Comp. Parasitol.
76(2), 2009, pp. 293–296

Research Note

Some Nematodes from Olrog's Gull, *Larus atlanticus* Olrog, 1958 (Aves: Laridae), and Prey Crabs from the Bahía Blanca Estuary, Argentina

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ABSTRACT: Three species of nematodes (Acuariidae) were recovered from a total of 108 adult and chick Olrog's Gulls, *Larus atlanticus*. Birds were collected from a breeding colony in the Bahía Blanca estuary of Argentina, during the breeding seasons of 2005 (n = 66 chicks, 3 adults), 2006 (n = 37 chicks, 1 adult), and 2007 (n = 1 chick). Nematodes were identified as *Pectinospirura argentata*, *Skrjabinoclava andersoni*, and *Sciadiocara* sp., and all represent new host and locality records. Prevalence of infection among chicks during the 2005 and 2006 breeding seasons was 80.3% and 89.2%, respectively, and 67% for adults in 2005. Also, third-stage acuarid nematodes were found in possible intermediate hosts, *Neohelice granulata* (Crustacea: Decapoda) and *Cyrtograpsus angulatus* (Crustacea: Decapoda).

KEY WORDS: Acuariidae, Argentina, Bahía Blanca estuary, *Larus atlanticus*, Olrog's Gull, crabs, nematodes, *Pectinospirura argentata*, *Sciadiocara* sp., *Skrjabinoclava andersoni*.

Olrog's Gull, *Larus atlanticus* Olrog, 1958 (Laridae), is endemic to the tidal wetlands along the Atlantic coast of Argentina, Uruguay, and southern Brazil (Yorio et al., 2005). The limited geographical range of activity, small population size (4,000–5,000 breeding pairs), dietary specialization, and susceptibility to anthropogenic changes in the environment have lead to its current status as a vulnerable species (BirdLife International, 2008). Its breeding range is restricted to only 2 nesting areas, which are about 700 km apart, in southern Buenos Aires Province and northern Chubut Province, Argentina (Yorio et al., 1997). The largest and most important Olrog's Gull colony comprises about 80% of the breeding population for the species, and is located at Isla del Puerto (38°48′S; 62°15′W), in the Bahía Blanca estuary of Argentina (Delhey et al., 2001a). Adults are foraging specialists during their breeding season and feed primarily on the grapsid crabs, *Neohelice granulata* (Dana, 1851) Sakai, Türkay and Yang, 2006, and *Cyrtograpsus angulatus* Dana, 1851 (Crustacea: Decapoda) (Delhey et al., 2001b), which they also feed to their chicks.

Parasites are recognized as an important force behind the dynamics of wild populations (Tompkins and Begon, 1999), and thorough helminthological descriptions are the first step toward understanding these complex processes. Helminth parasites seem to play a role in the high morbidity and mortality among hatch-year Olrog's Gulls at Isla del Puerto breeding colony (La Sala and Martorelli, 2007), but related epidemiological studies are still lacking.

The main objectives of this study were to, first, determine the prevalence of nematode infection in Olrog's Gulls from the Bahía Blanca estuary of Argentina and, second, to identify likely intermediate hosts.

As part of a broader study of the epidemiology of helminth parasitism in Olrog's Gull, freshly dead, prefledged chicks and adults were salvaged during 3 consecutive breeding seasons (2005: 66 chicks, 3 adults; 2006: 37 chicks, 1 adult; 2007: 1 chick) at the Isla del Puerto breeding colony. The breeding season typically ranges from early September through late December. Birds were necropsied within 4 hr of collection by removing the gastrointestinal (GI) tract, which was fixed in 10% formalin until examination. The entire GI tract was examined for the presence of helminths. Nematodes recovered from the GI tracts were stored in 70% ethanol, cleared in glycerinated ethanol, mounted, and studied under a light microscope. Representative specimens of each species were dried by the critical-point method and examined using a JEOL® (Tokyo, Japan) JSV 6063 LV scanning electron microscope. The specimens were identified according to measurement of various structures, such as total body length, body width, length of ptilina, length of buccal capsule, distance between anterior end and nerve ring and deirids, distance between posterior end and excretory pore and vulva, length of muscular and glandular esophagus and their ratios to body length, ratio of vulva length to body length, length of vagina uterine and

