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A new species with high sexual dimorphism of *Xenelmis* Hinton (Coleoptera: Elmidae) from Mount Roraima National Park, Brazil

André S. FERNANDES[1, 3,*], Maria L.S. ALMEIDA[2,4], Rafael BOLDRINI[2, 3]

[1] Universidade Federal do Tocantins, Campus de Porto Nacional, Coordenação de Laboratórios de Ciências Biológicas, Laboratório de Entomologia, CP 136, 77500-000 Porto Nacional – TO, Brazil

[2] Universidade Federal de Roraima, Campus Paricarana, Centro de Estudos da Biodiversidade, Laboratório de Entomologia, 69310-000 Boa Vista – RR, Brazil

[3] Polo Universidade Federal de Roraima, Programa de Pós-Graduação Rede de Biodiversidade e Biotecnologia da Amazônia Legal - Bionorte, 69310-000 Boa Vista – RR, Brazil

[4] Universidade Federal de Roraima, Programa de Pós-Graduação em Saúde e Biodiversidade, 69310-000, Boa Vista, RR, Brazil

* Corresponding author: andresf@uft.edu.br; https://orcid.org/0000-0002-5635-0291

ABSTRACT

Xenelmis is one of the 51 Neotropical genera of the aquatic beetle family Elmidae and is currently represented by 15 species distributed throughout the Neotropics. This genus of tiny beetles is especially well represented in South America, where all but one species can be found, and Brazil has the greatest richness, with ten species recorded so far. Here we describe and illustrate *Xenelmis tuchaua* **sp. nov.**, a new Elmidae species with remarkable sexual dimorphism and unique diagnostic characteristics. The new species was found in an Amazonian stream located in Mount Roraima National Park, Roraima state, Brazil. We provide an updated species list for *Xenelmis* with comments on the occurrence of sexual dimorphism in the genus.

KEYWORDS: aquatic insects, morphology, riffle beetles, sexual dimorphism, taxonomy

Uma nova espécie com alto dimorfismo sexual de *Xenelmis* Hinton (Coleoptera: Elmidae) do Parque Nacional do Monte Roraima, Brasil

RESUMO

Xenelmis é um dos 51 gêneros neotropicais da família de besouros aquáticos Elmidae. O gênero é atualmente representado por 15 espécies distribuídas pelo Neotrópico. Esse gênero de diminutos besouros é especialmente bem representado na América do Sul, onde apenas uma das espécies conhecidas não ocorre, e o Brasil possui a maior riqueza, com dez espécies registradas até o momento. Aqui nós descrevemos e ilustramos *Xenelmis tuchaua* **sp. nov.**, uma nova espécie de Elmidae com marcado dimorfismo sexual e características diagnósticas únicas. A nova espécie foi encontrada em um riacho amazônico localizado no Parque Nacional do Monte Roraima, estado de Roraima, Brasil. Fornecemos uma lista atualizada das espécies conhecidas de *Xenelmis*, com comentários sobre a ocorrência de dimorfismo sexual no gênero.

PALAVRAS-CHAVE: insetos aquáticos, morfologia, besouros de corredeira, dimorfismo sexual, taxonomia

INTRODUCTION

Elmidae Curtis, 1830 is a cosmopolitan family of Coleoptera with more than 1500 known species distributed in 153 genera (Jäch *et al.* 2016; Barr and Shepard 2021; Polizei *et al*. 2022). The family has its greatest richness and abundance in the tropics (Jäch and Balke 2008) and, as expected, the Amazonian elmid fauna is remarkably diverse (Passos *et al*. 2009).

The genus *Xenelmis* Hinton, 1936 is currently represented by 15 species distributed throughout the Neotropical region, from the southern United States to Argentina (Manzo 2006; Sampaio *et. al.* 2015; Jäch *et al.* 2016). They are very small elmid beetles commonly found in small streams across all South America, and only one species, *Xenelmis sandersoni* Brown, 1985 is not found on this continent (Manzo 2006; Jäch *et al.* 2016). Brazil has the most representative *Xenelmis* fauna, with ten species recorded so far (Jäch *et al.* 2016; Passos *et al*. 2023).

Morphologically, *Xenelmis* is easily recognizable among other Neotropical genera due to its small size (up to 2 mm), ovoid body shape with a highly convex dorsum, and the

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pronotum with an opaque cuticular aspect. In her review of *Xenelmis*, Manzo (2006) updated the diagnosis of the genus as follows: 1) the dorsal surface of the head is covered with granules; 2) there is no tomentum on the genae; 3) the pronotum is tomentose; 4) the prosternal process is almost as wide as long; 5) all abdominal sternae are covered with granules; and 6) the parameres of the aedeagus are shorter than the penis. This diagnosis properly applies to the new species described in here.

