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RESEARCH NOTE / NOTA CIENTÏFICA

# FILARIAL INFECTION BY *APROCTELLA STODDARDI* CRAM, 1931 (NEMATODA: ONCHOCERCIDAE) IN PASSERIFORMES FROM PERIURBAN AREAS, PARÁ STATE, BRAZIL

# INFECCION FILARIAL DE *APROCTELLA STODDARDI* CRAM, 1931 (NEMATODA: ONCHOCERCIDAE) EN PASSERIFORMES DE AREAS PERIURBANAS, ESTADO DE PARÁ. BRASIL

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## ABSTRACT

Reports of filarial nematodes in wild birds are scarce in South America, particularly in the Amazon region. We analyzed the organs in the thoracic and abdominal cavities of 34 wild birds belonging to 12 different species of the order Passeriformes in the Periurban areas of Para State. Adult filariae was observed in 3/34 (9%) birds, located in the abdominal cavity of hosts. The morphological and morphometric characteristics of the filarial nematodes were consistent with the taxonomic classification of *Aproctella stoddardi* Cram, 1931, making this the first report of this species in the Amazon region in northern Brazil. Due to the observed migration of other genera of filariae, *Aproctella* Cram, 1931 may have the ability to infection at other sites, such as the liver, heart, lung, and brain. In addition, it is necessary to expand the records of the presence of filariae in birds of the region to elucidate the factors that influence this infection.

**Key words:** Brazilian Amazon – Filarial – Onchocercidae – Wild Birds



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## RESUMEN

Reportes de nematodos filarias en aves silvestres son escasos en América del Sur, principalmente en la región amazónica. Fueron analizados los órganos de las cavidades torácica y abdominal de 34 aves silvestres pertenecientes a 12 especies diferentes de aves Passeriformes en áreas periurbanas del Estado de Pará. Filarias adultas fueron observadas en 3/34 (9%) aves, localizadas en la cavidad abdominal de los huéspedes Las características morfológicas y morfométricas de los nematodos fueron compatibles con la clasificación taxonómica de *Aproctella stoddardi* Cram, 1931, siendo este el primer relato de esta especie en la amazónica en el norte de Brasil. Debido a la migración observada de otros géneros de filarias, *Aproctella* Cram, 1931 puede tener la capacidad de infección en otros sitios, como hígado, corazón, pulmón y cerebro. Además, es necesario ampliar los registros de filarias en aves de la región para elucidar los factores que influencian esta infección.

**Palabras clave:** Amazonia brasileña – Aves silvestres – Filarias – Onchocercidae

## INTRODUCTION

Birds of the order Passeriformes have a worldwide distribution, with greater diversities in tropical and subtropical regions. They function as plant pollinators, seed dispersers, and pest controllers, contributing to the ecological balance (Almeida *et al*., 2018). Passeriformes are hosts for various parasitic agents (Berto *et al*., 2011; Magalhães-Matos *et al*., 2016; Santos *et al*., 2020), within which helminths are the most frequent in free-living birds, including nematodes *Capillaria* Zeder, 1800, *Dispharynx* Rudolphi, 1819 and acanthocephalan *Mediorhynchus* Van Cleave, 1916, the genera of helminths predominantly found in the gastrointestinal tract (Mascarenhas *et al*., 2009; Souza *et al*., 2019).

