



New records of *Apostolepis kikoi* Santos et al., 2018 (Serpentes, Dipsadidae) in the state of Mato Grosso, Central-West Brazil

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Abstract

The fossorial snake *Apostolepis kikoi* Santos et al., 2018 is known only from its type locality, in Chapada dos Guimarães, state of Mato Grosso, Brazil. Here, we present the first records of this species after its description, expanding its distribution to transition areas between the Amazon and Cerrado biomes, in the southwestern portion of Mato Grosso. The new record expands the known distribution of *A. kikoi* by 297 km west from the type locality. In addition, we provide data on morphological variation by comparing our sample with the type series.

Keywords

Amazon, biogeography, Cerrado, Elapomorphini, reptiles, snake.

Academic editor: Raul F.D. Sales | Received 19 March 2020 | Accepted 10 August 2020 | Published 21 August 2020

Citation: Fermiano EC, Silva-Alves VD, Silva-Diogo O, Seba MFR, Araujo-Goebel LG, Santos-Filho M, Silva DJ (2020) New records of *Apostolepis kikoi* Santos et al., 2018 (Serpentes, Dipsadidae) in the state of Mato Grosso, Central-West Brazil. Check List 16 (4): 1049–1053. <https://doi.org/10.15560/16.4.1049>

Introduction

Among dipsadid genera of the Elapomorphini tribe, *Apostolepis* Cope, 1862 is endemic to Cisandean South America (Harvey 1999; Lema 2001) and is currently composed of 38 species (Uetz et al. 2020), with 32 occurring in Brazil (Entiauspe-Neto et al. 2020). Species of this genus are mainly fossorial and with diurnal-nocturnal activity (Harvey 1999; Curcio et al. 2011). *Apostolepis* is mainly distributed in open formations such as those found in Cerrado, Caatinga, Pampas, and Pantanal biomes, but some species also inhabit the Amazon

and the Atlantic Forest (Harvey 1999; Harvey et al. 2001; Lema 2001; Ferrarezi et al. 2005; Curcio et al. 2011; Nogueira et al. 2011; Albuquerque and Lema 2012; Colli et al. 2019).

Due to their fossorial habits, *Apostolepis* snakes are considered rare to be sampled (Harvey 1999; Harvey et al. 2001; Lema 2001; Lema and Renner 2012). As a result, there is a low overall representativeness of this genus in museum collections, with some species being known only from their type series or by a few additional

individuals (Harvey et al. 2001; Nogueira et al. 2012; França et al. 2018; Entiauspe-Neto et al. 2019). This sampling deficit has resulted in several taxonomic conflicts, also making it difficult to determine distribution patterns in the genus (Ferrarezi et al. 2005; Curcio et al. 2011; Loebmann and Lema 2012; Nogueira et al. 2012).

Apostolepis kikoi Santos et al., 2018 is a small snake (snout–vent length, 152–310 mm) endemic to Brazil, described based on five individuals (one female as the holotype; three males and one female as paratypes) collected during a fauna rescue program in the reservoir of the Manso Hydroelectric Power Plant, Chapada dos Guimarães, state of Mato Grosso, Central Brazil (Santos et al. 2018). This species is known only from its type locality, with no additional records in the literature since its description (Nogueira et al. 2019). In this study, we present three new records of *A. kikoi* for ecotonal areas between the Amazon and Cerrado biomes in the state of Mato Grosso.

Methods

The specimens were sampled using a total of 126 sets of pitfall traps in 21 forest fragments, inserted in pasture matrix, located between the basins of the Jauru and Cabaçal rivers (15.251°S, 058.715°W and 15.561°S, 058.004°W), in the southwestern part of the state of Mato Grosso, Brazil. The phytophysiognomy present in the fragments is described as Submontane Semi-deciduous Seasonal Forest and is inserted in transition

areas between the Amazon and Cerrado biomes, in Mato Grosso (IBGE 2004; Silva Junior et al. 2019). In each fragment, six series of traps were installed with five 24 L buckets buried at ground level, arranged every 10 m and interconnected by 80 cm high guide fences. The sets of traps were arranged in the pasture and every 50 m towards the interior of the fragment. The traps remained open for ten consecutive days in each fragment, between January 2002 and August 2004.

The captured individuals were euthanized with ether, fixed using 10% formaldehyde, preserved in 70% alcohol, and deposited in the Museu de Zoologia de Tangará da Serra (MZT), Universidade do Estado de Mato Grosso, Brazil. The collections took place under license numbers 033/02, 004/03 and 057/04, granted by the Coordenação de Gestão de Uso de Espécies da Fauna, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis. A digital caliper (Digimess 100.176BL) was used to measure the specimens and a stereoscopic microscope for counting and observing diagnostic characters. The identification of the collected specimens was based on the original description of *Apostolepis kikoi* (Santos et al. 2018).