In this study, we describe *Xenelmis tuchaua* sp. nov., a species with remarkable sexual dimorphism discovered in a small stream in Mount Roraima National Park (MRNP), in Roraima state, Brazil. Additionally, we provide an updated list of species for the genus with distributional data and sexual dimorphism occurrence among the known species. We also coupleted the new species in the taxonomic key of Manzo (2006), updated by *Sampaio et al.* (2015), and provide a map showing the known distribution of the new species.

MATERIAL AND METHODS

The collection was a result of a scientific expedition to the Serra do Sol highlands, on the border between Brazil, Guyana and Venezuela, within the Raposa Serra do Sol Indigenous Reserve and Mount Roraima National Park (MRNP) (Figure 1). The expedition was conducted by the Chico Mendes Institute for Biodiversity Conservation (ICMBio) of the Brazilian Ministry of Environment (MMA). The new species was found in a stream near the base camp of MRNP, located in the municipality of Uiramutã, Roraima state, Brazil (Figure 1).

Identification to species level of the collected material was made using the taxonomic keys of Hinton (1946), Manzo (2006) and Sampaio *et al.* (2015), as well as original species descriptions and examination of images from type specimens from Hinton's collection at the Natural History Museum (NHM), London, United Kingdom, and examination of type specimens from Grouvelle's Collection at Muséum National d'Histoire Naturelle (MNHN), Paris, France.

For morphological analysis and photographs, we used a Leica MC120HD camera attached to a Leica M165C stereoscopic microscope. The genitalia were extracted from the specimens, cleared in heated 10% KOH for five minutes (Brown 1972) and mounted on temporary slides with glycerin. Photographs were taken with the aid of a light microscope Leica ICC50 HD and were edited using Adobe Photoshop CC®. Line drawings were digitized in Adobe Illustrator CC®. The map was made in QGIS 3.8.1.

Dissected genitalia were stored in microvials with glycerin attached to the same pin as the specimen. The head was not dissected to avoid damage to the few available specimens. Mouth parts were not completely exposed and were only partially described. The general morphological terminology followed Kodada *et al.* (2016). Specimen labels are quoted verbatim. Changes of lines are indicated by "/" and different labels are separated by "//".

The specimens used to describe the new species were deposited in the invertebrate collection of Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Amazonas, Brazil, and in the entomology collection of Universiade Federal do Tocantins (CEUFT).

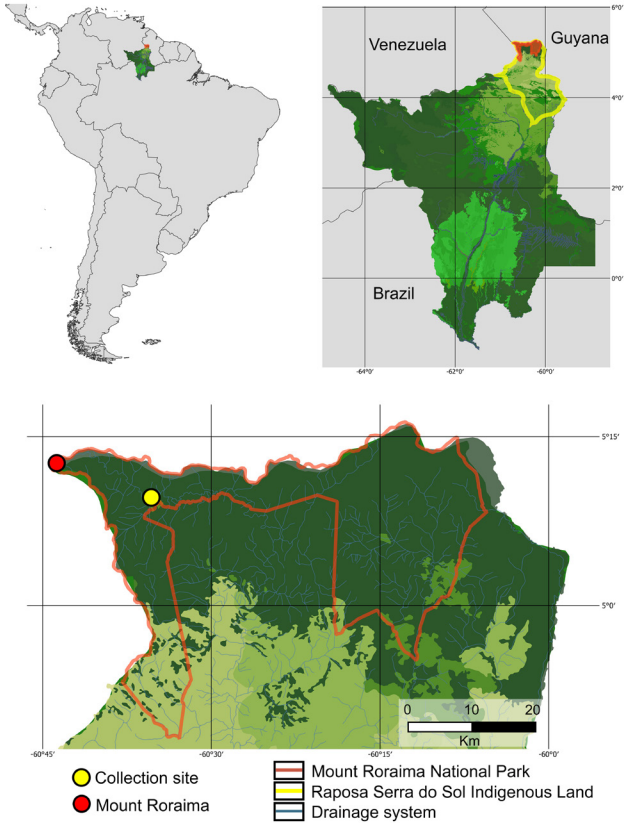

Figure 1. Location of the collection site of *Xenelmis tuchaua* **sp. nov.** in Mount Roraima National Park, Roraima state, Brazil. This figure is in color in the electronic version.

