



New records amplify the geographical distribution of *Rondonops biscutatus* Colli et al., 2015 (Squamata, Sauria, Gymnophthalmidae) into the Paraguay river basin, Mato Grosso, Brazil

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Abstract

Rondonops biscutatus is a gymnophthalmid litter-lizard which occurs in the Amazon rainforests and the transitional areas between Amazonia and Cerrado. This species' distribution is strongly biased by a lack of data, possibly because it was recently described, small-bodied, and living in cryptic habits. Here, we present occurrence data of six specimens from four locations in transitional areas between forests in Amazonia and Cerrado (central Brazil), in the upper Paraguay River, at the northern end of the Pantanal, midwestern Brazil. We expand the distribution of this species 507 km east from its original range.

Keywords

Amazon rainforest, biogeography, Cerrado, Iphisini, reptiles.

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Introduction

The squamate family Gymnophthalmidae contains 258 species (Uetz 2019) distributed from southern Mexico and Central America, including some islands in the Caribbean and South America, to the central portion of Argentina (Doan 2003; Vitt and Caldwell 2009; Cacciali et al. 2017; Mora et al. 2019). Despite their wide distribution and high number of species, the gymnophthalmids are among the least known Neotropical lizards given their cryptic habits and small body size (Cacciali et al. 2017).

The genus *Rondonops* (Colli et al. 2015), a member of the tribe Iphisini, contains two species that occur in the Amazonian forests of Brazil: *Rondonops biscutatus* Colli et al. (2015) and *Rondonops xanthomystax* Colli et al. (2015). *Rondonops xanthomystax* occurs in the states of Amazonas and Pará (Colli et al. 2015; Costa and Bernils 2018), whereas *Rondonops biscutatus* has a wider distribution, occurring in the states of Rondônia, Pará, and Mato Grosso, and the distribution of this species covers the Amazon and Araguaia–Tocantins basins (Colli et al. 2015; Abegg et al. 2017; Costa and Bernils 2018). The genus *Rondonops* was recently described (Colli et al. 2015), although *R. biscutatus* was earlier cited as “Gymnophthalmidae sp.” (Gainsbury and Colli 2003; Garda et al. 2013) and “*Colobosaura* sp. nov.” (Hoogmoed et al. 2007).

Despite the recent description of *R. biscutatus*, there are few studies on its biological and ecological traits. This species mainly occupies the leaf-litter (Colli et al. 2015) at sites with a relatively great abundance of small trees, low canopy, dense understory with a few trunks, a high density of termite nests, and few large trees (Garda et al. 2013). Cacciali et al. (2017), when evaluating the phylogeny of the tribe Iphisini, proposed that the genus *Rondonops* is restricted to Amazonian ecoregions. Furthermore, Colli et al. (2015) and Abegg et al. (2017) suggested that *R. biscutatus* might also occur in forests and open habitats in the transitional area between the Amazon and the Cerrado savannas. In this study, we confirm this prediction based on four new occurrences in the Paraguay river basin, where we collected a total of six specimens in Amazonian phytophysiology in Amazon–Cerrado savannas transition area.

Methods

We collected specimens using 12 sets of pitfall traps in seasonally flooded forests at four sites along the Paraguay River, in the municipality of Barra do Bugres (15°05'42"S, 057°14'30"W, DMS), Mato Grosso state. At each point, we installed three sets of Y-shaped pitfall traps, each composed of four 60 L buckets, which were buried within 15 m from the central bucket. The buckets were interconnected by a 70 cm high fence. In each site, we installed pitfall traps along a gradient of distance from the riverbank, at 10, 100 and 200 m. The

traps remained open from September 29, 2017 to October 8, 2017, totaling 480 bucket-nights of sampling effort.

We euthanized voucher specimens by injection of 2% lidocaine hydrochloride (Xylestesin®) and preserved them using 10% formalin. We conserved the voucher specimens in 70% ethanol and deposited them at the Centro de Limnologia, Biodiversidade e Etnobiologia do Pantanal (CELBE), at the Universidade do Estado de Mato Grosso (UNEMAT), Brazil. We collected specimens under the permanent license 8849-1 and expedition registration 10128, granted by the Sistema de Autorização e Informação em Biodiversidade (SISBIO). Also, we performed a review of three specimens, identified as *Colobosaura modesta*, collected by Silva (2005) in forest fragments in Amazon, in the Cabaçal and Jauru river basins, which are tributaries of the Paraguay River, in the Northern Pantanal. These specimens were collected in 2003 using pitfall traps and were deposited in the collection of CELBE/UNEMAT and INPA, Manaus. We used a digital caliper and a stereoscopic microscope to measure and count diagnostic characters, in order to identify specimens based on the original description of *R. biscutatus* (Colli et al. 2015).

