



Occurrence of endoparasitic worms in dusky notothen, *Trematomus newnesi* (Actinopterygii Nototheniidae), at Adélie Land, Antarctica

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Abstract: *Trematomus newnesi* (Nototheniidae), a benthic-pelagic fish, caught off Adélie Land (eastern Antarctic) was examined for the presence of internal parasitic worms. These fishes were infected with 11 species and larval forms of parasites: Digenea (*Macvicaria pennelli*, *Neolebouria terranovaensis*, *Genolinea bowersi*, and *Elytrophalloides oatesi*), larval Cestoda (two forms of tetraphyllidean metacestodes, bilocular form and trilocular form, and diphyllbothriid plerocercoids), Acanthocephala (*Metacanthocephalus campbelli*, *M. johnstoni*) and larval Nematoda (*Contracaecum osculatum*, *C. radiatum*). Larval cestodes were the dominant parasites, whereas acanthocephalans were relatively rare. Five species and larval forms were recorded also in fish caught in the Davis Sea. A check list of parasites of *T. newnesi* recorded in the eastern- and western Antarctic comprises 21 species and larval forms. Probably, *T. newnesi* plays an important role in life cycles of parasitic worms in the Antarctic.

Key words: Antarctica, Adélie Land, parasitic worms, fish, *Trematomus newnesi*.

Introduction

Dusky notothen, *Trematomus newnesi* Boulenger, 1902 is a small benthic-pelagic fish (maximum total length 20 cm) with circum-Antarctic distribution in the sub-coastal waters (DeWitt *et al.* 1990). The majority of hitherto published parasitic surveys of eastern Antarctic fish provides no information on the level of infection (Johnston and Mawson 1945; Prudhoe 1969; Prudhoe and Bray 1973). Zdzitowiecki (1997) reported a case of high infection with the digenean *Neolebouria terranovaensis* Zdzitowiecki, Pisano *et Vacchi*, 1993 (98 specimens in

a single host) in the Davis Sea. In total, five species of Digenea, one larval form of Cestoda, and three species of Nematoda in larval stage (two) and adult stage (one) have been recorded from *T. newnesi* in this area. The data from two localities in the western Antarctic, Admiralty Bay (South Shetland Islands) and Galindez Island (Argentine Islands), are richer and include indices of infection (Zdzitowiecki 1986a, 1986b, 1988; Zdzitowiecki and Rokosz 1986; Wojciechowska 1993; Rocka 1999; Laskowski and Zdzitowiecki 2005). In total, four species of Digenea, four larval forms of Cestoda, five species of Acanthocephala and at least three (probably four) species and larval forms of Nematoda have been found in *T. newnesi* in this area.

The present paper provides data on the occurrence of parasitic worms found in *T. newnesi* off Adélie Land. Previously, a total of 21 species and larval forms was recorded in other notothenioid fishes in this area (Zdzitowiecki *et al.* 1998, Zdzitowiecki 2001).

Material and methods

The fish (16 specimens) were caught on 4 August 2003, at the depth of 15 m, at 66.66°S, 140.01°E. Their total length (TL) was 14.2–19.4 cm (mean 16.5 cm) while their standard length (SL) was 12.5–17.0 cm (mean 14.6 cm). The viscera of fresh fish were dissected, fixed, and stored in ethanol. Additionally, two fish from the Davis Sea were provided by Dr Balushkin. They were caught on 06 January 1958, fixed, and stored in formaldehyde solution. These fishes measured 19.2 and 19.7 cm (TL), 16.6 and 16.6 cm (SL), respectively. Their internal organs were dissected in the laboratory. All viscera were examined using a stereoscopic microscope and the parasites found were stored in 75% ethanol. Identifications were based on temporary total mounts in glycerine (Nematoda) or benzyl alcohol (other parasites) according to Zdzitowiecki (1991, 1997) and Rocka (2003, 2004).

