Predation of *Rhinella granulosa* (Anura: Bufonidae) by the fish *Oligosarcus argenteus* (Osteichthyes: Characidae)

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Anurans can be considered potential prey for a wide diversity of vertebrates and invertebrates (Toledo, 2005). Even bufonids, medium and large-sized anurans which are capable of producing lethal toxins in their skin, are susceptible to predation (Toledo et al., 2007; Barbosa et al., 2009). Amphibians of the bufonid genus *Rhinella* Fitzinger, 1826 can be preyed upon by over 70 animal species (Oliveira et al., 2017). *Rhinella granulosa* (Spix, 1824), distributed throughout northeast and part of southeastern Brazil (Narvaes & Rodrigues, 2009, Frost, 2022), is part of the diet of several groups such as birds (Mesquita, 2009; Toledo et al., 2007), reptiles (Oliveira et al., 2017), amphibians (Costa-Pereira et al., 2015; Toledo et al., 2007), fishes (Zocca et al., 2017), and even arthropods (Yves et al., 2018; Silva-Silva et al., 2013; Zina et al., 2012).

Fishes, especially species with generalist feeding habits, are potential predators of anuran eggs and larvae (Semlitsch & Gibbons, 1988; Stauffer & Semlitsch, 1993), but there is little information regarding predation upon adult anurans. Such events are usually considered opportunistic (Toledo et al., 2007), and within *Rhinella*, there are only five records for this interaction

between the two groups (Almeida et al., 2009; Oliveira et al., 2017; Severo-Neto & Sugai, 2014; Zocca et al., 2017; Xiong, 2021). In this study, we report the first predation record of *Rhinella granulosa* by the "lambari-bocarra" fish, *Oligosarcus argenteus* Gunther, 1864 (Characidae).

During a field survey on August 14th 2020, a specimen of *Oligosarcus argenteus* (22 cm total length; Fig. 1C) was collected in the Casca river, part of the Rio Doce basin in Pedra do Anta municipality, Minas Gerais state, southeastern Brazil (-20.573° S, -42.633° W, 650 m a.s.l.). *Oligosarcus* are bentonic predators and prefer fishes and insects (Nunes & Hartz, 2006). After collection, the stomach contents of the fish were analyzed and a partially digested specimen of an adult *R. granulosa* was found (Fig. 1A–B). The amphibian was identified based on its geographical location, morphological aspects according to Narvaes & Rodrigues (2009) and comparison with *R. granulosa* specimens from nearby regions. The specimen was deposited at Museu de Zoologia João Moojen of Universidade Federal de Viçosa (MZUFV 20580). The predator did not exhibit any signs of intoxication from the toad's toxin in its physical appearance or behavior, nor in its internal organs when dissected. The toad exhibited signs of partial digestion of the skin, while its organs had been completely digested.

We also conducted a literature search of predation events of fishes upon the genus *Rhinella*. We searched through Google Scholar's database, using combinations of "*Rhinella*", "*Chaunus*", "*Bufo*", "fish", "predation" and "feeding". The journals Herpetologia Brasileira, Herpetological Review and Herpetology Notes were also searched. We found five records (Tab. 1), three of which were previously cited in Oliveira et al. (2017).

Our study is the sixth record of fishes preying upon *Rhinella* (Oliveira et al., 2017; Zocca et al., 2017; Xiong, 2021), and the second for *R. granulosa* (Zocca et al., 2017). This small number of reports may be explained by the difficulty of observing this kind of event during field surveys since the attack occurs in aquatic environments. Also important is the resistance of *O. argenteus* to the toad's toxin, as it remained normal in its physical and behavioral aspects after digesting the anuran. This observation increases understanding of the role played by amphibians and fishes in the trophic web, which is important for species conservation.

