside of the Lapa Zé de Sidinei cave, known occurrence of *Pseudochthonius olegario* n. sp., in Minas Gerais state, Brazil. Photos: Jonas Eduardo Gallão (A), Maria Elina Bichuette (B–C).

31–33 in *P. ramalho*), without microdenticles on the fixed pedipalpal finger (2 present in *P. ramalho*), rallum with 7 blades (8 in *P. strinatii*, 9 in *P. biseriatus*), heterodentate chelal teeth on the fixed finger (homodentate in *P. strinatii*), eyes or eyespots absent (eyespots present in *P. strinatii* and *P. ramalho*), and 4 setae on tergites I–II (2 setae in *P. biseriatus*). From other cave species of *Pseudochthonius*, *P. ramalho* differs from *P. ricardoi* Mahnert, 2001, due to the presence of 2 eyespots, 43 teeth on fixed chelal finger and 4 tergal setae on tergites III–V (6 on *P. olegario* n. sp.); *P. gracilimanus* Mahnert, 2001 differs from *P. olegario* n. sp. due to the presence of 2 small eyes, 23–26 teeth on the fixed chelal finger and 4 tergal setae on tergites III–V. Also, it differs from the other eyeless *Pseudochthonius* species, *P. arubensis*, by the number of coxal spines on coxa I (2–3) and coxa II (3–4) (4 on coxa I and 5 on coxa II in *P. olegario* n. sp.) and rallum with 6 blades. It differs from *P. troglobius* by the homodentate chelal teeth on the fixed finger, with 65 teeth, the quite different aspect, number and arrange of the coxal spines and the presence of one small coxal spine on coxa III, and the rallum with 8 blades. Regarding the position of trichobothrium *ist*, closer to *esb* than to *est*, *P. olegario* n. sp. has the ratio *ist-est*/*ist-esb* = 2.49. (3.0 in *P. strinatii*, 1.78–2.10 in *P. biseriatus*, 1.98 in *P. ricardoi*, 1.22 in *P. gracilimanus*, 2.4 in *P. arubensis*, 4.71 in *P. ramalho*, 1.72 in *P. galapagensis* Beier, 1977, 2.37 in *P. tuxeni* Mahnert, 1979, 2.34 in *P. brasiliensis* Beier, 1970 and 2.06 in *P. orthodactylus* Muchmore, 1970. *P. troglobius* has trichobothrium *ist* halfway between *est-esb* (1.0).

Remarks: Besides *P. olegario* n. sp., five other species of *Pseudochthonius* have been considered troglobites (*P. troglobius*, *P. biseriatus*, *P. strinatii*, *P. ramalho*, and *P. arubensis*), of which *P. troglobius* is the most specialized one for cave life, especially regarding the appendage elongations (i.e. chelal length 1.73 mm *v*. 1.30 mm in *P. biseriatus*), so it is the biggest species in the genus. However, *P. biseriatus* has, proportionally, the most elongated chela in this genus (ratio length/depth 6.88–8.68), followed by *P. troglobius* (7.86). *Pseudochthonius olegario* n. sp. is proportionally less elongated than *P. troglobius* but has its proportions proximally to *P. strinatii* and *P. ramalho*. Considering the South America group of *Pseudochthonius*, the new species is more like those species where the trichobothrium *ist* is more basal on the fixed chelal finger (*P. brasiliensis*, *P. strinatii*, *P. ramalho*, *P. ricardoi*, *P. tuxeni*, *P. orthodactylus*, and *P. biseriatus*). Despite that, the new species has the distal teeth on fixed chelal fingers well-spaced. In addition, the new species differs from *P. biseriatus* by the number of tergal setae on tergites I and II, and the number of rallum setae and their proportions.

Description of holotype male: Body yellowish-brown especially on the carapace, chelicera, and pedipalps, integument pale, appendages slender and weakly sclerotized. Troglomorphic.

Carapace (Fig. 4A,C) reticulate, subquadrate, slightly longer than broad (♂ 1.24×), strongly constricted posteriorly; medial part of anterior margin medially prominent and dentate, with a smooth pointed epistome. The anterior

Fig 3: *Pseudochthonius olegario* n. sp., holotype male in dorsal view. Scale bar = 0.5 mm. Photo: Luciana Bueno.

margin is slightly convex and the posterior margin slightly concave. Eyes or eyespots absent. With 18 macrosetae arranged 6: 4: 4: 2: 2; preocular setae smaller than others; 4 lyrifissures anteriorly and other 2 posteriorly.

