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Three new species of *Thrasychiroides* Soares & Soares, 1947 from Brazilian Mountains (Opiliones, Eupnoi, Neopilionidae)

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Abstract

Three new species of the genus *Thrasychiroides* are described from the Brazilian Atlantic Rain Forest mountains: *Thrasychiroides moporanga* **sp. nov.** (type locality: Reserva Biologica de Alto da Serra de Paranapiacaba, State of São Paulo), *T. toryba* **sp. nov.** (type locality: São Francisco de Paula, State of Rio Grande do Sul) and *T. ybytyra* **sp. nov.** (type locality: Parque Nacional do Itatiaia, State of Minas Gerais). The male genital of *Thrasychiroides brasilicus* Soares & Soares, 1947 is illustrated for the first time. A remarkable structure on the penis of *Thrasychiroides* species is described and defined as pair of "arms", also considered a putative synapomorphy of the genus.

Key words: Atlantic Rain Forest, Enantiobuninae, taxonomy, harvestmen, penis morphology, phylogeny

Introduction

The family Neopilionidae has more than 60 described species (Kury 2014; Taylor 2011, 2013) of southern Hemispheric-Gondwanan distribution (see map on Šilhavý 1970), and is divided into three subfamilies: Neopilioninae (2 spp., South Africa); Enantiobuninae (49 spp., Australia, New Zealand, Chile, Argentina and Brazil) and Ballarrinae (10 spp., Australia, South Africa and Chile). A morphological revision of the family was conducted by Hunt & Cokendolpher (1991) and Cokendolpher (2007). Taylor (2011) conducted a morphological cladistic analysis of the family, including 13 of the 18 included genera, which resulted in the synonymy of Monoscutidae under Neopilionidae. Regarding the taxonomy of Enantiobuninae, Taylor (2011) concluded that the southern Neotropical genus *Thrasychirus* Simon, 1884 is sister group to *Australiscutum* Taylor, 2009 from Australia because they share a synapomorphic mobile junction between the leg basitarsus and distitarsus, and distoventral spines on that junction. The latter feature reversals to the plesiomorphic condition outside Enantiobuninae (Taylor 2011). However, he did not include a representative of the single Neotropical genus, *Thrasychiroides* Soares & Soares, 1947a, in the analysis.

The genus *Thrasychiroides* was described by Soares & Soares (1947a) in Leiobuninae (Phalangiidae) based on a male named *T. brasilicus* Soares & Soares, 1947a, from Banhado, in the Atlantic Rain Forest within the State of Paraná, Southeastern Brazil. The authors did not provide a description of the penis. In the same work, they indicated a possible relationship of this genus with the Chilean/Argentinean genus *Thrasychirus* and diagnosed it by lack of a median apical apophysis in the pedipalpal patella (Soares & Soares 1947a). The same authors later described the female of *Thrasychiroides brasilicus* and stated that it was similar to the male, differing only in cheliceral size (Soares & Soares 1947b). These specimens were the only two members of *Thrasychiroides* recorded from Brazil.

Šilhavý (1970) transferred both *Thrasychiroides* and *Thrasychirus* to the Neopilionidae Enantiobuninae; he did not explicitly include the former in this family, although the transfer was mentioned in his figure 14 and references (see Cokendolpher 1984).

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In this paper we describe three new species of *Thrasychiroides* from mountain tops of southern and southeastern Brazil (states of Rio Grande do Sul to Minas Gerais). We also provide for the first time description and illustration of the penis of the type species and an emended diagnosis for the genus. We compare the genital morphology among species to support their reproductive isolation and hypothesize the relationship of this genus with others of the subfamily.

Material and methods

The specimens were illustrated using a stereomicroscope LEICA MZAPO, the male genitalia with a ZEISS AXIOSKOP and photographed with a stereomicroscope LEICA M125 attached to a DFC-290 camera with Automontage Leica Application Suite software version 3.3.0. All measurements are given in millimeters. The material examined is deposited in the Museu de Zoologia, Universidade de São Paulo (MZSP), Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul (MCTP) and Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul (MCN).

We used the data matrix published by Taylor (2011) and completed data for the genus *Thrasychirus* using *Thrasychirus gulosus* Simon, 1884 from Chile (Centro Cientifico Huinay, 42°22'37"S, 72°24'54"W) deposited in the MZSP (#56030). The new species described here and the type species of the genus were included in the matrix. We added a new character (#76) for the long paired processes in the penis, here called paired arms (0 = absent; 1 = present). They were coded as absent for all taxa present in Taylor's matrix (including *Thrasychirus*) and present in all four species of *Thrasychiroides*. The data matrix was analyzed using the computer program TNT (Goloboff *et al.* 2008) and all characters were equally weighted. Heuristic ("traditional") searches were conducted using 1000 replicates, holding 100 trees per replication and constructing trees using a tree bisection-reconnection swapping algorithm (TBR). All characters were treated as non-additive.

Results and discussion

Taxonomy

Key for Southamerican males of Enantiobuninae

1	Penis without arms	*Thrasychirus*
-	Penis with arms	*Thrasychiroides* ... 2
2	Distal region of arms bifid, arms connected to the shaft (Fig. 5G-I)	*T. toryba* **sp. nov.**
-	Distal region of arms not divided, arms jointed to the shaft	3
3	Penial glans inflated in mid-section, much wider than distal third (Fig. 5C)	*T. brasilicus*
-	Penial glans not inflated in mid-section, not wider than distal third (Fig. 5F and 5L)	4
4	Penial glans shoulder angles acute (Fig. 5J–L)	*T. ybytyra* **sp. nov.**
-	Penial glans shoulder angles rounded (Fig. 5D–F)	*T. moporanga* **sp. nov.**

Family Neopilionidae Lawrence, 1931

Subfamily Enantiobuninae Šilhavý, 1970

Thrasychiroides Soares & Soares, 1947a

Thrasychiroides Soares & Soares, 1947a: 82; Hunt & Cokendolpher 1991: 133; Crawford 1992: 45.

Emended diagnosis. General color variation from chestnut brown to darkish brown, with large stripes and maculations on lateral carapace and dorsal scutum, and rounded spots usually in median dorsal scutum (Figs. 2–4). Ocularium with lighter color, usually whitish pearl with a darkish contour surrounding the eyes (Figs. 2A, 3A, 4A). Setae spread on the surface of the ocularium, dorsal and ventral of the body. Second segment of chelicerae of males

massive, inflated and/or not expanded (Fig. 1B, D, F), with a prolateral spine or projection on apex and near movable finger. Pedipalp tuft with apical setae on the inner face of femora, patella and tibia with a lateral line of setae on each side, and a dorsal and a lateral line lacking setae (Fig. 2D, 3C, 4C). Shaft of penis with a pair of elongated sclerotized ventral movable projections resembling paired arms, connected or jointed to shaft (Fig. 5), apex of projections usually with spines or inflated, dorsal contour of glans forming a waist on the height of arms expansion and sometimes a shoulder that may have spiniform acuminate lateral sides. Glans with a terminal spine (Fig. 6).

Comparisons. *Thrasychiroides* is similar to the other South American genus, *Thrasychirus,* because it exhibits a prolateral spine on the apex of cheliceral segment II that is not observed in other members of the subfamily (C. Taylor, *personal communication*). It differs from *Thrasychirus* in possessing a spine the on penial stylus (Fig. 6), longer glans without an "U"-shaped cleft on the distal margin (glans length about ¼ of penis length, with U-shaped cleft on distal margin in *Thrasychirus*, see Fig. 7), and a shorter shaft of about ½ penis length (about 2/3 in *Thrasychirus*).

