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Comparison of Helminth Species and Their Prevalence in Rudd (*Scardinius erythrophthalmus* L. 1758) in Gölbaşı Dam Lake and Kocadere Stream in Bursa Province of Turkey

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Abstract: Variations in the helminth species parasitizing the rudd, *Scardinius erythrophthalmus* L., and their prevalences were compared in 2 different localities (Gölbaşı Dam Lake and Kocadere Stream) in Bursa province in northwestern Turkey. The overall prevalences of helminth infections were 46.7% and 92.3% at Gölbaşı Lake and Kocadere Stream, respectively. The following helminths were detected: *Dactylogyrus difformis*, *Diplostomum spathaceum* metacercariae, *Asymphlodora markewitschi*, *Ligula intestinalis* plerocercoids, *Skrajibillanus scardinii*, *Eustrongylides* sp. larvae, and *Hysterothylacium* sp. larvae. Among these species, *D. difformis* and *D. spathaceum* were recorded at both sampling stations. However, *D. difformis* was the dominant species in rudd in Gölbaşı Lake (overall prevalence 40%) while *D. spathaceum* was prevalent in Kocadere Stream (overall prevalence 80.7%). *L. intestinalis* plerocercoids were present only in Gölbaşı Lake, while *S. scardinii*, *A. markewitschi*, *Eustrongylides* sp. larvae, and *Hysterothylacium* sp. were detected only in Kocadere Stream. It is concluded that within the same fish species the distribution of helminths and their prevalence vary substantially, especially for some parasites, between 2 different habitats (lake and stream).

Key Words: Rudd, helminths, prevalence, comparison, Gölbaşı Dam Lake, Kocadere Stream

Gölbaşı Baraj Gölü (Bursa) ve Kocadere Deresi (Bursa)'ndeki Kızılkanat (*Scardinius erythrophthalmus* L. 1758) Balıklarındaki Helmint Türleri ve Bunların Prevalanslarının Karşılaştırılması

Özet: Kızılkanat (*Scardinius erythrophthalmus* L.) balığında bulunan helmint türlerinin çeşitliliği ve bunların prevalans değerleri iki farklı odakta (Bursa yöresinde Gölbaşı Baraj Gölü ve Kocadere Deresi) karşılaştırılmıştır. Bu balıklardaki helmint enfeksiyonlarının prevalansı sırasıyla Gölbaşı Baraj Gölü'nde %46,7, Kocadere Deresi'nde % 92,3 olarak belirlenmiştir. Bulunan helmintler şunlardır: *Dactylogyrus difformis*, *Diplostomum spathaceum* metaserkeri, *Asymphlodora markewitschi*, *Ligula intestinalis* pleroserkoidi, *Skrajibillanus scardinii*, *Eustrongylides* sp. larvası ve *Hysterothylacium* sp. larvası. Bu parazitlerden *D. difformis* ve *D. spathaceum* her iki odakta da saptanmıştır. Gölbaşı Baraj Gölü'ndeki balıklarda *D. difformis* (yıl boyu prevalans ortalaması % 40), Kocadere Deresi'ndeki balıklarda ise *D. spathaceum* (yıl boyu prevalans ortalaması % 80,7) dominant türler olarak belirlenmiştir. *L. intestinalis* pleroserkoidlerine sadece Gölbaşı Baraj Gölü'nde rastlanırken, *S. scardinii*, *A. markewitschi*, *Eustrongylides* sp. ve *Hysterothylacium* sp. larvaları sadece Kocadere Deresi'ndeki balıklarda bulunmuştur. Sonuç olarak aynı balık türünü enfekte eden helmint türlerinin ve bunların prevalanslarının farklı biyotoplarda (baraj gölü ve dere gibi), özellikle bazı parazit türleri açısından önemli değişiklik gösterdikleri saptanmıştır.

Anahtar Sözcükler: Kızılkanat, helmint, prevalans, karşılaştırma, Gölbaşı baraj gölü, Kocadere deresi

The rudd is a common cyprinid in Turkey and its helminth fauna has been investigated in several studies. *Asymphlodora markewitschi* and *Rhabdochona* sp. from Lake Uluabat, *Caryophyllaeides fennicus* from Lake Manyas, and *Dactylogyrus difformis*, *Diplozoon* sp., and

Contraecaecum sp. from Bayramdere lagoon have been recorded in rudd in Turkey (1-3). Even though these studies have focused on the helminth fauna of rudd only in lakes, none were carried out in the dam lakes or streams. Furthermore, none of the previous studies have

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compared any data regarding the helminth fauna between lakes and streams. Therefore, the principle aims of the present study were firstly to describe the richness and diversity of helminthic fauna as well as the overall prevalence of helminths in rudd caught in both Gölbaşı Dam Lake and Kocadere Stream in Bursa province, northwestern Turkey, and finally to compare the similarities and differences in such data between these 2 different habitats.

