A study of endohelminthes in some fish species caught between Kumlutarla-Gemici regions of Karakaya Dam Lake

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Keywords: Karakaya Dam Lake, Kumlutarla, Tabanbükü, Gemici, Fish, Parasite, Endohelminthes.

Introduction
Parasitic diseases has become widespread parallel to the increase of aquaculture in the World and Turkey. Therefore, studies on fish parasitology is also increasing. In a study conducted in Keban Dam Lake on Acanthobrama marmid, Diplostomum sp. infestation caused severe ocular disorders and death of the host, was found that the intensity of the eye lens parasite reached its maximum in September (Dörücü and İspir, 2001). In an other study performed in Koçkale Region of Keban Dam Lake where the city sewage spills, 14 parasites from same species belong to Neoechinorhyncidae family found that stuck to the small intestine of Capoeta trutta.

According to the microscopic examination and morphometric characteristics of the parasite it was found to be Neoechinorhynchus rutili. N. rutili previously identified in many fishes, and was confirmed by this study that also found in the Capoeta trutta (Sağlam and Sarıeyyüpoğlu, 2002).

In another study conducted in Euphrates River between the Keban Reservoir spillway and the starting to fill of Karakaya Dam Lake the area called Kumlutarla Village, it was carried out for 1 year and visited by 15 days intervals, total of 265 fishes caught by fishermen in that area was investigated. Captured fishes consists of Onchorhynchus mykiss, Barbus rajanarum mystaceus, Copaeta copoeta umbla, Chondrostoma regium, Leuciscus cephalus orientalis, Chalcalburnus mossilensis, Acanthobrama marmid and Copaeta trutta species and Khawia sinensis, Bothriocephalus acheilognathi, Diphyllobothrium sp. N. rutili Neoechinorhynchus zabensis parasite species were identified in this study (Ural et al., 2014).

In present study, parasitic fauna of fish obtained in Kumlutarla, Tabanbükü and Gemici regions of Karakaya Dam Lake were compared. In
addition, prevalence, abundance and density of parasite species were calculated. Changes of parasitic infections found in the fish were also examined according to weight, age and gender of fish.

Materials and methods

Fish species

Fish species examined for endohelmith in this study classified by using Geldiay and Balık (2002) and listed below (Fig. 1).

![Fish species](image)

Figure 1: Fish species examined from Kumlutarla, Tabanbükü and Gemici stations (original).

Collection and examination of study materials

Fish samples, 10-95 individuals from each species, were collected and transported to Fish Disease Laboratory in Firat University, Faculty of Fisheries and classified by using Geldiay and Balık (2002). Total, standard and fork length of fish samples used in the study were determined. Body weights were measured with a digital scale. Age determination for *C. regium* and *Acanthobrama marmid* was made from scales, for *Capoeta umbla* and *Alburnus mossulensis* from otolith and for *Capoeta trutta* from dorsal fin rays.

Internal inspection of the fish was made in accordance with the post-mortem techniques and gender was determined with macroscopic examination of fish gonads (Pritchard and Kruse, 1982). The fish was opened with dissecting scissors starting from the anus until operculum. Macroscopic examination was done for the parasite in the body cavity and internal organs. Then the internal organs of the fish were transferred to the physiological water in petri dishes and examined under a stereo microscope. Parasites found were examined alive or stored in small vials containing AFA solution (alcohol-
formalin-asetic acid) for later examination. For the diagnosis and photographing, parasites were transparented with lactophenol and then prepared with glycerol gel (Merdivenci, 1984; Arda et al., 2005). Parasite samples were detected related at class, order and species level and recorded. For correct classification with help of clear body parts of parasites adequate fixative and stains were used. (Pritchard and Kruse, 1982; Merdivenci, 1984; Chubb and Powell, 1996).

**Statistical analysis**

Prevalence, mean density and mean abundance values were calculated on the data obtained in the study as in Bush et al. (1997) to reveal the parasite ecology and given below (Tables 1,2,3,4,5,6).

