

## New records of gastrointestinal helminths from the red-billed gull (*Larus novaehollandiae scopulinus*)

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**Abstract** Eight species of gastrointestinal helminths were obtained from the red-billed gull (*Larus novaehollandiae scopulinus* Forster, 1844) from Otago Peninsula, of which six were new host records. One of these, *Maritrema novaezelandensis* (Trematoda), was a species new to science which is being described elsewhere; the other five were *Curtuteria australis* (Trematoda), *Echinoparyphium recurvatum* (Trematoda), *Cladogynia latovarium* (Cestoda), *Capillaria* sp. (Nematoda), and *Profilicollis novaezelandensis* (Acanthocephala). *Cladogynia latovarium* (Cestoda) and *Capillaria* sp. (Nematoda) were present in 14 of the 16 birds.

**Keywords** trematodes; acanthocephalans; nematodes; cestodes; *Larus novaehollandiae scopulinus*; red-billed gull; Otago Peninsula

### INTRODUCTION

The red-billed gull (*Larus novaehollandiae scopulinus* Forster, 1844) is endemic to New Zealand. It is distributed along the coasts of the North and South Islands of New Zealand as well as some offshore islands (Burger & Gochfeld 1996). This commonly observed shorebird has in the last century increased in population size to an estimated 500 000 breeding pairs (Burger & Gochfeld 1996).

Although the red-billed gull is very common, information about its helminth fauna is sparse. Four species of gastrointestinal helminths have previously been recorded from *L. novaehollandiae scopulinus* (Weekes 1982; McKenna 1998). These include the nematodes *Contracaecum microcephalum* Rudolphi, 1809, *C. rudolphii* Hartwich, 1964, *Sciadiocara tarapungae* Clark, 1978, and the trematode *Parorchis acanthus* Nicoll, 1906 (Johnston & Mawson 1953; Wisely 1977; Clark 1978a,b). Of two closely related species, Hartlaub's gull (*L. hartlaubii* Bruch, 1853) from South Africa, and the silver gull (*L. novaehollandiae* Stephens, 1826) from Australia, only the latter has been investigated for gastrointestinal helminths. Of 36 specimens investigated, 16 species of trematodes, 1 species of cestode, 4 species of nematodes, and 1 species of acanthocephalan were identified (Mawson et al. 1986). In addition, 6 trematodes, 1 cestode, and 4 nematodes were identified only to genus. In comparison with the closely related *L. novaehollandiae* and other aquatic bird orders such as the Anseriformes, *L. novaehollandiae scopulinus* has few recorded helminths (Weekes 1982; Mawson et al. 1986; McKenna 1998). Although the more numerous and more widely distributed *L. novaehollandiae* is expected to harbour a greater diversity of helminths than the nominate subspecies *L. novaehollandiae scopulinus*, an important explanation for the few helminths recorded in the latter seems to be a lack of study.

The objectives of this study were two-fold. Firstly, we wanted to determine whether *L. novaehollandiae scopulinus* is a definitive host of the trematode *Maritrema novaezelandensis* Martorelli, Fredensborg and Mouritsen, 2004 (Microphallidae) and of the acanthocephalan *Profilicollis novaezelandensis* Brockerhoff & Smales, 2002 (Polymorphidae). Larval stages of *M. novaezelandensis* have been found inhabiting the gonad of the New Zealand mud snail, *Zeacumantus subcarinatus* Sowerby, 1855, which is the first intermediate host for this parasite (Fredensborg unpubl. data). Furthermore, cystacanth larvae of

*P. novaehollandensis* and metacercarial cysts of *M. novaehollandensis* have been recorded from brachyuran decapods acting as intermediate hosts in the intertidal zone of Otago Harbour (Latham & Poulin 2001; Fredensborg unpubl. data). These are potential food items of *L. novaehollandiae scopulinus*, making it a potential candidate as a definitive host.

Secondly, we wanted to provide additional knowledge about the gastrointestinal helminth fauna of *L. novaehollandiae scopulinus*, from the Otago area where it has not been studied before.

## METHODS

Ten *L. novaehollandiae scopulinus* were obtained from Lamlash Bay, Otago Peninsula in August 2002. Gulls were anaesthetised with alpha-chloralose then killed by cervical-dislocation. In addition, another six well-preserved gulls found dead between January and July 2002, at various localities within Otago Harbour, were included in the study. All gulls were stored at  $-17^{\circ}\text{C}$  until examination for gastrointestinal

helminths by dissection. The gastrointestinal tract was removed from the gulls and divided into sections including the oesophagus, gizzard, duodenum, jejunum, ileum, caeca, rectum, and cloaca. Helminths obtained were fixed in alcohol-formalin-acetic acid (AFA) and identified using morphometric measurements and morphological descriptions from previously published studies (Yamaguti 1958; Allison 1979; Dronen et al. 1988; Czaplinski & Vaucher 1994; Sohn 1998; Brockerhoff & Smales 2002). Specimens of the retrieved parasite species are deposited in the zoological collection in the Otago Museum (reg. no. IV6188), except *M. novaehollandensis* which is currently being described.

