

NOTA***Xenodon guentheri* Boulenger 1894 (SQUAMATA, DIPSADIDAE): NEW STATE RECORD AND KEY TO THE GENUS *Xenodon* IN THE STATE OF RIO GRANDE DO SUL, SOUTHERN BRAZIL.****Arthur Diesel Abegg^{1*}, Rafael Lucchesi Balestrin², Martin Schossler², Javier Toso³ & Ivo Rohling Ghizoni- Jr ⁴**

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ABSTRACT

The dipsadid snake, *Xenodon guentheri*, endemic to Brazil, was recorded for the first time in the state of Rio Grande do Sul. Two specimens were found in São José dos Ausentes on 12 May 2014 and 14 April 2016. We reviewed the records of *X. guentheri* in scientific collections and a map was generated with the points of occurrence of the species throughout its distribution range. In addition, we also present a dichotomous key to identify species of the genus *Xenodon* in the State of Rio Grande do Sul.

Keywords: Araucaria forest, geographical distribution, Serpentes.

RESUMEN

***Xenodon guentheri* (Squamata, Dipsadidae): extensión de distribución, nuevo registro estatal y clave para el género *Xenodon* en el estado de Rio Grande do Sul, sur de Brasil.** La serpiente dipsádida *Xenodon guentheri*, endémica de Brasil, se registró por primera vez en el estado de Rio Grande do Sul. Dos especímenes fueron encontrados en São José dos Ausentes el 12 de mayo de 2014 y el 14 de abril de 2016. Se revisaron los ejemplares de *X. guentheri* en las colecciones científicas y con los puntos de ocurrencia de la especie se generó un mapa de toda su área de distribución. Además, presentamos una clave dicotómica para identificar las especies del género *Xenodon* del Estado de Rio Grande do Sul.

Palabras clave: distribución geográfica, Mata de Araucaria, Serpentes.

The genus *Xenodon* Boie 1827, comprises 12 species of Xenodontinae snakes distributed from Mexico in North America to Uruguay and Argentina, east of the Andes, in South America (Peters & Orejas-Miranda, 1970; Masiero, 2006; Grazziotin *et al.*, 2012; Uetz, 2015). In Brazil there are 10 species, and the genus is distributed throughout almost the whole country, from the Amazon rainforest in the northern region, to the Sulinos fields in the far south (Marques *et al.*, 2001; Freitas, 2003; Marques *et al.*, 2005; Bérnils & Costa, 2012; Fraga *et al.*, 2013). Of these, four have been recorded in Rio Grande do Sul in southern Brazil: *Xenodon merremii* (Wagler in Spix, 1824), *X. dorbignyi* (Duméril, Bibron & Duméril, 1854), *X. newwiedii* Günther, 1863 and *X. histricus* (Jan, 1863).

Although the biology and anatomy of some species have been well studied over the years, such as that of *Xenodon dorbignyi* and *X. merremii* (Vanzolini *et al.*, 1980; Oliveira *et al.*, 2001; Masiero, 2006; Pizzatto *et al.*, 2008; Tozetti *et al.*, 2010), there is still lack of basic information about the geographic distribution and natural history of several species, such as *X. guentheri* (Rodrigues, 2005).

Xenodon guentheri Boulenger, 1894, is endemic to Brazil (Bérnils & Costa, 2012) and occurs only in the southern region of the country, from the state of Paraná to the state of Santa Catarina, in an area of approximately 85.000 km² (Bérnils, 2009; Barbo, 2012). It is known only in the higher parts (Table 1) of the plateaus and mountains, and is considered endemic to the Araucaria forests (Morato, 1995; Bérnils *et al.*, 2007; Kunz & Ghizoni-Jr, 2009). Two records from the Museu de Ciências da Pontifícia Universidade Católica do Rio Grande do Sul to the state of São Paulo were considered erroneous by Morato (1995). In Campbell & Lamar (2004) there is a photograph of *X. guentheri* with the procedence «Rio Grande do Sul», authored by Dr. Otavio A. V. Marques, of Instituto Butantan. This specimen was referred to the herpetological collection of the Instituto Butantan, with the origin Porto Alegre, capital of the state of Rio Grande do Sul. However, this city is outside the area of Araucaria Forest domain, where *X. guentheri* is endemic, and the locality lacks the elevation consistent with the other gathered records by us for the species. As it was not possible to contact the specimen collector to clarify these issues, we conclude that this record should be considered a unconfirmed record.

