

Research Note

Helminth parasites of digestive tract of some teleost fish caught in the Dardanelles at Çanakkale, Turkey

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Summary

In this study the following parasites were found in fishes from the Dardanelles at Çanakkale: Cestoda: *Bothriocephalus scorpii*, *Grillotia* sp. and *Scolex pleuronectis* in *Solea solea*; Digenea: *Ectenurus lepidus*, *Prodistomum polonii* and *Monascus filiformis* in *Trachurus trachurus*, *Hemiuridae metacercaria* in *S. solea*, *Lecithocladium excisum* in *Scomber scombrus*, *Lecithostaphylus retroflexus* in *Belone belone*, *Opechona bacillaris* in *Pomatomus saltatrix* and *S. scombrus* and *Schikhobalotrema sparisomae* in *Liza saliens*; Nematoda: *Hysterothylacium aduncum* in *T. trachurus*, *S. solea*, *Sparus aurata*, *P. saltatrix*, *L. saliens* and *Engraulis encrasicolus* and *Anisakis simplex* in *S. scombrus*; Acanthocephala: *Neoechinorynchus agilis* in *L. saliens*. No parasites were recovered from *Sardinella aurata*. Most of these species are well known in both the Mediterranean and Black Seas, but the Dardanelles appears to be the limit of the range of *Anisakis simplex*.

Key words: teleost fish; Dardanelles; endohelminths

Introduction

Öktener (2005) listed the then-known parasite fauna of Turkish marine waters and none were reported as from the Dardanelles, Çanakkale or Western Anatolia. While it is true that little has been done in the Dardanelles, Öktener (2005) was in error, placing the records of *Anisakis simplex* by Oguz *et al.* (2000) in the Sea of Marmara or the Marmara Sea [*sic*] rather than in the Dardanelles strait. This paper is, therefore, only the second reporting endohelminths from fishes from this strait connecting the Aegean Sea and the Sea of Marmara.

Material and Methods

The study area is in Western Anatolia, with the coordinates 40°17'N, 26° 41'E (Fig. 1). During the period from 1st October 2001 to 19th April 2002, 223 fish were collected. These were 26 *Belone belone* (Linnaeus, 1758), 14 *Engraulis encrasicolus* (Linnaeus, 1758), 20 *Liza saliens* (Risso, 1810), 41 *Pomatomus saltatrix* (Linnaeus, 1766), 20 *Sardinella aurata* (Valenciennes, 1847), 12 *Sparus aurata* (Walbaum, 1792), 20 *Solea solea* Quensel, 1806, 50 *Trachurus trachurus* (Linnaeus, 1758) and 20 *Scomber scombrus* (Linnaeus, 1758). The fish were kept in the tanks until examination within 24 hours of collection.

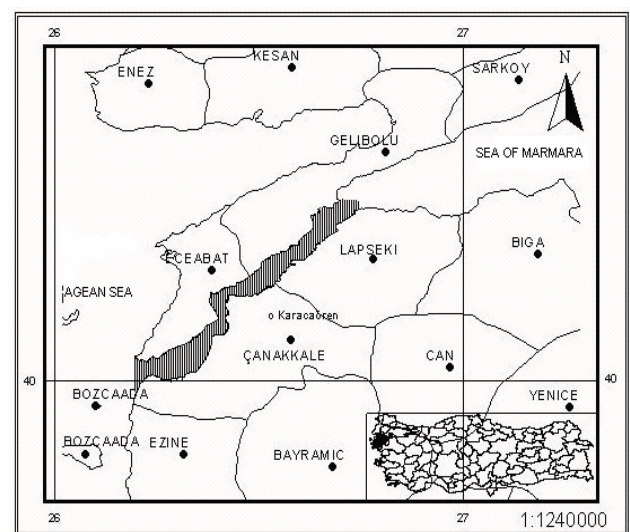


Fig. 1. The Research area

Methods adapted and utilised for the helminthological necropsy, and later for the analysis, were routine techniques (Pritchard & Kruse, 1982). All possible sites of infection were examined for the occurrence of parasites with the aid of a stereo microscope with $\times 12$ and $\times 50$ magnifications. The parasites were fixed with AFA, and then stained with Mayer's carmalum. Data for the prevalence, intensity and abundance are given (see Margolis, *et al.*, 1982). Abbreviations: DAP, Dardanelles Project number, HWML, Harold W. Manter Laboratory, Lincoln, Nebraska, USA.

