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urn:lsid:zoobank.org:pub:E2DEE417-A78A-48B6-9412-FF1DC6B5C3FD

***Brasilomma* gen. nov., a new prodidomid genus from Brazil (Araneae, Prodidomidae)**

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Abstract

The genus *Brasilomma* **gen. nov.** is described to include *B. enigmatica* **sp. nov.** collected in three caves from the state of Minas Gerais, Brazil. This genus can be distinguished from the remaining South American Prodidomidae by the male palps with large triangular projection, covering the base of the embolus, the distal border of the tegulum projected over the base of the conductor and median apophysis and by the female epigynum with blind, posterior atrium and anteriorly widened copulation ducts arising from an internal, mushroom-shaped plate. In addition, aspects of the species natural history are described.

Key words: new genus, new species, caves, Brazil, taxonomy

Introduction

Prodidomidae Simon is a large and widespread spider family that currently includes 303 species and 30 genera (Platnick 2012). As a member of the superfamily Gnaphosoidea, it shares with Ammoxenidae Simon, Cithaeronidae Simon, Gallienellidae Millot, Gnaphosidae Pocock, Lamponidae Simon and Trochantheriidae Karsch the flat and silvery posterior median eyes, with a triangular, egg-like or irregularly rectangular shape (Platnick & Baehr 2006). They are most closely related to Lamponidae and Gnaphosidae, with whom they share anterior lateral spinnerets composed of a single segment, but are distinguished from them by the enlarged piriform gland spigots with greatly elongated bases (Platnick *et al.* 2005).

Eleven genera occur in the Neotropical region but only three are described from Brazil: *Lygromma* Simon, with four species, *Oltacloea* Mello-Leitão, with two and *Tricongius* Simon, with one (Platnick 2012). In addition, *Zimiris doriae* Simon, a circumtropical synanthropic species, was recently recorded for the first time in the state of Bahia (Almeida-Silva & Brescovit 2008).

In this paper we describe the new prodidomid genus, *Brasilomma* **gen. nov.**, with *B. enigmatica* **sp. nov.** as the type species, based on four specimens collected in three caves in the state of Minas Gerais. This taxon was easily recognized as belonging to Prodidomidae by the presence of piriform gland spigots greatly elongated with long and plumose setae at their base (Figs 9–10, 13–14; Platnick *et al.* 2005). Within Prodidomidae the genus can be placed in Theuminae (Platnick *et al.* 2005) due to the presence of a large protrusion between the fourth coxae with numerous long erect setae, specialized claw teeth grasping the claw tuft seta (Figs 6–8) and extremely convoluted ducts in the female epigynum (Figs 21–22). In addition to the description, notes on the species' natural history and habitat are presented.

Material and Methods

Specimens are deposited in the collection of Arachnida and Myriapoda of the Instituto Butantan, São Paulo (IBSP, curator: D.M.Barros Battesti). Illustrations were made using a stereomicroscope Leica MZ16 with a camera lucida. Photographs were taken with a Leica DFC 500 digital camera mounted on a Leica MZ 16A stereomicroscope. Extended focal range images were composed with Leica Application Suite version 2.5.0. Scanning electron micrographs (SEM) were taken with a Zeiss DSM 940 from the Laboratório de Microscopia Eletrônica de Varredura of the Universidade de São Paulo (USP). Left male palp was detached from body and illustrated in ventral and retrolateral views. Female epigynum was dissected and immersed in clove oil to study internal structures. All measurements are in millimeters. Terminology and format of descriptions follow Platnick *et al.* (2005). Abbreviations: d, dorsal; m, median; p, prolateral; r, retrolateral; RTA, retrolateral tibial apophysis; v, ventral.

Taxonomy

Family Prodidomidae Simon 1884

Genus *Brasilomma* Brescovit, Ferreira & Rheims gen. nov.

Etymology. The generic name is a contraction of Brazilian *Lygromma*, neuter in gender.

Type species: *Brasilomma enigmatica* sp. nov.

Diagnosis. Within Theuminae, *Brasilomma* gen. nov. is distinguished from other genera by the absence of clavate translucent setae on the abdominal dorsum (see Platnick *et al.* 2005: fig. 31). It further differs from *Chileuma* by the absence of eyes (species of *Chileuma* have six well developed eyes); from *Chilongius* by lacking their centrally situated epigynal atrium (see Platnick *et al.* 2005: figs 65, 69); from *Tricongius* by lacking the protruding chelicerae with relatively long fangs and modified cheliceral promargin (see Platnick & Höfer, 1990: 5) and from *Lygromma* by having a single long prong in the RTA, instead of two or more short ones (see Platnick & Shadab, 1976: figs 10, 14). It can be distinguished from the remaining South American prodidomids by the male palps with a large triangular projection, covering the base of the embolus (Fig. 18) and by the distal border of the tegulum projected over the base of the conductor and median apophysis (Figs 18–19).

