



Contribution to the knowledge of the parasitic fauna of fish off Adelie Land, Antarctica

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Abstract: In total, 42 fish belonging to 16 species were examined. All fish were infected. Parasitic worms were endoparasites: Digenea (eight species), Cestoda (three mixed groups of larval forms), Acanthocephala (two species) and Nematoda (one species in adult and one in larval stage, and two *Contracaecum* spp. in larval stage). Undetermined parasitic Copepoda and Hirudinea were external parasites. Summing up previous and new data 25 species and mixed groups were found. Parasites in larval stage using fish as intermediate or paratenic hosts were more numerous than species maturing in fish. For example, 1913 nematodes *Contracaecum* spp. were recorded in one fish, whereas the digenean, *Genolinea bowersi*, was the most numerous maturing parasite (168 specimens in one fish).

Key words: Antarctica, Adelie Land, fish parasites.

Introduction

Only limited data on the occurrence of helminths in fish at Adelie Land have previously been published. Ten species were recorded in fish examined in neighbouring sub-coastal waters, but without numerical data regarding infections (Johnston and Best 1937; Johnston 1938; Johnston and Mawson 1945; Prudhoe 1969; Prudhoe and Bray 1973). Recently Zdzitowiecki (1998, 2001), Zdzitowiecki *et al.* (1998) and Laskowski *et al.* (2007) have studied the infection of 48 individuals of fish caught at Adelie Land (66°S, 140°E) in shallow water (*ca* 15 m) between 1995 and 2003, during the ICOTA programme. Fish belonged to five species: *Trematomus bernacchii* (one specimen), *T. hansonii* Boulenger, 1902 (8), *T. newnesi* (16), *Notothenia coriiceps* Richardson, 1844 (18) and *Chionodraco hamatus* (5). In these studies 22 helminth species and undetermined larval forms were found.

Materials and methods

Present material was available from fish collected during the same ICOTA programme and in the same locality (66°S, 140°E), in the austral summer of 2005/2006, but in deeper water (*ca* 80 m). Newly collected parasites come from 42 notothenioid fish, of which 41 specimens belonged to 16 species and one (probably channichthyid) was undetermined (Table 1). Names of fish are given according to Gon and Heemstra (1990). In two cases only external parasites (Copepoda and Hirudinea) were collected. Internal parasites were found in the body cavity, liver and in the lumen of the alimentary tract. Host tissue and parasites were fixed and stored in 70% ethanol. Most of the samples of fish organs (28) were in good condition, but four viscera were badly damaged. The contents of alimentary tracts and body cavities of eight further fish were isolated just after fishing and their organs were not preserved. After this procedure, it is possible that some parasites other than Nematoda and Acanthocephala were lost. Also, it is possible that some of the parasites occurring in the distal region of the large intestine could have been lost. As the exact number of parasites could have been larger, the numerical data on infections should be considered approximate. All preserved samples were examined at the Institute of Parasitology in Warsaw, Poland. One undetermined digenean specimen listed by

Table 1

List of fish examined.

Name of fish examined	Number of fish
<i>Cygnodraco mawsoni</i> Waite, 1916	1
<i>Gymnodraco acuticeps</i> Boulenger, 1902	8
<i>Racovitzia glacialis</i> Dollo, 1900	1
<i>Chionobathyscus dewitti</i> Andriashev <i>et</i> Neelov, 1978	1
<i>Chionodraco hamatus</i> (Lönnberg, 1905)	5
<i>Cryodraco antarcticus</i> Dollo, 1900	2
<i>Neopagetopsis ionah</i> Nybelin, 1947	2
<i>Pagetopsis maculatus</i> Barsukov <i>et</i> Permitin, 1958	1
<i>Artedidraco shackletoni</i> Waite, 1911	1
<i>Pagothenia borchgrevinki</i> (Boulenger, 1902)	2
<i>Trematomus bernacchii</i> Boulenger, 1902	3
<i>Trematomus eulepidotus</i> Regan, 1914	2
<i>Trematomus loennbergii</i> Regan, 1913	1
<i>Trematomus newnesi</i> Boulenger, 1902	8
<i>Trematomus pennellii</i> Regan, 1914	1
<i>Trematomus tokarevi</i> Andriashev, 1978	2
Undetermined fish	1

Zdzitowiecki *et al.* (1998) is deposited in the Natural History Museum in London. Most of Acanthocephala and Digenea were contracted but identifiable, taking into account morphological features. Tetraphyllidean metacestodes are mixed groups of bilocular and trilocular forms. *Contracaecum* spp. are mixed groups of not less than two species, *C. osculatum* (Rudolphi, 1802) and *C. radiatum* Linstow, 1907. Publications with descriptions of parasites reported by Zdzitowiecki *et al.* (1998) were listed in that paper. Two digenean species absent from this list were determined according to descriptions of Zdzitowiecki (1997, 1999). Indices of infection were not calculated due to small sample size (one to eight fish of each species) and a lack of the exact intensities of parasites.