Results

See Tables 1 – 3.

Systematic observations on parasites found:

Cestoda

Pseudophyllidea

Bothriocephalidae

Bothriocephalus scorpii (Müller, 1776)

Host: *Solea solea*

Infection site: Stomach

Table 1. Helminth parasites of some fish species of Çanakkale Coasts, Turkey

Host fish species	N	In & (%)	Identified parasite species	M & (X \pm S.D.) Σ
<i>S. solea</i>	20	1 (5.0)	<i>Bothriocephalus scorpii</i>	5 (5.0 \pm 0.0) 5
<i>S. solea</i>	20	1 (5.0)	<i>Grillotia</i> sp.	545 (545.0 \pm 0.0) 545
<i>S. solea</i>	20	2 (10.0)	<i>Scolex pleuronectis</i>	1 – 2 (1.5 \pm 0.7) 3
<i>S. solea</i>	20	1 (5.0)	Hemiuridae metacercaria sp.	1 (1.0 \pm 0.0) 1
<i>S. solea</i>	20	1 (5.0)	<i>Hysterothylacium aduncum</i>	1 (1.0 \pm 0.0) 1
<i>B. belone</i>	26	6 (23.1)	<i>Lecithostaphylus retroflexus</i>	1 (1.0 \pm 0.0) 6
<i>P. saltatrix</i>	41	1 (2.4)	<i>Opechona bacillaris</i>	1 (1.0 \pm 0.0) 1
<i>P. saltatrix</i>	41	6 (14.6)	<i>Hysterothylacium aduncum</i>	1 – 3 (1.3 \pm 0.8) 8
<i>S. scombrus</i>	20	2 (10.0)	<i>Opechona bacillaris</i>	1 (1.0 \pm 0.0) 2
<i>S. scombrus</i>	20	10 (50.0)	<i>Lecithocladium excicum</i>	1 – 3 (1.4 \pm 0.9) 14
<i>S. scombrus</i>	20	2 (10.0)	<i>Anisakis simplex</i>	4 – 17 (10.5 \pm 6.8) 21
<i>T. trachurus</i>	42	3 (7.1)	<i>Prodistomum polonii</i>	1 – 2 (1.3 \pm 0.5) 4
<i>T. trachurus</i>	42	2 (1.4)	<i>Ectenurus lepidus</i>	1 (1.0 \pm 0.0) 1
<i>T. trachurus</i>	42	9 (21.4)	<i>Hysterothylacium aduncum</i>	1 – 8 (3.5 \pm 2.4) 32
<i>T. trachurus</i>	42	2 (4.8)	<i>Monascus filiformis</i>	1 – 4 (2.5 \pm 2.1) 5
<i>L. saliens</i>	20	1 (5.0)	<i>Schikhobalotrema sparisomae</i>	1 (1.0 \pm 0.0) 1
<i>L. saliens</i>	20	7 (35.0)	<i>Hysterothylacium aduncum</i>	1 – 7 (2.1 \pm 2.2) 15
<i>L. saliens</i>	20	12 (60.0)	<i>Neoechinorhynchus agilis</i>	1 – 8 (4.2 \pm 2.9) 42
<i>S. aurata</i>	12	1 (8.3)	<i>Hysterothylacium aduncum</i>	1 (1.0 \pm 0.0) 1
<i>E. encrasicolus</i>	14	1 (7.1)	<i>Hysterothylacium aduncum</i>	1 (1.0 \pm 0.0) 1

