Odhneria odhneri Travassos, 1921 (Trematoda: Microphallidae) in Migrant Shorebirds from Patagonia, Argentina

Odhneria odhneri Travassos, 1921 (Trematoda: Microphallidae) en aves playeras migratorias de Patagonia, Argentina

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ABSTRACT: The aim of this paper is to describe *Odhneria odhneri* in migratory shorebirds at Patagonian sites. A total of 48 *Calidris fuscicollis,* 44 *Calidris bairdii,* and 5 *Charadrius falklandicus* from several areas in Argentinean Patagonia were examined. Adult specimens of *O. odhneri* were obtained from the intestinal cecae of *C. bairdii* (P=6.8, MI=30.3), and *C. falklandicus* (P=20, MI=17.5). Morphological and morphometric characteristics agree with those of previous records. This is the southernmost record for the trematode *O. odhneri*, and the first host record for *C. bairdii* and *Ch. falklandicus.* We propose that *C. bairdii* may act as a dispersing agent for *O. odhneri* between the America's southern and northern hemispheres. Apparently, gastropod mollusks, crustaceans and birds are maintaining the life cycle of this species in Patagonia. The host, *C. bairdii*, has the potential of passing viable eggs of *O. odhneri* into the environment during their northward migration and onto their nesting sites during the boreal summer. This discovery broadens our knowledge about the range of hosts and the potential ways of dispersal of parasites along the American coast and, represents a valuable contribution to the general knowledge of shorebird parasites in South America.

Keywords: *Odhneria odhneri, Calidris fuscicollis, Calidris bairdii, Charadrius falklandicus,* Patagonia, Argentina.

RESUMEN: El objetivo de este trabajo es reportar la presencia del trematode *Odhneria odhneri* en aves playeras migratorias en la Patagonia argentina. Se examinaron un total de 48 *Calidris fuscicollis*, 44 *Calidris bairdii* y 5 *Charadrius falklandicus* de diferentes zonas de la Patagonia. Se obtuvieron adultos de *O. odhneri* de los ciegos intestinales de *C. bairdii* (P = 6,8; IM=30,3) y de *Ch. falklandicus* (P=20, IM=17,5). Las características morfológicas y morfométricas observadas coinciden con las registradas por autores previos. Este es el registro más austral de *O. odhneri* y el primer registro hospedatorio para *C. bairdii* y *Ch. falklandicus. Calidris bairdii* podría actuar como agente dispersor de *O. odhneri* entre América del Norte y América del Sur. Aparentemente, moluscos gasterópodos, crustáceos y aves estarían manteniendo el ciclo de vida de esta especie en la Patagonia. El hospedador *C. bairdii* tiene el potencial de dispersar huevos viables de *O. odhneri* en el ambiente durante su migración hacia el norte y en las áreas reproductivas durante el verano boreal. Estos hallazgos incrementan nuestro conocimiento sobre el rango hospedatorio y las formas potenciales de dispersión de parásitos a lo largo de la costa americana y representan una valiosa contribución al conocimiento general de los parásitos de aves playeras migratorias en América del Sur.

Palabras claves: *Odhneria odhneri, Calidris fuscicollis, Calidris bairdii, Charadrius falklandicus,* Patagonia, Argentina.

INTRODUCTION

In South America very little is known about helminth parasites of migratory and sea birds (Diaz, 2006). The study of helminth communities in birds not only help us in understanding the ecology of the host species, but also can be used to elucidate diets, migration routes, foraging habits, and differentiate among host populations. Three species of shorebirds, the Baird's Sandpiper *Calidris bairdii* Coues, the White-rumped Sandpiper *Calidris fuscicollis* (Vieilliot), and the Two-banded plover *Charadrius falklandicus* Latham from several areas in Argentinean Patagonia were examined for helminth parasites.