The females are distinguished by the blind, posterior atrium (Fig. 20) in the epigynum and by the anteriorly widened copulation ducts (Fig. 21) arising from an internal, mushroom-shaped plate (Fig. 22).

Description. Small spiders, total length 2.3–3.0. Prosoma ovate, narrowed anteriorly to slightly less than half its maximum width; surface covered with short, light, needle-like setae; thoracic groove short, longitudinal, on posterior third of prosoma. Eyes absent, with only a pair of vestigial whitish spots anteriorly (Figs 1–2). Chelicerae vertical, not divergent; promargin not modified, with three pro and one retromarginal teeth in males; seven pro and five retromarginal denticles in females; fang longer than chelicerae width; chilum entire. Labium pentagonal, slightly wider than long, widest posteriorly. Endites rectangular, convergent anteriorly; serrula short and slightly curved. Sternum longer than wide, projected between coxae IV; surface smooth, with long, darkish setae along lateral margins. Legs covered with short, light, needle-like setae; leg formula 4123; trochanter smooth, without deep notch; metatarsi and tarsi without scopula; tarsi with two pectinate claws, I–II long toothed (Fig. 6) and III–IV short toothed (Fig. 8); specialized claw teeth and specialized setae at base of claws (Figs 6–8); claw tufts composed of 4–5 widened spatulate setae (Figs 6–8); trichobothria with deep ridges, 4–5 dorsal on metatarsi and 2–3 dorso-prolateral on all tarsi (Fig. 1–2). Tarsal organ with elevated and rounded border (Fig. 5). Opisthosoma oval, longer than wide, covered with short, light, needle-like setae and anteriorly with long, dark, posteriorly curved setae; colulus absent. Six spinnerets, anterior laterals elongated, not advanced anteriorly, widely separated (Figs 13–15), bearing long major ampullate gland spigots, few piriform gland spigots and many accompanying setae (Figs 9–10, 13–14); posterior medians small, narrow, contiguous (Figs 14–15); posterior laterals almost contiguous, with at least 3 aciniform gland spigots with narrow shaft, and at least two spigots with larger shafts, probably of cylindrical glands (Figs 11–15). Male palp: tibia short, approximately half cymbium length, with single conical RTA, two strong, elongate setae prolaterally and one dorsally; cymbium ovate, without scopula and with two or three strong,

dark setae; tegulum ovoid with distal triangular projection partially covering the embolus; embolus short and conical, arising prolaterally and gently curving retrolaterally towards laminar, hyaline conductor; median apophysis present, hook-shaped, slightly wider at base (Figs 18–19). Epigynum wider than long with posterior, blind rounded depression (Fig. 20); pair of copulation openings on internal mushroom-shaped, sclerotized plate (Fig. 21); copulation ducts proximally wide and straight, distally narrowed and very convoluted; spermathecae indistinct; fertilization ducts short, hook-shaped and pointing away from each other (Fig. 22).

Distribution. Known from three caves in the state of Minas Gerais, Brazil.

Composition. Monotypic.



FIGURE 1. *Brasilomma enigmatica* sp. nov. Immature, latero-dorsal habitus, collected in Moeda Sul cave (iron ore cave). Photo: R.L. Ferreira.

***Brasilomma enigmatica* Brescovit, Ferreira & Rheims sp. nov.**

Figs 1–22

Type material: Holotype: 1♂ from Gruta Moeda Sul [19° 59' 09" S 43° 50' 49" W], Nova Lima, Minas Gerais, Brazil, 2005, R.L. Ferreira leg. (IBSP 160617). **Paratypes:** 1♀, with same data of holotype (IBSP 160617); 1♂, Gruta das Bromélias [21°42'31"S/43°54'02"W, alt. 1050 m], Parque Estadual de Ibitipoca, Lima Duarte, Minas Gerais, Brazil, 28.VII.2005, R.L. Ferreira leg. (IBSP 160618).

Additional material examined. BRAZIL. *Minas Gerais:* Matozinhos, Gruta MOC131 [19°33' S; 44°04' W], 1 ♀, 04–15.IV.2011, F. Pelegatti-Franco leg. (IBSP 161700, left legs and opisthosoma used for SEM).

Etymology. The specific name is a noun in apposition and refers to the uncommon distribution of the species, since there are only remote possibilities of contiguity between the subterranean known habitats of the different populations (see discussion).

