

First record of *Rhinella achavali* (Maneyro, Arrieta & de Sá, 2004) in the state of Santa Catarina, southern Brazil (Anura: Bufonidae)

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Abstract: *Rhinella achavali* is a large toad associated with lotic environments in Uruguay and Rio Grande do Sul, southern Brazil. Herein, we provide the first record of the species in the state of Santa Catarina, Brazil, extending its range approximately 200 km north from the previous records.

Key words: Amphibia; Araucaria Plateau; range extension; new record

The *Rhinella marina* species group is currently composed of 10 species of large-bodied toads distributed from Texas (USA) to Uruguay: *R. marina* (Linnaeus, 1758), *R. icterica* (Spix, 1824), *R. poeppigii* (Tschudi, 1845), *R. arenarum* (Hensel, 1867), *R. schneideri* (Werner, 1894), *R. rubescens* (A. Lutz, 1925), *R. jimi* (Stevaux, 2002), *R. achavali* (Maneyro, Arrieta & de Sá, 2004), *R. veredas* (Brandão, Maciel & Sebben, 2007), and *R. cerradensis* Maciel, Brandão, Campos & Sebben, 2007 (Maciel et al. 2010; Kolenc et al. 2013).

The species belonging to the *R. marina* group are characterized by a morphological synapomorphy: the point of articulation between the medial ramus of the pterygoid and parasphenoid alae formed by a jagged or “scalloped” suture (see Pramuk 2006; Maciel et al. 2007). The monophyly of the *R. marina* group was also supported by molecular evidence (Maciel et al. 2010), although Vallinoto et al. (2010) found it to be paraphyletic with respect to the *Rhinella crucifer* species group. There are two major clades in the *R. marina* group: one is formed by *R. achavali*, *R. arenarum*, *R. icterica* and *R. rubescens*; and the other by *R. cerradensis*, *R. jimi*, *R. marina*, *R. poeppigii*, *R. schneideri*

and *R. veredas*. The first clade includes species from south-central South America and the second includes species from central South America to southern North America (Maciel et al. 2010).

Rhinella achavali is the most recently described species of large toads belonging to the *R. marina* group occurring in southern Brazil. It is known only from small streams and rivers in hilly regions of Uruguay and the state of Rio Grande do Sul, southern Brazil and almost nothing is known about its biology (Maneyro et al. 2004; Kwet et al. 2006; Maneyro and Kwet 2008). Recently, Alvares et al. (2015) presented an updated distributional map for the species with new records in the state of Rio Grande do Sul, extending its distribution northward to the Southern Brazilian Plateau (Araucaria Plateau), in areas of Seasonal and Araucaria Moist forests, demonstrating that it is not restricted to the Pampa Biome. Still, the new records corroborate its association with lotic environments.

On 17 July 2014, during opportunistic searches for the faunal monitoring program of the São Roque Hydroelectric Dam at the Canoas river, state of Santa Catarina, we found a large number of toads in a permanent pond beside the left margin of the São João river, in Campos Novos municipality (27.392656° S, 051.158055° W, 880 m above sea level; Figure 1), outside our regular sampling areas. The toads belonged to three species: *Rhinella achavali*, *R. icterica* and *R. henseli* (Figure 2). Of these, *Rhinella achavali* was the most numerous species and several pairs were found in amplexus, including one interspecific amplexus between a male *R. achavali* and a female *R. icterica* (see Figure 2b). None of the three species was emitting advertisement calls, but *R. achavali* was clearly in