Results

In total, 11 species and larval forms of parasitic worms were found in *Trematomus newnesi* at the Adélie Land (Table 1). Two *T. newnesi* caught in the Davis Sea were infected with five of them: *Neolebouria terranovaensis* (98 and 0 specimens, respectively), *Genolinea bowersi* (Leiper *et* Atkinson, 1914) (1 and 0), bilocular tetraphyllidean metacestode (258 and 179), diphyllbothriid plerocercoid (8 and 8), and *Contracaecum* spp. (125 and 64). Taking into account the data from both localities mentioned, the dominant forms were larval cestodes, especially bilocular metacestode, whereas larval nematodes, *Contracaecum osculatum* (Rudolphi, 1802) and *C. radiatum* (Linstow, 1907), were sub-dominants. Among

Table 1
 Infection with endoparasitic worms of *Trematomus newnesi* (n = 16) at Adélie Land
 (intensity range is the number of parasites per host)

Parasite	Prevalence %	Mean abundance	Intensity range (mean)
Digenea			
<i>Macvicaria pennelli</i>	38	3.25	1–41 (8.67)
<i>Neolebouria terranovaensis</i>	19	0.56	1–5 (3.00)
<i>Genolinea bowersi</i>	82	5.44	1–32 (6.69)
<i>Elytrophalloides oatesi</i>	13	0.13	1
Cestoda			
Bilocular metacestode	94	22.63	1–119 (24.13)
Trilocular metacestode	31	0.69	1–5 (2.20)
Diphyllobothriid plerocercoid	100	11.25	4–24 (11.25)
Acanthocephala			
<i>Metacanthocephalus campbelli</i>	6	0.06	1
<i>Metacanthocephalus johnstoni</i>	19	0.75	1–7 (4.00)
Nematoda			
<i>Contracaecum osculatatum</i>	88	5.69	1–16 (6.36)
<i>Contracaecum radiatum</i>	75	2.38	1–10 (3.17)

the digeneans, *Macvicaria pennelli* (Leiper *et* Atkinson, 1914) and *G. bowersi* were more abundant at the Adélie Land, but the infection of one fish in the Davis Sea with *N. terranovaensis* was very strong. *Elytrophalloides oatesi* (Leiper *et* Atkinson, 1914) was rare. Acanthocephalans were less numerous; only two species of Echinorhynchida were recorded.

Discussion

Almost all parasites previously reported from *Trematomus newnesi* in the eastern Antarctica were found. The exception was the lack of the digenean *Neolepidapedon macquariensis* Zdzitowiecki, 1993 (= *Neolepidapedon* sp. of Prudhoe and Bray (1973)). This species seems to be more abundant in the sub-Antarctic (Zdzitowiecki 1997). Another species, *N. trematomi* Prudhoe *et* Bray, 1973, occurs in various nototheniids in sub-continental waters in the Antarctic. A nematode *Ascarophis nototheniae* Johnston *et* Mawson, 1945 reported by Johnston and Mawson (1945) was absent in the present material.

Two or three species of the acanthocephalan echinorhynchid genus *Metacanthocephalus*, *M. campbelli* (Leiper *et* Atkinson, 1914), and *M. johnstoni* Zdzitowiecki, 1983 and/or *M. rennicki* (Leiper *et* Atkinson, 1914), were recorded in other hosts off Adélie Land (Zdzitowiecki *et al.* 1998, Zdzitowiecki 2001). In

Table 2
 A check list of endoparasitic worms occurring in *Trematomus newnesi* in the Antarctic
 (references are given in the introduction)