Diagnosis. See generic diagnosis.

Description. Male (IBSP 160617, holotype): Prosoma, chelicerae and legs not pigmented; opisthosoma gray in males (Fig. 2), not pigmented in females and juveniles (Fig. 1). Total length 2.3. Prosoma length: 1.05 long, 0.80 wide. Chelicerae with 3 denticles on promargin and a single retromarginal denticle. Leg measurements: I: femur 1.0/ patella 0.55/ tibia 0.90/ metatarsus 0.65/ tarsus 0.55/ total 3.65; II: 1.0/ 0.45/ 0.80/ 0.65/ 0.55/ 3.45; III: 0.9/ 0.5/ 0.65/ 0.6/ 0.55/ 3.2; IV: 1.05/ 0.6/ 0.75/ 1.0/ 0.7/ 4.1. Leg spination: leg I: femur p1-0-0, d1-1-2, r0; tibia p0-1-1, r1-1-0, v3-3-2-2-2-3-2-0; metatarsus p1-0-0, v2-2-2-2; leg II: femur d1-1-2, tibia p1-1-1, r1-1-0, v2-3-2-2-2-2-2-0; metatarsus p1-0-0, v2-2-2-2; leg III: femur d1-1-1-1, p0-0-1, r0-0-1, tibia d1-1-0, p1-1-0, r1-1-0, v1r-2-2; metatarsus p1-0-2, r1-0-2, v2-0-1m; leg IV: femur d1-1-3, tibia p1-1-0, r1-1-0, v1p-2-2; metatarsus p0-1-2, r0-1-2, v1p-0-1m. Palp as in generic description (Figs 18–19).

