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Coccidial distribution from passerines in an area of Atlantic Forest in Marambaia Island, Rio de Janeiro, Brazil

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This study aimed to identify the species of *Eimeria* Schneider, 1875 and *Isospora* Schneider, 1881 from oocysts recovered from feces of several passerines captured in an area of Atlantic Forest in Marambaia Island, Rio de Janeiro, Brazil. *Isospora tiesangui* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora marambaiensis* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora sepetibensis* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora cadimi* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora navarroi* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora ramphoceli* Berto, Flausino, Luz, Ferreira, Lopes, 2010, *Isospora mionectesi* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora feroxis* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora cagasebi* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora coerebae* Berto, Flausino, Luz, Ferreira, Lopes, 2010, *Isospora piacobrai* Berto, Luz, Flausino, Ferreira, Lopes, 2009 and *Eimeria sicki* Berto, Luz, Flausino, Ferreira, Lopes, 2009 were identified according to their respective hosts of the order Passeriformes, which inhabit the forest understory in Marambaia Island.

Keywords oocysts, coccidia, *Isospora*, *Eimeria*, Passeriformes

Resumo Este estudo teve como objetivo identificar as espécies de *Eimeria* Schneider, 1875 e *Isospora* Schneider, 1881 a partir de oocistos recuperados de fezes de vários pássaros capturados em uma área de Mata Atlântica na Ilha da Marambaia, Rio de Janeiro, Brasil. *Isospora tiesangui* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora marambaiensis* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora sepetibensis* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora cadimi* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora navarroi* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora ramphoceli* Berto, Flasino, Luz, Ferreira, Lopes, 2010, *Isospora mionectesi* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora feroxis* Berto, Flausino, Luz, Ferreira, Lopes, 2009, *Isospora cagasebi* Berto, Flausino, Luz, Ferreira, Lopes, 2008, *Isospora coerebae* Berto, Flausino, Luz, Fer-

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reira, Lopes, 2010, *Isospora piacobrai* Berto, Luz, Flausino, Ferreira, Lopes, 2009 e *Eimeria sicki* Berto, Luz, Flausino, Ferreira, Lopes, 2009 foram identificadas de acordo com seus respectivos hospedeiros da ordem Passeriformes, que habitam o biótopo de sub-bosque na Ilha da Marambaia.

Palavras-chave oocistos, coccidia, *Isospora*, *Eimeria*, Passeriformes

Introduction

The order Passeriformes is the most representative of the class Aves. In Brazil, there have been records of more than a thousand different species, some of which are endemic (Sick 1997, CBRO 2011, IUCN 2013). The Marambaia Island is considered a conservation area and national security, occupied by the General Command of the Marine Corps and although anthropogenic, has a great biodiversity of birds that represent a sampling of passerine species observed in the biomes of Atlantic Forest, Restinga and Mangrove (CGCFN, 2005).

Similarly to other vertebrates, passerines can be parasitized by coccidia, being that *Isospora* Schneider, 1881 can be considered the genus most important, followed by the genus *Eimeria* Schneider, 1875. These parasites have life cycles intestinal although some species promote extra-intestinal stages. The specificity has been the subject of several questions, mainly because of the systematics of the order Passeriformes often be regrouped, however, it is understood that it is family-specific. Diagnosis of coccidiosis can be done by observation of oocysts in the feces, which are the exogenous forms of these parasites (Berto et al. 2011, Berto & Lopes 2013).

In this context, this study aimed to identify the species of *Eimeria* and *Isospora* from oocysts recovered from feces of several species of the order Passeriformes captured in an area of Atlantic Forest in Marambaia Island, Rio de Janeiro, Brazil.

