

## Zooplankton Composition of Karkamış Dam Lake (Gaziantep-Turkey)

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**Abstract.** Zooplankton of Karkamış Dam Lake was investigated seasonally between April 2011 and May 2012 period. During the study, a total of 43 species (28 belong to phylum Rotifera, 10 to Cladocera and 5 Copepoda) were found in Karkamış Dam Lake. All of the zooplanktonic species have been identified for the first time in Karkamış Dam Lake. Some chemical and physical parameters as pH, dissolved oxygen, water temperature were measured during field trips.

**Key words:** Rotifera, Cladocera, Copepoda, Karkamış Dam Lake.

### Introduction

In freshwater ecosystems, 3 groups of zooplankton, namely Rotifera, Cladocera, and Copepoda, have been reported (Berzins & Pejler 1987). Zooplankton occupies the second trophic level in the food chain, the first being occupied by phytoplankton. In lake ecosystems, these organisms are the main food source for invertebrates, fishes, and sometimes for aquatic birds. Some species have been reported as characteristic indicators of water quality and trophic level of lakes (Sladeczek 1983, Herzog 1987, Saksena 1987).

Many studies were carried out on zooplanktonic organisms in Turkey, Gündüz (1997), Bozkurt et al. (2002), Bekleyen (2003), Bozkurt (2004), Ustaoglu (2004), Saler (2004, 2009), Tellioglu & Yilmaztürk (2005), Yiğit & Altındağ (2005), Yiğit (2006), Tellioglu & Akman (2007), Kaya and Altındağ (2007), Saler et al. (2010, 2014), Saler and Şen (2010), Gürel & Saler (2015). We carried out this study to explain the zooplankton fauna of Karkamış Dam Lake and to discuss the species compositions and species richness. The present study is the first survey of zooplankton in Karkamış Dam Lake. Also this study was to hence contribute to knowledge of zooplankton fauna of south-eastern Anatolia.

### Material and Methods

Karkamış Dam Lake is located on the Euphrate River. Dam was 4.5 kmfar away from Syria border. In normal water level the dam lake volume is 157.00 hm<sup>3</sup> and the lake area is 28.40km<sup>2</sup> (URL,1).

Zooplankton samples were collected seasonally between April 2011- May 2012 period from three stations with a plankton net (Hydrobios Kiel, 25 cm diameter 55 µm mesh size) horizontal and vertical hauls and the specimens were preserved in 4% formaldehyde solution in 100 ml plastic bottles. Location of stations in Karkamış Dam Lake was given in Figure 1.

Zooplankton species were examined under Leitz inverted microscope. Relevant literatures Koste (1978 a, b), Dumont & De Ridder (1987), Reedy (1994) Kaya et al. (2007) and Kaya & Altındağ (2007a) were used for the identification and classification of the species. In addition, some physical and chemical parameters as water temperature and oxygen were measured with Oxi 315i/SET oxygen meter, pH with Lamotte (pH 5-WC) pH meter.

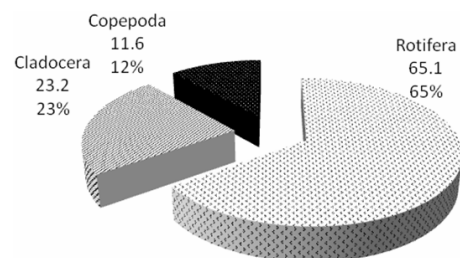
### Results

In Karkamış Dam Lake, 43 species were found, including 28 Rotifera, 10 Cladocera and 5 Copepoda groups. Based on the



**Figure 1.** Location of samplingstations in Karkamış Dam Lake.

number of individuals rotifers were the dominant group in the dam lake (65.1%) followed by Cladocera (23.3%) and Copepoda (11.6%) (Figure 2). Dominant species of rotifers was *Keratella cochlearis* and followed by *Polyarthra dolichoptera*. *Alonarectangula*, *Daphnia longispina* and *Ceriodaphnia reticulata* were the dominant cladoceran species. *Cyclops vicinus*, *C.strennus* and *A. denticornis*were represented as the-dominant copepod species. The seasonal distributions of species are given in Table 1 and 2.