Results

Rondonops biscutatus Colli et al., 2015

We collected six specimens of *R. biscutatus* from four locations in a transitional region between the Amazon forests and Cerrado savannas. We found three specimens in the municipality of Barra do Bugres, one in Figueirópolis d'Oeste, and two in São José dos Quatro Marcos, all of them near the banks of the upper Paraguay River (Fig. 1).

New Records. Brazil, Mato Grosso, Barra do Bugres Municipality: ecotone between Amazonia and Cerrado, on the left bank of the Paraguay River (15°05'44.30"S, 057°14'23.52"W), 1 adult male (CELBE-L-0050, 53 mm SVL, femoral pores 18) collected on 6 October 2017 by Odair D. da Silva, Vancleber DS Alves, and Manoel dos S. Filho (Fig. 2).

Brazil, Mato Grosso, Barra do Bugres Municipality: ecotone between Amazonia and Cerrado, on the right bank of the Paraguay River (15°05'40.03"S, 057°14'34.71"W), 2 adult females (CELBE-L-0026 and CELBE-L-0031, 48 and 47 mm SVL) collected on 30 September 2017 by Odair D. da Silva, Thatiane M. da Costa, and Dionei J. da Silva (Fig. 2).

Brazil, Mato Grosso, Figueirópolis d'Oeste Municipality: Amazon forest on the right bank of the Jauru River (15°31'00.35"S, 058°38'29.21" W), 1 adult female (INPA-H 15994, 43 mm SVL), collected by Dionei J. da Silva and Manoel dos S. Filho on 21 February 2003.

Brazil, Mato Grosso, São José dos Quatro Marcos Municipality: Amazon forest on the right bank of the Cabaçal River (15°22'43.86"S, 058°04'34.46" W), 2 adult males, 1 collected by Dionei J. da Silva on 29 January