Materials and methods

The research site was the Marambaia Island, which is situated on the Costa Verde, south of the State of Rio de Janeiro, at the entrance of the Sepetiba Bay. Sampling occurred in eight distinct periods: May and August 2007; August and September 2008, and January, April, July and August 2009. The points of origin of the fecal samples of birds were selected in biotope understory of the Atlantic Forest, more precisely distributed in a circumference of 1km of the coordinates 23° 04' S and 43° 53' W. The passerines birds were captured, identified and had their stool specimens collected by Prof. Dr. Ildemar Ferreira. A total of 167 fecal samples were collected and transported to the Laboratório de Coccídios e Coccidioses located at the Universidade Federal Rural do Rio de Janeiro (UFRRJ). Samples were placed in a thin layer (~5 mm) of $K_2Cr_2O_7$ 2.5% solution in Petri dishes, and incubated at 23–28°C for 10 days or until 70% of oocysts were sporulated. Oocysts were recovered by flotation in Sheather's sugar solution (S.G. 1.20) and microscopically examined using the technique described by Duszynski & Wilber (1997). Morphological observations and measurements, given in micrometers (ìm), were made using a Carl Zeiss binocular microscope with an apochromatic oil immersion objective lens and an ocular micrometer (K-15X PZO, Poland). Line drawings were prepared using a Wild M-20 binocular microscope with a drawing tube. Photomicrographs were taken using a digital camera (Sony CD Mavica MVC-CD250). Size ranges are shown in parenthesis followed by average and shape index (L/W ratio).

Results and discussion

Passerines have been identified of 12 different families in the Marambaia Island (Figs. 1, 2). The family with the highest species diversity captured was Tyrannidae, while Thraupidae was the most representative in the number of specimens. In these 12 different families, only Tyrannidae, Coerebidae, Thraupidae and Parulidae shed oocysts of the genus *Isospora* and/ or *Eimeria*.

The passerines were captured apparently healthy, including those infected by coccidia. Totality of passerines captured and identified and the frequency of positives for families and species can be observed in Table 1.