Calidris bairdii and *C. fuscicollis* are Nearctic migrant

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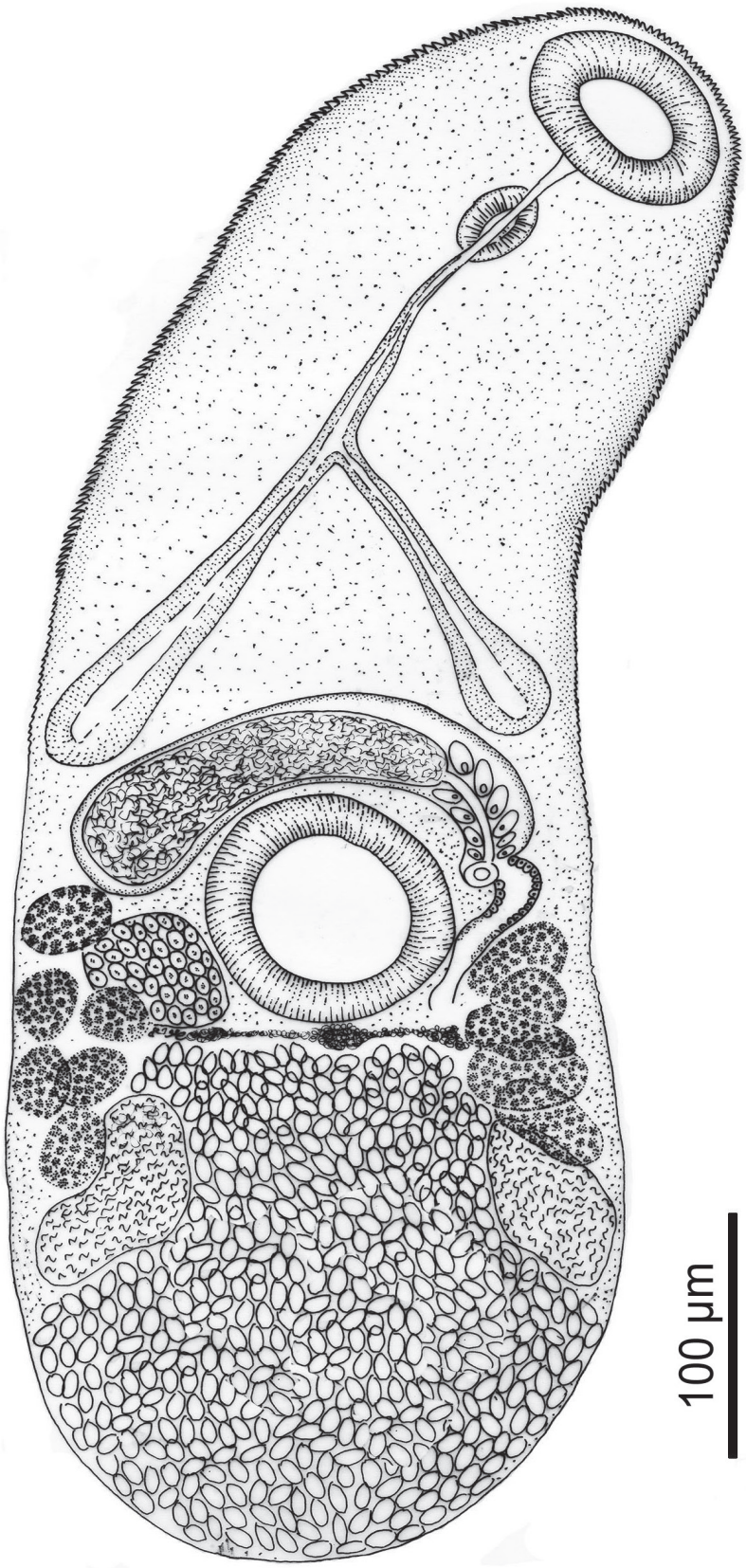

Figure 1. Ventral view of *Odhneria odhneri* from *Calidris bairdii* from Patagonia (Argentina).

shorebird species, flying hundreds of kilometers from their nesting grounds in the Arctic tundra, Canada, Alaska, and Greenland to their wintering grounds in Patagonia. Adults arrive to South America at the beginning of the austral spring, reaching their wintering areas a month later. Specimens remain in Argentina and Chile until the early austral autumn when starts the return to their breeding areas in North America (O'Brien *et al*., 2006). They tend to form mixed flocks during migration to the Southern Hemisphere, where *C. bairdii* frequents mainly grasslands, flooded areas and inland wetlands while *C. fuscicollis* mostly transit

Table 1: Comparison between measurements of *Odhneria odhneri* from its original description and those from different hosts and localities in Argentina.

