

## Article

# A New Genus of Prodidominae Cave Spider from a Paleoburrow and Ferruginous Caves in Brazil (Araneae: Prodidomidae) <sup>†</sup>

Igor Cizauskas <sup>1,\*</sup> , Robson de A. Zampaulo <sup>2</sup> and Antonio D. Brescovit <sup>3</sup> 

<sup>1</sup> Organização de Apoio à Pesquisa da Biodiversidade, OAPBio, Rua Frei Inácio da Conceição, 238, São Paulo CEP 05362-040, São Paulo, Brazil

<sup>2</sup> Gerencia de Licenciamento Ambiental e Espeleologia, Vale S.A., Avenida Doutor Marco Paulo Simon Jardim, Nova Lima CEP 34006-200, Minas Gerais, Brazil; rzampaulo@yahoo.com.br

<sup>3</sup> Laboratório de Coleções Zoológicas, Instituto Butantan, Av. Vital Brasil 1500, São Paulo CEP 05503-900, São Paulo, Brazil; antonio.brescovit@butantan.gov.br

\* Correspondence: i.cizauskas@gmail.com

<sup>†</sup> zoobank: urn:lsid:zoobank.org:pub:76FC167F-81A5-4572-B7EE-6FD4382249E2.

**Abstract:** A new monotypic genus of Prodidominae, *Paleotoca* gen. n., is proposed to include one cave species collected in a paleoburrow and ferruginous caves from Quadrilátero Ferrífero, Minas Gerais, Brazil: *Paleotoca diminus* sp. n. (♂♀). The new genus is closely related to other Neotropical Prodidominae by sharing the classic claw tuft clasper. *Paleotoca* gen. n. is diagnosed by the absence of a dorsal abdominal scutum, a ventral parallel rows of strong spines on the tibia and metatarsus I–II, a lack of a conductor, a discrete median apophysis on the bulb and a bifid retrolateral tibial apophysis in the male palp, a posterior extension that is beak-shaped, and folds of a copulatory duct ventrally visible in the female epigyne. Like other Prodidominae species from caves, *P. diminus* sp. n. is a troglobitic spider with morphological characteristics that indicate specialization to live in subterranean environments, including reduction in cuticular pigments, eye loss, heavy spination and trichobothria.

**Keywords:** subterranean spider; taxonomy; Dionycha



**Citation:** Cizauskas, I.; Zampaulo, R.d.A.; Brescovit, A.D. A New Genus of Prodidominae Cave Spider from a Paleoburrow and Ferruginous Caves in Brazil (Araneae: Prodidomidae). *Taxonomy* **2024**, *4*, 574–586. <https://doi.org/10.3390/taxonomy4030028>

Academic Editor: Peter Michalik

Received: 11 April 2024

Revised: 15 July 2024

Accepted: 22 July 2024

Published: 5 August 2024



**Copyright:** © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

Prodidomidae Simon, 1884 includes small to medium-sized spiders distributed Worldwide [1,2] and is currently represented by 190 species in 23 genera [3]. Only ten genera occur exclusively in the Neotropical region: *Tricongius* Simon, 1893, *Lygromma* Simon, 1893, *Moreno Mello-Leitão*, 1940, *Caudalia* Alayón, 1980, *Chileomma* Platnick, Shadab & Sorkin, 2005, *Chileuma* Platnick, Shadab & Sorkin, 2005, *Chilongius* Platnick, Shadab & Sorkin, 2005, *Brasilomma* Brescovit, Ferreira & Rheims, 2012, *Paracymbiomma* Rodrigues, Cizauskas & Rheims, 2018 and *Indiani* Rodrigues, Cizauskas & Lemos, 2020.

Among Neotropical spiders, seven species are considered subterranean: *Lygromma gertschi* Platnick & Shadab, 1976, known from limestone caves in Jamaica, *L. anops* Peck & Shear, 1987, from volcanic caves in the Galapagos Islands and from Brazilian caves *Paracymbiomma caecus* and *P. bocaina* Rodrigues, Cizauskas & Rheims, 2018 from ferruginous caves of the Pará State, and *Tricongius ybyguara* Rheims & Brescovit, 2004, from a limestone cave, *Brasilomma enigmatica* Brescovit, Ferreira & Rheims, 2012, from ferruginous, limestone and quartzitic caves, and *Indiani gaspar* Rodrigues, Cizauskas & Lemos, 2020 from limestone caves of the Minas Gerais.

In this paper we describe a new monotypic genus of Prodidominae, *Paleotoca* gen. n. to include one new species found exclusively in a paleoburrow and ferruginous caves from Brazil. The new genus belongs to a clade of Neotropical genera that has a classic claw tuft clasper as a non-homoplasious synapomorphy [4].

## 2. Material and Methods

The examined material is deposited in the collection of the Instituto Butantan, São Paulo, Brazil (IBSP, curator: A.D. Brescovit). Morphological observations and illustrations were made under a Leica MZ165C stereomicroscope with a camera lucida. Format of descriptions and terminology follow [4]. All measurements are in millimeters. The number and arrangement of spines follow [5]. Leg measurements are listed as total length (femur, patella, tibia, metatarsus, tarsus). Positions of embolar insertion are given according to clock positions, based on the left palp in ventral view. Pictures were taken using a MC170HD camera mounted on a Leica S8APO stereomicroscope. Extended focal range images were composed with the Leica Application Suite, version 4.0. Scanning electron micrographs (SEM) were taken with a FEI Quanta 250 scanning electron microscope from the Laboratório de Biologia Estrutural at the Instituto Butantan. Material used for SEM was dehydrated through a series of graded ethanol (80% to 100%), dried by critical-point drying method, mounted on metal stubs, and sputter coated with gold. Distribution maps were prepared using the Geographic Information System (GIS) software program Quantum Gis version 3.28.3. Geographical coordinates of caves were obtained from the National Speleological Information Registry (CANIE) on the CECAV/ICMBio (National Center for Research and Conservation of Caves, Brazil) website.