RESULTS

This work and its nomenclatural acts are registered in ZooBank under LSID (Life Science Identifier): urn:lsid:zoobank.org:pub:07163698-4B7E-4C32-A73B-AD48E4AFDFBF

Xenelmis tuchaua **sp. nov.** Fernandes, Almeida & Boldrini, 2023 (Figures 2–4)

Material examined

Holotype ♂ (INPA-COL 002421), two paratype ♀ (INPA-COL 002422-002423); one paratype ♂ (CEUFT 005860) and three paratype ♀ (CEUFT 005861-005862): BRAZIL / RORAIMA / UIRAMUTÃ // PARQUE NACIONAL DO MONTE RORAIMA // Igarapé Anarém River / R. Serra do Sol camp base // 05º08'17.80"N/60º35'10.25"W / 12-20. XII.2019 // Boldrini, R. *leg.* / Active collection.

Diagnosis

Head with a pair of carinae formed by large protuberances on vertex. Pronotum without carinae or impressions, completelly covered with granules, anteriorly acuminate and projected over the entire head (Figures 2a,c; 3a,b). Elytra with three parallel carinae on third, fifth and seventh intervals (Figures 2a,c). Males with pronotum broadly rounded and expanded antero-laterally, barely wider than elytra (Figure 2a); elytra slightly longer than wide (Figure 2a); femora very robust, profemur diameter about two times that of metafemur in medial cross-section (Figures 2a,b; 3a,b), protibia dilated apically with rhomboid apical projection on posterior face (Figure 3e) and with wide opened cavity over tibio-tarsal joint on ventral face (Figure 3f); metatarsomere V evenly slender in anterior/posterior views (Figure 3i), slightly explanate and rectangular in ventral/dorsal views (Figure 2a,b), slightly longer and slender than pro- and mesotarsomeres V (Figures 3g–i), with ventral fringe of long pale setae (Figure 3i). Parameres slightly shorter than phallobasis, broadly rounded apically in ventral view; penis about the same size as phallobasis, with shape and width similar to the parameres in ventral view (Figure 4a), elongated and strongly bent apically towards the dorsum in lateral view (Figure 4b).

Description

Holotype (Figures 2a,b; 3a–c, e–i; 4a,b): male, total length 2.05 mm; head retracted on pronotum, completely unseen dorsally; pronotum greatest width 1.15 mm, length 0.85 mm; elytra greatest width 1.1 mm, length 1.25 mm. Body reddish-brown, lighter in appendages; entirely coated with microplastron, except head, coxae, protibiae, tarsi and middle of ventrites; entirely covered with granules, except tarsi, antennae and mouthparts. **Head** (Figures 2a,b; 3a–c) covered with granules, coarser and sparser on vertex than those on frons; with a pair of granules and protuberances on vertex forming carinae; frons elevated between eyes; antennae eleven-segmented, filiform, antennomeres I and II slightly wider than remaining ones, antenomere I as long as antenomers II–III combined, antenomere XI as long as antenomeres IX–X combined and fusiform; clypeus trapezoid, densely covered with almost symmetric disposed setose granules, fronto-clypeal suture slightly concave, anterior margin slightly

Figure 2. *Xenelmis tuchaua* **sp. nov.** Habitus, male [holotype]: A – dorsal view; B – ventral view. Habitus, female [paratype]: C – dorsal view; D – ventral view. Scale bar = 0,5 mm**.** This figure is in color in the electronic version.

convex; labrum very short, with same width of anterior margin of clypeus, lighter in color and covered with short setae; maxillary palpi four segmented, palpomere IV elongate, elliptical and as long as remaining palpomeres combined; galea elongate, fusiform, outer lateral margin covered with stout, rather long setae; labial palpi three segmented, palpomere III widely obovate, flattened and as long as palpomeres II and III combined; mentum and prementum transverse; gula about two times wider than long, slightly wider than mentum. **Pronotum** (Figures 2a,b; 3a,b) wider (1.15 mm) than long (0.85 mm); strongly convex in lateral view; without carinae or impressions; densely covered with elliptical, evenly distributed granules, slightly larger than an ommatidium and mostly covered with a short setae; anteriorly accuminate; anterior margin rounded and projected over the entire head; lateral margins arcuate, strongly expanded anterolaterally and broadly rounded, projecting slightly beyond the line of the elytral lateral margins, narrowing posteriad; posterior margin three-sinuate, with small concavity in front of scutellum and two large concavities in front of elytra. **Elytra** (Figures 2a,b; 3a) longer (1.25 mm) than wide (1.1 mm); moderately convex in lateral view; surface sparsely covered with rounded, evenly distributed granules, slightly smaller than the an ommatidium and mostly covered with a short setae; well visible striae formed by rows of punctures; with three parallel carinae formed by rows of fine granules on intervals III (from base to apical 2/3), V (from base to apical 7/8) and VII (from base to apical 3/4); anterior margin of elytron sinuate; humerus slightly projected beyond the line of postero-lateral angle of pronotum; lateral margins arcuate and crenate; apically accuminate; posterior margin rounded and projected; epipleura covered with thinner and sparser granules, extending from base to the

