

SEASONAL VARIATION OF THE PLEROCERCROID *LIGULA*
INTESTINALIS (L.) OBSERVED IN ROACH (*RUTILUS*
RUTILUS, L) FROM THE YENICE IRRIGATION POND,
ÇANAKKALE, TURKEY*

PROMENE U PRISUSTVU PLEROCERKOIDA GLISTE *Ligula intestinalis*
(L) U ZAVISNOSTI OD GODIŠNJEG DOBA KOD CRVENPERKE (*Rutilus*
rutilus, L) IZ JENIS JEZERA ZA NAVODNJAVANJE KOD GRADA
ÇANAKKALE, TURSKA

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*This study was carried out at the Yenice Irrigation Pond between October 1999 and October 2000. For this study 368 roach (*Rutilus rutilus*) were examined and 37 parasites and 93 *Ligula intestinalis* were found in the abdominal cavity of the host (prevalence 10.1%, mean intensity 2.51 specimens/fish). Based on season, the highest number of infected fish occurred during summer (33.3%, 4 parasite/fish), and during the other season the mean intensity of infection was relatively low (prevalence 3.3%, 1 specimens/fish). On the other hand, the parasite species was determined especially on small and medium host fish sizes (2.17-100%). Basic criteria for the assessment of the parasite species of host fish were the general parameters related to parasite populations, which are prevalence, mean intensity, seasonal variation, and relationship between host size and infection.*

Key words: Plerocercoid, Ligula, seasonal variation, roach, Rutilus

Introduction / Uvod

It has been accepted among fisheries scientists world-wide that the plerocercoid of *ligula intestinalis* can cause major damage to cyprinid [9]. The

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plerocercoids develop and mature in the body cavity of minnows, suckers and other fishes causing compression on gonadal tissue [8]. An important aspect of the damage caused by *Ligula intestinalis* to fish is its effect on reproduction. The size of gonads of even slightly infected fish is always smaller than in uninfected ones [2], limiting the reproductive capacity of the host.

The studied Yenice Irrigation Pond, contains numerous fish species including common carp, *Cyprinus carpio*; roach, *Rutilus rutilus* and *Barbus* species. It is of major economic importance to the area not only for the aquatic products and irrigation, but also of commercial importance since the fish represent a significant source of profit for the fishermen. This is one reason to select *Rutilus rutilus* for the present study due to its economic value and as it is a known host for *Ligula* sp. This study aims to enable us to grasp the parasite fauna of the fish, as well as the geographical properties of the lake. Naturally, it would be valuable to currently determine the parasite fauna of the fish for its future evaluations.

Material and methods / Materijal i metode rada

Yenice Irrigation Pond, situated near Çanakkale (39°, 27"-40°-42" N-25°, 40"-27°-30" E-consists of two peninsula). The Pond covers 3333 hectares (ha) and varies in depth to a maximum of 23 m. *Rutilus rutilus* were collected each month with 100 m. long gill-nets with 18-22 mm mesh. The nets were set in strategic places in the Yenice Irrigation Pond at sunset and removed at dawn. The fish specimens were placed in plastic aerated tanks filled with water from the Yenice Pond and transported immediately to the laboratory at Çanakkale University. Each fish was killed in a humane way, classified according to genus and species, and then weighed, measured and evaluated for state of health after which each was dissected by standards methods [12].

The plerocercoids for *Ligula* sp. were observed and collected primarily from the abdominal region of each fish. The plerocercoids were removed, washed and relaxed in cold water, and then fixed in 70% ethyl alcohol. The plerocercoids were stained and keyed to genus and species [3].

Results / Rezultati ispitivanja

Figure 1 correlates with water temperature (°C) and sampling dates. Figures 2 and 3 show a graphical representation of the fluctuation of infected fish during the 12-month time period and host fish size with the mean number of infected fish and numbers of plerocercoids per fish.