Chelicera (Fig. 4D,F) (♂ 2.12×) hand with five setae, seta *vb* short, with two dorsal lyrifissures and one ventral. Fixed finger with 10 teeth proximally reduced in size. Movable finger with an isolated subapical tooth, with nine teeth proximally reduced in size; spinneret absent; seta *gl* near the base of the movable finger. Rallum with 7 blades (Fig. 4C), with the first (shorter) and the last (longer), shortly pectinate. The other blades are pectinate, with long denticles. Serrula exterior with 15 blades, serrula interior with 14 blades.

Coxal manducatory process with two long setae of equivalent size, pointed forward, pedipalpal coxa with three setae (one distal seta near the anterior margin), without lyrifissures; coxa I with four setae and four dentate coxal spines; II with five setae and five dentate coxal spines (Fig. 4G), III with seven setae and IV with eight setae; intercoxal tubercle absent.

Abdomen chaetotaxy of tergites 4: 4: 4: 4: 6: 6: 6: 6: 6: 4: 4, tergites X and XI each with 2 sublateral tactile setae. Anterior genital operculum (most setae fallen off) (Fig. 4H) with eight marginal and discal setae, genital opening slit-like triangular, with six marginal setae on each side; sternal chaetotaxy III–XI (3) 5 [6+6] 5 (3): (1) 11 (1): 10: 8: 8: 8: 6: 6: 0, sternites V–VIII with lateral setae shortened, sternite X with two submedial tactile setae, anal cone without dorsal setae and with two ventral setae. Sternites VII, IX–X with a medial pore.

Pedipalp (Fig. 5A–D) trochanter 2.0× longer than broad, femur 7.25× longer than broad, patella 1.91× longer than broad, hand 2.23× longer than broad, chela 6.69× longer than deep, movable finger 2.0× longer than hand; femoral chaetotaxy 5:6:4:6:1, with one lyrifissure on the second row between setae 5 and 6, distally. Femur/movable finger 1.0× longer, femur/carapace 1.26× longer, chela/carapace 1.89× longer, chela/femur 1.5× longer. Chela with hand weakly depressed dorsoventrally, proximally at base of hand, very gentle slope (almost flat) between trichobothria *ib*/*isb* and *eb*; width slightly shorter than depth, maximum width slightly proximal to *ib*/*isb*; Fixed finger strongly curved distally, with 31 pointed teeth and with dental canals (with exception of the seven basal ones), five first distal teeth small, dental row reaching up to the total length of the finger. Movable finger shorter than the fixed finger, with 26 retrorse teeth; Trichobothria as in Fig. 5B–D; trichobothrium *ib* and *isb* situated close together medially on dorsum of hand, slightly proximal to base of hand, one lyrifissure (*hb*) aligned in middle of *ib* and *isb*, a little posterior to them; *eb* and *esb* close together, but *eb* slightly external laterally than *esb*, pointed slightly internally, both at base of fixed finger, one lyrifissure (*ha*) aligned with *hb*, on base of fixed finger; *ist* 3.3× nearer to *eb*/*esb* than to *est*; *est* and *it* distomedial and forming a pair, two lyrifissures on middle of fixed finger, *it* slightly more distal than *est*; *et* subdistal and duplex *dx* distal, on point of fixed finger at beginning of curvature, pointed forward; one lyrifissure between *et* and *it*; *b* near movable finger base; distance between *sb*-*st* 2.0× longer than that between *sb*-*b*, with two lyrifissures between *b* and *sb*, one lyrifissure between *sb*-*st*, near *st*, two lyrifissures after *t*, basally positioned; distance between *st*-*t* ~2.5× areolar diameter, *st* distant from *sb*, ~8× than *st*-*t*.