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Table 1. Summary of parasitological data collected from salvaged Olrog's Gulls. Prevalence (%) is reported along with its 95% confidence interval (95% CI), sample size (*n*), mean intensity, and range.*

	Prevalence (%)	*n*	95% CI	Mean intensity (range)
Year 2005				
Adults	66.7	3	64.4–68.9	107 (95–119)
Chicks	80.3	66	79.5–81.1	23.6 (1–147)
Year 2006				
Adults	100	1	NA	93
Chicks	89.2	37	87.7–90.7	37
Year 2007				
Adults	NA	NA	NA	NA
Chicks	100	1	NA	NA

* NA, no data were available or only 1 individual was salvaged.

vagina vera, and egg width and length. The keys of Chabaud (1974) were used for helminth identification. Measurements are presented in micrometers. Voucher specimens were deposited in the Helminthological Collection of the Museo de La Plata, La Plata, Argentina (MLP 5896, MLP 5897, MLP 5898, MLP 5899).

Also, the crustaceans *C. angulatus* ($n = 421$) and *N. granulata* ($n = 436$) were sampled for parasitic larvae from foraging areas of Olrog's Gulls from the study colony (38°44′S; 62°22′W). The crabs were killed by chilling and then fixed in 10% formalin until examined. Additional subsamples of *C. angulatus* ($n = 27$) and *N. granulata* ($n = 9$) were transported to the laboratory alive, killed by chilling, and dissected to harvest live larval stages.

Three species of nematodes belonging to the family Acuariidae (Spirurida) were found in the proventriculi of Olrog's Gull chicks and adults. Prevalence of infection among chicks and adults is provided in Table 1. These were identified as *Pectinospirura argentata* Wehr, 1933; *Skrjabinoclava andersoni* Cremonte and Navone, 1999; and *Sciadiocara* sp. Identification was based on the study of 10 males and 14 females of *P. argentata*, 11 males and 10 females of *S. andersoni*, and 5 females of *Sciadiocara* sp.

The genus *Pectinospirura* (Acuariinae) comprises 3 species. Among birds, *Pectinospirura argentata* has been reported in the Herring Gull, *Larus argentatus* Pontoppidan, 1763 (Laridae), from the United States (Wehr, 1933); the Caspian Tern, *Hydroprogne caspia* Pallas, 1770 (Charadriidae), from Australia (Mawson, 1969); the Ring-billed Gull, *Larus delawarensis* Ord, 1815 (Laridae), from Canada (Wong and Anderson, 1982); and the Kelp Gull, *Larus dominicanus* Lichtenstein, 1823 (Laridae), from Argentina (Cremonte and Navone, 1999). Morphology and measurements from this study agree with those reported by Cremonte and Navone (1999).

The genus *Skrjabinoclava* (Acuariinae) comprises 30 known species, most of which have been found in shorebirds. Only 3 species have been recorded in the South American Atlantic: *Skrjabinoclava thapari* Freitas, 1953, from Perú (Vicente et al., 1983); *Skrjabinoclava tupacincae* Freitas, Vicente and Ibañez, 1970, from Brazil (Freitas, 1970); and *Skrjabinoclava andersoni* Cremonte and Navone, 1999, from Argentina (Cremonte and Navone, 1999). In the South American Pacific, there are reports of *S. tupacincae*; *Skrjabinoclava bakeri* Wong and Anderson, 1987; *Skrjabinoclava hartwichi* Wong and Anderson, 1987; and *Skrjabinoclava inornatae* Wong and Anderson, 1988 (Freitas et al., 1970; Wong and Anderson, 1987, 1990; Wong et al., 1989). To date, the only *Skrjabinoclava* species reported from gulls are *S. inornatae* from *L. delawarensis* in North America, and *S. andersoni* from *L. dominicanus* in Argentina (Wong and Anderson, 1987; Cremonte and Navone, 1999). Most of the key diagnostic features and measurements of *S. andersoni* from this study correspond with those reported by Cremonte and Navone (1999). However, males of *S. andersoni* from our study had a shorter mean distance between the excretory pore and the posterior end (110–180 vs. 150–270). As well, our females had a shorter total length (2,050–3,020 vs. 2,670–4,030), a shorter distance between the deirids and the anterior end (64–68 vs. 78–84), and a shorter glandular esophagus (770–1,263 vs. 1,010–1,310). Despite the morphometric differences observed, we consider them to represent intraspecific variability.