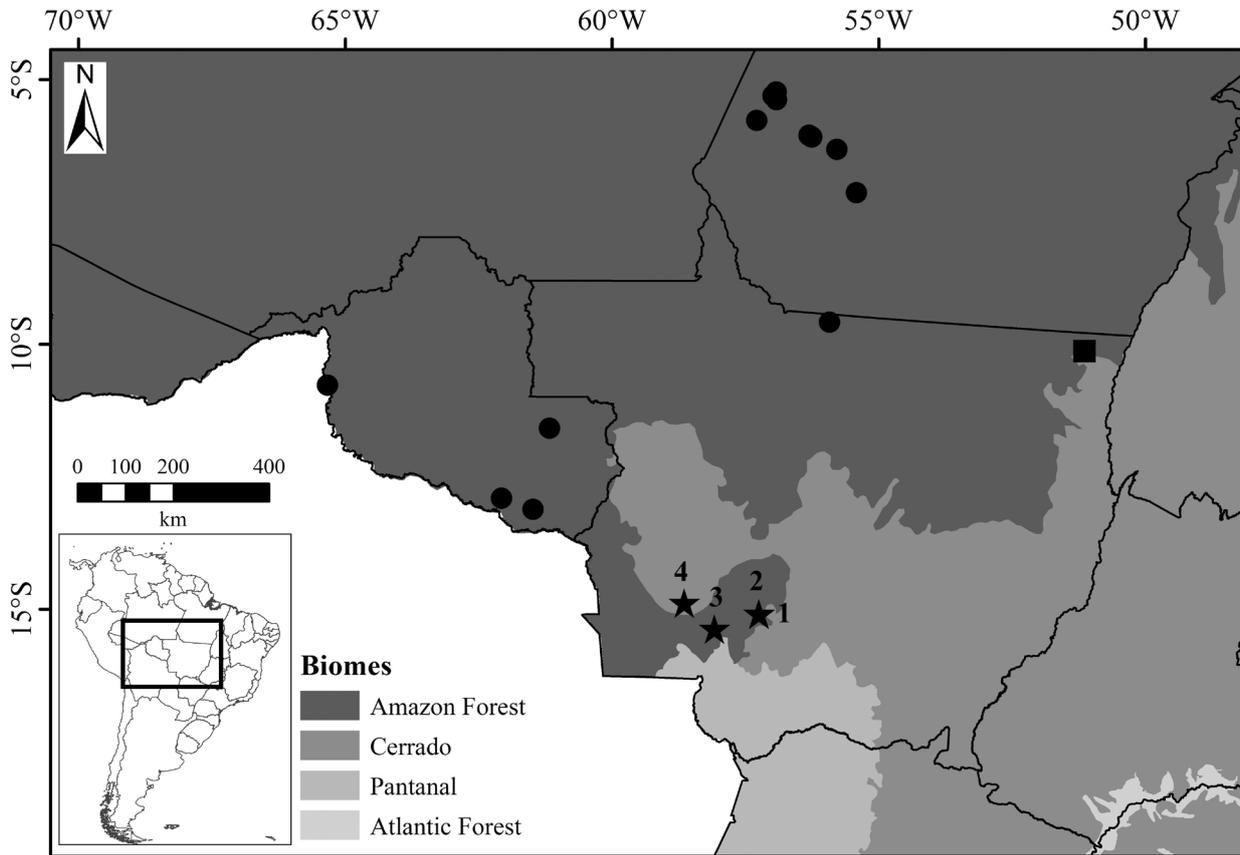


Figure 1. Geographical distribution of *Rondonops biscutatus*. Circles: Colli et al. (2015); square: Abegg et al. (2017); stars: 1, 2 = Barra do Bugres, 3 = Quatro Marcos, 4 = Figueirópolis d'Oeste.

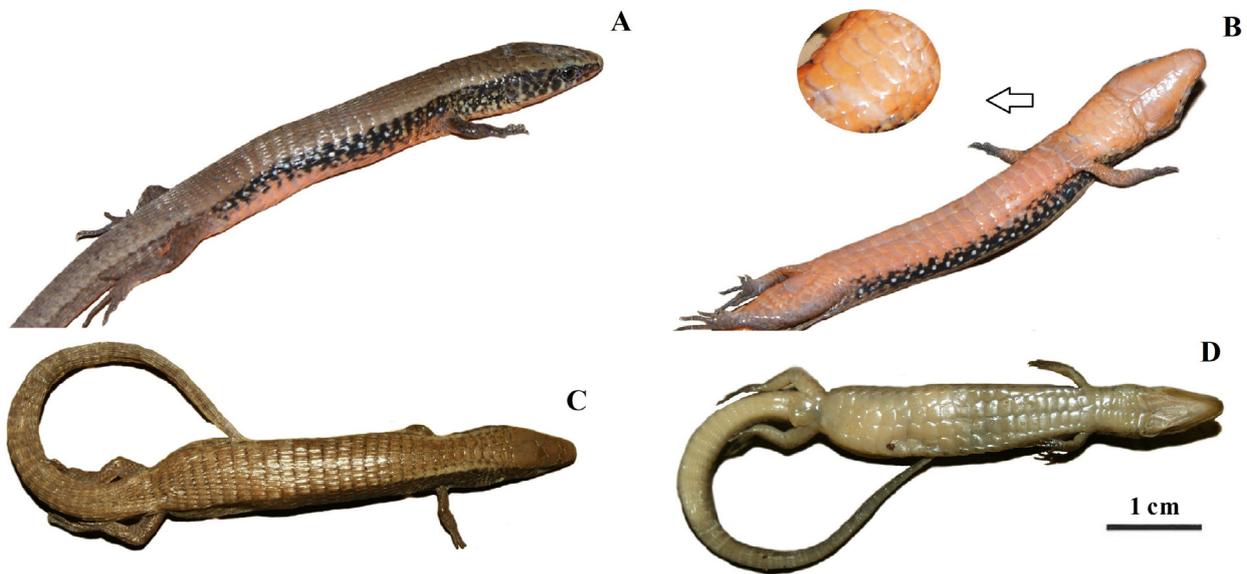


Figure 2. *Rondonops biscutatus* recorded in Barra do Bugres, Mato Grosso. **A, B.** Adult male (CELBE-L-0050): color in life, SVL 53 mm, Femoral pores 18: **(A)** dorsolateral view; **(B)** ventral view, gular region highlighted, with diagnostic characteristic of the species, two rows of wide ventral scales. **C, D.** Adult female (CELBE-L-0031), color in alcohol, SVL 47 mm: **(C)** dorsolateral view; **(D)** ventral view.

