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Research note

First report of the genus *Physaloptera* (Nematoda: Physalopteridae) in *Lithobates montezumae* (Anura: Ranidae) from Mexico

Primer registro del género *Physaloptera* (Nematoda: Physalopteridae) en *Lithobates montezumae* (Anura: Ranidae) de México

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Abstract. Nematode third stage larvae of the genus *Physaloptera* (Nematoda: Physalopteridae) were recovered from the stomach of *Lithobates montezumae* (Anura: Ranidae) collected in the Pedregal de San Angel Ecological Reserve in Mexico D. F. (19°11'6.50" N, 99°11'41.42" W; 2 312 m asl). The morphology of the larvae is briefly described and a list of previously recorded localities and hosts in Mexico is given. This study is the first record of *Physaloptera* sp. parasitizing *L. montezumae*, and also represents the first helminthological record for anurans in this locality, as well as a new locality record for the nematode genus.

Key words: helminths, stomach parasites, leopard frog, third stage larvae, México D. F.

Resumen. Se aislaron larvas de tercer estadio de *Physaloptera* (Nematoda: Physalopteridae) del estómago de *Lithobates montezumae* (Anura: Ranidae) capturados en la Reserva Ecológica del Pedregal de San Ángel en la Ciudad de México (19°11'6.50" N, 99°11'41.42" O; 2 312 m snm). La morfología de las larvas se describe brevemente y se proporciona un listado de los registros del género en México con localidad y hospedero. Este estudio es el primer registro de *Physaloptera* spp. como parásito de *L. montezumae* y también representa el primer registro helmintológico para anuros en esta localidad, así como un nuevo registro de localidad para este género de nemátodos.

Palabras clave: helmintos, parásitos de estómago, ranas leopardo, tercer estadio larvario, México, D. F.

Lithobates montezumae Blaird 1854 (= *Rana montezumae*) (Anura: Ranidae) occurs in the center of Mexico through the states of Jalisco, Michoacán, Puebla, Mexico State, Tlaxcala, México D. F., San Luis Potosí, Hidalgo and Querétaro. It breeds in lakes and large bodies of water of pine-oak or oak forest above 2 000 m asl (AmphibiaWeb). Although *L. montezumae* is the amphibian species that has been most extensively studied for helminths in Mexico (Pérez-Ponce de León et al., 2002) there are no previous records of the nematode *Physaloptera* spp. parasitizing this host. Adults of *Physaloptera* occur in the stomach of mammals, snakes, and a few species of lizards and amphibians. The hosts acquire the infection through the ingestion of insects containing infective larvae. Larvae are common in amphibians and some lizards,

which are considered as paratenic hosts (Anderson, 2000). Only 2 species of *Physaloptera* have been recorded as adults in anurans: *P. amphibia* Linstow 1899 described from *Limnectes macrodon* (= *Rana macrodon*) from the Philippines and *P. tigrinae* Ali and Farooqui 1969 from *Hoplobatrachus tigrinus* (= *Rana tigrina*) in India (Baker, 1987). There is also a record of an adult female of *Physaloptera* sp. from *Lithobates brownorum* in Mexico (Terán-Juárez, 2011). In addition to the present record, *Physaloptera* third stage larvae have been recorded in 12 Mexican anurans from the families Bufonidae, Hylidae, and Ranidae from 13 localities in 9 states of Mexico (Table 1).

The aim of the present work is to report for the first time the presence of *Physaloptera* sp. in *L. montezumae*.