Very little is known about the natural history of *X. guentheri*, and no exclusive studies have been published about this species. Morato *et al.* (1995) refer to the status of *Xenodon guentheri* as indeterminate in the Red List of Threatened Species of Paraná. Bérnils *et al.* (2004) updated the list of Morato *et al.* (1995) but did not include *X. guentheri* due to changes in the evaluation criteria. Rodrigues (2005) added *X. guentheri* to the “data deficient” (DD) category, according to the criteria of the International Union for Conservation of Nature (IUCN). Barbo (2012) suggested that the species should be included in the “near threatened” (NT) category of the IUCN list and that it may become “vulnerable” (VU) or “endangered” (EN) in the near future, due to anthropogenic changes occurring in the Araucaria forests, culminating in habitat loss for this species, the main threat to the conservation of Brazilian reptiles (Rodrigues, 2005).

In this study, *Xenodon guentheri* was recorded for the first time in the state of Rio Grande do Sul, extending the geographic distribution of the species by approximately 50 km south of São Joaquim (state of Santa Catarina). Moreover, a survey was conducted of the known localities of this species (Fig. 1) using records in the literature and by consulting the following scientific collections: Universidade Federal de Santa Catarina (CHUFSC, Florianópolis),

Table 1. Locality records of *Xenodon guentheri*. The geographical coordinates were obtained from Bérnills (2009) and Google Earth™ software. The localities without coordinates were not used on the map.

State	Municipality (Locality)	Source	Lat.	Long.	Elevation (m)	Source of coordinate
RS	São José dos Ausentes, (Faxinal Preto)	This study	28°27'55.00"S	49°52'35.00"W	1100	Aproximate
RS	São José dos Ausentes, (Faxinal Preto)	This study, DZURGS 7450	28°31'53.74"S	49°52'48.64"W	1330	Aproximate
SC	Caçador	Bérnills (2009); DZURGS 1021, IBSP 25974-5, 42201, 49550, 62955, 66371-2, MCP 782;	26°46'34.63"S	51°00'45.06"W	917	Country seat
SC	Caçador, (Linha São Francisco)	MCP 16846	-	-	-	-
SC	Caçador, (SC 302, Km 26)	MCP 16847	26°50'08.75"S	50°52'34.93"W	1054	Aproximate
SC	Caçador, (Linha Aliança)	MCP 16848	-	-	-	-
SC	Caçador, (Linha do Bugre)	MCP 16849	-	-	-	-
SC	Caçador, (Taquara Verde)	Bérnills (2009); MCP 13170	26°46'07.51"S	51°12'37.01"W	1087	Country seat
SC	Água Doce, (rodovia BR-153, Km 3, fazenda Lago Azul)	Bérnills (2009); MCP 14986	26°38'00.00"S	51°30'30.00"W	1300	Aproximate
SC	Lages	Bérnills (2009); CHUFSC 474, 488, MCN 10066	27°48'26.40"S	50°19'15.78"W	887	Country seat
SC	Lages, (Cajuru)	MCP 16845	-	-	-	-
SC	Lebon Régis, (Fazenda Serra da Esperança)	Bérnills (2009); MCP 17974	26°56'00.00"S	50°42'00.00"W	980	Aproximate
SC	Canoinhas, (Felipe Schmidt)	Bérnills (2009); IBSP 28129	26°11'00.00"S	50°41'30.00"W	760	Aproximate
SC	Canoinhas, (Paciência)	Bérnills (2009); IBSP 21613-4, 23791	26°07'30.00"S	50°38'00.00"W	780	Aproximate
SC	Canoinhas, (Paula Pereira)	Boulenger (1894)	26°03'00.00" S	50°31'30.00"W	760	Aproximate
SC	Joinville	Bérnills (2009); IBSP 23327, 29841	26°14'21.68"S	49°04'38.43"W	880	Aproximate

Table 1. (Cont.)

