

Metazoan Parasite Fauna of the Prussian carp, *Carassius gibelio* (Bloch, 1782) (Cyprinidae), from Marmara Lake, Turkey

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Abstract: In total, 168 individuals of *Carassius gibelio* from Marmara Lake, Manisa Province (Western Turkey) were examined for metazoan parasites. The fish were caught at monthly intervals from June 2011 to May 2013. Six species of metazoan parasites were recorded: two species of Monogenea (*Dactylogyrus anchoratus*, *Gyrodactylus* sp.), one species of Crustacea (*Lernaea cyprinacea*), three species of Nematoda (*Eustrongylides excisus*, *Pseudocapillaria tomentosa* and *Contracaecum* sp.). Mean abundance and prevalence of each parasite species in relation to season were determined. *Carassius gibelio* is a new host record for *Eustrongylides excisus*, *Pseudocapillaria tomentosa* and *Contracaecum* sp. in Turkey.

Key words: *Carassius gibelio*, Monogenea, Crustacea, Nematoda, Turkey

Introduction

The Prussian carp, *Carassius gibelio* (Bloch, 1782) (Cyprinidae), inhabits lakes, ponds and slow-moving rivers. It feeds on plankton, plant material and benthic invertebrates. It can tolerate low oxygen concentrations and pollution. This species occurs in East Asia and Siberia and has been introduced throughout Europe and Asia. In Turkey, it is distributed in freshwaters of the Thrace Region as well as in several lakes, ponds and reservoirs in Anatolia (KOTTELAT, FREYHOF 2007; GELDIAY, BALIK 2007). There were five reports of parasites in *C. gibelio* from Turkey: ÖZTÜRK (2010) detected two species from Seyitler Dam Lake, Afyon Province; ARSLAN, EMİROĞLU (2011) recorded one annelid from Lake Uluabat; ÖZTÜRK (2011) reported two parasites from Emre Dam Lake, Afyon Province; KIR, SAMANCI (2012) detected four parasites from Karacaören II Dam Lake; and ÇOLAK (2013) reported seven metazoan parasites from Lake Sığircı, Edirne Province.

The aim of the present study is to identify metazoan parasites of the Prussian carp from Marmara Lake, Manisa Province, Turkey. We also determined the prevalence and abundance of parasite species in

relation to season. This is the first detailed parasitological study conducted on *C. gibelio* from Manisa Province, Western Turkey.

Materials and Methods

The study was carried out from June 2011 to May 2013 in Marmara Lake, Manisa Province (38°36'55" N, 27°58'59" E; Fig. 1). Marmara Lake is an eutrophic freshwater shallow lake, 12 km long and 6 km wide. Several fish species belonging to the families Atherinidae, Cyprinidae, Cobitidae, Percidae, Poeciliidae and Gobiidae live in it. Fishing is the main source of income for inhabitants of adjacent villages (ALTINAYAR *et al.* 1994).

A total of 168 individuals of *C. gibelio* were collected by fishing net at monthly intervals. After capture, the fishes were transported to the laboratory. They were kept in aquaria and measured and weighed before examination. The mean total length (\pm SD) of the specimens was 19.90 \pm 4.84 cm (range 10.60–32.20 cm) and the mean total weight was 147.22 \pm 111.19 g (range 18.0–591.0 g). The skin,

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fins and gills were examined for ectoparasites. The digestive tract and inner organs were placed in Petri dishes with physiological saline and dissected under stereomicroscope. The parasite specimens were fixed in 70% ethanol. Monogeneans were mounted in ammonium picrate glycerine (MALMBERG 1970). Nematode and crustaceans were prepared in glycerine-gelatine mounts. Prevalence, mean intensity and mean abundance were calculated according to BUSH *et al.* (1997). The identification was based on the works by MARKEVICH (1951), YAMAGUTI (1961), BYKHOVSKAYA-PAVLOVSKAYA *et al.* (1964) and MORAVEC (1994).

Kruskal-Wallis test was used to compare differences in the mean abundance of the parasite species for seasons. The significance level of $\alpha \leq 0.05$ was used. All statistics analyses were performed using SPSS, Version 22.0.

Results

Six species of metazoan parasites were detected from Prussian carp. These were *Dactylogyrus anchoratus* (Dujardin, 1845), *Gyrodactylus* sp. (Monogenea); *Lernaea cyprinacea* Linnaeus, 1758 (Crustacea); *Eustrongylides excisus* Jägerskiöld, 1909, *Contracaecum* sp. and *Pseudocapillaria tomentosa* (Dujardin, 1843) (Nematoda). The infection sites included the skin, fins, gills, abdominal cavity and intestine (Table 1).

