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Occurrence of *Ochoterenella digiticauda* (Nematoda: Onchocercidae) infecting the gladiator frog *Hypsiboas lundii* (Anura: Hylidae) in Brazil

Gislayne M. Toledo[1,*], Bruno F. Fiorillo[2], Reinaldo J. Silva[1], Luciano A. Anjos[3], Cynthia P. A. Prado[2]

Abstract. *Hypsiboas lundii* is a gladiator frog endemic to the Cerrado of central and southeastern Brazil. This species in reproductive period inhabits streams in primary and secondary forests. Despite its wide distribution, the helminth fauna of this species has not been studied yet. Fourteen individuals were sampled and examined for helminth parasites. Three males were infected with *Ochoterenella digiticauda* (Onchocercidade). The mean abundance and mean intensity of infection were 0.7 ± 0.5 and 3.3 ± 1.9, respectively. All parasites were found in the body cavity of *H. lundii*, which represents a new host record for *O. digiticauda*.

Keywords. Nematoda, Amphibia, parasite, Cerrado

Brazil harbors the highest species richness of anurans (IUCN, 2011), with 913 formally described species (Segalla et al., 2012), and a high endemism rate of 60% (IUCN, 2011). In the open habitats of the Brazilian Cerrado approximately 150 anuran species can be found, of which approximately 28% represent endemic species (Klink and Machado, 2005).

Hypsiboas Wagler, 1830 is one of the largest Neotropical genera in the Hylidae family (Faivovich et al., 2005), with approximately 86 recognized species (Frost, 2011; Segalla et al., 2012). The gladiator frog *Hypsiboas lundii* (Burmeister, 1856) is distributed throughout the Cerrado formation in central and southeastern Brazil (Bastos et al., 2003). Adults are arboreal, males call perched on the vegetation of both primary and secondary forests, about 1.5 to 10 m high, at the margins of streams (Brasileiro et al., 2005), and larvae are aquatic, developing in the streams.

In Brazil, despite the great diversity of anuran species (Segalla et al., 2012), information about their parasite fauna is still scarce (Anjos, 2011). However, studies on helminth parasites of Brazilian frogs have been increasing recently (Goldberg et al., 2007; Holmes et al., 2008; Campião, Silva and Ferreira, 2009). In this study we describe the occurrence of one helminth species in individuals of *H. lundii* from the Cerrado in southeastern Brazil.

Fieldwork was carried out in the municipality of Sacramento (19°51'S; 47°26'W), Minas Gerais State, southeastern Brazil, from December 2010 to September 2011, under a license from SISBIO (Sistema de Autorização e Informação em Biodiversidade, No. 28108-1). Frogs were captured by active search at night, during their activity period, transported to the laboratory, and euthanized with xylocaine 10%. Afterwards, individuals were fixed in formalin 10% and preserved in alcohol 70%. Voucher specimens were deposited in Coleção de Anfíbios Célio F. B. Haddad (CFBH), at the Universidade Estadual Paulista, Rio Claro, São Paulo state, Brazil.

A total of 14 anurans were examined (nine adult males, four adult females, and one juvenile; mean snout-vent length = 60.85mm ± 7.13 SD) (CFBH 34305-07; 34316-17; 34322; 34329; 34341; 34346; 34349; 34364; 34375; 34380; 34388). Individuals were necropsied and their gastrointestinal tracts and body cavities were surveyed under a stereomicroscope for the presence of helminths. Nematodes were preserved in 70% ethanol and identified according to Vicente et al. (1991), Anderson, Chabaud and Willmot (2009), and Gibbons (2010). Parasites were cleared with lactophenol and examined using a Leica Qwin Lite 2.5 computerized system. Prevalence (number of hosts infected with one or more individuals of a particular parasite species), mean abundance (total

1 Departamento de Parasitologia, Instituto de Biociências, Universidade Estadual Paulista, 18618-970, Botucatu, São Paulo, Brazil.

2 Departamento de Morfologia e Fisiologia Animal, FCAV, Universidade Estadual Paulista, 14884-900, Jaboticabal, São Paulo, Brazil.