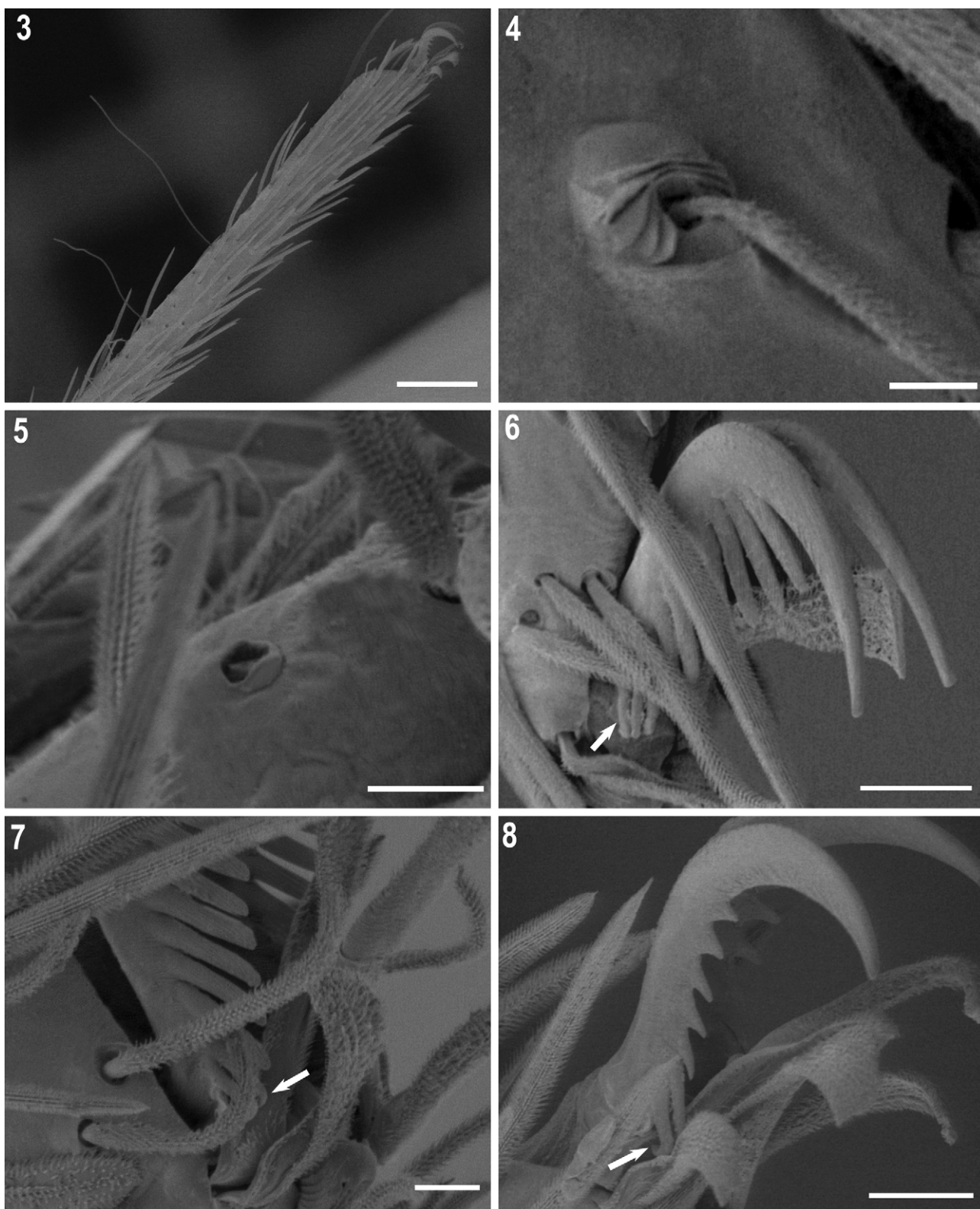


FIGURE 2. *Brasilomma enigmatica* sp. nov. Male, dorsal habitus, collected in Bromélias cave (quartzite cave). Photo: R.L. Ferreira.

Female (IBSP 160617, paratype): Coloration as in male. Total length 3.0. Prosoma length: 1.4 long, 1.1 wide. Prosoma and eyes as in male. Chelicerae with 7 denticles in promargin and 5 denticles in retromargin. Leg measurements: I: femur 1.5/ patella 0.6/ tibia 1.3/ metatarsus 1.05/ tarsus 0.80/ total 5.31; II: 1.4/ 0.7/ 1.1/ 1.05/ 0.80/ 5.05; III: 1.3/ 0.6/ 1.05/ 1.15/ 0.75/ 