**Results and discussion**

During the study, 595 fishes belonging to *A. mossulensis*, *C. regium*, *C. trutta*, *C. umbra* and *A. marmid* were examined for endohelmint and 3 parasite species have been found in 405 fish. *Diplostomum* sp. has been found in the eyes of *A. mossulensis*, *C. regium*, *C. trutta* and *C. umbra*; *K. sinensis* found in the abdominal cavity of *A. mossulensis* and *A. marmid*; *N. rutili* found in the intestine of *C. trutta*.

Morphological and anatomical features of parasite species and findings belong to those species are presented below. Size, weight, gender, age, infection rates, density and abundance of the parasite species according to the regions were determined and shown below (Table 1,2,3,4,5,6).

*Diplostomum* sp.

Front part of the body is leaf-shaped and the ventral part concave. The rear like a small conical shaped projecting from the posterior dorsal (Fig. 2). Usually there are a couple subsidiary organ called the lateral pull and there is no real parasite cysts.

![Figure 2: Microscope image of Diplostomum sp. metaserker (Original).](image)

*Neoechinorhynchus rutili* (Müller, 1780)

Body is generally bent towards the ventral, rear end thin (Fig. 3). Hose is too short and six rows with three hooks exist on it.

![Figure 3: Microscope image of Neoechinorhynchus rutili (Original).](image)
Khawia sinensis (Hsu, 1935)

Body slim long. There is only one reproductive organ on body’s posterior without posterior segments. Testicles are many and extending to the cirrus sac from back of skolex. Ovary 'H' shaped and puckered between the uterus and ovary cirrus sac (Fig. 4).

![Microscope image of Khawia sinensis (Original).](image)

**Table 1: Total numbers and infection levels of fishes examined by region.**

<table>
<thead>
<tr>
<th>Regions</th>
<th>Total fish No</th>
<th>Non-infected Fish</th>
<th>Infected fish</th>
<th>Parasite No</th>
<th>Density</th>
<th>Abundance</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kumlutarla</td>
<td>203</td>
<td>82</td>
<td>121</td>
<td>2057</td>
<td>17.00</td>
<td>10.13</td>
<td>% 59.60</td>
</tr>
<tr>
<td>Tabanbükü</td>
<td>201</td>
<td>59</td>
<td>142</td>
<td>3557</td>
<td>25.04</td>
<td>17.69</td>
<td>% 70.64</td>
</tr>
<tr>
<td>Gemici</td>
<td>191</td>
<td>49</td>
<td>142</td>
<td>2537</td>
<td>17.86</td>
<td>13.28</td>
<td>% 74.34</td>
</tr>
<tr>
<td>Toplam</td>
<td>595</td>
<td>190</td>
<td>405</td>
<td>8151</td>
<td>20.12</td>
<td>13.69</td>
<td>% 68.06</td>
</tr>
</tbody>
</table>

**Table 2: Distribution of parasite species in fishes by region in Karakaya Dam Lake.**

<table>
<thead>
<tr>
<th>Regions</th>
<th>Parasite species</th>
<th>Fish Species</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kumlutarla</td>
<td>Diplostomum sp.</td>
<td>(A. mossulensis)</td>
<td>30 (22)</td>
</tr>
<tr>
<td></td>
<td>Neoechinorhynchus rutili</td>
<td>(C. regium)</td>
<td>820 (32)</td>
</tr>
<tr>
<td></td>
<td>Khawia sinensis</td>
<td>(C. trutta)</td>
<td>24 (10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C. umbla)</td>
<td>138 (22)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A. marmid)</td>
<td>705 (27)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1717</td>
</tr>
<tr>
<td>Tabanbükü</td>
<td>Diplostomum sp.</td>
<td>(A. mossulensis)</td>
<td>26 (16)</td>
</tr>
<tr>
<td></td>
<td>Neoechinorhynchus rutili</td>
<td>(C. regium)</td>
<td>1693 (40)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C. trutta)</td>
<td>224 (26)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C. umbla)</td>
<td>201 (27)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A. marmid)</td>
<td>922 (28)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3066</td>
</tr>
<tr>
<td>Gemici</td>
<td>Diplostomum sp.</td>
<td>(A. mossulensis)</td>
<td>31 (18)</td>
</tr>
<tr>
<td></td>
<td>Neoechinorhynchus rutili</td>
<td>(C. regium)</td>
<td>936 (37)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C. trutta)</td>
<td>232 (29)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C. umbla)</td>
<td>242 (30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A. marmid)</td>
<td>626 (24)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2067</td>
</tr>
</tbody>
</table>