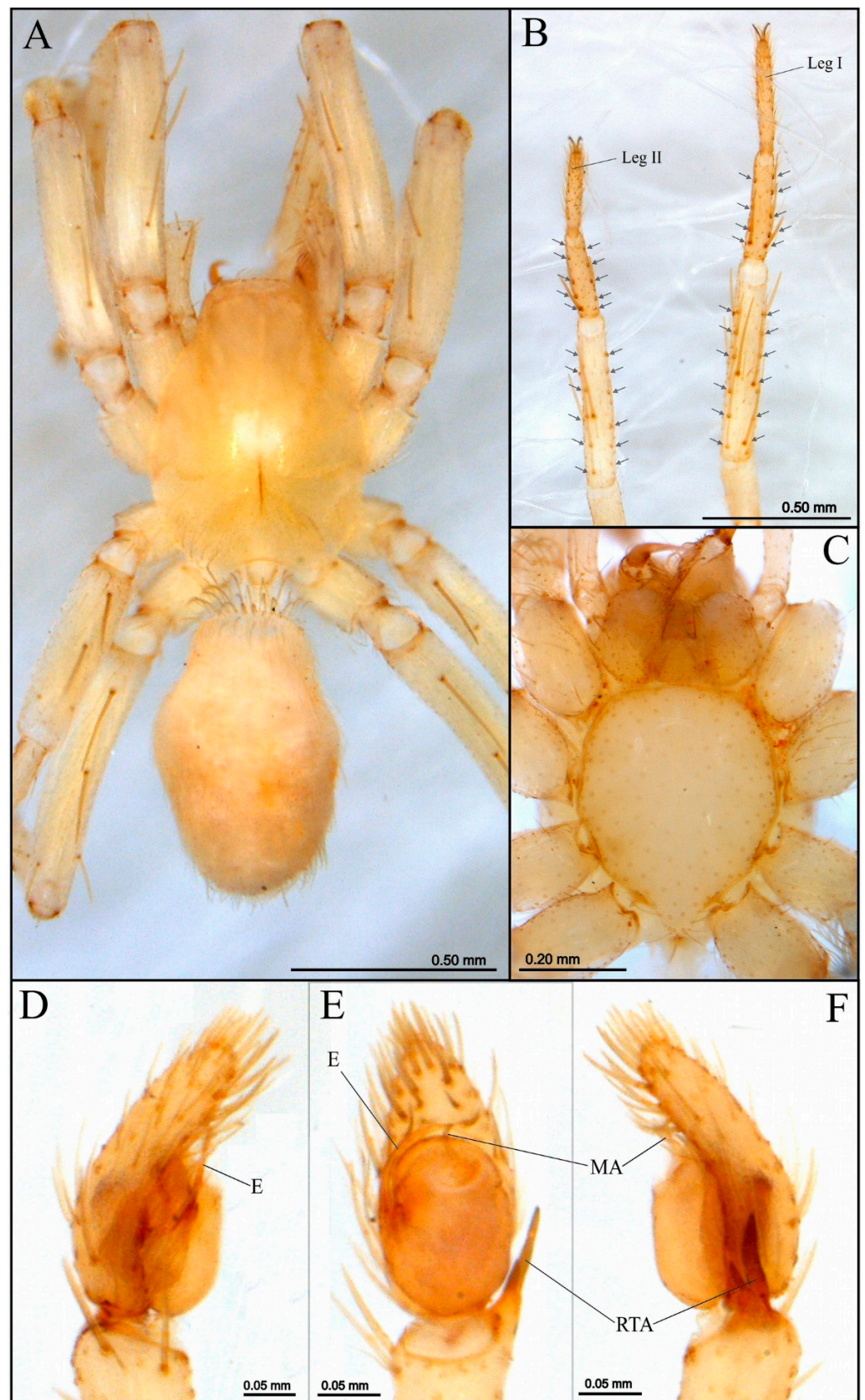
Abbreviations used throughout the text: **A**—atrium; **ALS**—anterior lateral spinnerets; **CD**—copulatory duct; **CO**—copulatory opening; **Cy**—cylindrical gland spigot; **d**—dorsal; **E**—embolus; **EF**—epigynal field; **FD**—fertilization duct; **MA**—median apophysis; **MaAm**—major ampullate gland spigot; **MiAm**—minor ampullate gland spigot; **p**—prolateral; **Pcb**—paracymbium; **PEs**—promarginal escort seta; **PEx**—posterior extension of epigynum; **Pi**—piriform gland spigot; **PIIn**—postepigastric invaginations; **PLS**—posterior lateral spinnerets; **PMS**—posterior median spinnerets; **PS**—primary spermathecae; **PRk**—promarginal rake seta; **PWh**—promarginal whisker seta; **r**—retrolateral; **RTA**—retrolateral tibial apophysis; **SS**—secondary spermathecae; **v**—ventral; **Wh**—cheliceral whisker seta.

## 3. Taxonomy

### 3.1. *Paleotoca* gen. n.

**Etymology.** The generic name is the union of the “Paleo” prefix from the Greek adjective “palaios”, which means “old”, with “toca”, a word probably originating from the Tupi language “oka”, which means house. “Paleotoca” is a subterranean shelter excavated by extinct megafauna mammals. The generic name is feminine.

**Diagnosis.** *Paleotoca* gen. n. differs from the other genera of Prodidomidae due to the male palp lacking a conductor, a discrete median process in the bulb, originating in the central subapical region of the tegulum (Figure 1E,F and Figure 4A,B), a bifid tibial process with two projections, a long posterior one and an anterior one smaller, ventrally directed, and inserted on the retrolateral surface of the tegulum (Figure 1F and Figure 4B); females are distinguished by the inconspicuous atrium in a posterior position, a posterior extension of the beak-shaped epigyne (Figures 5A, 6C and 7F), and folds of the copulatory duct visible ventrally (Figures 5A and 6C). It resembles the genera *Moreno*, *Chileomma*, *Brasilomma*, *Nopyllus*, and *Indiani* due to the presence of a ventral parallel rows of strong spines on tibia and metatarsus I–II and also the absence of scopules (Figure 1B; see Rodrigues et al., 2020 [4], fig. 1C), but with a unique number of spines. As in *Nopyllus*, *Paleotoca* gen. n. has a rounded sternum, which is wider around coxae II, a very narrow posterior end, and a projection between coxae IV (see Ott, 2014 [6], fig. 27, Rodrigues & Rheims, 2020 [4], fig. 111), but with the projection between coxae IV being longer and more pointed (Figure 1C). And as in *Moreno*, the male palp has an oval cymbium with an embolus in the apical position (Figure 1E, Figures 3C and 4A; see Platnick et al., 2005 [7], figs. 15, 19, 23 and 27). However, *Paleotoca* gen. n. has prolateral filiform embolus and a retrolateral tibial bifid apophysis, which is divided by a slit (Figure 1E,F, Figures 3D and 4B; see Platnick et al., 2005 [7], figs. 16, 20, 24 and 28).



**Figure 1.** *Paleotoca diminus* sp. n., (A–F) male (IBSP 264705). (A) Habitus, dorsal view; (B) legs I–II, ventral view; (C) sternum, ventral view; left palp (D) prolateral view; (E) ventral view; (F) retrolateral view. Abbreviations: E—embolus; MA—median apophysis; RTA—retrolateral tibial apophysis.

### 3.2. *Paleotoca gen. n.*

**Description.** Carapace and legs pale yellow, abdomen weakly pigmented (Figure 1A). Carapace longer than wide, narrower at cephalic region. Fovea present as a narrow dark longitudinal line on posterior half of carapace (Figure 1A). Eyes absent (Figures 1A, 2A, 6A and 7A). Chilum present (Figure 7A). Chelicerae with a convex boss, promargin with one teeth and retromargin with five teeth, region proximal to the teeth differentiated in the form of scales (Figures 2B and 7B,C). Endites slightly convergent anteriorly (Figure 1C); serrula present in single row, male three teeth (Figure 2C) and female five teeth (Figure 7E); labium with distal margin similar to basal margin (Figure 1C). Sternum rounded, widest around coxae II, posterior end very narrow and projecting between coxae IV (Figure 1C); precoxal triangles absent. Pedicel with ventral sclerite triangular. Leg formula 4123. Two ventral parallel rows of strong spines on tibia and metatarsus I–II (Figure 1B). Trichobothria present on dorsum of tibia, metatarsi and tarsi III, bothrium with three deep ridges (Figure 8C). Tarsal organ capsulate with elongated drop shape opening, located dorsally on tarsi (Figure 8D). Two pectinate tarsal claws; claw tufts inserted together composed of slightly widened tenent setae (Figures 3A and 8E,F); claws with claw tuft clasper (Figures 3A and 8E). Abdomen oval, longer than wide (Figures 1A and 6A); dorsal scutum absent, dorsum of abdomen anteriorly with long, dark, posteriorly curved setae (Figures 1A and 6A); postepigastric invaginations present (Figure 6C). Six spinnerets; ALS separated from each other by one diameter or more (Figure 6B), one major ampullate gland spigot and four piri-form gland spigots elongated with few associated setae (Figure 2D); PLS and PMS conical and short, PLS larger than PMS (Figure 6B), PMS with one cylindrical gland spigot (Figure 2E) and PLS with one minor ampullate gland spigot (Figure 2F). Female pedipalp with one pectinate claw (Figure 8A,B). Male palp: femur with dorsal posterior spine, two prolateral anterior and one posterior; tibia short with bifid tibial apophysis with two branches, anterior smaller, directed ventrally, posterior long, directed apically, both inserted in a large base on the retrolateral side of the tibiae (Figures 1F and 3D), trichobothria present (Figure 3B), bothrium with four deep ridges (Figure 3B,E,F); cymbium oval without scopula and with one posterior dorsal strong setae and seven or eight ventral apical setae (Figure 1D–F); bulb oval; embolus prolateral, filiform, inserted at 9-o'clock position (Figures 1D and 3C), tapering and curved at the margin of a subapical flattening of the tegulum toward the apical region (Figures 3C and 4A); small median apophysis originating in the subapical central region of the tegulum Figures 1E,F and 4A,B). Epigyne: atrium small and narrow (Figures 6C and 7F), projected posterior extension border shaped medially (Figures 5A, 6C and 7F), folds of copulatory duct ventrally visible (Figures 5A and 6D). Vulva: FD with hyaline part three times longer than sclerotized part closer to CO; PS elongate, roughly five times longer than wide (Figures 5A and 6C); secondary spermathecae absent. (Figures 5B and 6D).