Host	*Nyctanassa violacea*	*Phalacrocorax olivaceus*	*Larus dominicanus*	*Larus dominicanus*	*Larus atlanticus*	*Calidris bairdii*	*Charadrius falklandicus*
Distribution	San Pablo, Brazil	San José Gulf, Chubut Argentina	San José Gulf, Chubut, Argentina	San José Gulf, Chubut, Argentina	Bahía Blanca, Buenos Aires, and San José Gulf, Chubut, Argentina	Bahía Bustamante and Laguna del Ornitólogo, Chubut, Argentina	San Antonio Oeste, Río Negro, Argentina
References	Travassos1921	Cremonte & Etchegoin, 2002	Cremonte & Etchegoin, 2002	Diaz, 2006	La Sala *et al.*, 2009	Present study	Present study
N*	-	10	2	20	-	10	10
Total L	780–950	653 (560-800)	628, 719	646 (550-700)	330–620	730 (490-910)	580 (420-730)
W at acetabulum level	-	217 (184-270)	223, 269	266 (240-290)	-	183 (140-250)	202 (140-330)
Oral sucker L	70–80	71 (52-84)	70, 87	66 (60-75)	50x50–60	59 (39-80)	62 (40-75)
W	-	77 (65-88)	68, 77	77 (60-85)	-	61 (42-80)	52 (35-70)
Acetabulum L	90–10	67 (52-84)	100, 108	77 (52-90)	40–90	71 (50-88)	72 (60-80)
W	-	81 (70-90)	58, 62	97 (87-102)	-	70 (55-105)	60 (45-70)
Prepharynx L	-	41 (34-45)	50	5 (0-20)	-	43 (15-80)	38(18-71)
Pharynx L	-	54 (50-61)	48, 65	53 (50-60)	-	41 (31-55)	42(25-50)
W	-	30 (25-34)	21, 23	33 (26-40)	-	27 (15-40)	21(12-30)
Esophagus L	140–160	113 (100-140)	110, 138	108 (80-130)	200–900	164 (103-290)	76(50-100)
Testicle aporal side L	-	79 (60-90)	89, 90	59 (58-65)	-	78 (40-135)	-
W	-	45 (32-52)	40, 45	91 (87-95)	-	40 (27-50)	-
Testicle poral side L	-	81 (70-89)	60, 78	60 (58-67)	-	77 (40-120)	-
W	-	47 (45-50)	40, 48	83 (75-90)	-	40 (30-60)	-
Cirrus sac L	-	152 (120-190)	150, 180	193 (165-210)	-	157 (108-200)	120(100-150)
W	-	38 (30-45)	39, 49	41 (32-51)	-	36 (20-70)	29(25-35)
Ovary L	-	52 (41-61)	56, 58	80 (75-90)	-	51 (35-95)	40
W	-	56 (39-70)	68, 74	41 (35-50)	-	37 (27-70)	25
Eggs L	-	20 (17-22)	19, 21	20 (18-22)	-	15 (12-20)	16(12-20)
W	-	10 (9-11)	10, 12	11 (10-12)	-	9 (7-10)	10
Follicles (poral side)	-	10 (8-11)	9, 10	-	-	7 (5-8)	7(6-8)
Follicles (aporal side)	-	7 (7-9)	8, 9	-	-	7 (6-10)	7(7-8)

