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Newly distribution of *Rhinella gildae* Vaz-Silva et al., 2015 (Anura, Bufonidae): a little known species of the *Rhinella margaritifera* species group

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The genus *Rhinella* Fitzinger, 1826 is one of the most diversified among bufonids (Duellman and Schulte, 1992; Frost, 2017). The *Rhinella margaritifera* species group currently comprises 19 species, which inhabit the forest floors of tropical ecosystems in South America (Vaz-Silva et al., 2015; Frost, 2017). This group of species have a problematic taxonomic history (Hass et al., 1995; Pramuk, 2008; Lavilla et al., 2013; dos Santos et al., 2015), and some species have been only recently described (Fouquet et al., 2007a; Ávila et al., 2010; Moravec et al., 2014; Vaz-Silva et al., 2015). This situation exists for several neotropical amphibian lineages, such as the genera *Boana* and *Engystomops* (Funk et al., 2012), the *Boana albopunctata* and the *B. semilineata* species groups (Caminer et al., 2014; Fouquet et al., 2016), and the nominal species *Dendropsophus minutus* (Gehara et al., 2014). Thus, the implement of integrative approaches are crucial to unveiling the real diversity inside the *R. margaritifera* group (Fouquet et al., 2007b; Ávila et al., 2010; Moravec et al., 2014; dos Santos et al., 2015).

In a recent paper, two new species belonging to the *Rhinella margaritifera* group were described, *R. sebbeni* and *R. gildae* (Vaz-Silva et al., 2015). *Rhinella sebbeni* occurs in Goiânia, Ouro Verde de Goiás, and Niquelândia Municipalities, all in Goiás State, Brazil, along of the Central Brazilian plateau in the *cerrado* formations. *Rhinella gildae* was described based only on two adult males, both from the scientific collection of the Museu Nacional, Rio de Janeiro, Brazil. *Rhinella gildae* was previously known to occur associated with southern Amazonian habitats, at the type locality of São Pedro da Água Branca Municipality (Vaz-Silva et al., 2015). An additional report of this species for Maranhão State may have been presented by Freitas et al. (2017), but specimen examination would be needed to confirm the identity of this population (Vaz-Silva, pers. comm.).

We here present new records for *Rhinella gildae* in the Tocantins State, including the first live image of the species, and briefly provide aspects of its natural history. We performer field samplings on Araguaína and Xambioá Municipalities based on visual surveys along water bodies and pitfall traps with drift-fences, with three traps in both localities. Each trap consisted in seven buckets, buried six meters apart one each other and arranged in "Y" shape. The collected specimens (collection permit 51036-3 ICMBio) were euthanized with 5% lidocaine gel, fixed in 10% formalin, and preserved in 70% alcohol. Voucher specimens have been depositet in the Coleção Zoológica da Universidade Federal de Mato Grosso do Sul (ZUFMS-AMP). Additionally, we analysed specimens from three other Brazilian museums, including Coleção Herpetológica da Universidade de Brasília, Brasília, Distrito Federal (CHUNB), the Museu Nacional do Rio de Janeiro, Rio de Janeiro (MNRJ), and the Museu de Zoologia José Hidasi, Porto Nacional, Tocatins (MZJH). GPS coordinates are given using the datum WGS84.

We provide in this paper new distribution records of *Rhinella gildae* (Fig. 1) for six municipalities in

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Figure 1. Specimens of *Rhinella gildae* in life. Adult male (a), juvenile with light grey pattern (b), juvenile with reddish-orange pattern (c), and a juvenile showing the thanatosis behaviour (b). The sex of juveniles was not determined.

Tocantins State (Fig. 2) based on 17 specimens, 10 from museums and seven from field surveys (Table 1).