State	Municipality (Locality)	Source	Lat.	Long.	Elevation (m)	Source of coordinate
SC	Porto União	Bérnils (2009); IBSP 46917-9, 46647	26°14'44.04"S	51°04'34.94"W	855	Country seat
SC	Porto União, (Colônia Santa Maria)	MCP 16996	26°39'59.92"S	50°41'59.76"W	1050	Aproximate
SC	Porto União, (Jangada)	MCP 16820, 16821, 16826	26°22'25.36"S	51°15'08.72"W	896	Aproximate
SC	Porto União, (Engenheiro Eugênio de Mello)	Bérnils (2009); IBSP 2928	26°16'38.05"S	51°04'22.99"W	805	Aproximate
SC	Porto União, (Maratá)	MCP 16819	26°14'13.89"S	51°04'32.77"W	752	Aproximate
SC	Porto União, (Santa Cruz do Timbó)	MCP 17001	26°23'20.03"S	50°52'50.73"W	773	Country seat
SC	Porto União, (Lança)	MCP 16822	26°17'56.48"S	50°58'36.96"W	874	Aproximate
SC	Porto União, (Nova Galícia)	Bérnils (2009); IBSP 21485	26°22'08.67"S	51°09'21.63"W	1076	Aproximate
SC	Porto União, (São Miguel da Serra)	Bérnils (2009); IBSP 32952	26°22'25.56"S	51°04'53.18"W	973	Country seat
SC	Porto União, (Rio dos Pardos)	MCP 16827	26°25'23.05"S	50°57'03.28"W	782	Aproximate
SC	Fraiburgo	Bérnils (2009); IBSP 55642	27°01'25.15"S	50°55'20.56"W	1018	Country seat
SC	Rio das Antas	Bérnils (2009); IBSP 22389	26°53'42.38"S	51°04'04.48"W	873	Country seat
SC	São Bento do Sul	Bérnils (2009); IBSP 338-9, 406-8, 433, 439, 515, 572, 577, 2666, 2931, 55627	26°15'00.26"S	49°23'00.87"W	851	Country seat
SC	São Cristóvão do Sul	Bérnils (2009); MHNCI 744	27°16'01.94"S	50°26'21.52"W	1047	Country seat
SC	São Joaquim	Bérnils (2009); MNRJ 3524	28°17'56.45"S	49°56'12.07"W	1312	Country seat
SC	Vargem Bonita, (Campina da Alegria)	Bérnils (2009); MHNCI 6308	26°52'25.01"S	51°47'31.69"W	879	Country seat
SC	Tangará	Bérnils (2009); IBSP 27780	27°06'16.70"S	51°14'41.68"W	650	Country seat

Table 1. (Cont.)

State	Municipality (Locality)	Source	Lat.	Long.	Elevation (m)	Source of coordinate
SC	Vieira	Bérnils (2009); IBSP 9631, 29661, 50194, 51874; Amaral (1977)	27°00'20.30"S	51°09'16.10"W	700	Country seat
SC	Timbó Grande	MCP 16843	26°37'09.20"S	50°40'20.01"W	978	Country seat
SC	Urubici, (SC 430)	Kunz & Ghizoni-Jr (2009)	28°05'42.00"S	49°38'20.00"W	1150	Aproximate
SC	Urubici, (SC 430)	Kunz & Ghizoni-Jr (2009)	28°05'26.00"S	49°38'13.00"W	1145	Aproximate
SC	Urubici, (Parque Nacional de São Joaquim)	CHUFSC 3044	28°07'44.77"S	49°31'04.59"W	1675	Aproximate
SC	Urubici, (estrada para Morro da Igreja)	Bérnils (2009); DZURGS 4012	28°06'33.08"S	49°29'55.74"W	1580	Aproximate
SC	Urubici, (Vale do Rio Pelotas)	CHUFSC 1164	-	-	-	-
SC	Urubici	MCP 16828, 16829, 16830, 16831	28°00'26.29"S	49°35'23.96"W	910	Country seat
SC	Bocaina do Sul, (BR 282)	Kunz & Ghizoni-Jr (2009)	27°44'26.00"S	49°52'07.00"W	875	Aproximate
SC	Bom Jardim da Serra, <i>Boca da Serra</i>	Bérnils (2009); MZUSP 5183	28°23'30.00"S	49°33'00.00"W	1420	Country seat
SC	Bom Jardim da Serra, (Santa Bárbara)	CHUFSC 77, 83, 87	28°10'00,00"S	49°36'30.00" W	1660	Aproximate
SC	Urupema	CHUFSC 222	28°00'41.17"S	49°53'44.07"W	1223	Country seat
SC	Painel	CHUFSC 269	27°55'22.69"S	50°5'59.07"W	1147	Country seat
SC	Rancho Queimado	CHUFSC 812	27°40'26.25"S	49°00'44.74"W	800	Country seat
PR	União da Vitória	Bérnils (2009); MHNCI 766, 1098, 1194-5, 1339, 1466, 1531, 1605, 1680, 1761, 1775, 1813, 1856-60, 2250, 2329, 2335, 3994, 6082; MCP 16817, 16998	26°13'20.04"S	51°05'06.09"W	750	Country seat