Rudd specimens were caught from Gölbaşı Dam Lake and Kocadere Stream from February 2005 to January 2006 at monthly intervals. The gills, gastrointestinal tract, liver, kidney, heart, swim bladder, gallbladder, eyes, fins, and body surfaces were examined separately under a dissecting microscope. The collected parasite specimens were identified using the appropriate literature (4-6). Prevalence (%) and mean intensity of parasites are described according to Bush et al. (7).

Three helminth species were found on 64 of the 137 (46.7%) fish examined at Gölbaşı Lake. However, 6 helminths were recorded on 144 of the 156 fish (92.3%) examined from Kocadere Stream. In general, 2 parasites both on the gills and eyes and 5 parasites in the intestine and the body cavity were recorded: *D. difformis*, *Diplostomum spathaceum* metacercariae, *A. markewitschi*, *Ligula intestinalis* plerocercoid, *Skrjibillanus scardinii*, *Eustrongylides* sp. larvae, and *Hysterothylacium* sp. larvae. The first 2 parasites were found at both localities. *L. intestinalis* plerocercoids were only present at Gölbaşı, while all the other species were found only at Kocadere. Data on the prevalence and mean intensity of helminth infections of rudd at monthly intervals from the 2 localities are shown in the Table.

The overall prevalences of *D. difformis* were almost the same at the 2 stations (40% at Gölbaşı; 42.3% at Kocadere). The values varied from 20% in February to 100% in October at Gölbaşı Lake (Figure 1).

In contrast to the lake, at the stream prevalence rates of 100% were detected for *D. difformis* from February to April and then dropped to 83% in May (Figure 1). On the other hand, the prevalence of *D. spathaceum* differed substantially between the 2 localities (12.4% at Gölbaşı Lake versus 80.7% at Kocadere Stream). The metacercariae of *D. spathaceum* were found throughout the entire study period at Kocadere Stream, while it was not detected in the May, June, September, December, or January samples at Gölbaşı Lake (Figure 2).

A. markewitschi occurred in the intestine of rudd only in May and June (2 specimens in June). The 3 nematode species found in this study were observed only at Kocadere Stream. Among these, the dominant species was *S. scardinii* and 24 fish (15.3%) were found to be infected with this parasite. *Eustrongylides* sp. larvae were recorded in 12 of 156 fish (7.6%), whereas *Hysterothylacium* sp. larvae were found in 6 fish (3.8%).

In this study, helminth parasites and their prevalence in the rudd were compared between 2 different habitats, i.e. lake (Gölbaşı) and stream (Kocadere), for the first time both in this region and, to our knowledge, in Turkey. It was shown that in rudd specimens from Gölbaşı Dam Lake and Kocadere Stream, 3 and 6 helminth species exist, respectively. *D. difformis* prevalence was almost the same at the 2 stations (40% at Gölbaşı, 42.3% at Kocadere). There is only 1 record for *D. difformis* in rudd from this area and its overall prevalence was 30.7% in Bayramdere lagoon (3). Furthermore, Öztürk and Altunel (8) have reported an overall prevalence of 28.1% for *D. difformis* from Manyas Lake. These data are slightly lower than ours. Parasite abundance patterns may be influenced by both host and environmental factors, some of which lead to the seasonal occurrence of monogeneans by influencing the duration of their life cycle. Abiotic factors (e.g., water flow, oxygen concentration, water temperature) can significantly influence the abundance of gill monogeneans on fish. However, the host factors size and branchial irrigation have a strong influence on infection levels of monogeneans on their fish hosts (9). Therefore, differences in the prevalence of *D. difformis* might have been influenced by some of these factors above. The prevalence of *D. spathaceum* at Kocadere Stream was almost 6-7 times higher than that at Gölbaşı Lake. No reports seem to be available on the infection of *D. spathaceum* in rudd from this region (Bursa). The larvae of this species penetrate actively into the fish. In the present study, remarkable differences in the prevalence values between the 2 localities might be explained by the penetration and migration rates of the parasite into the lens of the host, with Gölbaşı Dam Lake having a much lower abundance of lymnaeid snails, the first intermediate hosts, than Kocadere Stream.