Within the Onchocercidae family, 16 genera are observed infecting the lungs, joints, and abdominal and thoracic cavities of wild birds, including *Andersonfilaria* Bartlett & Bain, 1987, *Aproctella* Cram, 1931, *Aproctiana* Skrjain, 1934, *Cardiofilaria* Ström 1937, *Chandlerella* Yorke & Maplestone, 1926, *Dessetfilaria* Bartlett & Bain, 1987, *Eufilaria* Seurat, 1921, *Eulimdana* Founikoff, 1934, *Lemdana* Seurat, 1917, *Paronchocerca* Peters, 1936 *Pelecitus* Railliet & Henry, 1910, *Pseudlemdana* Sonin & Shumilo, 1964 *Sarconema* Wehr, 1939, *Splendidofilaria* Skrjabin, 1923, *Striatofilaria* Lubimov, 1927, and *Struthiofilaria* Noda & Nagata, 1976, some of which, such as *Splendidofilaria caperata* Hibler, 1964, are associated with severe lung damage in American crows and by microfilariae in boreal owls (Bartlett & Anderson, 1981; Atkinson *et al*., 2009; Larrat *et al*., 2012). Despite the knowledge about the great number and diversity of birds in the Amazon region, the records of filarial nematodes in these hosts are scarce. Therefore, we report the occurrence of filarial nematodes in free-living Passeriformes in the periurban areas of Pará State, Brazil.

## MATERIAL AND METHODS

During the period from January 2018 to August 2019, 34 wild birds of the Order Passeriformes originating from free living and collected for wildlife monitoring belonging to the species were analyzed: *Ammodramus humeralis* Bosc, 1792 (n=2), *Turdus leucomelas* Vieillot, 1818 (n=7), *Myiothlypis flaveola* Baird, 1865 (n=1), *Dendrocinela fuliginosa* Vieillot, 1818 (n=3), *Sporophila nigricollis* Vieillot, 1823 (n=2), *Sporophila castaneiventris* Cabanis,1849 (n=1), *Zonotrichia capensis* Statius Müller, 1776 (n=2), *Saltator maximus* Statius Müller,1776 (n=1), *Ramphocelus carbo* Pallas,1764 (n=5), *Schistochlanys melanopis* Latham, 1790 (n=1), *Pitangus sulphuratus* Linnaeus, 1766 (n=2), *Tachyphonus rufus* Boddaert,1783 (n=1) and six specimens that, due to their poor state of conservation, could not be identified. The birds were necropsied at the Animal Pathology Laboratory of the Federal Rural University of the Amazon (LABOPAT-UFRA) and were deposited in the Zoology Collection of the Federal Rural University of the Amazon - MZUFRA (deposit

codes: MZUFRA birds-037), 1 bird from the Zoobotanic Park Mangal das Garças (S 1° 27'49.082 ", W 48°30'19.552"), 18 birds from UFRA - Campus Belém (S 1°27'21.380 "S, W 48°26'15.893" ) and 15 birds from the Serra Leste Fauna Monitoring Program in Curionópolis-Pará (S5°58'12.886 ", W49°37'43.115").

To obtain the helminths, the thoracic-abdominal cavity and the gastrointestinal organs: proventriculus, ventriculus, duodenum and jejunum ileum, cecum and liver, were analyzed and the adult specimens were removed and preserved in 70ºGL ethanol. Subsequently, the specimens were clarified with Amann's Lactophenol for the observation of internal structures according to the nematode protocol by Amato & Amato (2010) and identified according to the taxonomic keys of Anderson & Chabaud (1959). For the measurement and obtaining of the photos of the helminths found, a Moticam10 camera coupled to the Zeiss Primo Star light microscope was used.

**Ethic aspects:** The study was approved by the Ethics Committee on the Use of Animals of Federal Rural University of the Amazon (CEUA-UFRA) under protocol nº 034/2014 (CEUA) - 23084-022512 / 2014-2018. The authors assert that all procedures contributing to this study was conducted in accordance with bioethical requirements at the Universidade Federal Rural da Amazônia.

## RESULTS AND DISCUSSION

Of the 34 birds analyzed, adult filariae were observed in three (9%). One male specimen was found in the final portion of the large intestine of the host *D. fuliginosa*; two specimens (one male and one female) were found in the initial portion of the small intestine within the abdominal cavity in the host *T. leucomelas* and one female specimen was found in the liver capsule of the host *T. rufus* (Fig. 1A). In general, the average intensity of infection was 1.6 specimens/host. Two infected birds came from the Curionópolis region, while one from the Universidade Federal Rural da Amazonia, Belém, State of Pará, Brazil.