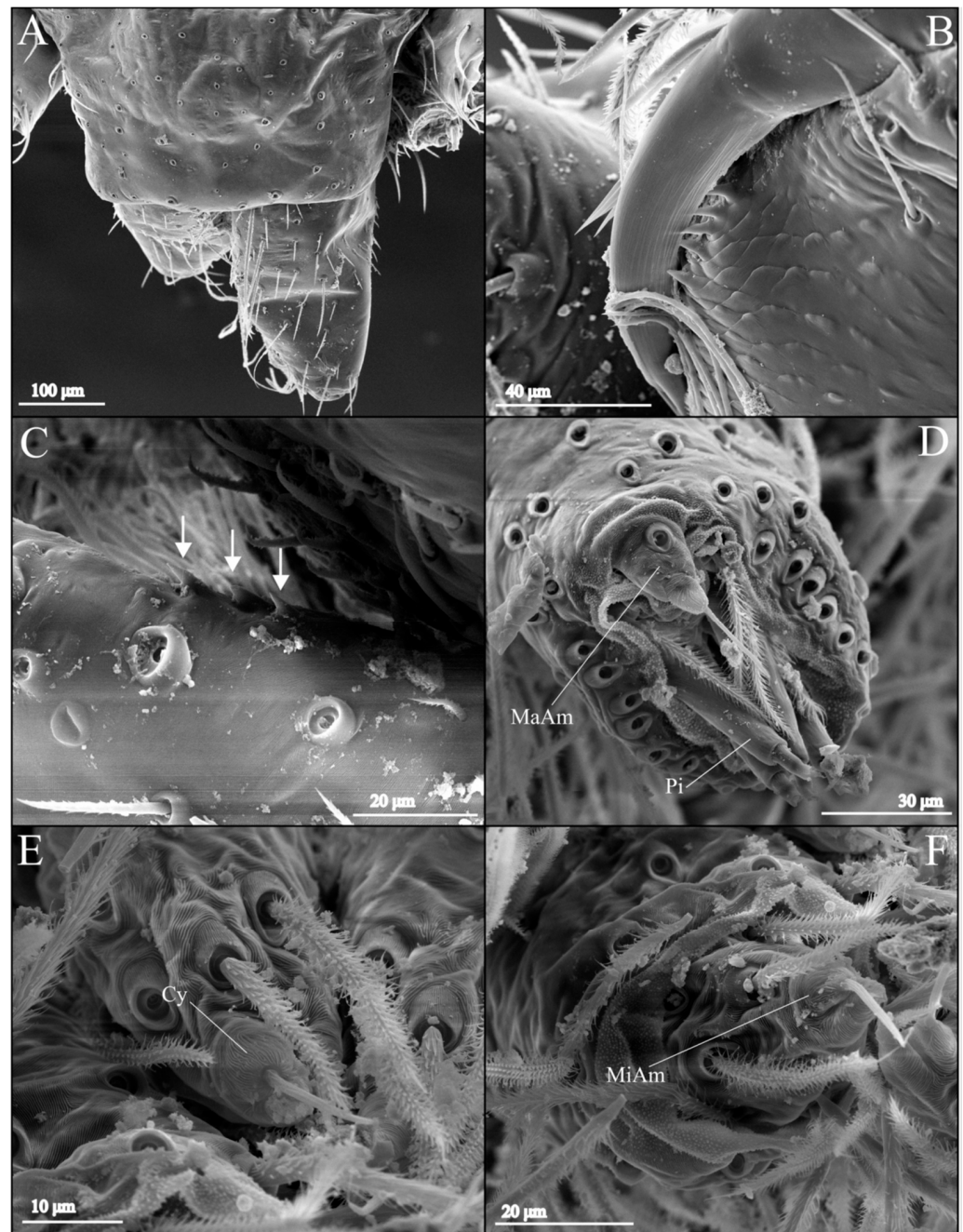
Composition. Monotypic.

### 3.3. *Paleotoca diminias sp. n.*

Figures 1–9 and 11.

**Type material:** **Holotype male** and **female paratype** from Cave AP-0038 (Paleoburrow) [20°01'52" W, 43°40'45" S], Caeté, Minas Gerais, Brazil, 12 February 2012, R. Andrade et al. leg., deposited in IBSP 264705. 1♀, same data as holotype (IBSP 264708), 1♂, same data as holotype, 19–25 July 2008, R. Bessi et al. leg. (IBSP 264704), 2♀, same data as holotype, 31 May to 5 June 2012, R. Bessi et al. leg. (IBSP 264707).

**Etymology.** The specific name “diminias” is the popular Brazilian way to inform that the object in question originates from the State of Minas Gerais “De Minas Gerais”. The specific name is feminine noun.