One plerocercoid of the cestode *L. intestinalis* was found only at Gölbaşı Lake. This cestode species has not previously been found in rudd in Bursa. However, plerocercoids of *L. intestinalis* have been reported in other

Table. Monthly prevalence and mean intensity rates of helminths detected in the rudd in Gölbaşı Dam Lake and Kocadere Stream.

	Feb 2005	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan 2006
No. of fish examined	5	10	8	13	16	16	10	12	17	10	10	10
No. of fish infected	2	6	7	8	8	11	3	1	17	1	0	0
<i>D. difformis</i>												
Prevalence (%)	20	60	88	62	50	56	0	0	100	0	0	0
Mean intensity \pm SD	3 \pm 0	12.6 \pm 4.4	7.2 \pm 6.7	7.3 \pm 8.6	30 \pm 33.2	29 \pm 24.2	0	0	41.8 \pm 25.2	0	0	0
<i>D. spathaceum metacercariae</i>												
Prevalence (%)	20	30	25	0	0	13	30	8	24	10	0	0
Mean intensity \pm SD	4 \pm 0	1 \pm 0	1 \pm 0	0	0	1 \pm 0	1.3 \pm 0.5	1	1 \pm 0	1	0	0
<i>L. intestinalis plerocercoid</i>												
Prevalence (%)	0	0	0	0	0	13	0	0	0	0	0	0
Mean intensity \pm SD	0	0	0	0	0	7 \pm 2	0	0	0	0	0	0
No. of fish examined	5	18	7	18	24	5	5	19	15	10	15	15
No. of fish infected	5	18	7	18	17	4	4	18	15	10	13	15
<i>D. difformis</i>												
Prevalence (%)	100	100	100	83	33	80	60	21	0	20	0	0
Mean intensity \pm SD	33 \pm 14	19.7 \pm 12	37.7 \pm 26	33.4 \pm 38	12.1 \pm 19	4.5 \pm 0.8	5.6 \pm 1.5	7.7 \pm 9.9	0	2 \pm 1.4	0	0
<i>D. spathaceum metacercariae</i>												
Prevalence (%)	80	50	85	77	33	80	80	89	100	100	86	86
Mean intensity \pm SD	7.7 \pm 3	3.7 \pm 3.1	8.6 \pm 6.5	4.6 \pm 4.5	2.8 \pm 2	9 \pm 9.9	10.5 \pm 5.9	5.2 \pm 9.5	5.2 \pm 2.3	4.6 \pm 1.8	22.1 \pm 50.5	5.3 \pm 3.8
<i>A. markewitschi</i>												
Prevalence (%)	0	0	0	11	4	0	0	0	0	0	0	0
Mean intensity \pm SD	0	0	0	27.5	2	0	0	0	0	0	0	0
<i>S. scardinius</i>												
Prevalence (%)	60	0	0	0	16.6	0	0	0	0	0	53	60
Mean intensity \pm SD	1.6 \pm 1.2	0	0	0	1.25 \pm 0.5	0	0	0	0	0	2.5 \pm 2.1	3.6 \pm 4.7
<i>Eustrongylides</i> sp. larvae												
Prevalence (%)	20	0	0	0	0	0	0	0	0	0	20	26.6
Mean intensity \pm SD	2	0	0	0	0	0	0	0	0	0	2.3 \pm 2	1.5 \pm 1
<i>Hysterothylacium</i> sp. larvae												
Prevalence (%)	0	0	0	16	0	0	0	15	0	0	0	0
Mean intensity \pm SD	0	0	0	1	0	0	0	7 \pm 4	0	0	0	0

