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The Investigation of *Diplostomum* sp. Metacercariae in Some Cyprinids from Murat River (Genç Area), Bingöl, Turkey

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Abstract

This study was carried out on a total of 310 fish; 59 *Acanthobrama marmid*, 23 *Leuciscus cephalus,* 4 *Cyprinus carpio,* 3 *Mastacembelus* sp., 91 *Capoeta trutta*, 71 *Capoeta capoeta umbla,* 28 *Chondrostoma regium,* 2 Glyptothorax sp., 12 *Garra rufa*, 7 *Alburnus mossulensis* and 10 *Barbus lacerta* caught in Genç Region of Murat River between November 2010 and October 2011. *Diplostomum* sp. metacercariae were encountered in 79 infested fish. There were no infections in *Mastacembelus* sp., Glyptothorax sp., *C. carpio* and *L. cephalus*. In general, the prevalence of *Diplostomum* sp. metacercariae was higher in *G. rufa*, *A. marmid* and *B. lacerta* (66.66%, 62.71%, 50.0%, respectively) while mean intensity was higher in *C. trutta, C. c. umbla* and *B. lacerta* (5.79, 5.27 and 4.20 parasite/fish, respectively).

Keywords: *Diplostomum*, Cyprinidae, seasonal changes, Murat River, Bingöl

Murat Nehri'nden (Genç, Bingöl) Yakalanan Bazı Sazan Türlerinde *Diplostomum* sp. Metaserkarya'nın Araştırılması

Özet

Bu çalışma Murat Nehri Genç Bölgesinde Kasım 2010 ve Ekim 2011 tarihleri arasında 59 *Acanthobrama marmid*, 23 *Leuciscus cephalus,* 4 *Cyprinus carpio, 3 Mastacembelus* sp., 91 *Capoeta trutta*, 71 *Capoeta capoeta umbla,* 28 *Chondrostoma regium, 2 Glyptothorax* sp., 12 *Garra rufa*, 7 *Alburnus mossulensis* ve 10 *Barbus lacerta* olmak üzere toplam 310 balıkta *Diplostomum* sp. metaserkarya'nın varlığı araştırılmıştır. İncelenen 79 balıkta *Diplostomum* sp. metaserkarya tespit edilirken, *Mastacembelus* sp., *Glyptothorax* sp., *C. carpio* ve *L. cephalus* balıklarında tespit edilmemiştir. *Diplostomum* sp. metacercariae, *C. trutta, C. c. umbla* ve *B. lacerta* (5.79, 5.27 ve 4.20 parazit/balık) balıklarında tespit edilirken, *L. cephalus*, *C. carpio*, *Glyptothorax* sp. ve *Mastacembelus* sp. balıklarında tespit edilmemiştir. Ayrıca *Diplostomum* sp. metaserkarya varlığı sırasıyla *G. rufa*, *A. marmid* ve *B. lacerta* (%66.66, %62.71, %50.0) balıklarında bulunurken, *L. cephalus*, *C. carpio, Glyptothorax* sp. ve *Mastacembelus* sp. balıklarında bulunmadığı görülmüştür.

Anahtar kelimeler: *Diplostomum*, Sazangiller, mevsimsel değişimler, Murat Nehri, Bingöl

Introduction

Eye flukes (*Diplostomum* spp.; Digenea: Diplostomatidae) are ubiquitous parasites of freshwater fishes. The most common species, *Diplostomum spathaceum*, has been found in over 100 species of fishes worldwide (Chappell, 1995). Several fish species in Turkey alone have been reported to be infected with *Diplostomum* sp. (Dorucu and Ispir, 2001; Ozesen Çolak, 2011; Turgut and Ozgul, 2012; Barata and Dörücü, 2014). This parasite is typically associated with blindness and cataracts in fish, and infection can lead to emaciation, deformities and death (Shariff et al., 1980; Chappell et al., 1994; Chappell, 1995).

The aim of this study was to investigate the existence of Diplostomatidae parasite fauna on some cyprinid fishes in Genç Region of Murat River, Bingöl, Turkey. Moreover, it aimed to determine changes in *Diplostomum* sp. metacercariae intensity and prevalence level depending on seasons, and host fish size. In the former respect, the present study is particularly interesting given that so little is known about the seasonality of *Diplostomum* sp. metacercariae in Murat River (Genç, Bingöl), Turkey.