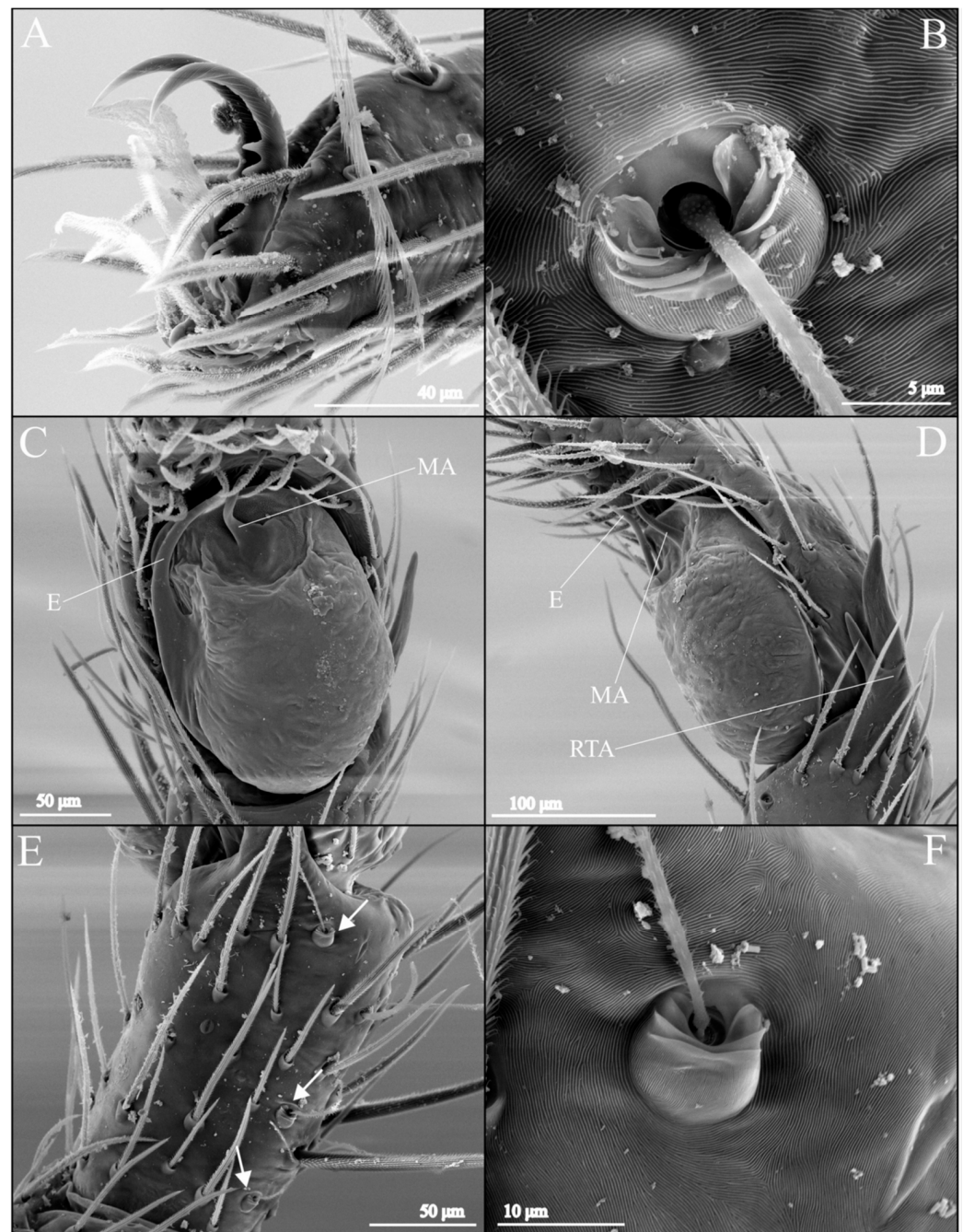


**Figure 2.** *Paleotoca diminus* sp. n., (A–F) male (IBSP 264704). (A) Carapace, dorsal view; (B) chelicerae, retromargin; (C) endites, promargin (arrows indicate teeth); (D) anterior lateral spinneret, detail; (E) posterior median spinneret, detail; (F) posterior lateral spinneret, detail. Abbreviations: Cy—cylindrical gland spigot; MaAm—major ampullate gland spigot; MiAm—minus ampullate gland spigot; Pi—piriform gland spigot.

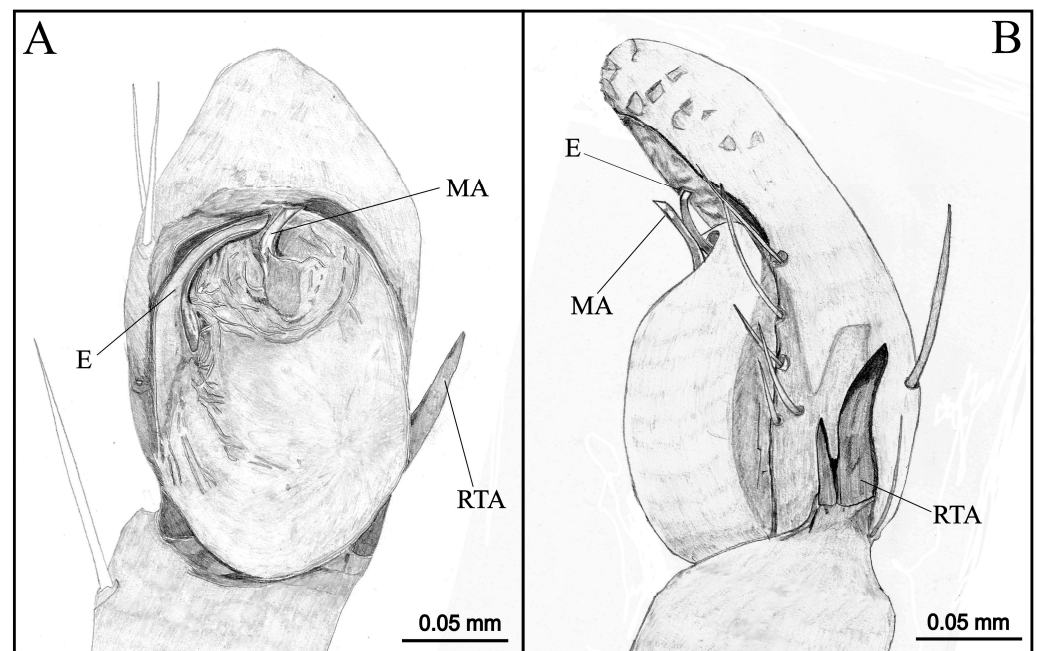
**Diagnosis.** See generic diagnosis.

**Description. Male (holotype).** Cephalothorax pale yellow and depigmented abdomen. Total length: 1.75. Carapace 0.8 long, 0.61 wide; abdomen 0.81 long, 0.51 wide; sternum 0.56 long, 0.43 wide; ALS 0.18 long, 0.07 wide. Eyes absent. Chelicerae 0.17 long. Leg formula 4123; measurements: I: 2.52 (0.72, 0.27, 0.66, 0.46, 0.42); II: 2.26 (0.61, 0.23, 0.53, 0.47, 0.41); III: 2.13 (0.58, 0.21, 0.43, 0.50, 0.40); IV: 2.88 (0.79, 0.25, 0.63, 0.71, 0.50). Leg spination: I—femur d1-1-0-r1, p0-0-1, v0-1-0; tibia v2-1-2-2-1-2-2-2, d-0-1-0; metatarsus v2-2-2-2-2. II—femur d1-1-0-r1; tibia v2-2-1-2-2-2, p-0-0-1-0-0, r0-0-1-0-0; metatarsus v2-2-2-

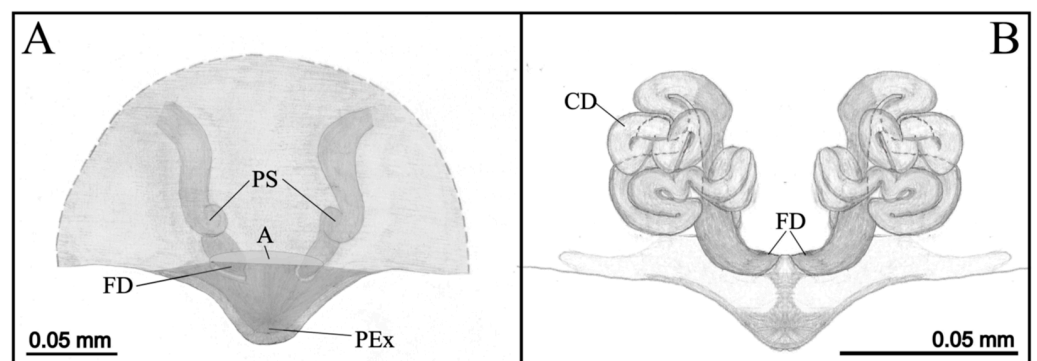
2. III—femur d0-1-0-r1-p1; tibia d0-1-0, p1-0-1, r1-0-1, v0-1-0; metatarsus v2-1p1r-2-1p1r. IV—femur d1-1-0-1r-1p; tibia r1-p1-d1-p1-r1; metatarsus r1-d1-p1-v1-r1-p1. Palp as in generic description (Figure 1D–F and Figure 4A,B).



**Figure 3.** *Paleotoca diminus* sp. n., (A–F) male (IBSP 264704). (A) Leg III, detail of claw, retrolateral view; (B) tricothria, tibia leg III; left palp (C) ventral view; (D) retrolateral view; (E) palpal tibia, retrolateral view (arrows indicate tricothria); (F) tricothria, dorsal view. Abbreviations: E—embolus; MA—median apophysis; RTA—retrolateral tibial apophysis.



