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Additions to the millipede fauna of an Amazonian ferruginous landscape: a new species of *Pseudoporatia* Golovatch, 1999 widespread in rock outcrops (Diplopoda, Polydesmida, Pyrgodesmidae)

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Living specimens inside caves of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.

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Additions to the millipede fauna of an Amazonian ferruginous landscape: a new species of *Pseudoporatia* Golovatch, 1999 widespread in rock outcrops (Diplopoda, Polydesmida, Pyrgodesmidae)

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KEY WORDS
Carajás, Brölemann, Schubart, cave-dwelling, subterranean fauna, new species.

ABSTRACT
Here we describe the new species *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., widespread in the Amazonian ferruginous landscape of the state of Pará, Brazil. The species differs from its only congener *P. perplexa* Golovatch, 1999 by the presence of 19 body rings in adults (vs 20 body rings), the position of the porosteles on the paraterga, and the morphology of the gonopods. Notes on its ecology and comments on the diversity of millipedes in the region of Serra dos Carajás, state of Pará, Brazil, are also provided.

MOTS CLÉS
Carajás,
Brölemann,
Schubart,
habitat troglodytique,
faune souterraine,
espèce nouvelle.

RÉSUMÉ
Ajouts à la faune de mille-pattes d'un paysage ferrugineux amazonien : une nouvelle espèce de Pseudoporatia *Golovatch, 1999 répandue dans les affleurements rocheux (Diplopoda, Polydesmida, Pyrgodesmidae).* Nous décrivons ici la nouvelle espèce *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., répandue dans le paysage ferrugineux amazonien de l'État de Pará, Brésil. L'espèce diffère de son seul congénère *P. perplexa* Golovatch, 1999 par la présence de 19 anneaux corporels chez les adultes (contre 20 anneaux corporels), la position des porostèles sur les paraterga et la morphologie des gonopodes. Des notes sur son écologie et des commentaires sur la diversité des mille-pattes dans la région de Serra dos Carajás, État de Pará, Brésil, sont également fournis.

INTRODUCTION

The widespread class Diplopoda (millipedes) includes more than 11 000 described species (Shear 2011; Enghoff *et al.* 2015). Members of the class occur on all continents except Antarctica, but with most of the species restricted to small distribution areas (Golovatch & Kime 2009; Shelley & Golovatch 2011; Enghoff 2015). In the Neotropical region, millipedes have received little attention compared to other arthropod groups, possibly due to the historically low number of local taxonomists or lack of any regional guidebooks (see Hoffman *et al.* 1996). Historically, knowledge of the millipede fauna in Brazil is almost restricted to the Southeast region due to the studies made by the European naturalists O. Schubart and H. W. Brölemann from the beginning of the 20th century (Brölemann 1902a, b, 1904, 1909; Hoffman 1980; Bouzan *et al.* 2018; Iniesta *et al.* 2020, 2021).

Millipedes are commonly found in subterranean environments (Golovatch & Kime 2009; Enghoff 2015), which are characterized by peculiar attributes such as the permanent absence of light, high relative humidity, constant temperature, and scarcity of organic resources (Culver & Pipan 2019). In Brazil, the region of the Carajás National Forest (FLONA of Carajás), located within the Amazon Forest domain in the state of Pará, represents one of the most important regions regarding subterranean environments. The FLONA of Carajás is a landscape composed of large plateaus of ferruginous outcrops with around 2000 caves recorded. To date, the economy of the Serra dos Carajás region has been intensified due to mining operations in its huge deposits of iron ore, influencing directly the local urban development and environmental pressures on land use (Palheta *et al.* 2017). The rock outcrops of this region harbor numerous endemic invertebrates (Chagas-Jr & Bichuette 2018; Brescovit *et al.* 2018; Asenjo *et al.* 2019; Campos-Filho *et al.* 2020; Junta *et al.* 2020; Teodoro *et al.* 2021), including some millipede species such as *Glomeridesmus spelaeus* Iniesta & Wesener, 2012 (Glomeridesmida Latzel, 1884, Glomeridesmidae Latzel, 1884), *Pseudonannolene spelaea* Iniesta & Ferreira, 2013 (Spirostreptida Brandt, 1833, Pseudonannolenidae Silvestri, 1895), *Parastenonia carajas* Bouzan & Iniesta, 2019 (Polydesmida Leach, 1815, Chelodesmidae Cook, 1895), and *Stemmiulus brasiliensis* Iniesta & Ferreira, 2015 (Stemmiulida Pocock, 1894, Stemmiulidae Pocock, 1894) (Iniesta *et al.* 2012; Iniesta & Ferreira 2013, 2015; Bouzan *et al.* 2019).

The family Pyrgodesmidae is one of the largest families of the millipede order Polydesmida, with more than 170 genera and nearly 400 species (Hoffman 1980; Shear 2011; Enghoff *et al.* 2015). Pyrgodesmids are distributed throughout all the tropics, marginally in southern Europe, northern Africa, southern USA, and Southeast Asia (Enghoff *et al.* 2015), with species occurring in leaf litter, in the uppermost and deeper soil, in dead wood and under bark of trees, and in caves (Golovatch & Kime 2009). In the Neotropical region, large areas of tropical and subtropical forests do not have any record of pyrgodesmids, and new records invariably turn out to be new species, reflecting how little is known about the species richness of the family.

Pyrgodesmidae species are small-sized, usually identified by the metatergal tubercles typically differentiated, paraterga with marginal lobulations, and ozopores often on porosteles (Hoffman 1980; Akkari & Enghoff 2011a; Enghoff *et al.* 2015). Most species present a cerotegument, sometimes coated with soil, covering the surface of the body rings (Golovatch & Kime 2009; Makarov 2015; Enghoff *et al.* 2015).

In the Amazon rainforest, most of the known species of pyrgodesmids are results of extensive studies conducted in recent decades (Golovatch 1996, 1997, 1999; Golovatch & Adis 1998). The monotypic genus *Pseudoporatia* Golovatch, 1999, with type species *P. perplexa* Golovatch, 1999, was described from a primary tropical rainforest in the environs of Manaus, Amazonas, Brazil (Golovatch 1999). One of the most important features of this genus is the presence of highly complex gonopods, with secondary processes and lamellae on the telopodite (Golovatch 1999: figs 33-35).

In the last decades, extensive surveys in the Serra dos Carajás have been conducted with emphasis on the biodiversity of its ferruginous caves, resulting in a considerable amount of material available for study. Here, we describe the new pyrgodesmid species *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., widely distributed in the ferruginous caves from the Serra dos Carajás. Additionally, we provide comments on the diversity of millipedes in the region.

MATERIAL AND METHODS

Specimens were examined in 70% ethanol under stereomicroscope Leica MZ16A and microscope Leica DM4000B. Photographs were taken with a Leica DFC 500 digital camera

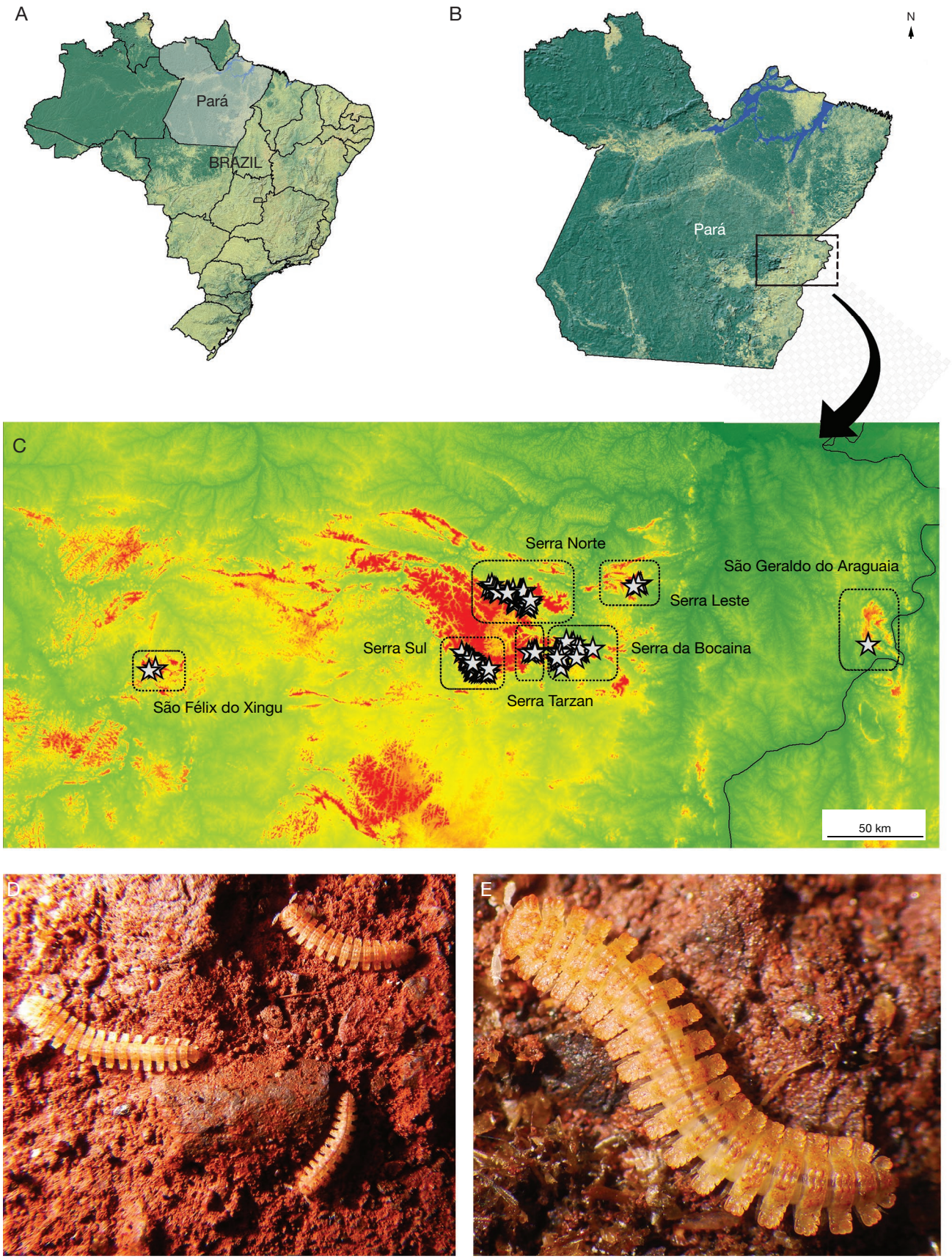

Fig. 1. — **A**, Map of Brazil with Pará state in grey; **B**, Pará state highlighting the region where the specimens were collected; **C**, occurrences points of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. in a Digital Elevation Model (DEM) with the iron ore formations in **red**; **D**, **E**; living specimens inside caves. Photos: D, E: courtesy of I. Cizauskas and L. M. Rabello, respectively.

mounted on Leica MZ16A stereomicroscope at the IBSP (São Paulo, Brazil). Focus-stacked images were composed with Leica Application Suite (ver. 2.5.0, Leica Microsystems, Canton de Saint-Gall, Switzerland). For the Scanning Electron micrographs (SEM), the structures were cleaned ultrasonically in two cycles of 30 seconds, transferred to 100% ethanol gradation (70%, 80%, 90%, and 100 % by 15 minutes), and left to dehydrate for *c.* 24 hours. These structures were then critically point dried, mounted, and coated with gold-palladium for observation. The SEM images were taken using FEI Quanta 250, at the Laboratório de Biologia Celular, IBSP. Measurements (in millimetres) of males and females were taken using the Leica Application Suite options in the Leica MZ16A. Numbers of podous and apodous rings, maximum midbody diameter, and total length were counted and measured only from non fragmented specimens. For the terminology of sexual and somatic structures we followed Akkari & Enghoff (2011b), Aswathy *et al.* (2021), and Hoffman (1976). The geographical coordinates were obtained from the original label of examined lots in the collections (when provided) and checked individually according to the "Cadastro Nacional de Informações Espeleológicas (CANIE)". All the coordinates are shown in South American Datum (SAD'69). The distribution maps were made using the free software DIVA-GIS 7.5.0 (Hijmans *et al.* 2001).

Abbreviations

Morphological parts

al	anterior lobe;
at	apicodorsal tufts;
ca	cannula;
cx	coxae;
DM	distolateral lobes;
fs	fringed setae;
IX	body ring 9;
ml	medium lobe;
oz	ozospore;
osg	opening of seminal groove;
p	porosteles;
pl	prefemoral lamella;
PM	paramedian lobes;
pol	posterior lobe;
ppf	post-prefemoral branch;
s	spinneret-like setae;
sb	subfalcate branchlet;
sc	sensory cones;
sl	second lamella;
so	solenomere;
ss	spatulate setae;
ssp	spatulate setae on epiproct;
V	body ring 5;
VI	body ring 6;
VII	body ring 7;
vv	vulvae;
X	body ring 10.

Institutions

IBSP	Instituto Butantan, São Paulo;
INPA	Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas;
MNHN	Muséum national d'Histoire naturelle, Paris;
MPEG	Museu Paraense Emílio Goeldi, Belém, Pará;
ZMUM	Zoological Museum of Moscow University, Moscow.

RESULTS

Order POLYDESMIDA Latreille, 1802/03
Family Pyrgodesmidae Silvestri, 1896

Genus *Pseudoporatia* Golovatch, 1999

Type species. — *Pseudoporatia perplexa* Golovatch, 1999, by monotypy.

Emended diagnosis. — Based on Golovatch (1999: 228). *Pseudoporatia* can be distinguished from other Neotropical genera of the family by following combination of characters: collum flabellate, entirely covering the head from above (Fig. 2), with 5 + 5/6 + 6 lobulations; metaterga with 2 + 2 rounded paramedian and distolateral lobes in usual three longitudinal rows (Golovatch 1999: figs 30-32; Fig. 6A, B), and with irregularly scattered middorsal and intercalary small tubercles; paraterga with three lateral marginal lobulations (Fig. 3B, C). Midbody legs unmodified. Males with extremely complex gonopod structure: hemispherical coxae, setose, and strongly papillate (Golovatch 1999: figs 33, 34; Figs 9A; 10C); telopodites nearly fully concealed or exposed from the gonocoel, containing conspicuous, hyaline, fringed lamellae (Golovatch 1999: figs 33, 35; Figs 9-11); prefemoral processes with distal branchlets (Fig. 9C-F); solenomere fringed, with subterminal opening of seminal groove (Fig. 11B, C). *Pseudoporatia* resembles the widely distributed genus *Poratia* Cook & Cook, 1894 in somatic characters (Cook & Cook 1894; Golovatch & Sierwald 2000: 183), but differs mainly in having much more complex gonopods (see Golovatch & Sierwald 2000: 183). The gonopods of *Pseudoporatia*, with secondary processes on the femoral region and lamellae, superficially resemble those of some non-Neotropical genera such as *Cryptocorypha* Attems, 1907, *Dedalodesmus* Silvestri, 1927, and *Tonodesmus* Silvestri, 1923 (Attems 1907; Silvestri 1923, 1927; Golovatch 1999; Golovatch *et al.* 2011b; Golovatch & VandenSpiegel 2015), and particularly the Asian genus *Ampelodesmus* Miyosi, 1956 by the presence of subunciform branchlets, strongly fringed distal lobes, and lamellae partially covering the telopodite (Golovatch *et al.* 2011a: figs 5, 7). Nonetheless, no putative relationship is inferred between these genera until further phylogenetic analysis is carried out.

Composition. — *Pseudoporatia perplexa* Golovatch, 1999, and now including *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.

Distribution. — Members of *Pseudoporatia* seem to be associated with tropical rainforests of the Amazonian region. The distribution of the genus is here extended from the Madeira province in the Brazilian subregion (Amazonas state, Brazil) up to the Xingu-Tapajós province in the Chacoan subregion (Pará state, Brazil).

Pseudoporatia perplexa Golovatch, 1999

Pseudoporatia perplexa Golovatch, 1999: 229, figs 30-35.

Type material. — **Holotype**. **Brazil** • ♂; Reserva Florestal Adolpho Ducke; primary tropical rainforest on terra firme, Manaus, Amazonas; Kempson extraction (K14 RD4); 2°57'48.0"S, 59°55'21.4"W; 8.XII.1982; J. Adis coll.; INPA (examined by photographs).
Paratypes. **Brazil** • 2 ♂, 3 ♀ and 1 juvenile; same data as holotype; INPA • 1 ♀; same data as holotype; ZMUM • 1 ♂, 1 ♀; K10 RD4; INPA • 1 ♂ and 1 ♀; K24 RD9; 10.V.1983; J. Adis coll.; INPA.