The genus *Sciadiocara* (Schistorophinae) comprises 8 species, which mainly parasitize birds belonging to the family Charadriidae (Wong and Lankester, 1985). *Sciadiocara umbellifera* Molin, 1860, and *Sciadiocara haemantopodi* Cremonte, Navone and Etchegoin, 1999, are the only species reported from South America (Wong and Lankester, 1985; Wong and Anderson, 1991; Cremonte et al., 1999). *Sciadiocara* sp. from the present study differed considerably in some measurements from *S. haemantopodi* found in *Haematopus palliatus* Temminck, 1820, and in *L. dominicanus* from Argentina (Cremonte et al., 1999), such as a shorter distance between the ptilina and the anterior extremity (20–25 vs. 31–37), a considerably larger distance between the nerve ring and the anterior extremity (90–133 vs. 42–75), a longer esophagus (2,197–2,810 vs. 1,830–2,220), larger eggs (length: 39–50 vs. 33–39; width: 22–38 vs. 21–24), a longer vagina vera (50–90 vs. 33–39), and a shorter vagina uterine (100–140 vs. 285–300). Despite morphometric differences, we found only female specimens, which precluded the possibility of species identification.

In both species of the studied crabs, third-stage larvae of Acuariinae gen. sp. (Acuariidae) were identified based on the study of 6 larvae. The presence of long cuticular cordons places these larvae in the family Acuariidae (Spiruridae) (Chabaud, 1974), and most likely in the subfamily Acuariinae (Anderson, 2000). Only one previous work reported the presence of Acuariinae gen. sp. third-stage larvae in the crabs *Uca uruguayensis* Nobili, 1901, and *N. granulata* from Argentina (Cremonte et al., 2007). The morphology of our specimens agrees with that described by Cremonte et al. (2007). However, because the life cycles were not experimentally completed, they could not be assigned to any specific genus of Acuariinae.

Adult specimens of all nematode species found in the present study have been reported previously from a number of birds; however, this is the first report, to our knowledge, of *S. andersoni*, *P. argentata*, and *Sciadiocara* sp. in Olrog's Gulls and the southernmost record of these nematodes from marine birds. Also, this is the first and southernmost record of third-stage larvae of the family Acuariidae in crustaceans as intermediate hosts.

The crabs *C. angulatus* and *N. granulata* have been previously reported as intermediate hosts for digeneans of Olrog's Gull from Argentina (Etchegoin and Martorelli, 1997). This finding supports our hypothesis of a life cycle involving these crabs as possible intermediate hosts of nematodes (Acuariinae) found in Olrog's Gulls from the Bahía Blanca estuary of Argentina.

We thank Club Náutico Bahía Blanca and Club Náutico Gral. Daniel Cerri, Mrs. Andrea Fernández, Mrs. Marta Rodríguez, Ing. Carlos Fernández, and park rangers Martín Sotelo and Lucrecia Diaz for their support. We also thank Joaquín Cereguetti and Nicolás Acosta for field assistance, and the Wildlife Health Fund, Field Veterinary Program (Wildlife Conservation Society) for funding early stages of this project. This study was partly funded by Agencia Nacional de Promoción Científica y Tecnológica (PICT 309 and PICT 34412/05). All authors are members of CONICET.

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