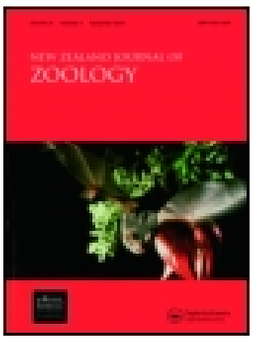

New Zealand Journal of Zoology

ISSN: 0301-4223 (Print) 1175-8821 (Online) Journal homepage: http://www.tandfonline.com/loi/tnzz20

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A. David M. Latham & Robert Poulin

To cite this article: A. David M. Latham & Robert Poulin (2002) New records of gastrointestinal helminths from the southern black-backed gull (Larus dominicanus) in New Zealand, New Zealand Journal of Zoology, 29:3, 253-257, DOI: 10.1080/03014223.2002.9518309

To link to this article: http://dx.doi.org/10.1080/03014223.2002.9518309

Published online: 30 Mar 2010.

New Zealand Journal of Zoology, 2002, Vol. 29: 253–257
0301–4223/02/2903–0253 $7.00/0

New records of gastrointestinal helminths from the southern black-backed gull (*Larus dominicanus*) in New Zealand

A. DAVID M. LATHAM*
ROBERT POULIN
Department of Zoology
University of Otago
P.O. Box 56
Dunedin, New Zealand
email: valhalla_sf@yahoo.co.nz

Abstract Nine species of gastrointestinal helminths were found in southern black-backed gulls (*Larus dominicanus* Lichstenstein, 1823) from Otago Peninsula. Eight of these, *Parorchis acanthus*, *Echinostoma revolutum* and *Echinoparyphium recurvatum* (Trematoda), *Dildotaenia latovarium* and *Hymenolepis alaskensis* (Cestoda), *Sciadiocara tarapunga* (Nematoda), and *Profilicollis antarcticus* and *P. novaezelandensis* (Acanthocephala), are new records in this host species in New Zealand. A second nematode species present, *Cosmocephalus tanakai*, has been reported from *L. dominicanus* previously.

Keywords acanthocephalans; cestodes; trematodes; nematodes; *Larus dominicanus*; southern black-backed gull; Otago Peninsula

INTRODUCTION

The southern black-backed gull (*Larus dominicanus* Lichtenstein, 1823) is found across much of the Southern Hemisphere. It is a resident of South Africa, Australia, South America and the Falkland Islands, Antarctica, and New Zealand (Burger & Gochfeld 1996). The New Zealand population of *L. dominicanus*, a common and conspicuous bird of coastal regions, exceeds 1 million breeding pairs (Burger & Gochfeld 1996).

Despite being a common shorebird in New Zealand, very little is known about its helminth fauna here. Only three species of helminths have previously been recorded from *L. dominicanus* in New Zealand (McKenna 1998). These include one species of nematode, *Cosmocephalus tanakai* Rodrigues & Vicente, 1963 and two species of trematode, *Ornithobilharzia canaliculata* (Rudolphi, 1819) and *Philopthalmus* sp. Looss, 1899: these were recorded by Bowie (1981), Rind (1974), and Howell (1965), respectively. Of these, only *C. tanakai* is found in the gastrointestinal tract (oesophagus), whereas the others are found in the blood and orbit of the eye, respectively (Weekes 1982). Elsewhere in its range, *L. dominicanus* harbours a rich fauna of gastrointestinal helminths (e.g., in Argentina, see Labriola & Suriano 2001). The relatively short list of helminths recorded from this gull in New Zealand may simply reflect a lack of study.

The primary objective of this study was to determine whether *L. dominicanus* is the definitive host for two species of acanthocephalan parasites, *Profilicollis antarcticus* Zdzitowiecki, 1985 and *P. novaezelandensis* Brockerhoff & Smales, 2002 (Acanthocephala: Polymorphidae). The cystacanth larvae of these species have been recorded in brachyuran decapods (= intermediate hosts) in New Zealand (Latham & Poulin 2001; Brockerhoff & Smales 2002). Furthermore, adult *P. antarcticus* have been recorded from the pale-faced sheathbill, *Chionis alba* (Gmelin), and *L. dominicanus* in the South Shetland Islands, Antarctica, and Chile (Zdzitowiecki 1985; Torres et al. 1991, 1992). However, neither acanthocephalan species had been recorded from *L. dominicanus* in New Zealand.

A second objective was to provide additional information on the gastrointestinal helminth fauna of *L. dominicanus*.

*Author for correspondence.
Z01038; published 9 September 2002
Received 25 October 2001; accepted 18 March 2002

METHODS

Nine *L. dominicanus* were obtained from hunters during the 2001 duck-hunting season at Papanui and Hooper's Inlets, Otago Peninsula. Two of the nine birds had been dead for up to 3 days before being recovered for analysis, the remaining seven specimens were all recovered less than 1 day after having been shot. All birds were frozen before dissection. Ideally, parasites should be alive when collected from the host to ensure that they are in a suitable condition to permit identification with confidence (Zdzitowiecki 1991). However, as our gulls had been dead for some time when we received them, the collection of live parasites was not possible.