Diagnosis. — *Pseudoporatia perplexa* can be distinguished from *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. by adults having 20 body rings (vs 19 rings in P. *kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.); collum with 5 + 5 lobulations

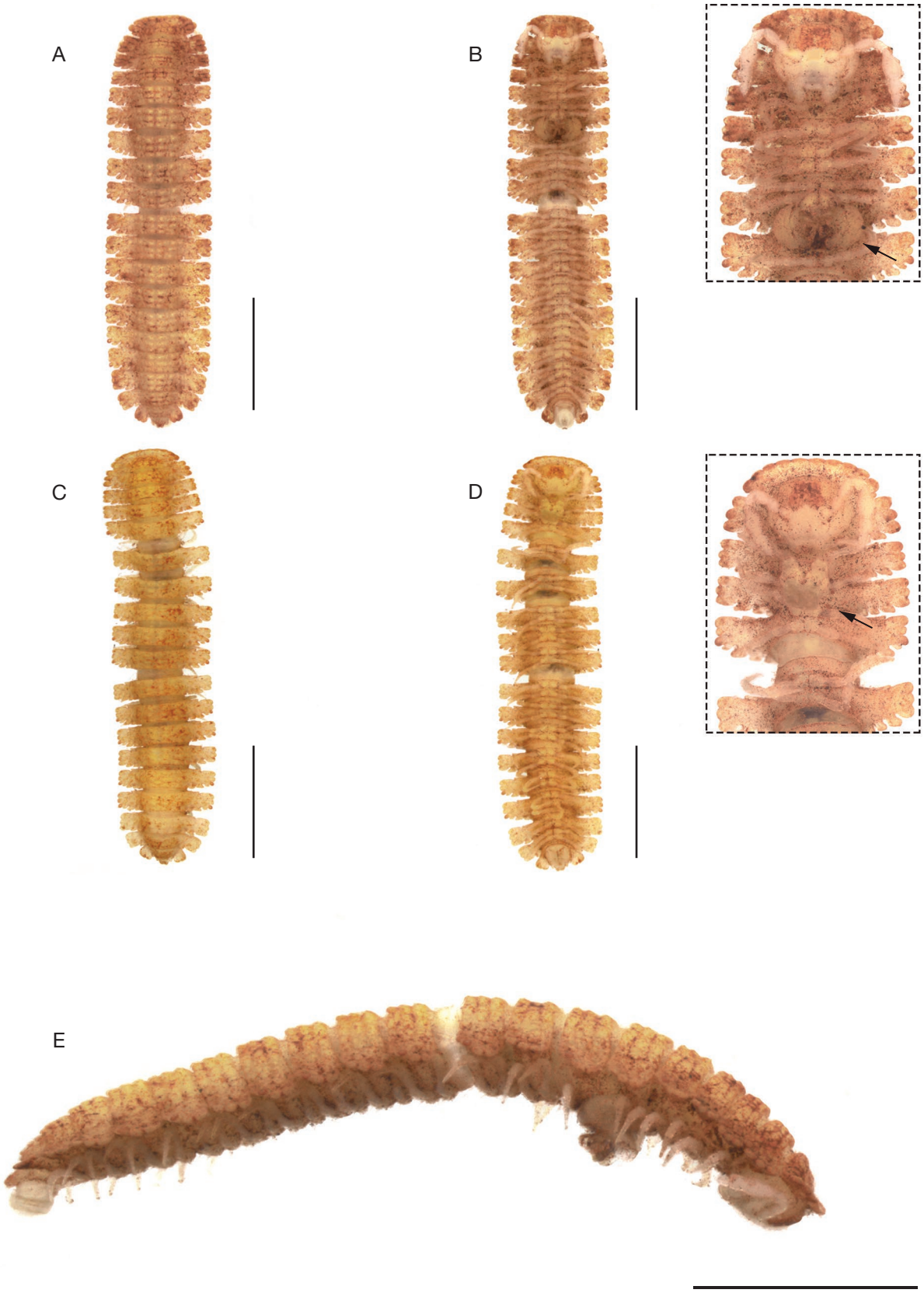

Fig. 2. — Habitus of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. (IBSP 6528): **A**, male in dorsal view; **B**, male in ventral view, with detail of anterior region; **C**, female in dorsal view; **D**, female in ventral view, with detail of anterior region; **E**, male in lateral view. **Arrows** in **B** and **D** indicating the gonopods and cyphopods, respectively. Scale bars: 2 mm.

deeply incised (Golovatch 1999: fig. 30) (vs collum with 6 + 6 lobulations); porosteles on second lobe of paraterga (Golovatch 1999: fig. 31) (vs porosteles on third lobe). Gonopods with telopodites largely concealed inside a prominent gonocoel (Golovatch 1999: fig. 33) (vs telopodites partially exposed from gonocoel); prefemoral region without a broad lamella covering solenomere anteriorly; solenomere with a fringe near the subterminal opening of the seminal groove, but without distal bifid branchlet; femoral process with a distally fringed branchlet and a hyaline branchlet (Golovatch 1999: figs 33-35).

Distribution. — Known only from the type locality.

Pseudoporatia kananciue
Iniesta, Bouzan, Souza & Brescovit, n. sp.
(Figs 1-12)

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Type material. — **Holotype**. **Brazil** • 1 ♂; Pará, Parauapebas, FLONA Carajás, cave N4WS_15; 6°3'59"S, 50°11'22"W; 20.IV-04.V.2010; R. Andrade leg.; IBSP 6181.
Paratypes. **Brazil** • 1 ♂; Pará, Canaã dos Carajás, FLONA Carajás, cave S11C-0023; 6°24'16.4"S, 50°23'13.8"W; 16.III.16; BioSpeleo leg.; IBSP 4725 • 1 ♂; Pará, Parauapebas, FLONA Carajás, cave N4E_02; 6°02'26.4"S, 50°09'40.0"W; 20.IV-4.V.2010 R. Andrade leg.; IBSP 6298 • 1 ♂; Pará, Parauapebas, FLONA Carajás, cave N5S_21; 6°05'15.4"S, 50°07'33.5"W; 25.VIII-3.IX.2009; R. Andrade leg.; IBSP 6523 • 2 ♂, 3 ♀; same collecting data as previous; IBSP 6528 • 2 ♂; cave GEM-1481; 6°18'43.2"S, 49°52'57.8"W; 05-15.III.2012; INPA-DI 394 (ex IBSP 10569) • 1 ♂, 1 juvenil; cave GEM-1418; 6°16'00.7"S, 49°57'03.2"W; 10-31.I.2013; MPEG-DIP 0175 (ex IBSP 10561); • 1 ♂, 1 ♀; cave GEM-1462; 6°18'54.8"S, 49°52'53.5"W; 17.I-02.II.2012; MPEG-DIP 0176 (ex IBSP 10959); all from Canaã dos Carajás, Pará, Brazil; F. Pellegatti leg.; MPEG-DIP 0176 (ex IBSP 10959).

Etymology. — The specific epithet "*kananciue*" (Kananciuê), a noun in apposition, refers to the main God of the indigenous tribe "Karajás", original inhabitants of forests of the Araguaia River and the Serra dos Carajás, where the species is widely distributed.

Diagnosis. — *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. differs clearly from *Pseudoporatia perplexa* by having 19 body rings in adults (vs 20 rings in *P. perplexa*) (Fig. 2), collum with 6 + 6 lobulations not deeply incised, porosteles on third lobe of paraterga (vs second lobe) (Fig. 3B, C). Gonopods with telopodites partially exposed from gonocoel (vs telopodites largely concealed inside prominent gonocoel). Gonopods with prefemoral region having a broad, fringed lamella covering solenomere anteriorly (Figs 9C, E, F; 10B-D); prefemoral process complex, with anteromedial branchlet and broad lamella; second fringed lamella distally covering solenomere (Figs 9C, F; 10D, F); post-prefemoral region somewhat lamellar distally, fringed, with bifid branchlet (Fig. 9D); solenomere distally branching into spinulate branchlets (Figs 10E; 11B), and without a fringe near the subterminal opening of the seminal groove (Fig. 11B).

Additional material examined. — 1377 individuals (746 males, 427 females, and 204 juveniles) were examined throughout this study. An extensive list of the examined material and their localities are given in the Appendix 1.

Distribution. — The species is widely distributed in ferruginous caves in the large plateaus of rock outcrops of the Serra dos Carajás region, such as Serra Norte, Sul, Leste, Tarzan, and Bocaina, and from the municipalities São Félix do Xingu and São Geraldo do Araguaia (Figs 1A-C; 12).

Description
Measurement
Holotype total length 7.8 mm, width of midbody rings 2 mm; male paratypes 6.6-6.8 mm total length, width of midbody rings 1.5-1.7. Female paratypes 6.8-7.4 mm total length, width of midbody rings 1.5-1.6. Live coloration whitish, when long-preserved in 70% ethanol slightly orangish, legs and antennae faded. Body rings widely crusted by sediments of iron ore.

Somatic characters
Body with 19 body rings in both sexes (Fig. 2). Head round, dorsal surface microgranulate (Fig. 5A, B), labral and supra-labral region densely setose (Fig. 5A, C). Interantennal isthmus about as wide as diameter of antennal socket. Antennae slightly clavate, *in situ* reaching body ring 4 when stretched ventrolaterally (Fig. 5A, C); antennomeres proportion 1<2<3>4<5>6>7; antennomeres 5-6 with apicodorsal tufts of bacilliform sensilla (Fig. 4, at); antennomeres 4-7 with long, apicodorsal setae (Fig. 4A, B). Gnathochilarium square-shaped (Fig. 5E, F); mentum subtriangular, apparently with short setae only distally; stipes elongated, subrectangular, with scattered setae basally and 4-5 setae distally; lamellae linguales subrectangular, with scattered setae. Apical palps elongated (Fig. 5F). Mandibles with one elongated and other short external teeth (Fig. 5D); internal teeth with 5-6 lobes, with the second larger and the remaining decreasing in size from posterior to anterior; number of pectinate lamellae variable, *c.* 7-9 lamellae. Collum flabellate, completely covering the head in dorsal view (Figs 2; 5A); with 6 + 6 lobulations not deeply incised. Paraterga slightly directed downwards (Figs 2; 3A, B), subhorizontal; clearly lobulated laterally, with three rounded and moderately incised lobulations on body rings 2-18 (Fig. 3B, C); cylindrical porosteles (p) located between the second and third lobulations on body rings 5, 7, 9, 10, 12, 13, 15, and 16 (Fig. 3C). Posterior margin with lobulations directed laterally; anterior margin without lobulations. Dorsum convex; tegument strongly encrusted with cerotegument coated with soil sediments of iron ore, dull, beset with microvilli (Figs 2; 3A). Limbus composed of palette-like lobes with spine-like anterolateral projections (Fig. 6C, D). Prozonae and metazonae finely alveolate; metaterga with usual three longitudinal rows of relatively large, rounded paramedian (PM) and dorsolateral (DL) lobes (Fig. 6A, B), and with irregularly scattered, middorsal and intercalary flat small ones (Fig. 3B, C). PM and DL lobes decreasing in size and inclined caudad toward telson. Paraterga 2 not enlarged, paraterga 18 and 19 directed posteriorly (Fig. 8A). Body rings microgranulate and micropapillate ventrally (Fig. 7A-D). Ventral surface of prozonae with regular covering of spherical knobs, and anterior surface with papilla-like cuticular outgrowths (Fig. 7D). Epiproct relatively short, subtruncate, divided into 2 + 2 subtriangular lobes at posterior margin (Fig. 8A, B); laterally with 1 + 1 small, rounded, bearing-setae lobes (Fig. 8C),

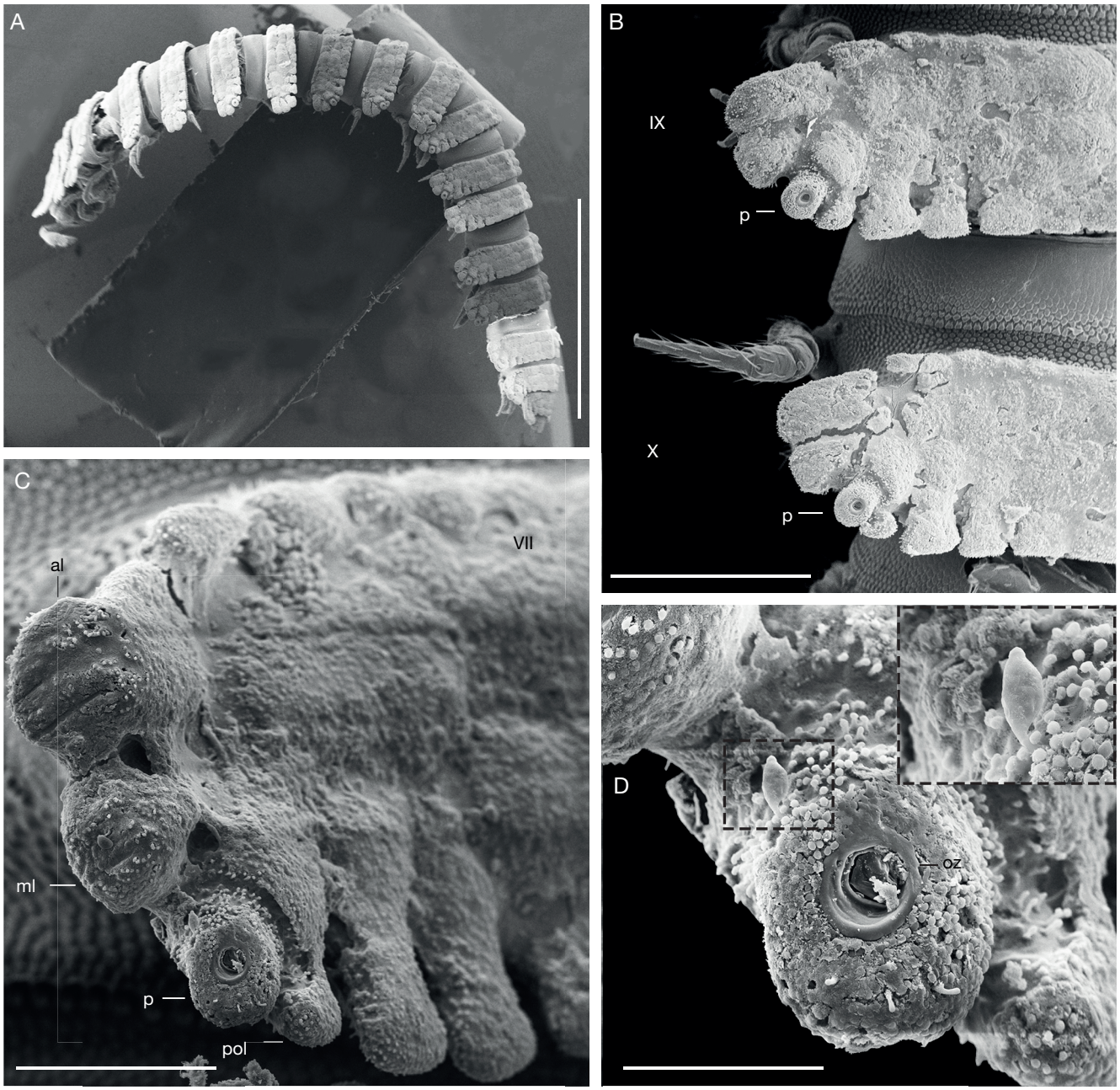

Fig. 3. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., female: **A**, habitus, lateral view (IBSP 10822); **B**, midbody paratergа, lateral view (IBSP 10822); **C**, distal region of midbody paratergum, lateral view (IBSP 10929); **D**, detail of ozospore, lateral view (IBSP 10929), with an associate fungus detailed. Scale bars: A, 2 mm; B, 200 µm; C, 100 µm; D, 40 µm.

and rows of spatulate-like setae (Fig. 8D, ssp); with 4 long, conical spinnerets (Fig. 8E, F). Hypoproct subtriangular, with 1 + 1 long setae on paramedian lobes (Fig. 8C). Legs not visible from above, unmodified (Fig. 7E); podomeres with long setae mesally, tarsus densely setose, tarsal claw slightly curved ventrally. Prefemur and femur microgranulate laterally. Tarsus slender and longer than remaining podomeres. Proportions of podomeres: coxae < prefemur ≈ femur > postfemur < tibia < tarsus. Tarsus of anterior legs of males with spatulate-like setae mesally, and femur with subrectangular, fringed setae located mesally (Fig. 7F).