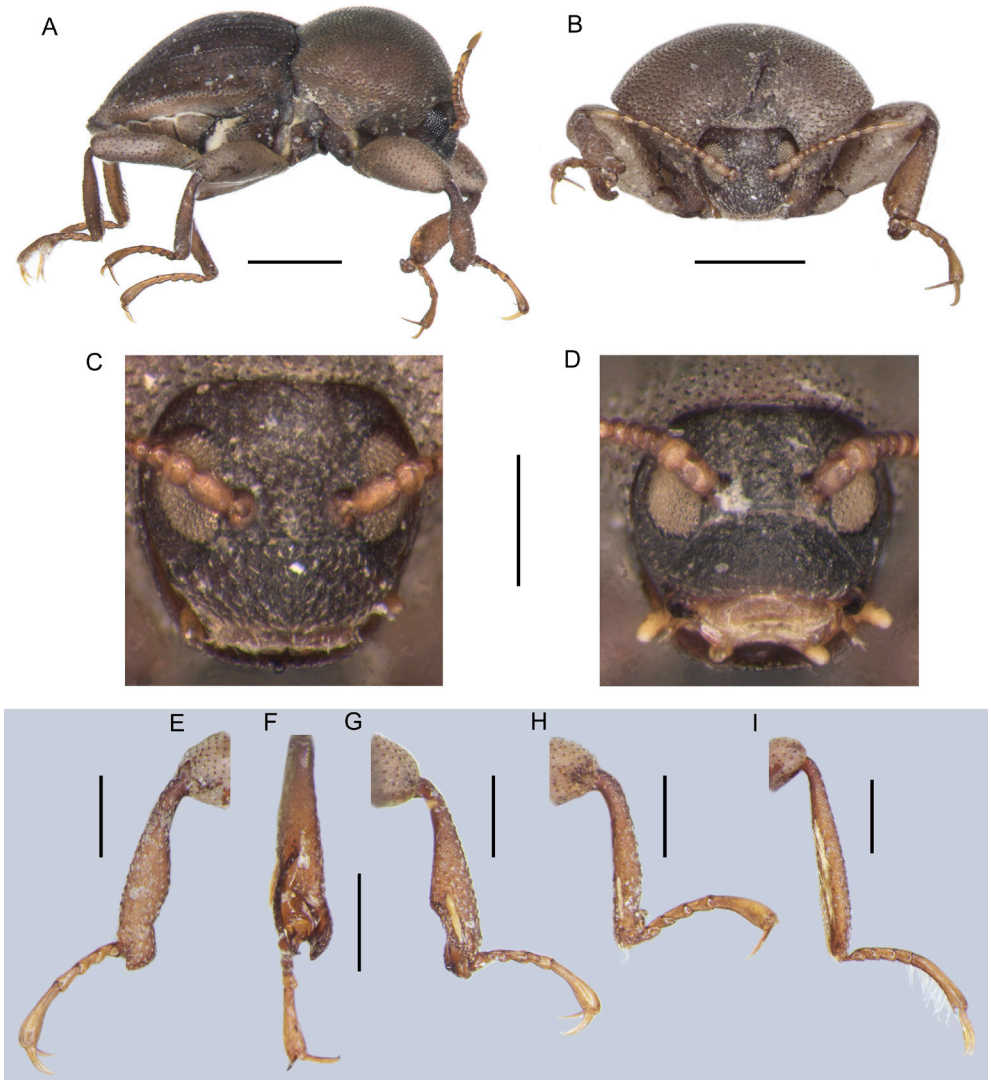

Figure 3. *Xenelmis tuchaua* **sp. nov.** Habitus, male [holotype]: A – lateral view; B – frontal view. Head, frontal view: C – male [holotype]; D – female [paratype]. Tibiae and tarsi, male [holotype]: E – protibia and -tarsus, posterior view; F – protibia and -tarsus, ventral view; G – protibia and -tarsus, anterior view; H – mesotibia and -tarsus, posterior view; I – metatibia and -tarsus, posterior view. Scale bars: A–B = 0,5 mm; C–I = 0,2 mm. This figure is in color in the electronic version.