The entire gastrointestinal tract was removed from the gulls and divided into clearly defined sections. These included the oesophagus, gizzard, duodenum, jejunum, ileum, caeca, rectum, and cloaca. Helminths recovered were fixed in alcohol-formalin-acetic acid (AFA); nematodes were then transferred to glycerol following Seinhorst's (1959) method. Parasites were identified using morphometric measurements and morphological descriptions from previously published studies (Angel 1954; Yamaguti 1958; Allison 1973; Rind 1974; Clark 1978a; Bowie 1981; Zdzitowiecki 1985, 1991; Dronen et al. 1988; Czaplinski & Vaucher 1994; Brockerhoff & Smales 2002).

In this paper, "prevalence" is defined as the percentage of hosts infected with one or more individuals of a particular parasite species out of the total number of hosts examined for that parasite species. "Mean intensity" is defined as the total number of parasites of a particular species found in a sample divided by the number of hosts infected with that parasite (see Margolis et al. 1982; Bush et al. 1997).

RESULTS

Four of the nine gulls dissected were females. Of these, three were adult birds, and the fourth was immature. The mean female body mass was 858 g (range: 780–940), whereas the mean female bill length was 55.3 mm (53–57). All five males were adult birds. The mean male body mass was 1107 g (1000–1150), whereas the mean male bill length was 60.8 mm (58–64).

With the exception of one female, all dissected birds harboured gastrointestinal helminths. A total of nine species of parasites was found including three trematodes, two cestodes, two nematodes, and two acanthocephalans (Table 1). The identification of one of these species, *Hymenolepis alaskensis* Deblock & Rausch, 1967, is tentative, given the poor condition of the specimens recovered. With the

Table 1 Prevalence (percentage of birds infected) and mean intensity (number of parasites per infected birds) of gastrointestinal helminths in nine southern black-backed gulls (*Larus dominicanus*) from Otago Peninsula.

Helminth species	Location in gut	% birds infected	Mean (range) helminth intensity
Trematodes:			
Parorchis acanthus	Duodenum, jejunum and rectum	22	4.5 (1–8)
Echinostoma revolutum	Jejunum	11	1 (1)
Echinoparyphium recurvatum	Rectum	11	4 (4)
Cestodes:			
Dildotaenia latovarium	Duodenum, jejunum and upper ileum	78	12.7 (1–45)
Hymenolepis alaskensis(?)	Duodenum, jejunum and upper ileum	56	1.4 (1–2)
Nematodes:			
Cosmocephalus tanakai	Oesophagus and under koilon in gizzard	44	11.3 (1–30)
Sciadiocara tarapunga	Under koilon in gizzard	11	2 (2)
Acanthocephalans:			
Profilicollis antarcticus	Lower ileum	11	2 (2)
P. novaezelandensis	Lower ileum	22	2.5 (2–3)

exception of the nematode *C. tanakai*, these helminths are reported for the first time in *L. dominicanus* in New Zealand. Furthermore, the acanthocephalan *P. novaezelandensis* is reported for the first time in *L. dominicanus* anywhere in the world.

Helminth parasites were found in all parts of the gastrointestinal tract except the caeca (though each species has a preferred site within the gastrointestinal tract, see Table 1). The most abundant helminths were *Dildotaenia latovarium* Dronen, Schmidt, Allison & Mellen, 1988 (Cestoda) and *C. tanakai* (Nematoda) (Table 1). Seven of the nine birds were infected with *D. latovarium*, with a mean intensity in infected birds of 12.7 (range: 1–45). Four of the nine birds were infected with *C. tanakai*. The number of *C. tanakai* per infected bird ranged from 1 to 30, with a mean intensity of 11.3. For the other helminth species, the prevalence and mean intensity of parasites was comparatively low (Table 1). Because of the low number of birds available and the low infection levels, quantitative analyses were not possible.

DISCUSSION

Of the nine species of gastrointestinal helminths recovered in this study, only *C. tanakai* (Nematoda) has been reported previously from *L. dominicanus* in New Zealand (McKenna 1998). However, some of the remaining parasite species are known from other New Zealand birds, or their intermediate hosts. The local helminth fauna of *L. dominicanus* therefore appears to include many species shared with other shorebirds, reflecting the local availability of generalist parasites in their common habitat.

The trematode *Parorchis acanthus* (Nicoll, 1906) is a cosmopolitan species (Yamaguti 1958). It was originally described as *Zeugorchis acanthus* Nicoll, 1906 but later renamed and redescribed (Nicoll 1907a, 1907b) because *Zeugorchis* was preoccupied. In New Zealand this trematode has been reported from the red-billed gull (*L. novaehollandiae scopulinus*) (Wisely 1977). *Parorchis acanthus* (var. *australis*) is also known from the silver gull (*L. novaehollandiae novaehollandiae*) in Australia (Angel 1954). Angel (1954) lists various intertidal gastropod species of Australian mudflats as intermediate hosts of *P. acanthus*. It is possible that similar gastropod species in New Zealand serve as the intermediate hosts to *P. acanthus*.

