

Geographic range extension of *Elachistocleis corumbaensis* Piva, Caramaschi & Albuquerque, 2017 (Anura, Microhylidae) with new records in ecotonal zones in the state of Mato Grosso, Brazil

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Abstract

Elachistocleis corumbaensis was documented in 2017 in the central region of the Brazilian Pantanal and no other record of the species has since been reported. In this study, we report on the extension of the geographic range of *E. corumbaensis* based on 4 new records found in the riparian forests of the Paraguay River, in the state of Mato Grosso. Of these, 1 specimen was collected in a protected area in the Pantanal. We also report on the presence of this species in the ecotones between the Pantanal, Cerrado, and Amazonia, which suggests that *E. corumbaensis* is associated with seasonally flooded forests but more widely distributed in western Brazil than previously reported.

Key words

Biogeography, distribution, oval frogs, Pantanal biome.

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Introduction

The genus *Elachistocleis* comprises 18 species distributed from Panama to southern South America and Trinidad (Frost 2018). Twelve species are known to occur in Brazil: *E. bicolor* (Guérin-Méneville, 1838); *E. bambameuboi* Caramaschi, 2010; *E. carvalhoi* Caramaschi, 2010; *E. cesarii* (Miranda-Ribeiro, 1920); *E. heliannae* Caramaschi, 2010; *E. erythrogaster* Kwet & Di-Bernardo, 1998; *E. magna* Toledo, 2010; *E. matogrosso* Caramaschi, 2010; *E. muiiraquitã* Nunes-De-Almeida & Toledo, 2012; *E. piauiensis* Caramaschi & Jim, 1983; *E. surumu* Caramaschi, 2010 and *E. corumbaensis* Piva, Caramaschi & Albuquerque, 2017.

In the Pantanal (Brazil's wetlands) only 4 species of *Elachistocleis* have been recorded to date: *Elachistocleis bicolor*, *E. cesarii*, *E. matogrosso* and *E. corumbaensis* (Frost 2018). The latter species was recently described based on specimens from the Parque Municipal de Piraputangas and Maciço do Urucum, both located in the central region of the Brazilian Pantanal in the state of Mato Grosso do Sul (Piva et al. 2017). Herein we report on a new area of occurrence of *E. corumbaensis* and the geographic range extension of the species. This was based on specimens collected from the seasonally-flooded riparian forests at the margin of Paraguay River, in the Brazilian Pantanal of Mato Grosso and ecotonal zones of Cerrado and Amazonia.

Methods

We installed a total of 48 sets of pitfall traps. Each set was comprised of 4 60-L buckets, arranged in a "Y" shape, and placed 15 m apart. All buckets were buried to their rims and linked at ground level by a 70-cm-tall plastic guide fence. At each sampling point, 3 sets of pitfalls were installed in seasonally-flooded riparian forests along the margins of the Paraguay River in the municipalities of Barra do Bugres and Cáceres, state of Mato Grosso. The first set of pitfalls was installed riverside, the second set was installed 100 m from the river and the third set was installed 200 m from the river. Between June 2017 and July 2018, the samplings totaled 1,920 bucket-nights. Specimens were euthanized by an injection of lidocaine chloridrate 2% (Xylestesin®) and fixed in 10% formalin. They were preserved in 70% ethanol and deposited in the Centro de Pesquisa de Limnologia, Biodiversidade, Etnobiologia do Pantanal, at the Universidade do Estado de Mato Grosso (UNEMAT), western Brazil (CELBE-A). The collection of specimens was granted by the Authorization System and Biodiversity Information (SISBIO), regulated by the Brazilian Institute of Environment and Renewable Natural Resources and the Brazilian Ministry of Environment (SISBIO permanent permit number 8849-1, expedition number 10128). The identification of the specimens collected was based on the original description of *Elachistocleis corumbaensis* (Piva et al. 2017). Morphometric mea-

surements (in mm) were taken using electronic calipers (Digimess 100.174BL).

