

Adeleidea pseudoparasites in *Cerdocyon thous* Linnaeus, 1766 in Southern Brazil

Adeleídeos pseudoparasitos em *Cerdocyon thous* Linnaeus, 1766 no Sul do Brasil

Rosiléia Marinho de Quadros¹; Anderson Barbosa de Moura^{2*};
Ruan Bruno Rodrigues³; Marzia Antonelli⁴; Wilian Rafael Veronezi⁵

Abstract

Carnivores may have very varied eating habits, including the consumption of insects free in the environment or within grains. The ingestion of these invertebrates is essential for the dispersion of some kinds of coccidia in nature, which occurs through stool. This study shows the presence of Adeleidae pseudoparasites in *Cerdocyon thous* faeces in Southern Brazil, as well as alerting veterinarians to the existence of spurious infections that may lead to misleading descriptions of new species in these hosts, or attribute wrongly the presence of these protozoa to illness symptoms.

Key words: Pseudoparasite. Coccidia. Adeleidae. Carnivore.

Resumo

O hábito alimentar de muitos carnívoros pode ser variado, o que inclui o consumo de insetos livres no ambiente ou que estejam em grãos. A ingestão destes invertebrados é essencial para que alguns coccídios possam ser dispersos na natureza através das fezes. Este estudo relata a presença de pseudoparasitos adeleídeos em fezes de *Cerdocyon thous* no sul do Brasil e alerta aos médicos veterinários quanto à existência de infecções espúrias que podem levar a descrições equivocadas de novas espécies nestes hospedeiros ou atribuir, erroneamente, à presença destes protozoários a algum sinal clínico.

Palavras-chave: Pseudoparasito. Coccídio. Adeleidae. Carnívoro.

¹ Profª, Curso de Ciências Biológicas, Universidade do Planalto Catarinense, UNIPLAC, Lages, SC, Brasil. E-mail: rosileia18@hotmail.com

² Prof., Programa de Pós-Graduação em Ciência Animal, Centro de Ciências Agroveterinárias, CAV, UDESC, Lages, SC, Brasil. E-mail: anderson.moura@udesc.br

³ Discente, Curso de Graduação em Medicina Veterinária e Bolsista de IC do Centro de Ciências Agroveterinárias, CAV, UDESC, Lages, SC, Brasil. E-mail: ruanbr@hotmail.com

⁴ Médica Veterinária, Associação R3 Animal, Florianópolis, SC, Brasil. E-mail: mahantonelli@hotmail.com

⁵ Técnico Administrativo, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, IBAMA, Painei, SC, Brasil. E-mail: wilianrafa@bol.com.br

* Author for correspondence

Introduction

Wild carnivores have a vast geographical range. The modified biomes may alter the natural landscape where these animals are found, and so interfere directly in their social life and behavioral patterns. As these species require large areas for living, the environmental fragmentation may lead to the migration of these animals towards urban areas in search for food and shelter. In Brazil, there are 29 land species of the Order Carnivora (REIS et al., 2006). From the seven genres and 11 species of wild Canidae that can be found in South America, three are seen in Rio Grande do Sul: the crab-eating fox (*Cerdocyon thous*), the pampas fox (*Lycalopex gymnocercus*) and the maned wolf (*Chrysocyon brachyurus*) (RUAS et al., 2008). In Santa Catarina, there is current evidence of *C. thous* and *L. gymnocercus* (CHEREM et al., 2007).

C. thous has an ample range, being sighted in almost all Brazilian biomes in a large variety of habitats (BEISIEGEL et al., 2013).

The species seems to be tolerant to anthropic interference and, with generalized eating habits, feeds off remains left by the human population, as well as domestic animals and grains. Aside from that, they are also considered important seed dispersers (CAZETTA; GALETTI, 2009).

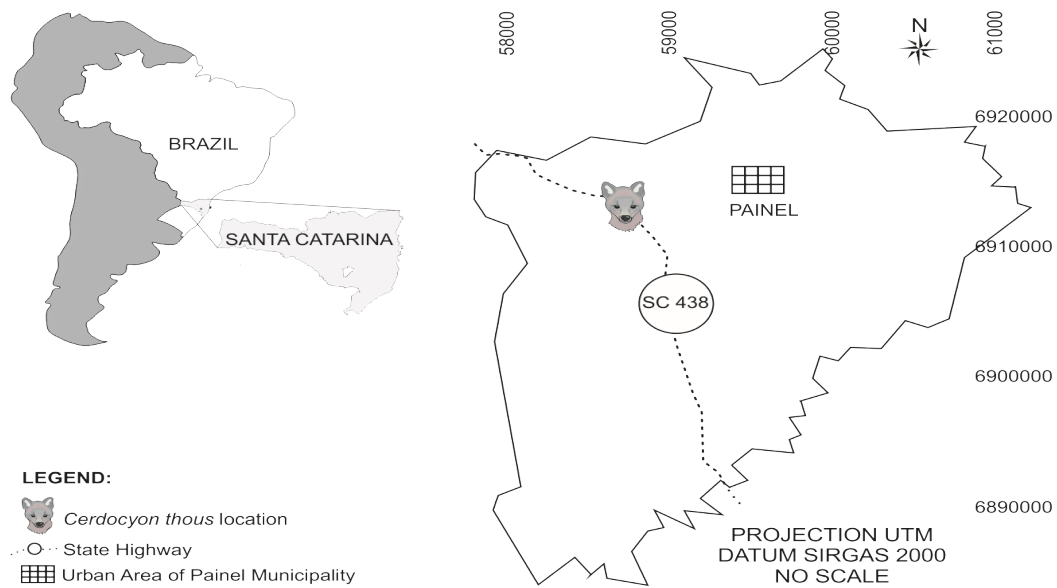
The coccidia of the Adeleidae Family are parasitic and/or symbiotic organisms of invertebrates, yet they are found in the digestive tract of vertebrate hosts through the ingestion of these invertebrates (BERTO et al., 2010). The insectivorous habit of some vertebrates is essential

to the proliferation of these protozoa, as they are dependent on the feeding habits of the animals that prey on them and guarantee their dispersal (LOPES et al., 2013).