## RESULTS

Seven of the 16 red-billed gulls dissected were males: bill colour and length indicated that one of the males was a sub-adult. Mean weight for males was 330 g (280–380) and mean bill length was 53 mm (50–56). One of the nine female birds was also determined to be sub-adult. Mean weight for

**Table 1** Prevalence (percentage of birds infected) and mean intensity (number of parasites per infected bird) of gastrointestinal helminths in 16 red-billed gulls (*Larus novaehollandiae scopulinus*) from Otago Peninsula.

Helminth species	Location in gut	% birds infected	Mean (range) helminth intensity
Trematodes:			
<i>Curtuteria australis</i>	Jejunum and ileum	13	1 (1)
<i>Maritrema novaehollandensis</i>	Duodenum, jejunum, ileum, and cloaca	56	3.2 (1–10)
<i>Echinoparyphium recurvatum</i>	Ileum and cloaca	6	3 (3)
Cestodes:			
<i>Cladogynia latovarium</i>	Duodenum and jejunum	88	7.5 (1–18)
Nematodes:			
<i>Capillaria</i> sp.	Oesophagus, gizzard, and duodenum	88	5.1 (1–16)
Habronematoidea or Acuarioidea	Oesophagus and gizzard	13	2.5 (1–4)
Habronematoidea or Acuarioidea	Cloaca	6	7 (7)
Acanthocephalans:			
<i>Profilicollis novaehollandensis</i>	Jejunum, ileum, and cloaca	44	5.4 (2–10)

females was 297 g (245–340) and the mean bill length was 48.7 mm (46–50.5).

All the dissected birds harboured gastrointestinal helminths. These parasites, along with their site of infection, prevalence, and intensity data, are shown in Table 1. Of the eight species recovered, one of the trematodes, *M. novaezealandensis*, was a species new to science which is being described elsewhere (Martorelli et al. in press). Furthermore, the trematodes *Curtuteria australis* Allison, 1979 and *Echinoparyphium recurvatum* (Linstow, 1873), the cestode *Cladogynia latovarium* (Dronen, Schmidt, Allison & Mellen, 1988), the acanthocephalan *P. novaezealandensis*, and the nematode *Capillaria* sp. are all new records from the red-billed gull.

The most abundant helminth species were *Cladogynia latovarium* (Cestoda) and *Capillaria* sp. (Nematoda) with 14 out of 16 birds infected with those two species. Mean intensities of infection for *D. latovarium* and *Capillaria* sp. were 7.5 (range: 1–18) and 5.1 (range: 1–16), respectively (Table 1). In addition, *M. novaezealandensis* and *P. novaezealandensis* were abundant with a prevalence of 56 and 44%, respectively. For the other species recorded, prevalence and intensities of infection were comparatively low (Table 1).

## DISCUSSION

Of the eight species of helminths recovered from *L. novaehollandiae scopulinus* in this study, at least six species are new records for this host.

The trematode *Curtuteria australis* was first described from the South Island pied oystercatcher (*Haematopus ostralegus finschi* Martens, 1897) (Allison, 1979) which until now has been the only confirmed definitive host for *C. australis*. The genus *Curtuteria* Reimer, 1963 is known from Europe, where three species of shorebirds have been recorded as definitive hosts for *Curtuteria* spp. (the whimbrel, *Numenius phaeopus* Linnaeus, 1758, the eider duck, *Somateria mollissima* Linnaeus, 1758, and the Northern Hemisphere oystercatcher, *H. ostralegus* Linnaeus, 1758) (Odening 1963; Reimer 1963; Smogorjevskaya & Iskova 1966). *C. australis* has a three-host life cycle including the whelk (*Cominella glandiformis* Reeve, 1847), as first intermediate host, the cockle (*Austrovenus stutchburyi* Finlay, 1927) as second intermediate host, and shorebirds as the definitive host (Allison 1979). Fragments of shells from bivalves were found in the intestines of the infected gulls, suggesting that the adult *C. australis*

found in this study originated from small trematode-infested cockles eaten by the gulls.

*Echinoparyphium recurvatum* (Trematoda) is a cosmopolitan species known to inhabit several avian taxa as definitive hosts (Yamaguti 1958). In New Zealand, it has been reported from the Australasian bittern (*Botaurus stellaris poiciloptilus* Wagler, 1827), several species of Anseriformes (Weekes 1982; McKenna 1998), and the southern black-backed gull (*L. dominicanus* Lichtenstein, 1823) (Latham & Poulin 2002). Trematodes of the genus *Echinoparyphium* show little specificity in their choice of hosts, distinguishing them from the majority of trematodes with a complex life cycle. For instance, *E. recurvatum* has been reported utilising many gastropod species as first intermediate hosts and insects as well as tadpoles as second intermediate hosts (Yamaguti 1958).