The trematode *Echinostoma revolutum* (Froelich, 1802) is also a cosmopolitan species, utilising a wide range of avian taxa, including *Larus* spp. as definitive hosts (Yamaguti 1958). In New Zealand, *E. revolutum* has been found in many species within Anseriformes, as well as in the rock pigeon *Columba livia* Gremlin, 1789 (Weekes 1982; McKenna 1998). Similarly, *Echinoparyphium recurvatum* (Linstow, 1873) (Trematoda) is also found in many Anseriformes, as well as the Australasian bittern (*Botaurus stellaris poiciloptilus*) (Weekes 1982; McKenna 1998). Rind (1974) stated that no host specificity is shown by many parasites common in Anatidae (including *E. revolutum* and *E. recurvatum*), so known pathogenic parasites could therefore endanger any species within this group. This lack of host specificity also extends to species other than those of the Anatidae (Yamaguti 1958). Yamaguti (1958) lists various gastropods, insects, and tadpoles as first and second intermediate hosts for the two species of trematodes.

The hymenolepid cestode, *Dildotaenia latovarium*, has previously been recorded in the American oystercatcher (*Haematopus palliatus* Temminck), and in New Zealand from the pied oystercatcher (*H. ostralegus finschi*) (Dronen et al. 1988). Czaplinski & Vaucher (1994) state that the monotypic genus *Dildotaenia* Dronen, Schmidt, Allison & Mellen, 1988 should be considered synonymous with *Cladogynia* Baer, 1938. The cestode *Hymenolepis alaskensis* has also previously been found in the oystercatchers, *H. ostralegus finschi* and *H. unicolor*, in New Zealand (Allison 1973). It should be noted that *H. alaskensis*(?) did not preserve well in this study, hence our identification is tentative.

Cosmocephalus tanakai (Nematoda: Acuariidae) was the only helminth found that has previously been recorded from *L. dominicanus* in New Zealand. Anderson (1992) states that in the related species *C. obvelatus* in Lake Ontario, Canada, first-stage larvae develop in the haemocoel of various species of amphipods, whereas infective larvae are found in various species of fish. Wong & Anderson (1982) believe that these species of fish are the source of *C. obvelatus* in ring-billed gulls (*L. delawarensis*). Both amphipods and small fish made up part of the gull's diet in their study. Hence, it is possible that a life cycle, similar to *C. obvelatus* in *L. delawarensis*, is followed by *C. tanakai* in *L. dominicanus* in New Zealand. The nematode *Sciadiocara tarapunga* Clark 1978 (Acuariidae) has been previously recorded from the red-billed gull, *L. novaehollandiae scopulinus* (Clark 1978a), but the intermediate hosts of *S. tarapunga* are unknown.

The acanthocephalan parasites *P. antarcticus* and *P. novaezelandensis* have both been found in two other species of New Zealand shorebird (pied oystercatcher, *H. ostralegus finschi* and the bar-tailed godwit, *Limosa lapponica*) (Brockerhoff & Smales 2002). Similarly, *P. antarcticus* is known from two bird species (*C. alba* and *L. dominicanus*) in the South Shetland Islands, Antarctica, and Chile (Zdzitowiecki 1985; Torres et al. 1991, 1992). However, this study reports for the first time the presence of *P. antarcticus* in *L. dominicanus* in New Zealand. Furthermore, it reports for the first time the presence of *P. novaezelandensis* in *L. dominicanus*.

The known intermediate hosts of the two acanthocephalans include four species of brachyuran decapods. *P. antarcticus* is known from *Hemigrapsus crenulatus* (Milne Edwards, 1837) in Chile (Pulgar et al. 1995), and *H. crenulatus*, *Helice crassa* Dana, 1851 and *Macrophthalmus hirtipes* (Heller, 1862) in New Zealand (Brockerhoff & Smales 2002). *Profilicollis novaezelandensis* is known from *H. crenulatus*, *H. crassa*, *M. hirtipes* (Brockerhoff & Smales 2002), and *Hemigrapsus edwardsi* (Hilgendorf, 1882) (Latham & Poulin unpubl. data). Given the very high abundance of larval acanthocephalans in their crustacean intermediate hosts around the Otago Peninsula (see Latham & Poulin 2001), and their relative scarcity in the gull *L. dominicanus*, we expect that they use other birds as definitive hosts in the area. Candidates include the white-faced heron (*Ardea novaehollandiae*), the red-billed gull (*L. novaehollandiae scopulinus*), from which unidentified acanthocephalans have been previously recorded (Clark 1978b), and other shorebirds capable of feeding on crabs.

ACKNOWLEDGMENTS

We are grateful to Annette Brockerhoff (Department of Zoology, University of Canterbury), Frans Laas, Simon McDonald, Kim Mouritsen, Hamish Spencer, and David Wharton (Department of Zoology, University of Otago) for their help with various aspects of this study.

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