

Helminths of the Magellanic Penguin, *Spheniscus magellanicus* (Sphenisciformes), During the Breeding Season in Patagonian Coast, Chubut, Argentina

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ABSTRACT: Twenty-seven Magellanic penguins, *Spheniscus magellanicus* (Sphenisciformes), were collected from September 1996 to November 2000 from Península Valdés (42°04'–42°53'S; 63°38'–64°30'W), on the Patagonian coast, Argentina and the gastrointestinal tract was examined for helminths. All birds were parasitized by at least 1 of the 5 following parasite species: *Tetrabothrius lutzi* (Cestoda); *Cardiocephaloides physalis* (Lutz, 1926) (Digenea), *Contracaecum pelagicum* (Johnston and Mawson, 1942), *Cosmocephalus obvelatus* (Creplin, 1825) (Nematoda), and *Corynosoma* sp. (Acanthocephala). The total mean intensity was 686. The helminth community composition of *S. magellanicus* is reported for first time in Argentina increasing the host range of many of the species registered.

KEY WORDS: Atlantic Ocean, helminth parasites, Cestoda, Digenea, Acanthocephala, Nematoda, *Tetrabothrius lutzi*, *Cardiocephaloides physalis*, *Contracaecum pelagicum*, *Cosmocephalus obvelatus*, *Corynosoma*.

The Magellanic penguin, *Spheniscus magellanicus* Foster (Sphenisciformes: Spheniscidae) is one of the most abundant marine birds on the Argentinean coast (Yorio et al., 2001; Schiavini et al., 2005). During the breeding season the colonies extend along the South American coasts, from 42°S on the Atlantic coast, and from 29°S on the Pacific coast, to Tierra del Fuego (54°S) (Frere et al., 1996; Yorio et al., 2001). Some colonies can be found occasionally, or accidentally, in Australia, New Zealand, and South Atlantic islands (Vanegas, 1999; Pütz et al., 2000). The adults arrive to the nest sites in late August or early September, and after a period of burrow excavation and nest repair, they begin to lay eggs around mid-October, which start hatching in mid-November. They leave the breeding areas in March and April (Scolaro, 1987). In the nonreproductive period, the birds migrate to the north, reaching the southern coast of Brazil in the east and the southern coast of Peru in the west (del Hoyo et al., 1996).

Although much is known about the habitat and behavior of the Magellanic penguin (Pütz et al., 2000; Forero et al., 2002; Walker and Boersma, 2003; Schiavini et al., 2005), there have been few reports of the parasitic helminths of this bird beyond incidental reports and specific descriptions of some of their parasites (Nybelin, 1929; Portes Santos, 1984; Diaz et al., 2001; Garbin et al., 2007; Gonzalez-Acuña et al., 2008).

The object of this study is to report the results of a survey of the helminth community in *S. magellanicus* from Península Valdés (Chubut Province, Argentina), one of the main reproductive areas of these birds on the Patagonian coast (Schiavini et al., 2005).

MATERIALS AND METHODS

The digestive tracts and internal organs of 27 morbid or freshly dead Magellanic penguins collected along the coast of Península Valdés, Chubut Province, Argentina (42°04'–42°53'S; 63°38'–64°30'W), Argentina from September 1996 to November 2000 were removed, fixed in 10% formalin, and transported to the laboratory. Gastrointestinal tracts were divided into esophagus, stomach, and intestine; this last organ was divided into five equal sections. The viscera were examined under a stereomicroscope. Helminths recovered from each section were counted and stored in 70% alcohol. Cestodes were stained in Harris' hematoxylin, dehydrated in a graded ethanol series, cleared in methyl salicylate, and mounted in Canada balsam. Digeneans were embedded in paraffin, sectioned in transversal and sagittal views of 8–10-µm thick, and stained in hematoxylin–eosin. Nematodes and acanthocephalans were cleared in lactophenol or in 25% glycerine alcohol. Some specimens of each species were dried by the critical point method and observed using scanning electron microscopy (JEOL/JSMT 6360 LV) from the Museo de La Plata, La Plata, Buenos Aires, Argentina. The terms prevalence, mean intensity, and community were interpreted and calculated according to Bush et al. (1997). Voucher specimens were deposited in the Helminthological Collection of Museo de La Plata (CHMLP), La Plata, Buenos Aires, Argentina.

