J. Black Sea/Mediterranean Environment
Vol. 13: 155-160 (2007)

The effect of *Ligula intestinalis L.* plerocercoid on the growth of bitterling (*Rhodeus amarus* Bloch, 1782)

Ligula intestinalis L. plerocercoidlerinin acı balığın (*Rhodeus amarus* Bloch, 1782) büyümesi üzerine etkisi

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Abstract

274 bitterlings (*Rhodeus amarus*) were parasitologically investigated in Sapanca Lake in October and November 2004. It was seen that the 70 of 169 fish in October and 27 of 105 fish in November were infected by *Ligula intestinalis* plerocercoid*s*. The average weight of the fish infected by *Ligula intestinalis* plerocercoid*s* was 2.54 g while this value was 2.98 g in uninfected fish. These results show that one *Ligula intestinalis* plerocercoid decreases the fish gigantism in the ratio of 14.77 percent.

Keywords: *Ligula intestinalis*, plerocercoid, bitterling, host gigantism

Introduction

The pseudopylidean cestode, *Ligula intestinalis* L. infect commonly cyprinid fishes in European freshwater systems and has three hosts in its life cycles (Arme, 2002). One of the more important problems in host – parasite ecology is the negative effect of parasite on the growth of the host. But, there are just a few studies about the effect of the parasite on the growth of the fishes (Laut *et al.,* 2002). In a study in Balaton Lake it was investigated the effect of *Ligula intestinalis* plerocercoid on the growth of common bream (*Abramis brama*) (Garadi and Biro, 1975) and showed that uninfected fishes are growing faster than the fishes infected by the parasite. Silver et al. studied on the relationship between the intensity of isopod parasites and the weight gained in the salmon aquaculture. They declared that the parasites

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increase the fish gigantism and the increasing of the parasite intensity also increases much more this gigantism (Sievers *et al.,* 1996). The aim of this study is searching the effect of the *Ligula* i*ntestinalis* plerocercoid infects the bitterling on the growth of host.

Material and Method

The fishes caught by long-line and gill nets in Sapanca Lake have brought to the laboratory as soon as possible and their weight was measured by a electronical balance (Kern) with 0.1 g sensitivity. Analyzing the scale exemplaries, the age of the fishes was determined. Fish were dissected and the parasites were examined. The parasites found were determined numerically and their weights were measured. The fish species were identified according to Geldiay and Balık (1988), Berg (1949), the parasite species were identified according to Bykhovskaya-Povlovskaya (1964), and Yamaguti (1959). It was utilized by Lagler (1956) on searching the scales for the determination of age. The methods proposed by Bush et al. (1991) were used in the statistical analysis. The fish weights of 2 groups (infected and uninfected with parasite) were compared by means of non parametric U Mann-Whitney test (Şenocak, 1998).

Results

This investigation was conducted in October and November 2004. 169 bitterlings in October and 105 in November, totally 274 bitterlings were investigated during this period. It was found that all of the fish caught were 3+ years old. It was seen that 70 of the 169 fish in October and 27 of the 105 fish in November, totally 97 fish were infected by *Ligula intestinalis* plerocercoid. It was found that each infected fish (except one fish caugth in November) was infected by just one plerocercoid. The parasitism values found are shown on Table 1.

In this study, it was found that the average weight of the uninfected fish is 2.99 g in October and 2.97 g in November, while the average weight of the infected fish with the weight of the parasite is 2.93 g in October and 2.96 g in November and the average weight of the infected fish except for the parasites were 2.53 g in October and 2.55 g in November. There were the statistically significant differences between the uninfected and infected fish weights in October and November ($p<0.05$; $p<0.01$). The weights of the pleurocercoids changed between 0.2 - 0.7 g and have an average of 0.41 g in October and 0.43 g in November.

