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Notes and Comments

First record of *Cosmocerca podicipinus* (Nematoda: Cosmocercidae) parasitizing *Leptodeira annulata* (Serpentes: Dipsadidae) in northeastern Brazil

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Currently, 37 species of the genus *Cosmocerca* Diesing, 1861 are known (Banerjee & Sou, 2020; Chen et al., 2020; Harnoster et al., 2022). These species were previously reported to parasitize amphibians (Campião et al., 2014) and lizards (Ávila and Silva, 2010; Teixeira et al., 2018). *Cosmocerca podicipinus* Baker and Vaucher, 1984 was originally described parasitizing *Leptodactylus podicipinus* in Amambay province, Paraguay (Baker and Vaucher, 1984). Later, this species was recorded parasitizing other amphibians from Argentina (Corrientes) *Dendropsophus nanus* (Boulenger, 1889), *Leptodactylus bufonius* Boulenger, 1894, *Leptodactylus chaquensis* Cei, 1950, *Leptodactylus gracilis* (Duméril & Bibron, 1841), *Leptodactylus latinasus* Jiménez de la Espada, 1875, *Odontophrynus americanus* (Duméril & Bibron, 1841), *Physalaemus albonotatus* (Steindachner, 1864), *Physalaemus santafecinus* Barrio, 1965, *Pseudopaludicola boliviana* Parker, 1927, *Pseudopaludicola falcipes* (Hensel, 1867), *Rhinella bergi* (Céspedez, 2000), *Rhinella fernandezae* (Gallardo, 1957), *Rhinella granulosa* (Spix, 1824), *Rhinella schneideri* (Werner, 1894), and *Scinax nasicus* (Cope, 1862); Brazil (Amazonas, Mato Grosso do Sul, Pará, Piauí, and Tocantins states) *Ameerega hahneli* Boulenger, 1884, *Dermatonotus muelleri* (Boettger, 1885), *Leptodactylus fuscus* (Schneider, 1799), *Leptodactylus latrans* (Steffen, 1815) (=*Leptodactylus ocellatus*), *Leptodactylus leptodactyloides* (Andersson, 1945), *Leptodactylus macrosternum* Miranda-Ribeiro, 1926, *Leptodactylus petersii* (Steindachner, 1864), *Leptodactylus podicipinus*, *Leptodactylus pustulatus* (Peters, 1870), *Leptodactylus vastus* Lutz, 1930, *Pseudis paradoxa* (Linnaeus, 1758) (=*Pseudis platensis*), and *Scinax fuscomarginatus* (Lutz, 1925); Colombia (Chocó and Caldas) *Atelopus spurrelli* Boulenger, 1914 and *Oophaga histrionica* (Berthold, 1845); Costa Rica *Rana forreri* Boulenger, 1883; Mexico (Sinaloa and Sonora) *Leptodactylus melanonotus* (Hallowell, 1861) and *Rana forreri*; Paraguay (Amambay, Caaguazu, Concepcion, Canendiyu, Alto Parana provinces) *Boana faber* (Wied, 1821) (=*Hypsiboas faber*), *Leptodactylus fuscus*, *Leptodactylus elenae,* and *Leptodactylus*; and Peru (Cuzco) *Allobates femoralis* (Boulenger, 1884) (=*Epipedobates femoralis*), *Allobates marchesianus* (Melin, 1941) (=*Colostethus marchesianus*), *Leptodactylus leptodactyloides*, *Pristimantis imitatrix* (Duellman, 1978) (=*Eleutherodactylus imitatrix*), and *Rhinella margaritifera* (Laurenti, 1768) (=*Bufo typhonius*) (Goldberg and Bursey, 2002; Bursey and Goldberg, 2005; Campião et al., 2014; Lins et al., 2017; Rebêlo et al., 2020; Benício et al., 2022).

The snake *Leptodeira annulata* (Linnaeus, 1758) is widely distributed in South America (Ávila and Morais, 2007). In Brazil, it is found in the north, northeast, south, and southeast regions, *L. annulata* has nocturnal activity and semi-arboreal habit (Ávila and Morais, 2007) while its diet is composed mainly of amphibians (Vitt, 1996). Helminth parasites were previously reported in *L. annulata*, as follows: nematodes *Hexametra boddaertii* Baird 1860, *Ophidascaris trichuriformis* Vaz, 1935, *Oswaldocruzia* sp., *Oxyascaris* sp., *Physaloptera* sp., and *Raillietnema spectans* Gomes 1964; cestodes *Ophiotaenia* sp. and unidentified cestode; trematodes *Renifer heterocoelium* Travassos, 1921 and *Styphlodora condita* Faria, 1911; and unidentified Acanthocephala's cysthacanths (Ammann and De Chambrier, 2008; Kohn and Fernandes, 2014; Carvalho et al., 2018).