**Figure 2.** Relative density of zooplanktonic groups in Karkamış Dam Lake.

The distribution of zooplankton depends on the temperature increases and decreases. There was a market decrease in total zooplankton species richness and individual number in winter and a sharp increase in spring and autumn months. The most taxa were observed in spring, but less taxa were observed in winter. According to the stations, the most number of species were recorded in the first station with 34 species (21 belonging to Rotifera, 8 to Cladocera and 5 to Copepoda) in spring and which the less were in the second station with 10 species (8 belonging to Rotifera, 1 to Clado-

**Table 1.** Seasonal distribution of Rotifera in Karkamış Dam Lake.

Seasons	Autumn			Winter			Spring			Summer		
Stations	1	2	3	1	2	3	1	2	3	1	2	3
ROTIFERA												
<i>Ascomorpha saltans</i> Bartsch, 1870	+	+	-	-	-	+	+	+	-	-	+	+
<i>Asplanchna priodonta</i> (Gosse, 1850)	-	-	+	-	-	+	+	-	-	+	+	-
<i>A. sieboldi</i> Leydig, 1854)	-	+	+	-	-	+	+	+	+	-	+	-
<i>Brachionus angularis</i> Gosse, 1851	-	+	-	-	+	-	+	+	+	-	-	+
<i>B. calyciflorus</i> Pallas, 1766	+	+	-	-	-	-	+	+	-	-	-	-
<i>B. quadridentatus</i> Hermann, 1783	+	-	+	+	-	-	+	+	-	+	-	+
<i>Cephalodella forficula</i> (Ehrenberg, 1830)	+	-	+	+	-	+	-	+	-	+	-	+
<i>C. gibba</i> (Ehrenberg, 1830)	-	+	-	-	-	-	-	+	+	-	-	-
<i>Colurella adriatica</i> Ehrenberg, 1831	-	+	-	-	-	-	+	-	+	-	+	-
<i>C. colurus</i> (Ehrenberg, 1830)	+	-	-	-	+	-	+	+	+	-	-	-
<i>Euclanis dilatata</i> Ehrenberg, 1832	-	+	-	-	+	-	-	-	+	+	-	-
<i>Filinia opoliensis</i> (Zacharias, 1898)	+	-	-	+	-	+	+	-	-	-	-	-
<i>Kellicottia longispina</i> (Kellicott, 1879)	-	-	-	+	+	+	-	-	-	-	-	-
<i>Keratella cochlearis</i> (Gosse, 1851)	-	+	+	+	-	+	+	+	+	+	+	-
<i>K. quadrata</i> (Müller, 1786)	+	-	+	-	-	-	+	-	+	-	-	-
<i>K. tecta</i> (Gosse, 1851)	-	+	+	-	-	-	+	+	+	-	-	-
<i>K. tropica</i> (Apstein, 1907)	-	-	-	+	-	-	+	-	+	-	+	+
<i>K. valga</i> Ehrenberg, 1834	+	-	+	-	-	-	+	+	+	-	-	+
<i>Lecane bulla</i> (Gosse, 1886)	-	-	-	+	-	-	-	+	+	+	-	-
<i>Lepadella patella</i> (Müller, 1773)	+	-	+	-	+	-	+	-	+	-	-	+
<i>Mytilina ventralis</i> (Ehrenberg, 1830)	+	-	-	-	-	-	+	-	+	-	-	+
<i>Notholca squamula</i> (Müller,1786)	-	-	+	+	+	-	-	-	-	-	-	-
<i>Polyarthra dolichoptera</i> Idelson, 1925	+	+	+	-	+	-	+	+	+	+	-	+
<i>Pompholyx sulcata</i> Hudson, 1885	-	+	+	-	-	-	+	-	+	-	-	-
<i>Synchaeta pectinata</i> Ehrenberg,1832	+	-	+	-	-	+	+	+	+	-	+	-
<i>Testudinella patina</i> (Hermann, 1783)	+	-	-	+	-	-	+	+	+	-	+	-
<i>Trichocerca longiseta</i> (Schrank, 1802)	-	+	-	-	-	-	-	+	+	-	-	-
<i>T. similes</i> (Wierzejski, 1893)	-	+	-	-	-	-	-	+	+	+	-	-

