NOTA CIENTÍFICA:

Publicações científicas do projeto "TAXONOMIA E ECOLOGIA DE COCCÍDIOS: IDENTIFICAÇÃO MORFOLÓGICA E MOLECULAR DE ESPÉCIES EM AVES SILVESTRES DO PARQUE NACIONAL DE ITATIAIA" (SISBIO 70132) no período de 2020-2021

Em expedições realizadas em diferentes localidades na parte baixa do Parque Nacional de Itatiaia, no período de 2014 até 2019, foram capturadas centenas de aves silvestres com redes de neblina, as quais foram anilhadas, medidas, pesadas, fotografadas e avaliadas quanto à características biológicas e ecológicas, além de terem suas amostras fecais coletadas para identificação morfológica e molecular de seus coccídios parasitas. A soltura destas aves foi feita imediatamente após estes procedimentos minimizando-se ao máximo o estresse pela manipulação.

A partir desta metodologia de campo e o trabalho posterior no Laboratório de Biologia de Coccídios (DBA/ICBS/UFRRJ) http://r1.ufrrj.br/labicoc, foram publicados os seguintes 6 artigos científicos nos anos de 2020 e 2021 (listados e anexados em ordem cronológica):

(1) BERTO, B. P.; LOPES, C. W. G. Coccidia of Wild Birds as Ecological Biomarkers: Some Approaches on Parasite-Host-Environment Interaction. JOURNAL OF PARASITOLOGY, v. 106, p. 707-713, 2020. http://dx.doi.org/10.1645/19-148

Os coccídios são um dos parasitas mais comuns das aves. Eles devem manter uma relação ecológica de parasitismo, podendo causar desde uma infecção assintomática até uma doença grave. Neste artigo científico são discutidos aspectos ecológicos dos coccídios de aves silvestres, avaliando seu uso como biomarcadores ecológicos por meio da associação de dados relacionados aos coccídios, como prevalência, densidades (carga parasitária), novos relatos, doença/morbidade/mortalidade e polimorfismo, com dados relacionadas ao meio ambiente e ao hospedeiro, como nível de urbanização, desmatamento e outros impactos em uma localidade, distribuição geográfica, isolamento e nível de especialização de espécies de aves, cativeiro e reprodução comercial, interesse em certas espécies para o comércio ilegal de aves silvestres e reintrodução por centros de reabilitação. Por fim, este artigo mostra que a distribuição, densidade e morfologia dos coccídios devem estar diretamente associadas aos impactos ambientais antropomórficos e/ou naturais, dispersão, adaptação ao hospedeiro/evolução, entre outros.

(2) GENOVEZ-OLIVEIRA, J. L.; OLIVEIRA, M. S.; THODE FILHO, S.; CARDOZO, S. V.; OLIVEIRA, A. A.; LIMA, V. M.; FERREIRA, I.; BERTO, B. P. Morphological and molecular identification of *Isospora massardi* Lopes, Berto, Luz, Galvão, Ferreira & Lopes, 2014 (Chromista: Miozoa: Eimeriidae) from thrushes *Turdus* spp. (Passeriformes: Turdidae) in South America. PARASITOLOGY INTERNATIONAL, 102040, 2019. http://dx.doi.org/10.1016/j.parint.2019.102040

Neste artigo, a espécie de coccídio denominada *Isospora massardi* foi identificada do sabiá-una, sabiá-coleira e do sabiá-laranjeira, em uma nova localidade de registro, o Parque Nacional do Itatiaia, fornecendo uma caracterização genotípica preliminar via sequenciamento dos genes COI e 18S. Os oocistos e esporocistos de *I. massardi* deste estudo foram morfologicamente semelhantes à descrição original e foram razoavelmente uniformes, embora tenham exibido diferentes padrões de tamanho associados a cada espécie de sabiá. Além disso, uma diferença genotípica de 3% foi encontrada nas sequências COI entre os oocistos eliminados pelo sabiá-una e pelo sabiá-laranjeira. Portanto, uma discussão ecológica foi introduzida neste artigo com o objetivo de associar essas diferenças morfométricas e genotípicas com um processo de especiação em andamento.