Results

The central objects of investigation were endoparasitic worms: Digenea, Cestoda, Acanthocephala and Nematoda. Lists of parasites and hosts accompanied with intensities of infection of each host specimen are given in Table 2. Two fish, including that undetermined specimen and one *Cryodraco antarcticus*, were examined only for the presence of external parasites and found to be infected with parasites occurring on the gills – undetermined Hirudinea and parasitic Copepoda. Taking into account only parasitic worms, 12 species were identified in the present samples, including eight Digenea, two Acanthocephala and two Nematoda (one in the larval stage). One species of Digenea, *Stenakron glacialis*, as well as parasitic Copepoda and Hirudinea, have not been previously reported from the environs of Adelie Land. Two digenean species, *Neolebouria terranovaensis* in *Trematomus newnesi* and *Gymnodraco acuticeps* as well as *Genolinea bowersi* in *G. acuticeps* were sometimes very numerous (maximum intensities more than 50 specimens). The largest infection intensity with larval Nematoda was 1913 specimens of *Contracaecum* spp. in the fish *G. acuticeps* accompanied with 28 tetraphyllidean cercoids and 89 Digenea. In the material discussed here, cystacanths of Polymorphida (mainly parasites of seals) were not found, although they were present in one of earlier samples.

Discussion

Most of the parasites were larval stage using fish as either intermediate or paratenic hosts. Tetraphyllidean metacestodes (bilocular and trilocular forms) mature in skates, whereas merocercoids and larval Nematoda, *Pseudoterranova decipiens* and *Contracaecum* spp. (not less than two species, *C. osculatum* and *C. radiatum*) mature in marine mammals. Representatives of mixed groups of larvae were more numerous than adult worms. Apart from infection intensity with

Table 2

Lists of hosts (fish) and numbers of parasites.

Parasites	Hosts	Intensities
Copepoda		
Undetermined species	<i>C. antarcticus</i>	2
	<i>T. newnesi</i>	2, 9
Hirudinea		
Undetermined species	<i>C. antarcticus</i>	4
	undetermined fish	2
Digenea		
<i>Macvicaria microtestis</i> Zdzitowiecki et Cielecka, 1997	<i>A. shackletoni</i>	1
<i>Macvicaria pennelli</i> (Leiper et Atkinson, 1914)	<i>P. borchgrevinki</i>	1
	<i>T. newnesi</i>	1, 48
<i>Neolebouria terranovaensis</i> Zdzitowiecki, Pisano et Vacchii, 1997	<i>C. mawsoni</i>	4
	<i>G. acuticeps</i>	3, 19, 21, 79
	<i>C. hamatus</i>	1
	<i>T. newnesi</i>	5, 21, 52, 84
<i>Stenakron glacialis</i> Zdzitowiecki, 1989	<i>R. glacialis</i>	2
<i>Lepidapedon garrardi</i> (Leiper et Atkinson, 1914)	<i>T. bernacchii</i>	2
<i>Genolinea bowersi</i> (Leiper et Atkinson, 1914)	<i>G. acuticeps</i>	2, 5, 11, 168
	<i>P. borchgrevinki</i>	1, 2
	<i>T. bernacchii</i>	1
	<i>T. newnesi</i>	1, 4, 12
<i>Gonocerca phycidis</i> Manter, 1925	<i>T. loennergii</i>	1
<i>Elytrophalloides oatesi</i> (Leiper et Atkinson, 1914)	<i>G. acuticeps</i>	1, 2, 3, 5, 11
	<i>T. newnesi</i>	1
Cestoda		
tetraphyllidean metacestodes	<i>C. mawsoni</i>	12
	<i>G. acuticeps</i>	23, 28, 67, 290
	<i>C. dewitti</i>	10
	<i>C. hamatus</i>	31, 100, 100, 150, 429
	<i>C. antarcticus</i>	400
	<i>N. ionah</i>	15, 51
	<i>P. maculatus</i>	17
Parasites		
tetraphyllidean metacestodes	<i>P. borchgrevinki</i>	1, 6
	<i>T. bernacchii</i>	4
	<i>T. eulepidotus</i>	93, 180
	<i>T. loennergii</i>	2
	<i>T. newnesi</i>	1, 6, 7, 7

Table 2 – continued.