Male sexual characters

Gonopodal aperture transversely oval (Fig. 2B); *in situ* with telopodites crossing each other (Fig. 9A). Gonopods rather complex: coxae (cx) large, setose, strongly papillate laterally (Figs 9A; 10B, C); cannula simple (Figs 10A; 11A, ca). Telopodite partially exposed from gonocoel. Prefemoral region densely setose (Fig. 10B), with a prominent, setose hump in posterior position (Fig. 10B, C); with a broad, hyaline, and fringed lamella (pl) covering solenomere anteriorly (Figs 9A, C, F; 10B, C; 11B). Prefemoral process curved mesad; with anteromedial subunciform branchlet finely fringed (Fig. 10F),

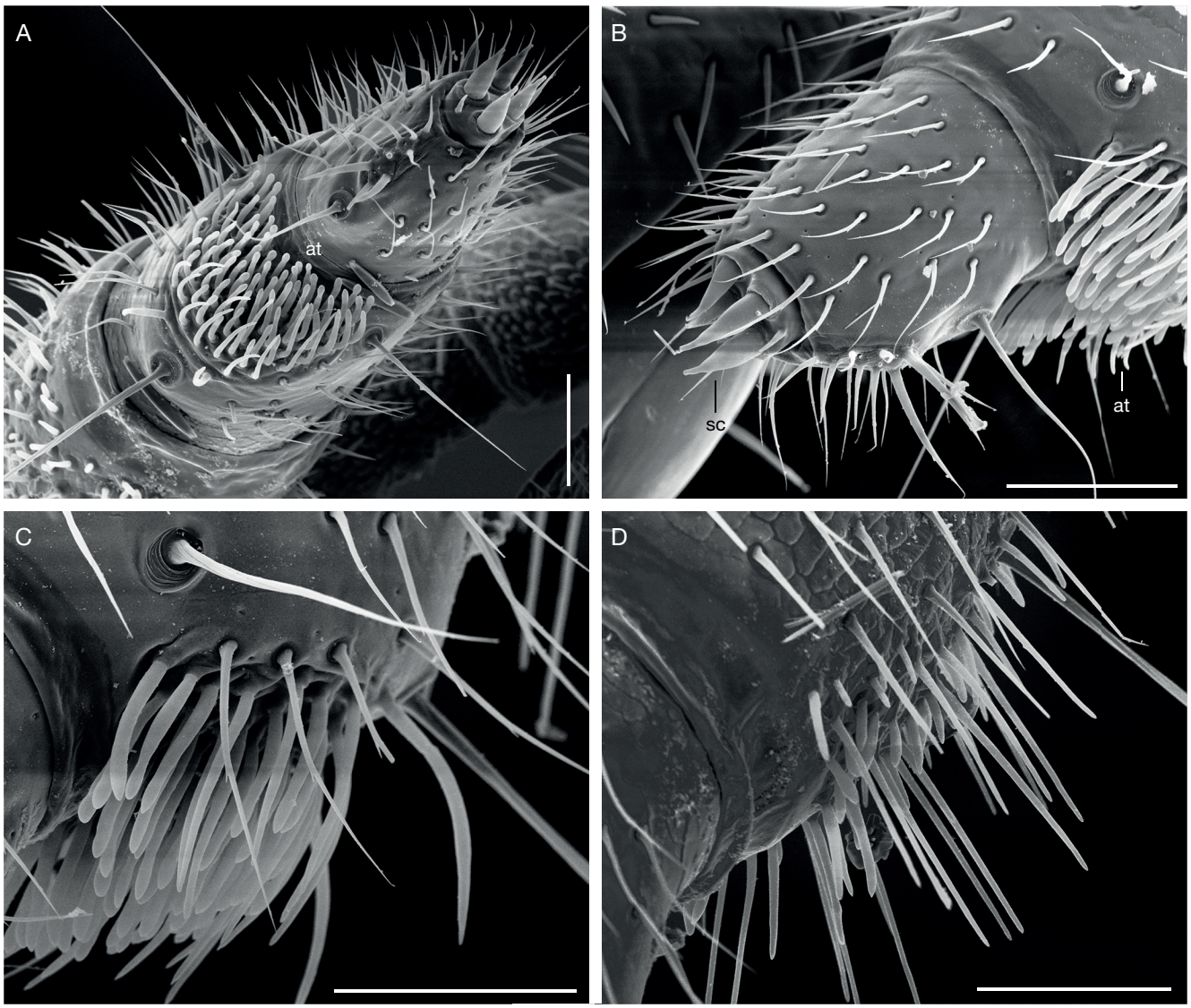

Fig. 4. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., female (IBSP 10929): **A**, last antennomeres, distal view; **B**, seventh antennomere, lateral view; **C**, detail of tufts on sixth antennomere, lateral view; **D**, detail of anterior tufts on fifth antennomere, lateral view. Scale bars: A, B, 50 µm; C, D, 40 µm. Abbreviations: see Material and methods.

and a second fringed lamella (sl) covering solenomere distally (Figs 9A, C, E, F; 10; 11B, C). Post-prefemoral region finely setose (Figs 9F; 10D-F); with branch thickened, slightly constricted medially, fringed marginally (Fig. 10F); distal region somewhat lamellar, fringed, and with a subfalcate, bifid branchlet (Fig. 9C-D, sb). Solenomere (so) arising medially, covered basally by prefemoral lamella and distally by secondary lamella (Figs 9E, F; 10A, E, F; 11B). Solenomere strongly fringed, distally branching into secondary, spinulate branchlets (Fig. 11B); subterminal opening of seminal groove (Fig. 11C, osg).

Female sexual characters

Vulvae (vv) fully exposed from transversely oval aperture (Figs 2D; 6E); setose marginally, subcylindrical; operculum setose (Fig. 6F).

Ecological remarks

The ferruginous caves of Carajás where *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. have been found are usually superficial in the outcrops, with an average horizontal projection of *c.* 30 metres (longest cave with 1500 metres in size). These caves are surrounded by forest or rocky fields, connected with each other by a huge network of small channels (canaliculi), considerably expanding the species habitat and allowing the flow of populations between the outcrops (see Ferreira *et al.* 2015). Adults and immatures of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. are mostly observed in deeper areas within the caves, usually in the aphotic zone, and preferring moist areas with any organic debris (Fig. 1D, E). The main organic matters in these caves are root mats of external vegetation and guano piles, with large populations of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.

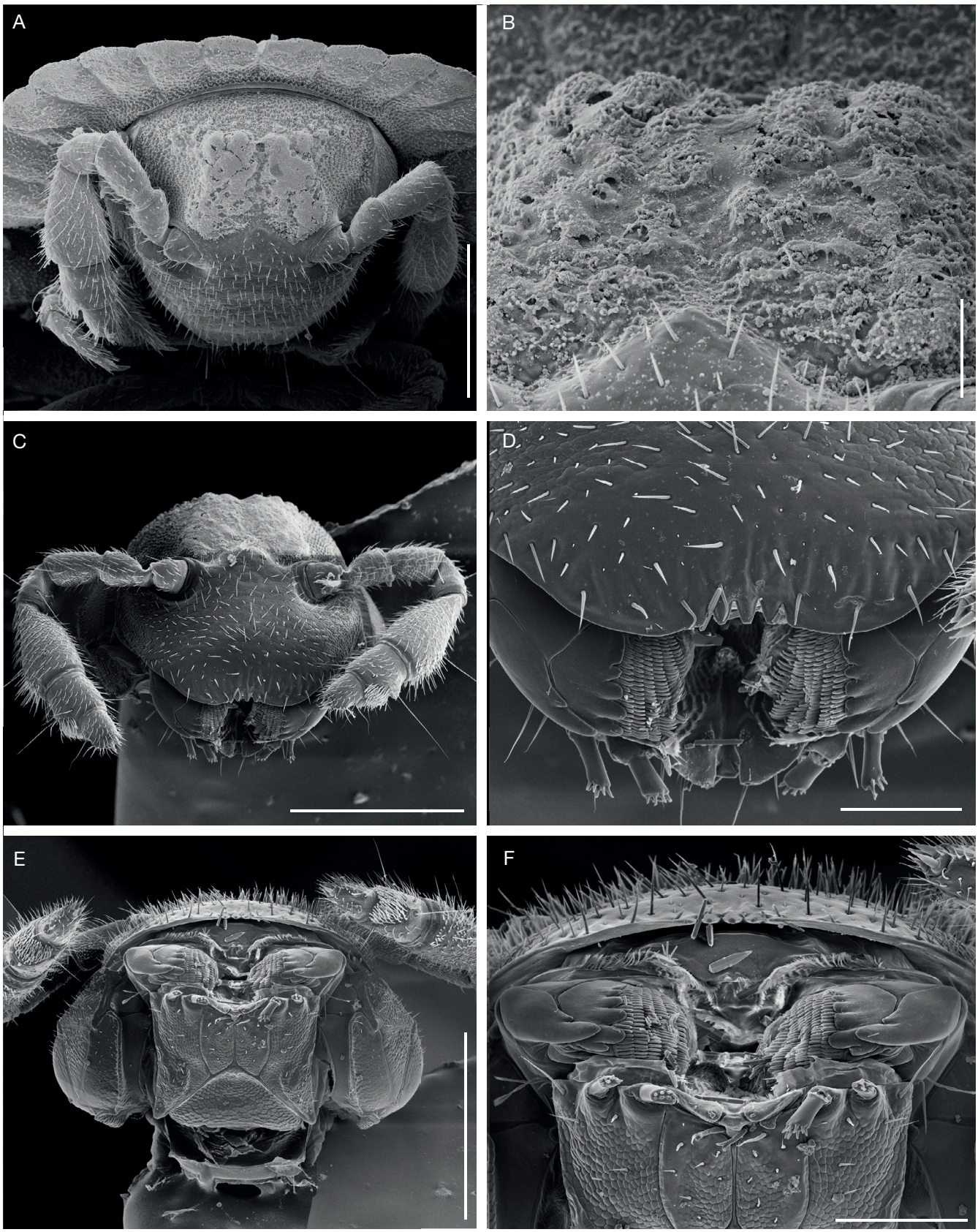

Fig. 5. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.: **A**, anterior region, anterior view (IBSP 4901); **B**, detail of head in anterior view (IBSP 6529); **C**, head, ventral view (IBSP 10929); **D**, detail of head, with labral region and mandibles, ventral view (IBSP 10929); **E**, head and gnathochilarium, ventral view (IBSP 10929); **F**, detail of head (IBSP 10929). Scale bars: A, 300 µm; B, 50 µm; C, E, 400 µm; D, F, 100 µm.

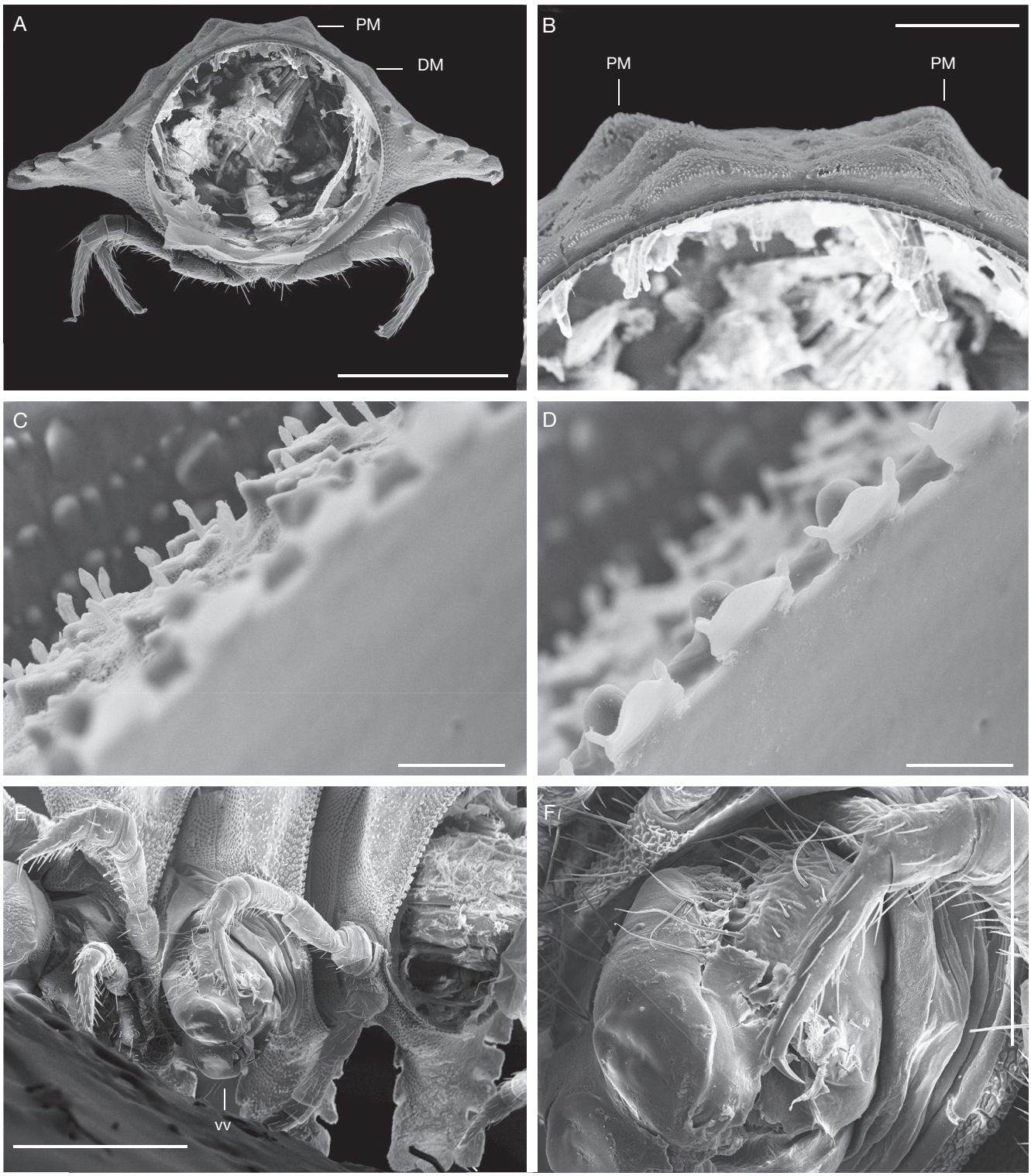

Fig. 6. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.: **A**, midbody ring, anterior view (IBSP 10929); **B**, detail of tergal region with limbus, anterior view (IBSP 10929); **C**, **D**, tergal microsculpture, anterior view (IBSP 10929); **E**, ventral region of female detailing the vulvae (IBSP 10822); **F**, detail of the vulvae, ventral view (IBSP 10822). Scale bars: A, 500 µm; B, 100 µm; C, D, 10 µm; E, 400 µm; F, 200 µm. Abbreviations: see Material and methods.

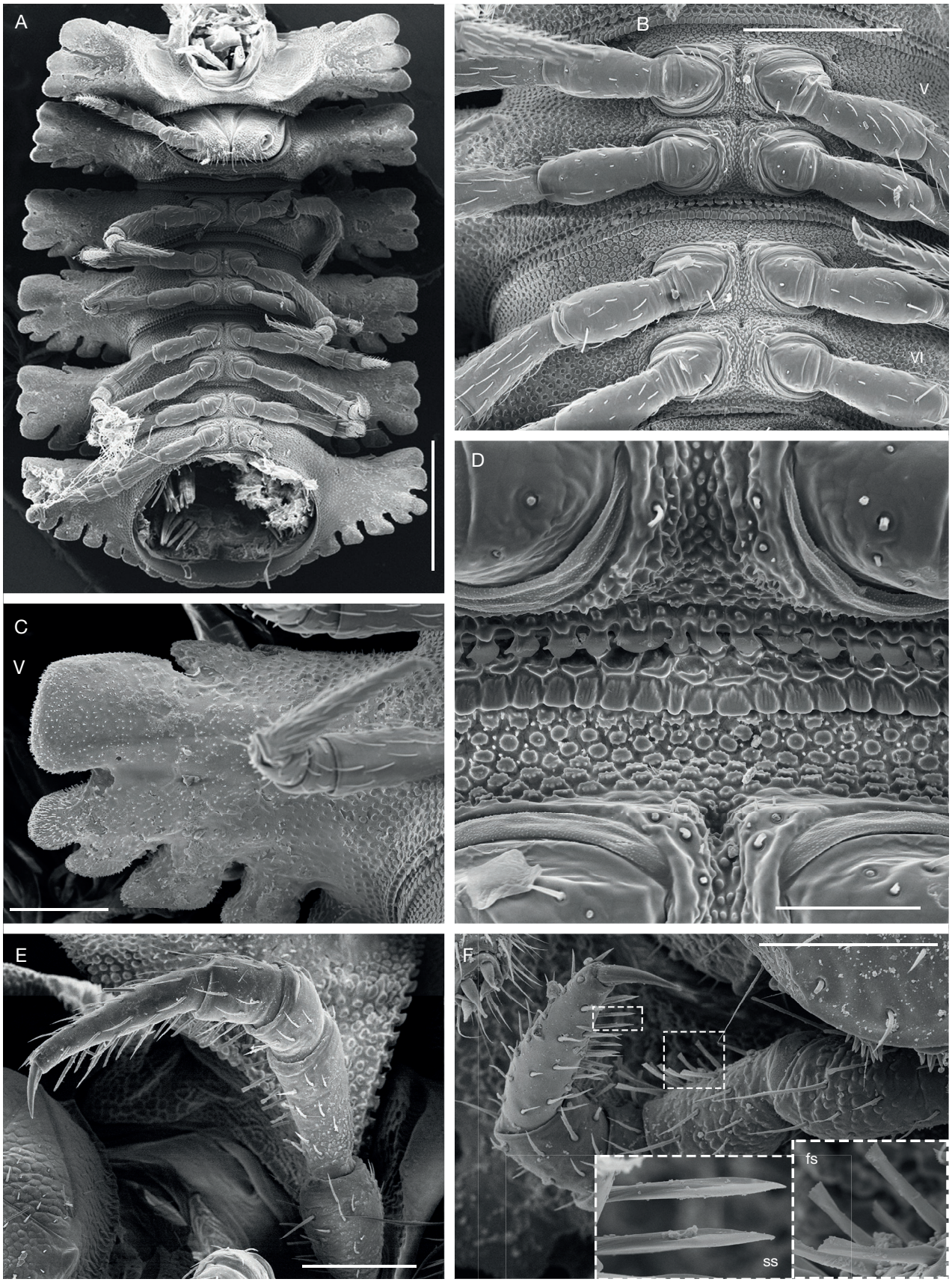

Fig. 7. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.: **A**, midbody rings, ventral view (IBSP 10929); **B**, detail of midbody rings, ventral view (IBSP 10929); **C**, paratergum of fifth body ring, ventral view (IBSP 10929); **D**, ventral microsculpture of midbody ring (IBSP 10929); **E**, midbody leg (IBSP 10822); **F**, anterior leg of male (IBSP 6529). Scale bars: A, 500 µm; B, 200 µm; C, E, F, 100 µm; D, 50 µm. Abbreviations: see Material and methods.