2003 (CELBE-L-MZT 123, 38mm SVL), and 1 collected by Manoel dos S. Filho on 5 August 2003 (INPA - H 15995, 46 mm SVL).

Identification. We identified specimens based on the original description of the genus and species (Colli et al. 2015), in which *Rondonops* was described as easily

distinguishable from any other gymnophthalmid lizards. The specimens we found show conspicuous diagnostic characters, such as two longitudinal rows of very wide nuchal scales, extending from the nape to the arm. This extension includes seven smooth and imbricated transverse scales followed by much narrower, lanceolate and mucronate scales (Fig. 1). *Rondonops biscutatus* also

differs from the other Gymnophthalmidae genus, except for *Iphisa*, by having only two rows of very wide ventral scales. *Rondonops biscutatus* can be distinguished from *Rondonops xanthomystax* by its smooth scales on the sides of its neck (keeled in *R. xanthomystax*). Additionally, *R. xanthomystax* presents a wide black stripe covering the entire lateral surface of the head in the superior region of the supralabial, which is absent in *R. biscutatus*, and dark-brown supralabials contrasting with the bright yellow-orange color covering most of the supralabials, infralabials, and ventral parts of the head, while in *R. biscutatus* the supralabials are strongly mottled with dark brown.

Discussion

The description of *R. biscutatus* is relatively recent, and few data on geographic distribution and morphological variation have been reported in the literature. Although the vegetation cover in our study area differed between Cerrado, Amazonia, Pantanal and ecotonal zones (Maurão et al. 2012), we only found the species in an area with Amazonian phytophysiognomy. Thus, our records, indicate that the species is restricted to Amazonian phytophysiognomies, which is consistent with the opinions of Colli et al. (2015), Abegg et al. (2017) and Cacciali et al. (2017). This conclusion is supported by the fact that we have sampled lizards across approximately 200 km along the upper Paraguay River, from the Barra do Bugres (15°05'41.66"S, 057°14'30.08"W) to the Taiamã Ecological Station (16°51'54.20"S, 057°33'11.52" W). Although this ecotonal region is environmentally very heterogeneous, the species has only been found in Amazonian forests characterized by tall trees (>20 m), few epiphytes, relatively distant trees and low abundance of lianas. The understory is dense, with up to 10 cm of leaf litter.

Our records extend the geographical range of *R. biscutatus* 507 km southeast from the southernmost previous record at Cerejeiras, Rondônia. However, we argue that the species distribution does not extend further east into the Cerrado savannas, because the low canopy in the Cerrado savannas is often associated with open understory and high solar incidence, which are suboptimal conditions for a litter lizard such as *R. biscutatus*.

A portion of the range of *R. biscutatus*, in the north, is within protected reserves. However, most of the species' distribution is currently undergoing habitat loss due to strong anthropological changes (Colli et al. 2015; Abegg et al. 2017), especially within the so-called arch of deforestation (Ferreira et al. 2005). In this region, human occupation has resulted in a matrix of monocultures of grains and pastures for cattle ranching associated with or preceded by illegal logging (Fearnside 2010). Likewise, the upper Paraguay River region, where the new records originate, is strongly influenced by soybean monoculture in the headwaters of the river and by the production of sugarcane and cattle ranching where large amounts of

pesticides are used (Tomas 2009). Thus, *R. biscutatus* is under pressure of habitat loss and degradation, as are many Brazilian reptiles, mainly caused by agribusiness activities and the use of agrochemicals, which have been pointed out as the main risk factor for reptiles (Gibbons et al. 2000; Rodrigues 2005; ICMbio 2018).

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Authors' Contributions

ODS, VDSA, TMC, JRM, OMAN, APDB, MAC, CCM, MSF and DJS collected the specimens. ODS, VDSA, ACG, ECF and DJS analyzed the specimens and wrote the first version of the manuscript. JRM produced the distribution map. BRB, ARAI and DJS revised and translated the final version.

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