**Table 2.** Seasonal distribution of Cladocera and Copepoda in Karkamış Dam Lake.

Seasons	Autumn			Winter			Spring			Summer		
Stations	1	2	3	1	2	3	1	2	3	1	2	3
CLADOCERA												
<i>Alona rectangula</i> Sars,1862	+	-	+	+	-	+	+	+	-	+	-	+
<i>Bosmina longirostris</i> (Müller, 1785)	+	+	-	-	+	-	+	-	+	+	+	-
<i>Ceriodaphnia pulchella</i> Sars, 1862	+	-	-	-	-	-	-	+	+	-	-	-
<i>C. reticulata</i> (Jurine, 1820)	-	+	+	-	-	+	+	+	-	+	-	+
<i>Chydorus sphaericus</i> (Müller, 1776)	-	+	+	-	-	+	+	+	+	-	+	-
<i>Diaphanosoma birgei</i> Korinek ,1981	-	-	+	-	-	-	+	-	+	-	+	-
<i>Daphnia cucullata</i> Sars,1862	-	-	+	-	-	-	+	+	+	-	-	+
<i>D. longispina</i> Müller, 1785	+	+	-	+	-	-	-	+	+	+	-	+
<i>Leydigia leydigi</i> (Schoedler, 1863)	+	+	-	-	-	-	+	-	+	-	-	-
<i>Moina micrura</i> Kurtz, 1874	-	+	-	-	-	-	+	+	+	-	+	-
COPEPODA												
<i>Acanthodiptomus denticonis</i> (Wierjesky, 1887)	+	+	-	+	-	-	+	+	+	+	+	+
<i>Cyclops strenuous</i> Fisher, 1851	+	+	-	-	-	-	+	+	+	-	+	+
<i>C.vicinus</i> Uljanin, 1875	+	+	+	+	-	-	+	+	+	-	+	-
<i>Macrocyclops albidus</i> (Jurine, 1820)	-	+	+	-	-	-	+	-	+	-	-	-
<i>Nitocra hibernica</i> (Brady, 1880)	-	+	-	+	-	-	+	+	-	-	-	-

**Table 3.**Seasonal values of temperature, dissolved oxygen and pH recorded in Karkamış Dam Lake.

Seasons	Autumn			Winter			Spring			Summer		
Stations	1	2	3	1	2	3	1	2	3	1	2	3
Parameters												
Temperature (C°)	15.5	14.1	13.7	9.4	9.0	8.2	17.1	16.2	16.0	24.0	23.1	22.8
Dis. Oxygen(mgL <sup>-1</sup> )	10.1	9.7	11.2	10.3	10.6	9.3	7.6	8.4	7.3	7.1	7.8	7.6
pH	7.0	6.7	6.8	6.7	7.2	7.7	7.3	7.5	8.4	7.9	8.2	8.3

cera) in winter (Table 1,2). *P. dolichoptera* and *K.cochlearis* were observed in 9 samplings. The dominant Cladoceran species *A. rectangula* was observed in 8 samplings. *A. denticornis* from Cladocera was identified from 9 samplings (Table 1, 2).

Temperature, dissolved oxygen and pH values of the Karkamış Dam Lake were recorded in the field and shown in the Table 3.

## Discussion

Zooplankton species are important indicators for aquatic habitats since most of them are used to determine the quality, the trophic level and level of population in lakes and streams. For example, *K. cochlearis* and *P. dolichoptera* species of Rotifera are indicators of productive habitats, while *N. squamulais* indicator of cold waters. These species were detected in Karkamış Dam Lake. Especially *N. squamula* was observed in the late of autumn and in winter in the dam lake. *K. cochlearis* and *P. dolichoptera* were the dominant rotifer species. Both of these species were recorded in every seasons. In Hancıoğlu (Saler & Aliş 2014) and Kalecik (Bulut & Saler 2013) dam lakes, *K. cochlearis* and *P. dolichoptera* were reported as the dominant rotifer species as in Karkamış Dam Lake.

In Birecik Dam Lake that is located in the same region with Karkamış Dam Lake, Bozkurt and Sagat (2008) identified 39 species, 21 of them belong to Rotifera, 11 belong to Cladocera and 7 belong to Copepoda. They also reported *P. dolichoptera* as dominant rotifer species as in Karkamış Dam Lake.