Legs (Fig. 5E–F): Leg I (Fig. 5E) trochanter 1.6× longer than broad, femur 6.0×, patella 4.5×, tibia 4.75×, tarsus

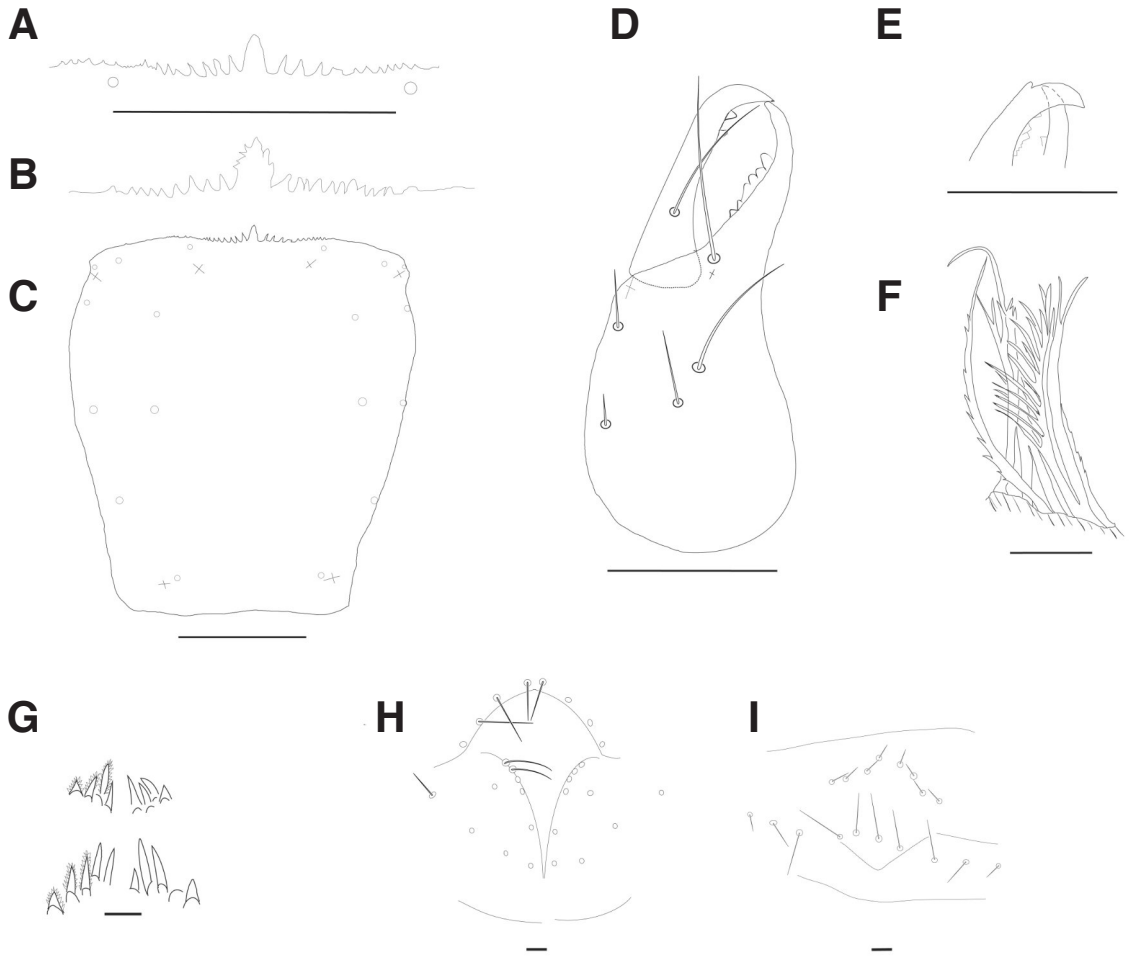

Fig. 4: *Pseudochthonius olegario* n. sp., male holotype (A, C–D, F–H) and female allotype (B, E, I). **A** anterior margin of carapace; **B** same, allotype; **C** carapace; **D** left chelicera; **E** detail of left chelicera, allotype; **F** rallum; **G** coxal spines of coxae I–II; **H** genital opening (most setae fallen off); **I** genital opening, allotype. Scale bars = 0.1 mm (A–E), 0.02 mm (F), 0.016 mm (G–I).

11.3× longer than broad. Leg IV (Fig. 5F) trochanter 1.42× longer than broad, femur+patella 2.87×, tibia 5.3×, basitarsus 4.25×, tarsus 11.3× longer than broad.

Description of female (*allotype, paratype*): As in male holotype, except as below. If differences occur between allotype and paratype, they are stated first for the allotype, then followed by those for the paratype, in parentheses.

Carapace slightly longer than broad (♀ 1.07×), less constricted posteriorly than male; pointed epistome also serrated (Fig. 4B).