4.85; IV: 1.6/ 0.6/ 1.5/ 1.6/ 1.05/ 6.35. Leg spination: leg I: femur d1-1-0, p0-0-1; tibia v2-2-2-2-2; metatarsus v2-2-2-2-2-2-2-2-2; leg II: femur d1-1-0; tibia v2-2-2-2-2; metatarsus v2-3-2-2-2-3-2-2; legs III–IV: femur d1-1-3; tibia d1-1-0, p1-1-0, r1-1-0, v2-2-2; metatarsus p0-1-2, r0-1-2, v2-0-2. Epigynum as in generic description (Figs 20–22).

Variation. Live specimen with brownish yellow prosoma.

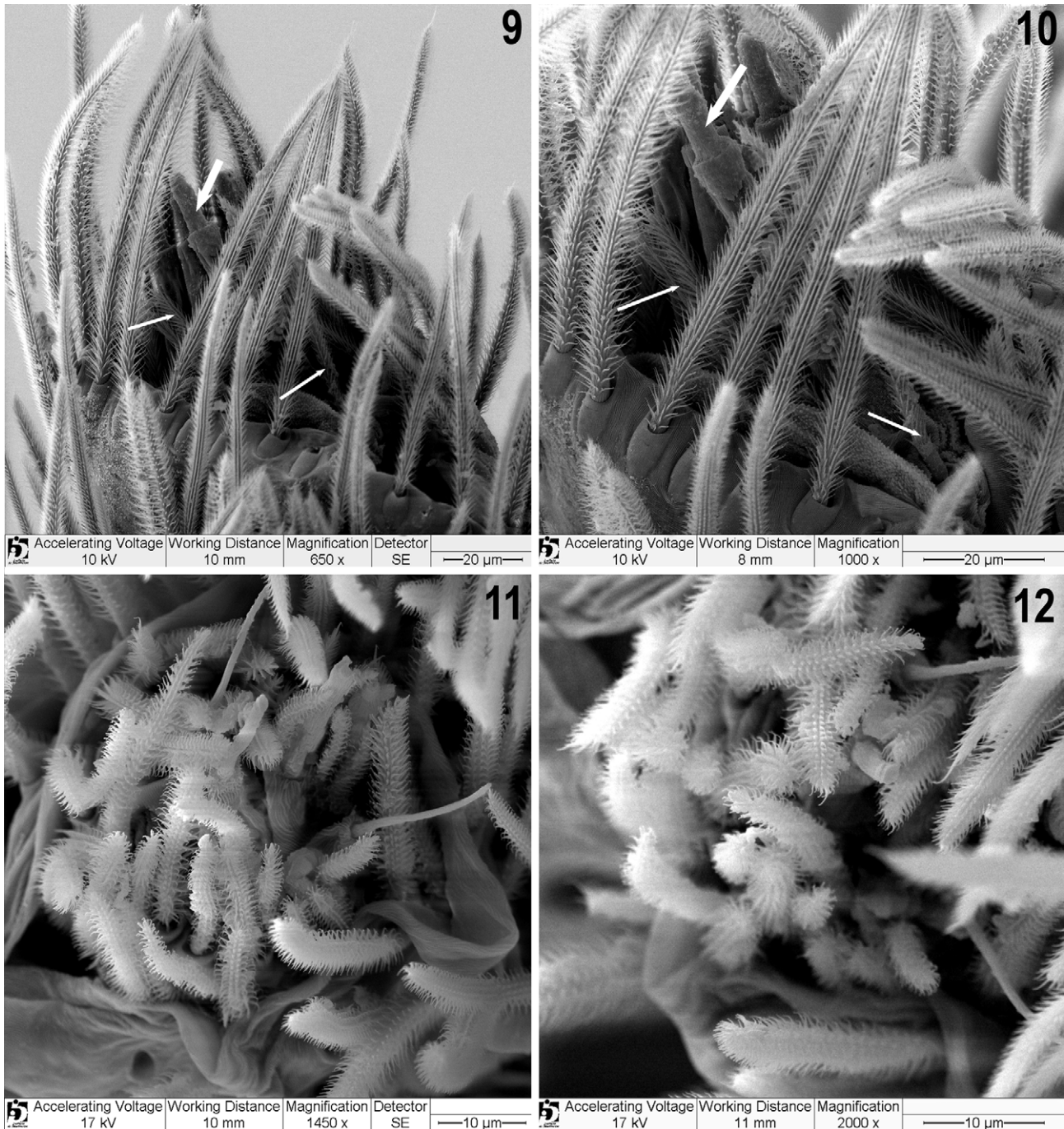
Distribution. Known from three caves in the state of Minas Gerais, Brazil (for details, see discussion).