(3) SILVA-CARVALHO, L. M.; GENOVEZ-OLIVEIRA, J. L.; OLIVEIRA, M. S.; OLIVEIRA, Á. A.; LIMA, V. M.; FERREIRA, I.; BERTO, B. P. Polymorphism and genetic diversity of *Isospora parnaitatiaiensis* Silva, Rodrigues, Lopes, Berto, Luz, Ferreira & Lopes, 2015 (Eimeriidae) from antbirds (Thamnophilidae) in Brazil. SYSTEMATIC PARASITOLOGY, v. 97, p. 847-

855, 2020. http://dx.doi.org/10.1007/s11230-020-09940-6

Neste artigo, a espécie *Isospora parnaitatiaiensis*, a qual foi originalmente descrita no Parque Nacional de Itatiaia em 2015, homenageando o parque, foi novamente identificada nas fezes da choquinha-lisa e do papa-taoca-do-sul, fornecendo uma caracterização genotípica preliminar via sequenciamento do gene COI. Os oocistos obtidos destas duas espécies de aves foram polimórficos e tinham pequeníssimas diferenças genotípicas que não foram consideradas suficientes para a descrição de novas espécies de coccídios, mas apenas diferentes genótipos e morfotipos de *I. parnaitatiaiensis*. Estas variações morfológicas e moleculares foram associadas a um processo de especiação com desenvolvimento adaptativo às suas respectivas espécies hospedeiras de aves.

(4) OLIVEIRA, M. S.; GENOVEZ-OLIVEIRA, J. L.; ORTÚZAR-FERREIRA, C. N.; MARONEZI, C.; THODE-FILHO, S.; CARDOZO, S. V.; OLIVEIRA, A. A.; LIMA, V. M.; BERTO, B. P. *Eimeria ferreirai* n. sp. (Chromista: Miozoa: Eimeriidae) from doves *Leptotila* spp. (Columbiformes: Columbidae) from Brazil. ZOOTAXA, v. 4821, p. 148-160, 2020. http://dx.doi.org/10.11646/zootaxa.4821.1.8

As pombas e rolinhas constituem o grupo taxonômico dos Columbiformes, os quais são pássaros granívoros e frugívoros com distribuição mundial. Neste artigo uma nova espécie nomeada como *Eimeria ferreirai*, em homenagem ao ornitólogo da UFRRJ, Prof. Dr. Ildemar Ferreira, foi descrita de forma morfológica e molecular de juritis-pupu e juritis-de-testa-branca no Parque Nacional do Itatiaia. Esta foi a primeira espécie coccidiana identificada de juritis e a vigésima descrição de uma *Eimeria* de Columbiformes.

(5) ORTÚZAR-FERREIRA, C. N.; GENOVEZ-OLIVEIRA, J. L.; OLIVEIRA, M. S.; MELLO, E. R.; THODE FILHO, S.; OLIVEIRA, A. A.; LIMA, V. M.; FERREIRA, I.; BERTO, B. P. *Isospora oliveirai* n. sp. (Chromista: Miozoa: Eimeriidae) from the greenish schiffornis *Schiffornis virescens* (Lafresnaye, 1838) (Passeriformes: Tyranni: Tityridae) in South America. ACTA PARASITOLOGICA, v. 65, p. 843-851, 2020. http://dx.doi.org/10.1007/s11686-020-00237-8

Este artigo teve como objetivo identificar e descrever a nova espécie *Isospora oliveirai*, a qual foi assim nomeada em homenagem ao parasitologista Prof. Dr. Francisco Carlos Rodrigues de Oliveira, pela sua contribuição ao estudo dos helmintos e protozoários parasitas de animais silvestres. Este novo coccídio foi identificado, de forma morfológica e molecular pelo gene COI, nas fezes de um flautim no Parque Nacional do Itatiaia. Com base nas características morfológicas e moleculares, *I. oliveirai* foi considerada como nova para a ciência e a primeira espécie coccidiana registrada na família Tityridae, a qual é a família do flautim.