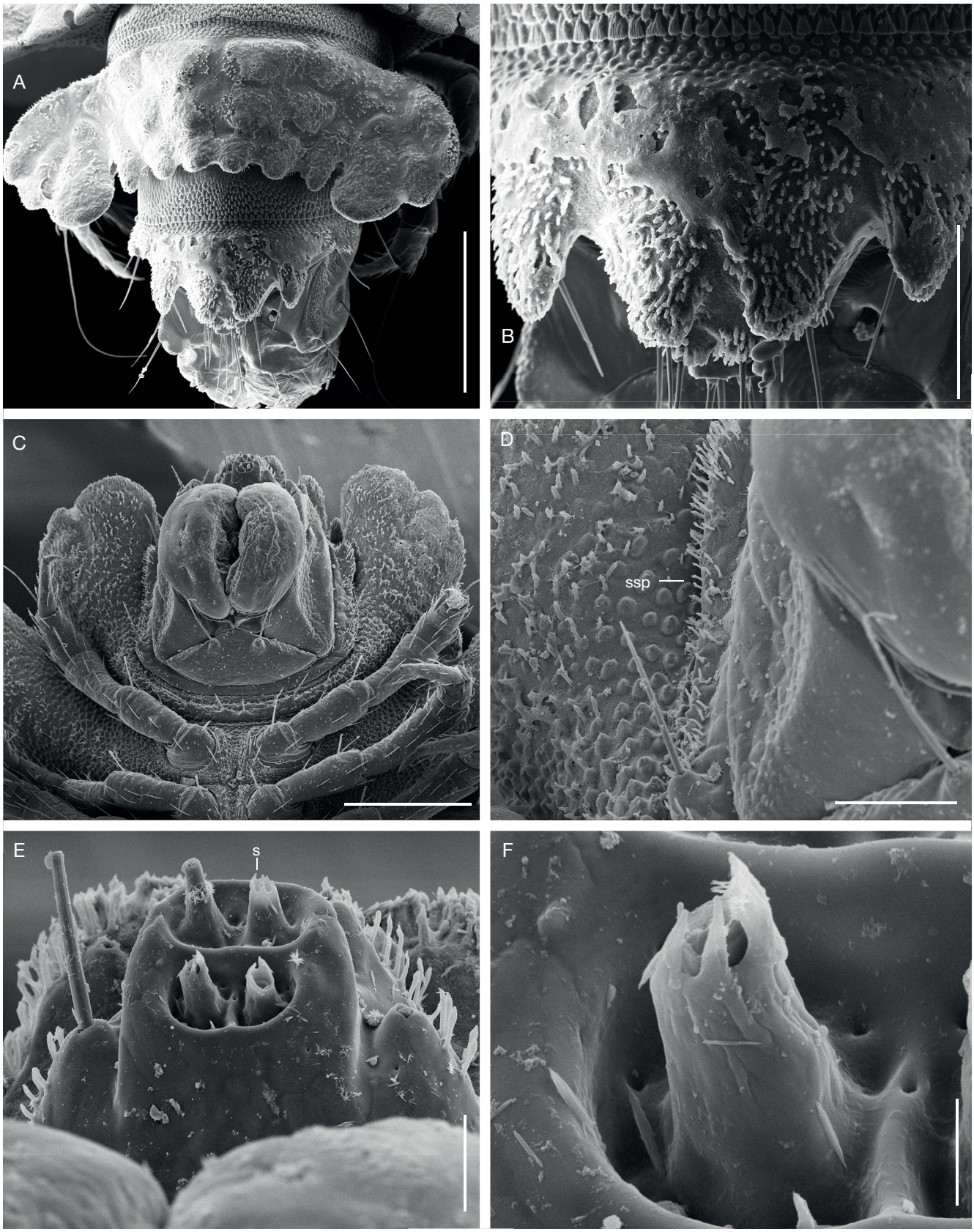

Fig. 8. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.: **A**, posterior region, dorsal view (IBSP 10929); **B**, detail of epiproct, dorsal view (IBSP 10929); **C**, posterior region, ventral view (IBSP 4901); **D**, detail of paraproct, ventral view (IBSP 4901); **E**, detail of epiproct with spinnerets (IBSP 4901); **F**, detail of spinneret (IBSP 4901). Scale bars: A, 500 µm; B, 300 µm; C, D, 100 µm; E, 400 µm; F, 200 µm. Abbreviations: see Material and methods.

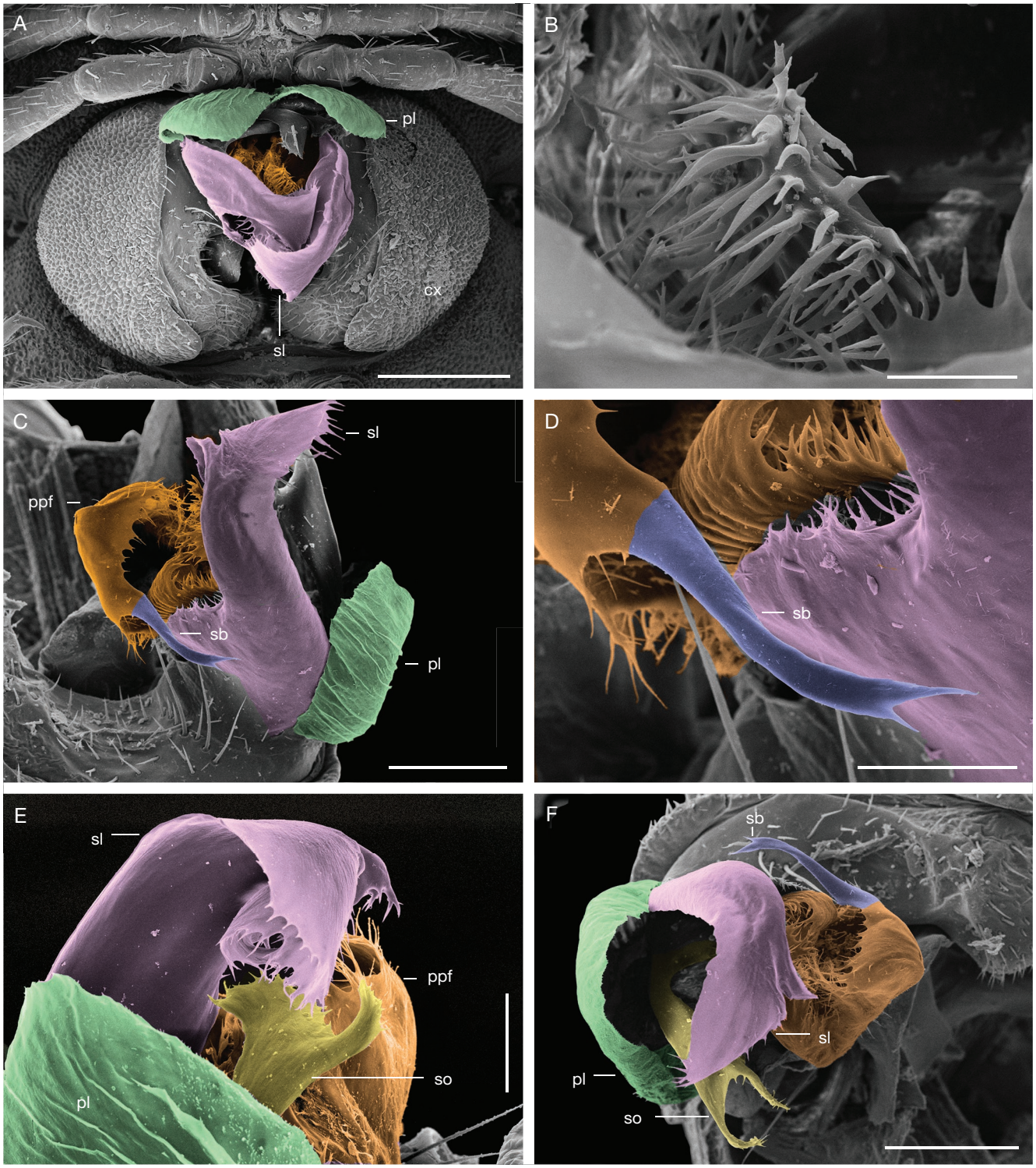

Fig. 9. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., gonopods: **A**, gonopods in situ, ventral view (IBSP 12509); **B**, fringed process on telopodite (IBSP 12509); **C**, right gonopod, ectal view (IBSP 7318); **D**, detail of post-prefemoral process (IBSP 7318); **E**, distal region of right gonopod (IBSP 6674); **F**, left gonopod, ventral view (IBSP 7318). Scale bars: A, 200 µm; B, 20 µm; C, F, 100 µm; D, 40 µm; E, 50 µm. Abbreviations: see Material and methods.

commonly observed close to huge deposits of guano of bats of the families Mormoopidae de Saussure, 1860 and Phyllostomidae Gray, 1825. Most of the caves where the species have been found in the Serra dos Carajás are in a relatively well-preserved area. Nonetheless, the original epigean phytophysiognomy of the region has been extensively altered over the last 30 years, with the vegetation nowadays partially represented by pastures or non-native plantations, mainly on areas located outside conservation units (Fig. 12) (for more details, Mota *et al.* 2015).

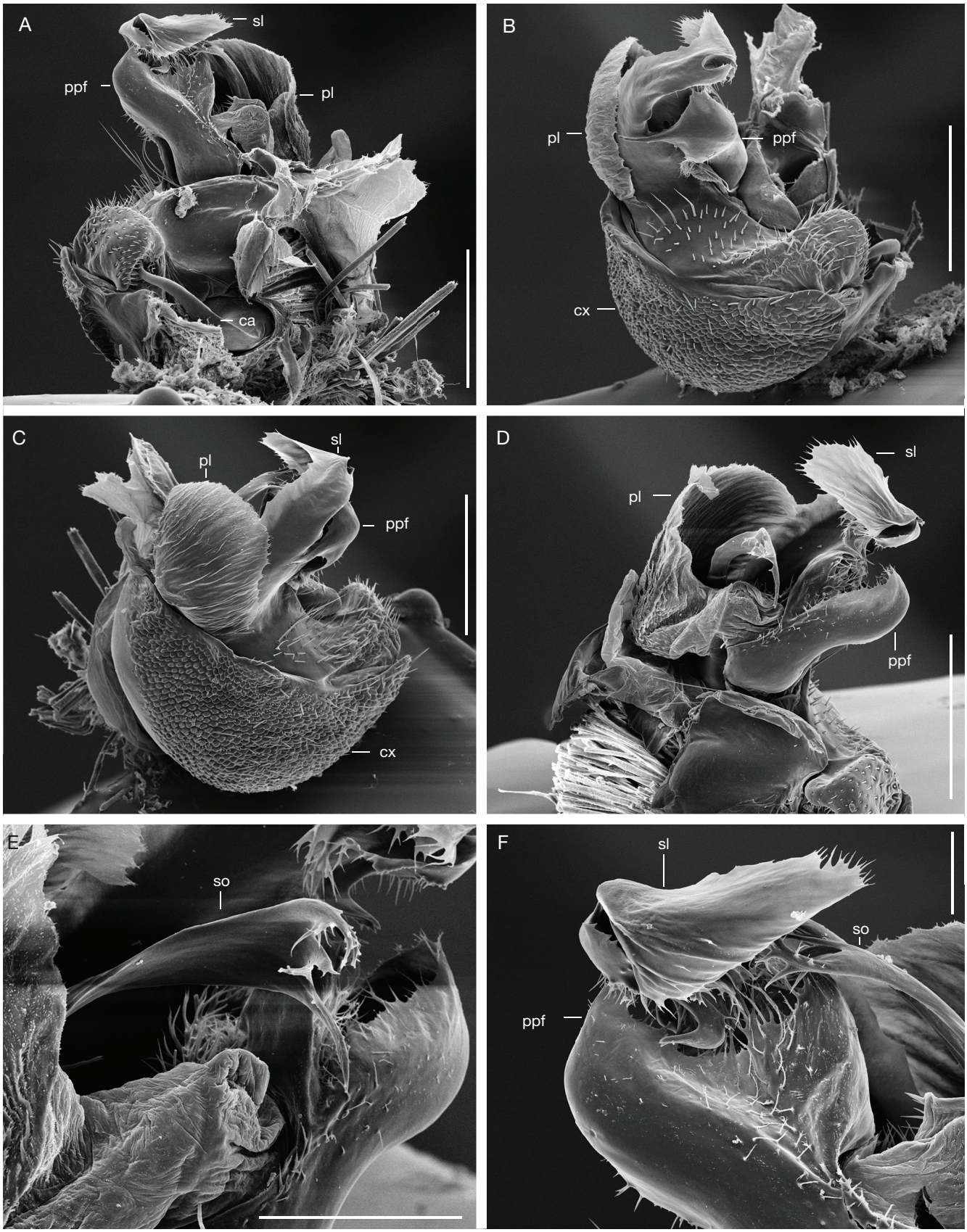

Fig. 10. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., male (IBSP 11002), left gonopod (**A**-**C**, **F**) and right gonopod (**D**, **E**): **A**, mesal view; **B**, submesal view; **C**, suboral view; **D**, submesal view; **E**, solenomere, submesal view; **F**, distal region, mesal view. Scale bars: A, 300 µm; B-D, 200 µm; E, F, 100 µm. Abbreviations: see Material and methods.

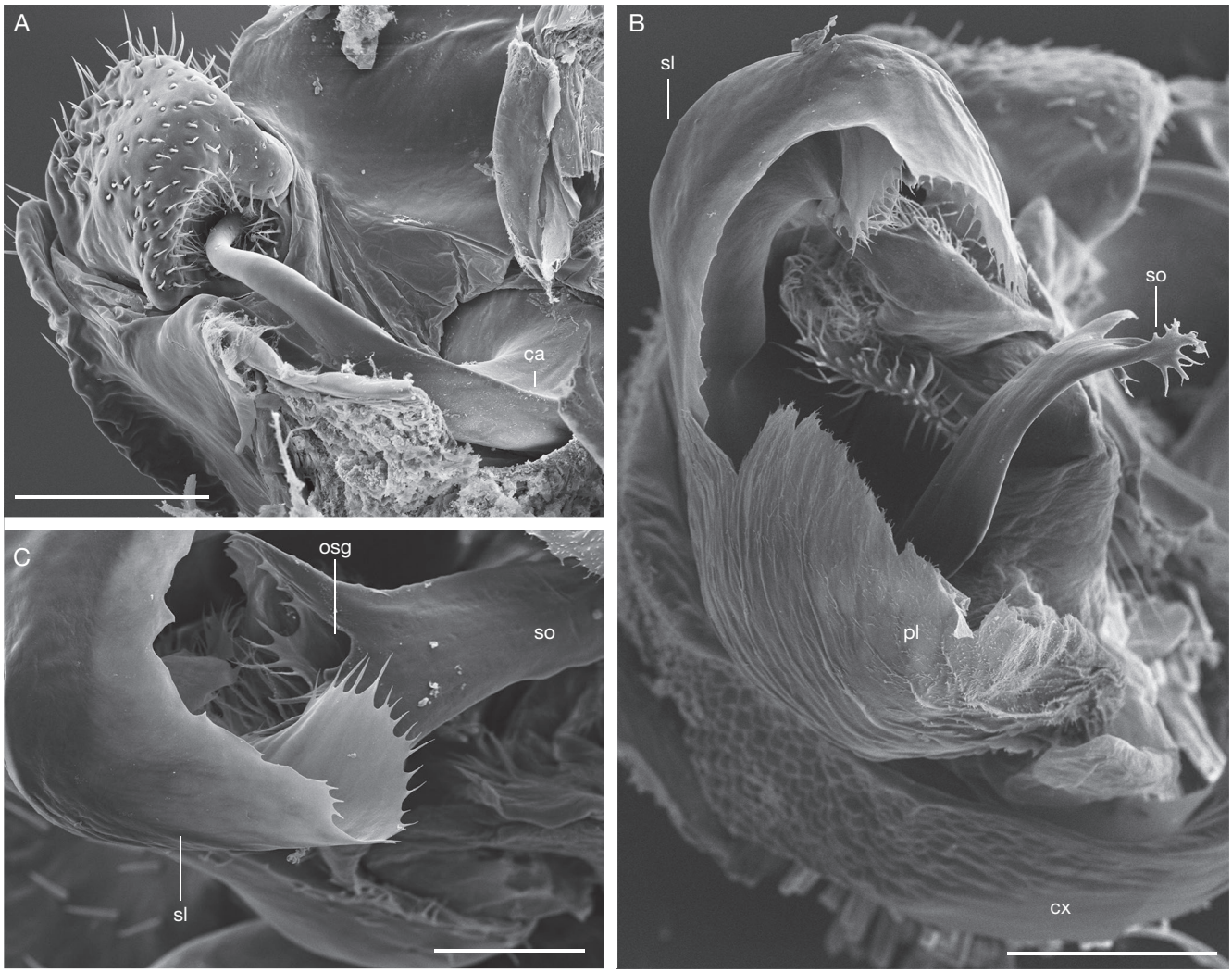

Fig. 11. — SEM of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., male (IBSP 11002), left gonopod (**A**, **B**) and right gonopod (**C**): **A**, cannula and prefemoral region, mesal view; **B**, distal region of the left gonopod; **C**, detail of apical region of femoral region and solenomere, showing the opening of seminal groove. Scale bars: A, B, 100 µm; C, 50 µm. Abbreviations: see Material and methods.