Parasites	Hosts	Intensities
merocercoides	<i>G. acuticeps</i>	30
	<i>C. dewitti</i>	1
	<i>C. hamatus</i>	4, 6, 16, 22, 115
	<i>C. antarcticus</i>	26
	<i>P. maculatus</i>	8
	<i>P. borchgrevinki</i>	23
	<i>T. bernacchii</i>	1
	<i>T. eulepidotus</i>	2, 3
	<i>T. newnesi</i>	2, 3
	<i>T. pennelli</i>	1
<i>T. tokarevi</i>	1, 20	
Acanthocephala		
<i>Metacanthocephalus campbelli</i> (Leiper et Atkinson, 1914)	<i>C. mawsoni</i>	1
	<i>T. bernacchii</i>	8
<i>Metacanthocephalus johnstoni</i> (Leiper et Atkinson, 1914)	<i>G. acuticeps</i>	2, 3
	<i>P. borchgrevinki</i>	1
	<i>T. bernacchii</i>	1, 13
Nematoda		
<i>Ascarophis nototheniae</i> Johnston et Mawson, 1945	<i>C. mawsoni</i>	2
	<i>C. hamatus</i>	2, 3
	<i>C. antarcticus</i>	4
	<i>T. bernacchii</i>	3
	<i>T. loennbergii</i>	4
<i>Pseudoterranova decipiens</i> (Krabbe, 1878)	<i>C. mawsoni</i>	1
	<i>G. acuticeps</i>	1, 4
	<i>T. bernacchii</i>	1
<i>Contracaecum</i> spp.	<i>G. acuticeps</i>	20, 23, 126, 195, 213, 245, 371, 1913
	<i>C. antarcticus</i>	109
	<i>C. hamatus</i>	11, 13, 18, 32, 195
	<i>P. maculatus</i>	1
	<i>P. borchgrevinki</i>	20, 35
	<i>T. bernacchii</i>	1, 19
	<i>T. eulepidotus</i>	1
<i>T. newnesi</i>	2, 4, 4, 22, 22, 23, 37, 81	

Contracaecum spp., the maximum intensities of both bilocular and trilocular tetraphyllidean metacestodes and merocercoides in *Chionodraco hamatus* were 429 and 115, respectively. Of adult parasites, the most numerous and diverse were

Digenea, with eight species located. The greatest intensity of Digenea species was 168 *Genolinea bowersi* in *G. acuticeps* and 84 *Neolebouria terranovaensis* in *T. newnesi*. Other identified parasitic worms, including six species of Digenea, two species of Acanthocephala, one species of Nematoda in adult stage and one in larval stage, were much less numerous (usually several worms in one host specimen). During this study one digenean species, *Stenakron glacialis* (two parasites in one *Racovitzia glacialis*) was found at Adelie Land for the first time. The total number of species and mixed groups of larval parasitic worms reported from fish caught at Adelie Land increases from 21 to 23, if two species of *Contracaecum* (*C. osculatum* and *C. radiatum*) are taken into account separately, and 25 if this counting also includes parasitic Copepoda and Hirudinea.

In total, 90 fish caught at Adelie Land were examined for the presence of parasites (Zdzitowiecki *et al.* 1998; Zdzitowiecki 2001; Laskowski *et al.* 2007; present data). The richest helminth fauna was found in *Notothenia coriiceps* (18 fish examined), the only host at Adelie Land of the acanthocephalan *Corynosoma pseudohamanni* Zdzitowiecki, 1984 (two specimens) and one undetermined digenean. Three species of Digenea, *Neolepidapedon trematomi*, *Helicometra pisanoae* and *Stenakron glacialis*, and two external parasites recored in/on fish at Adelie Land, were not reported from *N. coriiceps*. The most numerous fish species examined was *Trematomus newnesi* (24 specimens) infected with 12 forms of parasites – undetermined parasitic Copepoda, four species of Digenea, *Macvicaria pennelli*, *Neolebouria terranovaensis*, *Genolinea bowersi* and *Elytrophalloides oatesi*, two acanthocephalans of the genus *Metacanthocephalus*, larval cestodes and nematodes, with the exception of *Pseudoterranova decipiens*. Further host species infected with external parasites were not numerous – 10 specimens of the channichthyid predator *Chionodraco hamatus* as were two *Cryodraco antarcticus* and one undetermined fish. They harboured Copepoda, Hirudinea and numerous larval Cestoda and Nematoda (maximum intensity 429 and 195 respectively). Most of the specimens were infected with the digeneans. Other channichthyids, eating mainly krill, were usually infected only with larval Cestoda. Numerous *Neolebouria terranovaensis* (maximum intensity of infection of *C. hamatus* was 67) occurred in predatory channichthyids and bathydracoids together with non-host-specific larval Cestoda and Nematoda. Infections with the latter was heavy. One digenean, *Helicometra pisanoae*, was found to be specific for *Trematomus hansonii*, whereas *Stenakron glacialis* usually occurs in *Racovitzia glacialis* (see Zdzitowiecki 1997). The other eight digenean species and three species of Acanthocephala (*Metacanthocephalus campbelli*, *M. johnstoni* and *Corynosoma pseudohamanni*) do not have a narrow specificity for fish. Hitherto recorded parasites occurring in fish at Adelie Land were not numerous enough for preparing a final list of helminths occurring in fish at Adelie Land, but wide spectrum of species suggests that the list contains all or almost all parasitic worms in the investigated area.

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