REPTILES & AMPHIBIANS

Anurans from a Biodiversity Hotspot in the Cerrado-Pantanal Transition Zone, Mato Grosso do Sul, Brazil

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Abstract.—Despite their ecological importance, anuran diversity and distribution remain poorly studied in transitional regions of western Brazil. We surveyed the anuran assemblage in the Municipality of Corguinho, Mato Grosso do Sul, a transitional zone between the Central Brazilian Plateau (Cerrado) and the Pantanal floodplain. We recorded 32 species in five families: Bufonidae (3), Dendrobatidae (1), Hylidae (11), Leptodactylidae (14), and Microhylidae (3). Our results highlight the role of this underexplored ecotone in supporting a diverse anuran fauna characteristic of both biomes. In addition to updating the regional species list, we report a substantial range extension for *Pseudopaludicola ameghini*, expanding its known distribution approximately 490 km to the south. These new data reinforce the ecological value of transitional zones and underscore the need for continued biodiversity assessments in such threatened areas.

Recognized as both the most species-rich and one of the most threatened savannas worldwide (da Silva and Bates 2002), the Cerrado (Brazilian savannas) harbors exceptional biodiversity across its extensive landscapes (Françoso et al. 2020). Its designation as a global conservation hotspot reflects the combination of high endemism with severe habitat loss (Myers et al. 2000; Damasco et al. 2018; Ribeiro et al. 2020). Geographically, the Cerrado occupies a central and strategic position in South America, bordering major biomes such as Amazonia, Caatinga, Chaco, Atlantic Forest, and Pantanal (da Silva and Bates 2002). These ecological interfaces are broad extensive transitional zones, which in turn promote the coexistence of species adapted to contrasting environments (Valdujo et al. 2012; Guedes et al. 2014; Andrade et al. 2017; Durigan et al. 2022; Diaz-Ricaurte et al. 2020, 2022; Pivello et al. 2025). The Pantanal, in turn, is globally recognized for its mosaic of aquatic and terrestrial habitats (Junk et al. 2006), which support exceptional biodiversity through their ecological complexity (Palmer et al. 2002; Galvanin et al. 2014; Miranda et al. 2018). At their boundary, the Cerrado-Pantanal transition zone comprises an extensive and irregular mosaic of floodplain and savanna vegetation types (Girard et al. 2024), where distinct ecological conditions converge across a heterogeneous landscape (da Silva et al. 2015).

Transition zones are ecologically unique areas that often exhibit both physical and biological characteristics of the adjacent regions (Williams 1996; Remanamanjato et al. 2002). These areas are highly heterogeneous and can support a variety of animals, playing a crucial role in facilitating species dispersal and gene flow, as well as providing evolutionary conditions that promote the emergence of endemic populations (Ab'saber 2002; Urbina-Cardona et al. 2006; Haidar et al. 2013; Granda-Rodriguez et al. 2025). In this context, species inventories are essential for assessing regional species richness and detecting potential threats to populations. For example, the Brazilian Amphibian Conservation Action Plan (Verdade et al. 2012) highlights species lists as a scientific priority for advancing conservation across the country.

Gathering information on species diversity directly addresses both Linnaean and Wallacean shortfalls (Bini et al. 2006; Hortal et al. 2015). One of the most effective ways to overcome these shortfalls is by investing in biodiversity inventories (Balmford and Gaston 1999; Brooks et al. 2004). The lack of knowledge about species and their distributions has long been recognized as a major challenge for effective conservation and management efforts (Brooks et al. 2004). Such studies are essential for identifying areas of high conservation value (Eken et al. 2004), particularly for amphibians, a group for which substantial knowledge gaps exist (Rossa-Feres et al. 2011; Neves et al. 2020) and which are the most endangered vertebrate class (Luedtke et al. 2023).

Reptiles & Amphibians ISSN 2332-4961
https://doi.org/10.17161/randa.v33i1.24219

Despite their importance, information on amphibian diversity in western Brazil remains scarce, especially in the transition zones between the Pantanal and Cerrado biomes (Souza et al. 2017). Except for locations within protected areas, regions targeted by environmental impact assessments, or areas surrounding major urban centers, few amphibian inventories exist for the Cerrado and the Pantanal in Mato Grosso do Sul, and sampling coverage remains limited (Souza et al. 2017; Neves et al. 2020).