*N=number of specimens measured, L= length, W= width

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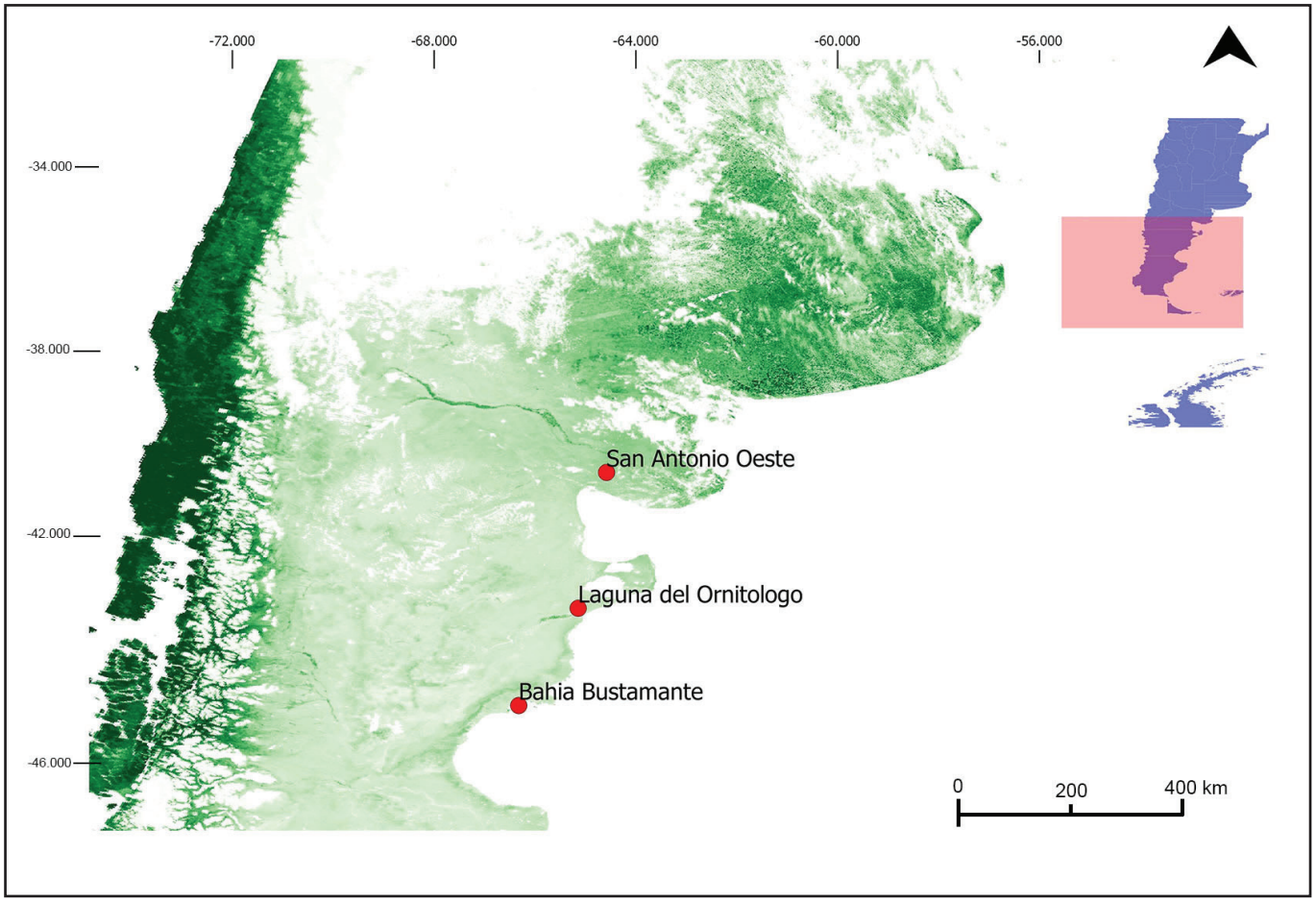

Figure 2. New localities for *Odhneria odhneri* in Patagonia (Argentina).

marine shorelines (del Hoyo *et al.*, 1996). Meanwhile, *Ch. falklandicus* is a short-distance migrant that inhabits southern part of South America. This migrant shorebird species reproduces in Patagonian sites and, D'Amico *et al.* (2004) reported that some individuals reach southern Brazil during the non-reproductive period.