Distribution. All Brazilian species of *Thrasychiroides* occur in the mountains of the Atlantic Rain Forest zone from 890 up to 2,400 m.a.s.l. The genus is now recorded in a few localities from the States of Rio Grande do Sul to Minas Gerais. It seems that *Thrasychiroides,* like other enantiobunines, inhabit colder climate and permanently humid realms, which are only found on mountains in southeastern Brazil. The northernmost record of the family Neopilionidae was *T. brasilicus* in the State of Paraná (Brazil). The spatial distribution of the family is extended to the north with the records of *Thrasychiroides ybytyra* **sp. nov.** for Minas Gerais (Brazil).

Thrasychiroides moporanga **sp. nov.**

(Figs1A–B; 2A–D; 5D–F; 6C–D)

Type material. Holotype ♂ from Reserva Biológica do Alto da Serra de Paranapiacaba (23º46'38"S, 46º18'45"W), Santo André, State of São Paulo, Brazil, 02–24.X.2009, in malaise trap, S. Nihei leg. (MZSP 42706).

Etymology. *Moporanga* is an adjective from the Brazilian native Tupy language that means "ornamented" and is a reference to the colorful aspect of this species.

Diagnosis. Ocularium white with a darkish contour surrounding the eyes, with six small dorsal setae. Pedipalpal claws with 16 teeth. Chelicerae not massive but long (segment I length: 3.6). Second segment (length: 6.2) not very inflated and covered with setae, each finger with many small teeth, one basal large tooth and many smaller teeth on movable finger. Penis with posterior half of glans three times larger than the anterior. Shoulders just slightly narrowing at the arms area, without acuminate laterals forming a pair of spines. A pair of dorso-lateral and trifid setae above mid-section of glans, pointing to posterior. Ventral arms larger at base narrowing medially and pointed at apex. Apex of stylus with spine 2/3 basally curved and perpendicular to penis axis, 1/3 distal torched and directed to penis base.

Description of male (holotype). Measurements**:** Body length: 2.88; prosoma length: 0.84; prosoma width: 2.2; chelicerae: segment I length: 1.68, segment II: 2.84.

Coloration (Fig. 2A–D). Carapace darkish brown with a pair of white marginal maculations in ocularium and one maculation behind it, two pairs of very small lateral maculations on each side of carapace close to ocularium. Dorsal scutum beige with luminous white maculations on lateral third and darkish brown paired maculations on median portion. Several small rounded luminous white spots in between. Ocularium luminous white with a darkish contour (ring) surrounding the eyes, basal segment of chelicerae cream with large dorsal chestnut colored maculation lined along its extension, other segments chestnut. Pedipalps, ventral trochanter, femora, patella, tibia and tarsus with chestnut maculations, anterior half of tarsus cream. Coxae and genital operculum cream with large darker apical chestnut maculations and scattered small maculations on the surface. Free tergites darkish brown with luminous white spots, anal operculum luminous white. Ventral color mostly cream; only free sternites dark brown with white luminous, rounded maculations.

Body and appendages (Figs 1A–B; 2A–D). Ocularium with six small setae distributed dorsally. Small setae spread on dorsal and ventral surfaces, including legs, genital operculum, coxae, pedipalps and chelicerae. Pedipalpal claws with 16 teeth (increasing in size towards the apex), pedipalp tuft with apical setae on the inner face of femora, a line of setae surrounding the contour of patella, patella and tibia with a dorsal and a lateral line

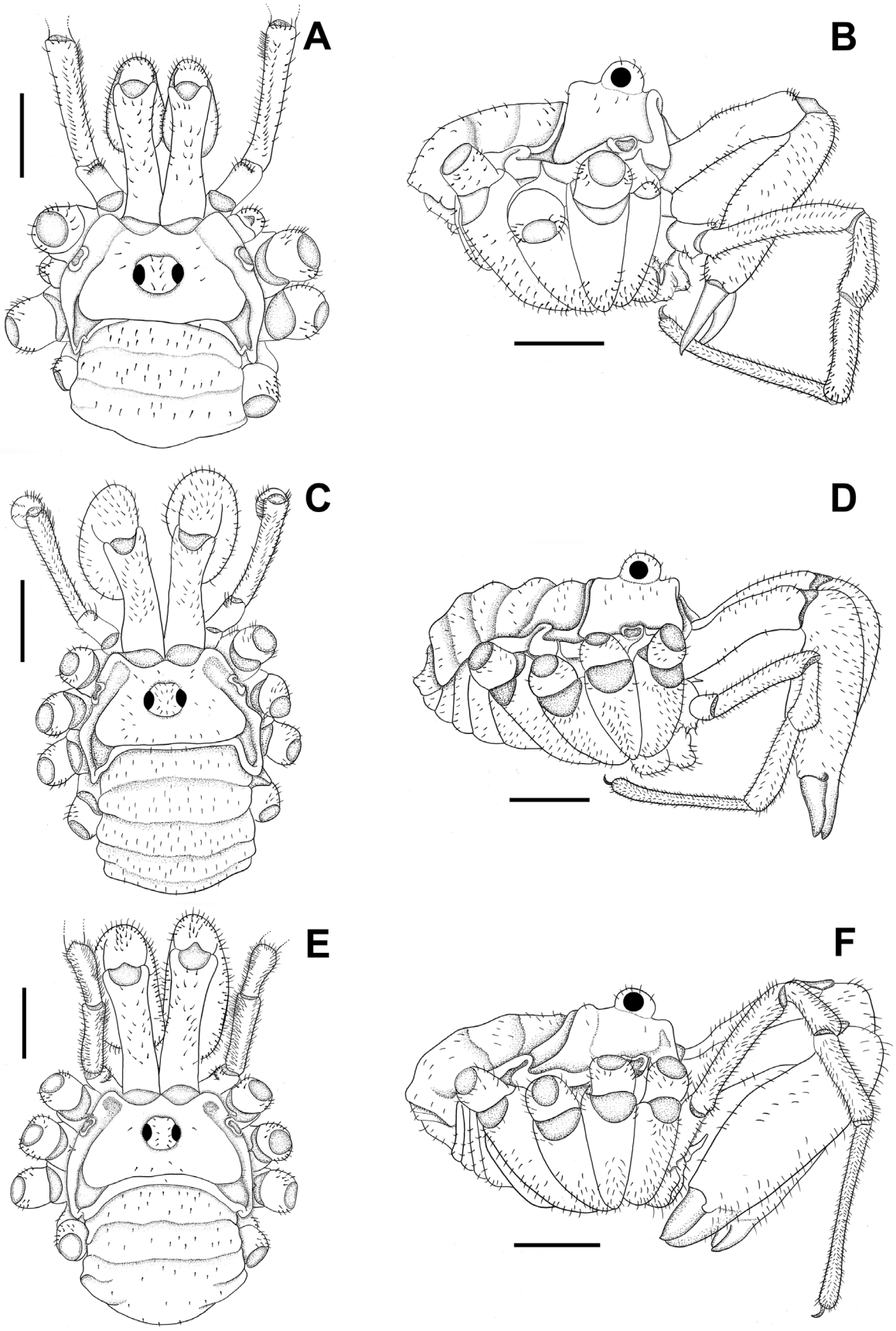

FIGURE 1. Dorsal and lateral views of the holotypes of the new *Thrasychiroides* species. A–B. *T. moporanga* **sp. nov.,** dorsal and lateral view, respectively; C–D. *T. toryba* **sp. nov.**, dorsal and lateral view, respectively; E–F. *T. ybytyra* **sp. nov.**, dorsal and lateral view, respectively. Scale bars = 0.5 mm.