Therefore, studies on amphibian distribution are vital for understanding spatial patterns, assessing conservation status, and informing biodiversity management (Verdade et al. 2012; Oliveira et al. 2017), while also providing key data for research in biogeography, ecology, and natural history (Vasconcelos et al. 2014; Barata et al. 2016; Neves et al. 2018; Martins et al. 2021). Based on the results of field expeditions conducted in the Municipality of Corguinho, Mato Grosso do Sul, a transitional area between the Central Plateau and the Pantanal floodplain, we herein document the anuran assemblage of this ecologically important region.

Methods

Study Area.—Corguinho is located on the plateau of the Serra de Maracaju in the north-central mesoregion of Mato Grosso do Sul, Brazil (Fig. 1). Strategically positioned at the interface of the Cerrado and Pantanal, it contributes to the physical, biological, and orographic dynamics of the region and is hydrologically connected to the Upper Paraguay Basin, which feeds the Pantanal floodplain (Benites and Mamede 2020).

The municipality's economy is based mainly on cattle ranching and grain cultivation (Galati et al. 1996), activities that have driven extensive deforestation and the conversion of native vegetation into pastures (Nunes et al. 1995; Galati et al. 1996). The elevational range of 200–700 m asl is a product of sedimentary rock formations that create two topographic levels, and the climate is Equatorial Savanna with a dry winter (Aw), characterized by two dry months (July and August) and a rainy season extending from October to March (Kottek et al. 2006). The local vegetation is dominated by dense savannah (Cerrado sensu stricto), interspersed with 'Cerradão' and gallery forests patches (Galati et al. 1996), although much of the original cover has been altered by land-use changes.

Data Collection.—We conducted fieldwork over ten sampling days distributed across ten field campaigns between 23 November 2015 and 20 March 2019 and encompassing both dry and rainy seasons (Ceron et al. 2020) (Table 1). Sampling sites were selected to represent the environment heterogeneity of Corguinho, including variations in relief, soil types, hydrography, and vegetation. We surveyed four main sites in the Corguinho region, three in the Fazenda Recanto