The parasite species, *L. intestinalis* infected the body cavity of host fish with a prevalence of 10.1% and mean intensity of 2.51 specimens/fish. Although noticed in all surveys, this species generally had a lower prevalence and mean intensity in infected fish (Fig. 2, 3). When seasonally viewed, it was ob-

served that the rate of infection increased steadily from winter toward summer and autumn except spring. In line with this result, the maximum density of this parasite occurred in July, with 10 specimens per fish. During winter and autumn, the difference between mean number of parasites and the number of parasites collected from host fish was more dramatic than the rate of parasite infection. Toward the

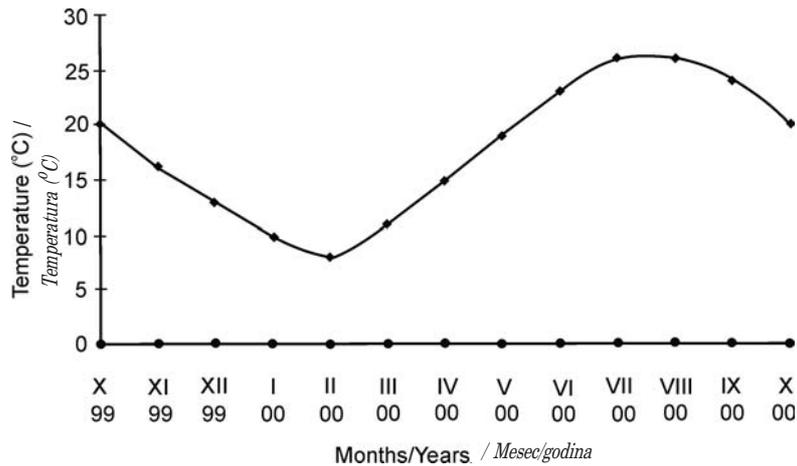


Figure 1. Water temperature of Yenice Irrigation Pond during the study period (surface) / Slika 1. Temperatura vode u Jenis jezeru za navodnjavanje u toku perioda istraživanja (površina)

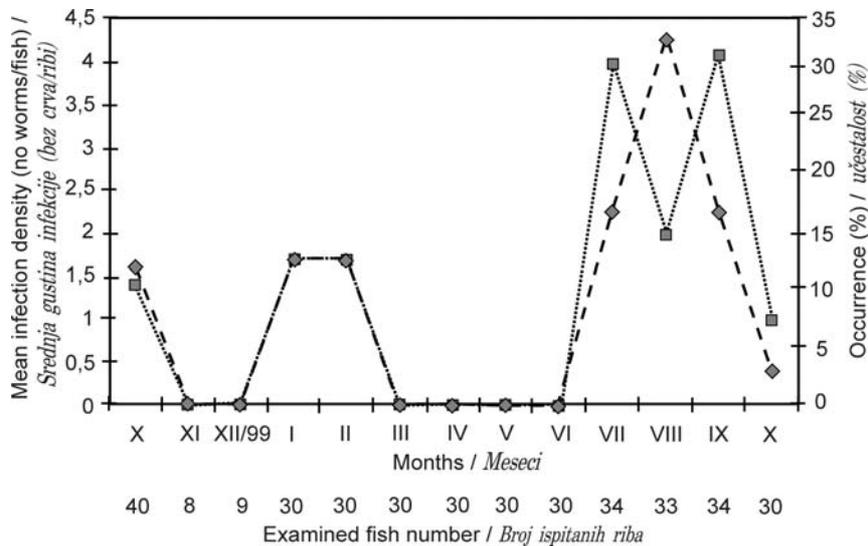


Figure 2. Occurrence (broken line) and mean density (solid line) of *L. intestinalis* in *R. rutilus* from Yenice Irrigation Pond over year / Slika 2. Učestalost (isprekidana linija) i srednja gustina (puna linija) za *L. intestinalis* kod *R. rutilus* iz Jenis jezera za navodnjavanje u odnosu na veličinu i grupe riba

end of autumn, however, the infection rate starts to decline, and parasites disappear in spring (Fig. 2).