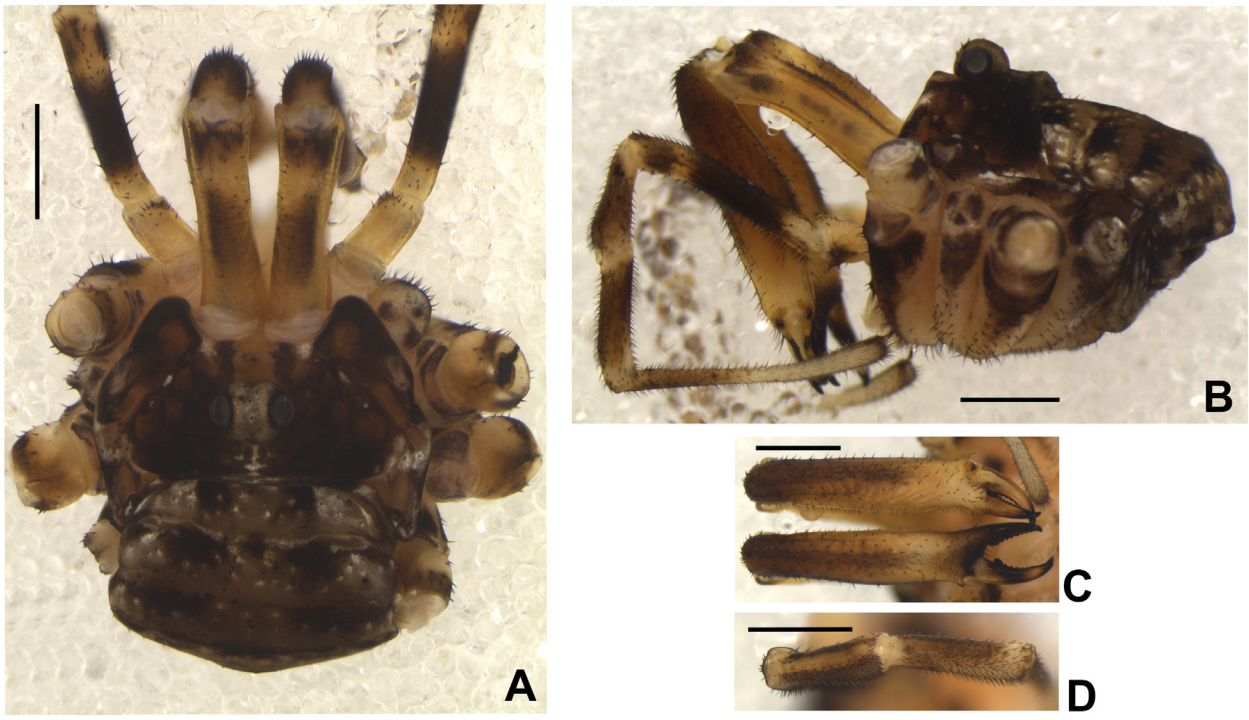

FIGURE 2. Photographs of the male holotype of *Thrasychiroides moporanga* **sp. nov.** A. dorsal view; B. lateral view; C. chelicera details; D. pedipalp tibia details. Scale bars = 1 mm.

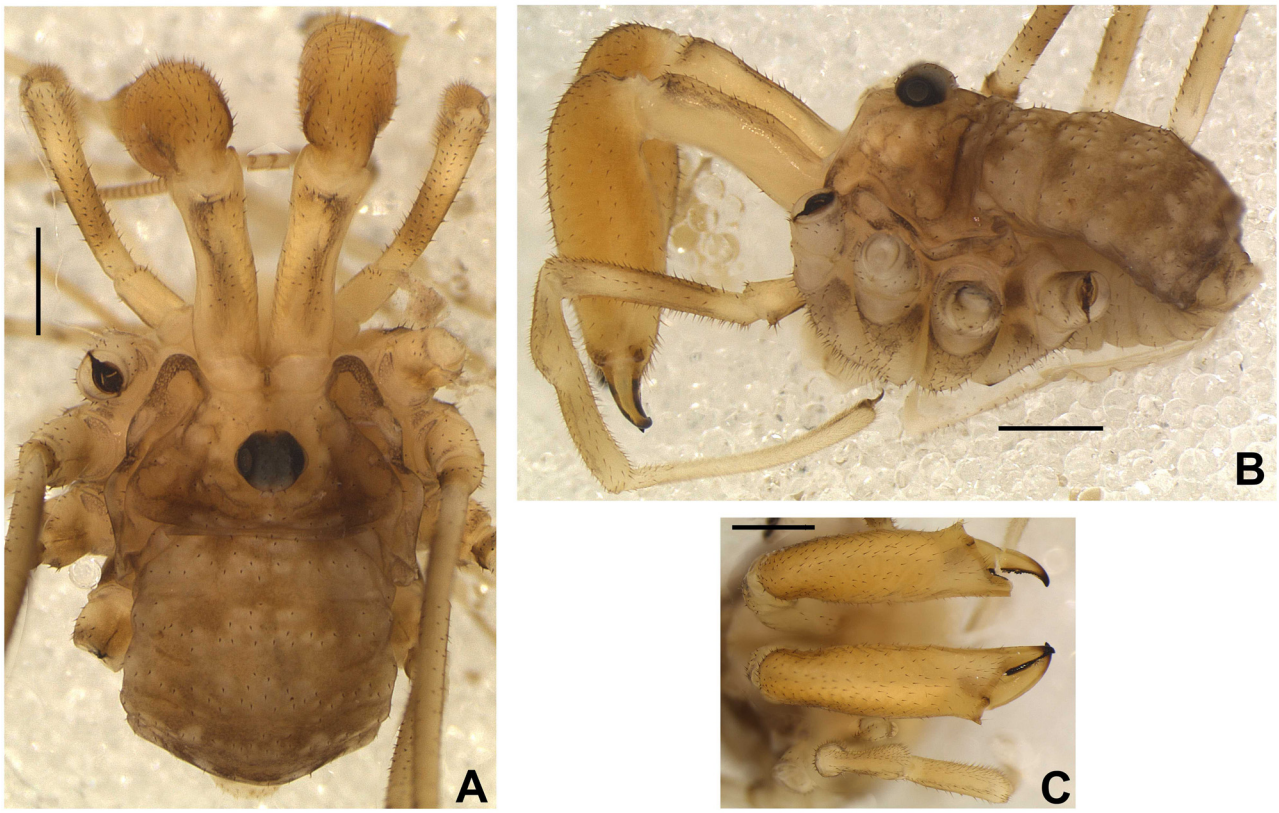

FIGURE 3. Photographs of the male holotype of *Thrasychiroides toryba* **sp. nov.** A. dorsal view; B. lateral view; C. chelicera and pedipalp details. Scale bars = 1 mm.

lacking setae (Fig. 2D), trochanter with basal apophysis and coxae with a large conspicuous basal apophysis. Chelicerae not massive but long, second segment not significantly inflated, covered with setae, each finger with one basal large tooth followed by many smaller teeth on movable finger.