Results

Apostolepis kikoi Santos et al., 2018

New records (Fig. 1). BRAZIL • 1 adult ♀ (Fig. 2); Mato Grosso state, São José dos Quatro Marcos municipality,

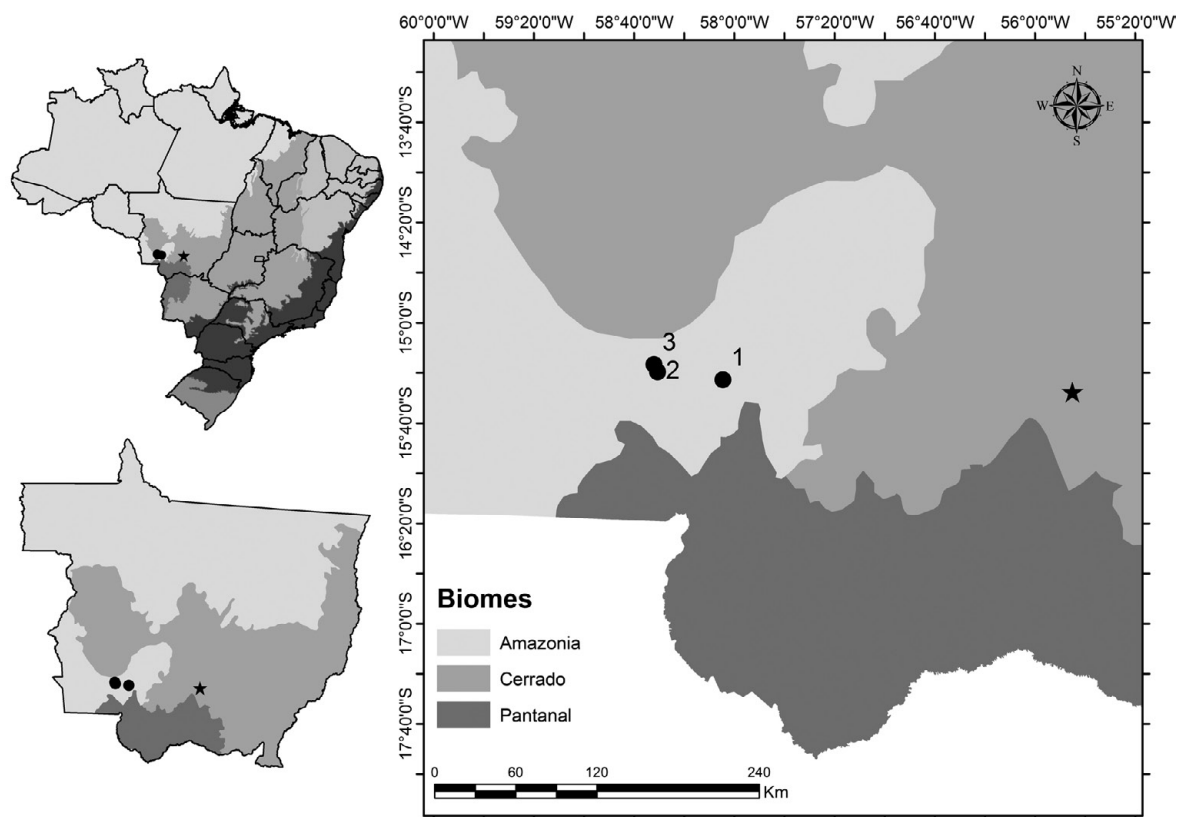


Figure 1. Geographic distribution of *Apostolepis kikoi*. Star: type locality in Chapada dos Guimarães, Mato Grosso state. Circles (new records): 1, São José dos Quatro Marcos municipality; 2 and 3, Araputanga municipality.



Figure 2. Adult female of *Apostolepis kikoi* (MZT 0011) recorded in São José dos Quatro Marcos municipality, state of Mato Grosso. Color in alcohol. **A.** Dorsal view. **B.** Lateral view of the head. Scale bars: 1 cm.

Cabaçal river basin; 15.3775°S, 058.0763°W; 173 m a.s.l.; 30 July 2003; Dionei José da Silva and Manoel dos Santos-Filho leg.; collected 100 m from the edge of a forest fragment of 46 ha; MZT 0011. • 1 adult ♂; Mato Grosso state, Araputanga municipality, Cabaçal river basin; 15.2766°S, 058.5344°W; 370 m a.s.l.; 22 Aug. 2004; Dionei José da Silva and Manoel dos Santos-Filho leg.; collected in the edge of a forest fragment of 71 ha; MZT 0052. • 1 adult ♂; Mato Grosso state, Araputanga municipality, Jauru river basin; 15.3311°S, 058.5105°W; 349 m a.s.l.; 02 Aug. 2004; Dionei José da Silva and Manoel dos Santos-Filho leg.; collected near the center of a forest fragment of 79 ha; MZT 0058.