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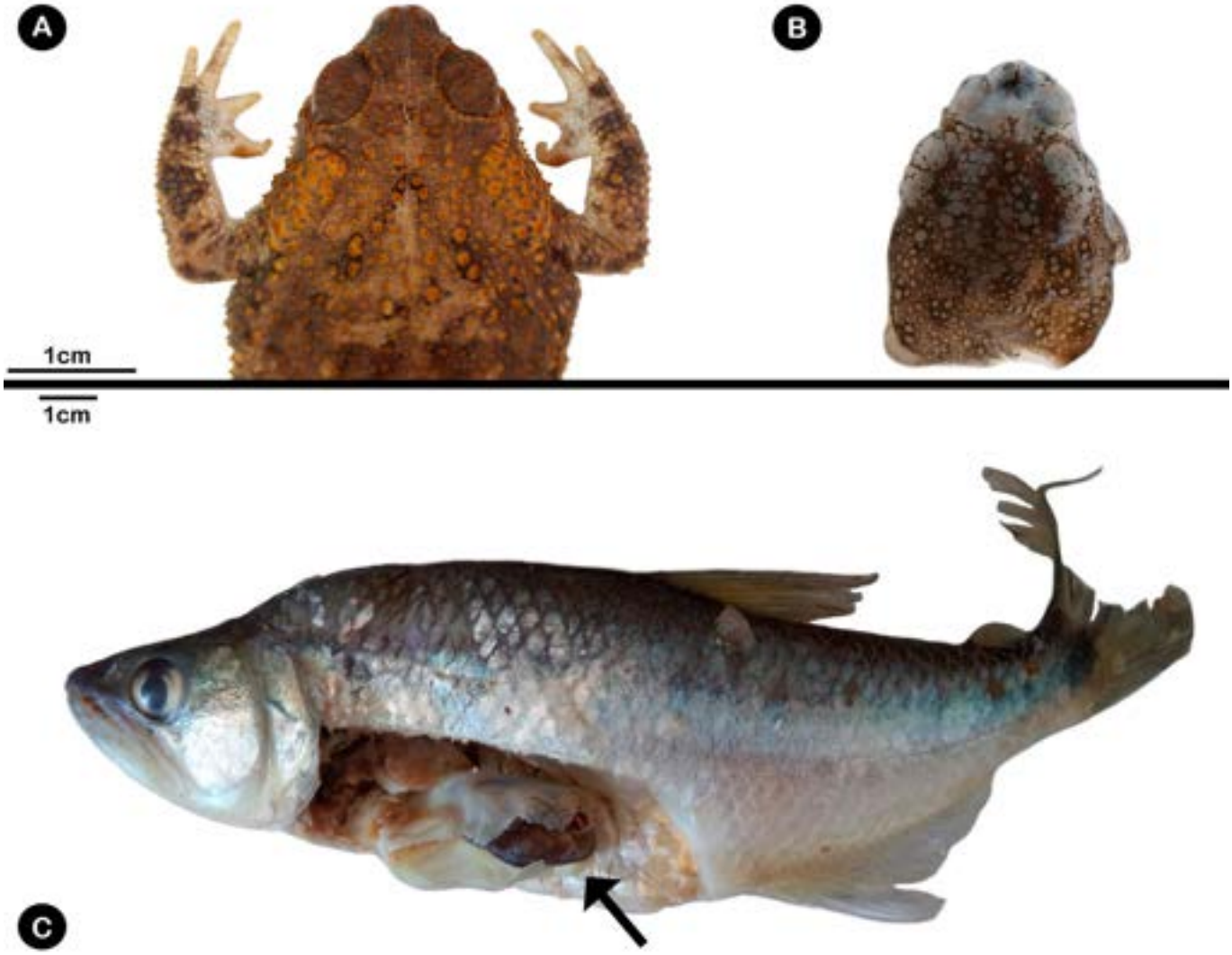

Figure 1. (A) Preserved specimen of *Rhinella granulosa* (MZUFV 16592), (B) partially digested specimen (MZUFV 20580) consumed by *Oligosarcus argenteus* and (C) predator *O. argenteus*. The arrow indicates the *R. granulosa* specimen inside the stomach of the predator.

Table 1. Records of predation by fish on the genus *Rhinella*.

Prey species	**Predator species**	**Reference**
Rhinella ornata	*Hoplias malabaricus*	Toledo et al. (2007)
	Salminus brasiliensis	Almeida et al. (2009)
Rhinella scitula	*Rhamdia quelen*	Severo-Neto & Sugai (2014)
Rhinella granulosa	*Hoplias malabaricus*	Zocca et al. (2017)
	Oligosarcus argenteus	This study
Rhinella marina	*Anguilla marmorata*	Xiong (2021)