The purpose of this paper is to investigate infections of the helminth parasite *Odhneria odhneri* Travassos, 1921 in *Calidris bairdii*, *Calidris fuscicollis*, and *Charadrius falklandicus* from Patagonia, Argentina. We also present comparative measurements of *O. odhneri* from various bird hosts and localities in Argentina, and provide some considerations about its life cycle.

MATERIALS AND METHODS

All birds were collected from different localities in both marine and freshwater environments in Río Negro, Chubut, Santa Cruz and Tierra del Fuego Provinces (Patagonia, Argentina). A total of 48 *C. fuscicollis*, 44 *C. bairdii*, and 5 *Ch. falklandicus*, found dead or died accidentally, during the execution of different projects carried out by other researchers, were collected during January 1999, 2004, 2005, 2006, 2009 (*C. fuscicollis*), January 2005 and January 2006 (*C. bairdii*), and November 2002, February 2008 and March 2016 (*Ch. falklandicus*). The majority of birds were dissected in the field and the viscera fixed in 10% formalin, and some hosts were frozen at -20°C until their analysis. In the laboratory, flukes were collected from the intestinal cecae and preserved in 70% ethanol. Specimens were stained with hydrochloric carmine, mounted in natural Canada balsam and observed with an Olympus microscope BX51®. Drawings were made with the aid of a camera lucida. Measurements are given in micrometers. Trematodes were identified following specific bibliography (Yamaguti, 1971; McDonald, 1981; Bray *et al*., 2008). Prevalence and mean intensity were calculated *sensu* Bush *et al*. (1997). Voucher specimens were deposited in the Colección Helmintológica del Museo de La Plata (MLP He 7420, 7421), La Plata, Argentina and in the Colección Parasitológica del Centro Nacional Patagónico (CNP 164, 165), Chubut, Argentina.

RESULTS

Only specimens of *C. bairdii*, and *Ch. falklandicus* were infected by *O. odhneri,* but none of *C. fuscicollis* were parasitized for this trematode species.

Description and Identification

Odhneria odhneri Travassos, 1921
Family Microphallidae Travassos, 1920
Subfamily Maritrematinae Belopol'skaia, 1952
General description (based on 10 specimens) (Fig. 1, Table 1). Body small and elongated, covered with spines. Oral sucker subterminal, followed by a long prepharynx and a muscular barrel-shaped pharynx. Esophagus long. Cecae preacetabular and short. Acetabulum of similar size to the oral sucker. Testes postacetabular. Cirrus pouch curved around the anterior border of acetabulum. Seminal vesicle elliptical. Genital pore sinistral, lateral to acetabulum. Vitellaria lateral to testes, extending from the testes to the acetabular zone. Ovary located above the right testicle, between the right vitellaria and acetabulum. Uterus occupying inter and postesticular zone. Metraterm well differentiated. Lateral borders of the body generally curved towards the ventral region forming folds. Small eggs.

Type host: *Nyctanassa violacea* Travassos, 1921
Type locality: Río de Janeiro, Brazil
New hosts: *Calidris bairdii* Coues, 1861, *Charadrius falklandicus* Latham, 1790.
New localities: San Antonio Oeste (40°43'48"S, 64°56'20"W), Río Negro Province, Argentina; Laguna del Ornitólogo (43°14'S, 65°14'W), and Bahía Bustamante (45°07'34"S, 66°32'14"W) Chubut Province, Argentina (Fig. 2).
Infection site: Intestinal cecae.
P: 6.8% in *C. bairdii*, and 20% in *Ch. falklandicus*.
MI: 30.3 in *C. bairdii*, and 17.5 in *Ch. falklandicus*.

DISCUSSION

Odhneria odhneri was described as an intestinal parasite from the yellow-crowned night heron *Nyctanassa violacea* (Linnaeus) in Brazil (Travassos, 1921). Later, this species have been found in many host species from America, most of them having migratory behavior (Sinclair, 1971). In Argentina, this trematode has been reported parasitizing the Neotropic cormorant *Phalacrocorax olivaceus* Humboldt and the kelp gull *Larus dominicanus* Lichtenstein (Cremonte and Etchegoin, 2002; Diaz *et al*., 2011) from Península Valdés, (Chubut Province), the Olrog´s gull *Larus atlanticus* Olrog (La Sala *et al*., 2009) in the estuary of Bahía Blanca (Buenos Aires Province), while Alda (2011) found larval stages of the genus *Odhneria* in different species of crustaceans in the latter locality.

