

A new isosporoid coccidia (Apicomplexa: Eimeriidae) from the southern house wren *Troglodytes musculus* Naumann, 1823 (Passeriformes: Troglodytidae) from Brazil

Bruno doBomfim Lopes¹, Mariana Borges Rodrigues², Lidiane Maria da Silva², Bruno Pereira Berto^{3*}, Hermes Ribeiro Luz⁴, Ildemar Ferreira³ and Carlos Wilson Gomes Lopes^{4*}

¹Programa de Pós-Graduação em Ciência, Tecnologia e Inovação em Agropecuária, Universidade Federal Rural do Rio de Janeiro (UFRRJ), BR-465 km 7, 23897-970 Seropédica, RJ, Brazil – Capes scholarship; ²Curso de Pós-Graduação em Ciências Veterinárias, UFRRJ, BR-465 km 7, 23897-970 Seropédica, RJ, Brazil – Capes, CNPq scholarships; ³Departamento de Biologia Animal, Instituto de Biologia, UFRRJ, BR-465 km 7, 23897-970 Seropédica, RJ, Brazil; ⁴Departamento de Parasitologia Animal, Instituto de Veterinária, UFRRJ, BR-465 km 7, 23897-970 Seropédica, RJ, Brazil – FAPERJ scholarship, CNPq fellowship

Abstract

A new isosporoid coccidian species (Protozoa: Apicomplexa: Eimeriidae) is reported from the southern house wren *Troglodytes musculus*, a very well distributed species in South and Central America. *Isospora corruirae* sp. nov. oocysts are subspherical to ovoidal, 24.1 × 21.4 μm, with smooth, bilayered wall. Micropyle and oocyst residuum are absent, but small spherules and splinter-like granules are frequently present. Sporocysts are ovoidal to piriform, 14.0 × 9.5 μm. Stieda body is prominent knob-like and substieda body is delicate. Sporocyst residuum is composed of scattered fragments of different sizes. Sporozoites are vermiform with posterior refractile bodies, anterior striations and a nucleus. This is the second description of an isosporoid coccidium infecting a New World wren.

Keywords

Morphology, taxonomy, coccidia, *Isospora*, oocysts, Passeriformes, Troglodytidae, Marambaia Island, Rio de Janeiro, Brazil

Introduction

Many species of *Isospora* have been reported and described in passerine birds (Berto *et al.* 2011) in the American continent, but in wrens the first described species was done by Keeler *et al.* (2012) in Costa Rica, Central America.

The wrens (Troglodytidae) include over 60 species and subspecies and are found throughout the American continent with a single species *Troglodytes troglodytes* (Linnaeus, 1758) reported in Eurasia and Northern Africa (BirdLife International 2012). Southern house wren *Troglodytes musculus* Naumann, 1823 is found through South and portions of Central America from Southeastern Yucatan, Mexico to Argentina. In Brazil, this species is very common in different biomes as Amazonian, Cerrado, Caatinga, Pampas, Pantanal and Atlantic forestry, including Costal Islands (CBRO 2014). This endemic bird was considered to be a separate species from *Troglodytes aedon* Vieillot, 1809 (CBRO 2014). It is found in the under-

growth and near the ground in humid forest, lowlands, and seems to be quite a shy bird. It feeds on invertebrates, and will follow army-ant swarms, but it also takes some fruits (Sick 1997, CBRO 2014, BirdLife International 2012).

The current study describes a new coccidian species infecting southern house wren *T. musculus* on the Marambaia Island, Southeastern Brazil.

Materials and Methods

A total of thirteen outings were conducted in Marambaia Island (23°04'S, 43°53'W), for capturing birds with mist nets and sample collections. These sampling occurred in distinct periods between the years 2007 to 2014, including sampling related by Lopes *et al.* (2013). Throughout the entire period, only two *T. musculus* were captured. These birds were kept in individual boxes and feces collected immediately after defe-

