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Communication

[*Comunicação*]

First record of *Dipetalonema graciliformis* (Filarioidea: Onchocercidae) in *Saguinus bicolor* (Spix, 1823) in Brazil

[*Primeiro registro de Dipetalonema graciliformis (Filarioidea: Onchocercidae) em Saguinus bicolor (Spix, 1823) no Brasil*]

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Saguinus bicolor, popularly known as "sagui-de-duas-cores" or "sauim-de-coleira", is a species of Brazilian primate, with exclusive natural occurrence in the state of Amazonas (Gordo *et al*., 2019). The species is critically endangered (Gordo *et al*., 2019; Lista…, 2022) due to habitat loss and fragmentation, roadkill, in addition to hunting and illegal trade, since its area of occurrence is restricted and has been occupied by the disorderly growth of the metropolitan region of the Amazonian capital (Reis *et al*., 2011; Bezerra-Santos *et al*., 2021).

Neotropical primates are commonly parasitized by filarial nematodes of the genera *Dipetalonema* and *Mansonella* (Bain *et al*., 2015; Laidoudi *et al*., 2020). Both differ morphologically, mainly by the presence of evident transverse striations and a pair of lateral conical processes near the tip of the tail in both sexes of *Dipetalonema* (Vicente *et al*., 1997). These parasites are transmitted by hematophagous insects (especially keratopogonid and simuliid dipterans), live in various tissues and cavities outside the gastrointestinal tract of the host (Strait *et al*., 2012), and may induce pathologies that involve pleuritis, fibrinopurulent peritonitis and fibrinous adhesion (Baker, 2018). Thus, understanding the impact of parasitic helminths on their hosts is an aspect that should not be neglected as a vital part of the conservation of primate species.

Studies on primate parasitic nematodes are scarce, therefore, the present study aims to describe, for the first time, the parasitism by *Dipetalonema graciliformis* (Filarioidea: Onchocercidae) in *Saguinus bicolor* (Spix, 1823) in Brazil.

For this purpose, two specimens of adult female filarids were received at the Laboratory of Veterinary Parasitology of the University of Santa Maria for taxonomic identification. The parasites were found during the necropsies of two adult female primates of the species *Saguinus bicolor*, carried out by the veterinary team of a zoo in Manaus, Amazonas. The animals were free-ranging and were found lifeless by the Wild Animal Screening Center team, in forest fragments near the zoo.

The nematodes, found under the serous membrane of the intestine and liver, were fixed in 70º alcohol, clarified in Amann's Lactophenol, mounted on permanent slides with Canada balsam under slide and coverslip (Amato and Amato, 2010) and taxonomically identified at the level of species according to the literature described by Freitas (1964), Petit *et al*. (1985), Bain *et al*. (1986) and Laidoudi *et al*. (2021). The specimens were identified and photographed with the aid of an Olympus optical microscope (CX22 series) and were deposited in the parasitological collection of the Laboratory of

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Veterinary Parasitology of the University of Santa Maria. The specimens were deposited in the parasitological collection of the Laboratory of Veterinary Parasitology at the Federal University of Santa Maria.

The two filarids were identified as *Dipetalonema graciliformis* (Fig. 1), which is the first record of the species in *S. bicolor* in Brazil. According to Côrrea *et al*. (2016), *D. graciliformis* had only been described in *Saguinus midas*, *Saguinus mystax* and *Saguinus niger* in the country, in the localities of Pará, Amazonas and Pará, respectively. The other species of *Dipetalonema* described in wild primates in Brazil are described in Table 1. In addition to *D. graciliformis*, *D. caudispina* and *D. gracile* are reported in the country, and these include records in *S. bicolor*.

The mean value, in μm (unless specified), of the measurements of *D. graciliformis* females found in this study are listed below: Body length (mm): 250 (240-260); Body width: 322.5 (310-335); Buccal capsule length: 10 (9-11); Nerve-ring from anterior extremity: 220.5 (219-222); Oesophagus length: 3400.5 (3315-3486); Muscular portion length: 408 (397-419); Glandular portion length: 2992.5 (2918-3067); Tail length: 249.5 (246-253); Caudal lappets length: 10.5 (10-11); Distance from the vulva to the anterior extremity: 766 (764-768) and vagina length: 205.5 (204-207). Comparative measurements of females of the other *Dipetalonema* species described in wild primates are detailed in Table 2.

The body of the filarids found is whitish with thin transverse cuticular striations. The anterior end is rounded, with a small buccal capsule, and the cuticle of the head in the cephalic region has a smooth quadrangular shape (Fig. 1 - A). A small oral opening with four labial papillae is arranged in a laterally elongated rectangle and four cephalic papillae are located around the oral opening. The oesophagus is divided into an anterior muscular part (short) and a posterior glandular part (long) and has a nerve ring located halfway along the muscular oesophagus, with an excretory pore visible behind the nerve ring. The vulva is at the level of the glandular oesophagus and the vagina has a sinuous duct (Fig. 1 – B). The ovaries are in the middle of the body. The posterior end is tapered, with the presence of the anal opening in this region (Fig. 1 – C). The females had an extremity with three well-developed petaloid appendages in a triangular shape (Fig. 1 - D).