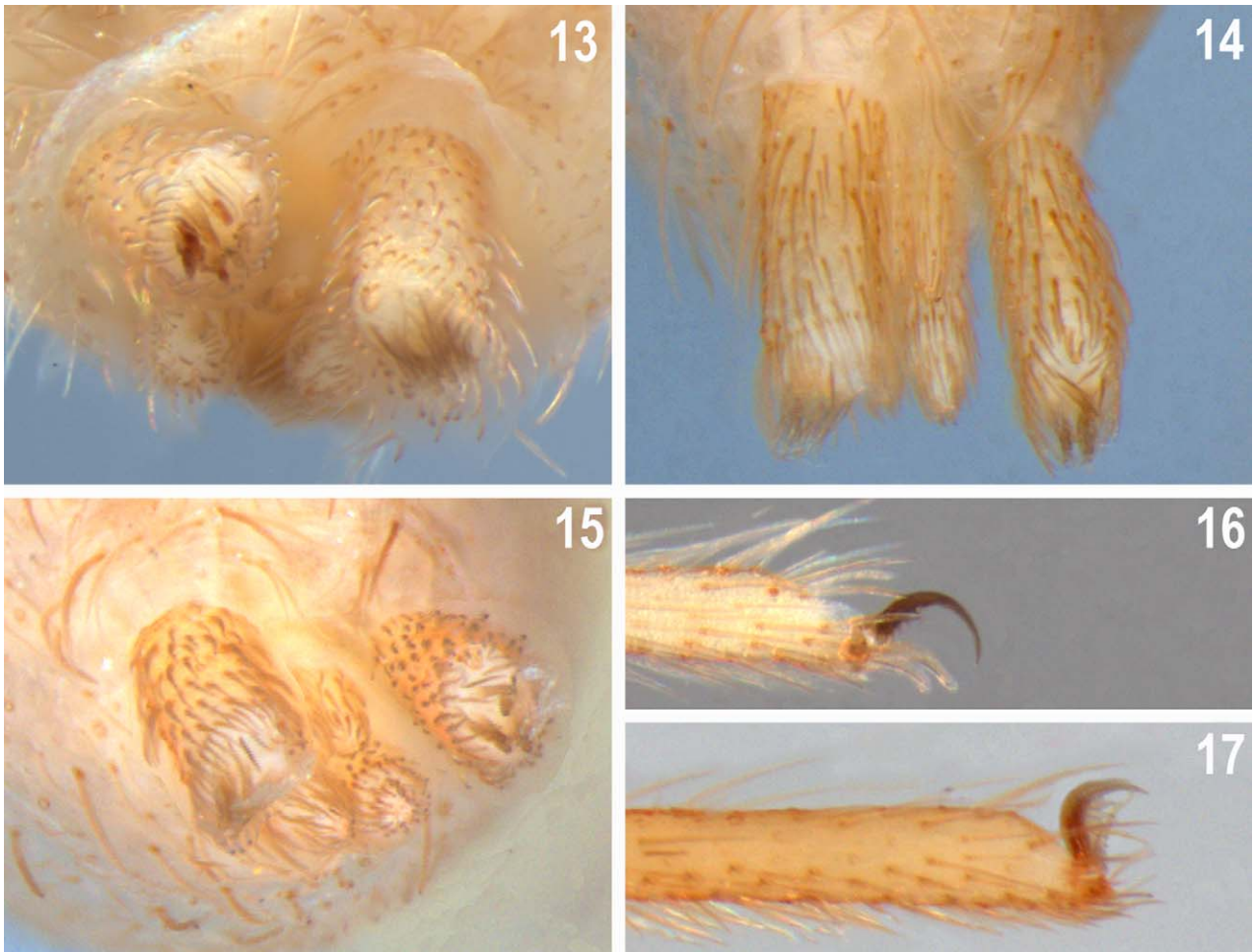
FIGURES 3–8. *Brasilomma enigmatica* sp. nov., female: **3** Tarsus I, lateral view; **4** Trichobothria, dorsal view; **5** Tarsal organ, dorsal view; **6–7** Tarsus I, lateral view, showing specialized claw teeth (arrow); **8** Tarsus IV, lateral view, with same claw teeth (arrow). Scale lines: 0.25 mm.