DISCUSSION

The assignment of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. to the genus is justified by the similarities regarding the extremely complex gonopods and patterns of lobulations on body rings with *P. perplexa*. Since there is a scarcity of phylogenetic analyses performed on pyrgodesmids to date (see Akkari & Enghoff 2011b), the morphological comparisons of *Pseudoporatia* are limited at least by topographical correspondences of structures and their superficial similarity. The gonopods of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. seem to be especially similar to those of *P. perplexa* by the presence of conspicuous, hyaline, fringed lamellae on the telopodite, and distal branchlets on the femoral region. The close resemblance, including the pattern of paramedial and dorsolateral tubercles on the metaterga and gonopodal conformation, indicates the affinity of both species.

In the Amazonian region, since the catalog of species made by Brölemann (1904) and a large temporal gap until the studies conducted by J. Adis in the 1990's, the pace of species discovery and descriptions have increased considerably in the region (Golovatch 1992, 1994, 1996, 1997, 1999; Hoffman *et al.* 1996; Golovatch & Adis 1998). Nevertheless, the species richness of millipedes remains vastly underestimated in the Amazonian rainforest, given the narrow and endemic ranges of most millipedes.

Although the fauna of pyrgodesmids in northern Brazil is still underexplored, at least three species described by Schubart (1947) are known in surrounding forests of the Araguaia-Tocantins basin, *Araguayadesmus cochlearius* Schubart, 1947, *A. ligulifer* Schubart, 1947 from the municipality of Xambioá, state of Tocantins (less of 5 km from the easternmost occurrence point of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.), and *Lophodesmus brasiliensis* Schubart, 1947 from the municipality of Ananindeua, state of Pará (*c.* 600 km

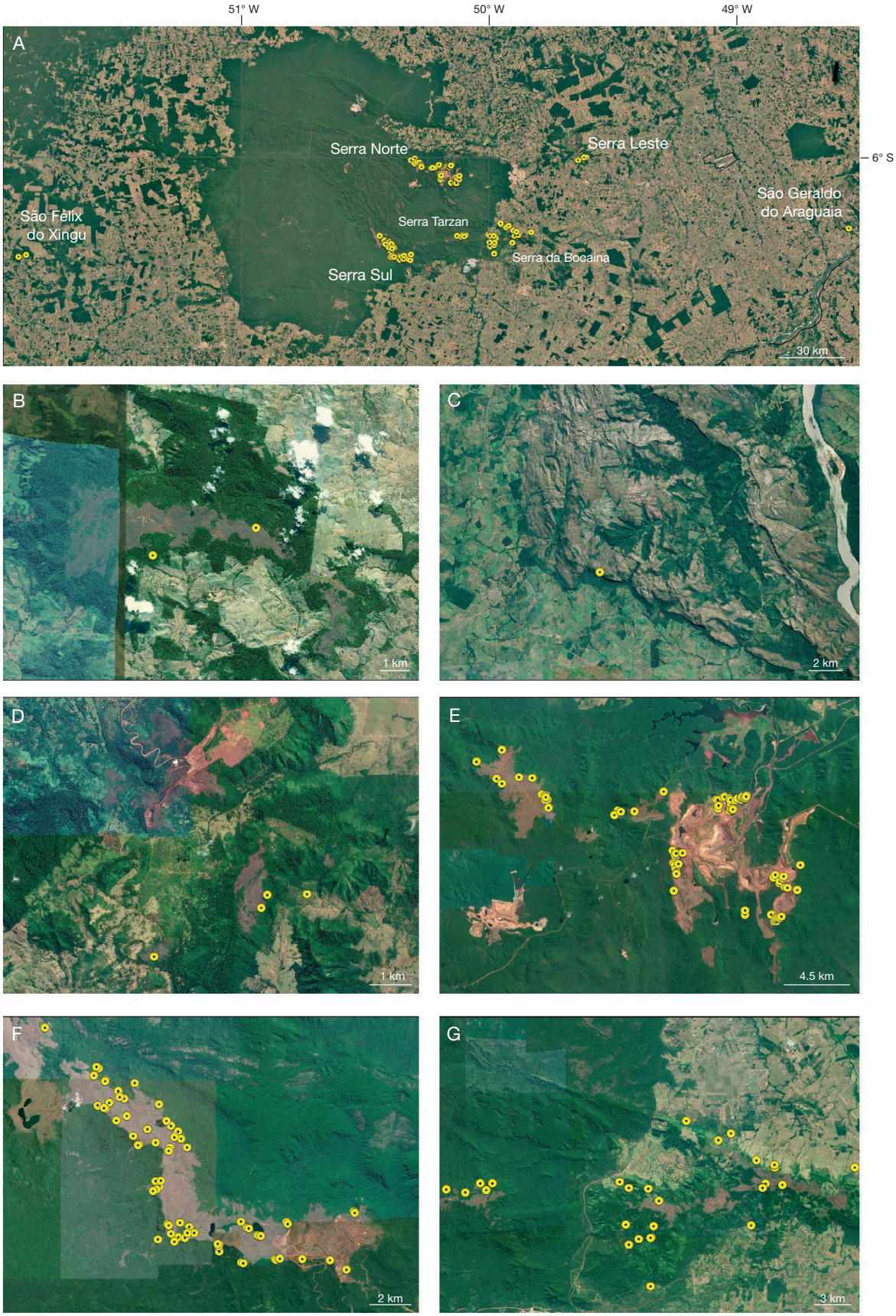

Fig. 12. — Occurrence points of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. in the ferruginous outcrops: **A**, Serra dos Carajás and surrounding area; **B**, São Félix do Xingu; **C**, São Geraldo do Araguaia; **D**, Serra Leste; **E**, Serra Norte; **F**, Serra Sul; **G**, Serra Tarzan and Bocaina.

away from the type locality of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp.). The gonopods of *A. cochlearius* and *A. ligulifer* are rather simple than those of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp., with a tongue-shaped prefemoral process and a solenomere elongated, suberect (Schubart 1947: figs 35-36, 48-50). For *Lophodesmus brasiliensis* only the female holotype is known, differing from the members of *Pseudoporatia* by the pattern of tubercles on body rings, including those strongly elongated on the seventh body ring (Schubart 1947: fig. 46).

Interestingly, a similar pattern of distribution in the Amazon rainforest of Pará is observed for the chelodesmid genus *Parastenonia* Hoffman, 1977, with the type species *Parastenonia parae* (Cook, 1895) occurring in Ananindeua (Cook 1895; Schubart 1947; Hoffman 1977), and *Parastenonia carajas* Bouzan & Iniesta 2019 widely distributed in caves of the Serra de Carajás (Bouzan *et al.* 2019).

Millipedes associated with subterranean habitats may present morphological adaptations as a consequence of their restriction to these habitats (troglomorphic species), such as elongated appendages, reduction of eyes, and body depigmentation. Nonetheless, most millipede species that are not restricted to subterranean habitats (but presenting some of these morphological features) may occur sporadically in caves (*sensu* subtroglophile, Sket [2008]). In fact, the definition of these troglomorphic features in some millipedes is not so clear, especially for groups common to soil and litter as Pyrgodesmidae. To date, the single obligatory cave-dwelling pyrgodesmid known in Brazil is *Yporangiella stygius* Schubart, 1946, described based on a single male from a carbonate cave in São Paulo state (Schubart 1946). Although *Y. stygius* is found only in a subterranean environment, apparently the species does not present a clear troglomorphism excepting the pale body coloration (Schubart 1946: 312).

Pseudoporatia kananciue Iniesta, Bouzan, Souza & Brescovit, n. sp. has only been sampled in caves, but no morphological indicator of its restriction to the subterranean environment is observed. Extensive samplings either by hand or using traps have been conducted outside caves in Carajás, including surrounding forests close to cave entrances, but no individuals of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. have been found in epigean areas to date, which would reinforce its apparent restriction in subterranean habitat. It is evident that the network of canaliculi in ferruginous caves may be one of the main causes of the wide distribution of the species in the region, especially when compared to the distribution of Neotropical epigean pyrgodesmids, such as members of *Araguayadesmus* Schubart, 1947 and *Lophodesmus* Pocock, 1894. Alternatively, the subsurface soil layers connected between the caves (or other types of subterranean interstitial spaces) can also function as routes for populations of *P. kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. in these outcrops, thus expanding the area of occurrence of the species. However, detailed phylogeographic studies are essential for a better understanding about the flow between populations of the species in these rocky outcrops in the Serra dos Carajás region.

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APPENDIX

Appendix 1. — Additional material examined of *Pseudoporatia kananciue* Iniesta, Bouzan, Souza & Brescovit, n. sp. throughout this study. Abbreviations: **cN**, catalog number; **M**, male; **F**, female; **J**, juvenil; **Lo**, locality; **sL**, specific locality; **La**, latitude; **Lo**, longitude; **leg.**, collector.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
8382	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1418 – Serra da Bocaina	611377mE	9301691mN	UTM SAD'69	10-31.I.2013	Pellegati *et al.*
8383	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1418 – Serra da Bocaina	611383mE	9301690mN	UTM SAD'69	29.VIII-7.IX.2012	Pellegati *et al.*
8384	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	Cav. GEM1423 – Serra da Bocaina	622488mE	9302030mN	UTM SAD'69	17.I-2.II.2012	Pellegati *et al.*
8400	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1423 – Serra da Bocaina	622488mE	9302030mN	UTM SAD'69	17.I-2.II.2012	Pellegati *et al.*
8394	C.A.R. Souza, 2018	2	–	1	Canaã dos Carajás	Cav. GEM1427 – Serra da Bocaina	610644mE	9302210mN	UTM SAD'69	10-31.I.2013	Pellegati *et al.*
8405	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1427 – Serra da Bocaina	610644mE	9302210mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegati *et al.*
8406	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	Cav. GEM1436– Serra da Bocaina	613818mE	9300640mN	UTM SAD'69	28.I-5.II.2013	Pellegati *et al.*
8381	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1457 – Serra da Bocaina	618649mE	9305607mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegati *et al.*
8411	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1460 – Serra da Bocaina	622253mE	9301707mN	UTM SAD'69	17.I-2.II.2012	Pellegati *et al.*
8374	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1461 – Serra da Bocaina	6232207mE	9303372mN	UTM SAD'69	5-15.III.2012	Pellegati *et al.*
8387	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1461 – Serra da Bocaina	622253mE	9301707mN	UTM SAD'69	–	Pellegati *et al.*
8408	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	Cav. GEM1481 – Serra da Bocaina	623221mE	9303374mN	UTM SAD'69	5-15.III.2012	Pellegati *et al.*
8391	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	Cav. GEM1487 – Serra da Bocaina	619663mE	9306148mN	UTM SAD'69	5-15.III.2012	Pellegati *et al.*
4710	L.F.M. Iniesta, 2021	1	–	1	Canaã dos Carajás	Cavidade S11C-0014EU	568296mE	9292230mN	UTM SAD'69	14.IV.2016	Bioespeleo
4715	L.F.M. Iniesta, 2021	1	1	–	Canaã dos Carajás	Cavidade S11C-0017EU	568418mE	9292454mN	UTM SAD'69	10.III.2016	Bioespeleo
4725	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0023EU	567820mE	9292076mN	UTM SAD'69	16.III.2016	Bioespeleo
4726	L.F.M. Iniesta, 2021	1	1	–	Canaã dos Carajás	Cavidade S11C-0023EU	567820mE	9292076mN	UTM SAD'69	16.III.2016	Bioespeleo
4732	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0027EU	567559mE	9292804mN	UTM SAD'69	8.IV.2016	Bioespeleo
4740	L.F.M. Iniesta, 2021	2	–	–	Canaã dos Carajás	Cavidade S11C-0029EU	567524mE	9292844mN	UTM SAD'69	8.IV.2016	Bioespeleo
4749	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0047	567797mE	9292095mN	UTM SAD'69	16.III.2016	Bioespeleo
4759	L.F.M. Iniesta, 2021	1	1	1	Canaã dos Carajás	Cavidade S11C-0053	568443mE	9292692mN	UTM SAD'69	9.III.2016	Bioespeleo
4772	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0060	568032mE	9292870mN	UTM SAD'69	5.IX.2015	Bioespeleo
4775	L.F.M. Iniesta, 2021	1	3	2	Canaã dos Carajás	Cavidade S11C-0060	568032mE	9292870mN	UTM SAD'69	8.III.2016	Bioespeleo
4776	L.F.M. Iniesta, 2021	1	–	1	Canaã dos Carajás	Cavidade S11C-0060	568032mE	9292870mN	UTM SAD'69	8.III.2016	Bioespeleo
4777	L.F.M. Iniesta, 2021	1	2	1	Canaã dos Carajás	Cavidade S11C-0060	568032mE	9292870mN	UTM SAD'69	8.III.2016	Bioespeleo
4785	L.F.M. Iniesta, 2021	1	1	–	Canaã dos Carajás	Cavidade S11C-0068	568667mE	9292414mN	UTM SAD'69	2.IX.2015	Bioespeleo
4807	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0091	567613mE	9292388mN	UTM SAD'69	12.III.2016	Bioespeleo
4823	L.F.M. Iniesta, 2021	2	2	–	Canaã dos Carajás	Cavidade S11C-0098	567952mE	9292236mN	UTM SAD'69	14.IV.2016	Bioespeleo
4835	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0113	567088mE	9294503mN	UTM SAD'69	14.III.2016	Bioespeleo
4837	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0116	567020mE	9292127mN	UTM SAD'69	31.VIII.2016	Bioespeleo
4849	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0117	566956mE	9294367mN	UTM SAD'69	20.IV.2016	Bioespeleo
4853	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0119	566814mE	9294303mN	UTM SAD'69	15.IV.2016	Bioespeleo
4867	L.F.M. Iniesta, 2021	1	1	–	Canaã dos Carajás	Cavidade S11C-0139	566934mE	9294757mN	UTM SAD'69	13.IV.2016	Bioespeleo
4872	L.F.M. Iniesta, 2021	1	1	–	Canaã dos Carajás	Cavidade S11C-0140	566923mE	9294737mN	UTM SAD'69	13.IV.2016	Bioespeleo
4877	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0144	567171mE	9294758mN	UTM SAD'69	13.IV.2016	Bioespeleo