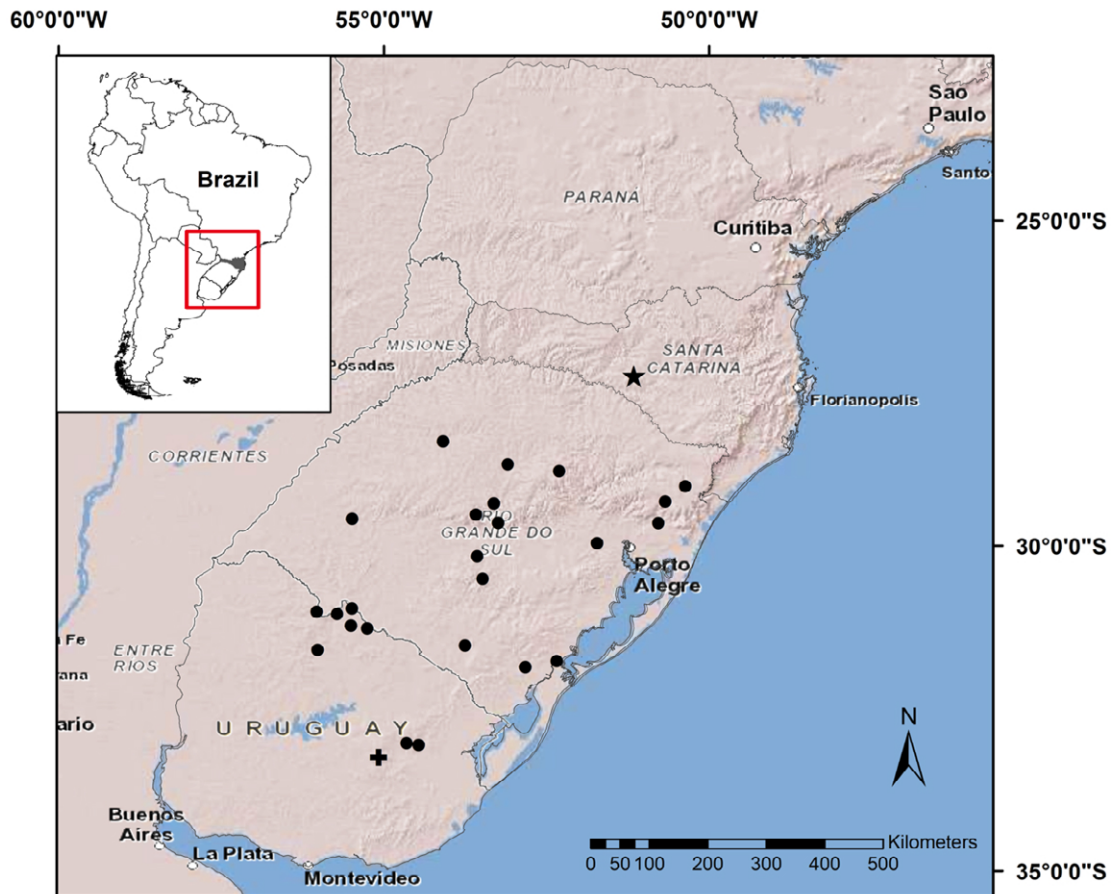


Figure 1. Geographic distribution of *Rhinella achavali*. Black star: New record for the State of Santa Catarina, Brazil; Black circles: literature records (Maneyro et al. 2004; Kwet et al. 2006; Alvares et al. 2015). Black cross corresponds to the type locality.

Table 1. Locality records for *Rhinella achavali*.

Locality	State/department	Country	Coordinates	Source
Rio São João, Campos Novos	Santa Catarina	Brazil	-27.392656°, -51.158055°	This study
Barragem do Salto, Canela	Rio Grande do Sul	Brazil	-29.31993°, -50.67442°	Alvares et al. 2015
Coronel Barros	Rio Grande do Sul	Brazil	-28.396667°, -54.087778°	Alvares et al. 2015
Tainhas State Park, Jaquirana	Rio Grande do Sul	Brazil	-29.084780°, -50.366718°	Alvares et al. 2015
São Sepé	Rio Grande do Sul	Brazil	-30.1606°, -53.5653°	Alvares et al. 2015
Taquara	Rio Grande do Sul	Brazil	-29.6506°, -50.7806°	Alvares et al. 2015
Perau de Janeiro, Arvorezinha	Rio Grande do Sul	Brazil	-28.853229°, -52.303220°	Alvares et al. 2015
Candiota	Rio Grande do Sul	Brazil	-31.5330°, -53.7500°	Kwet et al. 2006
Pedro Osório	Rio Grande do Sul	Brazil	-31.8642°, -52.8233°	Kwet et al. 2006
Quinze de Novembro	Rio Grande do Sul	Brazil	-28.7483°, -53.0936°	Kwet et al. 2006
Barreiro, Ivorá	Rio Grande do Sul	Brazil	-29.5203°, -53.5806°	Kwet et al. 2006
Manoel Viana	Rio Grande do Sul	Brazil	-29.586024°, -55.484508°	Kwet et al. 2006
Agudo	Rio Grande do Sul	Brazil	-29.6453°, -53.2400°	Kwet et al. 2006
Pinhal Grande	Rio Grande do Sul	Brazil	-29.3461°, -53.3067°	Kwet et al. 2006
São Jerônimo	Rio Grande do Sul	Brazil	-29.9592°, -51.7222°	Kwet et al. 2006
Três Igrejinhas, Pelotas	Rio Grande do Sul	Brazil	-31.7719°, -52.3425°	Kwet et al. 2006
Caçapava do Sul	Rio Grande do Sul	Brazil	-30.51036°, -53.481305°	Kwet et al. 2006
Trinidad Farm	Rivera	Uruguay	-30.96724°, -55.48998°	Kwet et al. 2006
Velázquez Farm	Rivera	Uruguay	-31.22925°, -55.50377°	Kwet et al. 2006
Capón Alto Farm	Rivera	Uruguay	-31.27021°, -55.25351°	Kwet et al. 2006
Arroyo de la Invernada	Artigas	Uruguay	-31.01551°, -56.02778°	Maneyro et al. 2004
Gruta de los Cuervos	Tacuarembó	Uruguay	-31.60000°, -56.016667°	Maneyro et al. 2004
Sierra de la Aurora	Rivera	Uruguay	-31.050089°, -55.716673°	Maneyro et al. 2004
Pueblo Valentines (type locality)	Treinta y Tres	Uruguay	-33.25346°, -55.08043°	Maneyro et al. 2004
Arroyo Yermal Grande	Treinta y Tres	Uruguay	-33.06330°, -54.46263°	Maneyro et al. 2004
Estancia Doña Alba	Treinta y Tres	Uruguay	-33.0333°, -54.6500°	Maneyro et al. 2004