Penis (Fig. 5D–F). Posterior portion of glans three times larger than the anterior, base concave, shoulders almost as wide as truncus, with rounded apical shoulders. A pair of long acuminate dorso-lateral and trifid setae above mid-section of glans, pointing to posterior. Ventral arms wider at base, narrowing medially and pointed at apex. Distal end of stylus with spine (Fig. 6C–D).

Biotope. The only record of this species is from the type locality, Reserva Biológica de Paranapiacaba, located in the municipality of Santo André (23°46'S, 46°18'W), in the State of São Paulo, Brazil. It spans an area of 336 ha covered with vegetation typical of the Atlantic Rain Forest. Average annual rainfall is 3380 mm, and altitudes range from 750 to 890 m.a.s.l.. The area has been subjected to the effects of pollution from the accelerated growth of an industrial park in the region of Cubatão (16 km E) in the 1960s and 1970s (Gutberlet 1996).

The harvestmen fauna from Paranapiacaba has been investigated since the 1920s and over the years 729 individuals were collected that represent 46 species. This is the highest alpha diversity record of harvestmen in the State of São Paulo and the second in Brazil (Bragagnolo & Pinto-da-Rocha, 2009). However, despite the intense sampling effort, only one individual of *Thrasychiroides moporanga* **sp. nov.** was collected by a malaise trap. This suggests that the species may be rare or may be difficult to collect using malaise traps.

Thrasychiroides toryba sp. nov.

(Fig.1C–D; 3A–C; 5G–I; 6E–F)

Type material. Holotype: ♂ from CPCN Pró-Mata (29°28'21"S, 50°09'25"W), São Francisco de Paula, 920 m.a.s.l., State of Rio Grande do Sul, Brazil, 25.X.2000, Ricardo Ott leg. (MCN 2065). Paratypes: same data as holotype, 2 ♂ (MCN 2066; 2067); 920 m.a.s.l., 2 ♀ (MCN 2068; 2069); ♂, 920 m.a.s.l. (MZSP 56031); ♀ (MZSP 56032); 870 m.a.s.l., ♂ (MCTP 419).

Etymology. *Toryba* is from the Brazilian Indian Tupy language that means “happy”, a feeling the three authors shared for the chance to be united working with such a beautiful group or harvestmen.

Diagnosis. Ocularium dark brown with darker contours surrounding the eyes, dorsally with more than 20 small setae. Pedipalpal claws with 15 teeth. Chelicerae massive, second segment very inflated and with few scattered setae. Penis (Fig. 5G–I), with posterior half of glans three times larger than the anterior, shoulders much shorter than base of glans with acuminate laterals forming spines with rounded apex, a pair of short acuminate and bifid dorso-lateral setae on widest part of glans. Ventral arms slender at basal half, widening subdistally and almost reaching the distal pair of spines on glans, distal region with subapical branch falciform and shorter and distal branch with serrate apex. Apex of stylus with spine almost straight and directed to penis base (Fig. 6E–F).

Description of male (holotype). Measurements: body length: 3.01; prosoma length: 1.08; prosoma width: 2.24; chelicerae: segment I length: 1.52, segment II: 2.68.

Coloration (Fig. 3A–C). General color chestnut with stripes and maculations white and cream-colored, lateral third of carapace chestnut, median third cream-colored, ocularium chestnuts with a darkish contour surrounding the eyes. Dorsal scutum with white and chestnut paired lateral maculations, median third chestnut with several rounded white maculations on median portion. Basal segment of chelicerae cream with large dorsal chestnut maculation lined along its extension, other segments chestnut. Pedipalps, legs cream-colored with a few chestnut maculations. Coxae and genital operculum cream with darker apical chestnuts maculations. Venter cream colored.

Body and appendages (Figs 1C–D; 3A–C). Ocularium with more than 20 small setae distributed dorsally. Small setae spread on dorsal and ventral surface, including legs, genital operculum, coxae, pedipalps and chelicerae. Pedipalpal claws with 15 teeth (increasing in size to the apex), pedipalp tuft with apical setae on the inner face of femora, patella and tibia with a dorsal and a lateral line lacking setae; anterior margin of patella without setae, trochanters with basal apophysis, coxae with a large basal conspicuous apophysis. Massive chelicerae, second segment very inflated and covered with few setae, each finger with many small teeth.

Penis (Fig. 5G–I). Posterior with posterior half of glans three times larger than the anterior, base concave, shoulders much shorter than base of glans with acuminate laterals forming spines with rounded apex, a pair of dorso-lateral acuminate and bifid setae on widest part of glans. Ventral arms slender at basal half and wider subdistally and almost reaching the distal pair of spines on glans. Distal region of arms with subapical branch falciform and shorter, distal branch with serrate apex. Apex of stylus with spine almost straight and directed to penis base (Fig. 6E–F).

Description of female (paratype). Measurements**:** body length: 4.36; prosoma length: 1.16; prosoma width: 2.12; chelicerae: segment I length: 0.76, segment II: 1.56.

All characters as in the male except for the following characters: Body larger than male, chelicerae not expanded or massive. Ovipositor with two seminal receptacles.

Biotope. All specimens were collected at "Centro de Pesquisas e Conservação da Natureza Pró-Mata", Potreiro Velho, São Francisco de Paula, State of Rio Grande do Sul, Brazil (29°28'21"S, 50°09'25"W, 870–920 m.a.s.l.). The area is characterized mainly by mixed ombrophilous forest (known as Brazilian pine forests, "Floresta de Araucária" or Araucaria Forest, whose most conspicuous element is *Araucaria angustifolia)* or within the domain of Atlantic Rain Forest. Detailed descriptions of the area are provided in Bertoletti & Teixeira (1997) and Indicatti *et al.* (2008). Six localities, in three distinct forest habitats, under different degrees of anthropic influence, were chosen for this study: two *Araucaria angustifolia* primary forests, two secondary forests and two pine (*Pinus* spp.) silvicultures. In each locality, 10 pitfall traps with 10 cm diameter openings (filled with a 4% formalin solution) were placed from 22.IX.2000 to 18.V.2002 (see Indicatti *et al.* 2008). Only eight individuals were obtained in the three habitats, which indicates that species may possibly be rare or may be possibly better sampled using other methods than pitfall trapping.

***Thrasychiroides ybytyra* sp. nov.**

(Figs 1E–F,4A–C; 5J–L; 6G–H)

Type material. Holotype: ♂ from Brejo da Lapa (22º21'45"S, 44º44'06"W, 2200 m.a.s.l.), Parque Nacional do Itatiaia, Itamonte, State of Minas Gerais, Brazil, 5–6.II.1997, A.B. Kury, R. Pinto-da-Rocha & L.A.M. Mestre leg. (MZSP 25685). Paratypes: same data as holotype, road to Vale dos Lírios (22º21'42"S, 44º42'24"W, 2400 m.a.s.l.), 4.II.1997., 2 ♂ (MZSP 21256).