The nematodes morphologically presented as small, fine, whitish worms. The morphometric description, which was based on two male and two female specimens (Fig. 1), showed a small, circular oral aperture with a slight projection from the oral opening (Fig. 1C) and four pairs of small cephalic papillae around the oral aperture. Males had 7.5–8.3 mm long and 108–123 µm wide. The short esophagus apparently without division was 370–400 µm. The nerve ring was located 110–130 µm from the anterior end (Fig. 1B). Short, robust, slightly, curved spicules, left 99–104 µm and right 90–99 µm length (Fig. 1H). The tail was 63–72 µm long, with a cloacal opening located at the posterior end, and caudal papillae were absent (Fig. 1G).

The females were 14.7–15.1 mm long and 119–141 µm wide. The esophagus was 360–392 µm long. The nerve ring was 145–150 µm long from the anterior end (Fig. 1D). The vulvar aperture posterior to the esophagus was 0.77–1.42 mm long from the anterior end (Fig. 1E). The anal aperture was located at the posterior end of the body. The tail with a rounded tip measured 110.5–160 µm in length (Fig. 1F). The filarid specimens were classified as *Aproctella stoddardi* Cram, 1931 (Nematoda: Onchocercidae) owing to the post-esophageal position of the vulvar aperture, presence of an esophageal tooth in the oral aperture, and absence of caudal papillae in the male specimen, consistent with studies by Anderson & Chabaud (1959), Sonin & Barus (1968), and Bain *et al*. (1981).

Filarial species of the genus *Aproctella* are non-specific to their definitive hosts, including various taxonomic orders of birds. Currently, four species of *Aproctella* are registered in the Americas for parasitizing the peritoneal cavity: *A. carinii* Pereira & Vaz, 1933, reported in Passeriformes and Pelecaniformes in southern Brazil (Mascarenhas *et al*., 2009; Scheer *et al*., 2019); *A. alessandroi*, Bain, Petit, Kozek & Chabaud, 1981 registered as Passeriformes *Thraupis episcopus* Linnaeus, 1766 in Colombia; *A. golvani* Bain, Petit, Kozek & Chabaud, 1981 in Passeriformes *Quiscalus lugubris* Swainson, 1838 and *Loxigilla noctis* Linnaeus, 1766 in Petit-Bourg, Central America (Bain *et al*., 1981); and *A. stoddardi*, initially reported in Galliformes, Coraciformes, and Passeriformes in the United States and Canada (Anderson, 1957; Anderson, 1961; Boyd, 1966) and later observed in 14 species of birds

Strigiformes, Psittaciformes, Piciformes, and Passeriformes in the island of Cuba (Sonin & Barus, 1968) and *Thraupis sayaca* Linnaeus,1766 in southern Brazil (Pinto *et al*., 1991).

Studies on the complex life cycle of the genera *Aproctella* are scarce. Bain *et al*. (1981) experimentally described the development of *A. alessandroi* microfilariae using Diptera *Aedes togoi* Theobald, 1907 as an intermediate host that reached its infective stage on day 13. According to studies by Pandey *et al*. (2015), Gomez-Puerta & Mayor (2017), and Mondal *et al*. (2017), filarid specimens of other genera are dynamic at the infection sites, and it is likely that in birds, the filariae can also reach the vital organs, such as the liver, heart, lung, reproductive organs, and brain. In the present study, we extended the distribution to the Amazon region of *A. stoddardi* in the hosts *Dendrocincla fuliginosa* Vieillot, 1818, *Turdus leucomelas* Vieillot, 1818, and *Tachyphonus rufus* Boddaert, 1783 at different infection sites with images of the morphology under light microscopy. It is necessary to expand the records of the presence of filarid nematodes in birds in the region to elucidate the ecological factors that influence this infection.