The passerines of the Thraupidae family

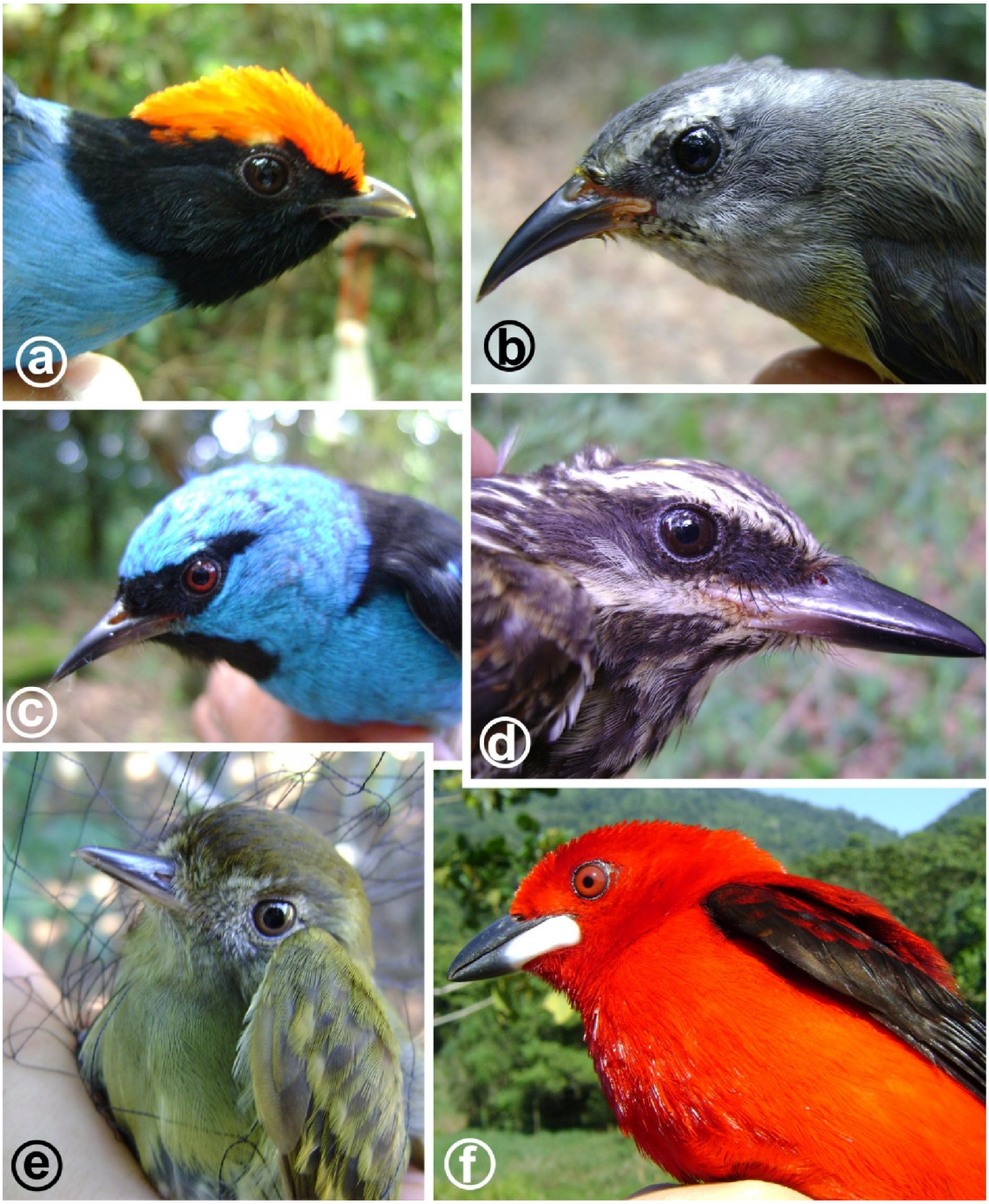

Fig. 1. Passerines captured in an area of Atlantic Forest in Marambaia Island, Rio de Janeiro, Brazil: (a) swallow-tailed manakin *Chiroxiphia caudata*; (b) bananaquit *Coereba flaveola*; (c) blue dacnis *Dacnis cayana*; (d) piratic flycatcher *Legatus leucophaius*; (e) sepia-capped flycatcher *Leptopogon amaurocephalus*; (f) Brazilian tanager *Ramphocelus bresilius dorsalis*.

were parasitized with the greatest diversity of species of coccidia, followed by families Tyrannidae, Coerebidae and Parulidae. Six different species of coccidia were observed parasitizing the tanagers *Ramphocelus bresilius dorsalis* Sclater, *Dacnis cayana* L. and *Thraupis palmarum* Wied. These were identified as *Isospora tiesangui* Berto, Flausino, Luz, Ferreira, Lopes, 2008 [44% (4/9)], *Isospora marambaiensis* Berto, Flausino, Luz, Ferreira, Lopes, 2008 [11% (1/9)], *Isospora sepetibensis* Berto, Flausino, Luz, Ferreira, Lopes, 2008 [78% (7/9)], *Isospora cadimi* Berto, Flausino, Luz, Ferreira, Lopes, 2009