Out of the 168 individuals of *C. gibelio*, 94 (55.95%) were infected with one or more parasites. Six parasite species (totally 408 individuals) were collected. Of the infected Prussian carps, 60 (63.83%) harboured one parasite species, 32 (34.04%) harboured two parasite species, two (2.13%) harboured three parasite species. There were 1.38 ± 0.05 (mean \pm 1SE) parasite species per infected host and 4.34 ± 0.48 parasite individuals per infected host.

Seasonal changes in mean abundance of each parasite species were determined. We found no significant differences of the values of the mean abun-



Fig. 1. Sampling sites of *Carassius gibelio*

dance of parasite species between seasons ($p > 0.05$). There were significant differences in the mean abundance of some parasite species among seasons. The mean abundance of *Dactylogyrus anchoratus* and *Gyrodactylus* sp. varied significantly among seasons ($p=0.016$ and $p=0.001$, respectively). Although these species were detected in summer, autumn and spring, there were no records in winter. Significant differences were found also in the mean abundance of *Lernaea cyprinacea* between seasons ($p=0.015$). While the highest mean abundance of this species was observed in summer, the lowest mean abundance was recorded in winter. Mean abundance of *Eustrongylides excisus*, *Contracaecum* sp. and *Pseudocapillaria tomentosa* did not differ significantly among seasons ($p > 0.05$).

Data on the seasonal changes of the prevalence of parasite species in Prussian carp from Marmara Lake (Fig. 2) showed that two parasite species (*Dactylogyrus anchoratus* and *Gyrodactylus* sp.) had the highest prevalence in summers. The seasonal prevalence of *L. cyprinacea* ranged from 14.81% (autumn 2012) to 48.27% (summer 2012). Although the other parasites had the highest prevalence in summer, *Eustrongylides excisus* had the highest prevalence (25%) in winter 2013.

Table 1. Prevalence, mean abundance and mean intensity of metazoan parasites of *Carassius gibelio* from Marmara Lake

Parasite species	Site of infection	Number of infected fish (%)	Mean abundance	Mean intensity	Min-Max
<i>Dactylogyrus anchoratus</i>	Gills	17 (10.12)	0.74	7.35	2-15
<i>Gyrodactylus</i> sp.	Gills	28 (16.67)	0.52	3.14	1-9
<i>Lernaea cyprinacea</i>	Skin, fins and gills	45 (26.79)	0.82	3.04	1-26
<i>Eustrongylides excisus</i>	Abdominal cavity	32 (19.05)	0.27	1.44	1-3
<i>Contracaecum</i> sp.	Intestine	5 (2.98)	0.04	1.40	1-2
<i>Pseudocapillaria tomentosa</i>	Intestine	3 (1.79)	0.03	1.67	1-3

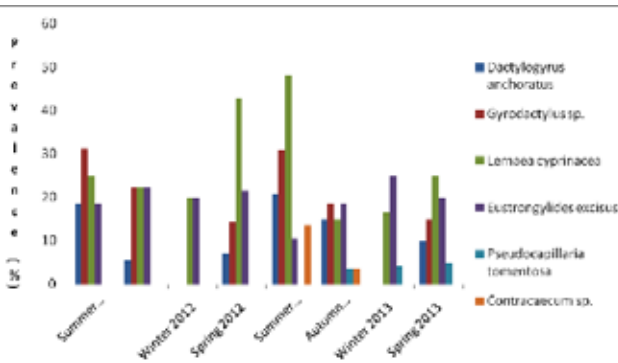


Fig. 2. Seasonal prevalence of the parasite species in Prussian carp from Marmara Lake

Discussion

Six metazoan parasites were found to infect *C. gibelio* in the present study: *Dactylogyrus anchoratus*, *Gyrodactylus* sp., *Lernaea cyprinacea*, *Eustrongylides excisus*, *Contracaecum* sp. and *Pseudocapillaria tomentosa*. Some parasite species were previously reported from *C. gibelio* in Turkey: *Dactylogyrus anchoratus*, *D. minutus*, *D. vastator*, *D. baueri*, *D. extensus*, *D. inexpectatus*, *Gyrodactylus* sp., *Gyrodactylus carassii* (Monogenea), *Diplostomum* sp. (Digenea), *Hysterothylacium aduncum* (Nematoda), *Lernaea cyprinacea* (Crustacea), *Piscicola geometra* (Hirudinea; ÖZTÜRK 2010; ARSLAN, EMİROĞLU 2011; ÖZTÜRK 2011; KIR, SAMACI 2012, ÇOLAK 2013). Therefore, we found *Eustrongylides excisus*, *Pseudocapillaria tomentosa* and *Contracaecum* sp. for the first time for *C. gibelio* in Turkey.

