

On the millipede genus *Heteropyge*: description of the adults of *H. araguayensis* and revalidation of *H. bidens* (Diplopoda: Spirostreptida: Spirostreptidae)

Luiz F. M. Iniesta^{1,2} , Rodrigo S. Bouzan^{1,2} & Antonio D. Brescovit¹

1. Laboratório Especial de Coleções Zoológicas, Instituto Butantan, Av. Vital Brasil, 1500, 05503-090 São Paulo, Brazil. (luiz-moretti@hotmail.com)
2. Pós-graduação em Zoologia, Instituto de Biociências, Universidade de São Paulo, São Paulo, Brazil.

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ABSTRACT. The South American genus *Heteropyge* Silvestri, 1897 is revised, accommodating now six accepted species. Adults of the poorly known species *Heteropyge araguayensis* (Schubart, 1947) are described for the first time from near-topotypic material collected near the Araguaia River, state of Mato Grosso, Brazil. In addition, based on recent samplings and on material from Schubart's collection, *H. bidens* (Schubart, 1945) is removed from the synonymy of *H. cayennophilus* (Silvestri, 1897) and revalidated. Both species show significant differences concerning the gonopods and male leg-pair 1. New records and additional data for *H. bidens* and *H. cayennophilus* are provided, as well as an updated checklist of the species belonging to *Heteropyge*.

KEYWORDS. Neotropical region, Spirostreptini, Mato Grosso, Brazil, millipedes.

RESUMO. Sobre o gênero de millipede *Heteropyge*: descrição dos adultos de *H. araguayensis* e revalidação de *H. bidens* (Diplopoda: Spirostreptida: Spirostreptidae). O gênero sulamericano *Heteropyge* Silvestri, 1897 é revisado, acomodando agora seis espécies aceitas. Adultos da espécie pouco conhecida *Heteropyge araguayensis* (Schubart, 1947) são descritos pela primeira vez a partir de material coletado próximo ao rio Araguaia, Mato Grosso, Brasil. Além disso, baseado em amostras recentes e materiais da coleção de Schubart, *H. bidens* (Schubart, 1945) é removida como sinônimo de *H. cayennophilus* (Silvestri, 1897), e assim revalidada. Ambas espécies apresentam significantes diferenças em relação a morfologia dos gonopódios e do primeiro par de pernas dos machos. Novos registros e dados adicionais para *H. bidens* e *H. cayennophilus* são fornecidos, além de uma lista atual de espécies para o gênero *Heteropyge*.

PALAVRAS-CHAVE. Região Neotropical, Spirostreptini, Mato Grosso, Brasil, millipedes.

Over the past few decades, numerous studies have been conducted with the purpose of describing and organizing the taxonomy of the large family Spirostreptidae Brandt, 1833 (HOFFMAN, 1980; KRABBE, 1982; HOFFMAN *et al.*, 2001; MWABVU *et al.*, 2010; ENGHOFF, 2017). The genus *Heteropyge* Silvestri, 1897 represents one of the poorly studied groups, with few species described or revised.

SILVESTRI (1897a) described the genus *Heteropyge* to accommodate *Odontopyge paraguayensis* Silvestri, 1895, which was originally assigned to Odontopygidae because of the presence of spiniform dorsal process on each paraprot (same as *processus superi spiniformes* cited at SILVESTRI, 1895). Then SILVESTRI (1897b) described *Archispirostreptus cayennophilus* Silvestri, 1897, assigning it to Spirostreptidae. ATTEMS (1914) considered the genus *Heteropyge* as a *nomen nudum* because of the absence of a diagnosis (ATTEMS, 1914:179). SCHUBART (1945) described *Orthoporus bidens* Schubart, 1945, also with the uncommon spiniform processes on the paraprot. Later, SCHUBART (1947) described *Orthoporus araguayensis* Schubart, 1947, based on immatures, but distinguished by

elongated spiniform processes on the paraprot. In the same paper the author also described *Orthoporus brasiliensis* Schubart, 1947, but with small spiniform processes. ATTEMS (1950) described the genus *Helicosolenus* Attems, 1950, with the species *H. lineolatus* Attems, 1950 and *H. solitarius* Attems, 1950. *Heteropyge* was revalidated by HOFFMAN (1960) which provided a proper diagnosis for the genus and considered *Helicosolenus* as junior synonym.

Since then few papers were published, including few complementary descriptions and additional drawings of species (JEEKEL, 1963; DEMANGE, 1964; MAURIÈS, 1975). However, not a single reference to adults of *H. araguayensis* was made, and the structure of its gonopods remained unknown. Finally, KRABBE (1982) published a list of the species of *Heteropyge*, considering *H. bidens* as a junior synonym of *H. cayennophilus*. Thus, we present below for the first time a description of the adults of *H. araguayensis* with the first images concerning the adults. We also revalidate *H. bidens*, based on types and additional examined material, and provide new records and additional data for *H. cayennophilus*.

MATERIAL AND METHODS

The material examined is deposited in the following Brazilian Institutions (curators in parentheses): IBSP, Instituto Butantan, São Paulo (A. D. Brescovit); MNRJ, Museu Nacional, Rio de Janeiro (A. B. Kury); MZSP, Museu de Zoologia, Universidade de São Paulo, São Paulo (R. Pinto-da-Rocha); UFPB, Universidade Federal da Paraíba, Paraíba (M. B. da Silva). The remaining institutions here cited: IRSNB, Institut royal des Sciences naturelles de Belgique; MSNG, Museo Civico di Storia Naturale “Giacomo Doria”, Genova, Italy; NHMW, Naturhistorisches Museum Wien, Vienna, Austria.

The photographs were taken with a Leica DFC 500 digital camera mounted on a Leica MZ16A stereomicroscope. Extended focal range images were composed with Leica Application Suite version 2.5.0. The scanning electron micrographs were taken using a FEI Quanta 250 SEM with an attached SLR digital camera at IBSP. The parts of the specimens for scanning electron microscopy were cleaned ultrasonically for 30 seconds twice, transferred to ethanol (70%, 80%, 90% and 100 % for 15 minutes each) and critical point dried. The samples were mounted on aluminum stubs and sputter coated with gold for 240 sec. Since the vulvae are not well sclerotized in Spirostreptidae, we opted to immerse them in Formaldehyde, to keep them as rigid as possible, for 30 minutes just before the critical point drying.

The geographical coordinates were obtained from the original literature (when provided). Terminology of gonopods follows HOFFMAN (2008). Abbreviations used in text: *app* – apicomeral proplicial process; *atp* – antetorsal process; *bf* – bursa furrow; *dmp* – distolateral metaplicial process; *gc* – gonoschisma; *gp* – gonopore; *ip* – inner process of metaplica; *mp* – metaplica; *pn* – penis; *pp* – proplica; *px* – paracoxite; *sg* – seminal groove; *sls* – spiral solenomere; *tt* – torsotope; *sl* – solenomere; *st* – sternum.

TAXONOMY

Heteropyge Silvestri, 1897

Heteropyge SILVESTRI, 1897a:651. Type species: *Odontopyge paraguayensis* Silvestri, 1895, by original designation.

Heteropyge ATTEMS, 1914:179; HOFFMAN, 1960:111; 1980:93; DEMANGE, 1970:394, 402; MAURIÈS, 1975:1271; KRABBE, 1982:332.

Odontopyge (non Brandt) SILVESTRI, 1895:11 (syn. in part, for *Odontopyge paraguayensis* Silvestri).

Orthoporus (non Silvestri) SCHUBART, 1947:27, 52 (syn. in part, for *Orthoporus araguayensis* and *O. brasiliensis*).

Helicosolenus ATTEMS, 1950:247. Type species: *Helicosolenus lineolatus* Attems, 1950 by original designation. Synonymized by HOFFMAN, 1960:111.

Diagnosis. The genus differs from all others spirostreptid genera by the following gonopodal characters: metaplica with a rounded distolateral process (Figs 18, 22, 23); inner process of metaplica robust (Figs 18, 33) and elongated (1/2 length of proplica); telopodite with a large, broad, lamellar expansion (Figs 21, 24, 25); a short antetorsal

process just before torsion (Fig. 24) and an evident seminal groove running medially on telopodite; solenomere concealed within the lamellar expansion and spirally coiled in one or two complete turns (Figs 21, 24, 25).