apical projection of elytra; scutellum flattened, cuticularly similar to elytra, slightly wider (0.15 mm) than long 0.10 mm), diamond shaped with anterior margin broadly rounded and apex acute. **Prosternum** (Figures 2b; 3a) twice wider (0.8 mm) than long (0.4 mm); depressed on middle; surface densely covered with elliptical granules like those of pronotum; anterior margin slightly projected over base of head, smooth and feebly convex; lateral margins oblique. Prosternal process wider (0.40 mm) than long (0.33 mm), projecting slightly beyond procoxal cavity line when completely attached to mesosternum; lateral margins sinuous and raised, with lobed expansion (broadest point) across the basal 1/2–3/5; anterior margin broadly rounded, about the same width of procoxal cavity. Hypomeron expanded over the entire lateral of the head; cuticle similar to that of prosternum, less densely granulose. **Mesoventrite** (Figure 2b; 3a) about twice wider than long; with wide and shallow depression to receive the prosternal process; cuticle similar to that of prosternum. Mesoepimeron and mesoepisternum covered with slightly thinner granules than those of mesoventrite. **Metaventrite** (Figure 2b; 3a) about twice longer than mesoventrite; discrimen conspicuous, extending from posterior margin to anterior 4/5; cuticle similar to that of mesoventrite. Metaepimeron and metaepisternum covered with slightly thinner granules than those of metaventrite.–**Legs** (Figures 2a,b; 3a,b,e–i) with pro- and mesocoxae globose and not covered with microplastron, metacoxae trapezoid and partially covered with plastron; procoxae as wide as anterior margin of prosternal process; trochanters cuticle similar to that of femora; femora covered with microplastron and small granules, cuticle similar to that of epimeron and episternum; profemur very robust, diameter about twice that of metafemur in medial cross-section; tibiae not covered with microplastron and not as granulose as femur, with cleaning fringe of tomentum on anterior margin occupying apical 1/3 on protibiae, posterior margins occupying apical 1/3 on mesotibiae and on posterior margin occupying apical 2/3 on metatibiae; protibia dilated apically with rhomboid apical projection on posterior face and with a wide opened cavity over tibio-tarsal joint on ventral face; metatibiae with row of spine-like setae on apical 2/3 of ventral margin; tarsi V segmented, tarsomeres V as long remaining four tarsomeres combined; metatarsomere V evenly slender in anterior/posterior views, slightly explanate and rectangular in ventral/dorsal views, slightly longer than pro- and metatarsomeres V, with ventral fringe of long pale setae. **Abdomen** (Figures 2b; 3a) covered with granules, coarser and denser at middle and gradually diminishing in size and spacement towards the lateral margins; entirely covered with microplastron, except on: disc of ventrite I, anterior margin and a small inverted triangle patch on ventrite II, and middle of anterior margin and a thin longitudinal patch on ventrites III–V. **Genitalia** (Figures 4a,b) with parameres slightly shorter