RESULTS

A total of 18,533 parasites was collected, and the mean intensity was 686. All birds were parasitized by

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at least 1 of the 5 parasite species found (1 cestode, 1 digenean, 2 nematodes, and 1 acanthocephalan). All parasite species found in this study were accounted for within the first 5 penguins examined.

Cestoda

Tetrabothriidea Baer, 1954
Tetrabothriidae Linton, 1891
***Tetrabothrius* Rudolphi, 1819**
***Tetrabothrius lutzi* Parona, 1901**
(Figs. 1–3)

Site of infection: Intestine, mainly first section.

Prevalence: 85%.

Mean intensity: 521.

Deposited specimens: 6084 CHMLP.

Remarks

Tetrabothriidean cestodes are widely distributed among marine mammals and seabirds (Hoberg, 1994). *Tetrabothrius* is one of the most speciose genera, with more than 40 species parasitizing seabirds (Baer, 1954; Temirova and Skrjabin, 1978; Schmidt, 1986). Five species of *Tetrabothrius* have been described from Sphenisciformes in South America and Antarctica (Baer, 1954; Clarke and Kerry, 2000; Barbosa and Palacios, 2009). The general morphology of the specimens recovered in this work agrees with those of *Tetrabothrius lutzi*. This species was originally described from fragmented specimens found in 1 Magellanic penguin in Brazil. Later, Nybelin (1929) published additional data on this species on the basis of material collected in Chile. Baer (1954), in a revision of Tetrabothriidae, examined the material of Parona and Nybelin and newly collected material from 1 specimen of *S. magellanicus* kept in captivity at the Zoological Garden of Bale (Switzerland), and added some information on *T. lutzi*. However, a detailed description of this species is lacking from the literature. This is the first record of this species from Argentina.

Digenea

Diplostomoidea Poirier, 1886
Strigeidae Railliet, 1919
Strigeinae Railliet, 1919
***Cardiocephaloides* Sudarikov, 1959**
***Cardiocephaloides physalis* (Lutz, 1926)**
(Figs. 4–6)

Site of infection: Intestine, mainly first section.

Prevalence: 56%.

Mean intensity: 153.

Deposited specimens: 6085 CHMLP.

Remarks

This species was originally described as member of the genus *Cardiocephalus* Szidat, 1928 which was later recognized as synonymous of *Cardiocephaloides* Sudarikov, 1959 by Dubois (1968). To date, 7 species of *Cardiocephaloides* have been reported from Lariidae, Spheniscidae, and Procellariidae (Dubois, 1968; Gibson et al., 2002). Species in this genus are quite similar; the distinction among them is based primarily on egg size, the ratio between anterior and posterior body region, and the morphology of the copulatory pouch. On the southern Atlantic coast, 2 species were reported in piscivorous birds, *Cardiocephaloides brandesii* Szidat, 1929 in *Rhynchops niger* (L.) and *Larus maculipennis* (L.) (Charadriiformes), and *Cardiocephaloides physalis* in *S. magellanicus* from Brazil and Uruguay coasts, *Spheniscus demersus* (L.) in South Africa, and *Spheniscus humboldti* Meyen (this host died in captivity of unknown causes) (Dubois, 1968; Clarke and Kerry, 2000). Features of our specimens agree with those of *C. physalis*. This is the only *Cardiocephaloides* species reported for *Spheniscus* spp. (Dubois, 1968; Randall and Bray, 1983; Clarke and Kerry, 2000). This is the first and most southern record of this species in Argentina.

Nematoda

Ascaridida

Anisakidae (Railliet and Henry, 1912)
Anisakinae (Railliet and Henry, 1912)
***Contracaecum* Railliet and Henry, 1912**
Contracaecum pelagicum
(Johnston and Mawson, 1942)
(Figs. 7, 8)

Site of infection: Stomach.