Chelicera (♀ 1.95–2.1×) fixed finger with 11 teeth distally to proximally decreasing in size. Small acute spinneret (Fig. 4E).

Coxa I with 2–2 (3–2) dentate coxal spines; coxa II with 4–6 (4–4) dentate coxal spines.

Abdomen anterior genital operculum with eight marginal and discal setae, and posterior genital operculum with ten setae (Fig. 4I). Sternal chaetotaxy III–XI 8: (1)10(1): (2)10(2): 12: 8: 8: 8: 6: 0.

Pedipalp trochanter 1.58–1.66× longer than broad, femur 6.7–6.8× longer than broad, patella 2.15–2.33× longer than broad, hand 2.0–2.13× longer than broad, chela 6.18–6.53× longer than deep, movable finger 1.93–2.0× longer than hand. Movable finger with 34 (35–36) retrorse teeth.

Legs: Leg I trochanter 1.3–1.4× longer than broad, femur 6.14–6.18× longer than broad, patella 4.0–5.2× longer than broad, tibia 5.25–7.0× longer than broad, tarsus 13.0× longer than broad. Leg IV trochanter 1.3–1.4× longer than broad, femur+patella 4.16–4.25× longer than broad, tibia 5.66–5.83× longer than broad, basitarsus 3.8–4.0× longer than broad, tarsus 13.0× longer than broad.

Dimensions: Male holotype (MZSP76522); female allotype (MZSP76523) and female paratype (LES24872) shown in Table 1.

Key to troglobitic *Pseudochthonius*

1 Eyeless, but with eyespots; trichobothrium *ist* at least 3× farther from *est* than from *esb* (ratio *ist-est*/*ist-esb* ≥ 3.0) 2

- Eyeless and without eyespots; trichobothrium *ist* less than 2.5× farther from *est* than from *esb* (ratio *ist-est*/*ist-esb* ≤ 2.5) 3

	Male holotype	Female
Body	1.20	1.58–1.60
Carapace	0.46/0.37	0.44–0.45/0.42
Pedipalp trochanter	0.12/0.06	0.19–0.20/0.12
Pedipalp femur	0.58/0.08	0.67–0.68/0.10
Pedipalp patella	0.23/0.12	0.28/0.12–0.13
Pedipalp chela	0.87/0.13	0.98–0.99/0.15–0.16
Pedipalp hand length	0.29	0.32
Pedipalp movable finger length	0.58	0.62–0.64
Chelicera length/width	0.34/0.16	0.39–0.42/0.20
Movable finger length	0.20	0.20
Leg I trochanter	0.08/0.05	0.13–0.14/0.10
Leg I femur	0.30/0.05	0.34–0.35/0.55–0.57
Leg I patella	0.18/0.04	0.20–0.21/0.04–0.05
Leg I tibia	0.19/0.04	0.21/0.03–0.04
Leg I tarsus	0.34/0.03	0.39/0.03
Leg IV trochanter	0.10/0.07	0.13–0.14/0.11–0.12
Leg IV femur+patella	0.46/0.16	0.50–0.51/0.12
Leg IV tibia	0.32/0.06	0.34–0.35/0.06
Leg IV basitarsus	0.17/0.04	0.19–0.20/0.05
Leg IV tarsus	0.34/0.03	0.39/0.03

Table 1: *Pseudochthonius olegario* n. sp., type series, measurements (mm).

2 Ratio *ist-est*/*ist-esb* = 4.71; chelal length = 0.82–0.90, pedipalpal patella larger (4.1), pedipalpal femur smaller (4.1); endemic to Gruna do Vandercir cave, Bahia state, Brazil..... *P. ramalho* Assis, Schimonsky & Bichuette, 2021

- Ratio *ist-est*/*ist-esb* = 3.0; chelal length = 0.82–1.06, Pedipalpal patella smaller (2.0), pedipalpal femur larger (5.3–6.1); occurrence in São Paulo, Minas Gerais and Paraná states, Brazil..... *P. strinatii* Beier, 1969

3 Tergites I and II each with 2 setae; *ist-est*/*ist-esb* = 1.78–2.10; chelal length = 1.24–1.39; endemic to Olhos d'Água cave, Minas Gerais state, Brazil..... *P. biseriatus* Mahnert, 2001

- With four setae on tergites I and II; trichobothrium *ist* from halfway between *esb* to *ist* at least 2.0× as far from *est* as from *esb*..... 4