Parasites	Western Antarctic		Eastern Antarctic	
	Admiralty Bay	Galindez Island	Previous data	Present data
Digenea				
<i>Macvicaria georgiana</i>	+	+	-	-
<i>Macvicaria pennelli</i>	-	-	+	+
<i>Neolebouria antarctica</i>	+	+	-	-
<i>Neolebouria terranovaensis</i>	-	-	+	+
<i>Neolepidapedon macquariensis</i>	-	-	+	-
<i>Genolinea bowersi</i>	+	+	+	+
<i>Elytrophalloides oatesi</i>	+	+	+	+
Cestoda				
Monocular metacestode	+	-	-	-
Bilocular metacestode	+	+	-	+
Trilocular metacestode	+	+	-	+
Diphyllobothriid plerocercoid	+	+	+	+
Acanthocephala				
<i>Aspersentis megarhynchus</i>	+	-	-	-
<i>Metacanthocephalus campbelli</i>	-	-	-	+
<i>Metacanthocephalus dalmori</i>	+	+	-	-
<i>Metacanthocephalus johnstoni</i>	+	+	-	+
<i>Corynosoma hamanni</i>	+	-	-	-
<i>Corynosoma pseudohamanni</i>	+	+	-	-
Nematoda				
<i>Ascarophis nototheniae</i>	-	+	+	-
<i>Pseudoterranova decipiens</i>	+	+	-	-
<i>Contracecum osculatum</i>	?+	?+	+	+
<i>Contracecum radiatum</i>	?+	?+	+	+
<i>Contracecum</i> spp.*	+	+	+	+

* Most probably both species listed above are present.

the presently described material, one immature female of *M. campbelli* was identified. This specimen was badly contracted and was determined based on the length of the genital system, 1.8 mm, fitting within the range reported for this species (Zdzitowiecki 1983). One male specimen and gravid females of another species, *M. johnstoni*, occurred in the same fish specimen. These and all other acanthocephalans were determined based on the length of proboscis (410–473 µm in males, 402–560 µm in females), hook formula 14 × 6–7, maximum hook length

62–97 μm , length of female genital system (1210–1490 μm), and egg length (93–102 μm). All these features fit the diagnosis of this species well, not the diagnosis of *M. rennicki* (see Zdzitowiecki 1983).

Two species of nematodes, *C. osculatum* and *C. radiatum*, were distinguished basing on oesophagus to caecum length ratio (Klöser and Plötz 1992).

The data on the occurrence of parasitic worms in *T. newnesi* in the eastern- and western Antarctic are shown in Table 2. Digeneans *M. pennelli* and *N. terranovaensis*, occurring in the eastern Antarctic, are replaced in the western Antarctic by *M. georgiana* (Kovaljova *et* Gaevskaya, 1974) and *N. antarctica* (Szidat *et* Graefe, 1967), respectively. One additional form of larval cestode, monolocular metacestode, four species of acanthocephalans, *Aspersentis megarhynchus* (Linstow, 1892), *Metacanthocephalus dalmori* Zdzitowiecki, 1983, *Corynosoma hamanni* (Linstow, 1892), and *C. pseudohamanni* Zdzitowiecki, 1984, as well as larval nematode *Pseudoterranova decipiens* (Krabbe, 1878) occurred in *T. newnesi* only in the western Antarctic. No species or larval form was specific to *T. newnesi*; all of them were more abundant in other notothenioid fishes. The total number of species and larval forms found in *T. newnesi* amounted to 21, of which 13 occurred in the eastern Antarctic and at least 16 (probably 17 if two species of the genus *Contracaecum* are taken into account) in the western Antarctic.

T. newnesi seems to play an important role as an intermediate or paratenic host of some parasitic worms, cestodes, acanthocephalans, and nematodes, listed in the Table 2. It becomes infected through feeding on various pelagic and bottom invertebrates, mainly crustaceans, which are known as its prey (DeWitt *et al.* 1990). Simultaneously, *T. newnesi* is a prey of marine birds and piscivorous fishes. Identifiable fish specimens, mainly *T. newnesi*, were found in the alimentary tract of *Notothenia coriiceps* caught in Admiralty Bay (unpublished observations of Zdzitowiecki) and at Galindez Island (Laskowski and Zdzitowiecki 2005). Zdzitowiecki (unpublished data) found fresh fish in the stomach of the cormorant, *Phalacrocorax atriceps*, in Admiralty Bay. Plerocercoids and acanthocephalans penetrating the walls of the alimentary tract were observed by Zdzitowiecki in various predatory fishes containing remains of digested small fishes.

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