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Taxonomic notes on the genus *Auranus* (Opiliones, Laniatores, Stygnidae), with description of two new species

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Abstract

Among the Amazonian families of harvestmen the members of Stygnidae are better known due to the recent revision of the family and efforts of specialists describing new taxa in the last few years. Species of Amazonian genus *Auranus* Mello-Leitão, 1941, have been collected in several inventories that were carried out in different locations of the Amazon basin. In this paper we provide a new diagnosis for *Auranus*, and the description of two new species: *Auranus leonidas* **sp. nov.** and *Auranus xerxes* **sp. nov.** from the Brazilian states of Roraima and Amazonas, respectively. We also offer complementary genital descriptions of *Auranus hehu* Pinto-da-Rocha & Tourinho 2012, *Auranus parvus* Mello-Leitão, 1941, and *Auranus tepui* Pinto-da-Rocha & Tourinho 2012. Five species are recognized in *Auranus*, including the two new species described in this paper. The lamina parva modified into a calyx is proposed as putative synapomorphy for the genus *Auranus*. Therefore, *A. hoeferscovitorum,* which does not possess this character, is removed from *Auranus.* Instead we propose for it the new combination *Verrucastygnus hoeferscovitorum* **comb. nov.** We also provide a key to the males of *Auranus,* and a map with the distribution for all species examined in this work.

Key words: Amazon basin, Gonyleptoidea, harvestmen, Neotropics, taxonomy

Introduction

Among all of the Neotropical Laniatores, Stygnidae Simon, 1879 is one of the best known families, with 28 genera and 104 species described, and three cladistic analyses published based on morphological data (Pinto-da-Rocha 1997; Pinto-da-Rocha & Villarreal 2009; Bragagnolo 2013). Consequently, during recent years the rate of descriptions of new Stygnidae species has been higher than in some other families with poorly known taxonomy. Stygnidae is distributed in Bolivia, Brazil, Colombia, Ecuador, French Guiana, Suriname, and Venezuela. It also has species occurring on some Caribbean islands, such as Dominica, Guadeloupe, and Trinidad & Tobago (Pinto-da-Rocha 1997; Kury 2003). Currently, the family is divided into two subfamilies: Heterostygninae, with 32 species distributed in northern South America, and Stygninae, with 19 genera and 72 described species distributed in the Andean and the Amazonian regions, being the largest group within Stygnidae.

Several genera of Stygnidae have species in the Amazon basin and/or other biomes (*e.g. Protimesius* and *Stygnus*), while others have been found only in the Amazon basin. This is the case with *Auranus* Mello-Leitão, 1941, a group of tiny leaf-litter dwellers distributed across the Brazilian states of Amazonas, Pará, and Roraima (Pinto-da-Rocha 1997; Pinto-da-Rocha & Tourinho 2012). The phylogenetic relationships within Stygnidae are still unclear. Although, in the particular case of *Auranus*, the group changed position within the subfamily Stygninae but always showing relationship to *Verrucastygnus* Pinto-da-Rocha, 1997 and *Stenostygnoide*s Roewer, 1913 (Pinto-da-Rocha 1997; Pinto-da-Rocha & Villarreal 2009; Bragagnolo 2013). More recently, it was suggested that *Auranus* could be more closely related to the monotypic genus *Jabbastygnus* Kury & Villarreal, 2015 than to any other group (Kury & Villarreal 2015). The current definition of *Auranus* is outdated and is based on a

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"pedipalpal femur very long and thin, distal setae of ventral plate shorter than ventral plate, and glans dorsal process lost secondarily" (Pinto-da-Rocha 1997, node 41). Another synapomorphy mentioned in the literature is the thin lamina parva, which also occurs as a convergence in Heterostygninae (Pinto-da-Rocha 1997).

In this paper we propose two new species of *Auranus* from the states of Amazonas and Roraima, and a new diagnosis for the genus. We also move *Auranus hoeferscovitorum* Pinto-da-Rocha, 1997 to *Verrucastygnus* Pinto-da-Rocha, 1997; this action is based on the genital characters of this species. We also discuss the genital characters in *Auranus*, and offer new data on the distribution of *Auranus parvus* Mello-Leitão, 1941, and *Verrucastygnus hoeferscovitorum* **comb. nov.**. In addition, we provide pictures and a key to males of *Auranus*, and a map of their distribution.

Methods

Repositories and taxonomy. The material is deposited in the collection of the Instituto Nacional de Pesquisas da Amazonia (INPA). Terminology for external morphology follows Acosta *et al*. (2007). Genital chaetotaxy and terminology follows Kury & Villarreal (2015). Male genitalia were cleared in hot lactic acid for 3–10 minutes (depending on the condition of each specimen) and mounted in glycerin. Drawings were made using a camera lucida attached to a Leica M80 stereoscope (external morphology) and a Leica DM500 compound microscope (genital morphology). Pictures and measurements were taken with an automated stereomicroscope Leica M205C system, a DFC295 Leica camera, and dedicated software Leica Application Suite version 4.0.0 (build 877) (Leica 2003–2011) at INPA. Measurements are given in mm, and acronyms follow mostly Pinto-da-Rocha & Tourinho (2012): DSL = dorsal scutum length; PL = prosomal length; DSW = dorsal scutum maximal width; PW = maximum prosomal width; ID = interocular distance; MH: maximum height; GOL: genital operculum length; GOW: genital operculum width. The map was generated using QGIS 2.8.2 (Quantum GIS Development Team 2015).

Systematics

Family Stygnidae Simon, 1879

Auranus Mello-Leitão, 1941

Auranus Mello-Leitão, 1941: 441; Pinto-da-Rocha 1995: 196; Pinto-da-Rocha 1997: 263; Kury 2003: 228; Kury & Villarreal 2015: 12, 29, 30, 32, 40. (Type species *Auranus parvus* Mello-Leitão, 1941, by original designation, examined).

Emended diagnosis. External morphology: Dorsal scutum rectangular. Prosoma slightly tuberculate, sometimes with an anterior hump. Eye mounds smooth. Area I divided by a median groove; I–II with small tubercles; III with two spines (just one spine in *Auranus xerxes* **sp. nov.**). Pedipalpal femur large; basal socket apex of tibia normal. Without tarsal process or scopula. Penis: Ventral plate present as a thin lamina parva, apically shaped as a calyx (Figs 2A–D, 5A–C) and with two lateral flat projections directed ventrally (Figs 2B, 5B–C). Truncus large and cylindrical, swollen distally, malleus surrounding completely the basis of the lamina parva. Chaetotaxy: MS A1–A3 flat and bifid, placed laterally on malleus; B ventrally on malleus, usually following the same row as MS A; MS C small, cylindrical and sharp, laterally on lamina parva; MS D reduced only to D1, dorsally on lamina parva; MS E1 close and similar in size and shape to MS C, E2 absent or when present, very large and located ventrally on malleus. Glans without dorsal process (one exception occurs in *Auranus xerxes* **sp. nov.**).

Species included. *Auranus hehu* Pinto-da-Rocha & Tourinho, 2012, *Auranus leonidas* **sp. nov.**, *Auranus parvus* Mello-Leitão, 1941 (type species), *Auranus tepui* Pinto-da-Rocha & Tourinho, 2012 and *Auranus xerxes* **sp. nov.**

***Auranus hehu* Pinto-da-Rocha & Tourinho, 2012**
(Figs 6A, 7A, 8)

Auranus hehu Pinto-da-Rocha & Tourinho, 2012: 11, figs 5A–E, 13D–F; Kury & Villarreal 2015: 4, 6, 18, 30, figs 4A–C. (Type INPA OP-0983, male holotype).