(6) OLIVEIRA, M. S.; MELLO, E. R.; CARDOZO, S. V.; OLIVEIRA, A. A.; LIMA, V. M.; FERREIRA, I.; BERTO, B. P. Distribution, redescription, and molecular identification of *Isospora striata* McQuistion et al. 1997 (Eimeriidae), from woodcreepers (Dendrocolaptidae) in South America. PARASITOLOGY RESEARCH, p. 1-9, 2021. http://dx.doi.org/10.1007/s00436-021-07140-9

Os arapaçus são pássaros da família Dendrocolaptidae, que possuem uma alta dependência florestal. Neste artigo a espécie de coccídio *Isospora striata* foi identificada e redescrita a partir de dois novos hospedeiros, o arapaçu-liso e o arapaçu-de-garganta-branca, no Parque Nacional de Itatiaia e no Parque Nacional da Serra dos Órgãos, além de fornecer a identificação genotípica preliminar via sequenciamento do gene COI. O estudo morfológico e a similaridade de 100% no sequenciamento do gene COI entre amostras dos arapaçus confirmaram a identificação de uma única espécie coccidiana, apoiando a identificação de *I. striata* na Mata Atlântica e consequentemente a ampla distribuição desta espécie coccidiana na Região Neotropical.

Estes últimos artigos publicados demonstram a aprofundamento desta linha de pesquisa e a dedicação dos integrantes do Laboratório de Biologia de Coccídios (LABICOC). O laboratório é de responsabilidade do Prof. Dr. Bruno Pereira Berto (DBA/ICBS/UFRRJ), e integrado por alunos de Doutorado, Mestrado e de Iniciação Científica, além de pesquisadores colaboradores. Abaixo segue a lista dos integrantes do LABICOC com links para seus respectivos Currículos Lattes:

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Journal of Parasitology 2020 106(5) 707–713

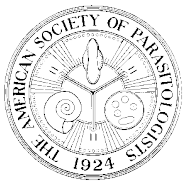
Published 29 October 2020

Contents and archives available through www.bioone.org or www.jstor.org

Journal of Parasitology

journal homepage: www.journalofparasitology.org

DOI: 10.1645/19-148



COCCIDIA OF WILD BIRDS AS ECOLOGICAL BIOMARKERS: SOME APPROACHES ON PARASITE-HOST-ENVIRONMENT INTERACTION

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Species of wild birds, like all wild animals, have different levels of specialization in their ecological niches, thus being classified into specialists when they have narrower ecological niches, and generalists when they have wider ecological niches and they are adaptable to different environments. Specialist bird species, which depend on very specific biotopes and are very sensitive to changes in their habitats, are often reported as bioindicators of natural ecosystems because disappearance or reduction of the population of these species reveals changes in an ecosystem (Sick, 1997; Odum,1998; Morganti et al., 2019).

The presence and abundance of a specialist species in an environment is associated with a well-conserved system where biodiversity is relatively high compared to less well-conserved systems. Therefore, there is the importance of detecting physical, chemical, and/or biological signals that reflect early changes in certain wild populations, thus allowing time for conservation and remediation actions to be implemented. In other words, behavioral, physiological, and/or anatomical changes; pathologies; detection of pollutants, toxins, metabolism products, etc.; and identification and quantification of certain parasites, among other factors, can be observed early in a wild population, before decrease or extinction of this population in a locality. All these signals can be considered as biomarkers (Fry, 1995; Bortolotti et al., 2002; Marentette et al., 2012; Giraudeau et al., 2014; Harris et al., 2017; Mallory et al., 2018; Salmón et al., 2018).

Coccidians of *Eimeria* spp. and *Isospora* spp. are some of the most common parasites of birds, especially passerines. These protozoans should maintain an ecological relationship of parasitism-producing outcomes ranging from severe disease to asymptomatic infection. Immunosuppression due to stress, malnutrition, captivity, preexisting diseases, and other factors are related to aspects of the parasitism in birds and other animals, and for this reason, the coccidians are potential ecological biomarkers. In addition, coccidia were historically associated with the host and environment through scientific literature addressing studies of prevalence and density (parasite load) of coccidians of wild birds (Gomez et al.,1982; Berto et al., 2008; Coelho et al., 2013; Giraudeau et al., 2014); coccidial dispersion and distribution (Berto and Lopes, 2013; Berto et al., 2014; Silva-Carvalho et al., 2018; Cardozo et al., 2019); co-evolution and cospeciation of coccidians and hosts (Gardner and Duszynski, 1990; Kunz, 2002; Jirků et al., 2013); and sporogonic effects caused by changes in their hosts/environments (Gomez et al., 1982; Berto et al., 2008; Li et al., 2010).