The Adeleidea are mainly found in arthropods. The majority of known species parasite insects, while others may be seen in mites, myriapods and oligochaetes. These invertebrate coccidian are considered pseudoparasites in vertebrates, because they use these animals so that their oocysts, already sporulated, may reach their natural hosts as they feed on carnivore stool. Carnivore and omnivore vertebrates, having consumed these invertebrates, end up harboring the evolving forms of these Coccidia. This has been responsible for many rash descriptions of new genres and species of protozoa diagnosed in fecal samples, as well as the vertebrate being wrongly identified as the permanent host (GRESSLER et al., 2009).

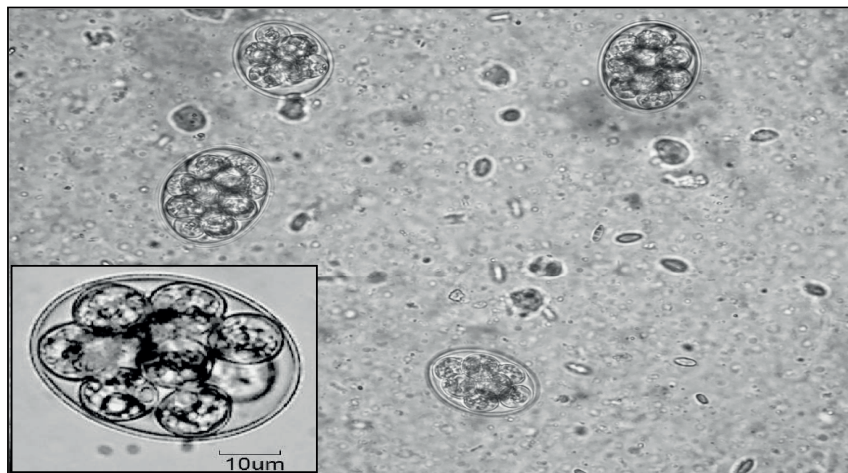
The goal of this study was report the occurrence of pseudoparasitic coccidian in *Cerdocyon thous* in the state of Santa Catarina and alerting veterinarians that these protozoa do not represent significant pathogens in spite of their presence in fecal samples.

An adult male animal of the species *Cerdocyon thous* (crab-eating fox) was found dead in September of 2011, by run over on Highway SC 438 (coordinates 27°53'53.79" S 50°07'28.12" W) near the town of Painel, state of Santa Catarina, Southern Brazil (Figure 1). Fecal samples were examined for parasites using the simple Willis-Mollay flotation method and spontaneous sedimentation (Hoffman).

Figure 1. Run over of the Canidae *Cerdocyon thous* in Santa Catarina state, Southern Brazil.

Copro-parasitological exams demonstrated, along with helminths eggs occurring in carnivores, spherical structures similar to coccidian oocysts, however multispored with approximately 10 sporocysts with $45,2 \mu\text{m} \times 38,1 \mu\text{m}$ dimensions under optical microscope (Figure 2). The coccidian found in this animal were compatible with pseudoparasitic protozoa in vertebrate members of the Adeleidae Family, found parasiting invertebrates (LOPES et al.,

2013). In the feces of a cat in Santa Maria (RS), and a pampas fox, in Cachoeira do Sul (RS), were found two species of adeleidae members (GRESSLER et al., 2009), possibly as a result of diet of these animals, including arthropods. Dipterous (MILUTINOVIĆ et al., 1995), grasshoppers, cockroaches, crickets, and beetles (BERTO et al., 2010), hunted or accidentally ingested, have been described parasitized by coccidia of the Adeleidae Family.

Figure 2. Multispored oocysts of the Adeleidae Family in fecal samples of *Cerdocyon thous* (Vis. 100 X/ Detail: 400X).

Due to the high resistance in the wall of oocysts and sporocysts of *Coccidia*, they do not lose their morphological characteristics when passing through the intestinal tract and being eliminated in the feces of non-host omnivores and carnivores, favoring their survival in the environment. Grains, mainly stored grains, may be attacked by several species of insects and plagues, predominantly by *Tenebrio* that may harbor *Adeleidea* (BERTO et al., 2008). *C. thous* is a predator with an opportunistic strategy, with an omnivore diet that includes mainly small mammals, birds, insects and fruit, usually consuming the most abundant food resources for each season (PEDÓ et al., 2006). It was observed in Venezuela that the intake of insects by *C. thous* occurs mainly in the rainy season; as in the dry months, the carnivore habit prevails, according to the study of stomach contents to determine the feeding habits of this species (BISBAL; OJASTI, 1980). This seasonal characteristic to the animal's diet can reveal the presence of these pseudoparasites in the warmer seasons of the year.

More attention and further studies are needed when working with *Coccidia*, particularly in wild animals, since feeding habits are partially or frequently unknown. There is the possibility of spurious infections, which can lead to rash descriptions of new species in these hosts, important information for veterinarians that do not know these pseudoparasites, leading to wrong diagnosis due to the presence of these protozoa.

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