Complementary description. *Penis.* Reinterpretation of the chaetotaxy: MS A–B bifid, A1–A3 is inserted dorsolaterally, while B is inserted almost ventrally, following the row of MS A. MS C: three small cylindrical and sharp setae on lateral edge of lamina parva. MS D: one pair of cylindrical and sharp setae inserted basally on laterals of lamina parva. MS E: E1 cylindrical and sharp, grouped with MS C, E2 bifid, inserted ventrally in the malleus. Illustrations of the genital chaetotaxy of this species are available in Kury & Villarreal (2015).

Distribution (Fig. 8): Brazil: Amazonas: Tapirapecó Mountain (type locality).

Material examined: male holotype (INPA-OP 0983), Amazonas, Barcelos, Tapirapecó, 180 m.a.s.l; Leg. A. Nogueira; 29.ix.2006 (photo voucher).

***Auranus leonidas* sp. nov.**
(Figs 1A–F, 2A–D, 6B, 7B)

Type material: *Holotype*: male (INPA-OP 003027) from (-0.99539 S, -62.15904W), Tatocuara, Comunidade Caicubí, Rio Jufari, Municipio de Caracaraí, Arquipélago de Mariuí e Baixo Rio Branco, Médio Rio Negro, Roraima Brasil; Leg. G. Giribet *et al.*; v.2012 (photo voucher). *Paratypes:* 1 female (INPA-OPI 003428) same data as holotype. 1male and 1 female (INPA-OPI 003430) same data as holotype. 1 male (dissected) and 3 females (INPA-OPI 003429) same data as holotype. 2 females (INPA-OP 3084), Caracaraí, Rio Jufari, Arquipiélago Mariuá-Jauaperi (01˚00´32.04" S, 62˚07´10.56" W), Roraima, Brasil; Leg. A. Tourinho *et al.*; 26.v.2012; leaf-litter.

Etymology: Noun in apposition, named after Leonidas I, king of the Greek state of Sparta, who died fighting against Xerxes I in the Thermopylae battle. He was also characterized as the defender hero in the recent Hollywood movie "300".

Diagnosis: Easily distinguishable from *A. parvus* and *A. tepui* by having two dorsoapical tubercles on femur IV. Distinguishable from *A. hehu* by having tibia IV with only one row of large tubercles. Different from *A. parvus* by absence of rows of granules on lateral margins of the dorsal scutum.

Male description (holotype): Measurements: DSL: 2.5; PL: 1.8; DSW: 1.5; PW: 1.4; ID: 0.9; MH: 1.2; GOL: 0.5; GOW: 0.3.

Dorsum (Figs 1A–B): Dorsal scutum rectangular. Prosoma: anterior margin smooth; anterior hump very low in lateral view, with two anterior paramedian tubercles and 3–4 small tubercles on each side. Opisthosoma: area I divided, with two tubercles each side; area II slightly divided, with two tubercles each side; area III with one pair of paramedian high spines, with one distal tubercle, and one posterior row of four tubercles. Posterior margin with one row of six tubercles. Free tergite I with five tubercles, II with four, and III with three. Anal plate with one pair of paramedian conspicuous tubercles.

Venter: Coxa I with two anterior tubercles and one median row of four tubercles; II–IV with sparse small tubercles. Posterior margin and free sternites with one row of minute setiferous tubercles.

Chelicerae: Segment I with well defined bulla, with two tubercles; II swollen and covered with setae distally, finger with two sub-distal small teeth; III with one basal tooth and three sub-distal small teeth.

Pedipalps (Figs 1C–D): Coxa with one dorsal mesal tubercle and one conspicuous tubercle. Trochanter with one dorsal and one ventral small tubercle. Femur thin and smooth, distal half slightly wider. Patella smooth, swollen distally. Tibia: ectal IiiIi, mesal IiiIi. Tarsus: ectal IiiIii, mesal IiIiIi.

Legs (Figs 1E–F): Coxae I, II, and III with two dorsal tubercles; IV with two sub-distal tubercles and some lateral granules. Trochanter I dorsally smooth, with one ventral tubercle; II with one dorsal and two small ventral tubercles; III dorsally smooth, with two small ventral tubercles; IV with one dorsal apical tubercle and two ventral tubercles. Femora I–II dorsally smooth, with two rows of small tubercles in the proximal half; III with two rows of ventral tubercles larger than I–II; IV with one retrolateral and two ventral rows of large tubercles, growing in size distally. Patella I–II smooth; III granulated; IV tuberculated, with three dorsoapical tubercles (Fig. 1E). Tibiae I–II smooth; III with one ventral row of minute tubercles; IV with three rows of tubercles: one prolateral, one retrolateral and one ventral (Figs 1E–F). Tarsal formula 6(3)/9(3)/6/7.

Penis (Figs 2A–D). Calyx with a dorsoapical central hollow and two lateral flat processes directed ventrally. Malleus projected laterally and dorsally. Chaetotaxy: MS A–B bifid: A1–A2 inserted on lateral projections of malleus, A3 inserted lateroventrally on malleus, B1 inserted ventrally on malleus. MS C: three pairs, cylindrical, curved and sharp, forming an oblique row on sides of calyx. MS D: one small pair, placed basally on lamina parva, hidden by expansion of malleus (Fig. 2D). E: reduced to one pair (E1), sharp and curved, placed ventrally, ending row formed by MS C. Glans membranous and compressed dorsoventrally, stylus long, without dorsal process.

Color (Figs 6B, 7B). Lateral portions of prosoma and sulci light ochre, with two central regions of dark reticle. Scutal areas, lateral margins and legs dark brown, except trochanter, which is lighter. Chelicerae lighter than dorsal scutum. Femora with 1–2 subdistal clear rings on darker background.

Female description (paratype INPA-OP 003430): Measurements: DSL: 2.5; PL: 0.9; DSW: 1.5; PW: 1.3; ID: 0.7; MH: 1.6; GOL: 0.5; GOW: 0.3. Chelicerae smaller than male. Femur and tibia IV with two rows of ventral minute tubercles instead of large tubercles. Tarsal formula: 6(3)/11(3)/6/7.

Distribution (Fig. 8): only known from type locality.

Other material examined: 3 females (INPA-OP 3080), Caracaraí, Rio Jufari, Arquipiélago Mariuá-Jauaperi (01˚01´7.38" S, 62˚05´2.33" W), Roraima, Brasil; Leg. G. Giribet *et al.*; 29.v.2012; active nocturnal searching. 1 male and 1 female (INPA-OPI 003431) same data as holotype. 2 females (INPA-OPI 003432) same data as holotype.