The current work approaches ecological aspects of coccidia of wild birds, evaluating their use as ecological biomarkers through the direct association of prevalence, densities, new reports, disease/morbidity/mortality, and polymorphism, with anthropomorphic and/or natural environmental impacts, dispersion, and adaptation to host/evolution.

THE ECOLOGY OF COCCIDIANS AND ITS USE AS ECOLOGICAL BIOMARKERS

Ecology refers to the study of the "house of living beings," which derives from the Greek words "oikos," meaning house, and "logos," which means science. However, the main definition of ecology is that of science that studies the interactions between organisms and their environment (Odum, 1998). Depending on the evolutionary stage of a coccidian, its "house," or environment, will be (1) the host, when in endogenous stages (merozoites, gametocytes, etc.), or (2) the external environment, when in exogenous stages (oocysts/sporocysts/sporozoites) (Fayer, 1980).

In the host, coccidia can be the cause of enteritis and death. In addition to directly interfering in health, coccidians can also interfere in physiology and behavior (Costa and Macedo, 2005; Aguilar et al., 2008; Atkinson et al., 2008). Depending on the coccidian species and health of the host, the clinical signs of the coccidiosis can vary from unapparent infection to severe disease and, in some cases, ending in death (Atkinson et al., 2008). The adverse effects induced by coccidia or the costs associated with the immune response against parasitism can result in important physiological and phenotypic costs. In the parasite-host interaction, at least 2 processes are observed: (1) the parasite must come into contact with the host and (2) the host must be able to respond immunologically. Immunity against coccidia is inherent to the coccidian species and to the multiple exposures (Soutter et al., 2020) and possibly to other unknown factors in wild birds. In general, a balance is reached between constant reinfection and the degree of immunity in adult birds (Krautwald-Junghanns et al., 2009; Merino, 2010). In other words, coccidiosis in immunocom-

Parasitology International 75 (2020) 102040

Contents lists available at ScienceDirect

Parasitology International

journal homepage: www.elsevier.com/locate/parint

Morphological and molecular identification of *Isospora massardi* Lopes, Berto, Luz, Galvão, Ferreira & Lopes, 2014 (Chromista: Miozoa: Eimeriidae) from thrushes *Turdus* spp. (Passeriformes: Turdidae) in South America

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ARTICLE INFO

Keywords:
Oocysts
Coccidia
Taxonomy
Morphology
Genotyping
Phylogeny
Thrushes
Parque Nacional do Itatiaia
Brazil

ABSTRACT

In the current work, *Isospora massardi* Lopes, Berto, Luz, Galvão, Ferreira & Lopes, [10] is identified from white-necked thrushes *Turdus albicollis* Vieillot, 1818, rufous-bellied thrushes *Turdus rufiventris* Vieillot, 1818 and from a new host, the yellow-legged thrush *Turdus flavipes* (Vieillot, 1818) in a new locality, the Itatiaia National Park, in Southeastern Brazil, providing a preliminary genotypic characterization via sequencing of the mitochondrial cytochrome *c* oxidase subunit 1 (COI) and 18S small subunit ribosomal RNA genes. The oocysts and sporocysts of *I. massardi* of the current study are morphologically similar to the original description and are uniform in the proportionality of width on length, but exhibited different patterns of size associated with each host species. Furthermore, a genotypic difference of 3% was found in the COI sequences from *T. flavipes* and *T. albicollis*. Therefore, an ecological discussion is introduced aimed at associating these morphometric and genotypic differences with an ongoing speciation process.