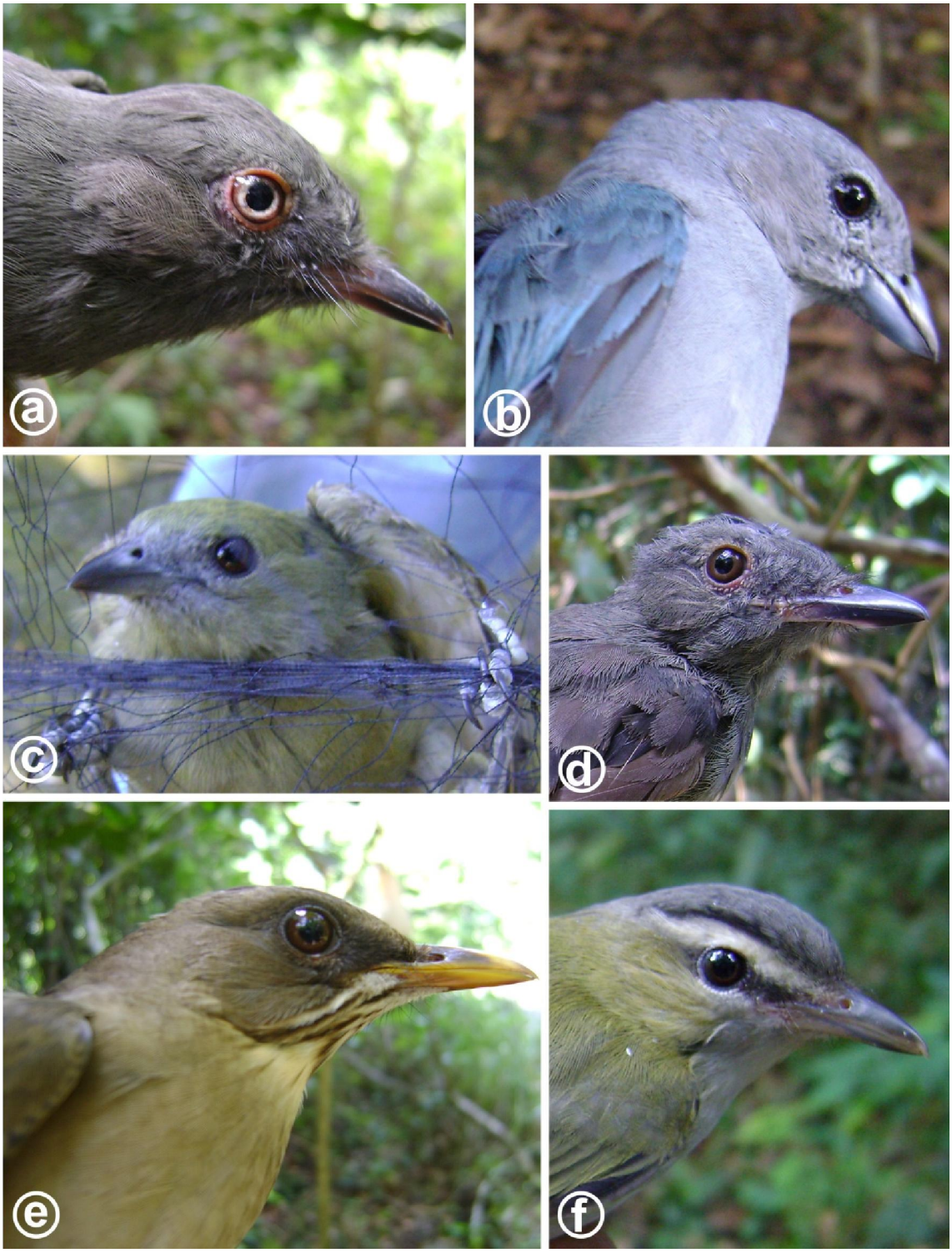

Fig. 2. Passerines captured in an area of Atlantic Forest in Marambaia Island, Rio de Janeiro, Brazil: (a) greyish mourner *Rhytipterna simplex*; (b) sayaca tanager *Thraupis sayaca*; (c) palm tanager *Thraupis palmarum*; (d) pale-breasted thrush *Turdus leucomelas*; (e) creamy-bellied thrush *Turdus amaurochalinus*; (f) red-eyed vireo *Vireo olivaceus*.

[78% (7/9)], *Isospora navarroi* Berto, Flausino, Luz, Ferreira, Lopes, 2009 [67% (6/9)] and *Isospora ramphoceli* Berto, Flausino, Luz, Ferreira, Lopes, 2010 [33% (3/9)]. *Ramphocelus bresilius dorsalis* shed oocysts of all these species, whereas *D. cayana* shed *I. tiesangui* [75% (3/4)] and *I. sepetibensis* [50% (2/4)] and *T. palmarum* shed *I. tiesangui*

Table 1. Totality of passerines captured and identified and the frequency of positives for families and species.