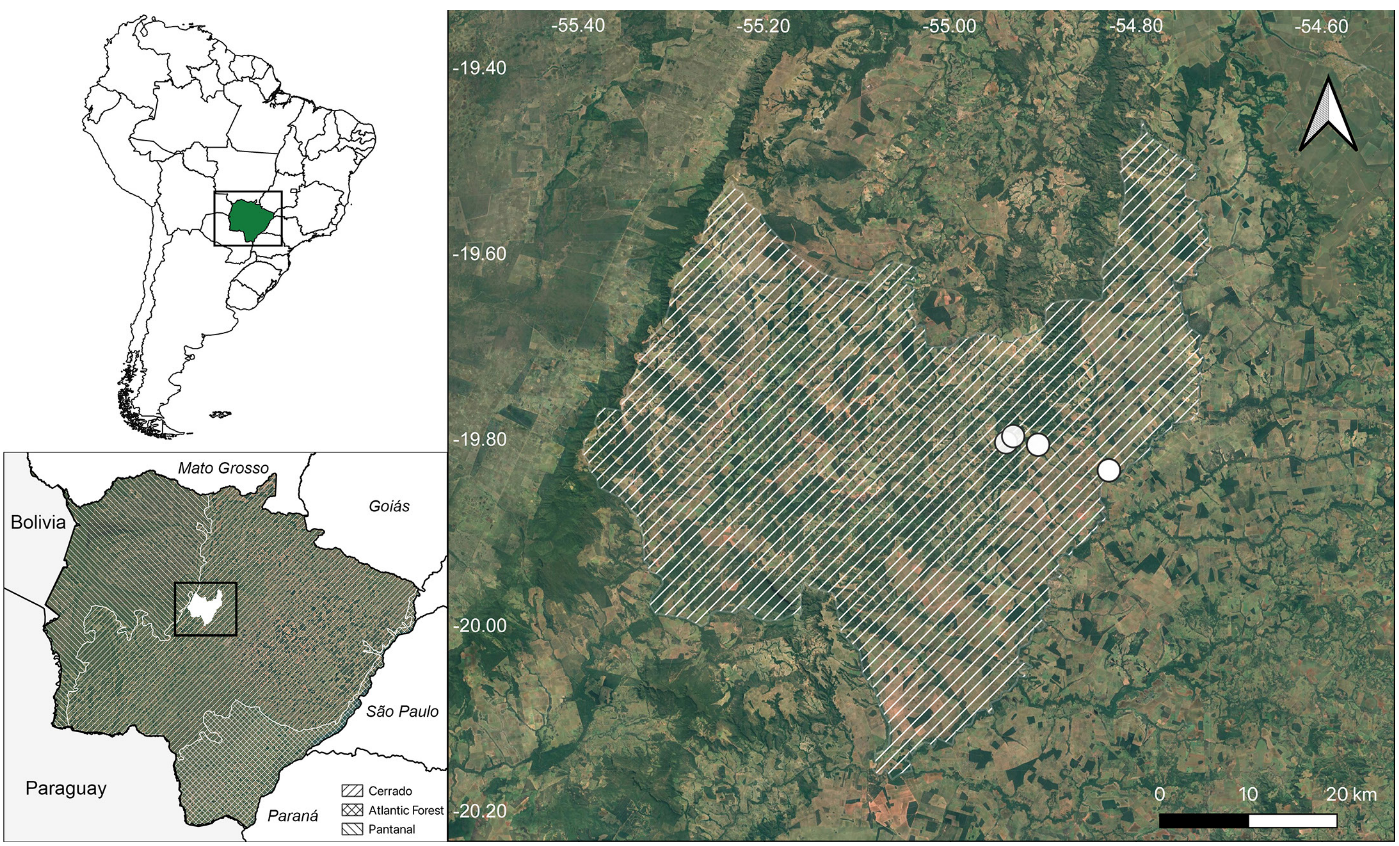

Figure 1. Map showing Corguinho Municipality at the border of the Brazilian Shield Plateau and the Pantanal floodplains in Mato Grosso do Sul, Brazil. Sampling sites are indicated by white dots.

Table 1. Sampling dates and locations (latitude and longitude) of ten surveyed sites in Corguinho Municipality, Mato Grosso do Sul, Brazil.

Sampling Date	Location
23 November 2015	-19.83170, -54.82940
28 May 2016	-20.45083, -55.62194
6 October 2016	-19.80410, -54.90562
15 October 2016	-19.83170, -54.82940
21 October 2016	-19.80411, -54.90562
13 November 2016	-19.83170, -54.82940
16 March 2017	-19.80167, -54.94000
13 August 2018	-19.79491, -54.93245
9 November 2018	-19.83170, -54.82940
20 March 2019	-19.83170, -54.82940

dos Anjos (19.801667, -54.940000; 19.803889, -54.905556; 19.794722, -54.932222; elev. 500 m asl) and one in the urban area of Corguinho (19.831389, -54.825556). These sites encompassed areas of semi-deciduous forest situated in transition zones between lowland floodplains and the plateau.

Individuals were recorded during diurnal and nocturnal visual-encounter surveys (Crump and Scott 1994) conducted between 1500 and 2100 h. No specific transects were established; instead, researchers walked through the study area searching for individuals following accessible paths and searching microhabitats likely to harbor anurans (e.g., beneath rocks and logs, in soil and leaf litter, in bromeliad clusters, and along riparian vegetation; Heyer et al. 1994). Thus, the surveys were not based on predefined or randomly placed transects, but rather on opportunistic visual searches across accessible habitats that included open fields, forested areas, ponds, temporary puddles, streams, and other bodies of water (Fig. 2).