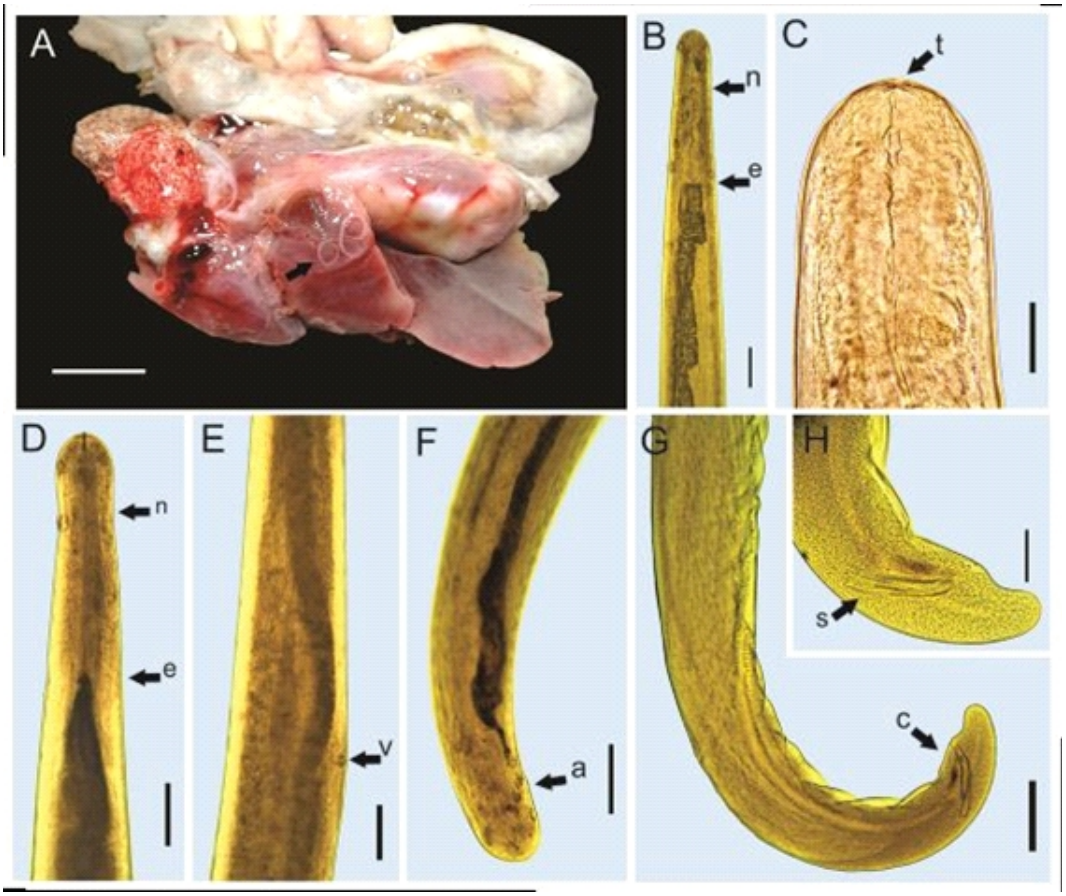


**Figure 1**. Specimens de *Aproctella stoddardi*. **A**: macroscopic view of the adult female specimen (arrow) in the capsule hepatic (scale bar=0.5 cm). **B**: Anterior end of the male showing the nerve ring (n) and the final esophagus portion and beginning of the intestine (e) (scale bar =100µm) **C:** Anterior end of the female showing the projection of the esophageal tooth in the oral aperture (t) (scale bar =40µm). **D**: Anterior end of the female showing the nerve ring (n) and the final esophagus portion and beginning of the intestine (e) (scale bar =100µm). **E**: anterior end portion of the female showing the vulvar aperture (v) (scale bar =100µm). **F:** Posterior end of female showing tail shape and anal aperture (a) (scale bar=100µm). **G**: Posterior end of male showing cloacal aperture (c) and tail shape (scale bar =100µm). **H:** Final portion tail of the male showing the shape of the spicules (s) (scale bar =20µm).

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