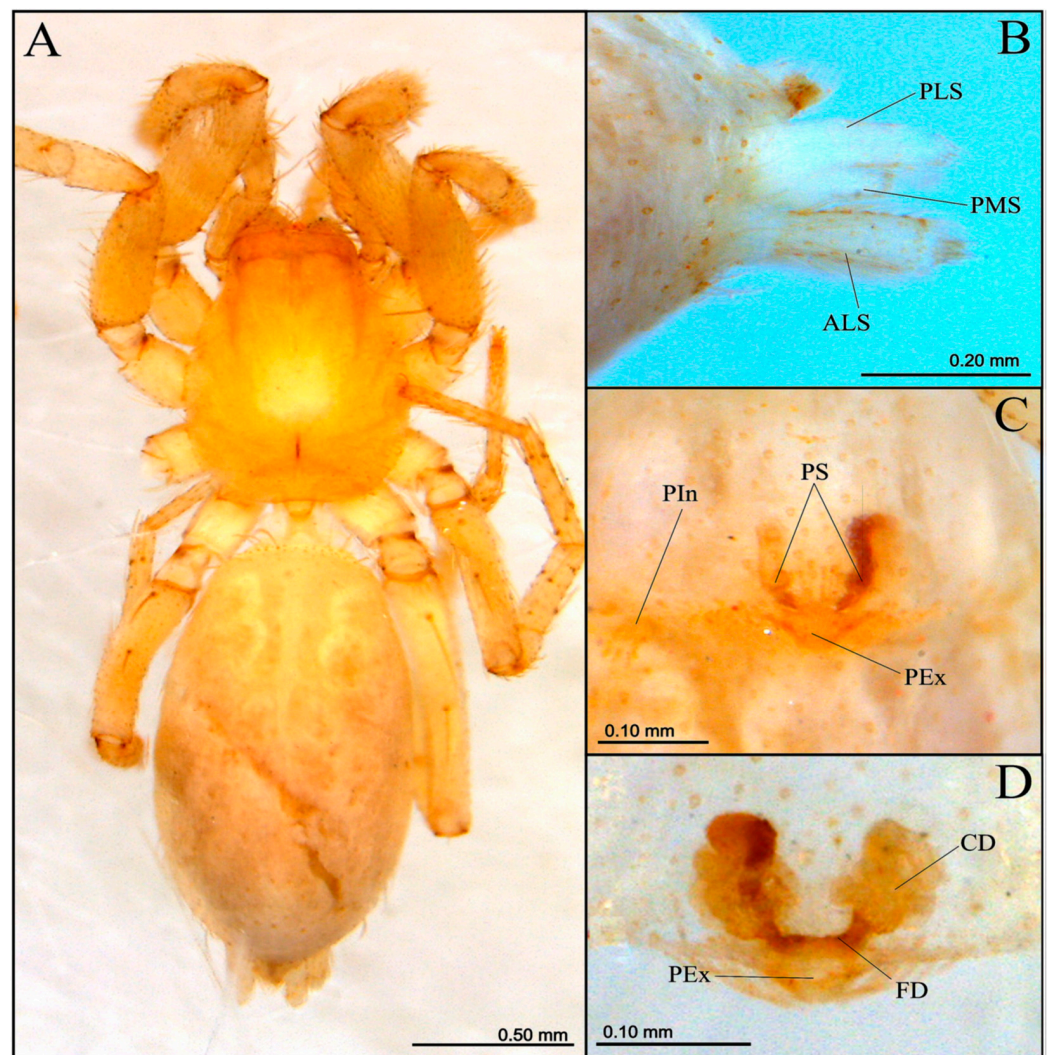
**Figure 4.** *Paleotoca diminus* sp. n., (A,B) male (IBSP 264705), left palp (A) ventral view; (B) retrolateral view. Abbreviations: E—embolus; MA—median apophysis; RTA—retrolateral tibial apophysis.



**Figure 5.** *Paleotoca diminus* sp. n., (A,B) female (IBSP 264705), genitalia (A) epigynum, ventral view; (B) vulva, dorsal view. Abbreviations: A—atrium; FD—fertilization duct; PS—primary spermathecae; CD—copulatory duct; PEx—posterior extension of epigynum.

**Female:** Female (paratype). Cephalothorax pale yellow and depigmented abdomen. Total length: 2.03 Carapace 0.765 long, 0.57 wide; abdomen 1.30 long, 0.62 wide; sternum 0.478 long, 0.414 wide; ALS 0.22 long, 0.065 wide. Eye absent. Chelicerae 0.186 long. Leg formula 4123; measurements: I: 2.12 (0.61, 0.21, 0.58, 0.35, 0.36); II: 2.02 (0.59, 0.24, 0.46, 0.36, 0.37); III: 1.93 (0.54, 0.22, 0.40, 0.42, 0.35); IV: 2.74 (0.67, 0.29, 0.59, 0.62, 0.48). Leg spination: I—femur d1-1-0, p0-0-1; tibia v2-2-2-2-2-2; metatarsus v2-2-2-2-2. II—femur d0-1-0; tibia v2-2-2-2-2-2; metatarsus v2-2-2-2-2. III—femur d0-1-0; tibia d01-0-1-0, p0-1-0-1, r0-1-0-1, v1-0-1-0; metatarsus d0-1-0-1, p0-1-0-1, r0-1-0-1, v0-1-0-1. IV—femur d1-0-1-0; tibia d0-1-0-1, v0-1-0-1; metatarsus v0-0-0-1, r1-0-1-1, p1-1-0-1. Epigynum as in generic description (Figures 5A,B, 6C,D and 7F).

**Other material examined.** BRAZIL, *Minas Gerais*: 1♀, Caeté, Cave AP-0069 [20°00'37" W, 43°40'11" S], 12–21 November 2009, R. Bessi et al. leg. (IBSP 264697); 1♀, Cave AP-0065 [20°01'24" W, 43°41'04" S], 31 May–5 June 2012, R. Bessi et al. leg. (IBSP 264706); 1♀, Mariana, Cave FN-0019 [20°12'28" W, 43°26'19" S] 30 June–1 July 2010, R. Andrade et al. leg. (IBSP 264709); 1♂, Santa Bárbara, Cave APOL-0001 [20°00'35" W, 43°39'56" S], 30 June–8–31 July 2011, R. Bessi et al. leg. (IBSP 264710).