1. Introduction

The subclass Coccidia (Chromista: Miozoa: Coccidiomorphea) brings together various genera of parasites of domestic and wild animals, which may be associated with enteritis and death [1,2]. In Passeriformes, the main genera are *Isospora* Schneider, 1881 and, infrequently, *Eimeria* Schneider, 1875 [3].

The coccidians, like other parasites, are of great relevance to thrushes due to the greater likelihood of transmission among several *Turdus* spp., which have extensive geographical ranges in the Neotropical region, being sympatric to each other [4,5,6,7]. Also, Turdidae is one of the families of Passeriformes with many descriptions and reports of coccidian species in the New World, totaling 10 *Isospora* spp. described to date, in addition to an *Eimeria* sp. recently described [8,9].

Isospora massardi Lopes, Berto, Luz, Galvão, Ferreira & Lopes, [10] was morphologically described from white-necked thrushes *Turdus albicollis* Vieillot, 1818 of the Marambaia Island [10]; and in the current work, this same coccidian species is identified from *Turdus flavipes* (Vieillot, 1818) and *Turdus rufiventris* Vieillot, 1818, in the Itatiaia National Park (Parque Nacional do Itatiaia) and in the Maramabia Island, in the interior and in the coast of the Southeastern Brazil, providing a preliminary genotypic characterization via sequencing of the mitochondrial cytochrome *c* oxidase subunit 1 (COI) and 18S small subunit ribosomal RNA (18S) genes.

2. Materials and methods

2.1. Sample collection

Twenty expeditions were conducted in the Itatiaia National Park,

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https://doi.org/10.1016/j.parint.2019.102040
Received 1 November 2019; Received in revised form 9 December 2019; Accepted 11 December 2019
Available online 13 December 2019
1383-5769/

Syst Parasitol (2020) 97:847–855
https://doi.org/10.1007/s11230-020-09940-6

Polymorphism and genetic diversity of *Isospora parnaitatiaiensis* Silva, Rodrigues, Lopes, Berto, Luz, Ferreira & Lopes, 2015 (Eimeriidae) from antbirds (Thamnophilidae) in Brazil

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Received: 24 March 2020 / Accepted: 1 September 2020 / Published online: 29 September 2020

Abstract *Isospora parnaitatiaiensis* Silva, Rodrigues, Lopes, Berto, Luz, Ferreira & Lopes, 2015 was identified from a new host, the plain antvireo *Dysithamnus mentalis* (Temminck), and also from the white-shouldered fire-eye *Pyriglena leucoptera* Vieillot, in its type-locality, the Itatiaia National Park in the southeastern Brazil, and a preliminary genotypic characterisation by sequencing the mitochondrial cytochrome *c* oxidase subunit 1 gene is provided. The oöcysts recovered from *P. leucoptera* and *D. mentalis* were polymorphic and have genotypic differences that were not considered sufficient for the description of new species, but only different genotypes and morphotypes of *I. parnaitatiaiensis* related to each host. These morphological and molecular variations were associated with a process of ongoing speciation and in adaptive development to their respective host species.

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Introduction

Thamnophilidae Swainson is composed of small birds frequently observed capturing ants and other arthropods in dense vegetation. Due to this insectivorous behavior, they are recognised as 'antbirds'. In South America, two major areas of distribution for this family are the Atlantic Forest and Amazon biomes (Wiens, 1989; Zimmer & Isler, 2003).

Passerines can be parasitised by several parasites, both surface, blood or intestinal, the coccidians of *Isospora* being the most frequently reported. However, until recently the only species of *Isospora* Schneider, 1881 described from thaminophilid birds was *Isospora sagittulae* McQuistion & Capparella, 1992, a parasite of the spotted antbird *Hylophylax naevioides* Lafresnaye in Ecuador. This species was later reported from the white-throated antbird *Oneillornis salvini* (Berlepsch) and the common scale-backed antbird *Willisornis poecilinotus* Cabanis in the

Zootaxa 4821 (1): 148–160
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4821.1.8
http://zoobank.org/urn:lsid:zoobank.org:pub:4777427F-022B-4667-896F-A4E91F89308C

Eimeria ferreirai n. sp. (Chromista: Miozoa: Eimeriidae) from doves *Leptotila* spp. (Columbiformes: Columbidae) from Brazil