**Table 3: Mean weight and mean standard length of the fish caught from Kumlutarla, Tabanbükü and Gemici Regions of Karakaya Dam Lake.**

<table>
<thead>
<tr>
<th>Fish Species</th>
<th>Number of fish Examined</th>
<th>Mean Weight (g)</th>
<th>Mean Standard Length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alburnus mossulensis</td>
<td>200</td>
<td>22.65</td>
<td>13.18</td>
</tr>
<tr>
<td>Chondrostoma regium</td>
<td>117</td>
<td>384.79</td>
<td>28.202</td>
</tr>
<tr>
<td>Capoeta trutta</td>
<td>103</td>
<td>373.37</td>
<td>26.515</td>
</tr>
<tr>
<td>Capoeta umbla</td>
<td>98</td>
<td>432.01</td>
<td>27.2959</td>
</tr>
<tr>
<td>Acanthobrama marmid</td>
<td>79</td>
<td>158,937</td>
<td>19,484</td>
</tr>
</tbody>
</table>

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Table 4: Infection rates in fish species by gender from Kumlutarla, Tabanbükü and Gemici stations.

<table>
<thead>
<tr>
<th>Regions</th>
<th>Fish species</th>
<th>Gender</th>
<th>Total</th>
<th>Infected</th>
<th>Non-infected</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alburnus mossulensis</td>
<td>Female</td>
<td>36</td>
<td>12</td>
<td>24</td>
<td>% 33,33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>33</td>
<td>10</td>
<td>23</td>
<td>% 30,30</td>
</tr>
<tr>
<td>Kumlutarla</td>
<td>Chondrostoma regium</td>
<td>Female</td>
<td>18</td>
<td>17</td>
<td>1</td>
<td>% 94,44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>20</td>
<td>15</td>
<td>5</td>
<td>% 75,00</td>
</tr>
<tr>
<td></td>
<td>Capoetta trutta</td>
<td>Female</td>
<td>10</td>
<td>4</td>
<td>6</td>
<td>% 40,00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>26</td>
<td>14</td>
<td>12</td>
<td>% 53,84</td>
</tr>
<tr>
<td></td>
<td>Capoeta umbla</td>
<td>Female</td>
<td>20</td>
<td>12</td>
<td>8</td>
<td>% 60,00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>13</td>
<td>10</td>
<td>3</td>
<td>% 76,92</td>
</tr>
<tr>
<td></td>
<td>Acanthobrama marmid</td>
<td>Female</td>
<td>17</td>
<td>17</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td>Alburnus mossulensis</td>
<td>Female</td>
<td>35</td>
<td>7</td>
<td>28</td>
<td>% 20,00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>33</td>
<td>9</td>
<td>24</td>
<td>% 27,27</td>
</tr>
<tr>
<td></td>
<td>Chondrostoma regium</td>
<td>Female</td>
<td>23</td>
<td>23</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>17</td>
<td>17</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td>Tabanbükü</td>
<td>Capoetta trutta</td>
<td>Female</td>
<td>16</td>
<td>15</td>
<td>1</td>
<td>% 93,75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>18</td>
<td>16</td>
<td>2</td>
<td>% 88,88</td>
</tr>
<tr>
<td></td>
<td>Capoeta umbla</td>
<td>Female</td>
<td>12</td>
<td>10</td>
<td>2</td>
<td>% 83,33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>19</td>
<td>17</td>
<td>2</td>
<td>% 89,47</td>
</tr>
<tr>
<td></td>
<td>Acanthobrama marmid</td>
<td>Female</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td>Alburnus mossulensis</td>
<td>Female</td>
<td>39</td>
<td>10</td>
<td>29</td>
<td>% 25,64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>24</td>
<td>8</td>
<td>16</td>
<td>% 33,33</td>
</tr>
<tr>
<td></td>
<td>Chondrostoma regium</td>
<td>Female</td>
<td>18</td>
<td>18</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>21</td>
<td>19</td>
<td>2</td>
<td>% 90,47</td>
</tr>
<tr>
<td>Gemici</td>
<td>Capoetta trutta</td>
<td>Female</td>
<td>15</td>
<td>15</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>18</td>
<td>18</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td>Capoeta umbla</td>
<td>Female</td>
<td>12</td>
<td>10</td>
<td>2</td>
<td>% 83,33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td>Acanthobrama marmid</td>
<td>Female</td>
<td>18</td>
<td>18</td>
<td>0</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>% 100</td>
</tr>
</tbody>
</table>