Under permits issued by the Instituto Chico Mendes de Conservação da Biodiversidade (SISBIO 49080-5 and 45889-3), we collected individuals that were anesthetized and euthanized using 5% xylocaine (following resolution CFBio nº148/2012; CFB 2012), fixed in 10% formalin, preserved in 70% ethanol, and deposited in the Coleção Zoológica da Universidade Federal de Mato Grosso do Sul (ZUFMS-

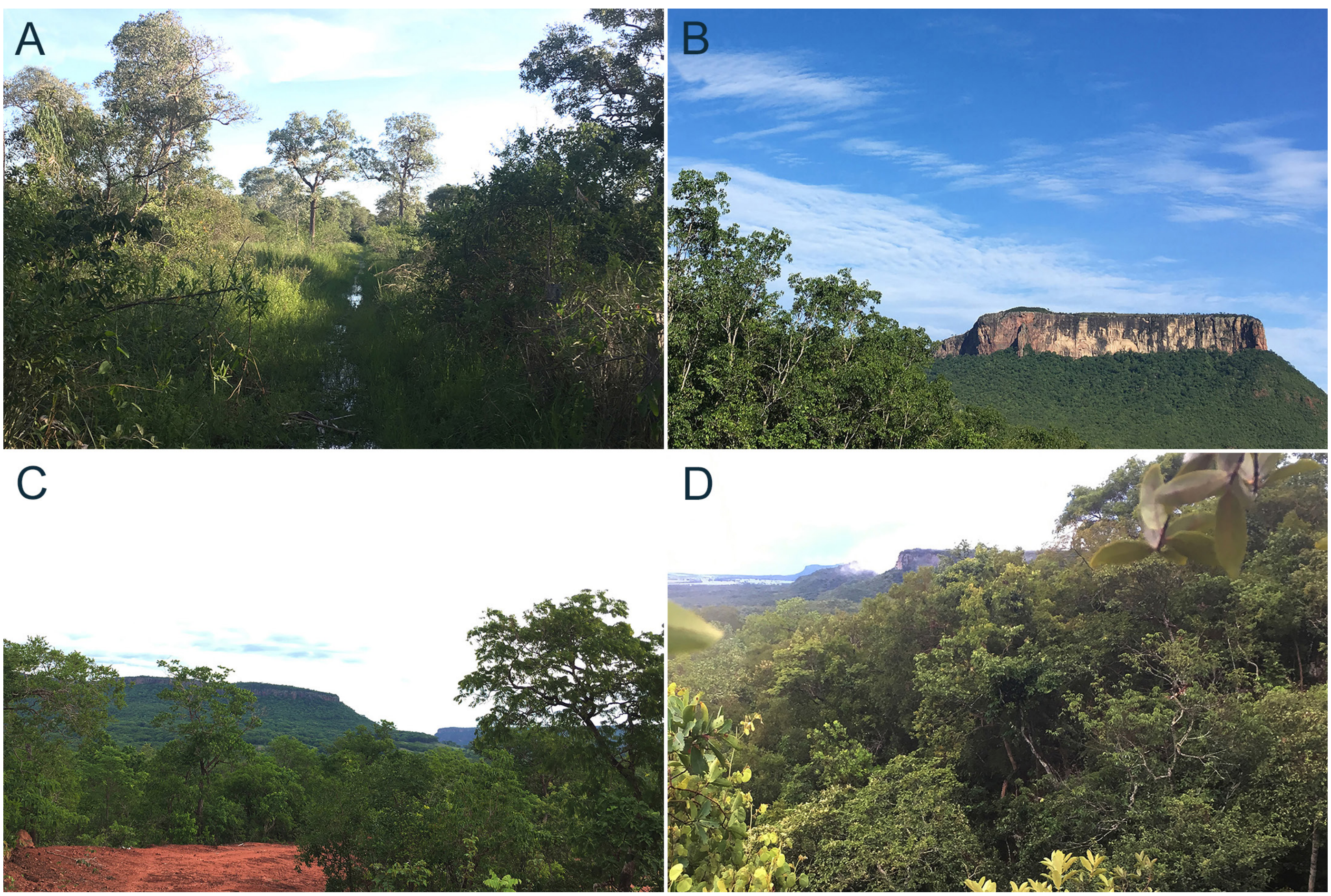

Figure 2. Sampled habitats in Corguinho Municipality, Mato Grosso do Sul, Brazil: swamp (A), typical plateau (B), dirt road through Cerrado vegetation (C), and hillside forest (D). Photographs by D.J. Santana.