Table 1. The parasitism values of the bitterlings (*Rhodeus amarus*)

Months	N.F.I.	N.I.F.	Prevalance %	Intensity	T.N.P.	Uninfected fish weight(g) X ± SD (min – max)	İnfected fish weigth		Parasite weight(g) X ± SD (min – max)
							Weight with parasite (g) X ± SD (min – max)	Weight Except for parasite (g) X ± SD (min–max)	
October	169	70	41.42	1	70	2.99 ± 0.72[a] (2.1 – 4.3)	2.93 ± 0.51 (2.3 – 3.9)	2.53± 0.42[a] (1.8 -3.3)	0.41± 0.13 (0.2 – 0.7)
November	105	27	25.71	1.04	28	2.97±0.36[b] (2.4 – 3.9)	2.96±0.41 (2.5 – 3.5)	2.55±0.30[b] (2.2 – 3.1)	0.43±0.12 (0.2 –0.6)
Average			33.57	1.02		2.98±0.57	2.95±0.46	2.54±0.36	0.42±0.13
Total	274	97			98				

N.F.I.: Number of fish investigated, N.I.F.: Number of the infected fish
T.N.P.: total number of parasites
[a]$p<0.05$; $p<0.01$ with respect to the value obtained in October
[b]$p<0.05$;$p<0.01$ with respect to the November value

Figure 1. The bitterling infected by *Ligula intestinalis* plerocercoid

Abdominal parts of the infected fish are more swollen than the uninfected fish. An infected fish is shown in figure 1.

The average weight of the uninfected fish was determined as 2.98 g, while the average weight of the infected fish except for the parasite is determined as 2.54 g. According to this research, it was calculated that *Ligula intestinalis* plerocercoid causes 14.77 percent of decrease in the fish weight gain.

Discussion

Ligula intestinalis plerocercoid, causes a diseases and has a deadly effect in many regions of the world , were edited in many repots that it was found also on the fishes in many lakes and dams of Turkey. (Güralp, 1968; Aydoğdu, 1996; Öge and Aydın, 1996; Koyun *et al.,* 1999). Inspite of these studies were reported the existence of them in the fish species like roach, tench, wels etc. , *Ligula intestinalis* plerocercoid, was not found in these fish species in this area neither in our working and nor in a docrorate thesis conducted by Soylu, 1990. But in this study revealed, *Ligula intestinalis* plerocercoids were found only in bitterling.

It was reported that the values of intensity and prevalence change according to seasonal conditions and fish species, increasing of the parasites especially in summer, rising of the value of prevalence to 50 percent and the rate of intensity changes between 1 and 30 percents (Koyun *et al.,* 1999). Despite of a convenience is between these prevalence values and the values we found as 33.57 percent during this study, there is a difference between the

intensity values. In such studies even the intensity riches to high values like 25-30, in our study, the ratio of the intensity was found a low value as 1.

While these reports declared the proportion of the parasite weight to the fish weight as 40 percent (Başaran and Kelle 1976), it was fixed that ratio as 16.5 percent. Laut and his colleagues examined the influence of *Ligula intestinalis* plerocercoids on Roach in three different fish populations and declared the relation between total pleurocercoid weights and the weight of fish and also he indicated that these values are variable in each population and change between 16 and 32 (Laut *et al.,* 2002).

Özet

Ekim 2004 ile Kasım 2004 tarihlerinde Sapanca gölünde gerçekleştirilen bu çalışmada 274 adet acı balık (*Rhodeus amarus*) parazitolojik açıdan incelendi. Ekim ayında incelenen 169 balığın 70 inin, Kasım ayında 105 balığın 27 sinin *Ligula intestinalis* plerocercoidleri ile enfekte olduğu görüldü. Balık populasyonunda *Ligula intestinalis* plerocercoidleri ile enfekte olan balıkların ortalama ağırlığı 2.54 g olarak bulunurken infekte olmayan balıkların ortalama ağırlığı 2.98 g olarak bulunmuştur. Bu da 1 adet *Ligula intestinalis* plerocercoid'inin ortalama balık ağırlık artışını % 14.77 oranında yavaşlattığını göstermektedir.

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Received: 15.11.2006
Accepted: 22.12.2006