Distribution. Known from the Brazilian states of Mato Grosso, Mato Grosso do Sul, Pará and from fragments of Atlantic rain forest in the states of Pernambuco, Rio de Janeiro and São Paulo, from Paraguay and French Guyana.

Composition. Six species: *H. araguayensis* (Schubart, 1947); *H. bidens* (Schubart, 1947), herewith revalidated; *H. cayennophilus* (Silvestri, 1897); *H. lineolatus* (Attems, 1950); *H. paraguayensis* (Silvestri, 1895) and *H. solitarius* (Attems, 1950).

Heteropyge araguayensis (Schubart, 1947)

(Figs 1–26)

Orthoporus araguayensis SCHUBART, 1947:27. Five immature males and five immature females, all syntypes from Santa Terezinha [10°43'19.09"S; 50°39'13.74"W; formerly Barra do Tapirapé], Mato Grosso, Brazil, 23.XI.1939 – 15.III.1940, A. L. de Carvalho leg., deposited in MZSP, examined; SCHUBART, 1958:240.

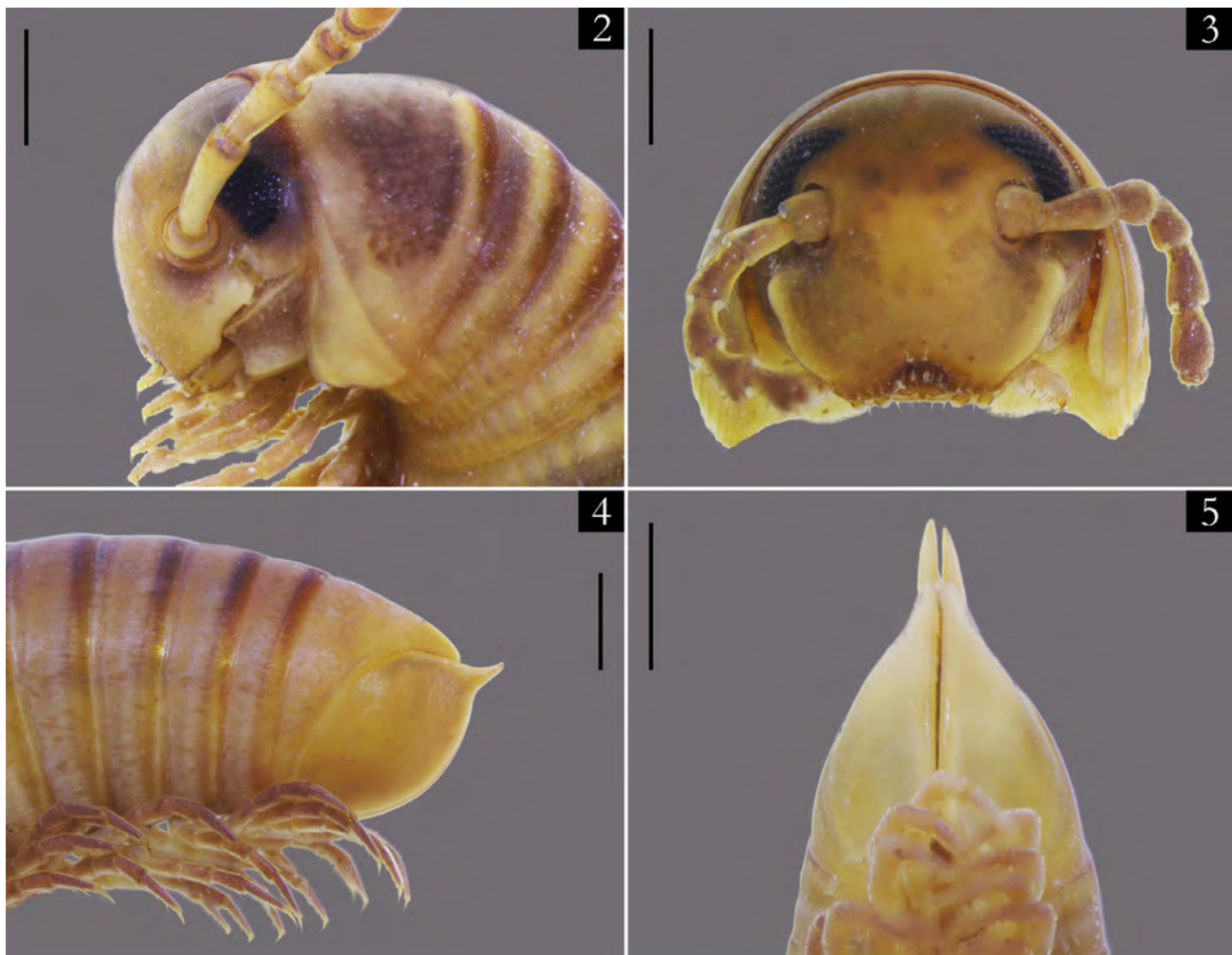
Heteropyge araguayensis. HOFFMAN, 1960:111, 113; KRABBE, 1982:333.

Additional material examined. BRAZIL, **Mato Grosso:** Pindaíba (14°58'14.72"S; 52°17'8.39"W), Fazenda Brasil, 17♂, 31♀ and 1 immature, 19-31.I.1998, M. E. V. Calleffo leg. (IBSP 540).

Diagnosis. The males differ from those of all other species of the genus by the elongated apicomeral process on the proplica (*app*; Figs 18, 22, 23); distolateral metaplicial process sinuous and birdhead-shaped (*dmp*; Figs 18, 22, 23); a rounded mesal edge and an acuminate ectal tip directed distally (Figs 18–20); first pair of male legs with a subtriangular process on prefemur and scattered setae at the base of the process (Figs 12, 13); presence of ventral pads on femur, postfemur and tibia (Fig. 12); telson of males and females with an elongated spiniform process on each



Fig. 1. *Heteropyge araguayensis* (Schubart, 1947), stereoscopic images of a male specimen from Pindaíba, Mato Grosso, Brazil (IBSP 540). Habitus, lateral view. Scale bar: 2 mm.



Figs 2–5. *Heteropyge araguayensis* (Schubart, 1947), stereoscopic images of the male specimen from Pindaíba, Mato Grosso, Brazil (IBSP 540). 2, anterior region; 3, frontal view; 4, posterior in lateral view; 5, ventral view. Scale bar: 1 mm.

paraproct (Figs 1, 4, 5); collum subrectangular, rounded sides, and an evident diagonal sulcus (Fig. 2).

Redescription. Immature males described by SCHUBART (1947). Additional data for adults here provided.

