First record of *Procyrnea* sp. (Nematoda: Habronematidae) in *Buteogallus schistaceus* (Sundevall) (Accipitriformes: Accipitridae) in Brazilian Amazon

**Short Communication**

**Abstract**

*Buteogallus schistaceus* (Sundevall) is an endemic bird of prey from the Amazon region, with a declining population according to international conservation agencies. The objective of this study was to report the occurrence of a parasitic nematodes in an individual treated at the Ambulatório de Animais Silvestres of Universidade Federal Rural da Amazônia, Belém campus. The animal was captured on campus and showed no resistance to capture. Fluid therapy and deworming were made, later the bird regurgitated ten nematodes identified as belonging to the genus *Procyrnea* Chabaud (1958). Reviewing the scientific literature, it was found that so far there are no records on the helminth fauna of this bird species, which is therefore the first report of a nematode in *B. schistaceus*.

**Keywords:** Nematode, Slate-colored Hawk, Pará.

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**Resumo**

*Buteogallus schistaceus* (Sundevall) é uma ave de rapina endêmica da região amazônica, com população em diminuição, segundo órgãos de conservação internacional. O objetivo deste trabalho foi relatar a ocorrência de nematódos parasitos em um indivíduo atendido no Ambulatório de Animais Silvestres da Universidade Federal Rural da Amazônia, Belém campus. O animal foi capturado na dependência do campus e não apresentou resistência à captura. Foram então instituídos fluidoterapia e vermifugação, após os quais o animal regurgitou dez nematódos identificados como pertencentes ao gênero *Procyrnea* Chabaud (1958). Ao revisar a literatura científica, verificou-se que, até o momento, não existem quaisquer registros sobre a helmintofauna dessa espécie de ave, sendo, portanto, o primeiro relato de um nematode em *B. schistaceus*.

**Palavras-chave:** Nematódeos, gavião-azul, Pará.
Introduction

The Brazilian avifauna comprises over 1900 species among which 91 are birds of prey (Placentini et al., 2015). This group is essential for population regulation because they are at the end of the food chain (Andery et al., 2013). The Slate-colored Hawk Buteogallus schistaceus (Sundevall) is a non-migrant, diurnal neotropical bird of prey endemic to the Amazon rainforest, which occurs from southern Bolivia, through Peru, Ecuador, Colombia, Venezuela, French Guiana and Brazil; in the latter mainly in the states of Amazonas, Pará and Amapá. It is currently declining in its population, despite being classified in conservation status as "least concern" according to BirdLife International (2016). It has a varied diet that includes lizards, snakes and some insects (e.g., orthopteran and moths) (Robinson, 1994).

Procyrene Chabaud, 1958 contains 60 species described around the world. Of these, 15 have been reported in the Neotropical Region, ten in Brazil (Table 1). They are parasites of the upper digestive system of birds, especially of the ventriculus and proventriculus (Arrona-Rivera et al., 2016). They can cause severe inflammation of the parasitized organ mucosa and consequent organic weakness followed by death (Niemuth et al., 2013).

Table 1. Records to the species of the Neotropical Procyrene Chabaud, 1958 from birds, indicating their hosts and geographical distributions.

| Species                      | Hosts                                                                 | Locality | Reference                  |
|------------------------------|-----------------------------------------------------------------------|----------|----------------------------|
| Procyrene anterouwvata       | Cheliodoptera tenebrosa brasiliensis Sclater                         | Brazil   | Pinto et al. (1996)        |
| P. brevecauda Zhang, Brooks & Causey, 2004 | Crypturellus cininomomeus (Lesson)                                | Costa Rica | Zhang et al. (2004)    |
| P. choique Bagnato, Frixione, Digiani & Cremonete, 2018 | Rhea pennata (d’Orbigny)                                         | Argentina | Bagnato et al. (2018)  |
| P. coloptes (Walton, 1927)   | Celeus lugubris lugubris (Malherbe)†                                | Brazil   | Pinto et al. (1996)        |
| P. longistriata (Molin, 1859) | Colaptes campestris (Viellot)†                                      | Brazil   | Cram (1927)                |
| P. mclennanae Zhang, Brooks & Causey, 2004 | Heliomaster constantii (De Lattre)                                 | Costa Rica | Zhang et al. (2004)    |
| P. mansioni (Seurat, 1914)   | Celeus grammicus (Natterer & Malherbe)‡                             | Brazil   | Pinto et al. (1994)        |
| P. mawsonae Zhang, Brooks & Causey, 2004 | Rupornis magnirostris (Gmelin)‡                                     | Costa Rica | Zhang et al. (2004)    |
| P. pileata (Walton, 1927)    | Celeus flavescens flavescens (Gmelin)‡                              | Brazil   | Pinto et al. (1996)        |
| P. ruschii (Freitas, 1967)   | Colibri serirrostris (Viellot)‡                                      | Brazil   | Vicente et al. (1995)      |
| P. spinosa (Gendre, 1923)    | Milvago chimicho chimacho (Viellot)‡                                 | Chile    | San Martin et al. (2006)   |
| P. uncinipennis (Molin, 1860) | Rhamphastos tucanus (Linnaeus)‡                                      | Brazil   | Cram (1927)                |
| P. unilaterialis (Molin, 1860) | Rhamphastos tucanus Linnaeus‡                                       | Brazil   | Cram (1927)                |
| P. waltoni (Freitas & Lent, 1947) | Rhea americana (Linnaeus)‡                                          | Brazil   | Freitas & Lent (1947)      |