Although *L. annulata* is parasitized with several parasite species, there is no report of infection of a snake host with species of the genus *Cosmocerca*. Here we report the occurrence of *C. podicipinus* in one adult female of *L. annulata* (snout-vent length 611 mm), collected on May 26th, 2018, in the Sete Cidades National Park (4°06'01" S, 41°42'27" W; datum WGS 84; 191 m a.s.l.), in the municipality of Piripiri, state of Piauí, Brazil. The voucher snake was deposited in the Herpetological Collection of the Universidade Regional do Cariri (URCA), under register number URCA 13739. The specimen was collected by the permanent license for capture/collection/transport of ICMBio SISBIO nº 29613-1 and the Research Ethics Committee of the Universidade Regional do Cariri (#00026/2015). We necropsied the animal and its gastrointestinal tract, respiratory system, gallbladder, and kidneys were examined for helminth parasites. Helminths

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were collected, counted, carefully cleaned, and processed following classical methodologies (Amato et al., 1991). The nematodes were cleared in lactic acid and mounted on temporary slides for identification. We deposited the specimens found in the Helminthological Collection of the Institute of Biosciences (CHIBB 8849), São Paulo State University (UNESP), Botucatu, São Paulo State, Brazil.

We recovered two specimens of *C. podicipinus*, one male and one female (Figure 1), in the large intestine of *L. annulata*. Nematodes have marked sexual dimorphism. The body presented a cuticle with transverse streaks and lateral alae, more accentuated in males. The oral opening is triangular and surrounded by three lips, each with two small papillae. The pharynx is followed by a long, muscular esophagus and a posterior sub-spherical bulb, with a sclerotized valve (Baker and Vaucher, 1984).

Male (n = 1): Body 2.35 mm and 142.3 µm wide. Pharynx 21 µm long, corpus 174.3 µm long, isthmus 32.8 µm long, oesophageal bulb 64.7 µm long, 66.3 µm wide. Nerve ring 170.2 µm and excretory pore 245.8 µm from anterior end, respectively. Tail 170.5 µm long. Gubernaculum 89.1 µm long, spicules 98.7 µm long, similar in size. At the posterior end, on the ventral surface, it presents five pairs of plectanes, arranged in two rows, the plectanes of each row are joined by a series of continuous "bars". Three pairs of rosette papillae "barrel" shaped, arranged in two rows, the first precloacal pair, the second adcloacal, and the third postcloacal and an unpaired papilliform papilla just anterior to the cloaca.

