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Batrachophagy by *Leptodactylus chaquensis* (Anura: Leptodactylidae) in the Brazilian Cerrado and Pantanal

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A primary ecological function of the Neotropical amphibians is to be prey of many other animals at higher trophic levels (Cortés-Gomez et al., 2015). They are essential items in food webs and in energy flow because they are an abundant source of protein and they are present in the diet of several species including other frogs (Boyd and Goodyear, 1971; Wells, 2007; Toledo et al*.,* 2007). Besides, amphibians are a good source of protein as they do not have any queratinous body part like feathers, beaks or claws (Cortés-Gomez et al., 2015).

Batrachophagy (predation on amphibians) is a common behaviour by anurans, and about 12% of anuran predation records refer to another anuran as predator (Toledo et al*.,* 2007). In the Neotropical domain, some species of Bufonidae (e.g. Cardoso and Sazima, 1977), Hylodidae (Giaretta et al*.,* 1993), Hylidae (e.g. Glorioso et al*.,* 2010), and Leptodactylidae (e.g. França et al*.,* 2004) have been recorded as preys of other anuran amphibians.

Leptodactylus chaquensis Cei, 1950 is a member of the *L. latrans* group and reproduces during the rainy season from November to February (Prado et al*.,* 2005). This species is distributed from northern Argentina, eastern Bolivia, Paraguay, northern Uruguay, and several states in Brazil along the diagonal of open formations (Frost, 2018). In Brazilian Pantanal and Cerrado, *L. chaquensis* is one of the commonest species.

Dendropsophus nanus (Boulenger, 1889) is a small tree frog (Hylidae) widely distributed in South America, including French Guiana, Surinam, Brazil, Bolivia, Uruguay and Argentina (Frost, 2018). Due to its small size, it has been reported as prey for spiders (Pramuk and Alamillo, 2002; Baracho et al*.,* 2014). However, *D. nanus* has never been reported as prey of other anurans. On the other hand, *Leptodactylus podicipinus* (Cope, 1862) is a mid-sized frog from open formations of Paraguay, Argentina, Uruguay and Central Brazil (Frost, 2018). It belongs to the *L. melanonotus* group, spawns in foam nests in water-filled basins constructed by males, and females perform parental care until the end of the tadpole's metamorphosis (Prado et al*.,* 2000; Martins, 2001; Prado et al*.,* 2002). This particular reproductive mode and parental care may increase the predatory risk (Martins, 2001; Prado et al*.,* 2002).

Although batrachophagy is a common behaviour in Anura, and in *Leptodactylus* in particular, prey species are mostly unknown. Here, we report two batrachophagy events by *Leptodactylus chaquensis* upon *D. nanus* and *L. podicipinus* in the Brazilian Cerrado and Pantanal, respectively. The specimens were captured and euthanized *in situ* with xylocaine cream (5%), fixed in 10% formalin, preserved in 70% alcohol, and are housed at Coleção Zoológica, Universidade Federal de Mato Grosso do Sul (ZUFMS-AMP5612, ZUFMS-AMP6645, ZUFMS-AMP6646, and ZUFMS-AMP6647).

The first report is from a Cerrado area (19°80' S, 54°90' W), in the municipality of Corguinho, state of Mato Grosso do Sul. In October 2016, a female *L. chaquensis* (snout-vent length [SVL]= 64.7 mm; Fig. 1A) was collected, and after stomach contents analysis in laboratory, we found an adult female *D. nanus* (SVL= 21.1 mm; Fig. 1B). There was another anuran in its stomach, however, we were not able to identify it due

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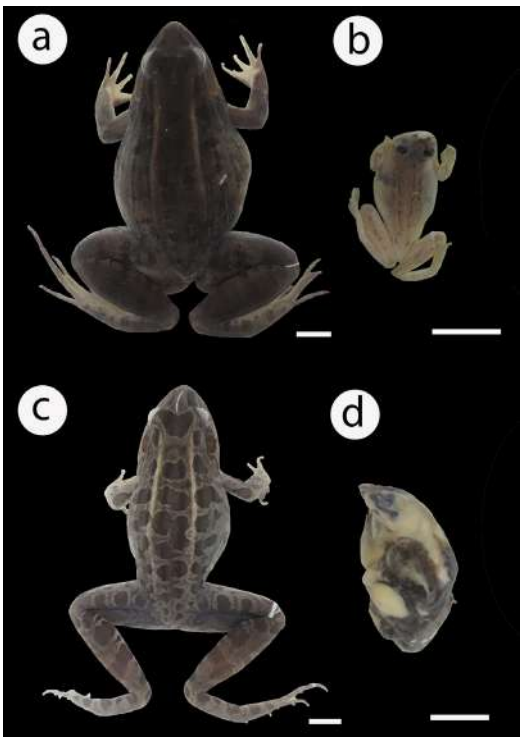

Figure 1. *Leptodactylus chaquensis* (a) from Cerrado with its *Dendropsophus nanus* prey (b), and *L. chaquensis* (c) from Pantanal with its *L. podicipinus* prey (d). Scale bar: 10 mm.

to the advanced digestion process. The second report occurred in December 2015 in the Brazilian Pantanal, near the Base de Estudos do Pantanal, a field station of the Federal University of Mato Grosso do Sul (19°34' S, 57°00' W), municipality of Corumbá, state of Mato Grosso do Sul. Near a temporary pond, a female *L. chaquensis* (SVL= 69.2 mm; Fig. 1C) was observed in a typical sit and wait predatory position when a female *L. podicipinus* (SVL= 28.7 mm; Fig. 1D) jumped close to it and was swallowed.

Events of batrachophagy have some importance in the diets of large *Leptodactylus* spp. (e.g. *L. latrans*, *L. labyrinthicus*), which can include larvae and adult specimens (Gallardo, 1964; Cardoso and Sazima, 1977; França et al*.*, 2004). Large-sized species of *Leptodactylus* usually feed on other species of anurans, including *Leptodactylus furnarius, L. latrans, Rhinella granulosa, Dendropsophus minutus, Physalaemus nattereri* and *Pseudopaludicola saltica* (Cardoso and Sazima, 1977; França et al*.*, 2004; Heyer and Giaretta, 2009).

The foraging strategy of *L. chaquensis* is considered as intermediate between "sit-and-wait" and active (Schaefer et al*.*, 2006). Besides, since the mouth grows proportional to the body (Schaefer et al*.*, 2006), large *L. chaquensis* individuals may be able to ingest relatively large prey, as we have reported here from the Pantanal. Gallardo (1964) and Duré (1990) reported batrachophagy in Argentinean populations of *L. chaquensis* without specifics, while in Brazilian populations, *Pseudis platensis* (Hylidae) and *Physalaemus centralis* (Leptodactylidae) were the only two anuran species known as preys of *L. chaquensis* (Heyer and Giaretta, 2009; Oda et al., 2016). Now we are able to include a second Hylidae (*D. nanus*) and a second Leptodactylidae (*L. podicipinus*) among the diet of *L. chaquensis*. Considering our results from the Cerrado and the reports mentioned above, we believe that more species of anurans may be included in *L. chaquensis*'s diet. Therefore, is necessary more research effort not only to identify prey species, but also to understand the importance of batrachophagy in *L. chaquensis* diet and in tropical food webs.

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