If the relationship between the intensity of infection by the parasite and the size of the host fish is assessed, it is evident that the parasite occurred more on smaller fish than on larger ones (Fig. 3). On the other hand, the highest mean intensity (3.6 parasites) was recorded on medium fish samples (except the last group). And then, as the fish became larger, infection by the parasite decreased steadily, and infection never occurred in fish larger than 13 cm. However, both infection and mean intensity per fish peaked on the biggest fish sampled (100%, 10 specimens one fish) (Fig. 3).

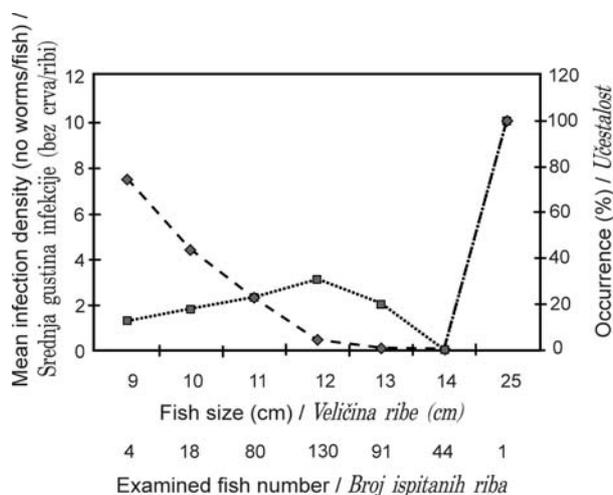


Figure 3. Occurrence (broken line) and mean density (solid line) of *L. intestinalis* for *R. rutilus* from Yenice Irrigation Pond in relation to size and groups of fish / Slika 3. Učestalost (isprekidana linija) i srednja gustina (puna linija) za *L. intestinalis* kod *R. rutilus* iz Jenis jezera za navodnjavanje u odnosu na veličinu i grupe riba

Discussion / Diskusija

The primary objective of the present study was not only to study the prevalence of *Ligula intestinalis* in roach but to note the seasonal variation in the number of infected fish and parasite load. Figure 2, 3 represent results of the study showing numbers and the number of plerocercoids per infected fish. For this research, the average fish size for ligulosis infection was 11.5 cm (Fig. 1). It was discovered by a number of researchers that there was a significant relation between the number of *Ligula* infections and the size of the fish. They attribute the existence of *Ligula* infections in varying numbers to the content and amount of the host food. In the present study as well, fish infected with *Ligula intestinalis* were identified on small and medium size host fish during summer and autumn. In a

similar vein, Marcogliese & Esch [11] pointed out that the intensity of infection by the present species increased in May-June, decreased in August-September, and again increased in September-October. Likewise, Dence [5] reported that the rate of infection by *Ligula* had a decreasing trend on age 3+ *A. brama*. Hartley [7] found that the number of *Ligula* in young fish was high due to the fact that the copepods were the main part of the fish's diet. He also found that the low infection level in old fish varies in parallel with the decrease in their feeding on copepods. Dubinina [6] states that the other factor effecting the growth of *Ligula* is the quality of water and points out that hot, rough and shallow waters are the most favorable medium for *Ligula*.

On the other hand, *Ligula* had a considerable pathogenic effect on host fish. Cantoray and Özcan [4], recorded the occurrence of a high infection rate by *Ligula* on *L. cephalus*, *C. capoeta* and *B. plebejus* in Lake Cip and the dam Lake of Keban. Moreover, Taylor & Hoole [13] reported that, in *Ligula*-infected fish, some organs such as gonads and liver are deformed by shrinking. It is known that, as indicated by Bauer [1], death of *Ligula*-infected host fish is not beyond possibility, it may occur. Kosheva [10] stressed the *Ligula* can cause a decrease in the growth rate of freshwater fish in Russia, and that it may even cause serious damage and mortalities. Hartley [7] who carried out a similar study attributes the reasons for high ligulosis infection is high in freshwater fish to the fact that copepods are a major part of the host diet, thus the infection in older fish is low due to their feeding preference. Similarly, in the present study, the parasite can cause damage to the host fish specimens especially by compression and atrophy of vital organs including the gonads in the coelomic cavity of the infected fish. Also, there occurs a thinning of the tissue of the body cavity. Stomachs were swollen and the surface of the liver was reddish. The necropsy of fish, found dead on the study site, showed that infection with *Ligula* was seriously high, suggesting that mortality of fish could be attributed to this parasite.