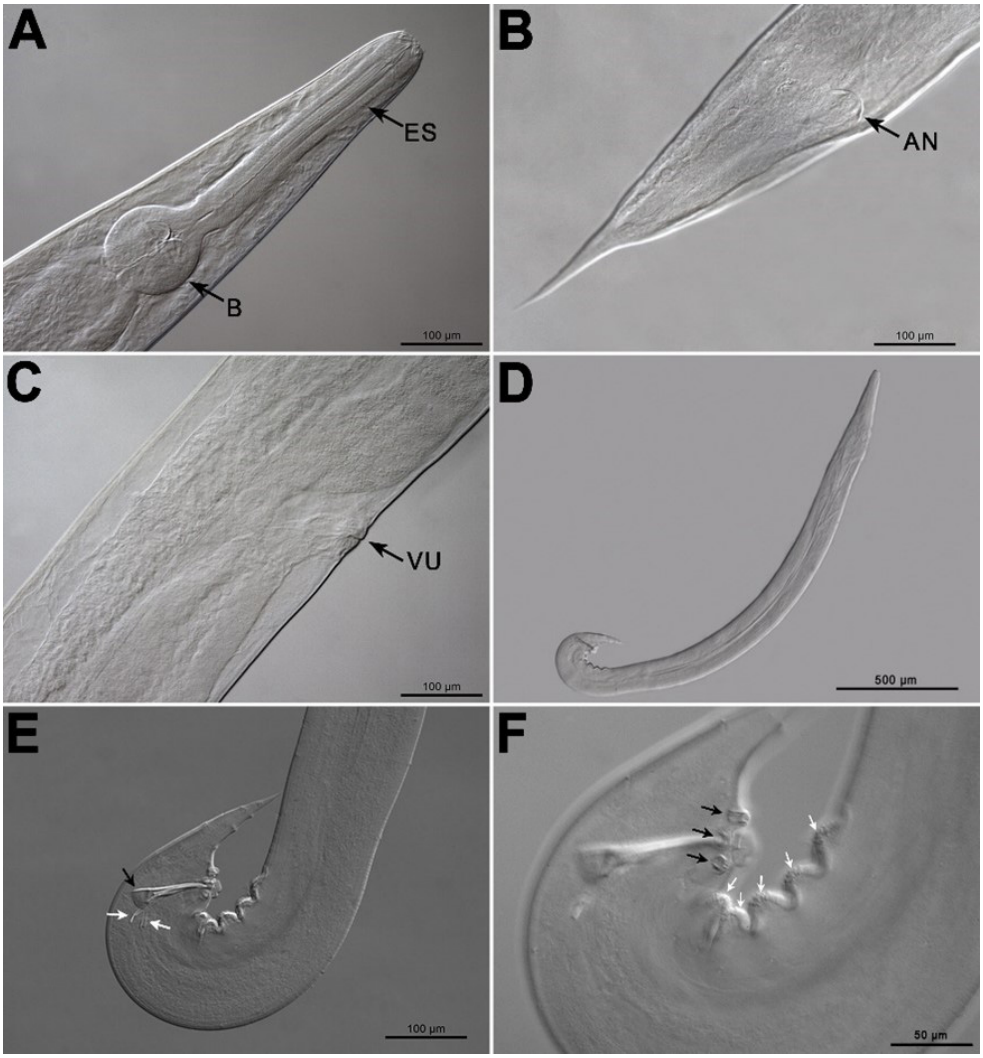

Figure 1. *Cosmocerca podicipinus* Baker and Vaucher, 1984 parasite of *Leptodeira annulata* (Linnaeus, 1758) from the Sete Cidades National Park, municipality of Piripiri, state of Piauí, Brazil. A - anterior region of the female showing esophagus (ES), bulb (B), lateral view. B - posterior region of the female with the anus (AN) opening in subventral view. C - Female with detail of the vulva (VU) opening, lateral view. D - male *in toto*, lateral view. E - Tail of the male showing spicules (white arrows), gubernaculum (black arrow), lateral view. F - detail of the male's caudal papillae, showing five pairs of plectanas (white arrows) precloacal and three pairs of rosettes papillae "barrel" shaped (black arrows), lateral view.

Female (n = 1): Body 4.89 mm long and 313.5 µm wide. Pharynx 30.1 µm long, corpus 310.9 µm long, isthmus 31.6 µm long, oesophageal bulb 104.6 µm long, 108.8 µm wide. Nerve ring 239.1 µm and excretory pore 427.9 µm from anterior end, respectively. Vulva 2.34 mm from anterior end. Eggs 86.9–92.1 µm long and 52.5–57.3 µm wide. Tail 521.7 µm long.

Cosmocerca podicipinus is distinguished from other species of the genus by the underlying sclerotized supports of plectanes conspicuous and fused between plectanes on each side of the body, and the adanal region with three pairs of large subventral rosette papillae protruding well above body surface and a large unpaired papilla on the anterior lip of the cloaca (Baker and Vaucher, 1984). The morphometry of *C. podicipinus* in the present study match with those from the original description (Baker and Vaucher, 1984).

Although *C. podicipinus* has been reported for amphibians and the parasitized snake use amphibians in its diet (Vitt, 1996), this report seems not a case of secondary infection, since the snake was necropsied immediately after the collection and the helminths were alive in the host large intestine and no amphibian remains were found in the snake's digestive tract.

This is the first record of one *Cosmocerca* species parasitizing snakes since *Cosmocerca* spp. have been previously reported only in amphibians and lizards (Ávila and Silva, 2010; Campião et al., 2014). This finding demonstrated that *C. podicipinus* is a generalist species with low specificity. In addition, Kirillova and Kirillov (2021) demonstrated that *Cosmocerca ornata* (Dujardin, 1845) has a direct life cycle with penetration through the eyes onto the conjunctiva in the surface-water layer. The low specificity of *C. podicipinus* and also the direct life cycle of this parasite could explain the occurrence of this nematode species in the snake *L. annulata*. It is assumed that the snake can use at least temporarily the same environment as the amphibians, exposing it to this infection. However, future experimental studies are necessary to prove this hypothesis.

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