During field surveys, we recorded the species in Araguaína and Xambioá Municipalities. In Araguaína Municipality, we collected seven specimens of *R. gildae* (two adult males and five juveniles with sex undetermined) during nocturnal surveys on 30 August 2015, 23 March and 18 October 2016, and 28 February 2017, at the Escola de Medicina Veterinária e Zootecnia da Universidade Federal do Tocantins (ca. 7.1037°S, 48.1978°W, elevation 230 m). The record of *R. gildae* in Araguaína increases its distribution by 228 km in a straight-line distance to the south of the type locality (Vaz-Silva et al., 2015). All specimens were recorded in gallery forest, along a temporary stream known as *Córrego da Vaca*. Adult calling males were observed in the margins of the stream and on fallen tree trunks on 28 February 2017. Additionally, we also report the thanatosis behaviour in this species. During a diurnal activity survey on 18 April 2017 at the same locality, we found one young male of *R. gildae* that, when handled, went into thanatosis (Fig. 1d). In Xambioá Municipality, we found one adult male of *R. gildae* (unvouchered specimen) using pitfall traps with drift fences on 24 March 2017, near the industrial complex of Votorantin Cimentos S.A. (ca. 6.4310°S, 48.4263°W, elevation 160 m). The record of *R. gildae* in Xambioá extends its distribution by nearly 146 km in a straight-line distance south from the type locality. In Xambioá, the pitfall trap was installed inside secondary forest, ca. 50 m away from a permanent stream. We have not determined the sex of this specimen.

Based on specimens from museum, we recovered six localities for *R. gildae* data, including records from Araguaína and Xambioá Municipalities. The additional Tocantins State municipalities where *R. gildae* was include Ananás (6.3671°S, 48.0745°W, elevation 200 m; n = 3), Muricilândia (7.1455°S, 48.6076°W, elevation

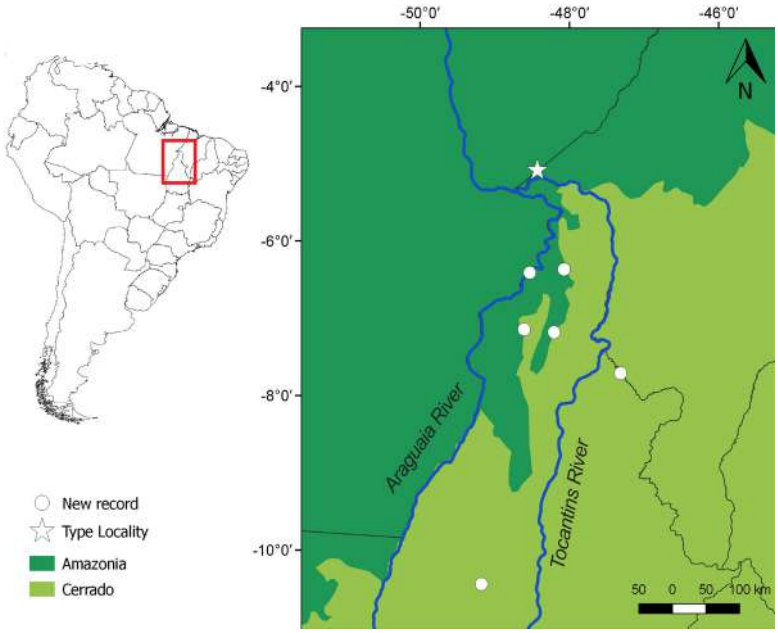

Figure 2. Distribution map of *Rhinella gildae* based on museums specimen and field work, in Tocantins State, northern Brazil.

190 m; n = 1), Goiatins (7.7133°S, 47.3149°W, elevation 190 m; n = 1), and Pium (10.4424°S, 49.1806°W, elevation 275 m; n = 1). We do not evaluated the sex of the specimens from museums. These records increase the species south of the type locality southwards in a straight-line distance by 143 km, 228 km, 309 km, and 605 km, respectively.