AMP), located in Campo Grande, Mato Grosso do Sul, Brazil (Appendix I).

The threat status of each species was based on listings in the IUCN Red List of Threatened Species (IUCN 2025) and the Red List of Endangered Brazilian Fauna (Livro Vermelho da Fauna Brasileira Ameaçada de Extinção) (MMA 2018). We used the classification proposed by Souza et al. (2017) to identify the biomes with which recorded anuran species were associated.

Results and Discussion

We recorded 32 anuran species from five families in Corguinho Municipality (Table 2, Fig. 3). The greatest species richness (14 species, 43.7% of the total number of species) was in the family Leptodactylidae, followed by Hylidae (11 species, 34.4%), Bufonidae (three species), Microhylidae (three species), and Dendrobatidae (one species). None of the species are listed in the Brazilian Red List of Endangered Species (MMA 2018) or in threatened categories in the IUCN Red List of Threatened Species (IUCN 2025).

Our study area is in a transition zone between Cerrado and Pantanal biomes. Most of the species recorded (e.g., *Rhinella diptycha*, *Pithecopus azureus*, *Leptodactylus labyrinthicus*, and *Physalaemus albonotatus*) reflected this transitional nature by occurring in both biomes. These are widespread species typical of open habitats found across both biomes (Uetanabaro et al. 2007; Valdujo et al. 2012). Some other species (e.g., *Boana raniceps* and *Dermatonotus muelleri*) are broadly distributed along the South American diagonal of open formations (Oliveira et al. 2018; Camurugi et al. 2022). Only two species (*Ameerega berohoka* and *Pseudopaludicola ameghini*) are endemic to the Cerrado; both are associated with the surrounding plateau regions (Neves et al. 2020).

Based on a new record from the Corguinho region, we also report a range extension for *Pseudopaludicola ameghini*. This species is endemic to Brazil and was previously known only from Chapada dos Guimarães and Vila Bela da Santíssima Trindade in the state of Mato Grosso (Pansonato et al. 2013). Our record extends the known distribution by about 490 km to the south (Fig. 4). This could lead to future studies on the species' population status and conservation, especially considering that the newly recorded area is subject to various anthropogenic threats that include wildfires, illegal logging, and cattle intrusion (Spanholi 2019). A photographed voucher has been deposited in the Coleção Zoológica da Universidade Federal de Mato Grosso do Sul (ZUFMS-AMP 8619, Fig. 3H) and the identity of the species was confirmed by Dario Cardozo.

Additionally, we highlight possible misidentifications in the literature. Populations referred to as *Ameerega braccata* by Souza et al. (2017) likely were *Ameerega berohoka* (Sant'Anna et al. 2017). Similarly, populations identified as *Pseudis*

Table 2. Species of anurans recorded in Corguinho Municipality, Mato Grosso do Sul, Brazil.