4 Carapace with 20 setae, including four on posterior margin; coxal spines numerous and varied on coxae I and II and including one small spine on coxa III; *ist-est*/*ist-esb* = 1.0; chelal length = 1.73; occurrence at Cueva del Cenote Xtolok, Chichkn Itza, Yucatan, Mexico ..... *P. troglobius* Muchmore, 1986

- Carapace with 18 setae, including two on posterior margin; coxal spines present on coxae I and II, but absent from III; trichobothrium *ist* closer to *esb* than to *est* ($2.40 \leq$ *ist-est*/*ist-esb* ≤ 2.49)..... 5

5 Coxa I with 2–3 spines, coxa II with 3–4 spines; *ist-est*/*ist-esb* = 2.40; chelal length = 0.7; rallum with six blades; occurrence at the cave of Quadirikiri, Aruba..... *P. arubensis* Wagenaar-Hummelinck, 1948

- Coxa I with 4 spines, coxa II with 5 spines; *ist-est*/*ist-esb* = 2.49; chelal length = 0.89–0.99; rallum with seven blades; occurrence at Zé de Sidinei cave, Minas Gerais state, Brazil ..... *P. olegario* n. sp.

Discussion

The region of Presidente Olegário harbours at least 250 caves (Grupo Pierre Martin de Espeleologia, pers. comm.; Zepon & Bichuette 2017). It has no legal protection, even with many threats to this heritage, especially due to damaging activities to the karst and caves, like mining for cement production, gas extraction, large scale *Eucalyptus* plantations, and deforestation for pasture and hydroelectric projects (Campos-Filho *et al*. 2014; Simone 2015; Souza *et al*. 2016; Gallão & Bichuette 2018). There is no information regarding the population size of *P. olegario* n. sp., despite considerable collection effort in six field trips to the area and sampling for invertebrates within seven caves in the region (Zepon & Bichuette 2017). Therefore, this species is regarded as data deficient data (DD), to fit on the different criteria of the IUCN Red List, which indicates that is necessary more studies on this area of Presidente Olegário due to the occurrence of this new species and other specialized subterranean fauna, i.e. the troglobitic amphipod *Hyalella veredae* Cardoso & Bueno, 2014 and the troglophile tricladid *Girardia pierremartini* Souza & Leal-Zanchet, 2016. Despite that, in those other caves, *Pseudochthonius olegario* n. sp. was not found and, so far, only these three individuals were found and sampled, which indicates that this species has a low number of specimens and its extent of occurrence is less than 100 km², fitting both the B1 and B2 criteria and the conditions a and b(iii). So, according to the parameters of the IUCN Red List this new species should be considered Critically Endangered (CR) by the criteria B1ab(iii)+2ab(iii) (IUCN Standards and Petitions Subcommittee 2017).

Diversity of troglobitic pseudoscorpion in Brazil

Pseudochthonius olegario n. sp. is the eleventh species known in this genus and it increases the number of Brazilian troglobitic pseudoscorpions to 20 species (Gallão & Bichuette 2018; Schimonsky & Bichuette 2019b; Assis, Schimonsky & Bichuette 2021) (Table 2).