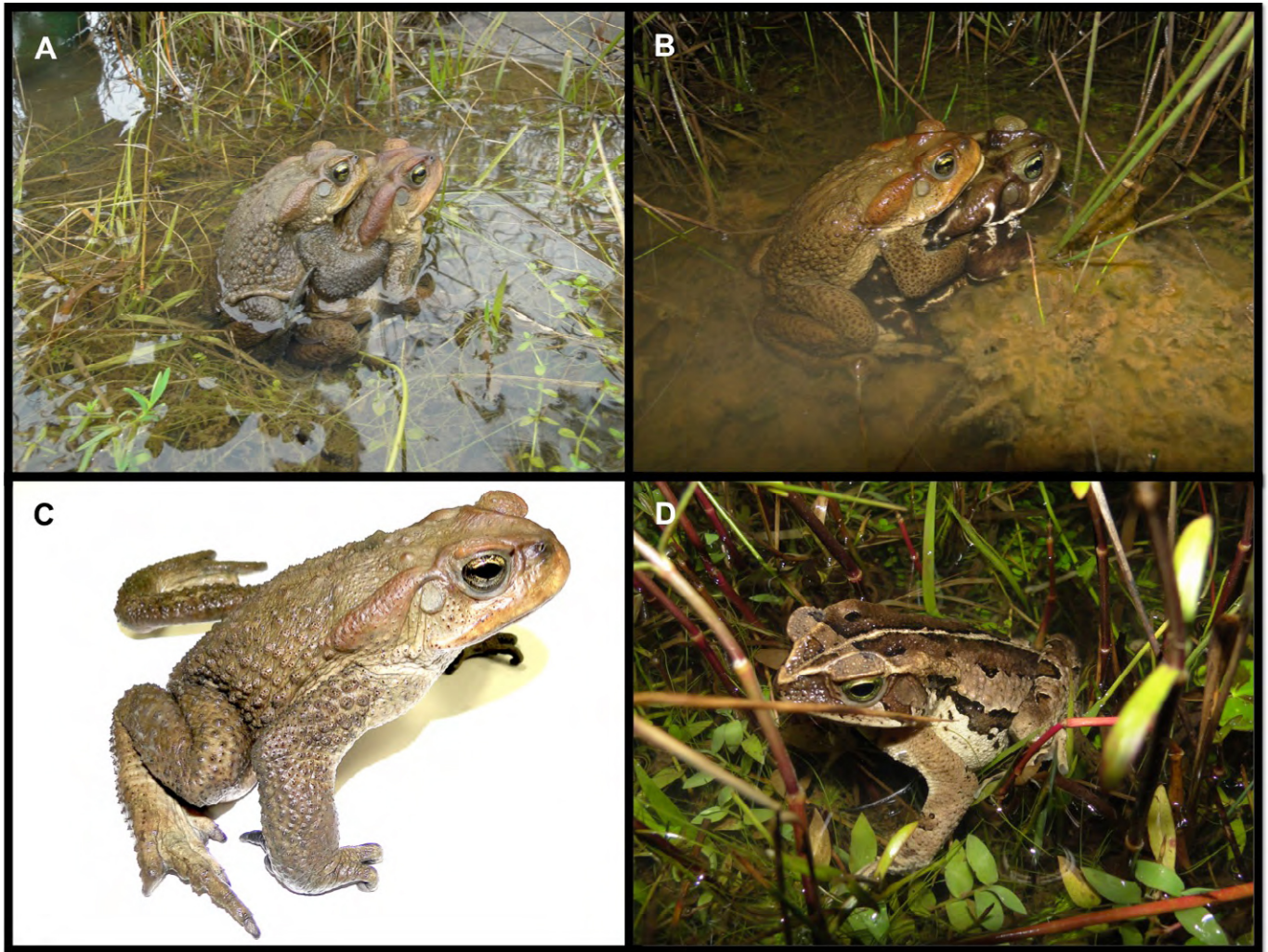


Figure 2. (A) A pair of *R. achavali* in amplexus; (B) Interspecific amplexus between a male *R. achavali* and a female *R. icterica*; (C) a collected specimen of *R. achavali* (UFRGS 7041); and (D) a female of *R. henseli* (CHUFSC 3263).

reproductive activities (besides several amplexant pairs, we found egg clutches). We collected four specimens of *R. achavali*, three of which were deposited in the herpetological collection of the Departamento de Ecologia e Zoologia, Universidade Federal de Santa Catarina (CHUFSC 3261-62, 3265) and one in the herpetological collection of the Departamento de Zoologia, Universidade Federal do Rio Grande do Sul (UFRGS 7041). Collection permits were provided by Fundação do Meio Ambiente – FATMA (permit number 029/2012).

Rhinella achavali has been found in sympatry with at least three similar species: *R. arenarum*, *R. icterica* and *R. schneideri* (Maneyro et al. 2004; Kwet et al. 2006; Alvares et al. 2015). It may be distinguished from *R. arenarum* by the size and shape of the parotoid glands (elongate with convex inner margin in *R. achavali*, short with sinuous inner margin in *R. arenarum*), by the colour of the parotoid glands and cephalic crests (reddish in *R. achavali*; gray or brown in *R. arenarum*), development of cranial crests (sharper in *R. achavali*), extent of toe

webbing (greater in *R. achavali*), and general dorsal coloration (light cream, sometimes yellowish-gray in *R. arenarum*; dark brown, ferruginous in *R. achavali*). It may be distinguished from *R. schneideri* and *R. icterica* by the presence of paracnemid (tibial) glands in *R. schneideri* (absent in *R. achavali*), well developed, subtriangular parotoid glands in *R. schneideri* and *R. icterica* (small and cylindrical in *R. achavali*), and less developed foot webbing in *R. schneideri* and *R. icterica* (well developed in *R. achavali*) (Maneyro et al. 2004; Kwet et al. 2006). The well-developed toe webbing was suggested to be an adaptation for better movement in lotic waters (Kwet et al. 2006).