Table 1. (Cont.)

State	Municipality (Locality)	Source	Lat.	Long.	Elevation (m)	Source of coordinate
PR	União da Vitória, (Colônia Papuã)	Bérnils (2009); MHNCI 7264; MCP 16825, 16823, 17000	26°05'30.00"S	51°10'00.00"W	920	Aproximate
PR	União da Vitória, (Vila Zulmira)	MCP 16999	-	-	-	-
	União da Vitória, (Colônia São Domingos)	MCP 16824, 16995	-	-	-	-
PR	General Carneiro	MCP 16834	26°25'31.66"S	51°19'03.79"W	908	Country seat
PR	General Carneiro, (Jangada do Sul)	Bérnils (2009); IBSP 801	26°22'30.00"S	51°15'30.00"W	900	Aproximate
PR	General Carneiro, (Salto Lili)	Bérnils (2009); IBSP 25986	26°30'00.00"S	51°16'00.00"W	960	Aproximate
PR	General Carneiro, (Linha Arroio do Gado)	MCP 16840	-	-	-	-
PR	Bituruna	Bérnils (2009); IBSP 32953, MHNCI 5168, 11921; MCP 16838	26°09'34.05"S	51°33'23.13"W	925	Country seat
PR	Bituruna, <i>Colônia</i> (Faxinal dos Santos)	MCP 17002	-	-	-	-
PR	Apucarana	Bérnils (2009); MHNCI 575	23°33'01.75"S	51°27'50.41"W	860	Country seat
PR	Curitiba	Bérnils (2009); IBSP 23205	25°25'00.00"S	49°16'00.00"W	920	Aproximate
PR	Balsa Nova	Bérnils (2009); IBSP 29860	25°34'51.84"S	49°37'46.17"W	879	Country seat
PR	Coronel Domingos Soares	Bérnils (2009); MNRJ 14094	26°13'42.38"S	52°02'09.76"W	1077	Country seat
PR	Cruz Machado	Bérnils (2009); IBSP 28149-52, 28431, 28459, MHNCI 6605	26°01'06.00"S	51°20'59.85"W	816	Country seat
PR	Cruz Machado, (rio Iguaçú, na foz do Rio da Areia)	Bérnils (2009); MHNCI 1812	26°01'00.00"S	51°34'00.00"W	880	Aproximate

Table 1. (Cont.)