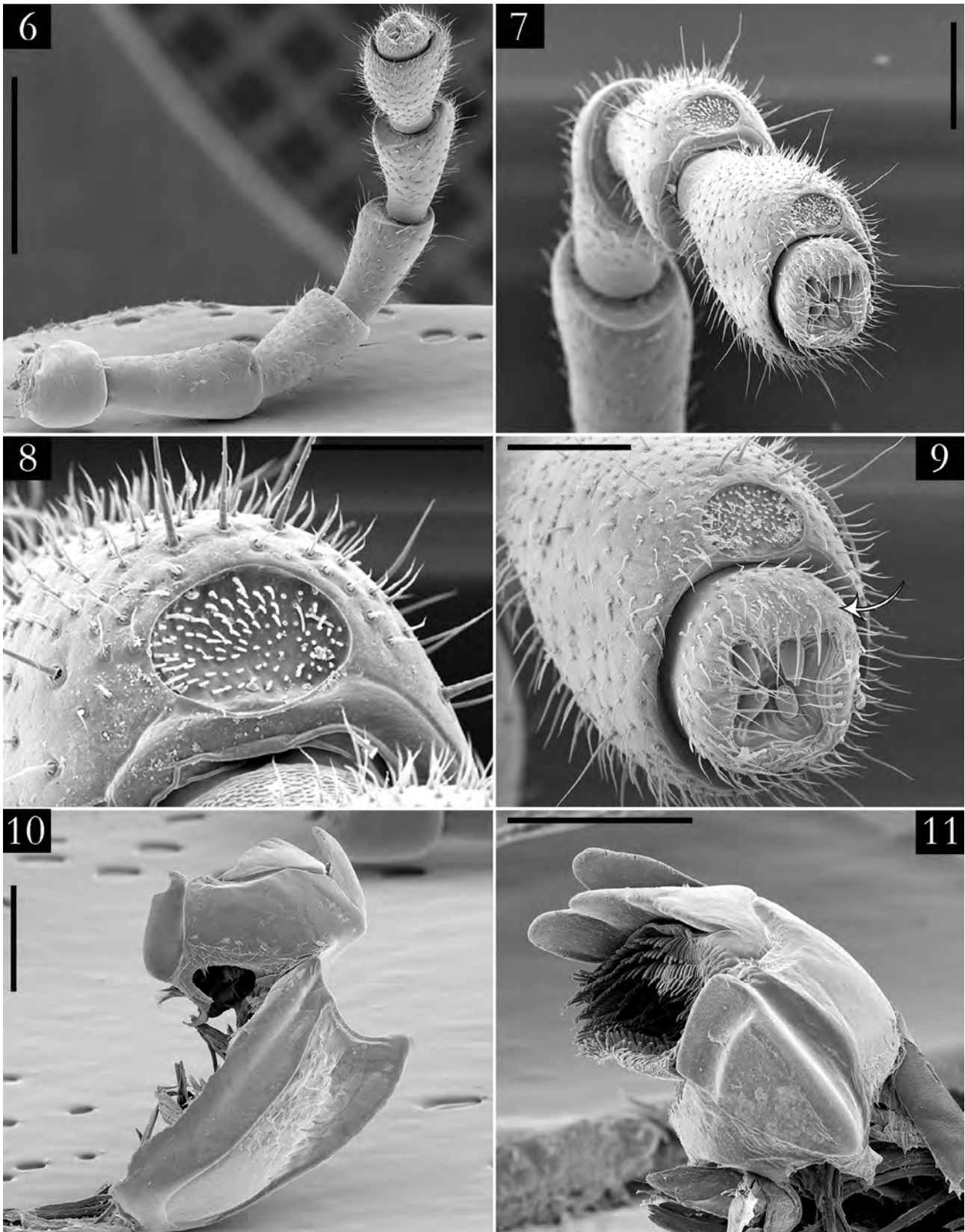
Male (IBSP 540). Total length: 48 mm. Maximum vertical diameter: 3 mm. Antennomere length: 4 mm.

General characteristics. Coloration (in 70% ethanol). Head and trunk reddish brown (Figs 1–3). Prozonite lighter; metazonite with a lighter ochre band and a darker on dorsal region (Fig. 1). Legs lighter brownish. Telson brownish. Head with 6 supralabral setae and 8 + 8 labral setae. Mandibles with superior and inferior stipital lobes. Mandibles with one external teeth and four internal teeth (Figs 10, 11). Ten rows of pectinate lamellae; a small group of lateral fringe located close to the end of lamellae. Antennomeres 5 and 6 each with a group of small basiconic setae within an elliptical concavity (Figs 6–9); antennomere 7 with numerous irregular sensilla basiconica (Fig. 9); four sensory cones in a square-shaped membranous area (Fig. 9). Collum subrectangular covering the basal part of the mandibular cardines; rounded sides, and an evident diagonal sulcus (Fig. 2). Ozopores starting with

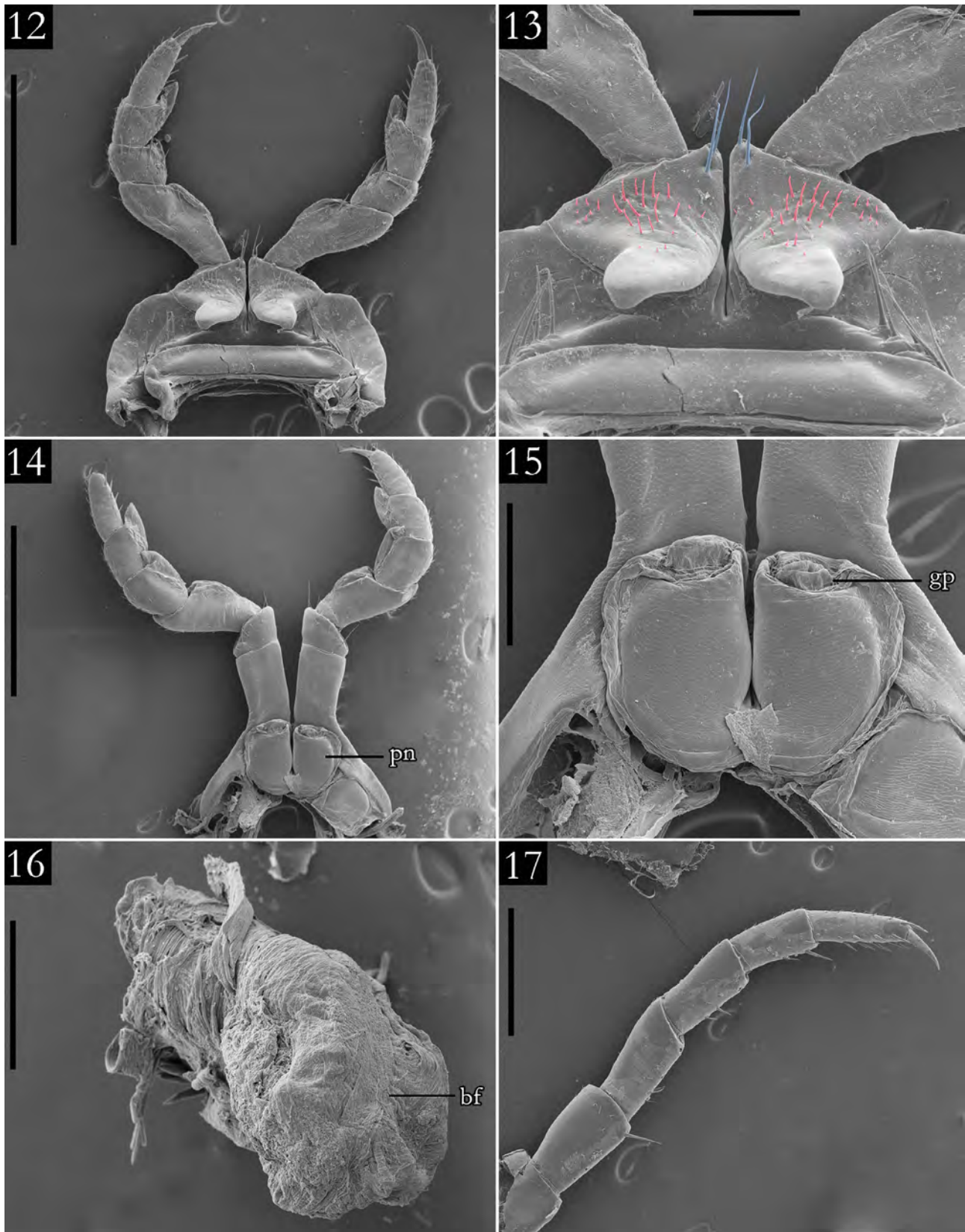
body ring 6. Epiproct with a posterior rounded projection; convex paraprocts with 1+1 elongated spiniform process, each around 0.4 mm long (Figs 4, 5); hypoproct triangular. Anterior sternum square; posterior sternum rhomboid, with shallow transverse sutures. Midbody legs with no modifications (Fig. 17).

First pair of legs: Coxae rounded, with 8+8 setiform setae in a curved row in mesal region (Fig. 12). Prefemur triangular; 2+2 distomesal setae (Figs 12, 13); a subtriangular prefemoral process with a rounded tip; a group of small scattered setae at the base of the process (Fig. 13). Femur, postfemur and tibia with membranous ventral pads (Fig. 12); tarsus with four setiform setae on internal side. Second pair of legs: coxae with a rounded and large basal portion. Prefemur appressed to and contiguous with the distal portion of coxae; femur, postfemur and tibia with membranous ventral pads (Fig. 14). Penis elongated and suboval (pn, Figs 14, 15).