Number of examined fish (N); number of infected fish (In); percentage (%); Minimum-maximum (M) and mean parasite number (X); standard deviation (\pm S.D.) and total (Σ) number of parasite

Table 2. Measurement (length x width) of the digenetic trematodes of the fish species caught in Canakkale coast, Turkey

Parasite species	Bd	Ph	Os	Vs	Tt (A – P)	Ov	Egg
<i>Hemiuridae</i> sp.	1160 x 330		86 x 60	200 x 196			
<i>L. retroflexus</i>	5120 x 1280	152 x 136	184 x 168	328 x 264	464 x 128 – 464 x 128	184 x 160	29 x 14
<i>O. bacillaris</i>	480 x 330	158 x 88	281 x 204	240 x 173	314 x 298 – 337 x 317	172 x 163	78 x 42
<i>L. excicum</i>	7671 x 903	413 x 206	459 x 421	407 x 362	618 x 419 – 379 x 319	333 x 283	17 x 11
<i>P. polonii</i>	1109 x 420	–	57 x 34	70 x 55	180 x 111 – 172 x 113	79 x 70	55 x 33
<i>E. lepidus</i>	2580 x 395	69 x 58	100 x 97	326 x 194	209 x 132 – 209 x 132	155 x 147	19 x 11
<i>S. sparisomae</i>	1920 x 745	104 x 125	192 x 136	216 x 176	416 x 224 –	125 x 110	85 x 66
<i>M. filiformis</i>	4145 x 279	–	503 – 93	232 x 155	–	–	58 x 43

Bd – body; Ph – pharynx; Os – oral sucker; Vs – ventral sucker; Tt – testes (A – anterior; P – posterior); Ov – ovary

Table 3. Measurement (length x width) of the nematodes of the fish species caught in Çanakkale coast, Turkey

Parasite species	Bd	Ph	Osp	Is	Os	An-Pe	M
<i>H. aduncum</i>	6800 x 240	39 x 39	920	615	380	154	16
<i>A. simplex</i>	15039 x 390	613 x 188	1294	–	–	95	15

Bd – body; Ph – pharynx; Osp – Oesophagus; Is – intestinal sucker; Os – Oesophageal sucker; An-Pe – Anus-posterior end; M – mouth

Voucher Specimen reference number: DAP 9017CBot1-5
Remarks: This species has been reported in many fishes including *Solea nasuta* in the Turkish Aegean Sea (Akmirza, 2001), but has rarely been reported in *Solea solea* (see Markowski, 1938, who found it in this host from the Belgian coast). It is now known that '*B. scorpii*' is a complex whose constituent species may be distinguished by molecular (e.g., Verneau *et al.*, 1997) and karyological markers (Petkevičiūtė, 2003). Worms of this complex are widely reported in the Mediterranean and Black Seas.

Trypanorhyncha

Grillotiidae

Grillotia sp.

Host: *Solea solea*

Infection site: intestine

Voucher Specimen reference number: DAP 9017 CGr.1-8

Remarks: According to the latest review, *Grillotia erinaceus* (van Beneden, 1858) is the only member of the genus reported from this host (Palm, 2004).

Tetraphyllidea

Larvae

'*Scolex pleuronectis* Müller, 1778'

Host: *Solea solea*

Infection site: intestine

Voucher Specimen reference number: DAP 9017CTet1-3

Digenea

Hemiuroidea

Hemiuridae

Ectenurus lepidus Looss, 1907

Host: *Trachurus trachurus*

Infection site: intestine

Voucher Specimen reference number: HWML 216161

Remarks: This species is a common parasite of *T. trachurus* (see Gibson & Bray, 1986) and many other hosts (see <http://www.nhm.ac.uk/research-curation/projects/host-parasites/database/>). It is frequently reported in the Mediterranean and Black Seas (Nikolaeva, 1975), including the Turkish Aegean Sea (Akmirza, 1997, 1998, 2000a, 2003).