Families/ Species/ Common Names		Samples		
		Positive	**Negative**	**Total**
Thamnophilidae				
Thamnophilus palliatus Lichtenstein	chestnut-backed antshrike	0	1	1
	Subtotals:	**0**	**1**	**1**
Furnariidae				
Xenops minutus Sparrman	plain xenops	0	1	1
	Subtotals:	**0**	**1**	**1**
Tyrannidae				
Leptopogon amaurocephalus Tschudi	sepia-capped flycatcher	1	9	10
Attila rufus Vieillot	grey-hooded attila	0	4	4
Myiarchus ferox Gmelin	short-crested flycatcher	1	4	5
Myiarchus swainsoni Cabanis, Heine	Swainson's flycatcher	0	3	3
Lathrotriccus euleri Cabanis	Euler's flycatcher	0	1	1
Rhytipterna simplex Lichtenstein	greyish mourner	0	2	2
Legatus leucophaius Vieillot	piratic flycatcher	0	2	2
Pitangus sulphuratus Linnaeus	great kiskadee	0	3	3
Mionectes rufiventris Cabanis	grey-hooded flycatcher	1	1	2
Myiodynastes maculatus Statius, Muller	streaked flycatcher	0	1	1
	Subtotals:	**3**	**30**	**33**
Pipridae				
Chiroxiphia caudata Shaw, Nodder	swallow-tailed manakin	0	7	7
Manacus manacus L.	white-bearded manakin	0	4	4
	Subtotals:	**0**	**11**	**11**
Vireonidae				
Vireo olivaceus L.	red-eyed vireo	0	7	7
	Subtotals:	**0**	**7**	**7**
Hirundinidae				
Stelgidopteryx ruficollis Vieillot	southern rough-winged swallow	0	2	2
	Subtotals:	**0**	**2**	**2**
Troglodytidae				
Troglodytes aedon musculus Naumann	house wren	0	1	1
Troglodytes rufulus Cabanis	Tepui wren	0	1	1
	Subtotals:	**0**	**2**	**2**
Turdidae				
Turdus albicollis Vieillot	white-necked thrush	0	15	15
Turdus amaurochalinus Cabanis	creamy-bellied thrush	0	8	11
Turdus rufiventris Vieillot	rufous-bellied thrush	0	5	5
Turdus leucomelas Vieillot	pale-breasted thrush	0	5	5
	Subtotals:	**0**	**33**	**36**
Coerebidae				
Coereba flaveola L.	bananaquit	3	5	8
	Subtotals:	**3**	**5**	**8**
Thraupidae				
Ramphocelus bresilius dorsalis Sclater	brazilian tanager	9	20	29
Tachyphonus coronatus Vieillot	ruby-crowned tanager	0	6	6
Trichothraupis melanops Vieillot	black-goggled tanager	0	1	1
Dacnis cayana L.	blue dacnis	4	15	19
Tangara cayana L.	burnished-buff tanager	0	1	1
Thraupis palmarum Wied	palm tanager	2	2	4
Thraupis sayaca L.	sayaca tanager	0	2	2
	Subtotals:	**15**	**47**	**62**
Emberizidae				
Volatinia jacarina L.	blue-black grassquit	0	2	2
Haplospiza unicolor Cabanis	uniform finch	0	2	2
Sporophila nigricollis Vieillot	yellow-bellied seedeater	0	1	1
	Subtotals:	**0**	**5**	**5**
Parulidae				
Geothlypis aequinoctialis Gmelin	masked yellowthroat	1	1	2
	Subtotals:	**1**	**1**	**2**
	Total:	**22**	**145**	**167**

[100% (2/ 2)] and *I. navarroi* [50% (1/2)].

In the family Tyrannidae, only one specimen of *Myiarchus ferox* Gmelin, *Leptopogon amaurocephalus* Tschudi and *Mionectes rufiventris* Cabanis shed *Isospora* and/ or *Eimeria* oocysts. In *M. ferox* were identified *Eimeria*

sicki Berto, Luz, Flausino, Ferreira, Lopes, 2009 and *Isospora feroxis* Berto, Flausino, Luz, Ferreira, Lopes, 2009; in *L. amaurocephalus* only *E. sicki*; and in *M. rufiventris* only *Isospora mionectesi* Berto, Flausino, Luz, Ferreira, Lopes, 2009.

Isosporoid coccidia of two distinct species were identified parasitizing *Coereba flaveola* L., which is the only passerine species of the family Coerebidae. These were *Isospora cagasebi* Berto, Flausino, Luz, Ferreira, Lopes, 2008 [67% (2/ 3)] and *Isospora coerebae* Berto, Flausino, Luz, Ferreira, Lopes, 2010 [67% (2/ 3)].

Isospora piacobrai Berto, Luz, Flausino, Ferreira, Lopes, 2009 was identified parasitizing one of the two specimens *Geothlypis aequinoctialis* Gmelin.

Finally, in this work 12 species of coccidia were identified according to their respective hosts using sporulated oocysts as the basis for identifying. The morphology and morphometry of oocysts of these species correspond to those previously described in the scientific literature (Berto et al. 2008, 2009a, b, c, d, 2010a, b, 2011a, b, c).

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