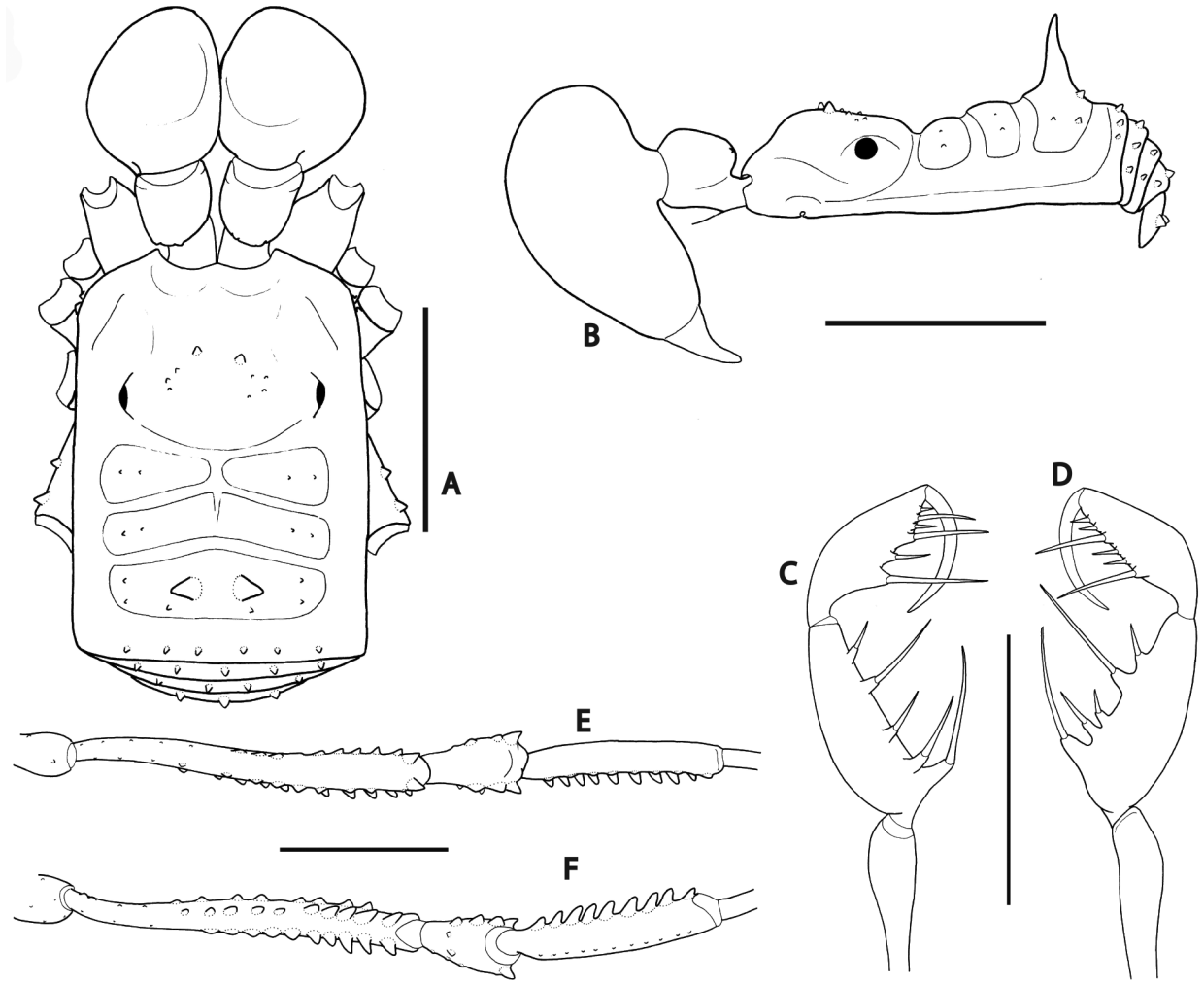

FIGURE 1. *Auranus leonidas* **sp. nov.** (male holotype INPA-OPI 003027): A, habitus, dorsal view; B, same, lateral view; C, left pedipalp, ectal view; D, left pedipalp, mesal view; E, right leg IV, dorsal view; F, right leg IV, ventral view.

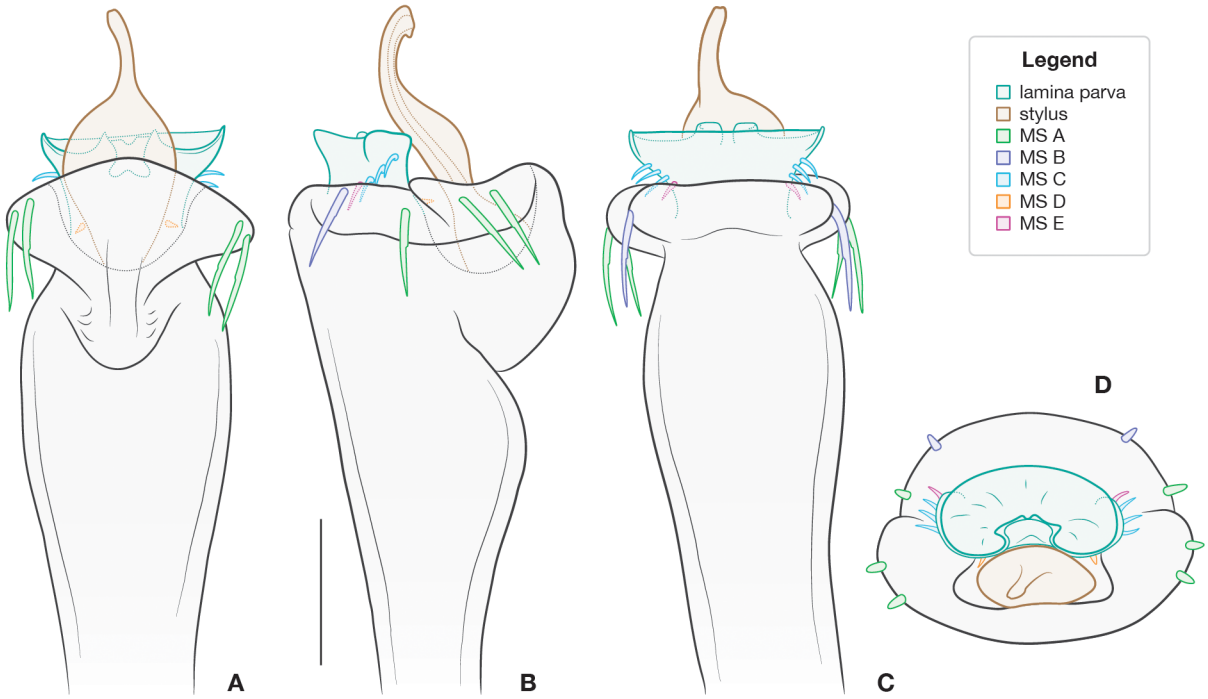

FIGURE 2. *Auranus leonidas* **sp. nov.** (male paratype INPA-OPI 003429) Penis: A, dorsal view; B, lateral view; C, ventral view; D, apical view.

Auranus parvus Mello-Leitão, 1941
(Figs 6C, 7C)

Auranus parvus Mello-Leitão, 1941: 441; B. Soares 1945: 386; Pinto-da-Rocha 1997: 264, figs 317–324, 529–530, 589, 593, 601; Kury 2003: 228; Kury & Villarreal 2015: 30. (Type MNRJ 177, female holotype, not examined).
Stygnidius inflatus [misidentification]: Friebe & Adis 1983: 103; Adis 1992: 40.

Complementary description. *Penis:* Chaetotaxy: MS A–B bifid: A1–A2 inserted on lateral projections of malleus, A3 inserted lateroventrally on malleus, B1 absent in some specimens, but when present, is inserted ventrally on malleus. MS C: three pairs, cylindrical, curved and sharp, forming an oblique row on sides of calyx. MS D: one small pair, placed basally on lamina parva, hidden under malleus. E: reduced to one pair (E1), sharp and curved, placed ventrally, ending row formed by MS C. Lamina parva, with two lateral flat processes folded ventrally, as in *A. leonidas* **sp. nov.**

Variation: dorsal scutum: one tubercle on each side of anterior margin of prosoma.

Distribution (Fig. 8): Brazil: Amazonas: Reserva Ducke; Tarumã Mirim; Fazenda UFAM, **New record**; Balbina, Presidente Figueiredo, **New record**. Careiro da Várzea, **New record.** Pará: Floresta Nacional Caxiuana.