Bufonidae
Rhinella bergi (Céspedez 2000)
Rhinella diptycha (Cope 1862)
Rhinela stanlaii (Lötters and Köhler 2000)
Dendrobatidae
Ameerega berohoka Vaz-Silva and Maciel 2011
Hylidae
Boana raniceps (Cope 1862)
Dendropsophus elianeae (Napoli and Caramaschi 2000)
Dendropsophus minutus (Peters 1872)
Dendropsophus nanus (Boulenger 1889)
Lysapsus limellum (Cope 1862)
Pithecopus azureus (Cope 1862)
Pseudis platensis Gallardo 1961
Scinax constrictus Lima, Bastos, and Giaretta 2005
Scinax fuscomarginatus (Lutz 1925)
Scinax fuscovarius (Lutz 1925)
Trachycephalus typhonius (Linnaeus 1758)
Leptodactylidae
Adenomera diptyx (Boettger 1885)
Leptodactylus macrosternum Miranda-Ribeiro 1926
Leptodactylus elenae Heyer 1978
Leptodactylus fuscus (Schneider 1799)
Leptodactylus labyrinthicus (Spix 1824)
Leptodactylus luctator (Hudson 1892)
Leptodactylus podicipinus (Cope 1862)
Leptodactylus syphax Bokermann 1969
Physalaemus albonotatus (Steindachner 1864)
Physalaemus centralis Bokermann 1962
Physalaemus cuvieri Fitzinger 1826
Physalaemus nattereri (Steindachner 1863)
Pseudopaludicola ameghini (Cope 1887)
Pseudopaludicola mystacalis (Cope 1887)
Microhylidae
Chiasmocleis mehelyi Caramaschi and Cruz, 1997
Dermatonotus muelleri (Boettger 1885)
Elachistocleis bicolor (Guérin-Méneville 1838)