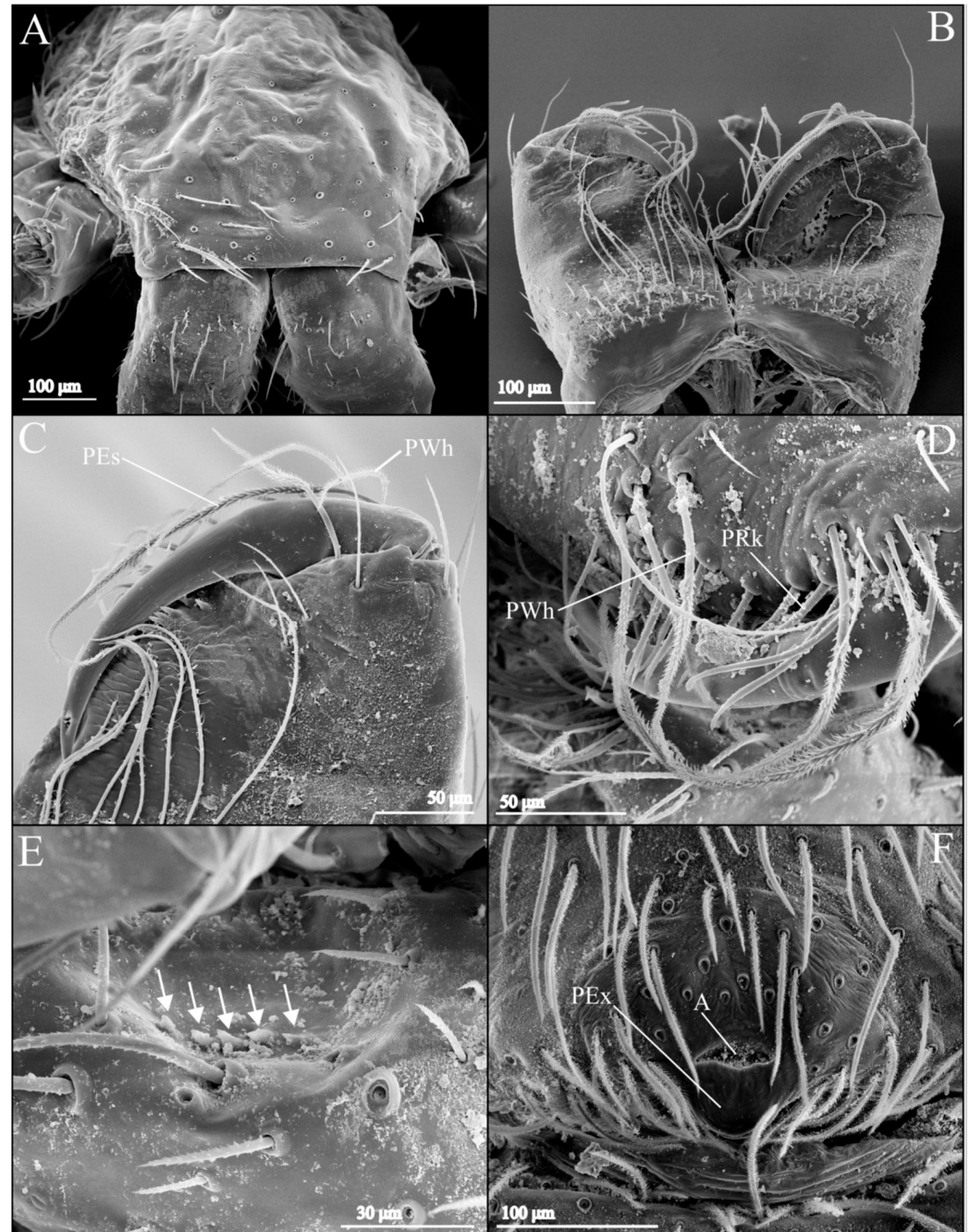


**Figure 6.** *Paleotoca diminus* sp. n., (A–D) female (IBSP 264705), (A) habitus, dorsal view; (B) spinnerets, lateral view; (C) genitalia, ventral view; (D) vulva, dorsal view. Abbreviations: ALS—anterior lateral spinnerets; FD—fertilization duct; CD—copulatory duct; PEx—posterior extension of epigynum; PIn—postepigastric invaginations; PLS—posterior lateral spinnerets; PMS—posterior median spinnerets; PS—primary spermathecae.

**Remarks.** Most of the individuals of *Paleotoca diminus* sp. n. (Figure 9A–D) were collected in a paleoburrow (Cave AP-0038), natural underground cavities of biogenic origin, excavated by extinct megafauna animals, such as giant ground sloths, that lived thousands of years ago [8,9]. It is located at an altitude of 1536 m and the horizontal projection is 345 m, with a difference in level of 6.8 m and an area of 676 m<sup>2</sup> and a volume of 798 m<sup>3</sup>. It is one of the ten largest caves in the world in iron formation [10]. This cave is inserted in the climatic context of the high-altitude tropical type (Cwb), with hot and humid summers and a well-defined dry season [11]. From a phytophysognomic point of view, the area is located on the boundary between the Atlantic Forest and Cerrado biomes where the shrubby rupestrian field, herbaceous rupestrian field on cangas, and semi-deciduous seasonal forest in medium and advanced stages of regeneration can be observed (Figure 10A,B). The cave has sections of conduits in a semicircular shape and walls with uniform surfaces, a morphology that is unusual for caves located in the country's iron formation (Figure 10C,E,F). Additionally, conduits grooves with dimensions ranging from 10 cm to approximately 90 cm in length and approximately 2 cm in thickness are observed (Figure 10D), which are compatible with claw marks from ground sloths [12]. In



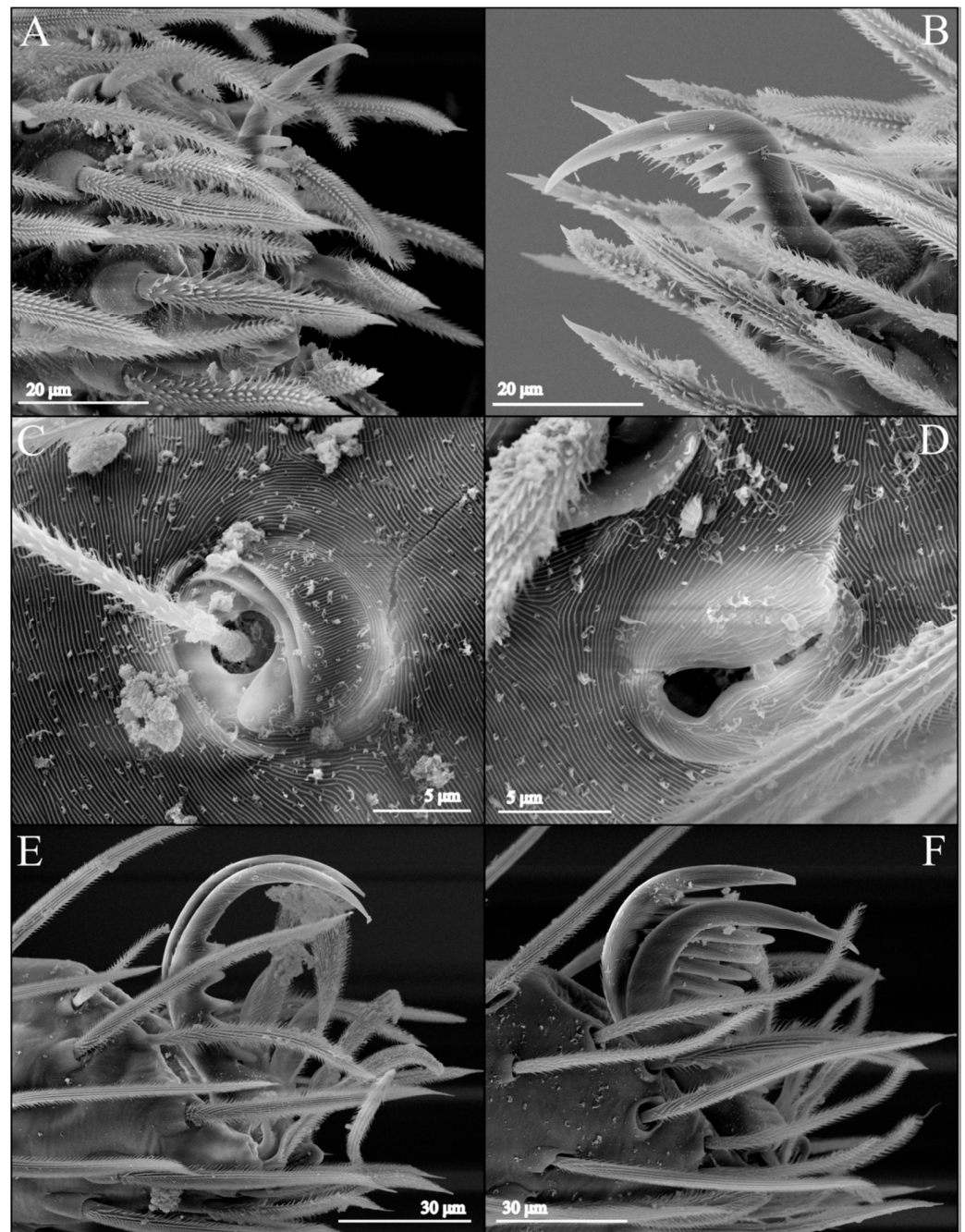
actually, different taxonomic groups were observed in Cave AP-0038 like bats, amphibians, and a high diversity and abundance of invertebrates, including two troglotic spiders: *Tisentnops mineiro* Brescovit & Sánchez-Ruiz, 2016 (Caponiidae) and *Paleotoca diminus* sp. n. (Prodidomidae) and others trogllobiontes.