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Abstract

The doves and pigeons constitute a taxonomic group (Columbiformes: Columbidae) of granivorous and frugivorous birds with a worldwide distribution. The current work aims to describe morphologically and molecularly a new protozoan from white-tipped doves *Leptotila verreauxi* Bonaparte, 1855 and grey-fronted doves *Leptotila rufaxilla* (Richard & Bernard, 1792) in Southeastern Brazil. *Eimeria ferreirai* **n. sp.** has oocysts that are sub-spherical to ellipsoidal, 21.4 × 18.8 µm, with smooth, bilayered wall, ~1.6 µm thick. Micropyle present. Oocyst residuum absent, but one to two polar granules are present. Sporocysts are elongate ovoidal to boomerang-shaped, 13.4 × 6.9 µm. Stieda body triangular to lozengal. Sporocyst residuum is composed of granules of different sizes. Sporozoites are vermiform with refractile body and nucleus. Sequencing of the mitochondrial cytochrome *c* oxidase subunit 1 (COI) gene and the subsequent phylogenetic molecular comparisons supported the description of the new species, since the maximum similarity was 90-95% with eimeriid species of Columbiformes, Anseriformes, Galliformes and Passeriformes. Thus, this is the first coccidian species reported from *Leptotila* spp. and the twentieth description of an eimerian from Columbiformes in the World.

Key words: taxonomy, morphology, coccidia, *Eimeria*, oocysts, Columbiformes, Columbidae, Itatiaia National Park, Serra dos Órgãos National Park, Rio de Janeiro, Brazil

Introduction

The Columbidae family (Columbiformes) brings together 367 species of doves and pigeons, which have a world-wide distribution. It is estimated that in the Neotropical regions there are about 68 species, where 23 of these were recorded in Brazil (Bennett & Peirce 1990; IUCN 2019).

The white-tipped doves *Leptotila verreauxi* Bonaparte, 1855 and grey-fronted doves *Leptotila rufaxilla* (Richard & Bernard, 1792) are found in wooded areas, frequenting the ground to feed; live alone or in pairs (Sick 1997). This behavior and granivorous and frugivorous eating habits favor the fecal-oral transmission of intestinal parasites, such as protistan coccidians (Dolnik *et al*. 2010; Berto & Lopes 2013).

 Accepted by L. Utz: 9 Jul. 2020; published: 30 Jul. 2020

Acta Parasitologica (2020) 65:843–851
https://doi.org/10.1007/s11686-020-00237-8

ORIGINAL PAPER

Isospora oliveirai n. sp. (Chromista: Miozoa: Eimeriidae) from the Greenish Schiffornis *Schiffornis virescens* (Lafresnaye, 1838) (Passeriformes: Tyranni: Tityridae) in South America

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Received: 24 April 2020 / Accepted: 27 May 2020 / Published online: 3 June 2020

Abstract

Background Coccidia are obligatory intracellular parasites with at least one intestinal phase in their life cycles, being *Isospora* Schneider, 1881 the main coccidian genus related to the order Passeriformes. However, there is no record of isosporans from the passerine family Tityridae, which is the family of the greenish schiffornis *Schiffornis virescens* (Lafresnaye, 1838).
Purpose This study aimed to examine the faeces from a greenish schiffornis *S. virescens* captured in the Itatiaia National Park, State of Rio de Janeiro, Southeastern Brazil, to determine what coccidian parasites were present.
Methods Only one specimen of *Schiffornis virescens* was captured with mist nets. Coccidian oocysts were recovered from the fecal samples by flotation in Sheather's saturated solution. Morphological observations, line drawings, photomicrographs and measurements were made in optical microscopy and digitally edited. The molecular analysis included the study of the sequence of the mitochondrial cytochrome *c* oxidase subunit 1 (COI) gene, with phylogenetic reconstructions based on the Neighbor-Joining and Maximum Likelihood analysis.
Results An *Isospora* sp. considered as new to science is described and identified from *Schiffornis virescens* (Lafresnaye, 1838). *Isospora oliveirai* n. sp. has oocysts that are subspheroidal, 26.0×24.8 µm, with rough, bilayered wall, *c.*2.5 µm thick. Micropyle and oocyst residuum absent, but one to six polar granules are present. Sporocysts lemon-shaped, 18.1×10.9 µm. The Stieda body is knob-like to half-moon-shaped and sub-Stieda is rounded. Sporocyst residuum is present, composed of scattered spherules of different sizes. Sporozoites are vermiform, with refractile bodies and nucleus. Molecular analysis at the COI gene exhibited similarity of 97% with *Isospora serinuse* Yang, Brice, Elliot et Ryan, 2015 from island canaries *Serinus canaria* (Linnaeus, 1758), and *Isospora* spp. from great tits *Parus major* (Linnaeus, 1758) and European robins *Erithacus rubecula* (Linnaeus, 1758).
Conclusion Based on the morphological and molecular features, *I. oliveirai* is considered as new to science and the first coccidian species recorded from Tityridae.