On April 11, 2011, 2 specimens of *L. montezumae* were collected at the botanical garden of the Instituto de

Table 1. *Physaloptera* sp. larvae in anurans from Mexico

Host	Locality	Prevalence % (n)	Reference
Bufonidae			
<i>Anaxyrus kelloggi</i> (= <i>Bufo kelloggi</i>)	Sonora	3 (29)	Goldberg and Bursey, 2002
<i>Incilius mazatlanensis</i> (= <i>Bufo mazatlanensis</i>)	Sonora	35 (20)	Goldberg and Bursey, 2002
<i>Rhinella marina</i> (= <i>Bufo marinus</i>)	Emiliano Zapata, Jalisco	30.6 (49)	Galicia-Guerrero et al., 2000
	Lago de Catemaco, Veracruz	9 (64)	Goldberg et al., 2002
	Presa Cerro de Oro, Oaxaca	8.3 (24)	Espinoza-Jimenez et al., 2007
Hylidae			
<i>Agalychnis dacnicolor</i> (= <i>Pachymedusa dacnicolor</i>)	Sonora	25(24)	Goldberg and Bursey, 2002
<i>Dendropsophus microcephalus</i> (= <i>Hyla microcephala</i>)	Laguna el Zacatal, Veracruz	4 (26)	Goldberg et al., 2002
<i>Pseudacris regilla</i> (= <i>Hyla regilla</i>)	San Ignacio, Baja California Sur	33 (3)	Goldberg et al., 2001
<i>Smilisca baudinii</i>	Oxtankah, Chetumal; Juan Sarabia and Nuevo Paraiso, Quintana Roo	25 (20)	Terán-Juarez, 2011
	Sinaloa	5(19)	Goldberg and Bursey, 2002
<i>Trachycephalus typhorius</i> (= <i>Trachycephalus venulosus</i>)	Oxtankah, Chetumal; Juan Sarabia and Nuevo Paraiso, Quintana Roo	45 (22)	Terán-Juárez, 2011
Ranidae			
<i>Lithobates forreri</i> (= <i>Rana forreri</i>)	Sonora	15 (39)	Goldberg and Bursey, 2002
<i>Lithobates</i> cf. <i>forreri</i> (= <i>Rana forreri</i>)	San Pedro las Playas, Guerrero	2.5 (40)	Cabrera-Guzmán et al., 2007
<i>Lithobates magnaocularis</i> (= <i>Rana magnaocularis</i>)	Sonora and Sinaloa	8 (26)	Goldberg and Bursey, 2002
<i>Lithobates montezumae</i> (= <i>Rana montezumae</i>)	Pedregal de San Ángel Ecological Reserve, México, D. F.	50 (2)	Present study
<i>Lithobates tarahumarae</i> (= <i>Rana tarahumarae</i>)	Yécora, Sonora	10 (42)	Bursey and Goldberg, 2001

Biología, Universidad Nacional Autónoma de México in Mexico D. F., which is surrounded by the Pedregal de San Ángel Ecological Reserve. The frogs were ventrally dissected and all internal organs were examined for helminths using a dissecting microscope. Nematodes were isolated, rinsed in saline solution (0.65%), and fixed in 70% hot ethanol. Subsequently, they were cleared in ethanol-glycerin (1:1) and examined via light microscopy. Some specimens were studied by scanning electron microscopy (SEM). These specimens were dehydrated in ethanol series, dried using the critical point technique, coated with gold, and examined with a Hitachi SU1510 scanning electron microscope. Measurements are presented as the range with means in parentheses and expressed in micrometers (μm), unless otherwise stated. Prevalence and intensity of infection were calculated based on Bush et al. (1997). The

studied specimens have been deposited in the Colección Nacional de Helmintos, Instituto de Biología, UNAM (CNHE # 8399).

A total of 131 third-stage nematode larvae were found in the stomach of *Lithobates montezumae* (prevalence and intensity of infection: 1 of 2 host infected (50%), 131 specimens). Nematodes were identified as *Physaloptera* sp. Rudolphi, 1819 (Physalopteridae) by the presence of a cephalic collar and mouth with large and triangular lips, each provided with teeth (Yamaguti, 1961).