We provide in this work the first report of live specimens of this species. Thus, we here include a brief description of colour patterns in juveniles and adults. In life, juveniles of *R. gildae* show a notable colour pattern variation, ranging from light grey (Fig. 1b) to reddish-orange (Fig. 1c). Many dorsal black dots or blotches, as well as a thin, light grey middorsal line, can be present. Black dots or blotches can also be found on the upper surface of the limbs. On the venter, juveniles have a dark grey to black throat and chest, the belly reddish anteriorly, with several black and withe spots. Posteriorly, the belly is scattered with black and white blotches (Fig. 1d). Near the cloacal region, the hidden surfaces of the thighs are cream-coloured; distally, the thighs possess white and black blotches (Fig. 1d). The adult specimens of *R. gildae* recorded here show dorsal colour variation ranging from light grey to dark grey, with a cream middorsal line (wider in juveniles). Irregular light blotches can be found on the dorsum and the upper surface of the limbs (Fig. 1a). The colour pattern in life of the venter in adults of *R. gildae* is unknown. Both in adults and juveniles, pupils are black and irises are gold with black reticulations.

The new distribution records of *R. gildae* reported here show that this specie has a wide distribution, covering habitats ranging from those with a strong Amazon influence to those that are core *cerrado* regions. *Rhinella gildae* was found to be sympatric with many Amazonian amphibian lineages in Araguaína Municipality (where we performed active surveys), including *Adelphobates galactonotus* (Steindachner, 1864), *Allobates crombiei* (Morales, 2002), *Boana cinerascens* (Spix, 1824), *B. multifasciata* (Günther, 1859), *Lithodytes lineatus* (Schneider, 1799), and *Osteocephalus taurinus* Steindachner, 1862. On the other hand, some *cerrado* endemic species were also recorded in Araguaína Municipality, including *Barycholos ternetzi* (Miranda-Ribeiro, 1937), *Leptodactylus pustulatus* (Peters, 1870), *Physalaemus centralis* Bokermann, 1962, and *Rhinella mirandaribeiroi* (Gallardo, 1965). The sympatric occurrence of species that occur both in Amazon and *cerrado* domains (Brasileiro et al., 2008; Oliveira et al., 2010; Valdujo et al., 2012; Cintra et al., 2014; Santos and Vaz-Silva, 2012), highlight the transitional character of the study area (the Araguaia-Tocantins hydrographic

Table 1. Specimens of *Rhinella gildae* examined in this study. Museum abbreviations are listed in the text. Biomes are listed as AM = Amazon and CE = *cerrado*.

Voucher	Municipality	Latitude	Longitude	Altitude	Domain	Source
CHUNB47258	Ananás	-6.368849°	-48.072189°	~200 m	AM-CE ecotone	CHUNB
CHUNB47295	Ananás	-6.368849°	-48.072189°	~200 m	AM-CE ecotone	CHUNB
CHUNB47296	Ananás	-6.368849°	-48.072189°	~200 m	AM-CE ecotone	CHUNB
MNRJ88529	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	MNRJ
MNRJ88530	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	MNRJ
MNRJ88531	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	MNRJ
ZUFMS-AMP07608	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
ZUFMS-AMP07609	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
ZUFMS-AMP07610	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
ZUFMS-AMP07611	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
ZUFMS-AMP07612	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
ZUFMS-AMP07613	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
ZUFMS-AMP07614	Araguaína	-7.181892°	-48.20585°	~230 m	AM-CE ecotone	Present work
MNRJ43941	Goiatins	-7.712612°	-47.314195°	~190 m	CE	MNRJ
MNRJ 73455	Muricilandia	-7.144986°	-48.607815°	~190 m	AM-CE ecotone	MNRJ
MZJH 017	Pium	-10.441658°	-49.178366°	~275 m	CE	MZJH
CHUNB47185	Xambioá	-6.430953°	-48.426319°	~155 m	AM	CHUNB

basin). The processes that may have promoted such distribution pattern are poorly understood at the moment, and comparative phylogeographic studies would provide important insights into the evolutionary history of amphibians along this contact zone between the two largest South America domains.

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