Table 5: The prevalence of infection in fish species by age from Kumlutarla, Tabanbükü and Gemici regions.

<table>
<thead>
<tr>
<th>Fish species</th>
<th>Age</th>
<th>Number of fish examined</th>
<th>Non-infected</th>
<th>Infected</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alburnus mossulensis</td>
<td>I</td>
<td>159</td>
<td>119</td>
<td>40</td>
<td>% 25,15</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>41</td>
<td>25</td>
<td>16</td>
<td>% 39,02</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>66</td>
<td>6</td>
<td>60</td>
<td>% 90,90</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>46</td>
<td>2</td>
<td>44</td>
<td>% 95,65</td>
</tr>
<tr>
<td>Chondrostoma regium</td>
<td>III</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>% 100</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>40</td>
<td>13</td>
<td>27</td>
<td>% 76,50</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>40</td>
<td>6</td>
<td>34</td>
<td>% 85,00</td>
</tr>
<tr>
<td>Capoetta trutta</td>
<td>III</td>
<td>23</td>
<td>2</td>
<td>21</td>
<td>% 91,30</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>10</td>
<td>2</td>
<td>8</td>
<td>% 80,00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>56</td>
<td>7</td>
<td>49</td>
<td>% 87,50</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>27</td>
<td>7</td>
<td>20</td>
<td>% 74,07</td>
</tr>
<tr>
<td>Capoeta umbla</td>
<td>IV</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>% 66,66</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>48</td>
<td>0</td>
<td>48</td>
<td>% 100</td>
</tr>
<tr>
<td>Acanthobrama marmid</td>
<td>II</td>
<td>31</td>
<td>0</td>
<td>31</td>
<td>% 100</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>595</td>
<td>190</td>
<td>405</td>
<td>% 68,06</td>
</tr>
</tbody>
</table>
Dörücü and İspir (2001), Karatoy (2004), Dörücü and İspir (2005), Uzunay and Soylu (2006), Aydoğdu et al. (2008), Özgül (2008), Karaman (2010) reported that they have identified *Diplostomum* sp. in their study.

Detecting *Diplostomum* sp. in this study are shown in agree with other studies.

However, the infection rate have reported as 50% by Aydoğdu et al. (2008) 16.6% by Karabulut (2009); 92.5% by Karatoy (2004); 100% Uzunay and Soylu (2006); 25.21% by Karaman (2010); 54% by Özgül (2008). In present study, infection rate was found as 93.38% in Kumluçarla, 95.77% in Tabanbükü and 97.88% in Gemici regions.

Diversity of the parasite infection rates between studies is thought to be caused by differences in the investigated fish species and the work area.