*Corresponding author: bertobp@ufrj.br or lopescwg@ufrj.br

cation. After identification of the species, the bird was released and stool samples were placed in centrifuge tubes containing 2.5% potassium dichromate solution ($K_2Cr_2O_7$) 1:6 (v/v). Samples were sent to the Laboratório de Coccídios e Coccidioses, Universidade Federal Rural do Rio de Janeiro (UFRRJ). Samples were incubated at 23–28°C for 10 days. Oocysts were recovered by flotation in Sheather's sugar solution (Specific gravity: 1.20) and examined microscopically using the technique described by Duszynski and Wilber (1997) and Berto *et al.* (2014). Morphological observations, line drawings, photomicrographs and measurements were made using an Olympus BX binocular microscope coupled to a digital camera Eurocam 5.0. Line drawings were edited using two software applications from CorelDRAW® (Corel Draw Graphics Suite, Version 11.0, Corel Corporation, Canada), specifically Corel DRAW and Corel PHOTO-PAINT. All measurements are in micrometres and are given as the range followed by the mean in parentheses. Abbreviations: total number of measurements [n], micropyle [M], oocyst residuum [OR], polar granule [PG], Stieda body [SB], substieda body [SSB], parastieda body [PSB], sporocyst residuum [SR], sporozoite [SZ], refractile body [SRB], nucleus [N].

Results

Two southern house wrens were examined; one of them shed oocysts in the feces. Initially, the oocysts were non-sporulated, but 70% of them sporulated by day four.

Isospora corruirae sp. nov. (Fig. 1a–c)

Description of sporulated oocyst: Oocyst shape (N = 9): subspherical to ovoidal; number of walls: 2; wall thickness: 1.1 (1.0–1.2); outer wall smooth, about 2/3 of total thickness; L × W: 24.1 × 21.4 (22–26 × 19–23), with L/W ratio: 1.1 (1.1–1.2); M and OR: absent; PG: absent or present as small spherules and splinter-like granules.

Description of sporocyst and sporozoites: Sporocyst shape (N = 9): ovoidal to piriform; L × W: 14.0 × 9.5 (13–15 × 9–11); L/W ratio: 1.47 (1.36–1.51); SB: present, prominent knob-like, ~ 1.0 × 1.5; SSB: present, delicate, rounded to trapezoidal, ~ 1.5 × 2.5; PSB: absent; SR: present, and composed of scattered spherules of different sizes; SZ: vermiform with posterior SRB, N and striations.

Type-host: southern house wren *Troglodytes musculus* Naumann, 1823 (Passeriformes: Troglodytidae).

Type-locality: Marambaia Island (23°04'S, 43°53'W), Rio de Janeiro, Brazil.

Material deposited: Phototypes and line drawings of the sporulated oocysts are deposited and available (<http://r1.ufrrj.br/lcc>) in the Parasitology Collection of the Laboratório de Coccídios e Coccidioses, at UFRRJ, located in Seropédica, Rio de Janeiro, Brazil. Photographs of the type-host specimen (symbiotype) are deposited in the same collection. The repository number is P-62/2015.

Site of infection: Unknown. Oocysts collected from fecal samples.

Prevalence: 50% (1 of 2 examined birds).