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
4882	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0151	567568mE	9296251mN	UTM SAD'69	30.VII.2015	Bioespeleo
4889	L.F.M. Iniesta, 2021	3	2	–	Canaã dos Carajás	Cavidade S11C-0151	567568mE	9296251mN	UTM SAD'69	12.IV.2016	Bioespeleo
6048	C.A.R. Souza, 2018	1	–	–	Curionópolis	Serra Leste; Gruta SL_0167	653325mE	9336605mN	UTM SAD'69	13-29.I.2015	Equipe Spelayon
6057	C.A.R. Souza, 2018	1	–	–	Curionópolis	Serra Leste; Gruta SL_0258	650804mE	9335467mN	UTM SAD'69	13-29.I.2015	Equipe Spelayon
6062	C.A.R. Souza, 2018	1	–	–	Curionópolis	Serra Leste; Gruta SL_0153	654405mE	9336919mN	UTM SAD'69	13-29.I.2015	Equipe Spelayon
6064	C.A.R. Souza, 2018	1	–	–	Curionópolis	Serra Leste; Gruta SL_0227	653468mE	9336909mN	UTM SAD'69	10.IX.2014	Equipe Spelayon
6070	C.A.R. Souza, 2018	1	1	–	Curionópolis	Serra Leste; Gruta SL_0167	653325mE	9336605mN	UTM SAD'69	10-IX.2014	Equipe Spelayon
6080	C.A.R. Souza, 2018	6	3	–	Parauapebas	FLONA Carajás; Gruta N4WS_0015	–	-50.18943300	decimal	20.X-1. XI.2006	Andrade *et al.*
6085	C.A.R. Souza, 2018	4	7	–	Parauapebas	FLONA Carajás; Gruta N4E_0061	–	-50.16792100	decimal	8-12.II.2007	Andrade *et al.*
6090	C.A.R. Souza, 2018	18	15	–	Parauapebas	FLONA Carajás; Gruta N4E_0033	–	-50.16046300	decimal	8-12.II.2007	Andrade *et al.*
6091	C.A.R. Souza, 2018	1	4	–	Parauapebas	FLONA Carajás; Gruta N4E_0023	–	-50.16906600	decimal	20.X-1. XI.2006	Andrade *et al.*
6093	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N4E_0013	–	-50.16086300	decimal	20.X-1. XI.2006	Andrade *et al.*
6095	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_0015	–	-50.16021600	decimal	20.X-1. XI.2006	Andrade *et al.*
6097	C.A.R. Souza, 2018	3	–	–	Parauapebas	FLONA Carajás; Gruta N4E_0014	–	-50.16073700	decimal	20.X-1. XI.2006	Andrade *et al.*
6099	C.A.R. Souza, 2018	3	6	–	Parauapebas	FLONA Carajás; Gruta N4E_0008	–	-50.16032000	decimal	20.X-1. XI.2006	Andrade *et al.*
6100	C.A.R. Souza, 2018	7	9	–	Parauapebas	FLONA Carajás; Gruta N4E_0026	–	-50.16783100	decimal	8-12.II.2007	Andrade *et al.*
6102	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N4E_0010	–	-50.16102500	decimal	20.X-1. XI.2006	Andrade *et al.*
6104	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_0008	–	-50.16032000	decimal	20.X-1. XI.2006	Andrade *et al.*
6105	C.A.R. Souza, 2018	2	3	–	Parauapebas	FLONA Carajás; Gruta N4E_0001	–	-50.16133900	decimal	20.X-1. XI.2006	Andrade *et al.*
6107	C.A.R. Souza, 2018	1	3	–	Parauapebas	FLONA Carajás; Gruta N4E_0021	–	-50.16054500	decimal	20.X-1. XI.2006	Andrade *et al.*
6108	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_0008	–	-50.16032000	decimal	20.X-1. XI.2006	Andrade *et al.*
6109	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_0028	–	-50.16753300	decimal	8-12.II.2007	Andrade *et al.*
6110	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_0002	–	-50.16111300	decimal	20.X-1. XI.2006	Andrade *et al.*
6112	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_0003	–	-50.16098700	decimal	20.X-1. XI.2006	Andrade *et al.*
6113	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_0006	–	-50.16041000	decimal	20.X-1. XI.2006	Andrade *et al.*
6115	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_0011	–	-50.16098000	decimal	20.X-1. XI.2006	Andrade *et al.*
6117	C.A.R. Souza, 2018	5	5	–	Parauapebas	FLONA Carajás; Gruta N4E_0022	–	-50.16817100	decimal	20.X-1. XI.2006	Andrade *et al.*
6177	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4WS_17	589031mE	9329555mN	UTM SAD'69	–	Andrade *et al.*
6178	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4WS_11	589189mE	9329129mN	UTM SAD'69	–	Andrade *et al.*
6181	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4WS_15	589699mE	9329386mN	UTM SAD'69	–	Andrade *et al.*
6182	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4WS_15	589699mE	9329386mN	UTM SAD'69	–	Andrade *et al.*
MNHN (ex IBSP - 6183)	C.A.R. Souza, 2018	–	4	–	Parauapebas	FLONA Carajás; Gruta N5S_85	589699mE	9329386mN	UTM SAD'69	–	Andrade *et al.*
6200	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_23	592000mE	9332998mN	UTM SAD'69	–	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
6207	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_14	592935mE	9332514mN	UTM SAD'69	3-13.V.2005	Andrade; Arnoni
6208	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_03	595762mE	9325106mN	UTM SAD'69	3-13.V.2005	Andrade; Arnoni
6209	L.F.M. Iniesta, 2021	1	2	–	Parauapebas	FLONA Carajás; Gruta N5S_08	596003mE	9325022mN	UTM SAD'69	3-13.V.2005	Andrade; Arnoni
6210	L.F.M. Iniesta, 2021	1	2	1	Parauapebas	FLONA Carajás; Gruta N5S_10	596113mE	9325034mN	UTM SAD'69	3-13.V.2005	Andrade; Arnoni
6213	L.F.M. Iniesta, 2021	2	2	–	Parauapebas	FLONA Carajás; Gruta N5S_09	596120mE	9325003mN	UTM SAD'69	3-13.V.2005	Andrade; Arnoni
6216	L.F.M. Iniesta, 2021	1	1	1	Parauapebas	FLONA Carajás; Gruta N5S_07	595920mE	9325025mN	UTM SAD'69	3-13.V.2005	Andrade; Arnoni
6217	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_52/53	595902mE	9324836mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6218	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592939mE	9332222mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6220	C.A.R. Souza, 2018	3	–	–	Parauapebas	FLONA Carajás; Gruta N4E_23	592000mE	9332998mN	UTM SAD'69	–	Andrade *et al.*
6232	L.F.M. Iniesta, 2021	3	4	–	Parauapebas	FLONA Carajás; Gruta N5E_01	-6.073682	-50.118073	decimal	22.III-3. IV.2005	Andrade; Arnoni
6233	L.F.M. Iniesta, 2021	1	3	2	Parauapebas	FLONA Carajás; Gruta N5E_11	*	*	*	22.III-3. IV.2005	Andrade; Arnoni
6236	L.F.M. Iniesta, 2021	2	3	6	Parauapebas	FLONA Carajás; Gruta N5E_06	-6.084802	-50.130676	decimal	22.III-3. IV.2005	Andrade; Arnoni
6238	L.F.M. Iniesta, 2021	1	1	4	Parauapebas	FLONA Carajás; Gruta N5E_12	*	*	*	22.III-3. IV.2005	Andrade; Arnoni
6240	L.F.M. Iniesta, 2021	2	2	–	Parauapebas	FLONA Carajás; Gruta N5E_09	-6.081787	-50.128727	decimal	22.III-3. IV.2005	Andrade; Arnoni
6241	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Gruta N5E_07	-6.083672	-50.130549	decimal	22.III-3. IV.2005	Andrade; Arnoni
6242	L.F.M. Iniesta, 2021	3	3	–	Parauapebas	FLONA Carajás; Gruta N5E_10	-6.080582	-50.128336	decimal	22.III-3. IV.2005	Andrade; Arnoni
6253	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_95	593084mE	9332318mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6296	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_01	592840mE	9332274mN	UTM SAD'69	–	Andrade *et al.*
6298	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_02	592856mE	9332300mN	UTM SAD'69	–	Andrade *et al.*
6302	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_14	592935mE	9332514mN	UTM SAD'69	–	Andrade *et al.*
6304	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_14	592935mE	9332514mN	UTM SAD'69	–	Andrade *et al.*
6305	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N4E_70	593737mE	9333180mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6307	C.A.R. Souza, 2018	3	1	1	Parauapebas	FLONA Carajás; Gruta N4E_70	593737mE	9333180mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6308	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_70	593737mE	9333180mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6310	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_70	593737mE	9333180mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6311	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_61	592130mE	9332403mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6312	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_61	592130mE	9332403mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6313	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_86	592904mE	9332862mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6314	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_20	592977mE	9332976mN	UTM SAD'69	–	Andrade *et al.*
6315	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_03	592875mE	9332292mN	UTM SAD'69	–	Andrade *et al.*
6318	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_22	592107mE	9332976mN	UTM SAD'69	–	Andrade *et al.*
6319	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_22	592107mE	9332976mN	UTM SAD'69	–	Andrade *et al.*
6320	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N4E_22	592107mE	9332976mN	UTM SAD'69	–	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
6322	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_22	592107mE	9332976mN	UTM SAD'69	–	Andrade *et al.*
6323	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_22	592107mE	9332976mN	UTM SAD'69	–	Andrade *et al.*
6326	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_73	593639mE	9333142mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6329	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_11	592883mE	9332438mN	UTM SAD'69	–	Andrade *et al.*
6332	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_73	593639mE	9333142mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6334	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_46	592945mE	9332562mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6338	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6339	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6340	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6341	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6342	C.A.R. Souza, 2018	3	1	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6343	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6344	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_33	592972mE	9332288mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6348	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_51	592894mE	9332349mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6349	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_16	592913mE	9332856mN	UTM SAD'69	–	Andrade *et al.*
6350	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_92	593106mE	9332366mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6351	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_92	593106mE	9332366mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6352	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_92	593106mE	9332366mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6354	C.A.R. Souza, 2018	1	3	–	Parauapebas	FLONA Carajás; Gruta N4E_92	593106mE	9332366mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6355	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_21	592943mE	9332978mN	UTM SAD'69	–	Andrade *et al.*
6357	C.A.R. Souza, 2018	2	–	1	Parauapebas	FLONA Carajás; Gruta N4E_21	592943mE	9332978mN	UTM SAD'69	–	Andrade *et al.*
6358	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_21	592943mE	9332978mN	UTM SAD'69	–	Andrade *et al.*
6359	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_21	592943mE	9332978mN	UTM SAD'69	–	Andrade *et al.*
6360	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_21	592943mE	9332978mN	UTM SAD'69	–	Andrade *et al.*
6362	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_10	592889mE	9332420mN	UTM SAD'69	–	Andrade *et al.*
6365	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N4E_15	592979mE	9332740mN	UTM SAD'69	–	Andrade *et al.*
6367	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_15	592979mE	9332740mN	UTM SAD'69	–	Andrade *et al.*
6368	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_15	592979mE	9332740mN	UTM SAD'69	–	Andrade *et al.*
6369	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_48	592941mE	9332567mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6370	C.A.R. Souza, 2018	4	7	–	Parauapebas	FLONA Carajás; Gruta N4E_26	592136mE	9332604mN	UTM SAD'69	18.VIII-3. IX.2009	Andrade *et al.*
6371	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_26	592136mE	9332604mN	UTM SAD'69	18.VIII-3. IX.2009	Andrade *et al.*
6376	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_19	592901mE	9332920mN	UTM SAD'69	–	Andrade *et al.*
6377	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_19	592901mE	9332920mN	UTM SAD'69	–	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
6378	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_95	593084mE	9332318mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6384	C.A.R. Souza, 2018	1	3	–	Parauapebas	FLONA Carajás; Gruta N4E_95	593084mE	9332318mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6385	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_68	593989mE	9333214mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6386	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_68	593989mE	9333214mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6388	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_68	593989mE	9333214mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6392	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_13	592900mE	9332504mN	UTM SAD'69	–	Andrade *et al.*
6393	C.A.R. Souza, 2018	1	3	–	Parauapebas	FLONA Carajás; Gruta N4E_13	592900mE	9332504mN	UTM SAD'69	–	Andrade *et al.*
6394	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_13	592900mE	9332504mN	UTM SAD'69	–	Andrade *et al.*
6395	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_13	592900mE	9332504mN	UTM SAD'69	–	Andrade *et al.*
6398	C.A.R. Souza, 2018	1	1	1	Parauapebas	FLONA Carajás; Gruta N4E_72	593664mE	9333140mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6399	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_72	593664mE	9333140mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6405	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_72	593664mE	9333140mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6407	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N4E_71	593683mE	9333148mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6408	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N4E_71	593683mE	9333148mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6413	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_57	592563mE	9333118mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6416	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_93	593117mE	9332356mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6419	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_39	592870mE	9333076mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6421	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_08	592957mE	9332412mN	UTM SAD'69	–	Andrade *et al.*
6422	C.A.R. Souza, 2018	3	2	–	Parauapebas	FLONA Carajás; Gruta N4E_08	592957mE	9332412mN	UTM SAD'69	–	Andrade *et al.*
6423	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_08	592957mE	9332412mN	UTM SAD'69	–	Andrade *et al.*
6424	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N4E_07	592952mE	9332384mN	UTM SAD'69	–	Andrade *et al.*
6426	C.A.R. Souza, 2018	5	–	–	Parauapebas	FLONA Carajás; Gruta N4E_89	593871mE	9333074mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6427	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N4E_89	593871mE	9333074mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6428	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_77	593981mE	9333120mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6429	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N4E_77	593981mE	9333120mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6431	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_75	593977mE	9333300mN	UTM SAD'69	15-22. IX.2009	Andrade *et al.*
6432	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_74	593427mE	9333078mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6433	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N4E_74	593427mE	9333078mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6434	C.A.R. Souza, 2018	3	3	1	Parauapebas	FLONA Carajás; Gruta N4E_74	593427mE	9333078mN	UTM SAD'69	24-30. VII.2009	Andrade *et al.*
6435	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_75	593977mE	9333300mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6436	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_75	593977mE	9333300mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6437	C.A.R. Souza, 2018	3	–	–	Parauapebas	FLONA Carajás; Gruta N4E_75	593977mE	9333300mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*
6438	C.A.R. Souza, 2018	1	–	2	Parauapebas	FLONA Carajás; Gruta N4E_74	593427mE	9333078mN	UTM SAD'69	19.II-4. III.2010	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
MNHN (ex IBSP-6440)	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_85	596684mE	9327144mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6444	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_19	596607mE	9327111mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6446	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_22	596732mE	9327014mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6447	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_51	595902mE	9324844mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6448	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_57	595986mE	9324725mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6450	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_18	596546mE	9327177mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6454	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_62	595701mE	9325110mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*
6456	C.A.R. Souza, 2018	1	3	–	Parauapebas	FLONA Carajás; Gruta N5S_04	595814mE	9325049mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6458	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N5S_62	595701mE	9325110mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6459	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_70	595768mE	9325498mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6460	C.A.R. Souza, 2018	4	1	–	Parauapebas	FLONA Carajás; Gruta N5S_70	595768mE	9325498mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6461	C.A.R. Souza, 2018	4	1	–	Parauapebas	FLONA Carajás; Gruta N5S_70	595768mE	9325498mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6462	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_08	596003mE	9325022mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6465	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_75	595861mE	9325598mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6466	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_75	595861mE	9325598mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6467	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_75	595861mE	9325598mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6468	C.A.R. Souza, 2018	1	–	1	Parauapebas	FLONA Carajás; Gruta N5S_20	596664mE	9327035mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6470	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_07	595920mE	9325025mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6471	C.A.R. Souza, 2018	3	1	–	Parauapebas	FLONA Carajás; Gruta N5S_07	595920mE	9325025mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6473	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N5S_07	595920mE	9325025mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6475	C.A.R. Souza, 2018	1	3	–	Parauapebas	FLONA Carajás; Gruta N5S_20	596664mE	9327035mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6476	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_20	596664mE	9327035mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6477	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_74	595756mE	9325624mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6478	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_74	595756mE	9325624mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6480	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_09	596120mE	9325003mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6481	C.A.R. Souza, 2018	3	2	–	Parauapebas	FLONA Carajás; Gruta N5S_09	596120mE	9325003mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6482	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_09	596120mE	9325003mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6483	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N5S_09	596120mE	9325003mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
MNHN (ex-IBSP 6484)	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_74	595756mE	9325264mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6489	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_13	595847mE	9325077mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6490	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N5S_63/64/65	595682mE	9325264mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
6491	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_63/64/65	595682mE	9325264mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*
6492	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_63/64/65	595682mE	9325264mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*
6494	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_55	595991mE	9324802mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6495	C.A.R. Souza, 2018	1	–	1	Parauapebas	FLONA Carajás; Gruta N5S_63/64/65	595682mE	9325264mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6497	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N5S_63/64/65	595682mE	9325264mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6499	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_63/64/65	595682mE	9325264mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6502	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_10	596113mE	9325034mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6504	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_10	596113mE	9325034mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6505	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N5S_11	596301mE	9325116mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6506	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_11	596301mE	9325116mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6508	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_11	596301mE	9325116mN	UTM SAD'69	14-23.X.2009	Andrade *et al.*
6510	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_52/53	595902mE	9324836mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6511	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_52/53	595902mE	9324836mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6512	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_52/53	595902mE	9324836mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6514	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_52/53	595902mE	9324836mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6515	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_52/53	595902mE	9324836mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6516	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6517	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6518	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6519	C.A.R. Souza, 2018	3	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6522	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6523	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6524	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6527	C.A.R. Souza, 2018	3	3	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6528	C.A.R. Souza, 2018	2	3	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6529	C.A.R. Souza, 2018	3	2	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6532	C.A.R. Souza, 2018	3	1	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6533	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6535	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*
6536	C.A.R. Souza, 2018	3	3	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*
6537	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	15-21. IX.2009	Andrade *et al.*
6540	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6541	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
6542	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6543	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6545	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6546	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6547	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6548	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6550	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6552	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N5S_85	596684mE	9327144mN	UTM SAD'69	14.III-4. IV.2010	Andrade *et al.*
6558	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_85	596684mE	9327144mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6559	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_85	596684mE	9327144mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6560	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_85	596684mE	9327144mN	UTM SAD'69	25.VIII-3. IX.2009	Andrade *et al.*
6669	L.F.M. Iniesta, 2021	1	–	–	São Geraldo do Araguaia	Gruta SI_01	771904mE	9304971mN	UTM SAD'69	31.VIII-09. IX.2010	Pellegatti-Franco *et al.*
6674	L.F.M. Iniesta, 2021	1	1	–	São Geraldo do Araguaia	Gruta SI_01	771904mE	9304971mN	UTM SAD'69	22.II-2. III.2011	Pellegatti-Franco *et al.*
4890	L.F.M. Iniesta, 2021	1	1	1	Canaã dos Carajás	Cavidade S11C-0153	567564mE	9296137mN	UTM SAD'69	01.VIII.2015	Bioespeleo
4901	L.F.M. Iniesta, 2021	4	–	–	Canaã dos Carajás	Cavidade S11C-0153	567564mE	9296137mN	UTM SAD'69	15.III.2016	Bioespeleo
4954	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0192	567950mE	9296961mN	UTM SAD'69	19.III.2016	Bioespeleo
4968	L.F.M. Iniesta, 2021	1	1	–	Canaã dos Carajás	Cavidade S11C-0202	568350mE	9296248mN	UTM SAD'69	28.VII.2015	Bioespeleo
4969	L.F.M. Iniesta, 2021	1	–	1	Canaã dos Carajás	Cavidade S11C-0202	568350mE	9296248mN	UTM SAD'69	5.IV.2016	Bioespeleo
4975	L.F.M. Iniesta, 2021	1	–	1	Canaã dos Carajás	Cavidade S11C-0202	568350mE	9296248mN	UTM SAD'69	5.IV.2016	Bioespeleo
4990	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade S11C-0206	567825mE	9296742mN	UTM SAD'69	18.III.2016	Bioespeleo
5061	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade ST_0001(3)	599910mE	9301568mN	UTM SAD'69	2.II.2016	Bioespeleo
5078	L.F.M. Iniesta, 2021	1	1	1	Canaã dos Carajás	Cavidade ST_0034	598125mE	9301324mN	UTM SAD'69	18.VII.2016	Bioespeleo
5098	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade ST_0035	599337mE	9302067mN	UTM SAD'69	4.II.2016	Bioespeleo
5038	L.F.M. Iniesta, 2021	1	2	2	Canaã dos Carajás	Cavidade ST_0041	600319mE	9302067mN	UTM SAD'69	23.I.2016	Bioespeleo
5088	L.F.M. Iniesta, 2021	1	1	2	Canaã dos Carajás	Cavidade ST_0041	600319mE	9302067mN	UTM SAD'69	23.I.2016	Bioespeleo
5083	L.F.M. Iniesta, 2021	1	–	–	Canaã dos Carajás	Cavidade ST_0044	596588mE	9301569mN	UTM SAD'69	3.VIII.2016	Bioespeleo
6947	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_01_S11	0573571mE	9291252mN	UTM SAD'69	22-31.V.2010	Andrade *et al.*
6990	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_18_S11	0569773mE	9291823mN	UTM SAD'69	22-31.V.2010	Andrade *et al.*
6942	C.A.R. Souza, 2018	3	1	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_19_S11	0569797mE	9291903mN	UTM SAD'69	22-31.V.2010	Andrade *et al.*
6938	C.A.R. Souza, 2018	2	1	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_21_S11	-6.405931	-50.369915	decimal	22-31.V.2010	Andrade *et al.*
6924	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_22_S11	0569745mE	9291837mN	UTM SAD'69	22-31.V.2010	Andrade *et al.*
6969	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_28_S11	0569803mE	9291586mN	UTM SAD'69	22-31.V.2010	Andrade *et al.*
6974	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	FLONA Carajás; Gruta CAV_34_S11	0568318mE	9292264mN	UTM SAD'69	22-31.V.2010	Andrade *et al.*
7175	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	FLONA Carajás; Gruta S11A_20	-6.318196	-50.440242	decimal	23.VIII-2. IX.2007	Andrade *et al.*
6970	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_10	0571111mE	9292692mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6972	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_10	0571111mE	9292692mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
6953	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_13	0571630mE	9292336mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
7181	C.A.R. Souza, 2018	4	2	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_13	-6.402184	-50.352746	decimal	23.VIII-2. IX.2007	Andrade *et al.*
6998	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_14	0571564mE	9292370mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6976	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_17	0571181mE	9292674mN	UTM SAD'69	1-14. VII.2010	Andrade *et al.*
6955	C.A.R. Souza, 2018	2	2	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_22	0570839mE	9291118mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6956	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_22	0570839mE	9291118mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6957	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_22	0570839mE	9291118mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6931	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_29	0572360mE	9291298mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6975	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_29	0572360mE	9291298mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6954	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_31	0572407mE	9291266mN	UTM SAD'69	3-19. VIII.2010	Andrade *et al.*
6936	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_32	0572552mE	9291258mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6932	C.A.R. Souza, 2018	2	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_33	0572583mE	9291304mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6992	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_37	0570925mE	9291096mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6994	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_37	0570925mE	9291096mN	UTM SAD'69	19-22. II.2010	Andrade *et al.*
6934	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_38	0572920mE	9292838mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6978	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	0572895mE	9292945mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6979	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	0572895mE	9292945mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6982	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	0572895mE	9292945mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6984	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	0572895mE	9292945mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
7191	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Gruta N5W_04	595775mE	9327723mN	UTM SAD'69	4-7.XII.2013	D.D. Guarda *et al.*
7201	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	4-7.XII.2013	D.D. Guarda *et al.*
7206	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Gruta N5W_01	595902mE	9327904mN	UTM SAD'69	4-7.XII.2013	D.D. Guarda *et al.*
7224	C.A.R. Souza, 2018	1	1	1	Parauapebas	FLONA Carajás; Gruta N4E_0016	592926mE	9332863mN	UTM SAD'69	3.II.2018	Andrade *et al.*
7225	C.A.R. Souza, 2018	1	–	4	Parauapebas	FLONA Carajás; Gruta N5S_0075	595870mE	932560mN	UTM SAD'69	29.I.2018	Andrade *et al.*
7229	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_0028	592169mE	9332616mN	UTM SAD'69	12.I.2018	Andrade *et al.*
7231	C.A.R. Souza, 2018	1	2	1	Parauapebas	FLONA Carajás; Gruta N4E_0018	592922mE	9332899mN	UTM SAD'69	5.II.2018	Andrade *et al.*
7245	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_74	585168mE	9331968mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7255	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_024	586505mE	9332227mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7261	C.A.R. Souza, 2018	5	6	8	Parauapebas	FLONA Carajás; Gruta N4E-10	592889mE	9332420mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7262	C.A.R. Souza, 2018	4	9	–	Parauapebas	FLONA Carajás; Gruta N4E-10	592889mE	9332420mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7263	C.A.R. Souza, 2018	1	1	9	Parauapebas	FLONA Carajá; Gruta N4E_14	592935mE	9332514mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7264	C.A.R. Souza, 2018	1	2	3	Parauapebas	FLONA Carajás; Gruta N4E_22	592107mE	9332976mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7265	C.A.R. Souza, 2018	1	4	7	Parauapebas	FLONA Carajás; Gruta N4E_26	592154mE	9332602mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
7266	C.A.R. Souza, 2018	2	7	3	Parauapebas	FLONA Carajás; Gruta N4E_33	592939mE	9332222mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7268	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N4E_61	592130mE	9332403mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7270	C.A.R. Souza, 2018	3	3	2	Parauapebas	FLONA Carajás; Gruta N4E_68	593989mE	9333214mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7271	C.A.R. Souza, 2018	3	1	–	Parauapebas	FLONA Carajás; Gruta N4E_95	593084mE	9332318mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7273	C.A.R. Souza, 2018	2	4	–	Parauapebas	FLONA Carajás; Gruta N5S_08	596003mE	9325022mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7274	C.A.R. Souza, 2018	2	–	6	Parauapebas	FLONA Carajás; Gruta N5S_08	596003mE	9325022mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7275	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N5S_10	596113mE	9325034mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7276	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N5S_11	596301mE	9325116mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7279	C.A.R. Souza, 2018	2	–	3	Parauapebas	FLONA Carajás; Gruta N5S_21	596716mE	9327033mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7280	C.A.R. Souza, 2018	3	1	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7283	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N1_14 Ataque)	-6.034393	-50.272625	decimal	–	Andrade *et al.*
7284	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N1_22 (Fael)	-6.032873	-50.272311	decimal	–	Andrade *et al.*
7286	C.A.R. Souza, 2018	1	–	1	Parauapebas	FLONA Carajás; Gruta N1_08 (Keda)	-6.039257	-50.270721	decimal	–	Andrade *et al.*
7288	C.A.R. Souza, 2018	3	2	11	Parauapebas	FLONA Carajás; Gruta N1_25 (Três Mosqueteiros)	-6.031716	-50.272563	decimal	–	Andrade *et al.*
7290	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N1_37 (Bial)	-6.030922	-50.27478	decimal	–	Andrade *et al.*
7293	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N1_72 (Tio Edy)	-6.020737	-50.288627	decimal	–	Andrade *et al.*
7295	C.A.R. Souza, 2018	1	2	–	Parauapebas	FLONA Carajás; Gruta N1_75 (Piranha)	-6.021007	-50.280673	decimal	–	Andrade *et al.*
7298	C.A.R. Souza, 2018	2	6	–	Parauapebas	FLONA Carajás; Gruta N1_103 (Cipó)	-6.004143	-50.29903	decimal	–	Andrade *et al.*
7299	C.A.R. Souza, 2018	2	–	–	Parauapebas	FLONA Carajás; Gruta N1_103 (Cipó)	-6.004143	-50.29903	decimal	–	Andrade *et al.*
7300	C.A.R. Souza, 2018	2	2	–	Parauapebas	FLONA Carajás; Gruta N1_116 (Dijé)	-6.011344	-50.314363	decimal	–	Andrade *et al.*
7301	C.A.R. Souza, 2018	1	1	–	Parauapebas	FLONA Carajás; Gruta N1_116 (Dijé)	-6.011344	-50.314363	decimal	–	Andrade *et al.*
7304	C.A.R. Souza, 2018	2	1	–	Parauapebas	FLONA Carajás; Gruta N1_173 (Escondida)	-6.024604	-50.299158	decimal	–	Andrade *et al.*
7305	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_74	585168mE	9331968mN	UTM SAD'69	2-23. VIII.2018	Freitas *et al.*
7306	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_74	585168mE	9331968mN	UTM SAD'69	2-23. VIII.2018	Freitas *et al.*
7307	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_74	585168mE	9331968mN	UTM SAD'69	2-23. VIII.2018	Freitas *et al.*
7309	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_76	585590mE	9332184mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7310	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_24	586505mE	9332227mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7311	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_24	586505mE	9332227mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7312	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_24	586505mE	9332227mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7313	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_54	585410mE	9332276mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7314	L.F.M. Iniesta, 2021	2	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_52	585393mE	9332269mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7315	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_47	585456mE	9332233mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7316	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_47	585456mE	9332233mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
7317	L.F.M. Iniesta, 2021	2	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_47	585456mE	9332233mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7318	L.F.M. Iniesta, 2021	2	2	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_47	585456mE	9332233mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7319	L.F.M. Iniesta, 2021	1	2	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_47	585456mE	9332233mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7321	L.F.M. Iniesta, 2021	2	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N3_47	585456mE	9332233mN	UTM SAD'69	2-23. VIII.2013	Freitas *et al.*
7322	L.F.M. Iniesta, 2021	1	2	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	19-22. VIII.2013	Freitas *et al.*
7323	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	19-22. VIII.2013	Freitas *et al.*
7324	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	19-22. VIII.2013	Freitas *et al.*
7325	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	FLONA Carajás; Serra Norte; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	19-22. VIII.2013	Freitas *et al.*
7343	C.A.R. Souza, 2018	2	3	–	Parauapebas	FLONA Carajás; Gruta N5S_37	595999mE	9325006mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7346	C.A.R. Souza, 2018	4	4	–	Parauapebas	FLONA Carajás; Gruta N1_15 (Mangangá)	-6.034192	-50.271496	decimal	–	Andrade *et al.*
7348	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N4E_68	593989mE	9333214mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7349	C.A.R. Souza, 2018	8	2	24	Parauapebas	FLONA Carajás; Gruta N4E_33	592939mE	9332222mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7351	C.A.R. Souza, 2018	2	2	7	Parauapebas	FLONA Carajás; Gruta N4WS_15	589701mE	9329352mN	UTM SAD'69	7-12.X.2008	Andrade *et al.*
7360	C.A.R. Souza, 2018	1	–	–	Parauapebas	FLONA Carajás; Gruta N3_003	588457mE	9333537mN	UTM SAD'69	–	Andrade *et al.*
7368	L.F.M. Iniesta, 2021	1	1	–	Parauapebas	Serra Norte; FLONA Carajás; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	4-7.XII.2013	Guarda *et al.*
7369	L.F.M. Iniesta, 2021	1	–	2	Parauapebas	Serra Norte; FLONA Carajás; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	4-7.XII.2013	Guarda *et al.*
7370	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	Serra Norte; FLONA Carajás; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	4-7.XII.2013	Guarda *et al.*
7371	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	Serra Norte; FLONA Carajás; Gruta N5W_03	595785mE	9327723mN	UTM SAD'69	4-7.XII.2013	Guarda *et al.*
7003	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	0572895mE	9292945mN	UTM SAD'69	3-19. VIII.2010	Andrade *et al.*
7005	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	0572895mE	9292945mN	UTM SAD'69	3-19. VIII.2010	Andrade *et al.*
7179	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_39	-6.396651	-50.341179	decimal	23.VIII-2. IX.2007	Andrade *et al.*
6959	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_43	0575028mE	9291062mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6928	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_45	0575599mE	9290820mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6949	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_61	0575973mE	9293332mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
6999	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_61	0575973mE	9293332mN	UTM SAD'69	1-14. VII.2010	Andrade *et al.*
6960	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_64	0575920mE	9293388mN	UTM SAD'69	1-14. VII.2010	Andrade *et al.*
6962	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_64	0575920mE	9293388mN	UTM SAD'69	1-14. VII.2010	Andrade *et al.*
6963	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_64	0575920mE	9293388mN	UTM SAD'69	1-14. VII.2010	Andrade *et al.*
6985	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_64	0575920mE	9293388mN	UTM SAD'69	13-30.I.2010	Andrade *et al.*
7165	C.A.R. Souza, 2018	2	5	5	Canaã dos Carajás	FLONA Carajás; Gruta S11D_64	-6.392318	-50.313616	decimal	23.VIII-2. IX.2007	Andrade *et al.*
6986	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	FLONA Carajás; Gruta S11D_96	0574740mE	9293225mN	UTM SAD'69	1-14. VII.2010	Andrade *et al.*