As a result, the data of the present study emphasize the world-wide distribution of *L. intestinalis* and the effect of plerocercoid on fish in Turkey. It is beyond the scope of this paper to postulate on how useful parasites may be in the future, in helping understand the fish and fisheries in the study area. These are the first results published on the possible hosts and parasite effects on a seasonal basis for the ichthyofauna in the present study area.

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SRPSKI

PROMENE U PRISUSTVU PLEROCERKOIDA GLISTE *Ligula intestinalis* (L.) U ZAVISNOSTI OD GODIŠNJEG DOBA KOD CRVENPERKE (*Rutilus rutilus*, L.) IZ JENIS JEZERA ZA NAVODNJAVANJE KOD GRADA ČANAKKALE, TURSKA

Kemal Oguz, Oguz Ozturk, Hajati Gure

Ispitivanja su obavljena kod Jennis jezera za navodnjavanje između oktobra 1999. i oktobra 2000. godine. Ispitano je 368 crvenperki (*Rutilus rutilus*) i pronađeno je 37 parazita i 93 gliste *Ligula intestinalis* u trbušnoj duplji domaćina (zastupljenost 10,0%, srednji intenzitet 2,51 uzoraka/ribi). U zavisnosti od godišnjeg doba, najveći broj zaraženih riba pojavio se u toku leta (33,3%, 4 parazita/ribi), a tokom drugih godišnjih doba srednji intenzitet infekcije bio je relativno nizak (zastupljenost 3,3%, 1 uzorak/ribi). Sa druge strane, ove vrste parazita posebno su ustanovljene kod malih i srednjih riba domaćina (2,17-100%). Osnovni kriterijumi za procenu vrsta parazita kod riba domaćina bili su opšti parametri u vezi sa populacijama parazita, kao što su zastupljenost, srednji intenzitet, promene po godišnjim dobima, i odnos između veličine domaćina i infekcije.

Ključne reči: plerocerkoide, *Ligula*, godišnja doba, crvenperka, *Rutilus*

ИЗМЕНЕНИЯ В ПРИСУТСТВИИ ПЛЕРОЦЕРКОИДОЗ ГЛИСТА *Ligula intestinalis* (L.) В ЗАВИСИМОСТИ ОТ ВРЕМЕНИ ГОДА У КРАСНОПЕРКИ (*Rutilus rutilus*, L.) ИЗ ЕНИС ОЗЕРА ДЛЯ ОРОШЕНИЯ У ГОРОДА КАНАКАЛЕ, ТУРЦИЯ

Кемал Огуз, Огуз Озтурк, Хаяти Гуре

Испытания совершены у Енис озера для орошения среди октября 1999 и октября 2000 года. Испытано 368 красноперок (*Rutilus rutilus*) и изображено 37 паразитов и 93 глиста *Ligula intestinalis* в брюшной полости хозяина (представительность 10,0%, средняя интенсивность 2,51 образчика (рыбы). В зависимости от времени года, наибольшее число заражённых рыб появилось в течение лета (33,3%, 4 паразита / рыбы). С другой стороны, этот вид паразитов отдельно установлен у маленьких и средних рыб хозяина (2,17-100%). Основной критерий для оценки видов паразитов у рыб хозяина были общие параметры в связи с популяциями паразитов, как представительность, средняя интенсивность, изменения по временам года, и отношение среди величины хозяина и инфекции.

Ключевые слова: плероцеркоиды, *Ligula*, времена года, красноперка, *Rutilus*