Natural history. Specimens of *Brasilomma enigmatica* sp. nov. were collected in three different caves in the state of Minas Gerais. One adult male was collected in the Gruta das Bromélias (Fig. 24), Parque Estadual de Ibitipoca, Conceição de Ibitipoca. This cave, with approximately 2,750 meters, is considered one of the largest

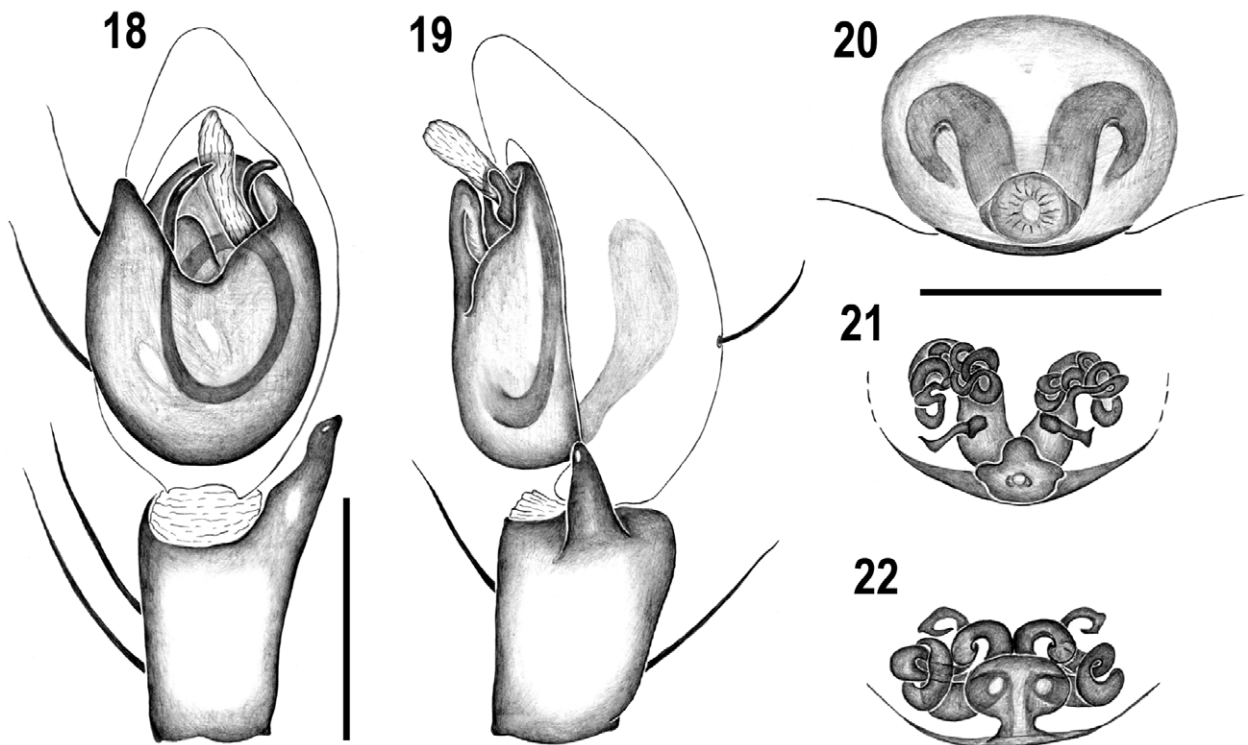
quartzitic caves in the world. The single male (Fig. 2) was observed walking on the top of a moist quartzite block in a completely dark area located approximately 200 meters from the nearest entrance. It was moving slowly, using its front legs to investigate the cave substrates. The Gruta das Bromélias has been prospected many times in other biospeleological surveys (data unpublished), but no other specimens were collected, which demonstrates its rarity. The male holotype and the female paratype were collected in ferruginous caves (Fig. 23) in the municipality of Nova Lima, in the region known as the “quadrilátero ferrífero”. One of the main characteristics of these underground systems is the existence of a large number of sub-surface canaliculi that make up a network of interstitial spaces (micro and mesocaves) connected to the macrocaves (Simmons 1963, Ferreira 2005, Piló & Auler 2005). A third adult female was recently collected in the Gruta MOC131, in Matozinhos, in a calcareous cave with vertical entrance approximately 30m below surface level, forming a precipice ending at an aphotic zone (unpublished data).