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
10967	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1342- Serra da Bocaina	616056mE	9307186mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
MPEG DIP 0175	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	GEM-1418	611377mE	9301691mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
8760	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta PESE06	593924mE	9325578mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8762	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás – Gruta PESE02	593909mE	9323276mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8765	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás – Gruta PESE02	593909mE	9323276mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8766	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás – Gruta PESE02	593909mE	9323276mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8767	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8768	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8774	C.A.R. Souza, 2018	1	1	2	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8775	C.A.R. Souza, 2018	1	2	1	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8776	C.A.R. Souza, 2018	3	–	–	Parauapebas	Flona Carajás – Gruta N5S30	589709mE	9328517mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8777	C.A.R. Souza, 2018	3	1	–	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8778	C.A.R. Souza, 2018	3	–	–	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8779	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N5S30	589371mE	9329768mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8781	C.A.R. Souza, 2018	2	1	–	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	14-16. XII.2010	R.Andrade col.
8782	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8785	C.A.R. Souza, 2018	2	1	–	Parauapebas	Flona Carajás – Gruta N5S35	596583mE	9327056mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8787	C.A.R. Souza, 2018	2	1	–	Parauapebas	Flona Carajás – Gruta N4WS09	589094mE	9326838mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8789	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás – Gruta N5S26	596583mE	9327056mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8793	C.A.R. Souza, 2018	2	1	–	Parauapebas	Flona Carajás – Gruta N4WS18/48	589214mE	9329308mN	UTM SAD'69	1-09.VI.2011	R.Andrade col.
8796	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N5S26	596583mE	9327056mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8797	C.A.R. Souza, 2018	1	–	2	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	14-16. XII.2010	R.Andrade col.
8798	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS39	589272mE	9329412mN	UTM SAD'69	1-09.VI.2011	R.Andrade col.
8799	C.A.R. Souza, 2018	2	–	2	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	14-16. XII.2010	R.Andrade col.
8800	C.A.R. Souza, 2018	1	3	1	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	14-16. XII.2010	R.Andrade col.
8801	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS16	589229mE	9328268mN	UTM SAD'69	1-09.VI.2011	R.Andrade col.
8802	C.A.R. Souza, 2018	2	–	2	Parauapebas	Flona Carajás – Gruta N5S26	596583mE	9327056mN	UTM SAD'69	14-16. XII.2010	R.Andrade col.
8806	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS09	599094mE	9326838mN	UTM SAD'69	10-19.V.2011	R.Andrade col.
8807	C.A.R. Souza, 2018	1	1	1	Parauapebas	Flona Carajás – Gruta N5S30	597406mE	9326924mN	UTM SAD'69	14-16. XII.2010	R.Andrade col.
8941	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS08	589108mE	9326836mN	UTM SAD'69	18.XI-1. XII.2010	R.Andrade col.
8944	C.A.R. Souza, 2018	1	–	1	Parauapebas	Flona Carajás – Gruta N4WS67	589452mE	9328690mN	UTM SAD'69	18.XI-1. XII.2010	R.Andrade col.
8945	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS03	589103mE	9328702mN	UTM SAD'69	18.XI-1. XII.2010	R.Andrade col.
8948	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS09	589094mE	9326838mN	UTM SAD'69	18.XI-1. XII.2010	R.Andrade col.