Material examined: 1 male (INPA-OP 2916), Amazonas, Manaus, Reserva Ducke, LO7-2500m, 2°58'39.21" S, 59°56'19.75" W; Leg. Saturnino; 03.viii.2008; nocturnal searching (photo voucher). 1 female (INPA-OP 1803), Amazonas, Manaus, Fazenda experimental UFAM, N6-1500; Leg. L. Lança; 28.viii.2010; nocturnal searching. 1 female (INPA-OPI 003426), Brazil, Amazonas, Presidente Figueiredo, Hidrelétrica de Balbina (Ilha Palhal 2, 01°47′24.4” S, 59°26′55.7”W); Leg. A. Tourinho; 19.vii.2006; nocturnal searching. 1 male (INPA-OPI 003424), Amazonas, Manaus, Tarumã Mirim; Leg. J. Adis; 06.xi.1977. 1 male (INPA-OPI 003425), Brazil, Amazonas, Careiro da Várzea; Leg. J. Adis; 09.iii.1987; Kempson extractor.

Auranus tepui Pinto-da-Rocha & Tourinho, 2012
(Figs 6D, 7D)

Auranus tepui Pinto-da-Rocha & Tourinho, 2012: 12, figs 6A–F, 14A–C. (Type INPA OP-1032, male holotype, examined).

Complementary description. *Penis.* Reinterpretation of the chaetotaxy (Pinto-da-Rocha and Tourinho 2012, figs 14 A–C): MS A: A1–A3 inserted lateroventrally on malleus; MS B: one pair inserted ventrally on malleus. MS C: three pairs, cylindrical and sharp, forming a group placed laterally on calyx. MS D: one pair, cylindrical and sharp. MS E: asymmetric, E1 sharp and placed ventrally, forming a group with MS C, and E2 large, placed ventroapically on malleus, as in *A. hehu*.

Distribution (Fig. 8): Brazil: Amazonas: Barcelos, Pico da Neblina (type locality).

Material examined: male holotype (INPA-OP 1032), Amazonas, São Gabriel da Cachoeira, Bebedouro Velho, Pico da Neblina, 400 m.a.s.l.; Leg. D. Candiani; 13.x.2007 (photo voucher).

***Auranus xerxes* sp. nov.**
(Figs 3A–D, 4A–C, 6E, 7E)

Type material: *Holotype*: male (INPA-OP 3412) from Reserva Biológica Uatumã, LO5-3500, (59˚14'34.23"S, 1˚49'05.55" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino.; 24.X.2008; nocturnal searching (photo voucher). *Paratypes:* (INPA-OP 3409) from Reserva Biológica Uatumã, LO4-1500, (59˚15'37.22" S, 1˚48'29.70" W), Reserva Biológica Uatumã, Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 24.X.2008; nocturnal searching. 1 male and 1 female (INPA-OP 3410), Reserva Biológica Uatumã, LO2-500 (59˚16'09.91" S, 1˚47'24.27" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 18.X.2008; nocturnal searching. 1 female (INPA-OP 3405), Reserva Biológica Uatumã, LO5-2500 (59˚15'05.28" S, 1˚49'04.84" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; x.2008; nocturnal searching. 1 female (INPA-OP 3407), Reserva Biológica Uatumã, LO1-2500 (59˚15'05.34" S, 1˚46'51.33" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 23.x.2008; nocturnal searching. 1 male and 1 female (INPA-OP 3402), Reserva Biológica Uatumã, LO5-3500 (59˚14'34.23" S, 1˚49'05.55" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 24.X.2008; nocturnal searching. 1 female (INPA-OP 3408), Reserva Biológica Uatumã, LO4-3500 (59˚14'31.73" S, 1˚48'30.21" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 25x.2008; nocturnal searching. 2 females (INPA-OP 3406), Reserva Biológica Uatumã, LO4-2500 (59˚15'05.79" S, 1˚48'30.17" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 02.x.2008; nocturnal searching. 1 male and 1 female (INPA-OP 3404), Reserva Biológica Uatumã, LO2-2500 (59˚16'10.81" S, 1˚48'29.25" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 22.x.2008; nocturnal searching. 3 females (INPA-OP 3403), Reserva Biológica Uatumã, LO2-2500 (59˚15'04.74" S, 1˚47'25.97" W), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 23.x.2008; nocturnal searching. 1male and 1 female (MNRJ 9100), Hidrelétrica de Balbina, Ilha Cachoeira (59˚22'02.3" W, 1˚51'44.3" S), Presidente Figueiredo, Amazonas, Brasil; Leg. R. Saturnino; 15.vii.2006; nocturnal searching.

Etymology: Noun in apposition, named after Xerxes I, who was the fifth great king of the Achaemenid (Persian) Empire from 486–465 BCE. He was also characterized as the villain of the recent Hollywood movie "300".

Diagnosis: Easily distinguishable from all other *Auranus* by having only one spine on mesotergal area III (Figs 3A, 6E, 7E). Also the only known species of *Auranus* with dorsal process on stylus (Figs 4A–B).

Male description (holotype): Measurements: DSL: 2.79; PL: 1.16; DSW: 2.19; PW: 1.98; ID: 1.39; MH: 2.07; GOL: 0.23; GOW: 0.28.

Dorsum (Figs 3A–B, 6E, 7E): Dorsal scutum rectangular. Prosoma: with anterior margin smooth; anterior hump with sparse tubercles, with two rows of tubercles on each side towards anterior margin; sparse minute tubercles in interocular space; lateral margins with one row of tubercles. Opisthosoma: area I divided, with two tubercles on each side; area II with 4–6 tubercles on each side; area III with one conical spine, with one tubercle in front and three tubercles on each side, with one posterior row of seven tubercles. Posterior margin with eight tubercles. Free tergites I–III with one row of tubercles. Anal operculum tuberculated.

Venter: Coxa I with two rows of four small tubercles; II–IV with sparse small tubercles. Posterior margin with one row of tubercles. Free sternites and anal operculum tuberculate.

Chelicerae: Segment I with well-defined bulla, with three proximal tubercles, and one mesal and one ectal small tubercle; II swollen and smooth, with three distal teeth; III with a larger proximal tooth and three small distal teeth.