Hemiuridae metacercaria

Host: *Solea solea*

Infection site: intestine

Voucher Specimen reference number. DAP 9017DHem1

Remarks: One unidentifiable juvenile hemiurid was found. Although the ecsoma was clear, no features of the reproductive system are visible.

Lecithocladium excisum (Rudolphi, 1819) Lühe, 1901

Host: *Scomber scombrus*

Infection site: intestine

Voucher Specimen reference number: HWML 216155

Remarks: This species is a very common parasite of *S. scombrus* (Gibson & Bray, 1986), and is widely reported in the Mediterranean and Black Seas (see <http://www.nhm.ac.uk/research-curation/projects/host-parasites/database/>; Nikolaeva, 1975), but has not been reported in Turkish waters (Öktener, 2005). Data on the life cycle have been present

by Køie (1991).

Microphalloidea

Zoogonidae

Lecithostaphylus retroflexus (Molin, 1859)

Host: *Belone belone*

Infection site: Intestine

Voucher Specimen reference number: DAP9017DZo001

Remarks: This species has only recently been reported from the Black Sea in *Belone belone euxini* off Bulgaria (Dimitrov, 1995). It is widely known in belonid fishes in the Mediterranean and north eastern Atlantic (Bray, 1987).

Lepocreadioidea

Lepocreadiidae

Opechona bacillaris (Molin, 1859)

Hosts: *Pomatomus saltrix*, *Scomber scombrus*

Infection site: Intestine

Voucher Specimen reference number: HWML 216156

Remarks: This is a common parasite of *S. scombrus* and is reported mainly in the North Atlantic and Mediterranean Sea, although occasional records come from a much wider range including several from the Black Sea (Bray & Gibson, 1990). This species has been reported twice from *Pomatomus saltatrix* off the Bulgarian coast of the Black Sea (Dimitrov, 1989; Bray & Gibson, 1990). The only record from Turkish waters in by Akmirza (1998) who reported it from *Trachurus mediterraneus* from the Aegean Sea. According to Bray & Gibson (1990) *P. polonii* (see below) is the common lepecreadiid from this host in the region and this identification may be doubtful.

Prodistomum polonii (Molin, 1859)

Host: *Trachurus trachurus*

Infection site: intestine

Voucher Specimen reference number: HWML 216160

Remarks: This is a common parasite of *T. trachurus* in the Black and Mediterranean Seas and the north-eastern Atlantic Ocean (Bray & Gibson, 1990). Sezen-Akandere (1972) reported two new *Lepidapedon* species, *L. sengunii* Sezen-Akandere, 1972 and *L. ricci* Sezen-Akandere, 1972 from *T. trachurus* in the Sea of Marmara, but Bray & Gibson (1990) considered both species as synonyms of *P. polonii*.

Haplospalchnoidea

Haplospalchnidae

Schikhobalotrema sparisomae Manter, 1937

Host: *Liza saliens*

Infection site: intestine

Voucher Specimen reference number: HWML 216128

Remarks: Oguz & Bray (2006) reported this parasite from this host in the neighboring Sea of Marmara, and pointed out that it has been recorded in the Aegean Sea and the Black Sea.

Gymnophalloidea

Fellodistomidae

Monascus filiformis (Rudolphi 1819)

Host: Trachurus trachurus

Infection site: Intestine

Voucher Specimen reference number: DAP9017DFd001

Remarks: Oguz & Bray (2006) reported this parasite from this host in the neighboring Sea of Marmara, and pointed out that it has frequently recorded in this host in the Mediterranean and Black Seas and the northern Atlantic Ocean.

Nemathelminthes

Nematoda

Hysterothylacium aduncum (Rudolphi, 1802)

Hosts: *Trachurus trachurus*, *Solea solea*, *Sparus aurata*, *Pomatomus saltatrix*, *Liza saliens*, *Engraulis encrasicolus*

Infection site: intestine, pyloric caecum

Voucher Specimen reference number: HWML 216161-216164.