Keywords Morphology · Molecular biology · Taxonomy · Phylogeny · Coccidia · Oocysts · Neotropical birds · Suboscines · Tityridae · Parque Nacional do Itatiaia

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Parasitology Research
https://doi.org/10.1007/s00436-021-07140-9

PROTOZOOLOGY - ORIGINAL PAPER

Distribution, redescription, and molecular identification of *Isospora striata* McQuistion et al. 1997 (Eimeriidae), from woodcreepers (Dendrocolaptidae) in South America

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Received: 12 February 2021 / Accepted: 24 March 2021

Abstract

Woodcreepers are passerines of the family Dendrocolaptidae, which have a high forest dependency. The current work aimed to redescribe *Isospora striata* McQuistion et al. 1997, from two new hosts in protected areas in Brazil, revealing new localities of parasitism, in addition to providing preliminary genotypic identifications via sequencing of the mitochondrial cytochrome *c* oxidase subunit 1 (COI) gene from both host species. *Isospora striata* has oocysts that are subspheroidal to ovoidal, 19.4 × 16.8 μm with smooth wall. Oocyst residuum is absent, but micropyle and polar granules are present. Sporocysts are ovoidal, 13.6 × 8.3 μm, with both Stieda and sub-Stieda bodies. Sporocyst residuum is present and sporozoites with refractile body, nucleus, and striations. The morphological study and the 100% similarity in sequencing of the COI gene between samples of different dendrocolaptid species confirmed the identification of a single species, supporting the identification of *I. striata* in the Brazilian Atlantic forest and consequently the wide distribution of this coccidian species in the Neotropical Region.

Keywords Taxonomy · Morphology · Sequencing · Coccidia · Oocysts · Passeriformes · Parque Nacional de Itatiaia · Parque Nacional da Serra dos Órgãos · Brazil

Introduction

Woodcreepers are passerines of the family Dendrocolaptidae, which brings together 52 species distributed predominantly in forest environments in the Neotropical Region (Marantz et al. 2003). Dependence on forest environments causes dendrocolaptid species to suffer population decline and even local extinction in altered forests and forest fragments (Marantz et al. 2003; IUCN 2020). In the Atlantic Forest of the Southeast and South of Brazil, several studies confirm this vulnerability of the woodcreepers to anthropogenic changes, notably forest fragmentation (Aleixo and Vielliard 1995; Christiansen and Pitter 1997; Bornschein and Reinert 2000).

These birds feed predominantly on large insects, small vertebrates, snails, and bird eggs that nest in tree cavities. They also regularly follow mixed flocks and army ants, foraging in all strata as dominant species (Sick 1997; Piacentini et al. 2015). This predominantly insectivorous feeding habit potentially reduces these birds the fecal-oral transmission of parasites, unlike frugivorous birds (Dolnik et al. 2010). Among the various parasites in this context, the coccidian protozoans can be highlighted due to its great importance for biodiversity and conservation of birds.

To date, six coccidian species are recorded from Neotropical woodcreepers, but none of them in Brazil. In this sense, the current work aimed to redescribe *Isospora striata* McQuistion et al. 1997, from two new hosts in protected areas in Brazil,

Section Editor: Nawal Hijjawi

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Published online: 02 April 2021