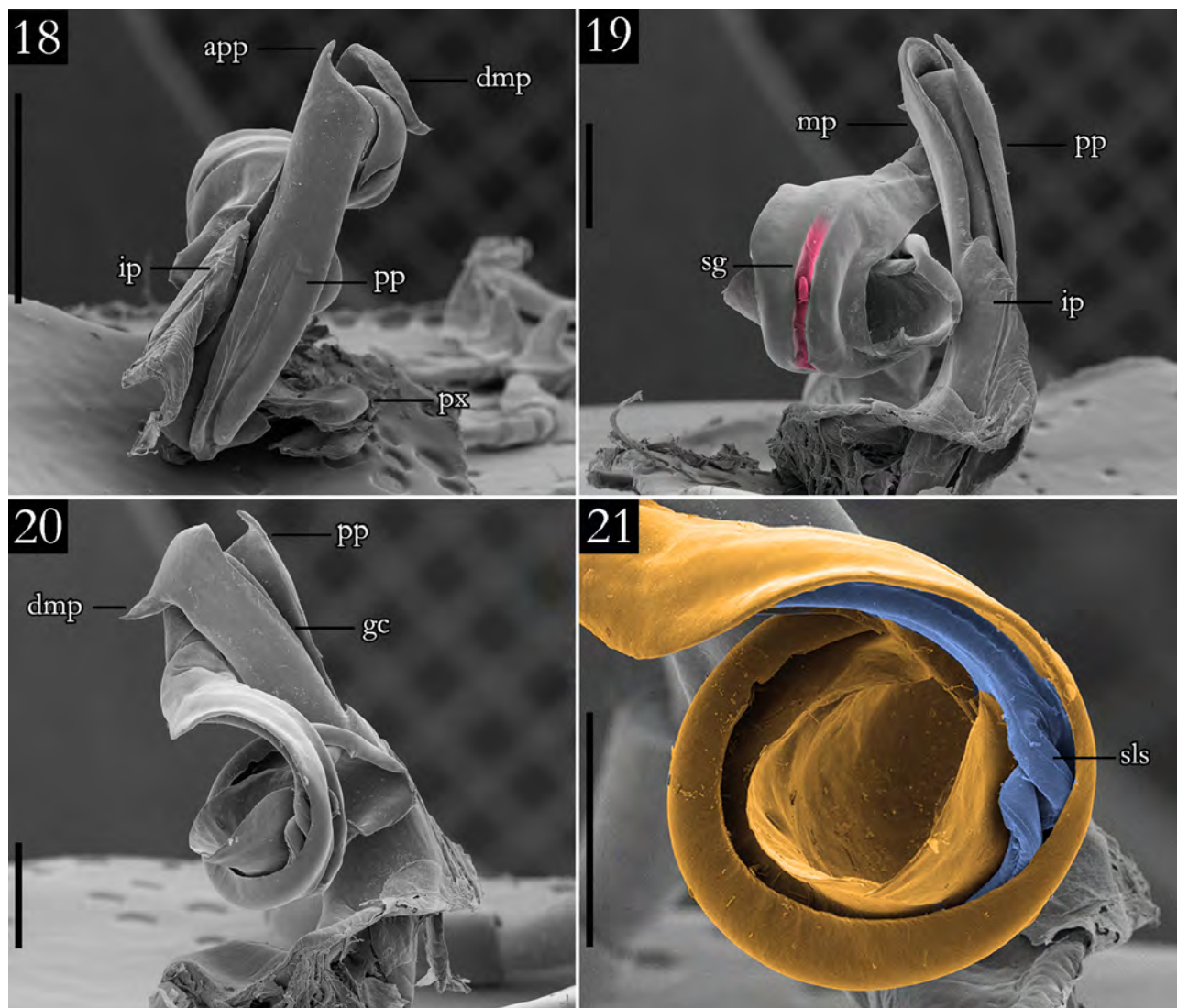
Gonopod (Figs 18–25). Sternum semi-circular. Paracoxite (px) rounded. Proplica short (pp); acuminate apicomeral process (app) and rounded ectal edge covered by the telopodite. Small setae scattered over distal region of



Figs 6–11. *Heteropyge araguayensis* (Schubart, 1947), SEM images of male specimen from Pindaíba, Mato Grosso, Brazil (IBSP 540): 6, antennae; 7, fifth, sixth and seventh antennomeres; 8, elliptical concavity on fifth antennomere in detail; 9, sixth and seventh antennomeres in detail (the arrow refers to the scattered basiconic setae); right mandible: 10, lateral view; 11, detail of the mandible with the lamellae pectinates. Scale bars: Fig. 6, 1 mm; 7, 250 μ m; 8, 200 μ m; 9, 200 μ m; 10, 500 μ m; 11, 300 μ m.



Figs 12–17. *Heteropyge araguayensis* (Schubart, 1947), SEM images of male and female specimens from Pindaíba, Mato Grosso, Brazil (IBSP 540): 12, first pair of legs of the male in anterior view; 13, detail of the prefemoral process (blue: distomesal setae, red: scattered setae on prefemur); 14, second pair of legs of the male in anterior view; 15, detail of the male gonopore; 16, vulva; 17, female mid-body leg in lateral view. Scale bars: Fig. 12, 1 mm; 13, 250 μ m; 14, 1 mm; 15, 300 μ m; 16, 400 μ m; 17, 600 μ m.



Figs 18–21. *Heteropyge araguayensis* (Schubart, 1947), SEM images of the right gonopod of male specimen from Pindaiba, Mato Grosso, Brazil (IBSP 540): 18, anterior view; 19, mesal view (pink: seminal groove [sg]); 20, posterior view; 21, detail of the telopodite (orange: lamellar expansion, blue: spiral solenomere [sls]). Scale bars: Fig. 18, 1 mm; 19, 1 mm; 20, 500 μ m; 21, 500 μ m.

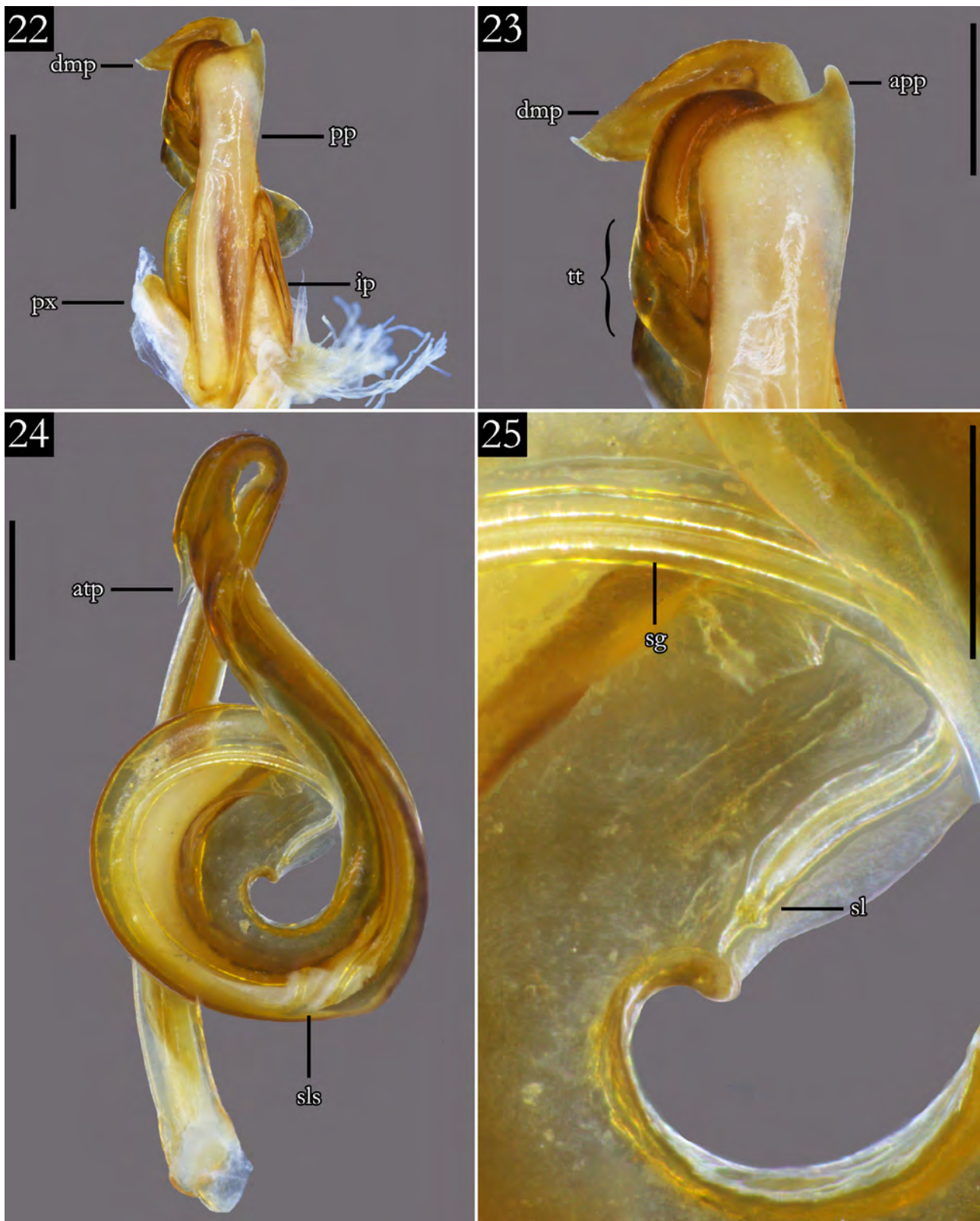
proplica. Metaplica elongated (mp); distolateral metaplical process (dmp) sinuous; birdhead-shaped (mainly in posterior view), lateral tip with pointed aspect and slightly directed distally; inner process (ip) stout, triangular. Gonoschisma evident between coxal folds (gc, Fig. 20). Telopodite bulky; short antetorsal process; a large, lamellar, broad expansion starting after the torsotope (tt, Fig. 23). Solenomere (sl) in medial region with two complete 360° torsions (sls; Figs 21, 24); partially covered by lamellar expansion; apex of solenomere triangular (Fig. 25) and covered by lamellar expansion. Seminal sulcus (sg; Fig. 19) running along entire lamellar portion of telopodite.