Results

We collected 4 specimens of *E. corumbaensis* from 2 municipalities, Cáceres and Barra do Bugres, in southeastern Mato Grosso. The specimen collected from Cáceres is from an ecotonal zone between Pantanal, Cerrado, and Amazonia and the specimens collected from Barra do Bugres (Fig. 1) are from an ecotone between Amazonia and Cerrado in the upper Paraguay river basin. A fourth specimen was collected from Estação Ecológica de Taiamã within the Pantanal de Cáceres subregion, in the northern region of the Pantanal.

Elachistocleis corumbaensis Piva, Caramaschi & Albuquerque, 2017

New records (Fig. 2). Brazil: Mato Grosso: municipality of Cáceres: Estação Ecológica de Taiamã in a riparian forest at the right margin of Paraguay River (16°51'27.6" S, 057°36'20.7" W, WGS 84, 104 m a.s.l), 12 August 2017, collected by Vancleber D. S. Alves (CELBE-A-0072).

Brazil: Mato Grosso: municipality of Cáceres: about 17 km from the urban area of Cáceres in a riparian forest at the left margin of Paraguay River (15°55'58.0" S, 057°38'31.0" W, WGS 84, 131 m a.s.l), 5 July 2017,

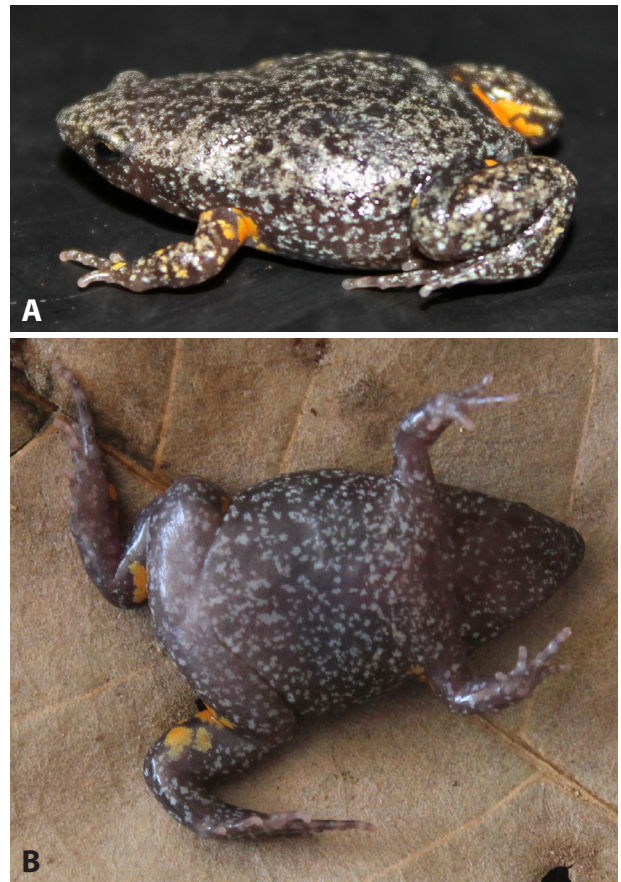


Figure 1. *Elachistocleis corumbaensis* in life. **A.** Dorsolateral view. **B.** Ventral view (CELBE-A-0504) from the municipality of Barra do Bugres, Mato Grosso, Brazil.