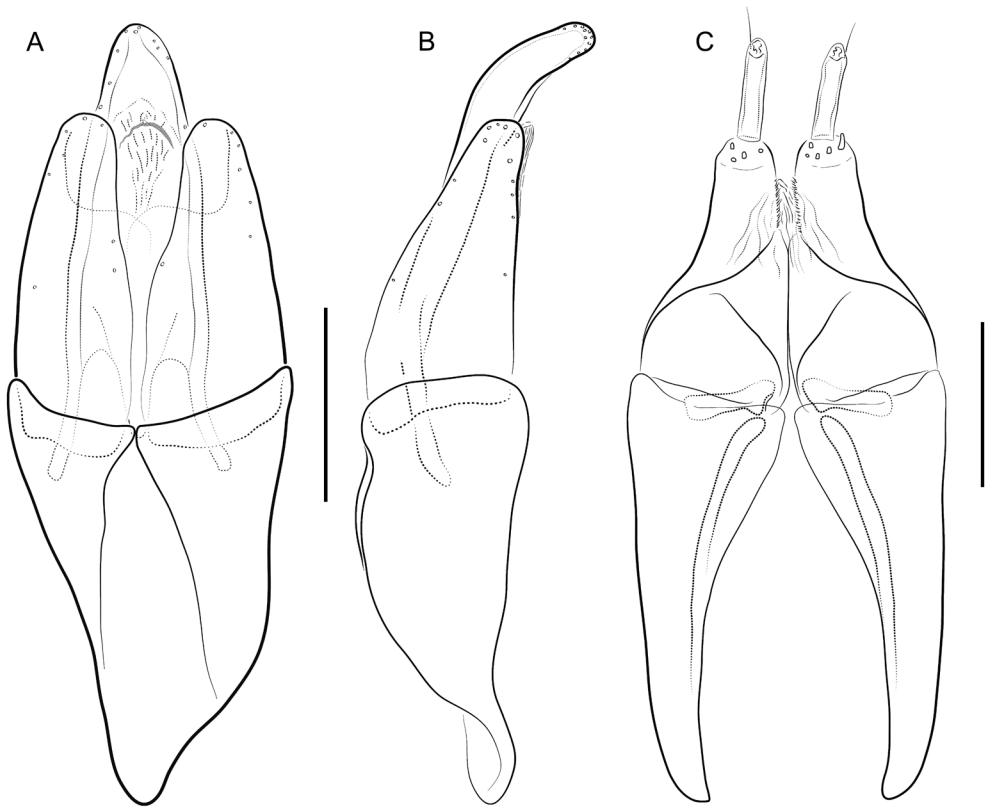

Figure 4. *Xenelmis tuchaua* **sp. nov.** Aedeagus, male holotype: A – ventral view; B – lateral view. Ovipositor, female paratype: C – ventral view. Scale bars = 0,1 mm.

than phallobasis, in ventral view broadly rounded apically. Penis about the same size as phallobasis, in ventral view with similar shape and width to the parameres; elongated in lateral view and strongly bent apically towards the dorsum; corona of sperm duct fan shaped in ventral / dorsal view.

Paratype: Female (INPA-COL 002421)**:** Body (Figures 2c,d; 3d) very similar to that of males in color and cuticular sculpture. Most noticeable differences from males are head (Figure 3d) with clypeus covering granules with much shorter setae than those covering male clypeus, anterior margin slightly concave; labrum about twice longer than on male, slightly narrower than anterior margin of clypeus, much lighter in color and not distinctly setose. Pronotal (Figure 2c) lateral margins not extending over lateral margins of elytron and not strongly expanded anterolaterally. Elytra (Figure 2c) widely obovate and less elongated than on male. Hypomeral (Figure 2d) anterolateral margins expanded only partially over lateral of the head. Legs (Figures 2c,d) without strongly modified features found on male, procoxae distinctly narrower than anterior margin of prosternal process, profemur slightly more robust than meso- and metafemora, protibiae with small apical excavation on anterior margin, metatibia without distinct row of spine-like setae on ventral margin; tarsomere 4 of metatarsus not modified and not bearing a fringe of long setae. Ovipositor (Figure 4c) symmetrical; valvifer membranous, approximately 1.5x longer than coxites, baculus bar-like and slightly sclerotized; coxites 2x wider at base than on apex, inner lateral margins straight, parallel and covered with hair-like setae, outer lateral margins converging innerly towards the apex, divided by an oblique line, apical area covered with a few stout sensory setae; styli 1/3 the length of coxites, cylindrical, with an apical long sensorial seta.

Variation

Color does not vary significantly among the seven studied specimens. Variation in size was observed and registered as follows: Males (n = 2): total body length 2.05–2.10 mm; pronotum greatest width 1.10–1.15 mm and length 0.90–0.95 mm; elytra greatest width 1.00–1.10 mm and length 1.15–1.25 mm. Females (n = 5): total body length 1.75–1.85 mm; pronotum greatest width 0.90–0.95 mm and length 0.65–0.85 mm; elytra greatest width 1.00–1.10mm and length 0.90–1.15 mm.

Comparative notes

According to the species groups proposed for *Xenelmis* by Hinton (1946), *Xenelmis tuchaua* sp. nov. can be placed into the *bufo*-group for not having any carinae or rows of granules on the pronotum. Other six species can be recognized as belonging to the *bufo*-group: *Xenelmis bufo*, *Xenelmis laura*, *Xenelmis leechi*, *Xenelmis marcapata*, *Xenelmis sandersoni* and *Xenelmis tarsalis* (see Table 1). Females and males of *Xenelmis tuchaua* sp. nov. can be distinguished from the remaining species of the *bufo*-group by the presence of carinae formed by a row of granules on the third interval of the elytron (absent in *X. bufo*, *X. leechi*, and *X. marcapata*), flat elytral intervals (the third interval is prominently raised in *X. sandersoni*), the absence of plumose setae on the posterior margin of the pronotum, and the pro- and metatibia without apical tufts of setae (the posterior margin of the pronotum is covered with plumose setae and the pro- and metatibia with apical tufts in *X. laura*), total length of females around 1.80 mm and of males around 2.0 mm, the prosternal process with a lobate lateral projection (total length around 1.50 mm, and lateral margins of prosternal process almost straight in *X. tarsalis*). Also, the new species can be distinguished from all other *Xenelmis* by the penis, in ventral view, quite similar in shape with the parameres and, in lateral view, strongly bent towards the dorsum without tapering apically.