*Cited as Celeus flavescens lugubris; †Cited as Celeus jumana jumana; ‡Cited as Polyrhynchus semitorquatus; †Cited as Buteo magnirostris magnirostris; †Cited as Buteo magnirostris nattereri; †Cited as Picus campestris; †Cited as Picus grammicus; †Cited as Buteo magnirostris; †Cited as Phoeboccus melanoleucus melanoleucus; †Cited as Phoebocetes robustus; †Cited as Phoebocetes rubricollis trachepoglyrus; †Cited as Chlorostilbon aureoventris pucherani; †Cited as Ramphastos erythrorhynchos.
One hundred and seventy years after its original description, there are still no references to the helminth fauna of *B. schistaceus* in the specialized literature. This fact is of great importance when considering that parasitic action, along with anthropic action, may interfere with its *ex situ* conservation (Santos et al., 2015). Therefore, the objective of this study was to report the occurrence of *Procyrnea* sp. in *B. schistaceus* in the state of Pará, Brazil.

**Case report**

A young specimen of *Buteogallus schistaceus* was received for care at the Ambulatório de Animais Silvestres of Universidade Federal Rural da Amazônia, Belém campus. All applicable institutional, national and international guidelines for the care and use of animals were followed. Scientific Collecting Permits were provided by Comitê de Ética no Uso de Animais (CEUA/ UFRA) (Permit Number 23084.022512/2014-14). The animal was observed by a university official on campus grounds (1°27'12.3"S, 48°26'36.5"W), who informed the clinic that the bird appeared to be ill. During capture the animal showed no resistance. At clinical examination, the animal was lethargic, with no escape reflex, with moderate dehydration, weighing 453 g. Direct parasitological examination of the feces did not reveal helminth eggs. The therapeutic protocol consisted of subcutaneous fluid therapy (0.9% saline solution in a total application of 26 mL for three days, combined with a single dose of Vitamin A 20,000 IU) and oral deworming (Praziquantel, Pirantel Pamoate and Oxantel Pamoate in combination) in two applications in a 15-day interval. After the first deworming the animal regurgitated ten nematodes that were collected, fixed in AFA (alcohol-formaldehyde) solution and sent to the Animal Helminthology Laboratory for taxonomic identification. Nematode specimens were clarified with 50% Aman lactophenol and temporarily mounted between slide and coverslip for observation and measurement of morphological characters under light microscope LEICA DM2500 with an imaging capture system. For the taxonomic classification of nematodes, the works of Vicente et al. (1995) and Bagnato et al. (2018) were consulted. Thirty days after admission the animal was returned to the wild.

The nematodes (one male, eight female and one broken specimen) had a thin body, with attenuated extremities and transversely striated cuticle. Mouth with two lips, one ventral and one dorsal, and two lateral pseudolabia with teeth at their anterior border. Esophagus divided into short anterior muscle part and long posterior glandular part. Deirids anterior to the nerve ring. Excretory pore posterior to the nerve ring. Body with two asymmetrical lateral alae. Male with unequal and dissimilar spicules. Gubernaculum present. Caudal alae present with longitudinal cuticular thickening. Females with median vulva, of lateral-ventral opening, and pointed tip. These characteristics are compatible with those described for the genus *Procyrnea* Chabaud, 1958 (Figure 1 and Table 2). Diagnosis at the specific level was not possible due to the collection of a single male with an extremely curled tail, making it impossible to observe the quantity and disposition of the caudal papillae.