Female (IBSP 540). Total length: 52 mm. Maximum vertical diameter: 4 mm. Antennomere length: 3.5 mm. Coloration (in 70% ethanol): head and trunk reddish brown. Somatic characters as in male, except as noted. Femur, postfemur and tibia of leg-pair 1 and 2 without membranous ventral pads. Vulva: appressed to base of coxae 2 and covered

by extensive muscular tissues. Bursa poorly-sclerotized. Lateral valves covered by a thin membranous protrusion; a rounded lobe in apical region and a furrow (bf) along bursa (Fig. 16).

Distribution. Known from the eastern areas of the state of Mato Grosso (Fig. 26).

Remarks. The taxonomic identification of *H. araguayensis* was possible through the structure of the immatures, which was the only known developmental stage of this species. SCHUBART (1947) measured and described the species, based on ten immature specimens (five males and five females). After the examination of the adults, described in the present study for the first time, the elongated spiniform processes on paraprot (around 0.3–0.5 mm) is evident, as previously noted by SCHUBART (1947:28). In addition, the adults resemble with the immatures in sharing a brownish coloration and a yellow-ochre posterior band on each body



Figs 22–25. *Heteropyge araguayensis* (Schubart, 1947), stereoscopic images of the left gonopod of male specimen from Pindaíba, Mato Grosso, Brazil (IBSP 540): 22, anterior view; 23, detail of the distal region in anterior view; 24, telopodite; 25, detail of the telopodite. Scale bars: 22, 500 μ m; 23, 500 μ m; 24, 500 μ m; 25, 200 μ m.

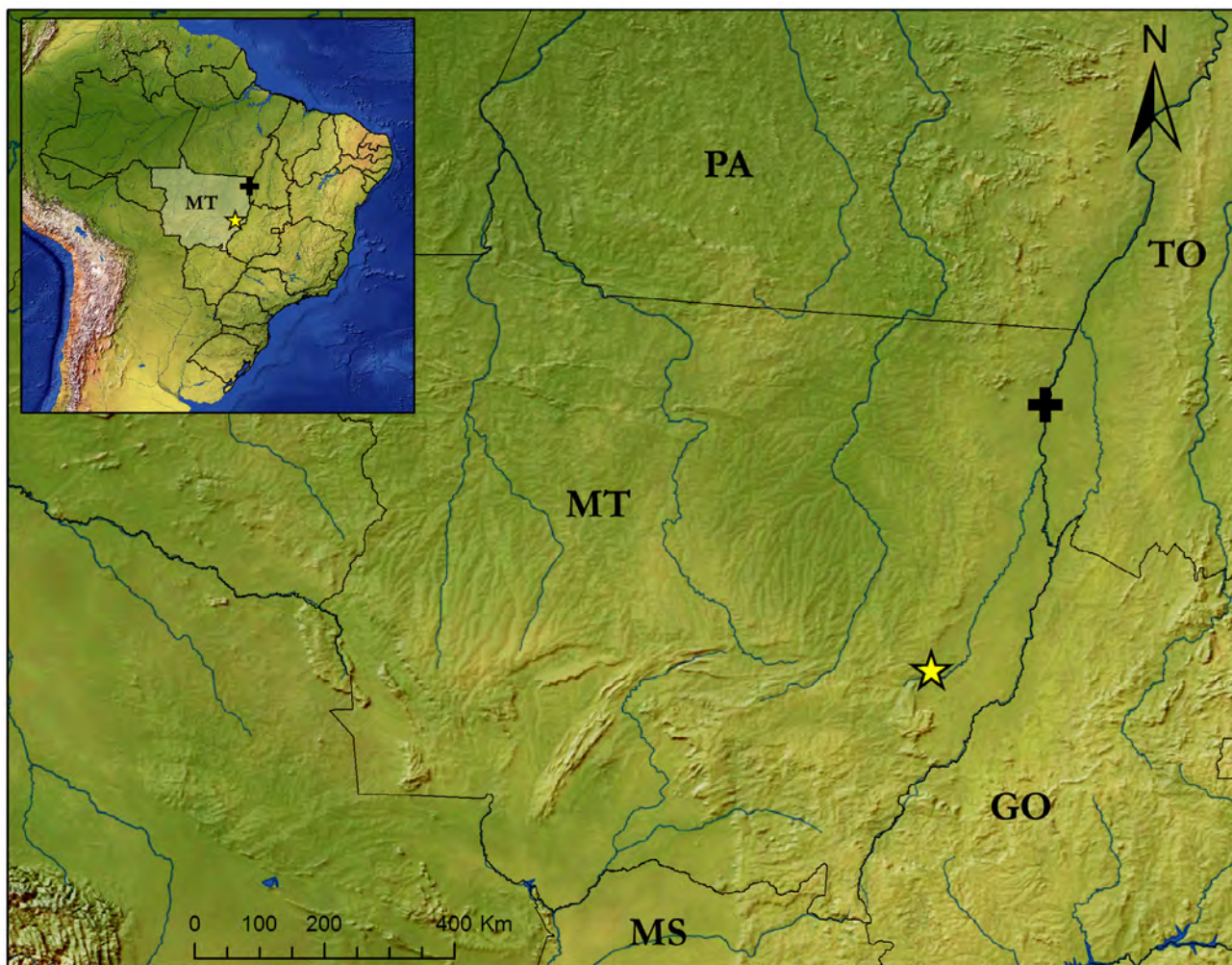


Fig. 26. Distribution map of *Heteropyge araguayensis* (Schubart, 1947) from Brazil. The cross refers to the type locality and the star to the new record in Pindaíba, Mato Grosso, Brazil (PA, Pará; TO, Tocantins; MT, Mato Grosso; GO, Goiás; MS, Mato Grosso do Sul).

ring (Fig. 1), as well as a curved furrow (set off the lateral margin) on the collum (Figs 1, 2) (SCHUBART, 1947:28).