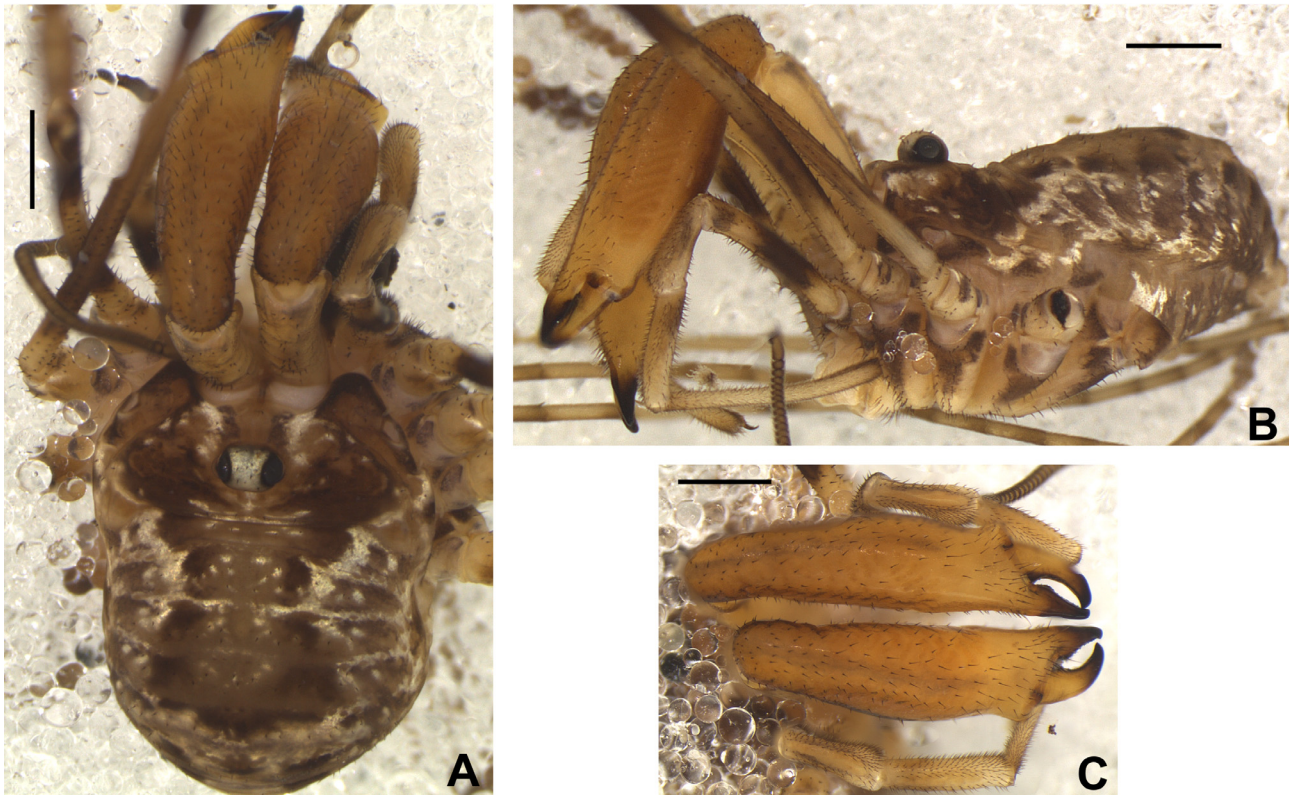

FIGURE 4. Photographs of the male holotype of *Thrasychiroides ybytyra* **sp. nov.** A. dorsal view; B. lateral view; C. chelicera and pedipalp details. Scale bars = 1 mm.

Etymology. *Ybytyra* is a noun from the Brazilian Indian Tupy language meaning "mountain", indicating the high altitude of the type locality.

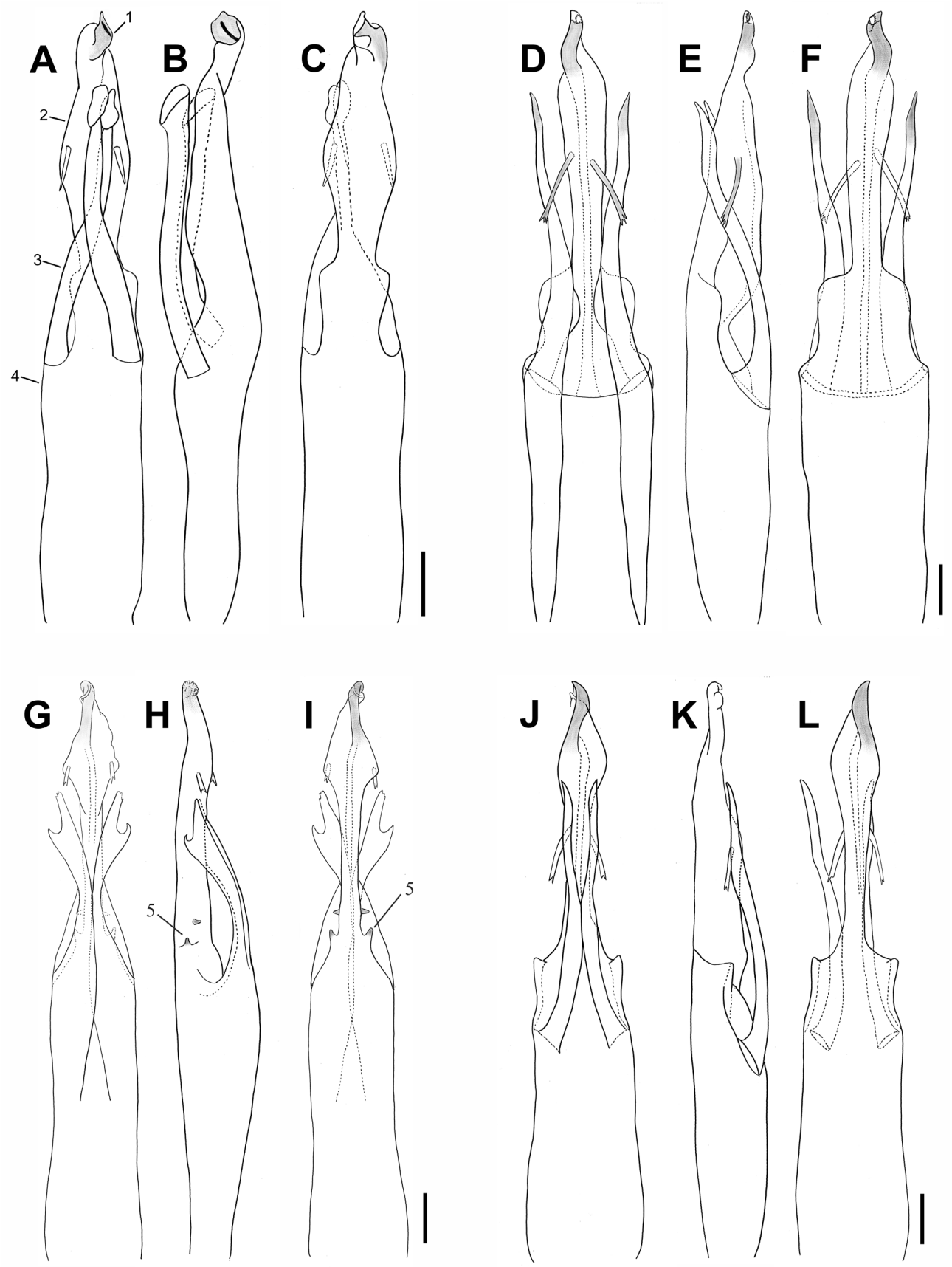

FIGURE 5. Penes of *Thrasychiroides* species. A–C. *T. brasilicus,* A. dorsal view; B. lateral view; C. ventral view. D–F. *T. moporanga* **sp. nov.**, D. dorsal view; E. lateral view; F. ventral view. G–I. *T. toryba* **sp. nov.**, G. dorsal view; H. lateral view; I. ventral view. J–L. *T. ybytyra* **sp. nov.**, J. dorsal view; K. lateral view; L. ventral view. Scale bars = 0.05 mm. Labels. 1= stylus; 2= glans; 3= arms; 4= shaft; 5= spine on shoulder.