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
8949	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás – Gruta N4WS04	589057mE	9328710mN	UTM SAD'69	18.XI-1.XII.2010	R.Andrade col.
8950	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás – Gruta N4WS73	589219mE	9328590mN	UTM SAD'69	18.XI-1.XII.2010	R.Andrade col.
8952	C.A.R. Souza, 2018	2	1	–	Parauapebas	Flona Carajás – Gruta N4WS09	589094mE	9326838mN	UTM SAD'69	18.XI-1.XII.2010	R.Andrade col.
9446	C.A.R. Souza, 2018	1	–	–	Parauapebas	GEM-1527	613141mE	9293674mN	UTM SAD'69	20-26.VI.2013	C.A.R. Souza *et al.* col.
9447	C.A.R. Souza, 2018	1	1	–	Parauapebas	GEM-1592	612202mE	9297518mN	UTM SAD'69	20-26.VI.2013	C.A.R. Souza *et al.* col.
9451	C.A.R. Souza, 2018	1	–	–	Parauapebas	GEM-1525A	613209mE	9297666mN	UTM SAD'69	20-26.VI.2013	C.A.R. Souza *et al.* col.
9454	C.A.R. Souza, 2018	1	1	–	Parauapebas	GEM-1592	612202mE	9297518mN	UTM SAD'69	20-26.VI.2013	C.A.R. Souza *et al.* col.
9457	C.A.R. Souza, 2018	1	–	–	Parauapebas	SB-226	611396mE	9297061mN	UTM SAD'69	20-26.VI.2014	C.A.R. Souza *et al.* col.
9458	C.A.R. Souza, 2018	2	1	–	Parauapebas	SB-176	623888mE	9301961mN	UTM SAD'69	8-22.V.2013	C.A.R. Souza *et al.* col.
9464	C.A.R. Souza, 2018	1	–	–	Parauapebas	GEM-1527	613141mE	9293674mN	UTM SAD'69	20-26.VI.2013	C.A.R. Souza *et al.* col.
9465	C.A.R. Souza, 2018	1	–	–	Parauapebas	GEM-1527	613141mE	9293674mN	UTM SAD'69	20-26.VI.2013	C.A.R. Souza *et al.* col.
10579	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	GEM-1418	611377mE	9301691mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10437	C.A.R. Souza, 2018	1	–	–	São Félix do Xingu	SFX-0057	400220mE	9299297mN	UTM SAD'69	3.II.2018	Ativo Ambiental col.
10946	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1418 - Serra da Bocaina	611383mE	9301690mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10562	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1423	622488mE	9302030mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10565	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	GEM-1423	622488mE	9302030mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10960	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	GEM-1423 - Serra da Bocaina	622488mE	9302030mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10560	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1427	610644mE	9302210mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10572	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1427	610644mE	9302210mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10942	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	GEM-1427 - Serra da Bocaina	623221mE	9303374mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10943	C.A.R. Souza, 2018	2	1	–	Canaã dos Carajás	GEM-1427 - Serra da Bocaina	610644mE	9302210mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10578	C.A.R. Souza, 2018	2	–	1	Canaã dos Carajás	GEM-1460	622253mE	9301707mN	UTM SAD'69	17.I-2.II.2012	Pellegatti *et al.* col.
10822	C.A.R. Souza, 2018	4	3	3	Canaã dos Carajás	GEM-1460	622253mE	9301707mN	UTM SAD'69	–	Pellegatti *et al.* col.
10947	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	GEM-1460 - Serra da Bocaina	611383mE	9301690mN	UTM SAD'69	–	Pellegatti *et al.* col.
10953	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	GEM-1460 - Serra da Bocaina	622253mE	9301707mN	UTM SAD'69	17.I-2.II.2012	Pellegatti *et al.* col.
10955	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1460 - Serra da Bocaina	622253mE	9301707mN	UTM SAD'69	17.I-2.II.2012	Pellegatti *et al.* col.
10963	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1461- Serra da Bocaina	623207mE	9303572mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10969	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1461- Serra da Bocaina	623207mE	9303572mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10573	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1462	622276mE	9301724mN	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10930	C.A.R. Souza, 2018	2	2	–	Canaã dos Carajás	GEM-1462 - Serra da Bocaina	622283mE	9301726mN	UTM SAD'69	17.I-2.II.2012	Pellegatti *et al.* col.
10876	L.F.M. Iniesta, 2021	1	–	–	Parauapebas	CAV – 21; S11	569731mE	9291922mN	UTM SAD'69	22-28.IX.2010	R. de Andrade *et al.* col.
10935	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1462 - Serra da Bocaina	618732mE	9305128mN	UTM SAD'69	17.I-2.II.2012	Pellegatti *et al.* col.

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
MPEG DIP 0176	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1462- Serra da Bocaina	622283mE	9301726mN	UTM SAD'69	17.I-2. II.2012	Pellegatti *et al.* col.
10811	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1465	623840mE	9301950mN	UTM SAD'69	29.VIII-27. IX.2012	Pellegatti *et al.* col.
10958	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1465- Serra da Bocaina	623843mE	9301972mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
10559	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1481	623221mE	9303374mN	UTM SAD'69	29.VIII-27. IX.2012	Pellegatti *et al.* col.
INPA DI 394	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	GEM-1481	623222mE	9303374mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
10580	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1481	623222mE	9303374mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
10584	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1481	623222mE	9303374mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
10950	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1481 - Serra da Bocaina	623221mE	9303374mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
10952	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1489 - Serra da Bocaina	621758mE	9303944mN	UTM SAD'69	5-15.III.2012	Pellegatti *et al.* col.
10929	C.A.R. Souza, 2018	–	1	1	Canaã dos Carajás	GEM-1525 - Serra da Bocaina	613162mE	9297605mN	SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10933	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	GEM-1526 - Serra da Bocaina	613151mE	9297638mN	UTM SAD'69	10-31.I.2013	Pellegatti *et al.* col.
10966	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	GEM-1592- Serra da Bocaina	612202mE	9297518mN	UTM SAD'69	17.I-2. II.2012	Pellegatti *et al.* col.
12541	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0009; Setor II	567507mE	9297508mN	UTM SAD'69	22.VI.2018	Ativo Ambiental col.
12544	C.A.R. Souza, 2018	2	1	1	Canaã dos Carajás	S11B-0009; Setor II	564948mE	9298996mN	UTM SAD'69	11.I.2019	Ativo Ambiental col.
12485	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0009; Setor III	567507mE	9297508mN	UTM SAD'69	22.VI.2018	Ativo Ambiental col.
12543	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0009; Setor III	667507mE	9297508mN	UTM SAD'69	22.VI.2018	Ativo Ambiental col.
12486	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	S11B-0009; Setor V	566557mE	9297049mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12546	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0012; Setor II	566641mE	9296915mN	UTM SAD'69	12.XI.2018	Ativo Ambiental col.
12540	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0012B; Setor II	566641mE	9293915mN	UTM SAD'69	12.XI.2018	Ativo Ambiental col.
10977	C.A.R. Souza, 2018	1	1	–	Parauapebas	Flona Carajás-Gruta N4WS-08	589108mE	9326836mN	UTM SAD'69	18.XI-1. XII.2010	R. de Andrade *et al.* col.
10986	C.A.R. Souza, 2018	1	–	1	Parauapebas	Flona Carajás-Gruta N4WS-08	589108mE	9326836mN	UTM SAD'69	18.XI-1. XII.2010	R. de Andrade *et al.* col.
10997	C.A.R. Souza, 2018	1	–	1	Parauapebas	Flona Carajás-Gruta N4WS-04	589057mE	9328710mN	UTM SAD'69	18.XI-1. XII.2010	R. de Andrade *et al.* col.
11002	C.A.R. Souza, 2018	1	–	–	Parauapebas	Flona Carajás-Gruta N4WS-67	-6.073103	-50.19203	UTM SAD'69	10-19.V.2011	R. de Andrade *et al.* col.
12529	C.A.R. Souza, 2018	1	1	2	Canaã dos Carajás	S11B-0026; Setor II	565350mE	9299207mN	UTM SAD'69	12.VI.2018	Ativo Ambiental col.
12530	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0030; Setor II	566490mE	9296848mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12531	C.A.R. Souza, 2018	2	–	4	Canaã dos Carajás	S11B-0030; Setor II	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
12505	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	S11B-0036; Setor II	564705mE	9298013mN	UTM SAD'69	11.IX.2018	Ativo Ambiental col.
12507	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0036; Setor III	564705mE	9298013mN	UTM SAD'69	11.IX.2018	Ativo Ambiental col.
12499	C.A.R. Souza, 2018	3	–	1	Canaã dos Carajás	S11B-0047; Setor II	564655mE	9296263mN	UTM SAD'69	24.I.2018	Ativo Ambiental col.
12468	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0055; Setor IV	565287mE	9298583mN	UTM SAD'69	21.I.2019	Ativo Ambiental col.
12509	C.A.R. Souza, 2018	4	–	3	Canaã dos Carajás	S11B-0055; Setor IV	567623mE	9297202mN	UTM SAD'69	27.IX.2018	Ativo Ambiental col.
12444	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	S11B-0055; Setor Q	565287mE	9298583mN	UTM SAD'69	21.I.2019	Ativo Ambiental col.
12472	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	S11B-0055; Setor V	565287mE	9298583mN	UTM SAD'69	21.I.2019	Ativo Ambiental col.
12495	C.A.R. Souza, 2018	1	3	4	Canaã dos Carajás	S11B-0055; Setor V	567623mE	9297202mN	UTM SAD'69	27.IX.2018	Ativo Ambiental col.
12458	C.A.R. Souza, 2018	1	1	2	Canaã dos Carajás	S11B-0055; Setor VII	565287mE	9298583mN	UTM SAD'69	21.I.2019	Ativo Ambiental col.
12470	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0065; Setor IV	565287mE	9298583mN	UTM SAD'69	27.I.2019	Ativo Ambiental col.
10597	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0073	-6.365657	-50.402014	decimal	–	Bioespelo Cons. Amb. Col.
10439	C.A.R. Souza, 2018	1	2	1	Canaã dos Carajás	S11B-0073; Setor 7	-6.365657	-50.402014	UTM SAD'69	3.II.2018	Ativo Ambiental col.
12481	C.A.R. Souza, 2018	3	–	1	Canaã dos Carajás	S11B-0073; Setor I	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.
12548	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	S11B-0073; Setor I	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.
12501	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0073; Setor II	566186mE	9206375mN	UTM SAD'69	19.IX.2018	Ativo Ambiental col.
12510	C.A.R. Souza, 2018	1	1	1	Canaã dos Carajás	S11B-0073; Setor II	567623mE	9296375mN	UTM SAD'69	19.IX.2018	Ativo Ambiental col.
12494	C.A.R. Souza, 2018	6	–	2	Canaã dos Carajás	S11B-0073; Setor III	566186mE	9296375mN	UTM SAD'69	19.IX.2018	Ativo Ambiental col.
12516	C.A.R. Souza, 2018	3	–	1	Canaã dos Carajás	S11B-0073; Setor III	566186mE	9296375mN	UTM SAD'69	19.IX.2018	Ativo Ambiental col.
12536	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	S11B-0073; Setor IV	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.
12489	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	S11B-0073; Setor V	566792mE	9293375mN	UTM SAD'69	19.IX.2018	Ativo Ambiental col.
12462	C.A.R. Souza, 2018	2	1	2	Canaã dos Carajás	S11B-0073; Setor VI	566186mE	9296375mN	UTM SAD'69	19.IX.2018	Ativo Ambiental col.
12453	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0073; Setor VIII	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.

Appendix 1. —Contination.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
12463	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0078; Setor III	566557mE	9297049mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12547	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	S11B-0078; Setor III	566557mE	9297049mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12450	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0078; Setor V	566557mE	9297049mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12455	C.A.R. Souza, 2018	1	1	1	Canaã dos Carajás	S11B-0078; Setor V	566557mE	9297049mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12473	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0078; Setor V	566557mE	9297049mN	UTM SAD'69	21.I.2019	Ativo Ambiental col.
12532	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0094; Setor I	567130mE	9298208mN	UTM SAD'69	7.XI.2018	Ativo Ambiental col.
12449	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0109; Setor II	565924mE	9296727mN	UTM SAD'69	16.XI.2018	Ativo Ambiental col.
12490	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0109; Setor II	565924mE	9296727mN	UTM SAD'69	13.VI.2018	Ativo Ambiental col.
12528	C.A.R. Souza, 2018	3	1	1	Canaã dos Carajás	S11B-0110; Setor II	565906mE	9296743mN	UTM SAD'69	13.VI.2018	Ativo Ambiental col.
12480	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	S11B-0159; Setor IV	565498mE	9298433mN	UTM SAD'69	5.VI.2018	Ativo Ambiental col.
12537	C.A.R. Souza, 2018	2	2	–	Canaã dos Carajás	S11B-0172A; Setor II	564137mE	9299465mN	UTM SAD'69	20.XI.2018	Ativo Ambiental col.
12551	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0172A; Setor II	564137mE	9299465mN	UTM SAD'69	20.XI.2018	Ativo Ambiental col.
12447	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0173; Setor III	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.
12461	C.A.R. Souza, 2018	2	–	3	Canaã dos Carajás	S11B-0177	564655mE	9299263mN	UTM SAD'69	22.III.2019	Ativo Ambiental col.
12465	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	S11B-0177; Setor III	564855mE	9298263mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12456	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0178	564827mE	9298239mN	UTM SAD'69	25.I.2019	Ativo Ambiental col.
12476	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	S11B-0178; Setor III	566186mE	9296375mN	UTM SAD'69	16.I.2019	Ativo Ambiental col.
12475	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	S11B-0178; Setor IV	564827mE	9298239mN	UTM SAD'69	23.I.2019	Ativo Ambiental col.
12471	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	S11B-0178; Setor VII	564827mE	9298239mN	UTM SAD'69	27.I.2019	Ativo Ambiental col.
12520	C.A.R. Souza, 2018	1	–	2	Canaã dos Carajás	S11B-0187; Setor V	564640mE	9299207mN	UTM SAD'69	13.IX.2018	Ativo Ambiental col.
12521	C.A.R. Souza, 2018	2	–	1	Canaã dos Carajás	S11B-0187; Setor V	564640mE	9299207mN	UTM SAD'69	22.I.2019	Ativo Ambiental col.
12445	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	S11B-0187; Setor VII	564640mE	9299207mN	UTM SAD'69	13.IX.2018	Ativo Ambiental col.

cN	Determination	M	F	J	Lo	sL	La	Lo	UTM	Date	leg.
12498	C.A.R. Souza, 2018	2	–	–	Canaã dos Carajás	S11B-0187; Setor VII	564640mE	9299207mN	UTM SAD'69	22.I.2019	Ativo Ambiental col.
12526	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0204; Setor II	564626mE	9298041mN	UTM SAD'69	9.I.2019	Ativo Ambiental col.
12550	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0215; Setor II	565984mE	9299121mN	UTM SAD'69	21.XI.2018	Ativo Ambiental col.
10435	C.A.R. Souza, 2018	1	2	1	Canaã dos Carajás	S11B-0220; Setor 4	564254mE	9299842mN	UTM SAD'69	26.IX.2018	Ativo Ambiental col.
12504	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	S11B-0220; Setor I	564254mE	9299842mN	UTM SAD'69	26.IX.2018	Ativo Ambiental col.
12460	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	S11B-0220; Setor III	564354mE	9299777mN	UTM SAD'69	24.I.2019	Ativo Ambiental col.
12451	C.A.R. Souza, 2018	1	1	–	Canaã dos Carajás	S11B-0220; Setor VI	564254mE	9299777mN	UTM SAD'69	24.I.2019	Ativo Ambiental col.
8735	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	SB 218	613393mE	9298565mN	UTM SAD'69	12-22.X.2013	C.A.R. Souza *et al.* col.
8729	C.A.R. Souza, 2018	1	2	–	Canaã dos Carajás	SB 229	621299mE	9298628mN	UTM SAD'69	12-22.X.2013	C.A.R. Souza *et al.* col.
10941	C.A.R. Souza, 2018	1	–	1	Canaã dos Carajás	SB-147 - Serra da Bocaina	-6.300954	-49.82743	UTM SAD'69	29.VIII-27.IX.2012	Pellegatti *et al.* col.
10815	C.A.R. Souza, 2018	1	–	–	Canaã dos Carajás	SB-164	612967mE	9301629mN	UTM SAD'69	10-20.IX.2013	Pellegatti *et al.* col.
11074	Caetano,R.S., 2016	1	1	–	Canaã dos Carajás	SB-229	611140mE	9298707mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.
11075	Caetano,R.S., 2016	1	1	1	Canaã dos Carajás	SB-229	611140mE	9298707mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.
11078	Caetano,R.S., 2016	2	3	1	Canaã dos Carajás	SB-229	611140mE	9298707mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.
11079	Caetano,R.S., 2016	1	1	2	Canaã dos Carajás	SB-229	611140mE	9298707mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.
11080	Caetano,R.S., 2016	1	–	–	Canaã dos Carajás	SB-229	611140mE	9298707mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.
MPEG DIP 0177	Caetano,R.S., 2016	3	2	3	Canaã dos Carajás	SB-229	611140mE	9298707mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.
11081	Caetano,R.S., 2016	1	–	–	Canaã dos Carajás	SB-239	621299mE	9298628mN	UTM SAD'69	13-23.II.2014	Carste *et al.* col.