State	Municipality (Locality)	Source	Lat.	Long.	Elevation (m)	Source of coordinate
PR	Cruz Machado, (6 Vicinal Vitória)	MCP 16818	-	-	-	-
PR	Inácio Martins	Bérnils (2009); IBSP 29695	25°34'24.71"S	51°04'37.54"W	1228	Country seat
PR	Inácio Martins, (Campina Bonita)	Bérnils (2009); MHNCI 4740	25°38'30.00"S	51°07'00.00"W	1080	Aproximate
PR	Irati, (Água Clara)	Bérnils (2009); IBSP 21530, 23291	25°34'00.00"S	50°57'00.00"W	1030	Aproximate
PR	Mallet	Bérnils (2009); IBSP 21366, 21549;	25°53'15.71"S	50°49'03.97"W	838	Country seat
PR	Mallet, (Dorizon)	MCP 802, 868, IBSP 217, 10044, 26947	25°57'00.00"S	50°51'00.00"W	820	Aproximate
PR	Paula Freitas	Bérnils (2009); IBSP 29234	26°11'24.87"S	50°48'14.51"W	770	Country seat
PR	Paulo Frontin	Bérnils (2009); IBSP 27334, 33258	26°02'32.90"S	50°49'54.67"W	814	Country seat
PR	Paulo Frontin, (Vera Guarani)	Bérnils (2009); IBSP 22659	26°02'00.00"S	50°47'00.00"W	780	Aproximate
PR	São José dos Pinhais	Bérnils (2009); MHNCI 1324	25°31'54.96"S	49°12'12.93"W	905	Country seat
PR	São José dos Pinhais, (Serro e Gemido)	Bérnils (2009); MHNCI 11737	25°41'00.00"S	49°03'00.00"W	1000	Aproximate
PR	Reserva do Iguaçu, Rio Iguaçu, UHE Segredo	Bérnils (2009); MHNCI 1183	25°47'30.00"S	52°06'30.00"W	600	Aproximate
PR	Porto Vitória	MCP 16832	26°10'4.36"S	51°13'53.25"W	835	Country seat
PR	Palmas	Boettger (1905)	26°28'50.55"S	51°59'26.84"W	1078	Country seat
PR	Matos Costa	Bérnils (2009); IBSP 12246-8, 29604, 29606; MCP 16841	26°28'57.26"S	51°09'20.16"W	1162	Country seat
PR	Matos Costa, (Rio dos Porcos)	MCP 16837	-	-	-	-