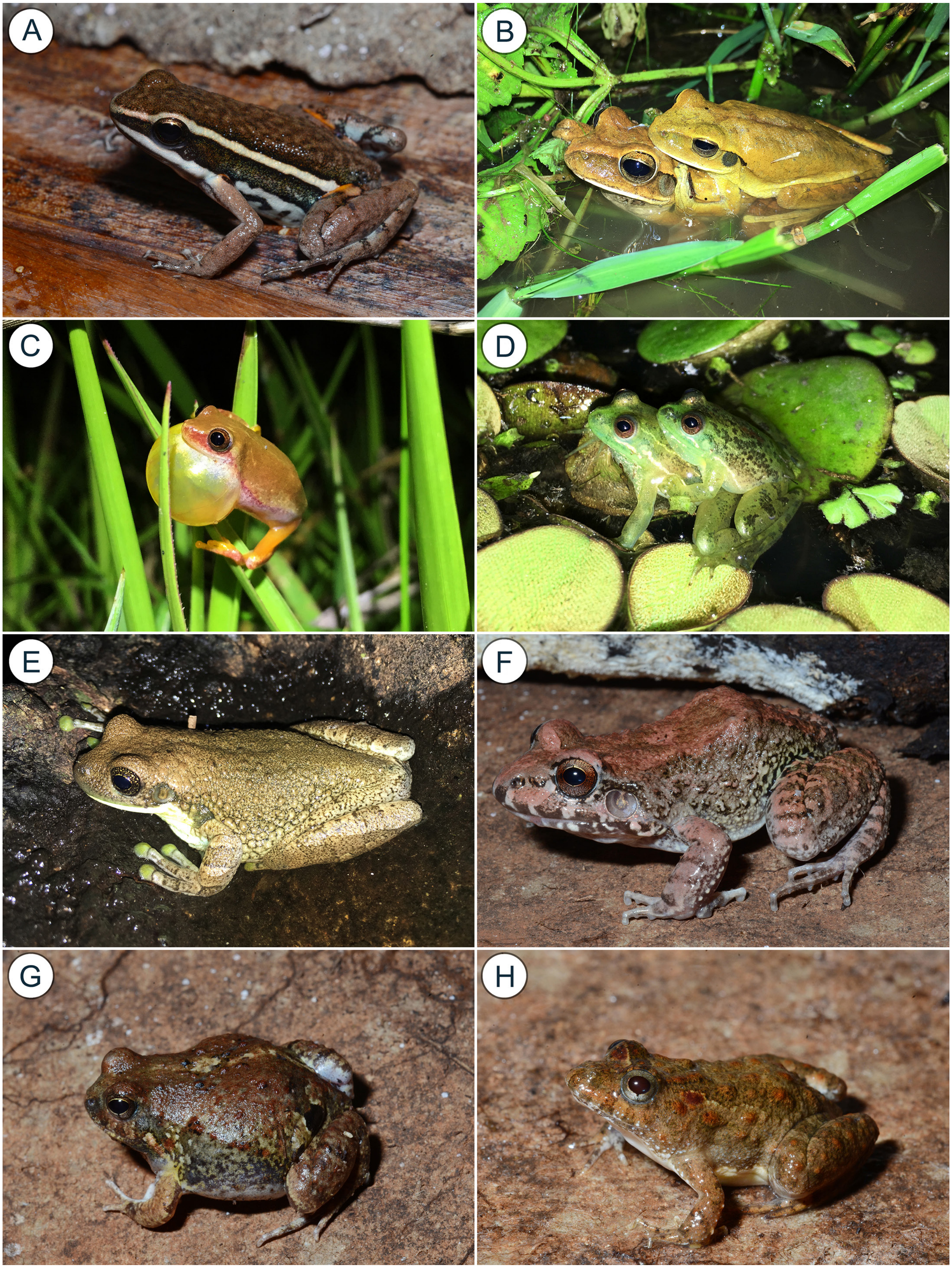

Figure 3. Anuran species recorded during the amphibian inventory in Corguinho Municipality, Mato Grosso do Sul, Brazil: *Ameerega berohoka* (A), *Boana raniceps* (B), *Dendropsophus elianeae* (C), *Lysapsus limellum* (D), *Trachycephalus typhonius* (E), *Leptodactylus syphax* (F), *Physalaemus nattereri* (G), *Pseudopaludicola ameghini* (H). Photographs by D.J. Santana.

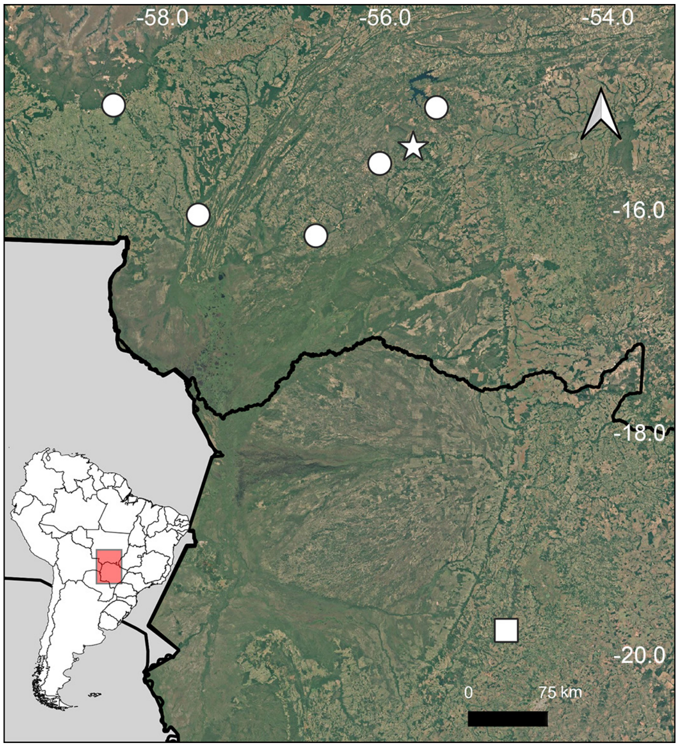

Figure 4. Distribution map of *Pseudopaludicola ameghini*. The star indicates the type locality, circles represent literature records, and the square marks the new record in Corguinho Municipality, Mato Grosso do Sul, Brazil, extending the known range approximately 490 km to the south.

paradoxa in the same study likely were *Pseudis platensis*. The latter reassignment is supported by the known geographic distributions of the two species, *P. paradoxa* is associated with Amazonian and other northern Brazilian watersheds (Garda et al. 2010), whereas *P. platensis* occurs in the Paraná River Basin (Neves et al. 2020).

Transitional zones play a key role in facilitating species dispersal, gene flow, and ecological interactions between adjacent biomes (Kolasa and Zalewski 1995; Smith et al. 1997; Urbina-Cardona et al. 2006). Despite their ecological importance and high conservation value (Kernaghan and Harper 2001), these areas remain poorly studied in Brazil, particularly along the imprecisely defined boundary between the Pantanal and Cerrado biomes (Eiten 1978). Basic biodiversity data are largely lacking for large portions of the Cerrado in the state of Mato Grosso do Sul (Ferreira et al. 2017), limiting our understanding of species distributions and conservation needs.