**Figure 7.** *Paleotoca diminus* sp. n., (A–F) female (IBSP 264705), (A) carapace, dorsal view; chelicerae, (B) ventral view; (C) detail, retromargin; (D) detail, promargin; (E) endites, promargin (arrow indicates teeth); (F) epigine, ventral view. Abbreviations: A—atrium; PEs—promarginal escort seta, PEx—promarginal rake seta, PRk—promarginal rake seta, PWh—promarginal whisker seta.

The specimens of *Paleotoca diminus* sp. n. were always located on the floor or under rocks in aphotic areas with high humidity. It is a troglotic spider with reduction in cuticular pigments, eye absent, heavy spination and trichobothria.

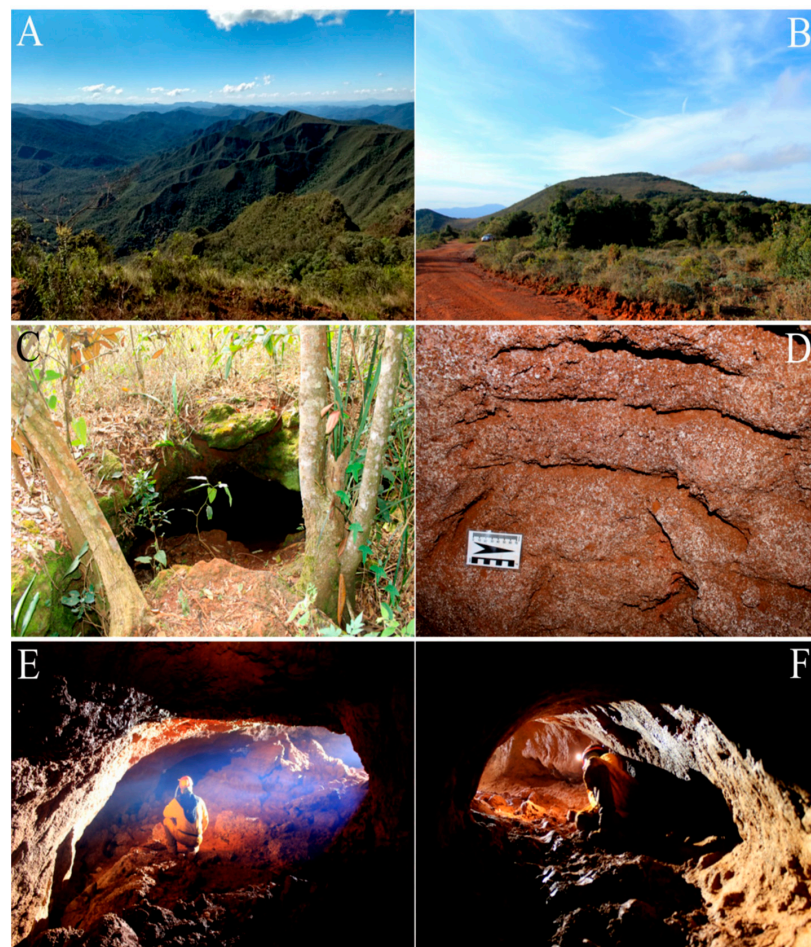
**Distribution.** It is known only from ferruginous caves in Quadrilátero Ferrífero, state of Minas Gerais, Brazil (Figure 11).



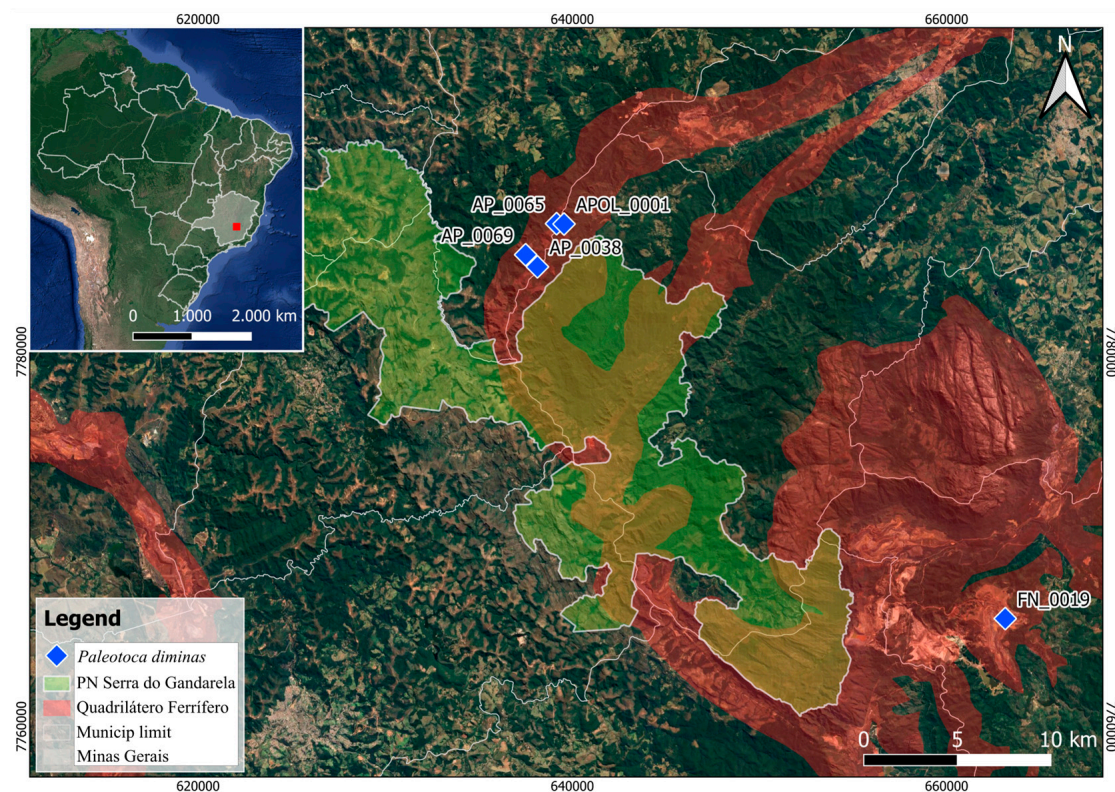
**Figure 8.** *Paleotoca diminus* sp. n., (A–F) female (IBSP 264705) pedipalp, detail of claw, (A) prolateral view; (B) retrolateral view; (C) trichobothria, dorsal view; (D) tarsal organ, dorsal view; (E) leg III, claw, prolateral view; (F) leg I, claw, prolateral view.



**Figure 9.** *Paleotoca diminus* sp. n. (male) observed in a paleoburrow (Cave AP-0038).



**Figure 10.** (A) Atlantic Forest view; (B) rupestrian field view; (C) cave entrance, epigeal view; (D) wall with claw marks from ground sloth; (E) entrance area, cave view; (F) cave conduit approximately 90 cm long.



**Figure 11.** Map showing collection records of *Paleotoca diminus* sp. n. (Prodidomidae) in caves of Quadrilátero Ferrífero, Minas Gerais, Brazil.