Distribution. Known from type locality. One specimen was photographed in a nearby locality Delfim Moreira, in 1.XI.2004 by the first author.

Diagnosis. Ocularium pearl-white with a darkish contour surrounding eyes and with eleven small dorsal setae. Pedipalpal claws with 19 teeth. Chelicerae massive, second segment very inflated and covered with setae, sometimes only on dorsal surface, each finger with one basal very large tooth followed by many smaller teeth. Penis with posterior portion of glans larger than anterior part, dorsal shoulders with acuminate laterals, paired and long bifid setae on dorso-lateral glans. Ventral arms slender and elongated, reaching the distal part of glans. Tips pointed and without apical modification. Stylus with apically sharp-pointed spine curved in "S" with distal third directed to penial base (Fig. 6G–H).

Description of males (holotype). Measurements: body length: 3.76; prosoma length: 1.08; prosoma width: 2.44; chelicerae: segment I length: 1.56, segment II: 3.36.

Coloration (Figs 4A–C). Dorsum coloration a variety or shades of chestnut with several pearl-like, white, large spots and stripes covering most of the lateral third of the body and small maculations spread on the carapace. Carapace with shades of chestnut, median third of dorsal scutum beige, ocularium pearl-like white with a darkish contour line (ring) surrounding eyes, basal segment of chelicerae beige, other segments with brown shades of chestnut, legs beige with cylindrical-like darker areas on subbasal and subdistal femora, patella, and tibia, trochanters with lateral chestnuts maculations. Pedipalps, ventral trochanter, femora, patella and tibia with chestnuts maculations. Coxae and genital operculum beige with darker chestnuts maculations. Free tergites varying from chestnuts and brownish with median pearl-like white spots, anal operculum pearl like white. Ventral color mostly beige. Only free sternites are chestnuts with white luminous rounded maculations.

Body and appendices (Figs 1E–F; 4A–C). Ocularium with eleven small setae distributed dorsally. Small setae spread on dorsal and ventral surface, genital operculum, coxae, pedipalps and chelicerae. Pedipalpal claws with 19 teeth that increase in size towards tip of claw. Pedipalp tuft with setae on the inner face of the femora, a line of setae surrounding the contour of the patella. Patella and tibia with a dorsal and a lateral line lacking setae (Figs 1E; 4C). Chelicerae massive, second segment very inflated and covered with setae, in some specimens only on dorsal surface. Each finger with one basal very large tooth followed by many smaller teeth. Tibia of legs II with three apical pseudo-articulations in one specimen.

Penis (Fig. 5J–L). Posterior with posterior portion of glans three times larger than the anterior, base concave, shoulders with acuminate laterals forming spines, a pair of long, bifid setae on dorso-lateral glans. Ventral arms slender and elongated reaching the distal part of glans, each branch simple and pointed, without apical ornamentation. Stylus with apical spine curved in "S" with distal third directed towards the penial base (Fig. 6G–H).

Biotope. The three specimens were collected at "Brejo da Lapa" (about 22°21'S, 44°42'W) at altitudes of 2200 and 2400 m.a.s.l. in Parque Nacional do Itatiaia, State of Minas Gerais, Brazil. The vegetation is Montane Atlantic Rain Forest, which occurs from 1,100 up to 2,700 m.a.s.l (Santos 2000). The trees are shorter and the average temperature is lower than at the base of the mountain. The high-altitude forests are very humid and are frequently covered in dense mists.

Thrasychiroides brasilicus Soares & Soares, 1947a

(Figs 5A–C; 6A–B)

Diagnosis. Ocularium with 20 small setae, with white patch between eyes (according to Soares & Soares 1947a). Chelicera massive, second segment inflated and covered with setae except in lateral surface, movable finger with median large tooth followed by 13 small teeth, fixed finger with 12 small teeth on distal half. Pedipalpal claws with 14 teeth. Penis with posterior portion of glans two times larger than the anterior part, base concave, shoulders slightly narrower than the arms area, with angular laterals not bearing spines (Fig. 5B–C). Inflated glans with a pair of dorso-lateral setae with acuminate tips (Fig. 5A). Ventral arms long and slightly S-shaped, with swollen and knob-like tips. Distal end of stylus with hook-like spine, mostly covered by a membranous sac (Fig. 6A–B).