Etymology

The specific epithet *tuchaua* comes from the Tupi indigenous word "tuxaua", which means "the one that rules" and is the title given to the main leader in many native indigenous tribes in South America. The name refers to the robust body and imponent anterior legs in males of the new species and is a tribute to the various indigenous peoples resisting and fighting for Amazonian biodiversity preservation.

Type locality

Igarapé Anarém (Anarém Stream), Raposa Serra do Sol Indigenous Reserve; municipality of Uiramutã, Roraima state, Brazil (Figure 1).

Habitat

The specimens were found in benthonic substrate samples collected with a kick net. Igarapé Anarém is located in a phytophysiognomic transition zone, with predominance of arboreal open savanna according to the classification of Barbosa and Miranda (2005). The average altitude in the collection site was about 700 m. The riparian vegetation cover over streambeds varied from almost complete coverage to almost complete exposition. The width of the sampled stream sections was about 5 m and were never deeper than 0.5 m. Substrates on the stream bottom were mostly composed of coarse sand, gravel, stones and boulders in rapids, and thinner sand and leaf packs in ponds.

Distribution

Roraima state, Brazil.

Inclusion of *X. tuchaua* sp. nov. in the key to *Xenelmis* by Manzo (2006)

9. Third elytral interval without row of granules ……..… 11

9'. Third elytral interval with row of granules ...……..…..

10. Third interval raised. USA and Mexico .... *X. sandersoni* Brown, 1985

10'. Third interval flat. Brazil (Roraima State)... *X. tuchaua* sp. nov.

DISCUSSION

With the new species described in here, *Xenelmis* is now represented by 16 species, 11 occurring in Brazil, six of them in the Brazilian Amazon region, of which three were recorded in the state of Roraima (Hinton 1946; Brown 1970; Gama Neto and Passos 2016) (Table 1).

Males of *Xenelmis tuchaua* sp. nov. can be immediately distinguished from all other described *Xenelmis* species by the unique shape and size of several body structures. On the other hand, females of *X. tuchaua* sp. nov. resemble typical *Xenelmis* specimens and need more careful examination to be determined. Given the fact that there is no proposed systematic classification for *Xenelmis*, we adopted Hinton's species group for comparative purposes between *Xenelmis tuchaua* sp. nov. and the other *Xenelmis* species.

Dimorphic secondary sexual characters are commonly found in many Neotropical Elmidae genera such as *Amazonopsis* Barr, 2018, *Austrolimnius* Carter & Zeck, 1929; *Cylloepus* Erichson, 1847; *Macrelmis* Motschulsky, 1859; *Stenhelmoides* Grouvelle, 1908; and even *Xenelmis*. In most of the cases, sexual dimorphism is not very conspicuous and only

Table 1. List of *Xenelmis* species, their known distribution and an overview on their sexual dimorphism. Distribution data is based on Jäch *et al.* (2016), Gama Neto and Passos (2016) and Passos *et al*. (2023). Information on sexual dimorphism is based on original species descriptions, Hinton (1940), Hinton (1946), Brown (1970), Manzo *et al*. (2006) and Sampaio *et al*. (2015). NSD = no distinct sexual dimorphism. Brazilian and US state names in parentheses.