Species richness of Rotifera was found quite high when compared to Cladocera and Copepoda in Turkish inland waters (Bozkurt 2004, Kaya & Altındağ 2007b, Saler 2004, 2009, 2010). According to the data in this study, most of the identified zooplankton species were from Rotifera with 28 species out of total 43 zooplankton species. Number of zooplankton species was showed increases in spring and autumn and especially in winter. In Gelingülü Dam Lake (Kaya & Altındağ 2007), Kepektaş Dam Lake (Saler 2009), Kesikköprü Dam Lake (Yiğit 2006) Keban Dam Lake (Telliöğlu & Akman 2007, Saler 2010), Sürgü Dam Lake (İpek Aliş & Saler 2013), Kalecik Dam Lake (Bulut & Saler 2013), Beyhan Dam Lake (Bulut & Saler 2014), Uzunçayır Dam Lake (Saler et al. 2014) zooplanktonic species compositions and distributions were showed similarities with this study. In all of these dam lakes rotifers were found to be the dominant species as species richness and frequency of occurrence. Stember & Gannon (1978) indicate that Rotifera forms an important part of biomass in eutrophic water systems. In Karkamış Dam Lake, Rotifera appeared as dominant group with 65.1%.

All the recorded rotifer species in the present study are widely distributed around the world (Serges, 2007). Also many of the recorded species are common in Turkey (Sak-sena 1987, Dumont & De Ridder 1987, Kaya & Altındağ 2007, Ustaoglu 2004, Ustaoglu et al. 2012). Only 8 species of Cladocera were observed in dam lake. Among the identified species *L. leydigii*, *D. birgei* and *C. pulchella* were rarely found in this dam lake. *C. sphaericus*, *B. longirostris*, *C. reticulata* and *A. rectangula* were observed throughout all seasons. *Cyclops*

*vicinus* and *A. denticornis* were the observed throughout all seasons but *M.albidus* representatives of Copepoda observed in spring and autumn.

The ecological features of the recorded species how that most of them are cosmopolitan and littoral inhabiting (Kolis-ko 1974). Additionally, among the recorded species, *B. longirostris* and *C. vicinus*, *P. dolichoptera*, *K. cochlearis* are well known indicators of eutrophy (Ryding & Rast 1989). *P. dolichoptera*, *K. cochlearis* are predominant in this habitat. *T. longiseta*, *T. similis*, *B. bidentata* and *C. adriatica* were rarely found in the dam lake.

The pH values of Karkamış Dam Lake were measured between 6.8-8.4 (Table 3). These values are convenient for zooplankton life (Berzins & Pejler 1987).

Some scientist (Matsubara 1993, Castro et al. 2005, Hesen et al. 2007) stated a positive correlation between temperature and species richness of zooplankton in aquatic environments. In the present study, species richness of zooplankton is positively affected by increasing temperature so that this study supports the hypothesis that species richness of zooplankton is positively affected by increasing temperature.

Rotifera species from Brachionus and Trichocerca genera were used for determination of trophic status of a lake.  $Q = B/T$ ; Brachionus species number / Trichocerca species number. Sladeck (1983), evaluated the index values as  $Q = 1 < \text{oligotroph}$ ,  $Q = 1 - 2 \text{ mesotroph}$  and  $Q = 2 > \text{eutroph}$ . In Karkamış Dam Lake Brachionus was represented with *B. angularis*, *B. calcyflorus* and *B. quadridentatus*. 2 species of Trichocerca were observed as *T. longista* and *T. similis*. According to  $Q=B/T$  equation Q is equal to 1.5. It could be said that that the lake has got a mesotrophic character.

## Conclusion

The zooplankton of Karkamış Dam Lake consists mainly of Cladocera, Copepoda and Rotifera groups. Totally 43 zooplankton species recorded. Rotifers were represented with 28 species. Rotifera exhibited high species richness and diversity throughout the study period. *K. cochlearis* and *P. dolichoptera* from Rotifera, *A. rectangula*, *D. longispina* from Cladocera *C. vicinus* from Copepoda have come out as the most adapted zooplankton species. Overall zooplankton diversities and abundance in Karkamış Dam Lake indicate that, the lake water is rich in nutrients and is moderately healthy. The lake may become polluted and eutrophic if it is not managed properly.

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