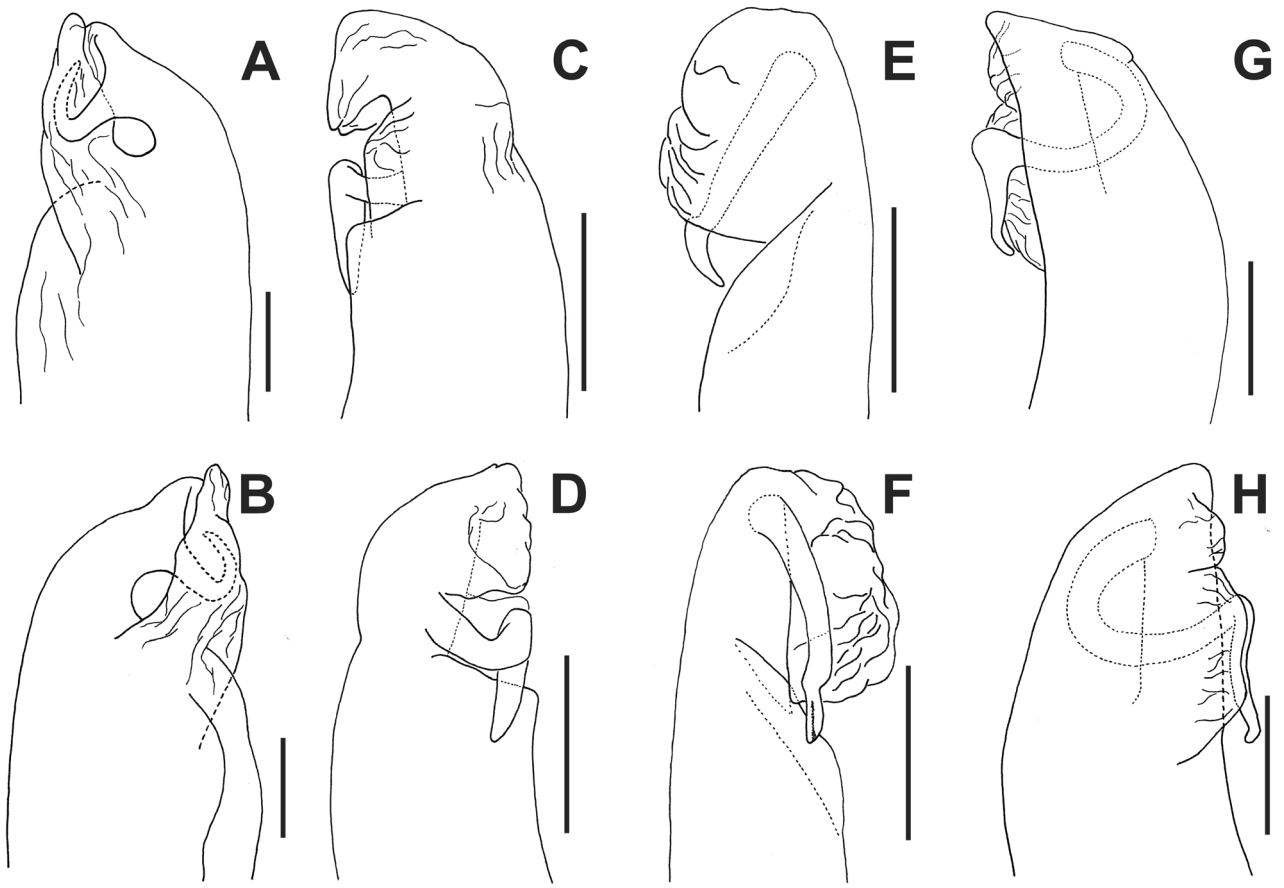

FIGURE 6. Tips of penial glans of the holotypes of *Thrasychiroides* species. A–B. *T. brasilicus.*. C–D. *T. moporanga* **sp. nov.** E–F. *T. toryba* **sp. nov.** G–H. *T. ybytyra* **sp. nov.** Upper row: ventral view; Bottom row: dorsal view. Scale bars = 0.05 mm.

Material examined: Holotype: ♂ from Banhado (25º27'S, 48º59'W), 858 m.a.s.l. at train station, since exact type locality is unknown, close by hills are about 300 m.a.s.l higher, Piraquara, State of Paraná, Brasil, XI.1945, C.N. Gofferjé leg. (MZSP 36153).

Cladistic analysis

Taylor (2011) conducted a cladistic analysis of the family Neopilionidae using most of the Australasian species, *Neopilio australis* Lawrence, 1931 from South Africa and one unnamed *Thrasychirus*. The South American genus *Thrasychiroides* was not included due to unavailability of its type species (*T. brasilicus*), which lacked both description and drawings of the male genitalia. We performed an analysis using the same parameters and matrix for non-South American taxa as described in Taylor (2011). We checked and completed characters for *Thrasychirus gulosus,* and included all four *Thrasychiroides* species herewith available. The analysis resulted in two equally parsimonious trees (length= 336; consistence index = 0.28; retention index = 0.67). The internal relationships here obtained (Fig. 8) are the same as Taylor (2011), except for the sister relationship of the South American genera *Thrasychirus* with *Thrasychiroides*, which were not evaluated in that study.

Taylor (2011) suggested that the single paired bristles on the penis of *Thrasychirus* could be derived via reduction from the bristle groups of other Enantiobuninae. We observed this feature in the type species of the genus *Thrasychiroides* and the three new species here described, as well as in *Thrasychirus gulosus* (Fig. 7), and we consider it a putative synapomorphy of these two genera.

Most of the autapomorphic characters of *Thrasychirus* presented in Taylor´s analysis are in fact synapomorphies of both South American genera, such as the following: short penial tendon; bristle groups as

lateral process of penis lacking; ventral face of glans without a central concavity; two seminal receptacles; ornamented microsculpture anterior to spiracle; and microtrichia of pedipalps present along full length of tarsus. An additional feature that supports the sister relationships of both genera is the absence of an angular ventral junction between shaft and glans, not coded by Taylor (2011), and the presence of spines or projections on apex of prolateral region of cheliceral segment II.

Thrasychirus is characterized by the presence of plumose setae on the pedipalp and pseudo-articulations in the femur II. We note that only *T. gulosus* was included and the other two species of the genus, *T. dentichelis* Simon, 1884 and *T. modestus* Simon, 1902, should be analyzed to test these putative synapomorphies.

The pair of projections on the shaft of the penis is herein termed "arms", and we suggest it as a synapomorphy of the genus *Thrasychiroides*. The somatic morphology in all the four Brazilian species of this genus is highly conserved and species are similar in shape and color patterns. However, the variable morphology of the penis, especially the movable arms, seems to be very important for *Thrasychiroides* species recognition, since differences on morphology may indicate that the species are reproductively isolated and are therefore biological species.

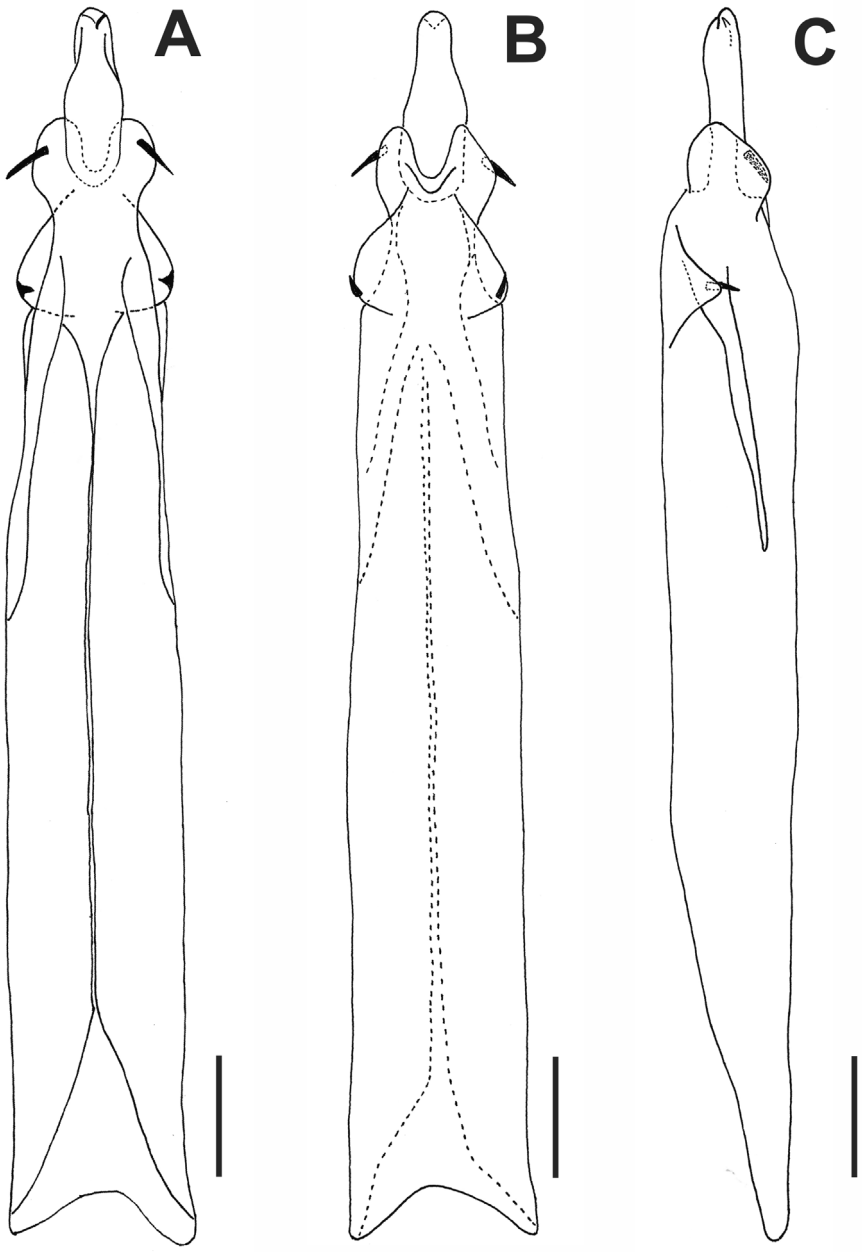

FIGURE 7. Penis of the holotype of *Thrasychirus gulosus* (MZSP 56030) A. dorsal view; B. ventral view. C. lateral view. Scale bars = 0.1 mm.