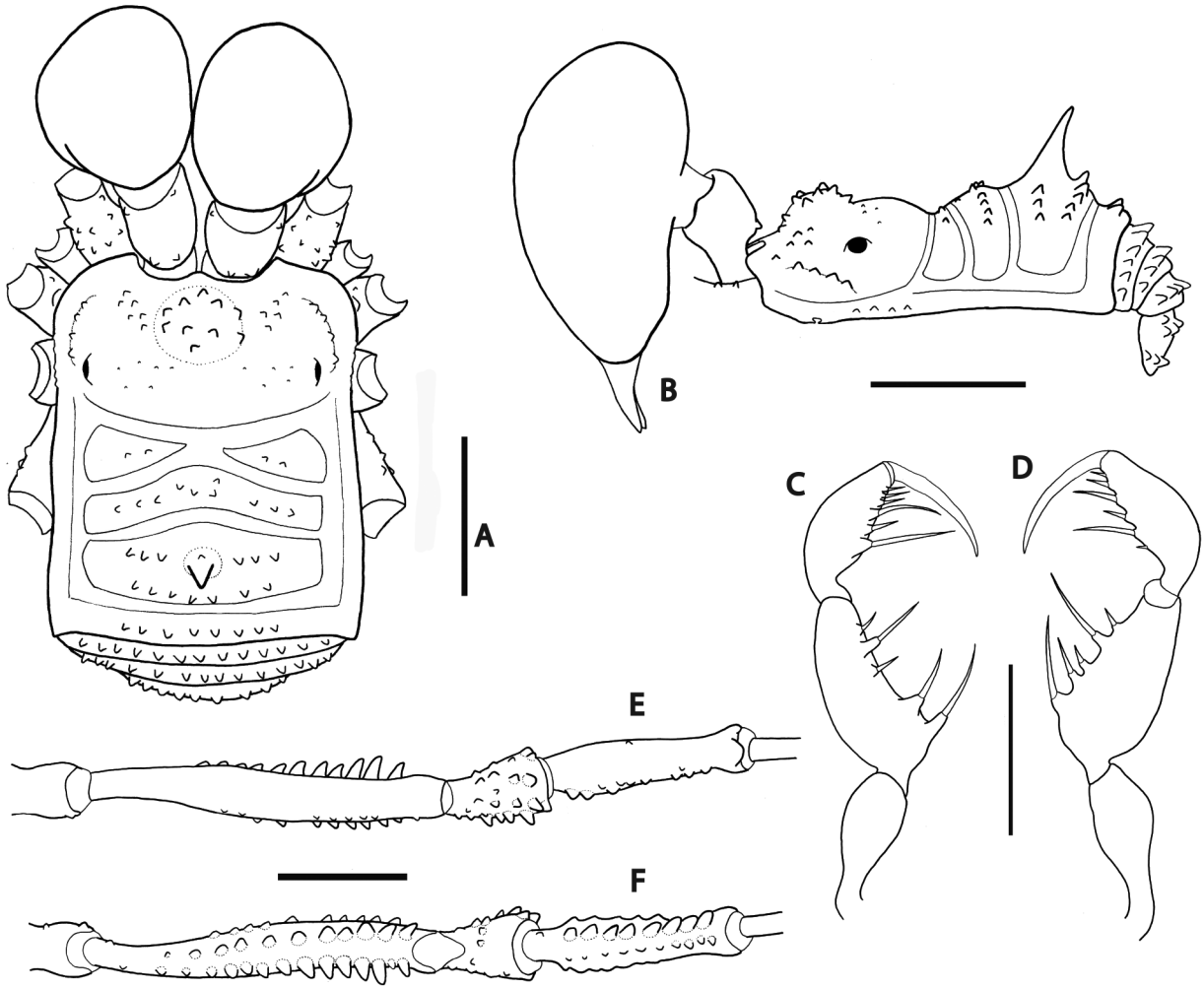

FIGURE 3. *Auranus xerxes* **sp. nov.** (male holotype INPA-OP 3412): A, habitus, dorsal view; B, same, lateral view; C, left pedipalp, ectal view; D, left pedipalp, mesal view; E, right leg IV, dorsal view; F, right leg IV, ventral view.

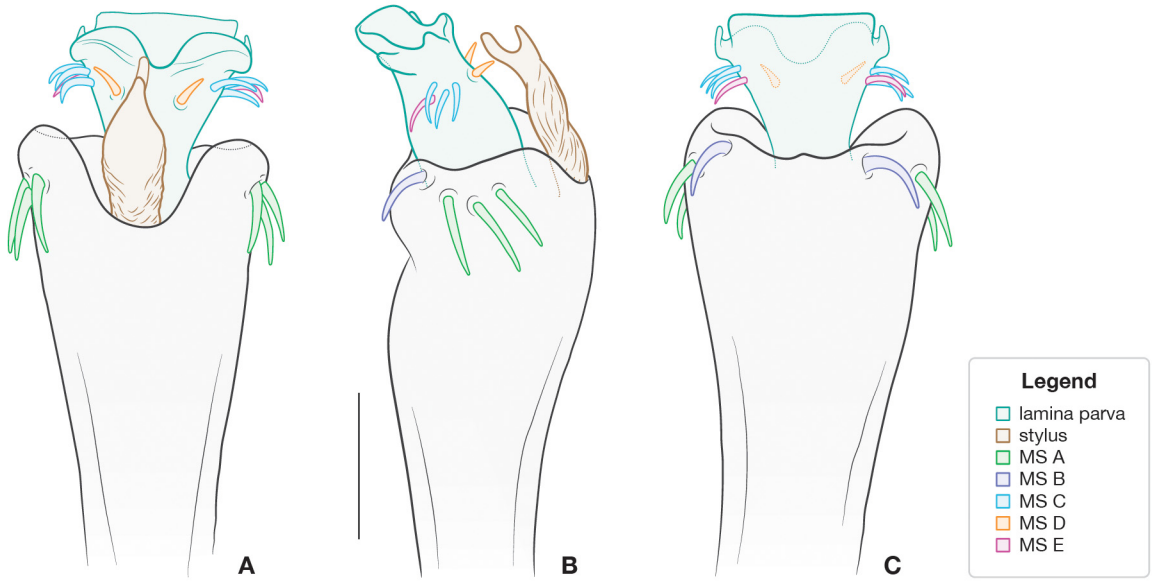

FIGURE 4. *Auranus xerxes* **sp. nov.** (male paratype INPA-OP 3402) Penis: A, dorsal view; B, lateral view; C, ventral view.

Pedipalps (Figs 3C–D): Coxa covered dorsally with 8–11 tubercles, with a ventral tubercle. Trochanter with one dorsal and one ventral tubercle. Femur slightly swollen distally, smooth dorsally, and with one ventral row of five small tubercles. Patella smooth, swollen distally. Tibia: ectal IiiIi, mesal IIiIi. Tarsus: ectal IiIii, mesal IiIiii.

Legs (Figs 3E–F): Coxa I–III smooth dorsally, IV tuberculated. Trochanter I smooth dorsally, with three ventral tubercles; II with one dorsal tubercle and four ventral tubercles; III with three dorsal and three ventral tubercles; IV with one dorsal tubercle and five ventral tubercles. Femur I smooth dorsally, with two rows of ventral tubercles; II smooth dorsally, with two rows of ventral tubercles; III with sparse dorsal tubercles and two rows of ventral tubercles increasing in size distally; IV smooth dorsally, with one retrolateral and two ventral rows of tubercles increasing in size distally. Patella I–II smooth; III with sparse tubercles; IV strongly tuberculated. Tibia I–II smooth; III with a row of tubercles; IV with some dorsal tubercles, and two rows of ventral tubercles: one row of small and a row of large. Tarsal formula 7(3)/12(3)/7/7.

Penis (Figs 4A–C). Calyx with a dorsoapical cleft and two lateral flat processes directed ventrally. Malleus slightly swollen, with a dorsal cleft, without projections. Chaetotaxy: MS A: A1–A2 inserted laterally on malleus, A3 inserted lateroventrally on malleus; MS B: one pair inserted ventrally on malleus. MS C: three pairs, cylindrical, curved and sharp, forming group placed laterally on calyx. MS D: one well developed pair, cylindrical and sharp, placed dorsal and sub-distally, almost at same height as group C. MS E: reduced to one pair (E1), sharp and curved and placed ventrally, forming group with MS C. Glans membranous, stylus short and with dorsal process.

Color (Figs 6E, 7E): Lateral portions of prosoma and sulci light brown. Eye mounds, scutal areas, margins and legs dark brown, except trochanter, which is yellowish. Some dark reticles on chelicerae and central portion of prosoma.

Female description (paratype INPA-OP 3409): Measurements: DSL: 3.15; PL: 1.08; DSW: 2.18; PW: 1.82; ID: 1.21; MH: 2.10; GOL: 0.37; GOW: 0.39. Chelicerae smaller than male. Femur and tibia IV with two rows of ventral turbercles, which are minute instead of large. Tarsal formula: 6(3)/11(3)/6/7.

Distribution (Fig. 8): only known from the type locality.