This study provides the first New Zealand record of the trematode *Maritrema novaezealandensis* (Martorelli et al. in press). It is furthermore the first record of any species of the genus *Maritrema* (Nicoll, 1907) in New Zealand, although nine species are known from Australia and Tasmania (Hickman 1955; Deblock & Pearson 1968; Smith 1974, 1983; Schimazu & Pearson 1991; Deblock & Canaris 1996). The definitive hosts for *Maritrema* in Australia and Tasmania include the white-faced heron, *Ardea novaehollandiae* Latham, 1790, the bar-tailed godwit, *Limosa lapponica* Linnaeus, 1758, and several *Charadrius*-spp. (Smith 1974; Mawson et al. 1986). In Europe, species of Charadriiformes and Lariformes have been recorded as definitive hosts for *Maritrema*-spp. (Deblock 1980). *M. novaezealandensis* has a complex life cycle including the New Zealand mud snail (*Z. subcarinatus*) as the first intermediate host, the crabs *Hemigrapsus crenulatus* (Milne Edwards, 1837), *H. edwardsi* (Hilgendorf, 1882), *Macrophthalmus hirtipes* (Heller, 1862), *Halicarcinus whitei* (Miers, 1876), and several species of amphipods as second intermediate hosts (Fredensborg unpubl. data). Although found only in *L. novaehollandiae scopulinus*, *M. novaezealandensis* probably utilises other shorebirds feeding on crustaceans, as do the Australian and European species.

*Cladogynia latovarium* (Cestoda: Hymenolepididae) has in New Zealand previously been recorded in *H. ostralegus finschi* and *L. dominicanus* (Dronen et al. 1988; Latham & Poulin 2002). Unidentified hymenolepid tapeworms have furthermore been recorded in *L. novaehollandiae scopulinus* (Clark 1978a). It should be noted that

some of the specimens found in the present study seemed to vary in the morphology of the scolex, making it difficult to determine whether more than one species of hymenolepid cestodes was present. It is a common observation that cestodes are difficult to preserve well (Czaplinski & Vaucher 1994; Latham & Poulin 2002). Hence, we recorded only *C. latovarium* in this study, but emphasise the need for further research in order to fully understand the cestode fauna in *L. novaehollandiae scopulinus*.

Nematode species of the genus *Capillaria* Zeder, 1800 have been reported from several avian taxa including terrestrial, freshwater, and marine species in New Zealand (Weekes 1982; McKenna 1998). Most relevant to this study is *C. anatis* Schrank, 1790 which has been recorded from the paradise shelduck (*Tadorna variegata* Gmelin, 1789) and an unidentified species of *Capillaria* found in the black swan (*Cygnus atratus* Latham, 1790) and the pied stilt (*Himantopus himantopus* Linnaeus, 1758) (Weekes 1982; McKenna 1998). Furthermore, three species of *Capillaria*, *C. jeanschi* T. H. Johnston & Mawson, 1945b, *C. laricola* Wassilikova & Gushanskaya, 1930, and *C. thomascameroni* Mawson, 1969 have been recorded from *L. novaehollandiae* in Australia (Mawson et al. 1986).

Two nematode species belonging to either of the superfamilies Habronematoidea or Acuarioidea (Spirurida) were found in the oesophagus, gizzard, and the cloaca, respectively. Unfortunately, the poor condition of the specimens did not allow further identification. Previously, *S. tarapunga* (Nematoda: Acuariidae) has been recorded from under the koilon in the gizzard of *L. novaehollandiae scopulinus* and *L. dominicanus* (Clark 1978b; Latham & Poulin 2002). In *L. dominicanus*, another acuariid, *Cosmocephalus tanakai* Rodrigues & Vicente, 1963 has been recorded from the same location (Bowie 1981; Latham & Poulin 2002). The life cycle of Acuariidae involves various arthropod intermediate hosts (Anderson 2000). A recent study of the shore crab *M. hirtipes*, a potential prey item for *L. novaehollandiae scopulinus*, recorded a high prevalence of infection by third stage larval Acuariidae (Moravec et al. 2003). It is possible that the nematode species found in the gizzard of *L. novaehollandiae scopulinus* in this study belongs to the family Acuariidae and may be identical to either of the two previously recorded acuariid nematodes.

The acanthocephalan *P. novaezealandensis* has previously been recorded in three New Zealand shorebirds (*L. lapponica* and *H. ostralegus finchi*

(Brockerhoff & Smales 2002)) and *L. dominicanus* (Latham & Poulin 2002). Whereas unidentified acanthocephalans have previously been found in *L. novaehollandiae scopulinus* (Clark 1978b), this study provides the first record of *P. novaezealandensis* in this species. The largest adult specimen of *P. novaezealandensis* found in this study was 42 mm long, which is much longer than the maximum of 22 mm previously reported for that species (Brockerhoff & Smales 2002). The intermediate hosts for *P. novaezealandensis* include the crabs *H. crenulatus*, *H. edwardsi*, *H. crassa*, and *M. hirtipes* (Latham & Poulin 2001; Brockerhoff & Smales 2002).

The relatively high prevalence of infection of some of the helminths found in *L. novaehollandiae scopulinus* (Table 1) suggests that this widely distributed shorebird is an important contributor to the abundant helminth fauna of invertebrates, especially trematodes and acanthocephalans, recorded in the intertidal zone in New Zealand (see Latham & Poulin 2001; Fredensborg unpubl. data).

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