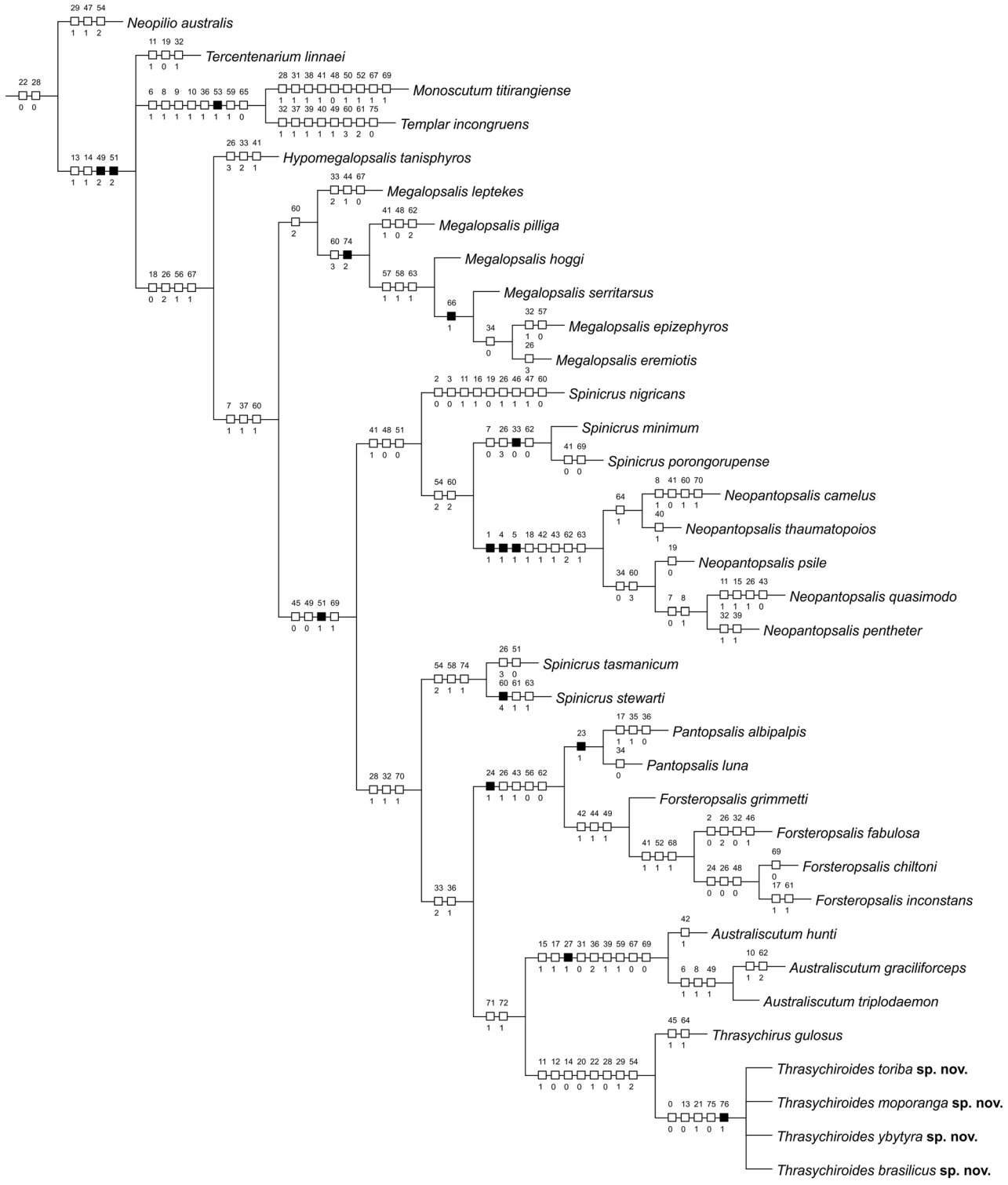

FIGURE 8. Strict consensus cladogram (338 steps, consistence index 0.28, retention index 0.64) showing the relationships among Enantiobuninae genera. For character description see Taylor (2011). For characters changed or added for *Thrasychirus gulosus, Thrasychiroides brasilicus* and the three new species of *Thrasychiroides* see Appendix 1.

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APPENDIX 1

Character codings of *Thrasychiroides* species and *Thrasychirus gulosus* for cladistic analysis (characters and codes are described in Taylor 2011).

	0										10									20
Thrasychirus gulosus	1	0	1	1	0	0	0	1	0	0	0	1	0	1	0	0	-	0	1	1	0
Thrasychiroides toryba	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	-	0	1	1	0
Thrasychiroides moporanga	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	-	0	1	1	0
Thrasychiroides ybytyra	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	-	0	1	1	0
Thrasychiroides brasilicus	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	-	0	1	1	-

continued.

	21									30										40
Thrasychirus gulosus	0	1	0	0	?	?	0	0	1	0	3	1	2	0	0	1	1	1	0	1
Thrasychiroides toryba	1	1	0	0	?	?	0	0	1	0	3	1	2	0	0	1	1	1	0	1
Thrasychiroides moporanga	1	1	0	0	?	?	0	?	1	0	3	1	2	0	0	1	1	1	0	1
Thrasychiroides ybytyra	1	1	0	0	?	?	0	?	1	0	3	1	2	0	0	1	1	1	0	1
Thrasychiroides brasilicus	1	1	0	0	?	?	0	?	1	0	3	1	2	0	0	1	1	1	0	1

continued.

	41									50										60
Thrasychirus gulosus	0	0	0	0	1	0	0	1	0	-	1	0	0	2	1	1	0	0	0	0
Thrasychiroides toryba	0	0	0	0	0	0	0	1	0	-	1	0	0	2	1	1	0	0	0	0
Thrasychiroides moporanga	0	0	0	0	0	0	0	1	0	-	-	-	0	2	1	1	0	0	-	-
Thrasychiroides ybytyra	0	0	0	0	0	0	0	1	0	-	-	-	0	2	1	1	0	0	0	0
Thrasychiroides brasilicus	0	0	0	0	0	0	0	1	0	-	-	-	0	2	1	1	0	0	0	0

continued.

	61										70						76
Thrasychirus gulosus	0	-	0	1	1	0	1	0	1	1	1	1	0	0	1	0	
Thrasychiroides toryba	0	-	0	-	1	0	-	0	1	1	1	1	0	0	0	1	
Thrasychiroides moporanga	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	1	
Thrasychiroides ybytyra	-	-	0	0	1	0	1	0	1	1	1	1	0	0	0	1	
Thrasychiroides brasilicus	-	-	0	0	1	0	-	0	1	1	1	1	0	0	0	1	