Other species described in this genus are: *Odhneria raminellae* Dery, 1783 in the mangrove rail *Rallus longirostris* Boddaert; *Odhneria charadrii* Cable, Connor and Balling 1960 in the Wilson's Plover *Charadrius wilsonia* Ord; and *Odhneria limnodromii* Schell 1967 in the short-billed dowitcher *Limnodromus griseus* (Gmelin). However, all mentioned species were considered synonyms of *O. odhneri* (Sinclair, 1971).

Although there are few variations, the morphology and the measurements of the specimens found in this study agree with previous descriptions of *O. odhneri* from other infected shorebirds (Cremonte and Etchegoin, 2002; Diaz, 2006; La Sala *et al*., 2009) (see Table 1).

The life cycle of *O. odhneri* was described by Stunkard (1979) from specimens collected in Woods Hole (Massachusetts, USA). Sporocysts and cercariae were recorded in the gastropod *Littorina saxatilis* (Olivi) and the shrimp, *Palaemonetes vulgaris* (Say), harbored metacercariae encysted in abdominal muscles. Several species of birds, mostly migratory, act as definitive hosts (Sinclair, 1971; Stunkard, 1979). It has been suggested that *O. odhneri* infection is seasonal, specimens live in their definitive hosts about a year, meanwhile weak and dying specimens are present in the cecae towards the end of boreal autumn (Sinclair, 1971). Given the longevity of these trematodes, *C. bairdii* may be acting as a potential dispersing agent harboring gravid adults able to deposit the parasite's eggs in the environment during their northward migration and at nesting sites in the North Hemisphere. Gastropod mollusks, crustaceans and different species of birds that feed in the intertidal zone may be responsible for maintaining the life cycle of this parasite species in Patagonia. Additional evidence confirming that the life cycle of *O. odhneri* occurs in South America is the finding of *O. odhneri* in resident birds such as *L. dominicanus*, *P. olivaceus* and *L. atlanticus* (Cremonte and Etchegoin, 2002; La Sala, 2009; Diaz *et al.,* 2011), whereas metacercariae of *Odhneria* sp. were found in the estuarine crabs, *Neohelice granulata* Dana, and *Cyrtograpsus angulatus* Dana; in the cirripeds, *Amphibalanus amphitrite* (Darwin), and *Balanus glandula* Darwin, and in the sergestid shrimp, *Peisos petrunkevitchi* Burkenroad (Alda, 2011). Considering the distribution of the crustaceans *B. glandula* and *C. angulatus* reaches the southern coast of the Chubut Province, it is probable that these crustaceans harbor the metacercariae of *O. odhneri*. It will be necessary to investigate these and other Patagonian crustacean species to further elucidate the life cycle *O. odhneri* in Patagonia.

Crustaceans are prey species of *C. fuscicollis* and *Ch. falklandicus* in Patagonia (D'Amico *et al*., 2004) therefore it could be possible that the latter host acquires *O. odhneri* from the ingested preys. In fact, species of the crab genus *Cyrtograpsus* are reported in the diet of both bird species (D'Amico and Bala, 2004; D'Amico *et al.*, 2004). Given that *C. fuscicollis* possesses a similar trophic behavior as

Ch. falklandicus, the absence of *O. odhneri* in the former bird species is remarkable. It is possible that *C. baridii* and *Ch. falklandicus* include more diversity of crustaceans in their diets. However, more studies will be necessary to know what prey, in the diet of *C. bairdii*, is acting as intermediate host of *O. odhneri.*

This is the southernmost record of *O. odhneri*, and the first host record for *C. bairdii* and *Ch. falklandicus.* This discovery broadens our knowledge about the range of hosts and the ways of dispersal of parasites along the American coast, and represents a valuable contribution to the general knowledge of shorebird parasites in South America.

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