In the present study, we observed differences in the mean abundance of some parasite species between seasons. Additionally, the prevalence of parasites varied among seasons. Different species of *Dactylogyrus* may show seasonal changes in their infection parameters. Our results demonstrated that the prevalence of *D. anchoratus* was the highest in summers. ÖZTÜRK (2010) also recorded similar increase of this parasite from *C. gibelio*. AYDOĞDU (2006) found that *D. anchoratus* infection of *Carassius carassius* varied according to the season and reached its highest values in May. ÖZTÜRK (2011) reported that the prevalence and mean abundance of *D. anchoratus* was higher in summer in *Carassius auratus*, and also the mean abundance of this parasite was higher in summer, and the prevalence was higher in spring in *C. gibelio*.

ÖZTÜRK (2010) found an increase in the prevalence of *Gyrodactylus carassii* from *C. gibelio* in summer. This finding was confirmed by the present results. ÖZTÜRK (2013) reported that the prevalence of *Gyrodactylus* sp. was the highest (31.82%) in

winter. In contrast, we did not record this parasite in winter. Host fish and sampling area differences may play a role in this situation.

Lernaea cyprinacea is an important crustacean parasite on freshwater fish. It, in some cases, is the reason for serious disease that can lead to death. KHALIFA, POST (1976) reported that *L. cyprinacea* leads to death especially when it infects the gills. In our study, the prevalence of *L. cyprinacea* was the highest (48.27%) in the summer of 2012. KIR, SAMACI (2012) recorded this species only in summer and autumn.

Eustrongylides excisus was reported in Turkey from several freshwater fish species (ÖZTÜRK *et al.* 2002, SOYLU 2005, KARATOY, SOYLU 2006, SELVER *et al.* 2010, AYDOĞDU *et al.* 2011, SOYLU 2013, ÇOLAK 2013). This nematode was also recorded from amphibians (*Rana ridibunda* from Lake Hazar; SAĞLAM, ARIKAN 2006) and reptiles (*Natrix natrix* and *Natrix tessellata*; YILDIRIMHAN *et al.* 2007) in Turkey. Although *E. excisus* was reported from various freshwater fishes, up to now there has been no report from *C. gibelio* in Turkey. We found that the prevalence of this nematode tended to be higher (25%) in winter 2013. SOYLU (2013) recorded the highest prevalence of *E. excisus* from perch in autumn and winter. SHUKEROVA *et al.* (2010) also found the highest prevalence of this nematode in autumn from *Perca fluviatilis* from Srebarna Lake, Bulgaria.

Contracaecum sp. were previously recorded in Turkey from various freshwater fish species (AYDOĞDU *et al.* 2002, 2008, 2011, EMENCE 2004, TEKİN-ÖZAN, KIR 2005, KOYUN, ALTUNEL 2007, SELVER 2008, KARAKIŞI, DEMİR 2012). Up to now, *Contracaecum* sp. has not been reported from *Carassius gibelio* in Turkey. The high prevalence of *Contracaecum* in freshwater fish may affect their health. ACHA, SZYFRES (1987) reported a decrease in weight of the host and the lipid content of the liver or even the death of young fish when larvae have invaded the cardiac region. In our study, seven specimens of *Contracaecum* sp. were recorded from five *C. gibelio*. These were found in June, July and November 2012.

Pseudocapillaria tomentosa was previously reported from *Cyprinus carpio* (from Lake Manyas) by ÖZTÜRK, ALTUNEL (2006) in Turkey. To the best of our knowledge, this is the second record of *P. tomentosa* in different host fish. We present here the first record from *Carassius gibelio* in Turkey. In the present study, this species was recorded only from three Prussian carps. ÖZTÜRK, ALTUNEL (2006) observed an increase in the prevalence of *P. tomentosa* from *Cyprinus carpio* in summer and winter. We recorded this species only in November 2012, and February and March 2013.

Studies on parasites of fish species in different countries are important for understanding the geographical distribution of parasite species and relationships with their hosts. Additional studies are

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- needed to examine different populations of *C. gibelio* for this purpose in future.
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