Again, Sağlam and Sarneyüpoğlu (2002), Dörücü and İspir (2005), Kir and Tekin Özan (2005), Dal (2006), Tekin Özan et al. (2006), Uzunay and Soylu (2006), Karaman (2010) reported in their study on freshwater fish that they have identified *Neoechinorhynchus Rutili*. However, Dörücü et al. (2008), Dörücü and İspir (2005), Sağlam and Sarneyüpoğlu (2002) have found *N. rutili* in *C. trutta*. Detecting *N. rutili* in this study show similarity by studies in terms of detecting parasites in fresh water fish. However, the rate of parasite infection are reported as 34.37% by Dörücü and İspir (2005); 1.25% by Kır and Tekin Özan (2005); 10.23% by Karabulut (2009); 38% Sağlam and Sarneyüpoğlu (2002); 71.4% by Dörücü et al. (2008) and 61.81% by Karaman (2010).

In our study, infection rate of *N. rutili* in *C. trutta* was determined as 36.11%, 73.52% and 93.93% for the Kumluçarla, Tabanbükü and Gemici regions respectively. These results showed similarity with the results in Dörücü and İspir (2001) (34.37%), Sağlam and Sarneyüpoğlu (2002) (38.0%) in

<table>
<thead>
<tr>
<th>Regions</th>
<th>Fish species</th>
<th>Correlation coefficient (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kumluçarla</td>
<td><em>Alburnus mossulensis</em></td>
<td>-0.36</td>
</tr>
<tr>
<td></td>
<td><em>Chondrostoma regium</em></td>
<td>-0.34</td>
</tr>
<tr>
<td></td>
<td><em>Capoeta trutta</em></td>
<td>-0.44</td>
</tr>
<tr>
<td></td>
<td><em>Capoeta umbla</em></td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td><em>Acanthobrama marmid</em></td>
<td>-0.32</td>
</tr>
<tr>
<td></td>
<td><em>Alburnus mossulensis</em></td>
<td>-0.29</td>
</tr>
<tr>
<td></td>
<td><em>Chondrostoma regium</em></td>
<td>+0.32</td>
</tr>
<tr>
<td>Tabanbükü</td>
<td><em>Capoeta trutta</em></td>
<td>-0.03</td>
</tr>
<tr>
<td></td>
<td><em>Capoeta umbla</em></td>
<td>-0.48</td>
</tr>
<tr>
<td></td>
<td><em>Acanthobrama marmid</em></td>
<td>+0.93</td>
</tr>
<tr>
<td></td>
<td><em>Alburnus mossulensis</em></td>
<td>+0.30</td>
</tr>
<tr>
<td></td>
<td><em>Chondrostoma regium</em></td>
<td>-0.15</td>
</tr>
<tr>
<td>Gemici</td>
<td><em>Capoeta trutta</em></td>
<td>-0.75</td>
</tr>
<tr>
<td></td>
<td><em>Capoeta umbla</em></td>
<td>-0.33</td>
</tr>
<tr>
<td></td>
<td><em>Acanthobrama marmid</em></td>
<td>+0.49</td>
</tr>
</tbody>
</table>
Kumlutarla region; Dörücü et al. (2008) (71.4%) in Tabanbükü region; but different infection rate with 93.93% in Gemici region is thought to be caused by differences in the investigated fish species.

Again, Dörücü and İspir (2005) reported *Khawia armaniaca* in *C. umbla* and Ural et al. (2014) reported *K. sinensis* in *Acanthobrama marmid* in their study. The same species have been also identified in this study.

Only one of *A. mossulensis* was to be infected with *K. sinensis* (% 1,44) of 69 fish examined in Kumlutarla region. This parasite was found only in a male fish. Again, only one *K. sinensis* (3.02%) was seen out of 27 *Acanthobrama marmid* examined in Kumlutarla region. This parasite found only in a male fish as five individuals. Findings in our study showed similarity with the results in Ural et al. (2014).

In this study, *Diplostomum* sp. was dominant parasite that found in the eyes of five fish species. In addition, *N. rutili* has also found in a high rate in the intestine of *C. trutta*.

*K. sinensis* were observed in *A. marmid* and *A. mossulensis*. Effects of fish length, weight, age and gender on infection rate in economically important fish species have tried to reveal in this study. Thus, when enough information obtained about the parasites, the environment in which it is thought will make living easier for them to overcome.

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