According to the general introduction provided by Schubart for the collection performed by A. L. de Carvalho (SCHUBART, 1947:2), the greater sampling effort was focused on the banks of the Araguaia River, mainly in the indigenous area of “Barra do Tapirapé” (= Santa Terezinha). Indeed, based on the recent material and the records of *H. araguayensis*, we may expect that the species is distributed along the moist forest close to the Araguaia River. (see Fig. 26).

***Heteropyge bidens* (Schubart, 1945), sp. reval.**

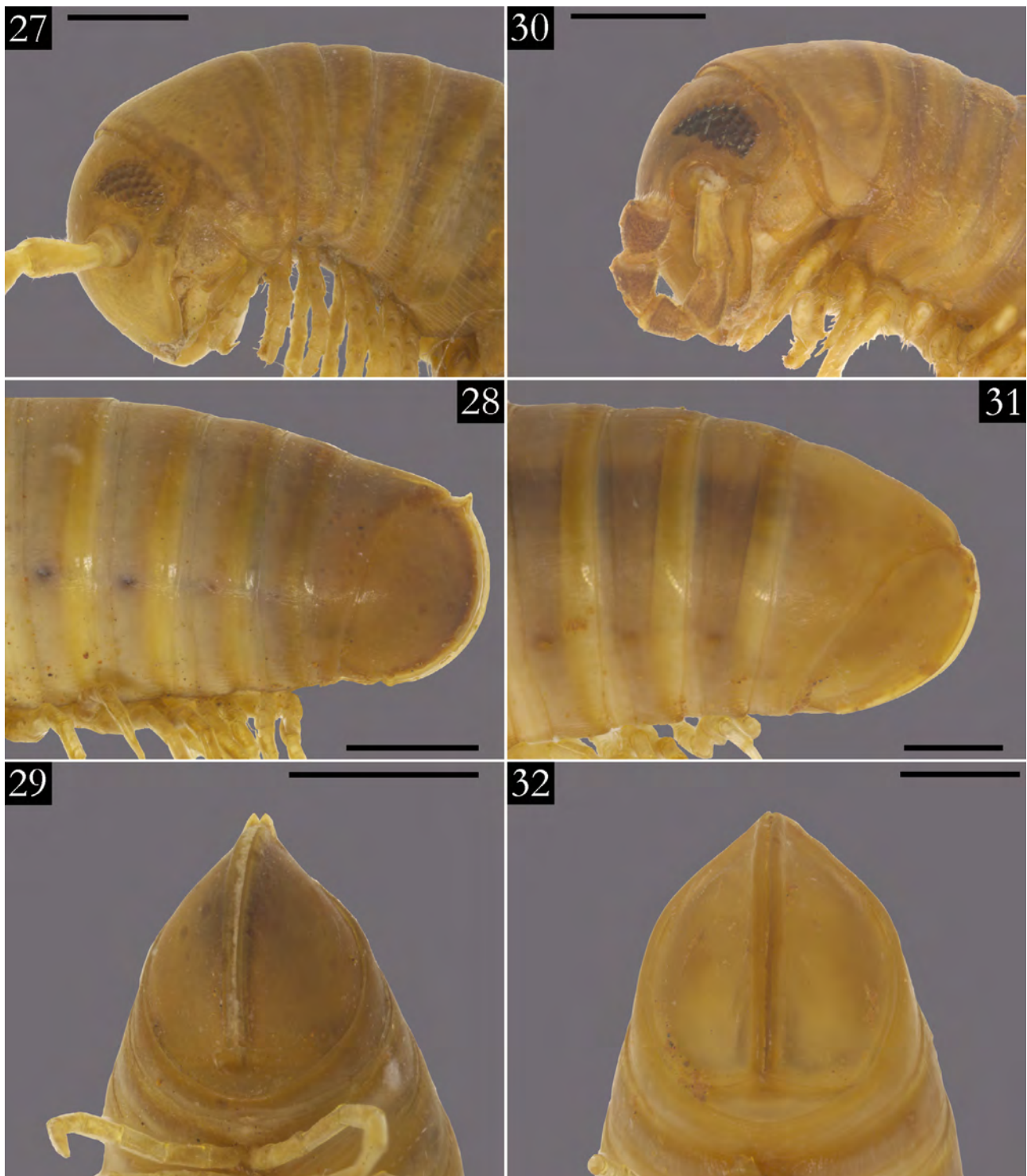
(Figs 27–29, 33–35, 39–41)

Orthoporus bidens SCHUBART, 1945:84. Male holotype from Ilha dos Pombos [21°50'39.65"S; 42°34'45.51"W], Carmo, Rio de Janeiro, Brazil, VI.1940, A. L. Gomes leg., deposited in MZSP, examined; DEMANGE, 1964:200.

Heteropyge bidens. HOFFMAN, 1960:113; MAURIÈS, 1975:1272; KRABBE, 1982:333 (as syn. of *H. cayennophilus* Silvestri).

Revalidation. The original description and the figures provided by SCHUBART (1945) are highly detailed, clearly showing the differences between this species and *H. cayennophilus*. From a detailed examination of both species, especially the distolateral metaplical process (dmp, Fig. 34), absence of apicomeral processes on the proplica (Fig. 34) and the first pair of legs (Figs 39–43), *H. bidens* is revalidated as a distinct species.

Additional material examined. BRAZIL, **Pernambuco**: Igarassu (7°50.069'S, 34°54.347'W), Reserva Ecológica Charles Darwin, ♂, 08.VIII.2011, A. M. Souza leg. (UFPB - Myr0045); **Rio de Janeiro**: São Gonçalo (22°49'38.41"S; 43°03'50.06"W), Fazenda Engenho Novo, ♂, 08.II.1947, Aguirre leg., (MZSP); Paraty (23°13'12.20"S; 44°43'13.71"W), 3♂ ♀, 19.VII.1956, O. Schubart leg. (MZSP 1014); Rio de Janeiro, Tijuca (22°55'59.62"S; 43°14'28.16"W), ♂, no data, O. Schubart leg. (MZSP 1013); Rio de Janeiro, Jacarepaguá (22°58'7.00"S; 43°23'27.09"W), ♂, no data, O. Schubart leg. (MZSP 1012). **São Paulo**: Santos (23°58'10.90"S; 46°19'41.16"W), 2♂, 01.V.1947, O. Schubart leg. (MZSP).