Description based on 10 specimens (Figs. 1, 2). Body length 2.04-2.5 (2.33) mm, maximum width at level of anterior intestine 90-120 (110); cuticle forming a collar around the anterior end, subsequently turning slightly grooved to tail. Apical end with 2 large and triangular lateral lips; each lip with 2 lateral papillae, an externolateral tooth,

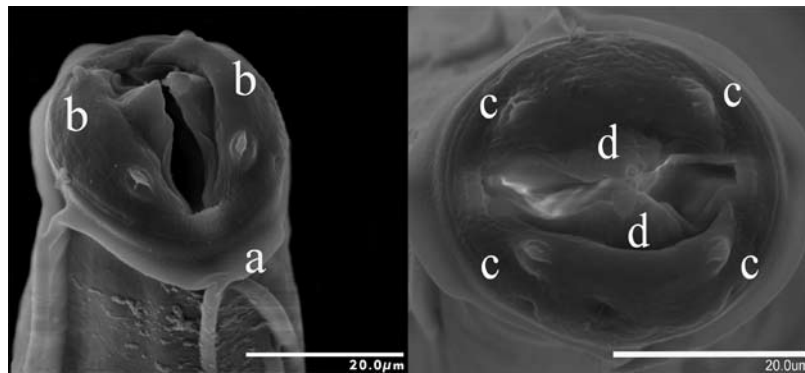


Figure 1. *Physaloptera* sp. from the stomach of *L. montezumae* from Mexico D. F. SEM micrograph of anterior end, lateral view, showing the cephalic collar (a) and 2 triangular lips (b). SEM micrograph of anterior end, apical view, showing 2 lateral papillae (c) and 1 externolateral tooth on each lip (d).

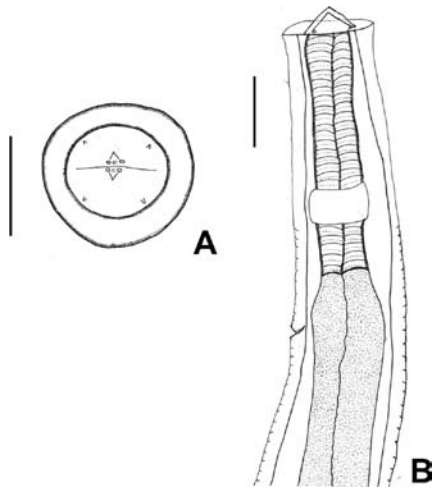


Figure 2. *Physaloptera* sp. third stage larva. A, anterior end, apical view, 3 small internolateral teeth on each lip; B, anterior end.

and 3 small internolateral teeth. Esophagus 0.86-1.09 (1) mm of total length; divided in short anterior muscular portion, and long posterior glandular portion: 130-180 (160) long, 21-26 (22) wide and 730-930 (840) long, 40-60 (54) wide, respectively. Nerve ring 90-130 (110) from the anterior end. Excretory pore close to anterior part of the glandular esophagus, 200-240 (210) from the anterior extremity. Tail conical, 82-100 (93) long.

From examination of table I, and considering the role of amphibians in food chains as prey of snakes and mammals, it is clear that anurans are commonly used as paratenic hosts of nematodes of the genus *Physaloptera*. Common carnivores in the Pedregal de San Ángel Ecological

Reserve include mammals *Urocyon cinereoargenteus nigristrois* (Canidae), *Mephitis macroura macroura*, *Spilogale putorius angustifrons* (Mephitidae), *Bassariscus astutus astutus* (Procyonidae), and *Mustela frenata frenata* (Mustelidae) (Hortelano-Moncada et al., 2009), and snakes *Thamnophis cyrtopis cyrtopis*, *T. eques eques*, *T. scalaris*, *Diadophis punctatus*, and *Rhadinaea laureata* (Colubridae) (Méndez-de la Cruz et al., 2009), all of which are the potential definitive hosts of *Physaloptera* spp.

The conducting of more studies on the helminth fauna of these vertebrates can provide additional information on food webs in the reserve through the linkage of larval and adult stages of parasitic forms using identification tools such as DNA barcodes. This study adds *L. montezumae* as new host of third-stage larvae of *Physaloptera* sp. It is also the first record of anuran helminths in the Pedregal de San Ángel Ecological Reserve in Mexico D. F., and the first record of the genus in this locality.

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