Table 1. Physical paramaters of Murat River (Genç, Bingöl)

Month	Year	Temperature (^{0}C)	Dissolved O_2 (mg/l)	pH
November	2010	7.0	9.7	8.05
December	2010	2.0	9.8	8.15
January	2011	0.0	10.4	8.01
February	2011	1.0	9.85	8.24
March	2011	3.0	10.2	7.93
April	2011	6.0	9.7	8.35
May	2011	13.0	9.01	8.25
June	2011	17.0	9.8	7.56
July	2011	22.0	9.54	7.02
August	2011	24.0	9.32	7.98
September	2011	19.0	10.1	8.42
October	2011	11.0	9.42	8.14

Materials and Methods

The fish samples were caught with gill nets every month between November 2010 and October 2011 in Genç Region of Murat River, Bingöl, Turkey. Number of fish examined, intensity and prevalence of *Diplostomum* sp. metacercariae infection are given in Table 3. The eyes were removed and lens were dissected from each eye then were teased apart under the stage of a 4 and 12 power dissecting microscopes. The number of parasites was counted if there was ever. All parasites recovered were identified with references to publications by Bychouskaya - Poulovskaya (1964); Hoffman (1967); Kennedy (1974). Weight and fork length of fish were measured. Gender of fish was determined. The picture of parasites found in eyes of fish was taken and fixed in Alcohol-Formalin-Acetic Acid (AFA) (Pritchard and Kruse, 1982). The prevalence and intensity of parasites were determined as explained by Margolis et al. (1982).

Differences in monthly intensity of *Diplostomum* sp metacercariae in Cyprinids were investigated by the One-way ANOVA. Product Moment Correlation Coefficient was used to test the relationships between the weight of fish and parasite intensity.

Table 2. Examined fish species and their biometric values

Fish species	Average lenght (mm)	Average weight (g)
Acanthobrama marmid	151,8	55,8
Leuciscus cephalus	276,4	241,3
Cyprinus carpio	281,7	288,9
Mastacembelus sp.	328,3	114,2
Capoeta trutta	256,1	144,7
Capoeta capoeta umbla	284,6	147,5
Chondrostoma regium	238,9	132.8
Glyptothorax sp.	153,2	114,8
Garra rufa	113,8	13,1
Alburnus mossulensis	114,6	11,8
Barbus lacerta	268,3	154,2

Results

Water temperature in Murat River varied from 0.0 to 24.0°C between November 2010 and October 2011. The lowest temperature was recorded in January and the highest in August (Table 1). The average length and weight of the fish species is shown in Table 2.

In this study, the fish-eye lenses disease of *Diplostomum* sp. parasites metacercaria were observed in a sample of fish in which there were no cornea rupture, exophthalmia and corneal infection, but in a few samples, the corneal opacity caused from the *Diplostomum* sp. parasite agglomeration was observed.

Infection of *Diplostomum* sp. metacercariae occurred throughout the year. The prevalence levels of *Diplostomum* sp. metacercariae from *A. marmid* was higher throughout the year (62.71%). *Diplostomum* sp. metacercariae from *Garra rufa* also showed similar result in prevalence level in

examined times (66.66%). The prevalence levels of *Diplostomum* sp. metacercariae from *Chondrostoma regium* was least throughout the year (3.57%). Prevalence levels of *Diplostomum* sp. metacercariae from other fish showed results in Table 3.

The abundance of *Diplostomum* sp. metacercariae from *A. marmid* and *B. lacerta* was higher throughout the study (2.09 and 2.10 parasite/fish, respectively). Abundance levels of *Diplostomum sp*. metacercariae from other fish showed results as in Table 3.

Diplostomum sp. metacercariae from fish species showed different results in their changes of the mean intensity level. The intensity of *Diplostomum* sp. from *C. trutta, C. c. umbla, B. lacerta* and *A. marmid* was higher in the study (5.79, 5.27, 4.20 and 3.32 parasite/fish, respectively). There were no infections in *Mastacembelus* sp., Glyptothorax sp., *C. carpio* and *L. cephalus*. Mean intensity levels of *Diplostomum* sp. metacercariae from other fish showed results as in Table 3.

Table 3. Abundance**,** intensity and prevalence of *Diplostomum* sp. metacercariae infection in fish species in Genç Region of Murat River.