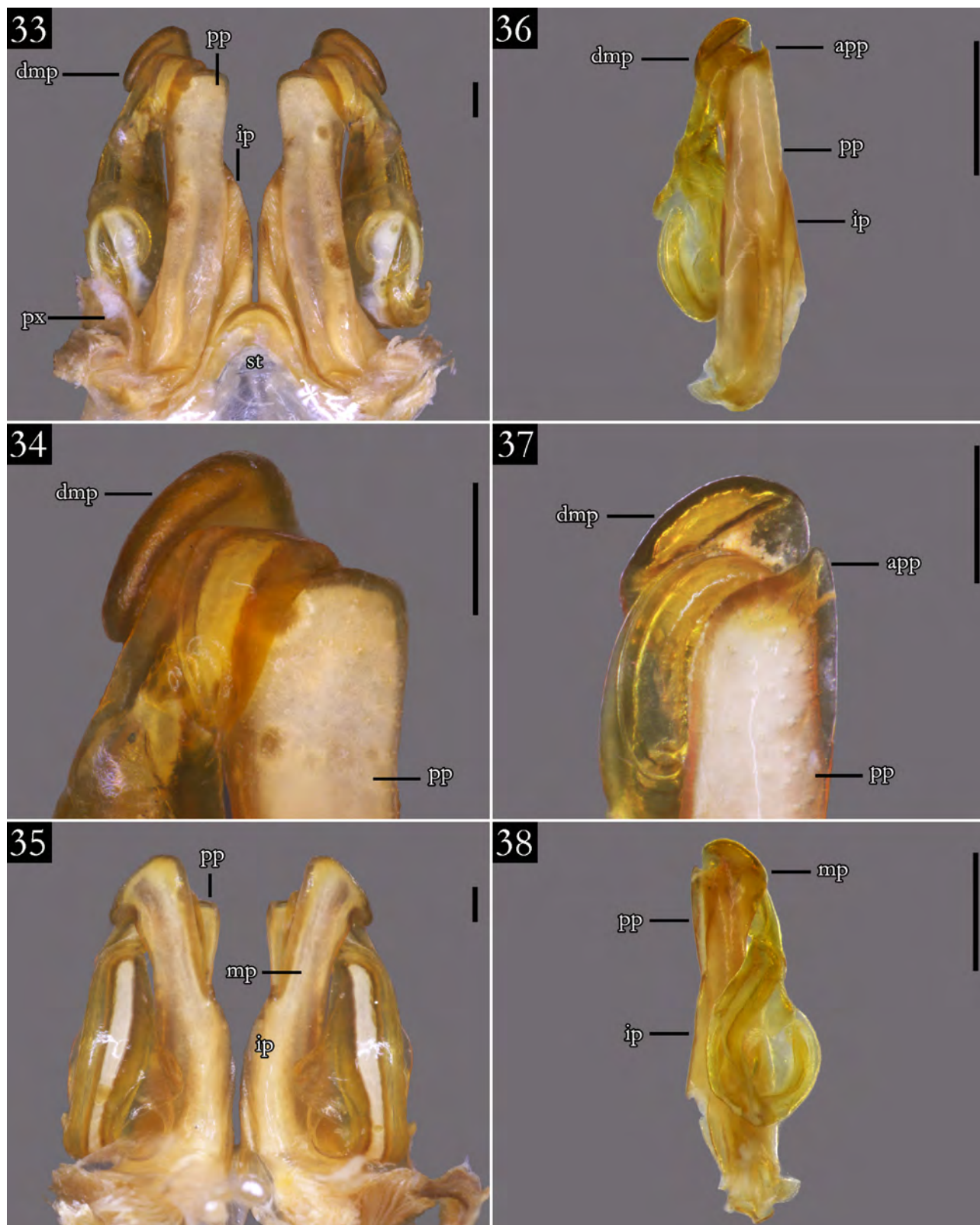


Figs 27–32. Stereoscopic images. Figs 27–29, *Heteropyge bidens* (Schubart, 1945) male (MZSP 1014): 27, anterior region; 28, posterior region; 29, ventral view. Figs 30–32, *Heteropyge cayennophilus* (Silvestri, 1897) male (IBSP 636): 30, anterior region; 31, posterior region; 32, ventral view. Scale bars: 27, 1 mm; 28, 1 mm; 29, 1 mm; 30, 1 mm; 31, 500 μ m; 32, 500 μ m.

Diagnosis. Males differ from those of congeners by the absence of a distal process on the proplica; distolateral process on metaplica (dmp) starting diagonally from proplica (Fig. 34); a thickened and contiguous distal edge (detail on dmp, Fig. 34), with ectal tip directed basally (posterior view

in the Fig. 35). Besides this, it differs from *H. cayennophilus* by the subtriangular process on prefemur in the first pair of legs (Fig. 40).

Description. Male described by SCHUBART (1945). Additional data here provided.



Figs 33–38. Stereoscopic images of the gonopods. Figs 33–35, *Heteropyge bidens* (Schubart, 1945) male (MZSP 1014): 33, anterior view; 34, detail of the distal region in anterior view; 35, posterior view. Figs 36–38, *Heteropyge cayennophilus* (Silvestri, 1897) male (IBSP 636): 36, anterior view; 37, detail of the distal region in anterior view; 38, posterior view. Scale bars: 33, 200 μm ; 34, 100 μm ; 35, 200 μm ; 36, 500 μm ; 37, 200 μm ; 38, 500 μm .

Male (MZSP 1014) (Figs 27-29). Specimen fragmented. Total length: 25 mm. Maximum vertical diameter: 2 mm.

First pair of legs: coxae rounded, with 6+6 setiform setae in a curved row on mesal region (Figs 39, 40). Prefemur square; 2+2 distomesal setae; a subtriangular prefemoral process; a group of small scattered setae (around 10) at base of the process (Fig. 40). Femur, postfemur and tibia with membranous ventral pads (Fig. 39). Second pair of legs: coxae rounded. Prefemur appressed to and contiguous with distal portion of coxae; postfemur and tibia with short membranous ventral pads (Fig. 41). Penis elongated and rounded.

Gonopod (Figs 33-35). Sternum semi-circular, linguliform. Paracoxite (px) rounded. Proplica short (pp); slightly curved; without apicomesal process. Metaplica elongated (mp) (Fig. 35); distolateral metaplical (dmp) process (Fig. 34) starting diagonally from proplica; with a thickened and contiguous distal edge (in anterior view). Inner process of metaplica (ip) evident; stout and rounded; with a thickened fold (in anterior view, Fig. 33) just behind sternum. Telopodite bulky; short antetorsal process; a large, lamellar, broad expansion. Solenomere in mesal region with one weak, 360° torsion; partially covered by lamellar expansion.

Distribution. Known from the states of São Paulo, Rio de Janeiro and Pernambuco (SCHUBART, 1945).

Heteropyge cayennophilus (Silvestri, 1897)

(Figs 30-32, 36-38, 42-44)

Archispirostreptus cayennophilus SILVESTRI, 1897b:348. Male holotype from Cayenna [4°55'21.13"N; 52°19'36.66"W], French Guiana, deposited in IRSNB, not examined. VIGGIANI, 1973:355.

Gymnostreptus (Gymnostreptus) cayennophilus ATTEMS, 1914:132.

Orthoporus brasiliensis SCHUBART, 1947:52. Syntypes from Aurá, Ananindeua [1°25'34.82"S; 48°23'10.84"W], state of Pará, Brazil, 18.IV.1940, A. L. Carvalho leg., deposited in MZSP and MNRJ 11846, examined; MAURIÈS, 1975:1272.

Scaphiostreptus (Scaphiostreptus) cayennophilus. ATTEMS, 1950:231.

Heteropyge brasiliensis. HOFFMAN, 1960:113. Synonymized by MAURIÈS, 1975:1272.

Orthoporus cayennophilus. JEEKEL, 1963:5.

Heteropyge cayennophilus. MAURIÈS, 1975:1272; KRABBE, 1982:333.

Additional material examined. FRENCH GUIANA, **Cayenne**: Bordat Montabo (04°56'46.47"N; 52°18'24.50"W), 2♂, 5♀, 2 immatures, VII.1951, A. R. Hoge & J. M. Ruiz leg. (IBSP 636); BRAZIL, **Pará**: Aurá (01°26'37.99"S; 48°23'9.24"W), 2♂, 6♀, ♀ immature, 18.IV.1940, A. L. Carvalho leg. (MNRJ 11847); 52♀ (MNRJ 11881); ♂ (MNRJ 11838); ♂ (MNRJ 11840); 25♂ immatures (MNRJ 11848); 11♀ immatures (MNRJ 11832); 27♂ (MNRJ 11853); ♂ (MNRJ 11839).

Diagnosis. Males of *H. cayennophilus* can be recognized by a rounded process on the prefemur of the first pair of legs (Fig. 43). Gonopod with an erect straight proplica (Fig. 36); a short or inconspicuous (MAURIÈS, 1975:1273, figs 32, 33) apicomesal process (app, Figs 36, 37); distolateral process on metaplica (dmp, Figs 36, 37) not protruding in posterior view; contiguous with metaplica (Fig. 37), different

in diagonal aspect from that of *H. bidens* (Fig. 34); short and rounded in appearance.

Description. Described by SCHUBART (1947) as *O. brasiliensis* and with a complementary description by MAURIÈS (1975). Additional data are presented here.

Male (IBSP 636) (Figs 30-32). Total length: 40 mm. Maximum vertical diameter: 2 mm.

First pair of legs: coxae rounded, with 5+5 setiform setae in a curved row on mesal region (Figs 42, 43). Prefemur triangular; 2+2 distomesal setae; a rounded prefemoral process; inconspicuous scattered setae at base of the process (Fig. 43). Tibia with membranous ventral pads (Fig. 42). Neither femur nor postfemur with ventral pads (at least not imperceptible). Second pair of legs: coxae rounded. Prefemur appressed to and contiguous with distal portions of the coxae; postfemur and tibia with very short membranous ventral pads (Fig. 44). Penis elongated and rounded.