**Table 2.** Morphometric data of *Procyrnea* sp. (Nematoda: Habronematidae) regurgitated by *Buteogallus schistaceus* (Sundevall), Belém, Pará State, Brazil. Measurements are given in micrometers unless otherwise stated, with the range followed, in parenthesis, by the mean and standard deviation.

| Features                                      | Male (n=1) | Female (n=8) |
|-----------------------------------------------|------------|--------------|
| Body length, mm                               | 9.34       | 9.42-19.40 (13.76 ± 3.39) |
| Body width                                    | 120        | 128.00-290.00 (239.88 ± 53.61) |
| Left lateral ala length                       | 1.65       | 2.08-5.45 (4.33 ± 1.15) |
| Right lateral ala length, mm                  | 3.97       | 1.88-3.05 (2.50 ± 0.39) |
| Buccal capsule length                         | 20         | 20.00-25.00 (21.14 ± 2.04) |
| Buccal capsule width                          | 13         | 13.00-20.00 (14.57 ± 2.82) |
| Muscular esophagus length                     | 371        | 233.00-528.00 (404.50 ± 87.13) |
| Muscular esophagus width                      | 36         | 33.00-71.00 (42.25 ± 12.96) |
| Glandular esophagus length, mm                | 2.00       | 1.67-2.78 (2.16 ± 0.36) |
| Glandular esophagus width                     | 96         | 43.00-129.00 (76.29 ± 27.18) |
| Deirids†                                      | 130        | 50.00-165.00 (132.63 ± 22.74) |
| Nerve ring†                                   | 213        | 180.00-250.00 (222.38 ± 36.99) |
| Excretory pore†                                | 310        | 242.00-333.00 (301.00 ± 34.53) |

*one broken specimen not included on measurements; †from anterior end.
Procyrnea sp. in Buteogallus schistaceus

Table 2. Continued...

| Features              | Procyrnea sp.* |
|-----------------------|----------------|
|                       | Male (n=1)     | Female (n=8) |
| Tail                  | 217            | 153.30-243.00 (188.54 ± 30.73) |
| Right spicule         | 316            | -             |
| Left spicule          | 880            | -             |
| Gubernaculum          | 37             | -             |
| Vulva, mm†            | -              | 3.97-6.71 (5.67 ± 0.96) |
| Egg length            | -              | 28.00-34.00 (30.94 ± 2.48) |
| Egg width             | -              | 14.33-17.00 (15.72 ± 1.12) |

*one broken specimen not included on measurements; †from anterior end.

Figure 1. Photomicrographs of Procyrnea sp. (Nematoda: Habronematidae) regurgitated by Buteogallus schistaceus (Sundevall), Belém, Pará State, Brazil. (A) Male anterior end, ventral view. Note the lateral ala on each side of the body. Bar: 100 µm; (B) Male tail, lateral view. Arrowheads indicate the beginning of spicules. Bar: 200 µm; (C) Vulva (arrow), lateral view. Bar: 50 µm; (D) View of the eggs. Bar: 25 µm; (E) Female tail with, lateral view. Bar: 50 µm; (F) Detail of the posterior end of the spicules and gubernaculum (arrowheads). Bar: 50 µm. Abbreviations: A = anus; BC = buccal capsule; D = deirid; GE = glandular esophagus; LA = lateral alae; ME = muscular esophagus; NR = nerve ring; PT = pointed tip.
Discussion

Chabaud analyzing the cephalic structures of habronematid nematodes, relocated some species described as *Habronema* Diesing, 1861, creating the *Procyrnea* subgenus within the genus *Cyrnea* Deshayes, 1858. Finally, Chabaud's work establishes the *Procyrnea* as genus (Zhang et al., 2004). *Procyrnea* nematodes are bird parasites, mainly in birds of prey of the Falconiformes and Strigiformes orders around the world (Eduardo & Villa, 2011; Bagnato et al., 2018). They use as an intermediate host an orthopteran insect in whose hemocoele they develop from larvae to infective stage L3, remaining encapsulated or free inside (Anderson, 2000). Of ten species reported in Brazil, only two were observed in accipitrids: *P. mansioni* (Seurat, 1914) in *Rupornis magnirostris* (Gmelin); and *P. leptoptera* (Rudolphi, 1819) in *R. magnirostris*, *Geranospiza caerulescens caerulescens* (Vieillot), *Harpagus diondon* (Temminck), *Heterospizias meridionalis meridionalis* (Latham), *R. magnirostris magnirostris* (Gmelin) and *R. magnirostris nattereri* (Sclater & Salvin) (Pinto et al., 1994; Vicente et al., 1995). In a recent publication, *Procyrnea* sp. has been reported in *Geranoaetus polyosoma* (Quoy & Gaimard) (Aves: Accipitridae) in Chile (Grandón-Ojeda et al., 2019).

Species of the genus parasitize the upper digestive system of birds, especially the ventricle and proventriculus (Arrona-Rivera et al., 2016). Clinical examination of the bird showed dehydration and low weight, which may be related to *Procyrnea* parasitism, considering its physiological recovery after the establishment of the fluid therapy and deworming protocol. Failure to observe eggs in the parasitological examination of feces does not rule out this possibility since false negatives may occur in non-specific tests, such as this one.

Based on research in the specialized scientific literature, this is the first report of the occurrence of *Procyrnea* sp. in *B. schistaceus*. No other reports of helminth parasitism were found in this bird of prey species, making this the first report of endoparasite in this bird.

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