Morphologically, *D. graciliformis* is similar to *D. gracile*, although females of *D. graciliformis* are longer and have a shorter oesophagus and tail (Bain *et al*., 1986). In size, *D. graciliformis* is similar to *D. yatesi*, *D. freitasi*, *D. caudispina* and *D. digitatum*. However, *D. yatesi* and *D. caudispina* have a simple vagina and a longer tail; *D. freitasi* and *D. digitatum* have a shorter oesophagus (Freitas, 1943; Bain *et al*., 1986; Notarnicola *et al*., 2007).

In the current study, we provide detailed morphological data of female specimens of *D. graciliformis* isolated from *S. bicolor* in the Brazilian Amazon. And so, the number of known hosts parasitized by this species of filarid in the country expands.

Figure 1. Female *Dipetalonema graciliformis*. (A) Head end with small oral capsule (arrow). (B) Lateral view of the anterior region showing vulvar opening (arrow) and vagina with sinuous duct (arrowhead). (C) Posterior extremity with detail in the anal opening (arrow). (D) Posterior extremity with lapel details (arrows).

Table 1. *Dipetalonema* species described in wild primates in Brazil

Dipetalonema species	Primate species	Geographic location	Reference
Dipetalonema caudispina	*Alouatta guariba*		Pinto *et al*. (2011); Corrêa *et al*. (2016)
	Ateles paniscus		
	Brachyteles arachnoides	Amazonas, São Paulo	
		Pará	
	Callicebus personatus	Rio de Janeiro, São Paulo	
		Unspecified location	
	Cebus apella	Mato Grosso, Minas Gerais	
	Cebus capucinus	São Paulo	
	Leontopithecus rosalia	Pará	
		Unspecified location	
	Leontopithecus chrysopygus	Unspecified location	
		Amazonas	
	Saguinus bicolor		
	Saimiri sciureus		
Dipetalonema graciliformis	*Saguinus midas*	Pará	
	Saguinus mystax	Amazonas	
	Saguinus niger	Pará	
Dipetalonema gracile	*Ateles paniscus*		
	Brachyteles arachnoides	Amazonas, Minas Gerais, Goiás, Pará, São Paulo	
		Unspecified location	
	Callithrix jacchus	Pará	
	Cebus apella	Mato Grosso do Sul, Pará	
	Cebus capucinus	Amazonas, Goiás, Mato Grosso, Mato Grosso do	
	Cebus cay	Sul, Minas Gerais, Pará, São Paulo	
	Cebus libidinosus	Amazonas, Pará, Goiás, Minas Gerais, São Paulo	
	Lagothrix lagotricha	Mato Grosso	
		Amazonas, Goiás, Minas Gerais, Pará, São Paulo	
	Leontopithecus chrysopygus	Unspecified location	
		Unspecified location	
	Leontopithecus rosalia	Unspecified location	
	Saginus bicolor	Amazonas, Goiás, Minas Gerais, Pará, Rio de Janeiro, São Paulo	
	Saimiris ciureus		

Table 2. Measurements in µm, unless specified, of *Dipetalonema* species (adult females) described in wild primates worldwide

Features	*D. graciliformis* (Freitas, 1964)	*D. yatesi* (Notarnicola, Jimenez and Gardner, 2007)	*D. robini* (Petit Bain, and Roussilhon, 1985)	*D. freitasi* (Bain Diagne and Muller, 1987)	*D. caudispina* (Molin,1858)	*D. gracile* (Rudolphi, 1819)	*D. digitatum* (Webber and Hawking, 1955)	*D. obtusa* (Esslinger, 1966)
Body length (mm)	255–330	239.6–254.2	130–152	210–230	295	167–210	170-260	23-46
Body width	340–350	339-575	250–430	450–460	220-250	400-450	380-550	57-77
Buccal capsule length	12	5-9	-	10-11	12	10	-	-
Buccal capsule width	-	17-21	-	-	-	-	-	35-43
Nerve-ring from anterior extremity	225	226-300	170–225	230	200	155	160	118-179
Oesophagus length	3360–3700	3175–4787	3920–4700	2000–2040	2720	3950–5500	1100-1300	417-882
Muscular portion length	430-550	350-750	700–1050	425-440	800	720	-	-
Glandular portion length	2930-3150	-	-	1575–1600	1980	-	-	-
Tail length	250-300	635-810	660	510–590	800	640-850	330-460	91-145
Caudal lappets length	12	10	8-11	9-10	10-12	7-12	-	-
Lateral lappets from tip of tail	8-14	-	-	6	8-10	5	-	-
Vulva from anterior extremity	760–850	588–1636	830–980	650–670	400-420	1150–1600	950-1200	324-510
Vagina length	280	269	200	380-390	350-460	300	-	-

RESUMO

Saguinus bicolor *é uma espécie de primata brasileiro, a qual se encontra criticamente em perigo de extinção. Os primatas são comumente parasitados por nematódeos filarídeos, transmitidos por insetos hematófagos, que parasitam vários tecidos e cavidades fora do trato gastrointestinal do hospedeiro. Portanto, o impacto dos helmintos parasitos em seus hospedeiros é um aspecto que não deve ser negligenciado como parte vital da conservação das espécies primatas. Com o presente estudo, objetivou-se descrever, pela primeira vez, o parasitismo por* Dipetalonema graciliformis *(Filarioidea: Onchocercidae) em* Saguinus bicolor *(Spix, 1823) no Brasil. Foram fornecidos dados morfológicos detalhados de espécimes fêmeas e, assim, expande-se o número de hospedeiros conhecidos parasitados por essa espécie de filarídeo no país.*

Palavras-chave: animais silvestres, filarias, nematódeo, primatas, sauim-de-coleira

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