This is the first record of *Rhinella achavali* for the state of Santa Catarina and it extends the species range approximately 310 km northeast from the previous northernmost record (Coronel Barros, RS), about 195 km northeast from Perau de Janeiro and 203 km northwest from Tainhas State Park, the nearest records (Alvares et al. 2015). It is also the highest elevation for the species; the previous highest record was at Tainhas

State Park, approximately 800 m above sea level. *Rhinella henseli*, which belongs to the *R. crucifer* species group, is recorded in sympatry with *R. achavali* for the first time. Despite the association of *R. achavali* with rivers and streams, we recorded reproductive activity in a lentic environment. However, the permanent pond where reproduction was recorded is located only a few meters from the São João River, a lotic habitat, and the pond is occasionally filled with river water during floods. According to Kolenc et al. (2013), the tadpoles of *R. achavali* have typical pond-dwelling morphologies, like other species of the *R. marina* group, which may imply that despite being associated with rivers, it uses lentic environments to breed. In addition, in August 2014 one of us (TSK) also observed several individuals of the species in a permanent pond near the margin of the Tainhas river, in Tainhas State Park, the same locality as in Alvares et al. (2015), although reproductive activity was not observed.

The present record is located on the Southern Brazilian Plateau, where the main vegetation types are the Araucaria Forest and Campos (grasslands). However, most of the region has been converted to agriculture. Despite conducting a long-term faunal monitoring program in the region, mainly in areas located at the margins of the Canoas River (a large tributary of the Uruguay River), it was the only place where we recorded this species, which suggests that it has small and/or disjunct populations, at least in its northern limit of distribution.

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