Gonopod (Figs 36-38). Sternum semi-circular. Paracoxite (px) rounded. Proplica very short (pp); erect straight; with short apico-mesal process (app, Fig. 37). Metaplica elongated (mp); distolateral metaplical (dmp) process not protruding in posterior view (Fig. 37), rounded and contiguous with metaplica. Inner process of metaplica (ip) evident; straight (Fig. 38). Telopodite bulky; antetorsal process absent; a large, lamellar, broad expansion covering partially the solenomere. Solenomere with one complete 360° torsion.

Distribution. Known from the northern region in French Guiana (SILVESTRI, 1897b; MAURIÈS, 1975), and extending down to the state of Pará in Brazil (SCHUBART, 1947).

Heteropyge lineolatus (Attems, 1950)

Helicosenus lineolatus ATTEMS, 1950:247. Male holotype from Paraguay [no specific geographical coordinates], deposited in NHM, not examined.

Heteropyge lineolatus HOFFMAN, 1960:112; KRABBE, 1982:334.

Distribution. Known from the type locality Paraguay (without further information) (ATTEMS, 1950) up to Cuiabá, Mato Grosso, Brazil (HOFFMAN, 1960).

Heteropyge paraguayensis (Silvestri, 1895)

Odontopyge paraguayensis SILVESTRI, 1895:11. Syntypes from the river Apa [no specific geographical coordinates], Paraguay, deposited in MSNG, not examined; VIGGIANI, 1973:363.

Heteropyge paraguayensis SILVESTRI, 1902:17; ATTEMS, 1914:179; HOFFMAN, 1960:113; KRABBE, 1982:334; GOLOVATCH *et al.*, 2005:278, 280, 284.

Orthoporus paraguayensis SCHUBART, 1945:84; 1958:237, 240.

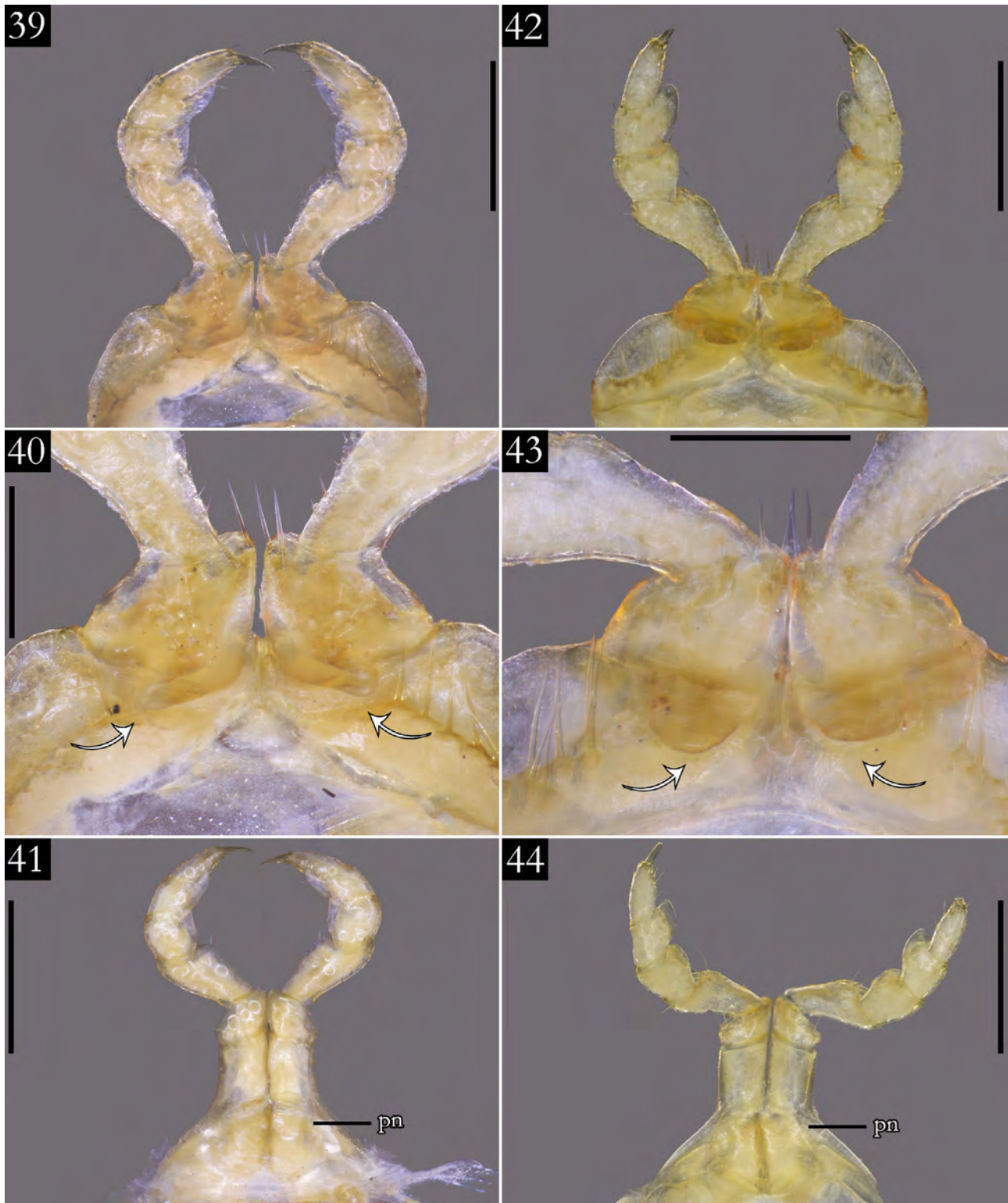
Distribution. Known from the southern region in Paraguay (SILVESTRI, 1895) and extending up to southern state of Mato Grosso, Brazil (GOLOVATCH *et al.*, 2005).

Heteropyge solitarius (Attems, 1950)

Helicosenus solitarius ATTEMS, 1950:248. Male holotype from Paraguay [no specific geographical coordinates], deposited in NHM, not examined.

Heteropyge solitarius. HOFFMAN, 1960:113; KRABBE, 1982:335.

Distribution. Known from the type locality Paraguay (without further information) (ATTEMS, 1950).



Figs 39–44. Stereoscopic images of the first and second pair of legs. Figs 39–41, *Heteropyge bidens* (Schubart, 1945), male (MZSP 1014): 39, first pair of legs in anterior view; 40, detail of the prefemoral process in anterior view (the arrows refers to prefemoral process); 41, second pair of legs in posterior view. Figs 42–44, *Heteropyge cayennophilus* (Silvestri, 1897), male (IBSP 636): 42, first pair of legs in anterior view; 43, detail of the prefemoral process in anterior view (the arrows refers to prefemoral process); 44, second pair of legs in posterior view. Scale bars: Fig. 39, 400 μm ; 40, 200 μm ; 41, 400 μm ; 42, 500 μm ; 43, 250 μm ; 44, 500 μm .

DISCUSSION

Most individuals of *H. araguayensis* were sampled under cattle dung in a floodplain area. Through an observation made by A. L. de Carvalho (see SCHUBART, 1947:29), on rainy days the species had a habit of climbing on lemongrass (*Cymbopogon* sp.) leaves. On some days before the floods, some agglomerations of individuals were found in elevated areas, either hidden in rotting logs or inside termitaria. As regards *H. bidens*, the unexpected distribution with a large gap of approximately 2,000 km (states of Rio de Janeiro, São Paulo and Pernambuco) could be explained by its previous occurrence along the Atlantic rain forest, and now restricted to its still remaining fragments. In agreement with this explanation, the only record further north is from an “Ecological Reserve”, corresponding to one of the few protected areas of the Atlantic rain forest in the northeastern region of Brazil. New samplings of the local fauna in these fragmented gaps will complete the records of *H. bidens*. It is important to highlight that the distribution of *H. bidens* is restricted to the Atlantic rain forest, while *H. cayennophilus* is distributed only in the Amazonian region (MAURIÉS, 1975; KRABBE, 1982). So both of these species are vastly allopatric.

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