

Isospora troglodytes n. sp. (Apicomplexa: Eimeriidae), a new coccidian species from wrens of Costa Rica

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Abstract Nineteen (91%) of 21 rufous-and-white wrens (*Thryothorus rufalbus*) and five (71%) of seven plain wrens (*Cantorchilus modestus*) sampled from Costa Rica were positive for a new species of *Isospora*. Oocysts have a thin, smooth, double, colorless wall and measure $20.1 \pm 1.4 \times 23.4 \pm 1.5 \mu\text{m}$ ($18\text{--}24 \times 20\text{--}26 \mu\text{m}$) with an average length–width ratio of 1.2 μm . Sporocysts are ovoid, measure $9.5 \pm 0.9 \times 15.5 \pm 1.1 \mu\text{m}$ ($7\text{--}12 \times 12\text{--}18 \mu\text{m}$) with an average length–width ratio of 1.6 μm . A nipple-like steida body continuous with the sporocyst wall and a prominent oval-shaped substeida body are present. In addition to the four sporozoites, a single compact sporocyst residuum was present in each sporocyst. This is the first description of an *Isospora*

species from the family Troglodytidae and the first report of *Isospora* from the rufous-and-white wren and plain wren.

Introduction

The wrens (Aves: Passeriformes: Troglodytidae) include over 60 species and are found throughout the New World with only a single species reported in Eurasia and Northern Africa (Stiles and Skutch 1989). The rufous-and-white wren (*Thryothorus rufalbus*) is found throughout Central America and portions of North and South America from southwestern Mexico to Northern Columbia and northwestern Venezuela. In Costa Rica, the rufous-and-white wren is common in the northwestern Pacific lowlands at elevations up to 1,100 m. The plain wren (*Cantorchilus modestus*) is found throughout Central America and Mexico. In Costa Rica, the plain wren is found along the Pacific slope extending into the Central Valley at elevations up to 2,000 m and in lowland areas along the Caribbean slope. At one time, these two geographically isolated populations were considered to be separate species, but the populations are now considered to be one species or potentially two subspecies (Stiles and Skutch 1989).

Many species of coccidia have been reported and described in Passeriformes including one species of *Isospora* in the white-throated magpie jay (*Calocitta formosa*) from Costa Rica (Svobodova 1994; McQuiston 2000; Upton et al. 1995). However, to date, few coccidia have been reported from Troglodytidae with only two unnamed *Isospora* sp. reported from a winter wren (*Troglodytes troglodytes*) (Rysavy 1954; Svobodova 1994) and a northern house wren (*Troglodytes aedon*) (Boughton et al. 1938). In this report, we describe a new species of coccidia from two species of wren in Costa Rica.

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Material and methods

From July 2005–September 2007, birds were captured via mist nets in the San Luis Valley, approximately 7 km southwest of the Monteverde region in Northwestern Costa Rica (10°16'57.117" N, 84°47'53.747" W). This valley is on the Pacific, leeward side of the volcanic Cordillera de Tilarán mountain range, and lies at 1,100 m elevation. Birds were captured primarily from two habitats, shade-grown coffee plantations and secondary tropical, pre-montane forest fragments. Captured birds were held in individual paper bags for a maximum of 30 min, and if a fecal sample was expelled, the feces were placed in 2.5% potassium dichromate and held at room temperature. Feces were examined using an Olympus CH30 microscope at $\times 100$ – $1,000$, oocysts and sporocysts were measured using an ocular micrometer, and measurements are given in micrometers followed by standard deviation. Photos were taken using a Zeiss Axioplan 2 microscope at $\times 400$ using Nomarski direct inference contrast.

Results

Nineteen (91%) of the 21 rufous-and-white wrens were positive for *Isospora*. Positive birds were found in both of the sampling habitats whereby 11 (85%) of the 13 birds from the forest and 8 (100%) of the birds from the coffee plantation were positive respectively. Five (71%) of the seven plain wrens were positive for *Isospora*. Positive birds were only found in the coffee plantation, where five (83%) of six birds were positive; however, only one bird was examined from the forested sites.

Description

Isospora troglodytes n. sp. (Figs. 1 and 2)

Sporulated oocysts characteristic of *Isospora* with each oocyst containing two sporocysts that contain four sporozoites. Oocysts ($n=53$) are ovoid, $20.1+1.4 \times 23.4+1.5$ (18–24 \times 20–26) with an average length–width ratio of 1.2. Oocyst wall is double-layered, smooth, and colorless. Oocyst residuum and micropyle absent but single circular to ovoid polar body (2–3 μm) present. Sporocysts ($n=53$) ovoid, $9.5+0.9 \times 15.5+1.1$ (7–12 \times 12–18) with an average length–width ratio of 1.6. A nipple-like steida body continuous with the sporocyst wall and a prominent oval-shaped substeida body present. The sporocyst possesses a single compact sporocyst residuum with pitted surface. Sporozoites are smooth with single terminal nuclei typically observed surrounding the compact sporocyst residuum. Centered refractile body was present.