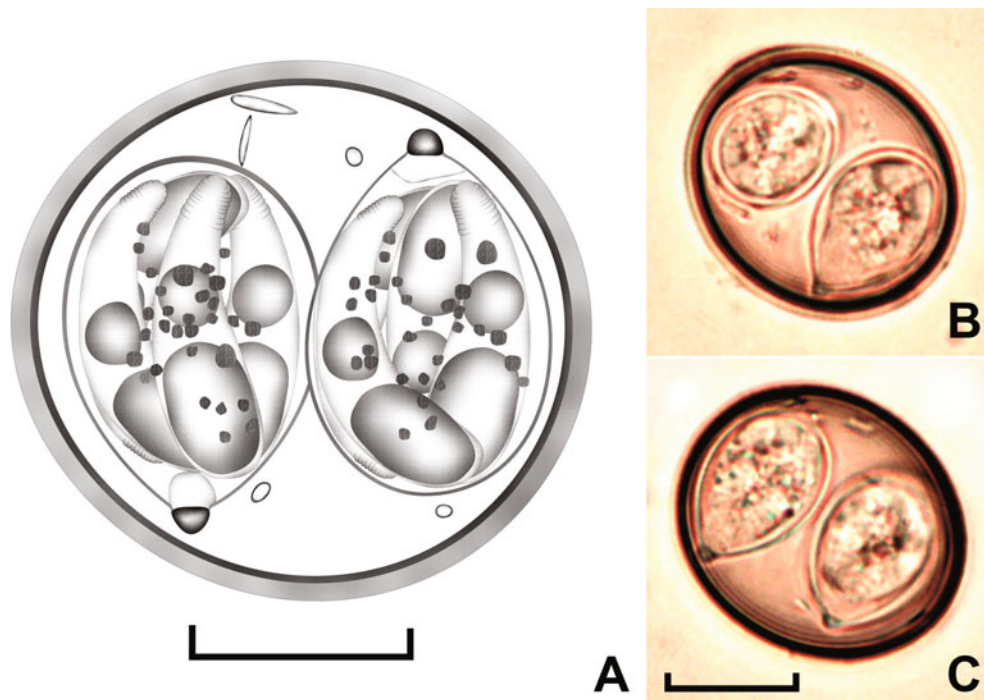


Fig. 1. Oocysts of *Isospora corruirae*, a new coccidian species collected from the feces of the southern house wren *Troglodytes musculus*. A. Composite line drawing; B–C. Photomicrographs. Scale-bar: 10 μ m

Table I. Comparative morphology of *Isoospora* spp. recorded from troglodytid passerines (wrens)

Coccidia	Hosts	References	Oocysts				Sporocysts				
			Shape	Measurements (μm)	Shape index	Polar granule	Shape	Measurements (μm)	Stieda body	Substieda body	Residium
<i>Isoospora</i> sp.	<i>Troglodytes aedon</i> Vieillot, 1809	Boughton <i>et al.</i> (1938)	–	–	–	–	–	–	–	–	–
<i>Isoospora</i> sp.	<i>Troglodytes troglodytes</i> (Linnaeus, 1758)	Svobodova (1994)	subspherical	19.3 × 20.1 (18–22 × 18–21)	–	present	ovoidal	–	flat	medium	diffuse
<i>Isoospora troglodytes</i> Keeler, Yabsley, Fox, McGraw, Hernandez, 2012	<i>Thryophilus rufalbus</i> (Lafresnaye, 1845); <i>Cantorchilus modestus</i> (Cabanis, 1861)	Keeler <i>et al.</i> (2012)	ovoidal	20.1 × 23.4 (18–24 × 20–26)	1.2	present, single, 2–3 μm	ovoidal	9.5 × 15.5 (7–12 × 12–18)	present, nipple-like	present, prominent oval shaped	compact
<i>Isoospora corruirae</i> sp. nov.	<i>Troglodytes musculus</i> Naumann, 1823	current work	subspherical to ovoidal	24.1 × 21.4 (22–26 × 19–23)	1.13 (1.06–1.18)	absent or present, small spherules and splinter- like granules	ovoidal to piriform	14.0 × 9.5 (13–15 × 9–11)	present, prominent knob-like, ~ 1.0 × 1.5 μm	present, delicate, rounded to trape- zoidal, ~ 1.5 × 2.5 μm	diffuse

Etymology: The specific epithet is derived from the common local name for the host, which is ‘corruira’.

Remarks: As observed in the host-family Troglodytidae, *Isospora troglodytes* Keeler, Yabsley, Fox, McGraw, Hernandez, 2012 have ovoidal oocysts with two PG, while *I. corruirae* have subspherical to ovoidal oocysts with small spherules or splinter-like granules. Additionally, *I. troglodytes* have sporocysts with SB nipple-like, SSB prominent ovoidal and SR compact, while *I. corruirae* have sporocysts with SB prominent knob-like, SSB delicate, SR composed of scattered spherules of different sizes. *Isospora troglodytes* SZ is smooth with a single nucleus, while *I. corruirae* SZ is vermiform with striations on anterior surface, posterior SRB and a N (Keeler *et al.* 2012) (Table I).

Discussion

Few coccidia have been reported in birds of the family Troglodytidae; however, those coccidia described in the New World assume greater importance due to the higher probability of transmission between sympatric passerines (Berto and Lopes 2013) as the Troglodytidae family which has very representative species of wrens across South, Central and North America (BirdLife International 2012). *Troglodytes musculus* has an extremely large range, having populations in various Brazilian biomes (CBRO 2014) and its species is distributed in the Americas and they can potentially disperse this coccidium between wrens across South, Central and North America (BirdLife International 2012).