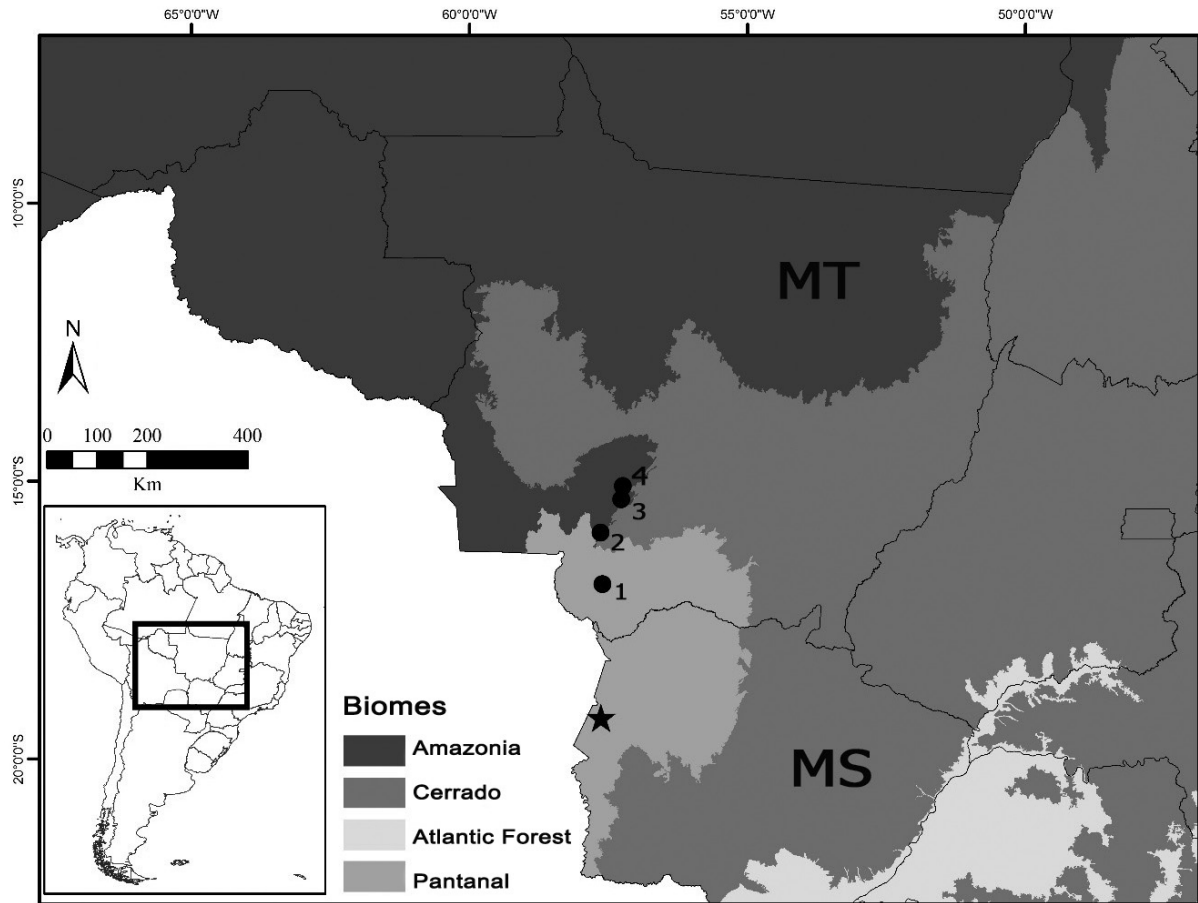


Figure 2. Current geographic distribution of *Elachistocleis corumbaensis*, including new records in Mato Grosso, Brazil. Star: Type locality (Piva et al. 2017); Circles: new records of the species. 1: Estação Ecológica de Taiamã; 2: Cáceres; 3 and 4: Barra do Bugres.

collected by Jessica R. Mudrek and Odair D. da Silva (CELBE-A-0002).

Brazil: Mato Grosso: municipality of Barra do Bugres: about 30 km from the urban area of Barra do Bugres, near the limits of Porto Estrela, in a riparian forest at the right margin of Paraguay River (15°19'56.0" S, 057°16'13.0" W, WGS 84, 147 m a.s.l), 25 July 2018, collected by Vancleber D. S. Alves and Dionei J. da Silva (CELBE-A-0504).

Brazil: Mato Grosso: municipality of Barra do Bugres: about 6 km from the urban area of Barra do Bugres in a riparian forest at the right margin of Paraguay River (15°05'40.2" S, 057°14'34.7" W, WGS 84, 157 m a.s.l), 7 September 2017, collected by Vancleber D. S. Alves (CELBE-A-0132).