#### 4. Discussion

*Paleotoca* gen. n. has characteristics also observed in different Neotropical genera of Prodidomidae. The spinulation of legs I and II is also observed in *Nopyllus* [6], *Chileomma* and *Moreno* [7], *Brasilomma* [13] and, *Indiani* [14]. In the male palp, the absence of the conductor is also observed in *Tricongius* [4] and the presence of a bifid retrolateral apophysis in the palpal tibia is characteristic of the species of *Moreno*. The female has an extension of the epigynum plate also observed in *Brasilomma*. However, *Paleotoca* gen. n. does not present diagnostic autopomorphies of the aforementioned genera. For example, the presence of a large, clavate, translucent setae on the abdominal dorsum is observed in *Moreno* (Mello-Leitão, 1940 [15], fig. 49, Platnick, Shadab & Sorkin, 2005 [7], fig. 31). Moreover, a sternum with an anterior margin less than half maximum width (Rodrigues & Rheims, 2020 [6], fig. 11K) and a cymbium with a bunch of thick setae on the ventral terminal part (Rodrigues & Rheims, 2020 [6], fig. 27) is present in *Tricongius*.

Among the spiders of the Prodidomidae family, *Paleotoca diminus* sp. n. is another troglobitic Neotropical species. Body depigmentation, anophthalmia and sensory organs (e.g., trichobrotria) are autapomorphies related to the way of life of this spider, specialized in the subterranean environment [16]. These characteristics are also observed in others species of Neotropical genera such as *Brasilomma enigmatica*, *Indiani gaspar* and *Tricongius ybyguara*. The spinulation of legs I–II is also present in *Brasilomma*, *Chileomma*, *Indiani*, *Moreno* and *Nopyllus*.

Still, little is known about the biodiversity of Neotropical Prodidomidae spiders [17]. Among the seventy-six Neotropical species, sixteen are known to Brazil, with six being from cave environments. Rodrigues & Rheims (2020) suggest that phylogenetic studies must be carried out to elucidate the evolutionary relation with the known Neotropical species. However, more studies that expand knowledge of the diversity of epigeal spiders are essential for understanding the subterranean fauna.

**Author Contributions:** Conceptualization, I.C. and A.D.B.; methodology, I.C.; investigation, I.C. and A.D.B.; writing—original draft preparation, review and editing, I.C., R.d.A.Z. and A.D.B.; illustrations, I.C. All authors have read and agreed to the published version of the manuscript.

**Funding:** This study was supported by VALE S.A. and Organização de Apoio à Pesquisa da Biodiversidade (OAPBio\_CN: 5900086682/2023-1) and CNPq (ADB grant PQ 303903/2019-8).

**Data Availability Statement:** No new data were created or analyzed in this study. Data sharing is not applicable to this article.

**Acknowledgments:** We wish to thank Beatriz Mauricio (Laboratório de Biologia Estrutural, Instituto Butantan, São Paulo) for helping with SEMs. The authors are very grateful to the editors and the reviewers for their careful reading of the manuscript.

**Conflicts of Interest:** Author Robson d. A. Zampaulo was employed by the company Vale S.A. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## References

1. Azevedo, G.H.F.; Griswold, C.E.; Santos, A.J. To complicate or to simplify? Phylogenetic tests of complexity trends and genital evolution in ground spiders (Araneae: Dionycha: Gnaphosidae). *Zool. J. Linn. Soc.* **2018**, *84*, 673–694. [CrossRef]
2. Platnick, N.I.; Höfer, H. *Systematics and Ecology of Ground Spiders (Araneae, Gnaphosidae) from Central Amazonian Inundation Forests*; American Museum of Natural History: New York, NY, USA, 1990; No. 2971; pp. 1–16.
3. World Spider Catalog. Version 25.0. Natural History Museum Bern. 2024. Available online: <http://wsc.nmbe.ch> (accessed on 27 May 2024). [CrossRef]
4. Rodrigues, B.V.B.; Rheims, C.A. Phylogenetic analysis of the subfamily Prodidominae (Arachnida: Araneae: Gnaphosidae). *Zool. J. Linn. Soc.* **2020**, *190*, 654–708. [CrossRef]
5. Petrunkevitch, A. Arachnida from Panama. *Trans. Conn. Acad. Arts Sci.* **1925**, *27*, 51–248.
6. Ott, R. Nopyllus, a new South American Drassodinae spider genus (Araneae, Gnaphosidae). *Iheringia* **2014**, *104*, 252–261. [CrossRef]
7. Platnick, N.I.; Shadab, M.U.; Sorkin, L.N. On the Chilean spiders of the family Prodidomidae (Araneae, Gnaphosoidea), with a revision of the genus Moreno Mello-Leitão. *Am. Mus. Novit.* **2005**, *3499*, 1–31. [CrossRef]
8. Bittencourt, J.S.; Vasconcelos, A.G.; Carmo, F.F.; Buchmann, F.S. *Registro Paleontológico em Caverna Desenvolvida em Formações Ferríferas na Serra do Gandarela*; Brazilian Speleology Society: Minas Gerais, Brazil, 2015; pp. 194–208.
9. Ruchkys, U.A.; Bittencourt, J.S.; Buchmann, F.S.C. A paleotoca da Serra do Gandarela e seu potencial como geossítio do Geoparque Quadrilátero Ferrífero, Minas Gerais. *Cad. De Geogr.* **2014**, *24*, 249–263. [CrossRef]
10. Carmo, F.F.; Campos, I.C.; Carmo, F.F.; Tobias-Junior, R.O. Vale do Peixe Bravo: Área prioritária para a conservação dos geossistemas ferruginosos no norte de Minas Gerais. In *Geossistemas Ferruginosos do Brasil: Áreas Prioritárias para Conservação da Diversidade Geológica e Biológica, Patrimônio Cultural e Serviços Ambientais*; Carmo, F.F., Kamino, L.H.Y., Eds.; 3i Editora: Belo Horizonte, Brazil, 2015; pp. 497–520.
11. Köppen, W. *Climatologia: Con um Estudio de los Climats de la Tierra*; Fondo de Cultura Economica: Mexico City, Mexico, 1948; 478p.
12. Buchmann, F.S.; Frank, H.T.; Ferreira, V.; Carvalho, M.T.N.; Cruz, E.A. Novas Paleotocas Escavadas em Metadiamicito (Minério de Ferro) em Minas Gerais, Brasil. In Proceedings of the Congresso da Associação Brasileira de Estudos do Quaternário, Anais ABEQUA XIV, Natal, Rio Grande do Norte, Brazil, 4–8 August 2013; p. 14.
13. Brescovit, A.D.; Ferreira, R.L.; Silva, M.S.; Rheims, C.A. *Brasilomma* gen. nov., a new prodidomid genus from Brazil (Araneae, Prodidomidae). *Zootaxa* **2012**, *3572*, 23–32. [CrossRef]
14. Rodrigues, B.V.B.; Cizauskas, I.; Lemos, Y. A new genus of cave spider from Neotropical region (Gnaphosidae: Prodidominae). *Zootaxa* **2020**, *4722*, 77–83. [CrossRef] [PubMed]
15. de Mello-Leitão, C.F. Arañas de la provincia de Buenos Aires y de las gobernaciones de La Pampa, Neuquén, Río Negro y Chubut. *Rev. Mus. Plata* **1940**, *2*, 3–62.
16. Mammola, S.; Isaia, M. Spiders in caves. *Proc. R. Soc. B* **2017**, *284*, 20170193. [CrossRef]
17. Rodrigues, B.V.B.; Cizauskas, I.; Rheims, C.A. Description of *Paracymbiomma* gen. nov., a new genus of prodidomid spiders from the Neotropical region (Araneae: Prodidomidae) including a new troglobite species. *Zootaxa* **2018**, *4514*, 301–331. [CrossRef]

**Disclaimer/Publisher’s Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.