Remarks: This widespread parasite of marine fishes has been reported in Turkish waters of the Aegean Sea by Akmirza (1997), in the Sea of Marmara by Oguz (1995) and in the Black Sea by Doganay (1994) and Avşar (1997).

Anisakis simplex (Rudolphi, 1809)

Host: *Scomber scombrus*

Infection site: intestine

Voucher Specimen reference number: HWML 216157-216158

Remarks: This widespread parasite whose larval stage is found in marine fishes and whose adult is usually found in cetaceans, has been reported in Turkish waters of the Aegean Sea by Akmirza (1997, 1998, 2000a, b, 2003) and the Aegean and Dardanelles by Oguz *et al.* (2000). It was reported in the Black Sea as an adult in *Phocaena phocaena* by Borcea (1935) and, although it remains listed as a parasite of Black Sea cetaceans, the record awaits confirmation (Birkun, 2002). Herreras *et al.* (1997) suggested that the absence of *Anisakis* spp. in the Black Sea is due to particular physical and chemical characteristics of the area. The systematics and phylogeny of *Anisakis* species is complex and several species are now recognised based on electrophoretic and molecular markers (Mattiucci & Nascetti, 2006).

Acanthocephala

Neoechinorynchus agilis (Rudolphi, 1918)

Host: *Liza saliens*

Infection site: intestine

Voucher Specimen reference number: HWML 216146

Remarks: This widespread parasite of mullets has been reported in the Turkish Aegean by Altunel (1982). It is widespread in the Mediterranean Sea and is reported in the Black Sea (Parukhin, 1975; Dmitrieva & Gaevskaia, 2001).

Conclusions

The Dardanelles (once known as the Hellespont) is the narrow strait connecting the Aegean Sea to the Sea of Marmara.

It is 61 km long and 6 km at its widest. It is shallow, with an average depth of 55 m, and is only 82 m at its deepest. A surface current runs from the Sea of Marmara to the Aegean and an undercurrent runs in the other direction. The water flowing into the Aegean from the Dardanelles has a salinity of 24 – 28 ‰. This study is the first attempt to survey the helminth fauna of this region. As pointed out above, Öktener (2005) was in error in listing no records from the Dardanelles, as *Anisakis simplex* had been reported there by Oguz *et al.* (2000). In Oguz & Bray (2006) we discussed the findings of a study of the digeneans of fishes in the Sea of Marmara, and found that all but two of the 13 species were reported in both the Mediterranean and Black Seas, these two having not been reported in the Black Sea. Similarly, in the current study only one fully identified worm is not convincingly reported in the Black Sea. This is *Anisakis simplex*, which has been reported once in a cetacean the Black Sea, but not in a fish in its larval form. The record of this worm from the Black Sea is now questioned (Birkun, 2002). It seems likely that the record of *Anisakis simplex* in this paper and those of Oguz *et al.* (2000) represent the furthest encroachment of *Anisakis* towards the Black Sea. The fauna is, as would be expected, undistinguishable from that of the adjacent Aegean Sea. The diversity index $M=N/N'$ (N number of parasite species/N' number of fish species examined) was used by us (Oguz & Bray, 2006) to compare the diversity of the Sea of Marmara with that of other Mediterranean and Black Sea sites (see Bartoli *et al.*, 2005). The figure for the Sea of Marmara was $M = 1.4$, and the figure for the digeneans in the present study is $M = 1.1$. Much more sampling is necessary in both regions, but both figures are relatively low and closer to those found in the Adriatic Sea than those found in other eastern Mediterranean and Black Sea sites. The data we have collected shows no influence of the Lessepsian migration which affects the figures in the eastern Mediterranean.

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RECEIVED FEBRUARY 27, 2007

ACCEPTED JUNE 18, 2007