Identification. The main traits that distinguish *E. corumbaensis* from its congeners are the head dimensions, post-commissural gland, and skin coloration. Within *Elachistocleis*, 2 major groups are distinguished by ventral coloration: (i) with immaculate venter (“without specks”), namely *E. bicolor*, *E. helianneae*, *E. matogrosso* and *E. muraquitan*; and (ii) with speckled venter (“gray, yellow or white venter with specks”) (Marinho et al. 2018). There are 8 species in the “spotted-belly” group: *E. erythrogaster* (yellow venter with black specks) (Kwet and Di-Bernardo 1998), *E. magna* (white venter with grayish

specks) (Toledo 2010), *E. piauiensis* (gray venter with dark brown specks) and *E. bumbameuboi*, *E. carvalhoi*, *E. cesarii*, *E. surumu* and *E. corumbaensis* (gray venter with white specks) (Piva et al. 2017). Finally, *E. corumbaensis* and *E. surumu* are the only 2 species to present a poorly developed post-commissural gland (Caramaschi 2010, Toledo 2010, Piva et al. 2017). However, *E. surumu* is smaller (SVL 26.4–30.8 mm in males; 23.2–38.2 mm in females) and have a smaller head dimension (head length about 77% of head width) than *E. corumbaensis*, which is one of the larger species, with SVL reaching 40.3 mm and head length about 89% of head width (Caramaschi 2010, Piva et al. 2017, Marinho et al. 2018). It is noteworthy that *E. corumbaensis* may present a large and irregular orange band on the inguinal region and yellow stains spread irregularly on the inguinal region, arms and forearms (Piva et al. 2017).

Discussion

Only 4 specimens of *Elachistocleis corumbaensis* had been collected to date, all of them restricted to the central region of the Pantanal in Mato Grosso do Sul, including the type locality of the species (Piva et al. 2017). Here we present the second record of *E. corumbaensis* inside a protected area, the Estação Ecológica de Taiamã, which is 240 km north from the type locality (point 1, Fig. 2). Estação

Ecológica de Taiamã is a fluvial island with 11.555 ha of seasonally flooded lowland formed by the Paraguay and Bracinho rivers (ICMBio 2017). Between January and April, this region is almost entirely flooded, similar to the other regions of central Pantanal—namely Maciço do Urucum and Parque Municipal de Piraputangas—where the other specimens of *E. corumbaensis* were collected. This indicates an association of *E. corumbaensis* with riparian forests periodically inundated by rivers during the flood pulses.

We also recorded *E. corumbaensis* in ecotonal zones between the Pantanal and the biomes Amazonia and Cerrado (point 2, 3 and 4, Fig. 2) where the flooding season is shorter. One specimen was collected from Barra do Bugres on the border of Porto Estrela, and thus, it is expected that this species also occurs within the municipality of Porto Estrela. Considering that flood pulses are crucial for the formation of reproductive sites and nutrient cycles (Prado et al. 2000, Prado et al. 2002, Prado et al. 2005, Rodrigues et al. 2003), these records of *E. corumbaensis* suggest wider ecological plasticity of the species than previously known. Similarly, *E. magna* was also found in ecotonal zones between Amazonia and Cerrado (Strüssmann 2012), indicating that other species of the genus are adaptable to environmental variation associated to microclimatic and vegetation differences between biomes. However, more detailed research on the use of microhabitats and the reproductive behavior of *E. corumbaensis* is needed to support further conclusions.

The northern record of the species reported here is 460 km north of the type locality. The 2 northernmost records of the species are located in areas threatened by deforestation due to the substitution of native vegetation by livestock grazing and monocultures. This highlights the importance of protected areas for the conservation of populations of *E. corumbaensis*. Finally, to improve our knowledge of the geographic distribution of this species and our understanding of its ecological needs, we recommend that more surveys should be conducted in the Cerrado and the Amazonia regions to confirm this species' occurrence beyond the transitional zones of the Pantanal.

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Authors' Contributions

VDSA, JRM, ODS, MSF, OMAN, TMC, ACG, MAC, CCM, JSJS, ARAI, RSD'A, BRB, APDB, CPAS and DJS collected the specimens. VDSA, JRM, GRC, MFRS, and DJS analyzed the specimens and wrote the first version of the manuscript. JRM produced the distribution map. GRC and APDB revised and translated the final version.

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