Identification. *Apostolepis kikoi* differs from all congeners by a combination of the following diagnostic characters: triangular blotch covering portions of the third to

sixth supralabials; white nuchal collar present; five dorsal stripes; distinct and wide paravertebral lines; paraventral sides without spots; 203–209 ventral scales; 26–30 subcaudals; 15 dorsal rows at midbody; six supralabials and seven infralabials (Santos et al. 2018). In addition, according to Santos et al. (2018), *A. kikoi* presents the fifth and sixth supralabials in contact with the parietals; lack of temporal scales; one preocular; one supraocular and one postocular; nasal scale in contact with the pre-ocular; fourth supralabial with rectangular shape; and four infralabials coming into contact with the first pair of chin shields. The three specimens of this study match the type series of *A. kikoi* (Santos et al. 2018), except for some slight variations (Table 1): MZT 0011 (female) has a smaller number of subcaudals scales; MZT 0052 (male) has a smaller number of dorsal scales of black caudal band; and MZT 0058 (male) has a

Table 1. Comparison between the new individuals of *Apostolepis kikoi* and type series: snout-vent length (SVL), infralabials (IL), supralabials (SL), tail length (TL), ventrals (VE), subcaudals (SC), dorsal rows (DO), and number of dorsal scales of black caudal band (DBB). Measurements in mm.

	MZT 0011 (female)	MZT 0052 (male)	MZT 0058 (male)	Santos et al. (2018)
SVL	310	290	270	152–310
IL	7/7	7/7	7/7	7/7
SL	6/6	6/6	6/6	6/6
TL	26	30	31	16–38
SC	24	29	30	26–30
VE	209	207	209	203–209
DO	15	15	15	15
DBB	8	5	8	7–10

triangular blotch covering only the third to fifth supralabial portions.

Discussion

The collection of only three individuals of *Apostolepis kikoi* over 32 months of sampling at 21 sites during our study suggests that this species, like its congeners, is rare. Several herpetofauna inventories have been carried out in Mato Grosso, including faunal rescues in hydroelectric power plants, and *A. kikoi* was not recorded (Nascimento et al. 1988; Marques et al. 2005; Silva-Junior et al. 2009; Ávila and Kawashita-Ribeiro 2011; Santos et al. 2011; Tavares et al. 2012; Kawashita-Ribeiro et al. 2013; Pinheiro et al. 2015; ICMBio 2016). Despite this, it is possible that this species occurs in other localities of Mato Grosso since there are no geographic barriers in the region (Martins and Lema 2015). Thus, the absence of *A. kikoi* records in other localities can be explained by insufficient sampling, the difficulty in collecting fossorial organisms and/or divergences in identification.

The morphological variations found in comparison to the specimens presented in Santos et al. (2018) are probably due to the low number of specimens of the type series. Although the female (MZT 0011) presents a smaller number of subcaudals scales (24), the other diagnostic characters correspond to the description of the type series. This variation can be related to sexual dimorphism, as reported for other *Apostolepis* species (Curcio et al. 2011). The triangular blotch covering smaller supralabial portions in one of the males (MZT 0058) can be an intraspecific variation, since all individuals are adults, and not due to the development stage, as observed by Lema et al. (2017). However, considering that intraspecific variations and polymorphism may occur (see Entiauspe-Neto et al. 2014; Guedes et al. 2018), we reinforce the need for more taxonomic studies.

Due to the recent description and apparent rarity, the distribution of *A. kikoi* was previously restricted to its type locality. Our records in São José dos Quatro Marcos and Araputanga represent the first after its description, extending the known distribution of *A. kikoi* by 297 km west from its type locality. The lack of information

on the natural history, distribution, and conservation of this species, resulting from the low number of specimens observed since its description, make it difficult to determine the current threat status for the species. Besides, it is worrying that the new recorded locations, corresponding to a transition area between the Amazon and Cerrado biomes, are inserted in a region highly pressured by deforestation and cattle ranching activity (Silva et al. 2014). Habitat loss is one of the main threats to the conservation of Brazilian reptiles (ICMBio 2018) and, therefore, conservation efforts are essential to guarantee the permanence of *A. kikoi* in these areas.

Acknowledgements

We are grateful to the Coordination for the Improvement of Higher Education Personnel (CAPES) for the Master's scholarship grant to ECF, LGAG, and ODS; to the National Council for Scientific and Technological Development (CNPq) for the Scientific Initiation scholarship granted to MFRS; and to the Mato Grosso Research Foundation (FAPEMAT) for the scholarship granted to VDSA. We also thank Antonio Miguel Olivo Neto for building the distribution map, Ana Paula Dalbem Barbosa for reviewing the English language, and the subject editor and two reviewers for their important contributions and comments, which helped considerably to improve this manuscript.

Authors' Contributions

DJS and MSF collected the specimens. ECF analyzed the specimens. All authors wrote the manuscript.

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