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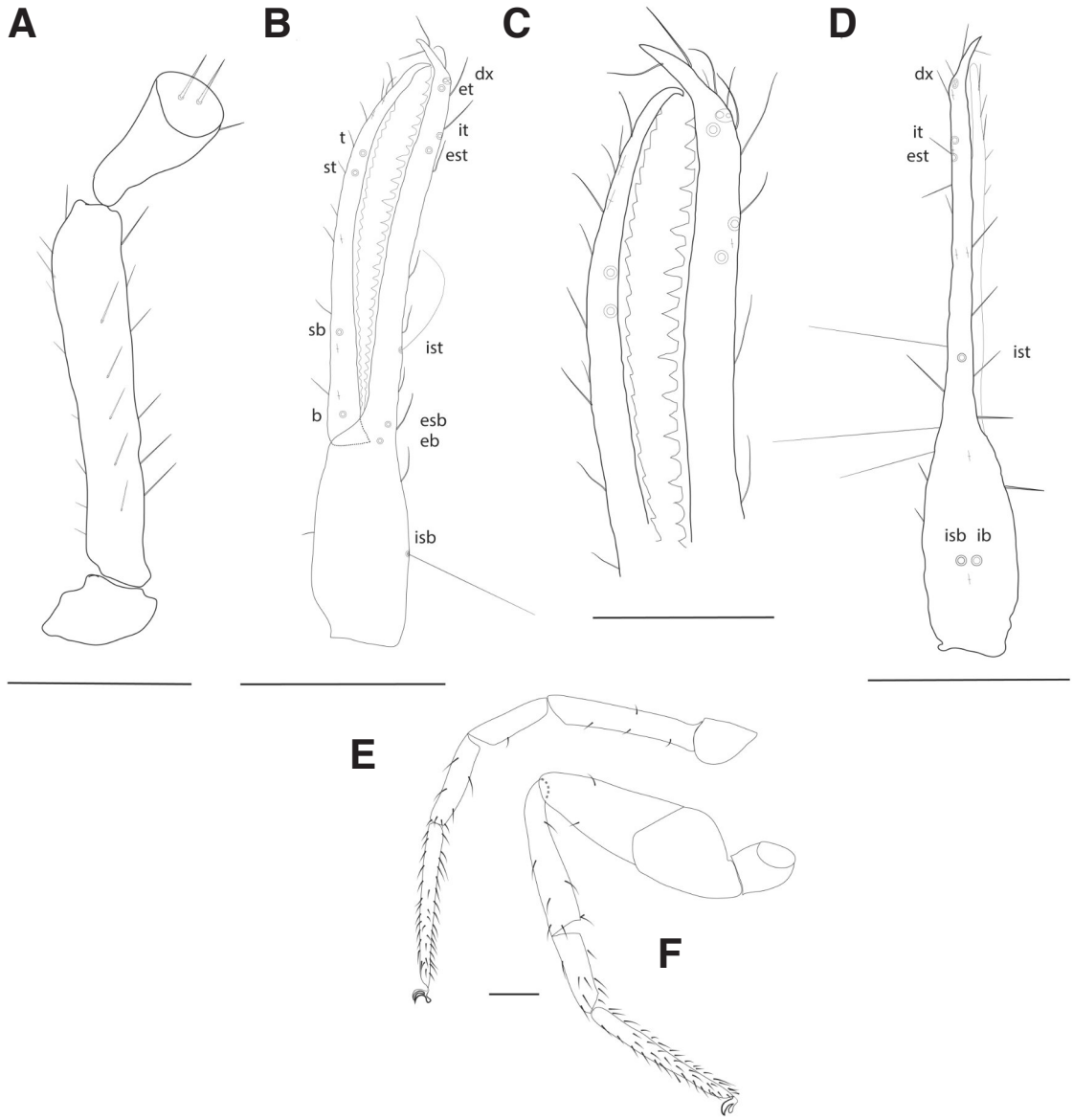

Fig. 5: *Pseudochthonius olegario* n. sp., male holotype. **A** left palpal trochanter, femur, and patella; **B** left chela, retrolateral view, showing trichobothria pattern; **C** detail of left chela; **D** left chela, dorsal view; **E** left leg I; **F** left leg IV. Scale bars = 0.02 mm (A–B, D); 0.01 mm (C, E–F).

tography in Fig. 3, to Leonardo de Assis for the help with drawings and to the Instituto Chico Mendes de Conservação da Biodiversidade for issuing collecting permits. DMVS is also grateful to Laboratório de Acarologia, in IBILCE, UNESP for the use of the space and equipment. We also thank to the two anonymous reviewers for they corrections and comments that certainly improve the text.