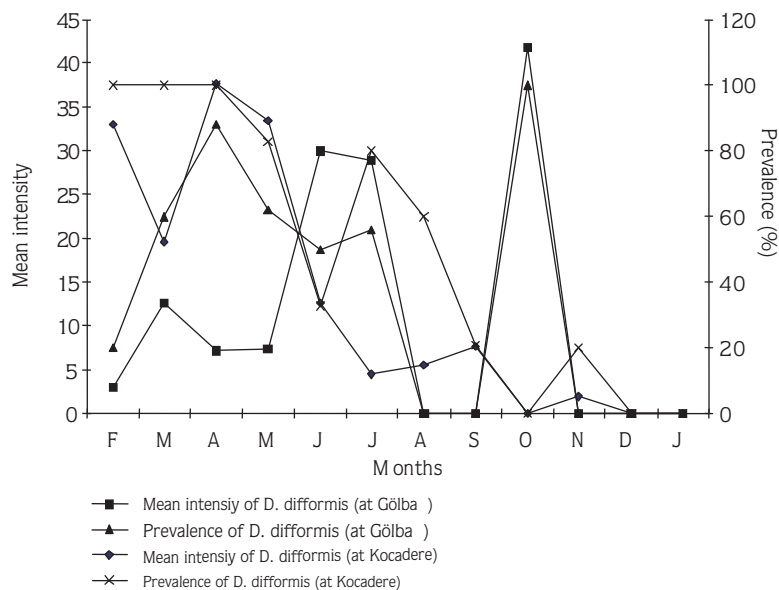


Figure 1. Monthly prevalence and mean intensity of *Dactylogyrus difformis* in Gölbaşı Dam Lake and Kocadere Stream.

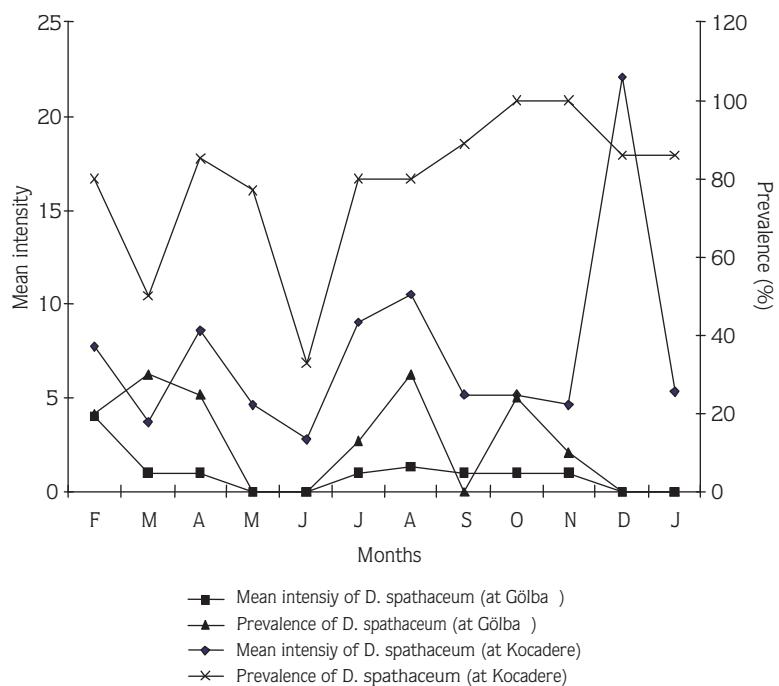


Figure 2. Monthly prevalence and mean intensity of *Diplostomum spathaceum* metacercariae in Gölbaşı Dam Lake and Kocadere Stream.

hosts in previous surveys from this area (10-12). The infection with this species is associated with the choice of food of fish and the proportion of ingested intermediate hosts that harbor the proceroid stages of this tapeworm.

This species was absent from Kocadere, probably because of the lack of intermediate hosts, or the choice and composition of the rudd's food, or due to differences in other ecological factors.

The nematode *Eustrongylides* sp. was detected in winter months and *Hysterothylacium* sp. only in May and September, both at Kocadere Stream. Larvae of *Hysterothylacium* spp. occur mostly in marine and migratory fish and are frequently carried into freshwater areas (6). However, little is known about the life cycle and larval morphogenesis of *Hysterothylacium* spp. On the other hand, fish infected with *Eustrongylides* sp. larvae are usually found in the larger bodies of still water (lakes, large ponds, reservoirs) (6). Aydogdu et al. (12) also recorded *Eustrongylides* sp. larvae in various fish species from İznik Lake. *S. scardinii* was the most common nematode species found in the present study and was detected in 24 fish. Moravec (13) reported that *S.*

scardinii occurred in rudd in Czechoslovakia in the period from October until May of the following year and gravid females with larvae in their uteri were found during all of these months. Our data are similar to those reported by Moravec (13). The decreases and increases in the prevalence of this species have been explained by the biology of the intermediate host branchiurids (13).

In conclusion, the results of this study showed that some of the helminth parasites common in Kocadere Stream were absent from Gölbashi Lake, and the prevalence of some species differs substantially between these 2 different habitats. More extensive sampling is needed in order to obtain a more detailed picture of the lack of different helminth species in these biotopes.

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