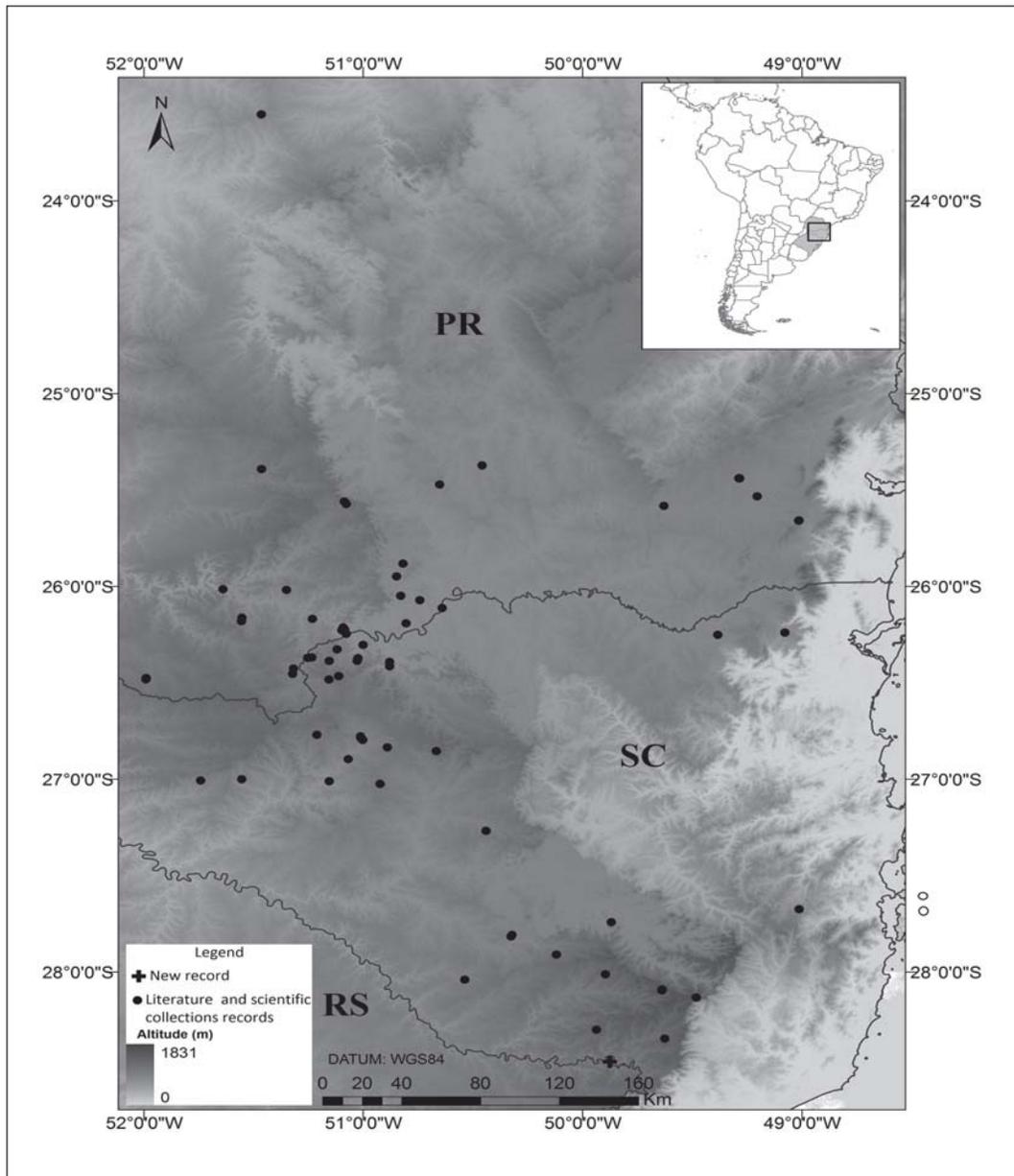


Fig. 1. Distribution map for *Xenodon guentheri* with the new records in São José dos Ausentes (cross), state of Rio Grande do Sul. Other symbols represent the literature and scientific collections records. PR: state of Paraná; SC: Santa Catarina; RS: Rio Grande do Sul.

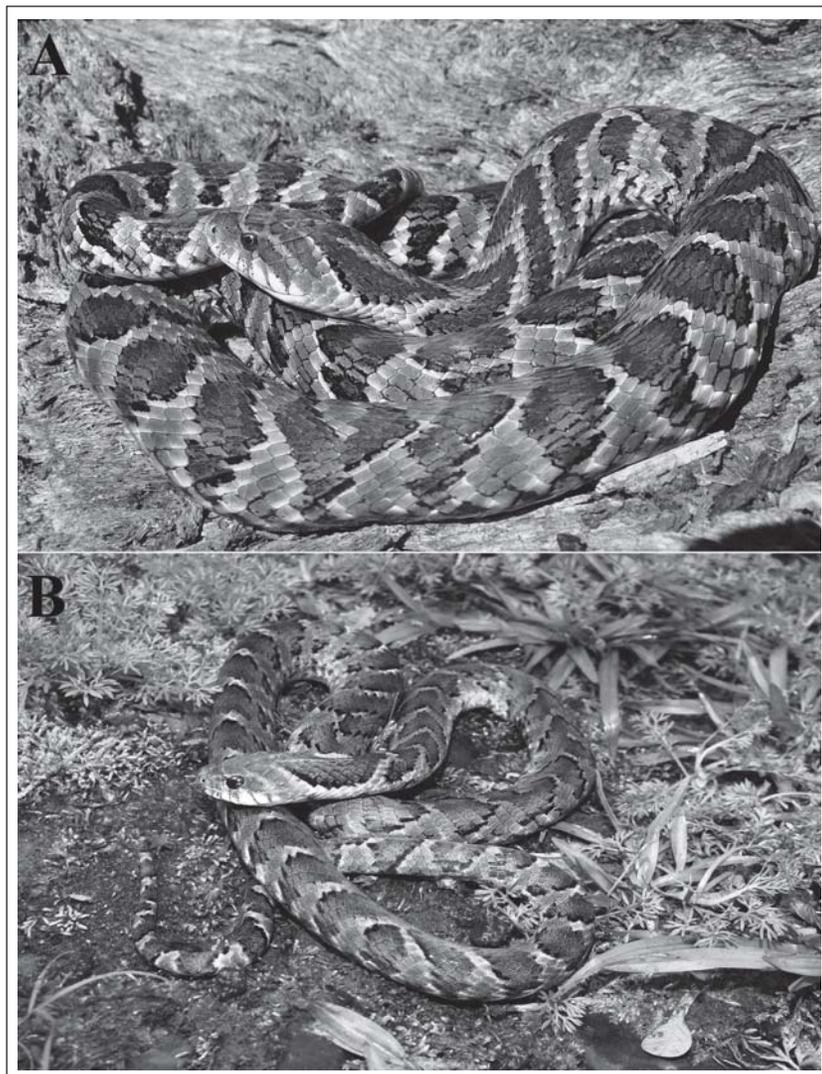


Fig. 2. Specimens of *Xenodon guentheri* observed in São José dos Ausentes, state of Rio Grande do Sul, Brazil.