Species	Distribution	Male sexual dimorphic features
Xenelmis. audax Hinton, 1946	Argentina, Brazil (Santa Catarina)	*Prosternal process*: lateral margins strongly angulate. *Tibiae*: protibiae - row of fine teeth on apex; mesotibiae - inner surface curved pre-apically; metatibiae - inner surface flattened with pre-apical row of tubercles. *Ventrites*: I - short basal carina on middle.
Xenelmis bufo (Sharp, 1882)	Belize, Costa Rica, Guatemala, Mexico, Panama, Venezuela	NSD
Xenelmis comis Hinton, 1946	Argentina, Brazil (Santa Catarina), Paraguay	*Prosternal process*: lateral margins angulate. *Tarsi*: ventral brush of hairs on basal tarsomeres.
Xenelmis granata (Grouvelle, 1889)	Brazil (Amazonas, Rio de Janeiro, Santa Catarina)	*Femora*: mesofemora - arcuate dorsally, projected over femoro-tibial joint; metafemora- strongly arcuate dorsally and ventrally, projected over femoro-tibial joint. *Tibiae*: metatibiae - ventral margin arcuate and deeply crenulate on basal third.
Xenelmis granatoides Sampaio, Passos & Ferreira-Jr, 2015	Brazil (Rio de Janeiro)	NSD
Xenelmis laura * Brown, 1970	Brazil (Pará)	*Tibiae*: meso and metatibiae - apical tuft of long straight setae. *Tarsi*: pro, meso and metatarsi - ventral tuft of long straight setae on basal four tarsomeres.
Xenelmis leechi Perkins & Steiner, 1981	Bolivia, Peru	NSD
Xenelmis marcapata Perkins & Steiner, 1981	Peru	NSD
Xenelmis micros (Grouvelle, 1889)	Brazil (Rio de Janeiro, Santa Catarina, Roraima), Paraguay	*Tibiae*: pro - short apical carina on inner side; meta - excavation and short apical carina on inner side. *Tarsi*: meso and meta - ventral tuft of long straight setae on basal four tarsomeres. *Ventrites*: I - short basal carina on middle.
Xenelmis rufipes Delève, 1968	Colombia, Ecuador	NSD
Xenelmis sandersoni Brown, 1985	Mexico, USA (Arizona)	NSD
Xenelmis sinecarina Sampaio, Passos & Ferreira-Jr, 2015	Brazil (Rio de Janeiro)	NSD
Xenelmis tarsalis Hinton, 1946	Argentina, Brazil (Rondônia, Roraima)	*Tarsi*: metatarsi - last tarsomere dilated and densely covered with ventral long setae.
Xenelmis teres Hinton, 1946	Brazil (Rondônia)	Male unknown
Xenelmis tuchaua sp. nov. Fernandes, Almeida & Boldrini	Brazil (Roraima)	*Head*: clypeus - covered with granules bearing moderately long setae; labrum - distinctly setose. *Promotum*: lateral margins expanded, exciding over elytral lateral margins. *Elytra*: slightly elongated *Femora*: profemora - distinctly more robust than meso and metafemora *Tibiae*: protibiae - dilated apically with rhomboid apical projection on posterior face and wide opened cavity over tibio-tarsal joint on ventral face. *Tarsi*: metatarsi - last tarsomere explanate and rectangular with ventral fringe of long pale setae.
Xenelmis uruzuensis Manzo, 2006	Argentina, Brazil (Goiás), Uruguay	*Tibiae*: metatibiae - row of large granules on inner margin. *Ventrites*: I - long carina on middle

*Species misrecorded for the following Brazilian states in Passos *et al*. (2023): Espirito Santo, Minas Gerais, Pará, Rio de Janeiro, Rio Grande do Sul, Santa Catarina and São Paulo.

a few species show a marked morphological differentiation between males and females (e.g., species of *Amazonopsis* Barr, 2018; *Cylloepus dimorphus* Shepard, Sites & Rodrigues, 2021; *Neoelmis guarani* Shepard & Barr, 2016).

In *Xenelmis*, sexual dimorphism is frequently reported in species descriptions (Hinton 1940; Hinton 1946; Deleve 1968; Brown 1970; Manzo 2006). Our review of the literature and examination of images from type material, showed that sexual dimorphism occurs in at least eight of the 16 known species of the genus (Table 1). Like in most elmids, the vast majority of morphological differences found in *Xenelmis* encompass presence in males and absence in females of a common set of cuticular features like hair/setae (e.g., *X. comis*, *X. laura*, *X. micros*, *X. tarsalis*) granules/teeth/tubercles (e.g., *X. audax*, *X. uruzuensis*) and depressions/elevations of the integument along the sclerites (e.g., *X. audax*, *X. comis*, *X. micros*). Also, size and shape of the thorax and its appendages (e.g., *X. granata*, *X. tarsalis*) may vary between genders (Table 1). However, major morphological differences between males and females in a varied set of structures, as seen in *X. tuchaua* sp. nov., is rare in Elmidae and unprecedented in *Xenelmis*.

The great sexual dimorphism in *Xenelmis tuchaua* sp. nov. made the association of males and females in this species non obvious at first glance. The fact that both genders occurred in the same collection sample made the comparative analysis leading to sexual dimorphism easier. After detailed morphological study and during species description, it became quite easy to distinguish the new species from other *Xenelmis*, based on both male and female characters. If males and females had been found isolated in distinct collection events, it is possible that each sex might have been initially described as a separate taxon.

CONCLUSIONS

With the new species described in here, *Xenelmis* is now represented by 16 species, 11 occurring in Brazil, six in the Brazilian Amazon, and three in the state of Roraima. Given that survey coverage is low in northern South America, the potential for increase in Elmidae diversity and morphological variability in the region is high. Besides being rather common among *Xenelmis* species, sexual dimorphism is usually confined to a set of a few structures with barely to very distinct modifications. The new species described in here has the highest sexual dimorphism observed so far in *Xenelmis*. Females of *X. tuchaua* sp. nov. resemble standard *Xenelmis* species in morphology, whereas males could easily be misidentified as belonging to another species of *Xenelmis* or even another genus. In this sense, finding both males and females on the same sample allowed us to associate genders more easily.

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