No of fish examined	Fish species	Infected	No of parasites	Abundance	Mean intensity	Prevalance (%)
59	*A. marmid*	37	123	2.09	3.32	62.71
23	*L. cephalus*	-	-	-	-	-
4	*C. carpio*	-	-	-	-	-
3	*Mastacembelus* sp.	-	-	-		-
2	*Glyptothorax* sp.	-	-	-	-	-
91	*C. trutta*	14	81	0.92	5.79	15.38
71	*C. c. umbla*	11	58	0.82	5.27	15.49
28	*C. regium*	1	3	0.11	3.00	3.57
12	*G. rufa*	8	11	0.92	1.37	66.66
7	*A. mossulensis*	3	11	1.57	3.66	42.85
10	*B. lacerta*	5	21	2.10	4.20	50.00

Discussion

In this study, the fish from Genç area (Bingöl, Turkey) of Murat River were tested for the eyes metacercaria infection. In Turkey, *Diplostomum* sp. metacercariae has been reported in several fish species (Soylu, 1989; Aydoğdu et al., 2000; Dorucu and Ispir, 2001; Karatoy and Soylu, 2006; Uzunay and Soylu, 2006; Aydoğdu et al., 2008; Selver, 2008; Karabulut, 2009; Kurupınar and Öztürk, 2009; Selver et al., 2010; Turgut and Ozgul, 2012), but this parasite was not reported in Cyprinids of Murat River (Genç, Bingöl).

These parasites metacercaria are known as eye worms, which cause eye abnormalities, impaired blood circulation and large longitudinal axis of the eye (Gratzyk, 1991). Cataracts induced by *Diplostomum* sp. parasites significantly increase the risk of predation in infected fish (Seppälä et al., 2005). In this study, one case of blindness caused by parasites in the eye was observed. The results of the researches indicated that the contamination with *Diplostomum spathaceum* metacercaria is likely to increase with the growth of age and length (Hoglund, 1995).

Generally, there is a positive relationship between the level of parasitic infestation and the size of the host fish (Barber and Crompton, 1997). In this study, especially, the infection prevalance in the *A. marmid* regarding the size of fish increased. Similar results are also available from other host-parasite systems (Barber and Crompton, 1997; Dorucu and Ispir, 2001; Marcogliese et al., 2001). In previous studies, the prevalence of *Diplostomum* sp. and infestation were considerably higher on *A. marmid* than the other hosts, with the highest recorded value (Karabulut, 2009; Barata and Dörücü, 2014). Barata and Dörücü (2014) demonstrated that the prevalence of *Diplostomum* sp. was significantly higher than the examined fish species including *A. marmid, C. carpio, C. trutta* and *A. mossulensis*. Similar results were also described by Karatoy and Soylu (2006) when comparing *Diplostomum* sp. parasite communities in Terkos Lake. This is probably due to the effect of pollutants on the habitat of *A. marmid* which might stress the fish and at the same time enhance the increase in parasite population.

In a similar study by Barber and Crompton (1997) the seasonal variations in *D. phoxini* in minnows from River Endrick and Loch Maragan in

Scotland were examined. While the prevalence of *D. phoxini* was 100% in River Endrick, Loch Maragan showed 96.2%. The prevalence and intensity of *Diplostomum* sp. in the current study varied greatly from those recorded from Murat River. Turgut and Ozgul (2012) reported the *Diplostomum* sp. in six fish species from Almus Dam Lake (Tokat, Turkey). The results they obtained indicated that the prevalence level of *Diplostomum* sp. in fish range from 12.5 to 91.0. In this study, the prevalance of *Diplostomum* sp. in Murat River was much lower than that recorded in Almus Dam Lake. Barata and Dorucu (2014) reported high prevalence (46.37 to 96.96%) of *Diplostomum* sp. in fish species caught in Karakaya Dam Lake, Kömürhan Region. In this study, there was little difference according to results of studies conducted in other regions of the country about prevalence of *Diplostomum* sp. These discrepancies in parasites prevalence and intensity from different water reservoirs were expected rather than being surprising. It is well documented that the abundance of parasites in certain ecosystems is controlled by multiple biotic and abiotic environmental factors. The interactions of such factors with the parasite and the host control the prevalence and intensity of specific parasites within certain host.

In conclusion, current study showed infection of metacercaria *Diplostomum* sp. from several fish species inhabiting Murat River (Genç, Bingöl). *Diplostomum* sp. is thought to be the most important Digenea that infects freshwater fishes including natural and farmed fish. In general, current results suggest that diplostomid parasites are able to adapt to their local host populations, which may have significant implications especially for endangered fish stocks in Murat River.

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