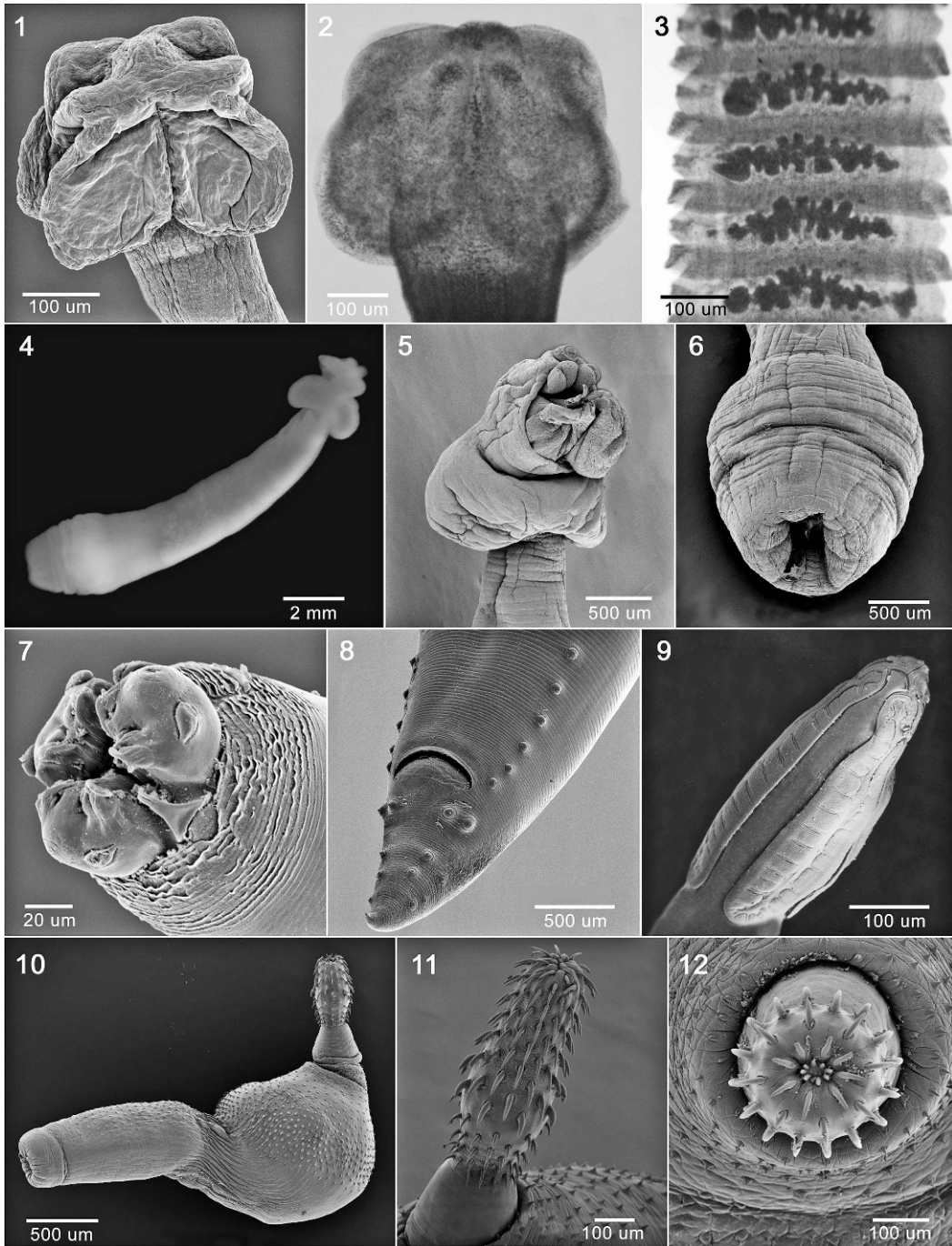
Prevalence: 67%.

Mean intensity: 190.

Deposited specimens: 5591 CHMLP.

Remarks

Anisakid nematodes have a worldwide distribution and are associated with fishes, birds, and marine mammals (Anderson, 2000). The genus comprises more than 50 species parasitizing piscivorous birds and mammals associated with freshwater, brackish, and marine systems (Anderson, 2000). There are several species of *Contracaecum* reported from



Figures 1–12. Helminths of *Spheniscus magellanicus* from Argentina. **1–3.** *Tetrabothrius lutzi*. **1.** Scolex (scanning electron microscopy [SEM]). **2.** Scolex (light microscopy [LM]). **3.** Mature segments (LM). **4–6.** *Cardiocephaloides physalis*. **4.** Entire worm (SEM). **5.** Anterior region (SEM). **6.** Posterior region (SEM). **7, 8.** *Contracaecum pelagicum* (SEM). **7.** Anterior end ventral view. **8.** Posterior end of male, ventral view. **9.** *Cosmocephalus obvelatus*, anterior end, lateral view (SEM). **10–12.** *Corynosoma* sp. (SEM). **10.** Full worm, lateral view. **11.** Protruded proboscis, lateral view. **12.** Proboscis, apical view.