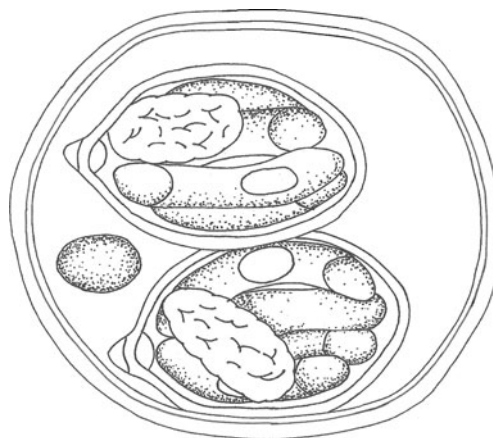


Fig. 1 Composite line drawing of a sporulated oocyst of *I. troglodytes* n. sp. from rufous-and-white wren (*T. rufalbus*)

Taxonomic summary

Type host: *Thryophilus rufalbus* (Lafresnaye, 1845), rufous-and-white wren

Other host: *Cantorchilus modestus* (Cabanis, 1861), plain wren

Type locality: San Luis, Costa Rica (9°51'0" N, 84°27'0" W)

Location in host: Unknown

Sporulation: Exogenous. Before 2 weeks at 25°C.

Type specimens: Photosyntype and a composite drawing of sporulated oocysts submitted to the US National Parasite Collection (USNPC), Beltsville, Maryland, USNPC no. 104839.

Etymology: The name is derived from the species in which the parasite was detected; *T. rufalbus* and *C. modestus* which are both species in the family Troglodytidae.

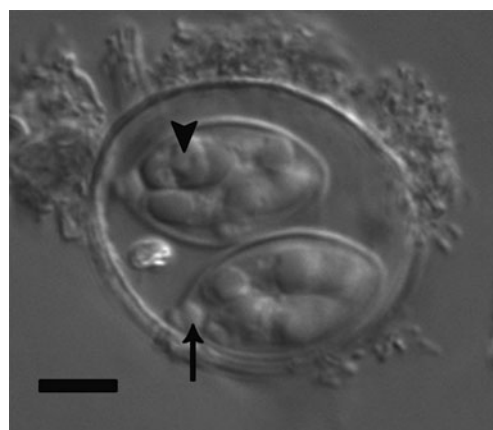


Fig. 2 Photomicrograph of a sporulated oocyst of *I. troglodytes* n. sp. from rufous-and-white wren (*T. rufalbus*). Note the single compact sporocyst residuum with pitted surface (arrow head) and the oval-shaped substeida body (arrow). Scale bar = 5 μm

Discussion

This is the first description of an *Isoospora* species from the family Troglodytidae and the first report of *Isoospora* from the rufous-and-white and plain wrens. Although only partially described, the *Isoospora* sp. type 3 reported from the winter wren (Svobodova 1994) can be differentiated from *I. troglodytes* n. sp. by multiple features. The oocysts of *Isoospora* sp. type 3 are slightly larger (21.5×24.0) and subspherical with an average length–width ratio of 1.1 compared to the oocysts of *I. troglodytes* n. sp. which measure 20.1×23.4 and are ovoid with an average length–width ratio of 1.2 (Svobodova 1994). The sporocyst residuum of *Isoospora* sp. type 3 is described as diffuse, compared to the single compact sporocyst residuum observed in *I. troglodytes* n. sp. (Svobodova 1994). Additionally, the *Isoospora* sp. type 3 has also only been reported in the winter wren, which has a near cosmopolitan distribution throughout Europe, Asia, and North America and is the only species of Troglodytidae outside of the New World, while the rufous-and-white wren and plain wren are restricted to Latin America (Rysavy 1954; Svobodova 1994).

Prevalence rates have not been reported in the three previous reports of *Isoospora* from the Troglodytidae (Boughton et al. 1938; Rysavy 1954; Svobodova 1994), but this information is available for other studies of passerines in Costa Rica and South America (McQuistion 2000; Upton et al. 1995). McQuistion (2000) compared prevalences of coccidian parasites between passerine host species with different behaviors and diets in South America. Ground-feeding and forest-dwelling birds had higher coccidian prevalences (23%) compared to forest border (13%) and canopy (9%)-feeding species, and insectivorous species (23–29%) had higher prevalences than frugivores (1%) (McQuistion 2000). Higher prevalences in ground-feeding passerine species have also been reported in Europe (Zinke et al. 2004). Species in the family Troglodytidae have diverse diets and behaviors, but

the diets of both the rufous-and-white wren and plain wren consist of insects, spiders, and invertebrates, and both species forage along the ground or on lower branches (Stiles and Skutch 1989). The prevalence rates we observed in both species of wren were higher than that reported for passerines with similar diets (23–29%) in South America and white-throated magpie jay in Costa Rica (50%) but consistent with passerines sampled in autumn in Europe (McQuistion 2000; Upton et al. 1995; Zinke et al. 2004).

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