Museu de Ciências da Pontifícia Universidade Católica do Rio Grande do Sul (MCP, Porto Alegre), Museu de Zoologia da Universidade de São Paulo (MZUSP, São Paulo) and Museu Paraense Emílio Goeldi (MPEG, Belém). As a result of the recent notable records for the genus in the state of Rio Grande do Sul, such as the rediscovery of *Xenodon histricus* (Alves *et al.*, 2013) and the first record of *X. guentheri* for the area, at the end of this article we

present a key to the species of *Xenodon* recorded for the state of Rio Grande do Sul, southern Brazil.

On May 12, 2014 and April 14, 2016 we found two specimens of *X. guentheri* (Fig. 2. A-B) in the municipality of São José dos Ausentes in the vicinity of Faxinal Preto (S 28° 27' 55.00"S, 49° 52' 35.00"W; 1100 m). The first individual (Fig. 2. A) was found at 12:00 hs, moving in a peri-residential area. At that time the temperature was 19°C and the day was sunny. The vegetation that characterizes the region is mixed ombrophilous forest and the area is part of the Zona Núcleo da Reserva da Biosfera da Mata Atlântica in Rio Grande do Sul. The forest where the specimen was found was not very characteristic due to cattle-farming activity and clearing of the understory. The specimen was identified at the site, photographed, and released because we did not have a capture license for its collection. Measurements were not taken, but the specimen was clearly an adult. The second, a male (CRC=510 mm; CT= 630 mm) (Fig. 2. B) was encounter road killed, in the road state RS-020, in the same locality (28°31'53.75"S, 49°52' 48.64"W; 1330 m) in the sandy road than across the pasture with trees (Fig. 3) and deposited in



Fig. 3. Locality (28°31' 53.746"S 49°52' 48.641"W) where it was found the second specimen of *X. guentheri* (DZUFRGS 7450) in the State of Rio Grande do Sul.

the Herpetology Collection of University Rio Grande do Sul (DZUFRGS 7450), the first voucher for the state. The two sites was around seven kilometers distance.

These records of *Xenodon guentheri* for the state of Rio Grande do Sul brings to five the number of species of this genus for this area. Considering the biogeographic provinces of Morrone (2001), *X. guentheri* is the only species of the genus endemic to forests of *Araucaria angustifolia* (Bert.) O. Ktze, where lives in sympatry with three congeners: *X. merremii*, *X. neuwiedii* and *X. histricus* (Bérnils, 2009; Alves *et al.*, 2013) Despite the constant concern about the conservation status of *X. guentheri*, justified by the low rate of encounter of the species over the years and the fragmentation of its habitat, the species has what can be considered a broad geographical distribution, having been recorded in conservation units (Barbo, 2012). However, there are still many gaps in our understanding of the natural history of *X. guentheri*, which need urgent attention. Studies of regional inventories could be of great use to locate and better understand the geographical distribution and biology of populations of this species in the state of Rio Grande do Sul.

Dichotomous key to species of the genus *Xenodon* in the state of Rio Grande do Sul, based on Peters & Orejas-Miranda (1970), Lema (1994) and Masiero (2006):

- 1a. Snout pointed, rostral scale lifted 2
- 1b. Snout rounded, rostral scale normal 3
- 2a. 19 rows of dorsal scales in the middle of the body. Eye in contact with two supralabials *Xenodon histricus*
- 2b. 21 rows of dorsal scales in the middle of the body. Eye usually separated from supralabials by smaller shields *Xenodon dorbignyi*
- 3a. 21 rows of dorsal scales in the middle of the body *Xenodon neuwiedii*
- 3b. 19 rows of dorsal scales in the middle of the body 4
- 4a. More than 12 maxillary teeth, including post- diastema fangs *Xenodon guentheri*
- 4b. 8-9 maxillary teeth, including post- diastema fangs *Xenodon merremii*

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