The coccidium of the current study was compared in detail with coccidian parasites of New World and European wrens that are morphologically-similar and belong to the same host family (Keeler *et al.* 2012) even though isosporoid coccidia described in *T. aedon* from USA and *T. troglodytes* from Czech Republic, by Boughton *et al.* (1938) and Svobodova (1994) respectively, have inconsistent descriptions to be compared, besides they have not been identified or named (Table 1).

Based on Table 1, it can be concluded that *I. corruirae* is differentiated using the morphology and morphometry of the oocysts from *Isospora* spp. from passerines of same family. Therefore, *I. corruirae* is considered as new, being the second species description in a troglodytid passerine.

Acknowledgements. This study was supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), and Fundação Carlos Chagas Filho do Rio de Janeiro (FAPERJ). Field-collecting permits were issued to B.P. Berto by SISBIO/ICMBio (license No. 42798-1) and C.W.G. Lopes by CEUA/UFRRJ (protocol No. 036/2014). We also thank the Brazilian Navy, in special to the command of CADIM (Centro de Adestramento da Ilha da Marambaia) that allowed us to access the Marambaia Island, located in the State of Rio de Janeiro, Brazil, and use some of the facilities of CADIM during the field work.

References

- Berto B. P., Flausino W., McIntosh D., Teixeira-Filho W. L., Lopes C.W.G. 2011. Coccidia of New World passerine birds (Aves: Passeriformes): a review of *Eimeria* Schneider, 1875 and *Isospora* Schneider, 1881 (Apicomplexa: Eimeriidae). *Systematic Parasitology*, 80, 159–204. DOI: 10.1007/s11230-011-9317-8
- Berto B. P., Lopes C. W. G. 2013. Distribution and Dispersion of Coccidia in Wild Passerines of the Americas. In: (Eds. L. Ruiz and L. Iglesias) *Birds: Evolution and Behavior, Breeding Strategies, Migration and Spread of Disease*. Nova Science Publishers, New York, USA, 47–66
- Berto B. P., McIntosh D., Lopes C.W.G. 2014. Studies on coccidian oocysts (Apicomplexa: Eucoccidiorida). *Brazilian Journal of Veterinary Parasitology*, 23, 1–15. DOI: 10.1590/S1984-29612014001
- BirdLife International. 2012. *Troglodytes aedon*. The IUCN Red List of Threatened Species. Version 2015.2. Available from: [//www.iucnredlist.org](http://www.iucnredlist.org) (accessed 30 June 2015)
- Boughton D.C, Boughton, R.B., and Volk, J. 1938. Avian hosts of the genus *Isospora* (Coccidiida). *Ohio Journal of Science*, 38, 149–163
- CBRO. 2014. Lista das aves do Brasil. Available from: <http://www.cbro.org.br> (accessed 30 June 2015)
- Duszynski D., Wilber P. 1997. A guideline for the preparation of species descriptions in the Eimeriidae. *Journal of Parasitology*, 83, 333–336. DOI: 10.2307/3284470
- Keeler S. P., Yabsley M. J., Fox J. M., McGraw S. N., Hernandez S. M. 2012. *Isospora troglodytes* n. sp. (Apicomplexa: Eimeriidae), a new coccidian species from wrens of Costa Rica. *Parasitology Research*, 110, 1723–1725. DOI: 10.1007/s00436-011-2691-y
- Lopes, B. doB., Berto, B. P., Ferreira, I., Luz, H. R., Lopes, C. W. G. 2013. Coccidial distribution from passerines in an area of Atlantic Forest in Marambaia Island, Rio de Janeiro, Brazil. *Coccidia*, 1, 10–16
- Sick H. 1997. *Ornitologia Brasileira*. Nova Fronteira, Rio de Janeiro, Brazil, pp. 862
- Svobodova M. 1994. *Isospora*, *Caryospora* and *Eimeria* (Apicomplexa: Eimeriidae) in passeriform birds from Czech Republic. *Acta Protozoologica*, 33, 101–108

Received: July 1, 2015

Revised: December 8, 2015

Accepted for publication: January 18, 2016