Verrucastygnus Pinto-da-Rocha, 1997

Verrucastygnus hoeferscovitorum (Pinto-da-Rocha, 1997) comb. nov.

(Figs 5A–C, 6F, 7F)

Auranus hoeferscovitorum Pinto-da-Rocha, 1997: 263, figs 311–316, 527–528, 602; Kury 2003: 228. (Type MCZN 1099, male holotype, not examined).

Complementary description. *Penis (Figs 5A–C):* Malleus slightly swollen, not surrounding the basal portion of lamina parva, which is funnel shaped with one sulcus on dorsal face. Chaetotaxy: MS A–B cylindrical: A1–A3 inserted lateroventrally, forming a row, B1 inserted and oriented ventrally. MS C cylindrical and sharp, reduced to two curved pairs and placed sub-distally. MS D: reduced to one well-developed pair, which is cylindrical and sharp, placed basally on lamina parva. MS E absent.

Variation: Chelicerae: Segment II slightly swollen, barely distinguishable from female.

Distribution (Fig. 8): Brazil: Amazonas: Reserva Ducke; Fazenda UFAM, **New record**; Rio Preto da Eva, **New record**; ZF-2 road, Km 18, **New Record.**

Justification of the new combination: the chaetotaxy of this species is more similar to *Verrucastygnus caliginosus* (Pinto-da-Rocha, 1990) than to *Auranus* spp.. The general shape of the pars distalis also suggests this species is closer to *Verrucastygnus*: lamina parva with straight lateral margins, slightly concave distal margin, and malleus slightly swollen but not covering the basis of lamina parva.

Material examined: 1 female (INPA-OPI 003423), Rio Preto da Eva, T7-16; Leg. Regiane, 14.i.2006; leaf-litter (linha 3). 1 female (INPA-OP 0934), Brazil, Amazonas, Reserva Biológica do Cueiras "ZF2", Km 18; Leg. M. C. R. Ribeiro; 06.xii.1990. 1 male (dissected, photo voucher) and 2 female (INPA-OP 1809), Amazonas, Manaus, Fazenda experimental da UFAM, L3-500; Leg. W. Cruz; 14.v.2010; leaf-litter. 1 female (INPA OP-1806), Fazenda UFAM, L2-2500, Manaus, Amazonas, Brasil; Leg. W. Cruz; 13.v.2010; leaf-litter. 1 female (INPA OP-1804), Fazenda UFAM, L1-1500, Manaus, Amazonas, Brasil; Leg. W. Cruz; 09.v.2010; leaf-litter. 1 male (INPA

OP-1805), Fazenda UFAM, L2-1500, Manaus, Amazonas, Brasil; Leg. L. Lança; 22.viii.2010; leaf-litter. 1 male (INPA OP-1810), Fazenda UFAM, L4-5500, Manaus, Amazonas, Brasil; Leg. L. Lança; 25.viii.2010; leaf-litter. 1 male (INPA OP-1807), Fazenda UFAM, L3-500, Manaus, Amazonas, Brasil; Leg. W. Cruz; 14.v.2010; leaf-litter. 1 female (INPA OP-4520), Reserva Ducke, LO3-500, Manaus, Amazonas, Brasil; Leg. P. Colmenares, W. Porto; 04.vii.2014; active nocturnal searching.

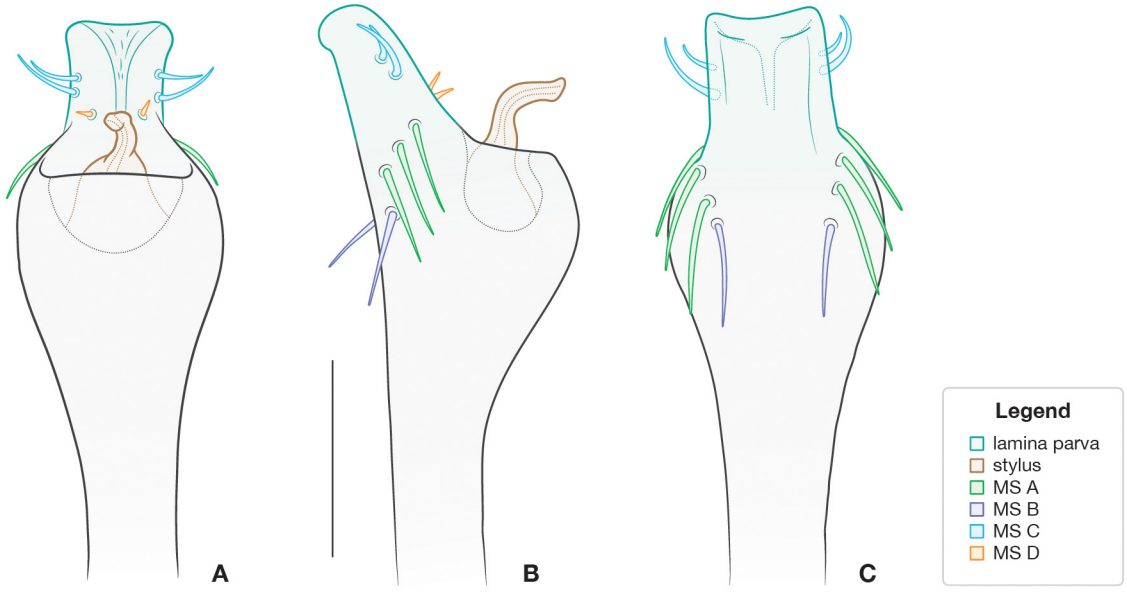

FIGURE 5. *Verrucastygnus hoeferscovitorum* **comb. nov.** (INPA-OP 1809). Penis: A, dorsal view; B, lateral view; C, ventral view.

Key to males of *Auranus*

1. One spine on scutal area III. . . . . *A. xerxes* **sp. nov.** (Figs 6E, 7E)
- Two spines on scutal area III 2
2. Femur IV without dorsoapical tubercles 3
- Femur IV with two dorsoapical tubercles 4
3. Lateral margins with a row of granules; posterior margin with a row of tubercles; three tubercles on area III . . . . . *A. parvus* (Figs 6C, 7C)
- Lateral and posterior margins smooth; one tubercle on area III . . . . . *A. tepui* (Figs 6D, 7D)
4. Lateral margins with a row of tubercles; tibia IV with two ventral rows of tubercles . . . . . *A. hehu* (Figs 6A, 7A)
- Lateral margins smooth; tibia IV with one ventral row of large tubercles . . . . . *A. leonidas* **sp. nov.** (Figs 6B, 7B)

Discussion

The relationship of *Auranus* with other genera is still in debate. Pinto-da-Rocha (1997, node 44) suggested *Auranus* as the sister group of (*Verrucastygnus* (*Stenostygnoides* (*Pickeliana* + *Protimesius*))). Later in Pinto-da-Rocha & Villarreal (2009) and Bragagnolo (2013) *Auranus* appears as the sister group of (*Verrucastygnus* + *Stenostygnoides*). Kury & Villarreal (2015), after a revision of genital characters in Gonyleptoidea, mentioned some similarities in the genital morphology of *Jabbastygnus* and *Auranus*, such as the modified lamina parva, the swollen sub-apical region, and the MS B inserted ventrally on the malleus. These genital similarities may reflect a natural link and a stronger relationship looks plausible, but only a new cladistic analysis involving a more detailed genital study of all genera of Stygnidae may clarify the position of *Auranus*.