Our study contributes to filling this gap by providing an updated inventory of anuran species in the Municipality of Corguinho and documenting a range extension for *Pseudopaludicola ameghini*. The latter expands the known distribution of the species and underscores the potential for additional discoveries in the region. Ongoing inventories in transitional areas such as this are essential for establishing conservation priorities and guiding management strategies, especially in the face of growing anthropogenic threats (Trindade-Filho et al. 2012; Verdade et al. 2012).

Acknowledgements

We thank J.F.C. Carrillo for reviewing an early draft of this manuscript; Mapinguari Lab team members for their help conducting species inventories in the area over the years; and Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq processes 404239/2021-8) and Fundação de Apoio ao Desenvolvimento do Ensino, Ciência e Tecnologia do Estado de Mato Grosso do Sul (FUNDECT process 054/2017) for financial support. BDV thanks Coordenação de Aperfeiçoamento de Pessoal de Nível Superior for her scholarship (CAPES – Funding code 001) and DJS thanks Conselho Nacional de Desenvolvimento Científico e Tecnológico for his research fellowship (CNPq 311284/2023-0).

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Appendix I. Specimens of amphibians collected in Corguinho Municipality, Mato Grosso do Sul, Brazil, and deposited in the Coleção Zoológica da Universidade Federal de Mato Grosso do Sul – Amphibia (ZUFMS-AMP).

Rhinella bergi – ZUFMS-AMP 11212; *Rhinella diptycha* – ZUFMS-AMP 10744, 11228; *Rhinella stanlaii* – ZUFMS-AMP 13351–56; *Ameerega berohoka* – ZUFMS-AMP 10579–92, 10754, 11213–15; *Boana raniceps* – ZUFMS-AMP 7982, 8814, 8816–19, 8821–22, 8825–28, 8830–38, 8840–42, 8844–55, 8858, 8861, 8863, 8866, 8868, 8870, 8877, 9746–48, 9751, 9753–55, 9757–58, 9760, 10740; *Dendropsophus elianeae* – ZUFMS-AMP 10743; *Dendropsophus minutus* – ZUFMS-AMP 8127, 9741–44, 10742, 14070; *Dendropsophus nanus* – ZUFMS-AMP 6645, 8171–74, 9270–71; *Pithecopus azureus* – ZUFMS-AMP 8523–24, 9715–28; *Scinax constrictus* – ZUFMS-AMP 10753; *Scinax fuscomarginatus* – ZUFMS-AMP 10745; *Scinax fuscovarius* –ZUFMS-AMP 10741, 10745, 11220–21, 14864–66; *Pseudis platensis* – ZUFMS-AMP 10577, 10725; *Leptodactylus elenae* – ZUFMS-AMP 10737; *Leptodactylus macrosternum* – ZUFMS-AMP 5605–06, 5612–17, 9667–68, 13010–11; *Leptodactylus fuscus* – ZUFMS-AMP 10736, 11241; *Leptodactylus labyrinthicus* – ZUFMS-AMP 10739; *Leptodactylus luctator* – ZUFMS-AMP 10750; *Leptodactylus podicipinus* – ZUFMS-AMP 10729–35, 10747–48, 11224; *Leptodactylys syphax* – ZUFMS-AMP 10609–10, 10613–21, 10751–52, 11230–32; *Physalaemus albonotatus* – ZUFMS-AMP 8435, 9675–78; *Physalaemus centralis* – ZUFMS-AMP 11227; *Physalaemus cuvieri* – ZUFMS-AMP 11225–26; *Physalaemus nattereri* – ZUFMS-AMP 10728, 11217–19, 14417–18; *Pseudopaludicola ameghini* – ZUFMS-AMP 8619; *Pseudopaludicola mystacalis* – ZUFMS-AMP 14740–44; *Chiasmocleis mehelyi* – ZUFMS-AMP 13601; *Dermatonotus muelleri* – ZUFMS-AMP 10726, 10746.