FIGURES 9–12. *Brasilomma enigmatica* sp. nov., female: **9–10** Anterior lateral spinnerets, distal view (thick arrows pointing to piriform gland spigots and thin arrows to plumose setae); **11–12** Posterior lateral spinnerets, distal view. Scale lines: 0.25 mm.



FIGURES 13–17. *Brasilomma enigmatica* sp. nov., female: 13–15 Spinnerets, distal view; 16–17 tarsus, lateral view (16 tarsus I, 17 tarsus IV).



FIGURES 18–22. *Brasilomma enigmatica* sp. nov.: 18–19 male, left palp (18 ventral view, 19 retrolateral view); 20–22 female, epigynum (20 ventral view, 21 dorsal view, 22 posterior view). Scale lines: 0.25 mm.



FIGURES 23–24. **23.** Moeda Sul cave (iron ore), Nova Lima, Minas Gerais, Brazil; **24** Bromélias cave (quartzite), Parque Estadual de Ibitipoca, Lima Duarte, Minas Gerais, Brazil. Photos: R.L. Ferreira.

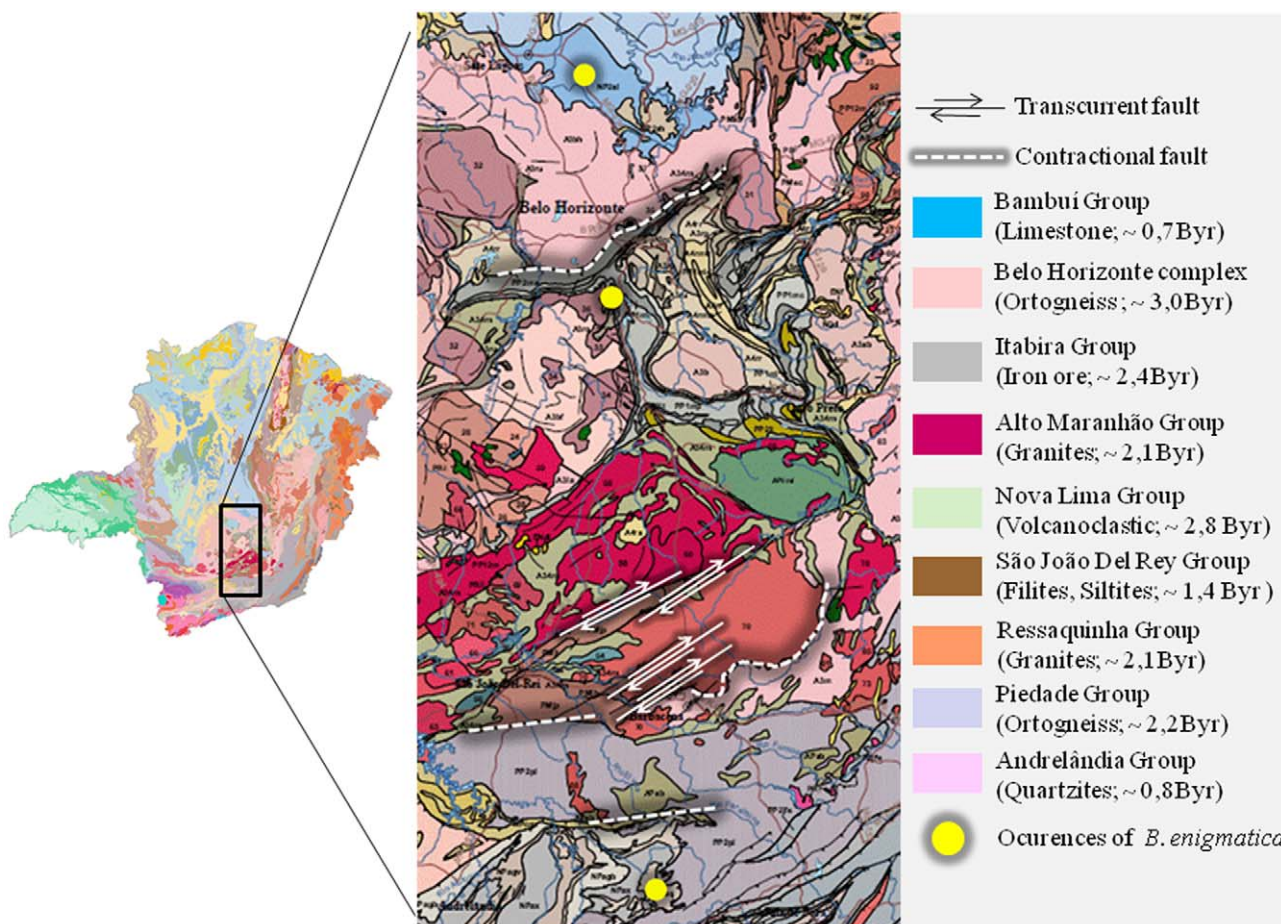


FIGURE 25. Schematic drawing of the geologic landscape on the occurrence area of *Brasilomma enigmatica* sp. nov. On the left, the geological map of the state of Minas Gerais (modified from CPRM, 2008). In detail, the main geological formations in the area. The legend, in the right, represents the groups trespassed by a straight line between the three yellow spots.

Discussion

Generally, stygobionts are more widespread than troglobionts (Lamoreux 2004, Miller 2005). Since troglobites cannot normally survive for long periods of time under surface conditions, the dispersion between caves across epigeal areas is considered rare (Barr 1967; Culver 1982; Barr & Holsinger 1985; Holsinger & Culver 1988). Thus, widespread troglobites can represent: i) several distinct cryptic species, erroneously grouped into a single species; ii) genetically isolated populations that have not diverged due to insufficient time or low rates of change, or iii) a single species represented by populations with mechanisms that enable gene flow between caves (Miller 2005). There are some examples of widespread troglolobitic spiders, such as *Porrhomma cavernicola* (Keyserling 1886) and *Phanetta subterranea* (Emerton 1875), two linyphiid species found in many caves in the Appalachian Mountains (Miller 2005). However, despite the wide ranged distribution of those species, they still occur in a single complex limestone formation (White 2009).

The known distribution of *B. enigmatica* is quite confusing. The iron ore formation has a huge and complex net of small channels (mesocaverns), especially in the ferruginous topmost breccia, named “canga”, to which most caves are associated (Piló & Auler 2005). However, the occurrence of single specimens in a limestone cave and in a quartzite cave, (the first one located approximately 60 km from the iron caves and the second more than 180 km), is enigmatic. There are different rock formations between these three occurrences (Fig. 25) and most of them represent ancient rocks with low porosity (e.g. granites, ortogneiss, filites), which reduces the possibilities of subterranean migration (CPRM 2008). Furthermore, the existence of many faults and joints tend to difficult hypogean movements, since most of these tectonic structures are sealed with minerals. Such deposits can function as strong barriers, even for aquifers. With this in mind, one would expect that *B. enigmatica* does not correspond to a real troglobite. However, the strong troglomorphic traits are obvious and no specimens were collected outside the caves. Thus, there are two plausible possibilities: i) the species is widespread in the area, but has not been collected due to its cryptic habitat and relatively low sampling effort, or ii) there are small subterranean discontinuities between all these rock formations. Nevertheless, it is important to point out that both possibilities are weak, and this is why the species was named “enigmatica”.

Acknowledgments

We wish to thank Dr. Augusto Auler for helping in the geological interpretation; for the Direction of the Parque Estadual de Ibitipoca, Instituto Estadual de Florestas (IEF), Critical Ecosystem Partnership Fund (CEPF), Aliança para conservação da Mata Atlântica (Conservação Internacional, SOS Mata Atlântica) and IBAMA-CECAV. Martín Ramirez (Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”) and two anonymous reviewers provided important comments on the first versions of the manuscript. This study was supported by “Conselho Nacional do Desenvolvimento Científico e Tecnológico” (CNPq grant 301776/2004-0 to ADB and CNPq grant 301061/2011-4 to RLF).

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