We compared the penis of all species of *Auranus* and we found three characters that can be putative synapomorphies for this group: 1) The apical modification of the lamina parva into a well developed calyx, a character that cannot be found in any other genera of Stygnidae. However, a related lamina parva was recently described for the monotypic genus *Jabbastygnus* (Kury & Villarreal 2015), not in the shape of a calyx, but concave

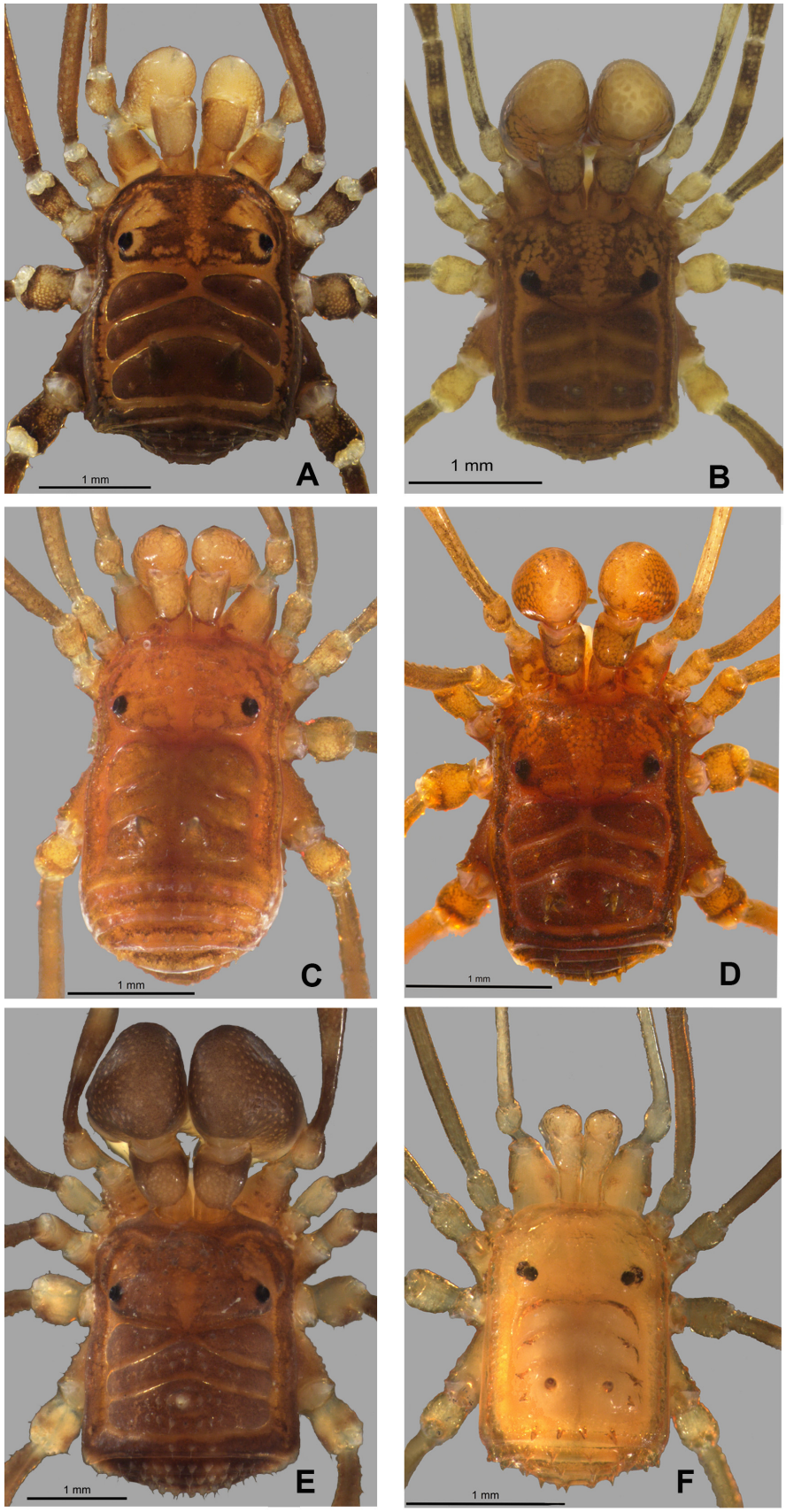

FIGURE 6. *Auranus* spp. and *Verrucastygnus hoeferscovitorum* **comb. nov.**, dorsal views. A, *A. hehu*; B, *A. leonidas* **sp. nov.**; C, *A. parvus*; D, *A. tepui*; E, *A. xerxes* **sp. nov.**; F, *V. hoeferscovitorum* **comb. nov.**.

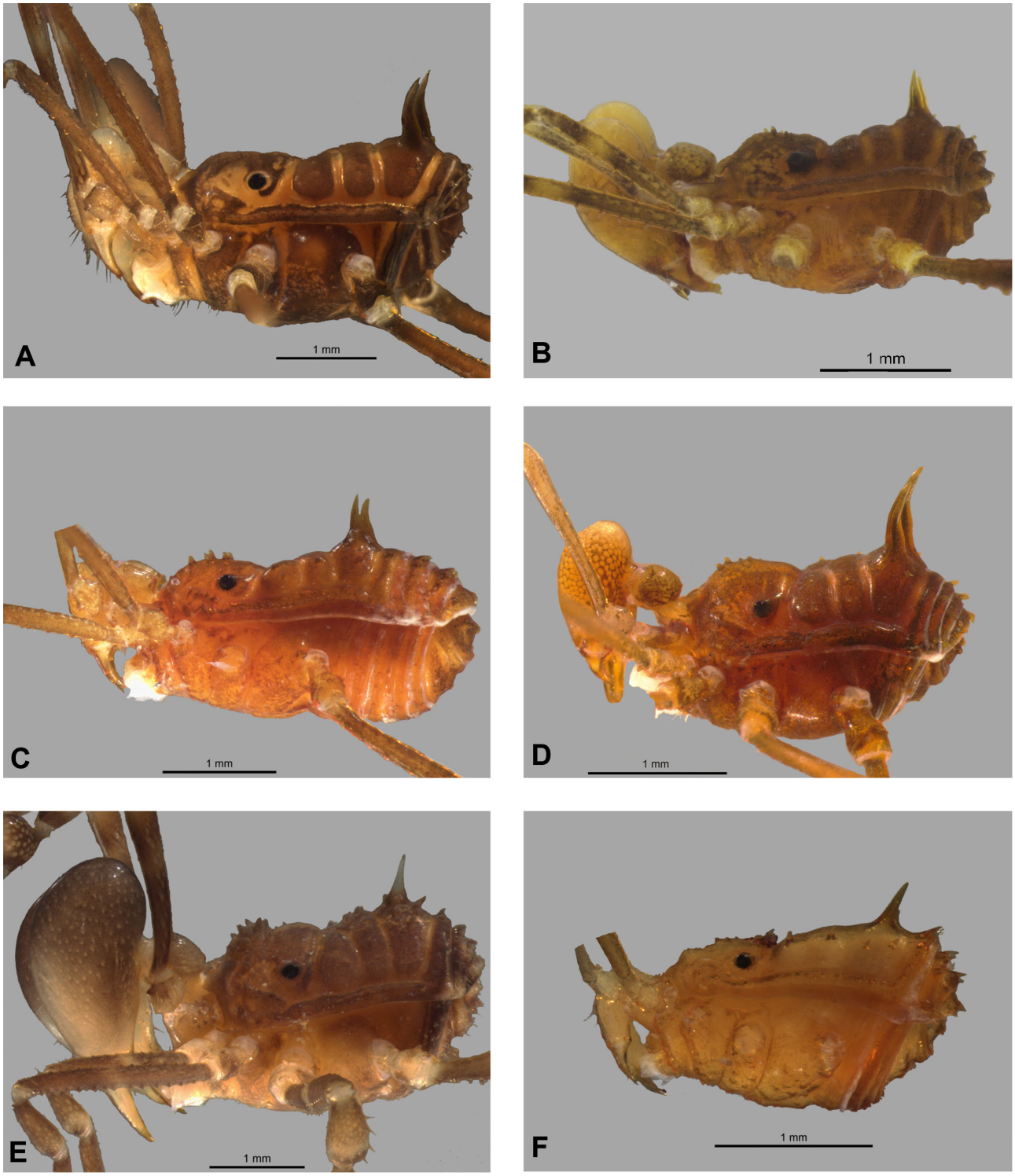

FIGURE 7. *Auranus* spp. and *Verrucastygnus hoeferscovitorum* **comb. nov.**, lateral views. A, *A. hehu*; B, *A. leonidas* **sp. nov.**; C, *A. parvus*; D, *A. tepui*; E, *A. xerxes* **sp. nov.**; F, *V. hoeferscovitorum* **comb. nov.**.