3 Departamento de Biologia e Zootecnia, FIES, Universidade Estadual Paulista, 15385-000, Ilha Solteira, São Paulo, Brazil.

*Corresponding author; gisatoledo@hotmail.com

Table 1. Anuran species reported as hosts of *Ochoterenella digiticauda* in the Neotropics. All parasites were found in the frogs's body cavities.

Host	Prevalence	Country	Reference
Bufonidae			
Rhinella marina	Uninformed	Costa Rica	Brenes and Bravo-Hollis, 1959
	4.6%	Brazil	Travassos and Freitas, 1964
	53%	Mexico	Goldberg *et al*., 2002
	8%	Mexico	Galicia-Guerrero *et al.*, 2000
	31%	Mexico	Espinoza-Jiménez *et al.*, 2007
	Uninformed	Mexico	Paredes-León *et al.*, 2008
	46.5%	Jamaica	Wong and Bundy, 1985
Rhinella schneideri	Uninformed	Paraguay	Lent, Freitas and Proença, 1946
Craugastoridae			
Craugastor ranoides	24%	Costa Rica	Goldberg and Bursey, 2008a
Craugastor taurus	10%	Costa Rica	Goldberg and Bursey, 2008a
Hylidae			
Hypsiboas lanciformis	Uninformed	Ecuador	Dyer and Altig, 1977
Smilisca sordida	50%	Costa Rica	Goldberg and Bursey, 2008b
Leptodactylidae			
Leptodactylus latrans	Uninformed	Brazil	Vicente and Santos, 1976
Ranidae			
Lithobates dunni	5%	Mexico	Pulido-Flores, 1994
Lithobates vaillanti	7%	Mexico	Goldberg et al., 2002

number of individuals of a particular parasite species in a sample of a particular host divided by the total number of hosts of the species examined), and mean intensity of infection (average intensity of a particular species of parasite among the infected members of a particular host species) were determined according to Bush et al. (1997).

Helminth voucher specimens were deposited at the Coleção Helmintológica do Instituto de Biociências de Botucatu (CHIBB), at the Universidade Estadual Paulista, Botucatu, São Paulo state, Brazil.

The only parasite species found in the body cavity of individuals of *H. lundii* was the nematode *Ochoterenella digiticauda* Caballero, 1944 (CHIBB 7053-7055). Of the 14 examined anurans, three males were infected (prevalence = 21.4%). The mean abundance of parasites was 0.7 ± 0.5 and the mean intensity of infection was 3.3 ± 1.9. There were no parasites in the gastrointestinal tracts or other organs of the frogs.

Ochoterenella digiticauda has also been registered in other Neotropical anuran species (Table 1). This nematode was originally described from *Bufo marinus* (currently *Rhinella marina*) collected in Mexico (Caballero, 1944) and later redescribed by Esslinger (1986), based on the type specimens. Wong and Bundy (1985) suggested that a haematophagous arthropod vector is required for infection by *O. digiticauda*. This helminth species is a generalist parasite of frogs, found in several species of hosts included in the anuran families Bufonidae, Leptodactylidae, and Hylidae (Table 1). This nematode has been found infecting the hylids *Hypsiboas albopunctatus* and *Trachycephalus mesophaeus* (references in Table 1), and thus *H. lundii* is a new host record for *O. digiticauda*.

Despite the enormous host diversity, research on parasite fauna of frogs is still scarce in Brazil (Anjos, 2011), precluding generalizations. However, a comparison of the helminth fauna of *H. lundii* here reported with other studied species of *Hypsiboas* (*H. prasinus*: Madelaire, Gomes and Silva, 2012; *H. albopunctatus*: Holmes et

al., 2008) suggests that parasite species richness tend to be low in these treefrogs. Data on frogs parasite richness, prevalence, and intensity are important for future studies aiming to investigate patterns of parasite-host diversity in Neotropical frogs, and the relationship between biotic and/or abiotic factors and parasite diversity, prevalence, and intensity among host taxa, which might have conservation implications (Marcogliese, 2001).

Our study showed that *H. lundii* exhibited a low rate of helminth infection at the study site, contributing to enhance the knowledge on the helminth fauna of frogs in the Brazilian Cerrado.

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