Argentina (see Garbin et al., 2008). In South America, *Contracaecum pelagicum* was reported from the black-browed albatross *Thalassarche melanophris* (Temminck) and the Magellanic penguin in Brazil (Johnston and Mawson, 1942; Portes-Santos, 1984). Recently, Garbin et al. (2007) provided a detailed description of adults and larvae of this species parasitizing these 2 bird species in Argentina.

Spirurida

Acuariidae (Seurat, 1913)

Acuariinae Raillet, Henry and Sisoff, 1912

***Cosmocephalus* Molin, 1858**

***Cosmocephalus obvelatus* (Creplin, 1825) (Fig. 9)**

Site of infection: Esophagus.

Prevalence: 18%.

Mean intensity: 5.4.

Deposited specimens: 4811 CHMLP.

Remarks

Cosmocephalus obvelatus is an acuariid nematode with wide geographical and host distributions; it has been reported on all continents (except Antarctica) from a variety of bird families (Baruš and Majudmar, 1975; Anderson and Wong, 1981; Anderson, 2000). Among members of Spheniscidae, *C. obvelatus* had only been reported from the rockhopper penguin *Eudyptes crestatus* (Miller) in Chile (Azuma et al., 1988) and *S. magellanicus* in Argentina (Díaz et al. 2001).

Acanthocephala

Echinorhynchidea (=Paleoacanthocephala)

Polymorphidae Meyer, 1931

***Corynosoma* Lühe, 1904**

***Corynosoma* sp.**

(Figs. 10–12)

Site of infection: Intestine, with low intensity in the first section.

Prevalence: 56%.

Mean intensity: 54.

Deposited specimens: 6086 CHMLP.

Remarks

Species of this genus are widely distributed among marine mammals, especially pinnipeds. Additionally, several birds have been identified as definitive hosts

(Zdzitowiecki, 1991). Most species of *Corynosoma* were described from Antarctica (Hoberg, 1986; Zdzitowiecki, 1984, 1985, 1986a, 1986b) and South Atlantic coasts (Yamaguti, 1963; Zdzitowiecki, 1991). Four species of *Corynosoma* have been reported from Sphenisciformes: *Corynosoma shackletoni* Zdzitowiecki, 1978; *Corynosoma pseudohammani* Zdzitowiecki, 1984; *Corynosoma hammani* (Linstow, 1892); and *Corynosoma bullosum* (Linstow, 1892) (Zdzitowiecki, 1991; Barbosa and Palacios, 2009). The unidentified species of *Corynosoma* found in the present study differ from other described species primarily in the number and distribution of proboscis hooks, egg size, and the distribution of body spines. The specimens found in this survey potentially represent a new species, being the first report of *Corynosoma* sp. in the Magellanic penguin.

DISCUSSION

A total of 5 helminth species was recovered from *S. magellanicus* in this work. *Tetrabothrius lutzi* is the most prevalent and abundant member of the component community, followed by *Cardiocephaloides physalis*, *Contracaecum pelagicum*, and *Corynosoma* sp. in similar proportions. The nematode *Cosmocephalus obvelatus* is the species less represented in the community.

The Magellanic penguin is a stenophagic bird that includes a narrow range of prey in its diet. During the breeding season at this latitude, 97% of its diet consists of the anchovy *Engraulis anchoita*, followed by smaller proportions of the hake *Merluccius hubbsi*, the silverside *Odontesthes smitti*, and the squids *Ilex* spp. and *Loligo* spp. (Scolaro et al., 1999). Taking into account that most sea parasites have complex life cycles, the low parasite richness observed in the Magellanic penguin could be due to its narrow diet spectrum of this species (i.e., low variety of food ingested).

The helminth community composition of *S. magellanicus* on the Patagonian coast is impoverished and similar in its generic composition to that reported for other species of penguins (Clarke and Kerry, 2000; Barbosa and Palacios, 2009); *Tetrabothrius* is the most widely reported genus from species of Spheniscidae.

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