with two lobes (compare Figs 2A–D, 4A–C with figs 19A–D From Kury & Villarreal 2015); 2) The massively swollen malleus, which covers the base of the lamina parva in all possible angles and makes it appear inserted apically and not as a continuation of the truncus. Many genera in Stygnidae (*e.g. Stygnoplus*, *Verrucastygnus*, *Protimesius*) have the truncus slightly swollen subdistally, but not hiding completely the base of the lamina parva, as in *Auranus*; and 3) The presence of a pair of lateral flat processes folded ventrally on the lamina parva in *A. hehu*, *A. parvus*, *A. leonidas* **sp. nov.** (Figs 2B–C) and *A. xerxes* **sp. nov.** (Figs 4B–C).

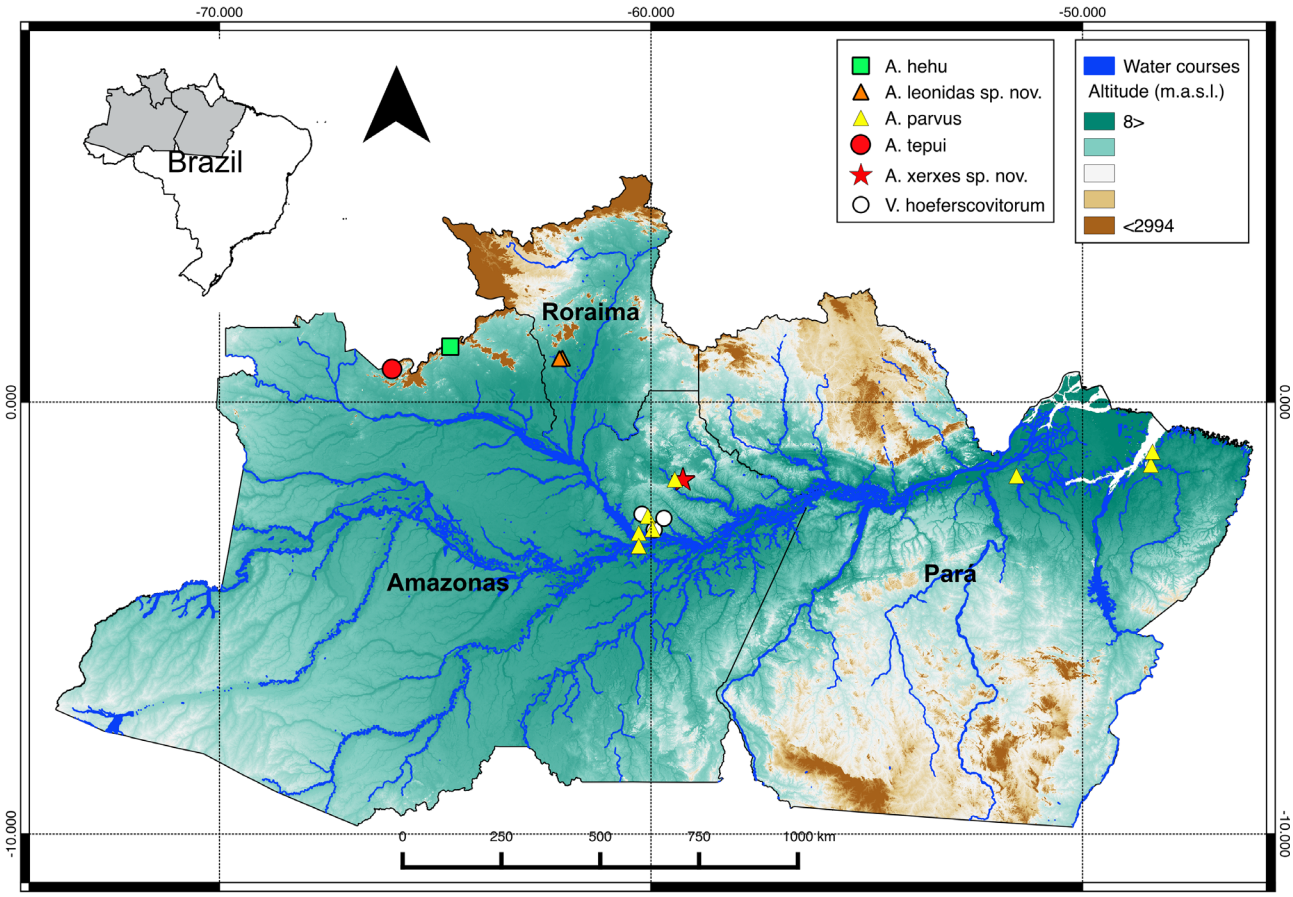

FIGURE 8. Distribution of *Auranus* spp. and *Verrucastygnus hoeferscovitorum* **comb. nov.**.

The lamina parva without a calyx, and the malleus not surrounding it, suggests that *A. hoeferscovitorum* does not belong to *Auranus* as is defined now. It could likely be the sister group of *Auranus*, but taking it from its current location brings the problem of creating a new monotypic genus. On the other hand, the genitals seem to be more related to *Verrucastygnus caliginosus* than to any other Stygnidae, due to the similar shape of the lamina parva and the truncus. In both species the arrangement of MS A, B, and C is nearly identical (Pinto-da-Rocha 1997, figs 531–532), and different from *Auranus*. This proximity between *Auranus* and *Verrucastygnus* was already proposed in the last two published phylogenetic analyses (Pinto-da-Rocha & Villarreal 2009; Bragagnolo 2013). Thus, we prefer to remove this species from *Auranus* and place it tentatively in *Verrucastygnus*, until more evidence is available and its relationships can be clarified.

Auranus parvus may be related to *A. tepui*, based on the absence of dorsoapical tubercles on male femur IV. On the other hand, *A. leonidas* **sp. nov.** seems to be related to *A. hehu* by the presence of the aforementioned tubercles. *Auranus xerxes* **sp. nov.,** on the other hand, also possesses a dorsal process on the glans, which was suggested to be lost secondarily in *Auranus* (Pinto-da-Rocha 1997). Absence and presence of the dorsal process occurring simultaneously in the same genus was not reported previously in other genera of Stygnidae; this character is very stable in the other genera and has been widely used to establish generic boundaries in Stygnidae.

Despite the lack of a hypothesis of relationships among Stygnidae based on a more integrative approach (molecular and morphological data), *Auranus* seems to be a monophyletic group supported by a good number of synapomorphies. Moreover, the diversity of *Auranus* is probably larger than we know, and more sampling of leaf-litter from other Amazonian localities may lead to the discovery of new species and the extension of the distribution of *Auranus*.

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