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	Type locality (Other records)	Lithology	Karst area
Chthoniidae			
Pseudochthonius strinatii Beier,1969	Areias de Cima cave[1] (Tapagem cave[1], Morro Preto cave[1], Lapa do Medo cave[2], Lapa Vermelha cave[2], Gruta do Rocha cave[3]	Limestone	Açungui, Bambuí-groups
P. biseriatus Mahnert, 2001	Olhos d'água cave[2]	Limestone	Bambuí-group
P. ramalho Assis, Schimonsky & Bichuette, 2021	Gruna do Vandercir cave[4]	Limestone	Bambuí-group
P. olegario n. sp.	Lapa Zé de Sidnei cave[2]	Limestone	Bambuí-group
Bochicidae			
Spelaeobochica allodentatus Mahnert, 2001	Gruta do Impossível cave[4]	Limestone	Una-Irecê-group
S. muchmorei Andrade & Mahnert, 2003	Ressurgência das Areias de Águas Quentes cave[1] (Areias de Cima cave)[1]	Limestone	Açungui-group
S. iuiu Ratton, Mahnert & Ferreira, 2012	Lapa do Baixão cave[4]	Limestone	Bambuí-group
S. goliath Viana, Souza & Ferreira, 2018	Lapa do Baianinho cave[2]	Limestone	Bambuí-group
S. mahnerti Viana & Ferreira, 2020	Velha Nova cave[2]	Limestone	Bambuí-group
Ideoroncidae			
Ideoroncus cavicola Mahnert, 2001	Areias de Cima cave[1] (Alambari de Baixo cave[1])	Limestone	Açungui-group
Chernetidae			
Maxchernes iporangae Mahnert & Andrade, 1998	Alambari de Baixo cave[1] (Águas Quentes cave[1])	Limestone	Açungui-group
Spelaeochernes altamirae Mahnert, 2001	Limoeiro cave[5] (Planaltina cave[5])	Sandstone	Maecuru-formation
S. armatus Mahnert, 2001	Botuverá cave[6] (Botuverá II cave[6])	Limestone	Açungui-group
S. bahiensis Mahnert, 2001	Poço Encantado cave[3] (Lapa do Bode cave[3], Gameleira cave[3], Lapa II cave[3])	Limestone	Una-Irecê and Bambuí-groups
S. dentatus Mahnert, 2001	Água Boa cave[3] (Terra Boa cave[3], Rocha cave[3], Ermidia Paiol do Alto cave[3], Maciel cave[3], Olhos d'Água cave[3], Lacinha cave[3]	Limestone	Bambuí, Açungui, Corumbá-groups
S. dubius Mahnert, 2001	Fazenda da Toca cave[1] (Vista da Cachoeira cave[1], Fazendão cave[1], Bocão cave[1], Córrego do Capão cave[2], Intoxicado cave[2], Lapa do Medo cave[2], Harmonia cave[7], Pitangueiras cave[7], Lago Azul cave[7])	Limestone, sandstone	Corumbá group, Botucatu-formation
S. eleonorae Mahnert, 2001	Sertãozinho de Baixo cave[1] (Ecos cave[8], Qualquer coisa cave[8], Tamboril cave[2], Lapa Vermelha I cave[2], Lapa das Pacas cave[2], Gruta da Dobra cave[2], Guaviral cave[7], Mimoso cave[7], Ametista cave[7], Vale do Prata cave[7], João Arruda cave[7], Curé cave[7], Dona Matilde cave[7], São Miguel cave[7], Santa Maria cave[7], X-Coqueiro cave[7], Abismo do Poço cave[7])	Limestone, Iron ore, Quarzitic, Sandstone	Bambuí group, Corumbá group, Açungui group, Botucatu formation, Quadrilátero Ferrífero formation, Serra-da-Mantiqueira
S. gracilipalpus Mahnert, 2001	Gruta dos Paiva cave[1] (Fóssil Desconhecido cave[1], Jane Mansfield cave[1], Cabeça de Paca cave[1], Minotauro cave[1], Chapéu cave[1], Arataca cave[1], Temimina II cave[1])	Limestone	Açungui-group
S. pedroi Mahnert, 2001	Gruta Milagrosa cave[4] (Califórnia cave[4], Pedra Suspensa cave[4], Toca dos Morcegos cave[4], Cristais cave[4])	Limestone	Bambuí-group, Araripe group
S. popeye Schimonsky & Bichuette, 2019	Toca da Raposa cave[9] (Borboletas cave[4], Presa II cave[4], Casa do Caboclo cave[9], Aventureiros cave[9], Morro do Parafuso cave[4], Zumbi cave[4], Lola cave[4], Fenda do Márcio cave[4], Abismo Aroeira cave[4], Brilhantina cave[4], Presa I cave[4], Fenda da Costura cave[4], Escondidinho cave[4])	Limestone	Canudos supergroup

Table 2: Troglobitic species of Pseudoscorpiones recorded in Brazil. States of [1]São Paulo, [2]Minas Gerais, [3]Paraná, [4]Bahia, [5]Pará, [6]Santa Catarina, [7]Mato Grosso do Sul, [8]Goiás, and [9]Sergipe.

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