
Araştırma Makalesi / Research Article

Zooplankton of Sürgü Dam Lake (Malatya - Turkey)

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Abstract

This study was completed with monthly surveys in Sürgü Dam Lake between June 2011 and July 2012 period. During the study, a total of 47 zooplankton species (31 species belong to Rotifera, 10 to Cladocera and six Copepoda) were identified in Sürgü Dam Lake. Based on the number of individuals, Rotifera (65.95%) were the dominant group in the dam lake followed by Cladocera (21.27%) and Copepoda (12.76%). All of the zooplanktonic species have been detected for the first time in Sürgü Dam Lake. pH, dissolved oxygen, water temperature were measured during field studies.

Key words: Rotifera, Cladocera, Copepoda, Sürgü Dam Lake, Turkey

Sürgü Baraj Gölü (Malatya –Türkiye)’nün Zooplankton

Özet

Bu çalışma Haziran 2011- Temmuz 2012 tarihleri arasında aylık alınan örneklerle tamamlanmıştır. Çalışma süresince Sürgü Baraj Gölü’nde toplam 47 zooplankton türü (31 tür Rotifera, 10 tür Cladocera ve 6 tür Copepoda teşhis edilmiştir. Birey sayısı bakımından Rotifera dominant grup olup (% 65,95) Cladocera (%21,27) ve Copepoda (%12,76) onu izlemiştir. Sürgü Baraj Gölü’nde saptanan bütün zooplanktonik türler gölde ilk kayıttır. pH çözülmüş oksijen ve su sıcaklığı çalışma esnasında ölçülmüştür.

Anaktar Kelimeler: Rotifera, Cladocera, Copepoda, Sürgü Baraj Gölü, Türkiye

1. Introduction

In freshwater ecosystems, three groups of zooplankton, namely Rotifera, Cladocera, and Copepoda, have been reported [1]. 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 [2-3].

Many studies were carried out on zooplanktonic organisms of lakes and dam lakes in Turkey, Gündüz [4], a check list for Cladocera (Crustacea) of Turkish inland waters, Bekleyen [5] a taxonomical study on the zooplankton of Göksu Dam Lake (Diyarbakır, Turkey), Ustaoglu [6], a check-list for zooplankton of Turkish inland waters, Yigit [7], analysis of the zooplankton community by the Shannon-Weaver Index in Kesikkopru Dam Lake, Tellioglu and Akman [8], a taxonomical study on the Rotifer fauna in Pertek region of Keban Dam Lake (Elazığ, Turkey), Saler [9], Rotifer of Kepektaş Dam Lake (Elazığ, Turkey), Saler et al.[10], Rotifer fauna of Battalgazi region of Karakaya Dam Lake (Malatya, Turkey), Dorak et al. [11], Diurnal vertical distribution of zooplankton in Tahtalı Reservoir.

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We carried out this study to explain the zooplankton fauna of Sürgü Dam Lake and to discuss the species composition and species richness. The present study is the first survey of zooplankton in Sürgü Dam Lake.

2. Material and Methods

Sürgü Dam Lake was built between 1965-1969 on Sürgü Stream for purpose of irrigation [12]. Samplings were made monthly between June 2011- July 2012 period from three stations which were defined to characterize whole Sürgü Dam Lake (Table 1).

Zooplankton samples were collected with a standart plankton net with horizontal hauls (Hydrobios Kiel, 25 cm diameter 55 μ m mesh size) and the specimens were preserved in 4% formaldehyde solution in 100 ml plastic bottles. Zooplankton species were examined under Leitz inverted microscope. Relevant literatures as Edmondson [13], Scourfield and Hardig [14], Dussart [15], Flössner [16], Harding and Smith [17], Kiefer [18], Koste [19-20], Dumont and De Ridder [21], were used for the identification and classification of the species. Number of zooplankton individuals in 10 ml were counted under microscope and this value converted to individual/L. The percentage of zooplanktonic groups were calculated by using number of individuals in a liter. In addition, water temperature and dissolved oxygen values were measured by Oxi 315i/SET oxygen meter and pH with Lamotte (pH 5-WC) pH meter. The coordinates of stations were given in Figure 1.



Figure 1. Location of sampling stations in Sürgü Dam Lake

3. Findings and Results

In Sürgü Dam Lake, 47 zooplankton species were identified, belonging to 31 species to Rotifera, 10 species to Cladocera and six species to Copepoda groups. Based on the number of individuals, rotifers were the dominant group in the dam lake (65.95%) followed by Cladocera followed by *Keratella cochlearis*. *Chydorus sphaericus*, *Bosmina longirostris* and *Daphnia longispina* were dominant Cladoceran species. *Cyclops vicinus* and *Cyclops stennus* were dominant Copepoda species. The seasonal distributions of species are given in Table 1.

There was a market decrease in total zooplankton species richness in winter and a sharp increase in spring and autumn months. The most species were recorded in spring (31 rotifers, six copepods, 10 cladoceran, totally 47 species), but the less taxa were observed in winter (20 rotifers, four copepods, six cladocerans, totally 30 species). According to the stations, the highest number of species were recorded in the third station with 37 species in spring and which the less were also in the third station with six species in winter. Water temperature values were changed between 24.0-8.0 °C, dissolved oxygen 11.2-7.0 mg/L and pH 9.1-6.9 (Table 2)

Table 1. Seasonal distribution of zooplankton fauna of Sürgü Dam Lake

Seasons Stations	Autumn			Winter			Spring			Summer		
	1	2	3	1	2	3	1	2	3	1	2	3
SPECIES												
Rotifera												
<i>Ascomorpha saltans</i> Bartsch, 1870	-	+	+	-	-	+	+	-	+	-	+	+
<i>Asplanchna priodonta</i> (Gosse, 1850)	-	-	+	-	-	+	+	-	-	+	+	-
<i>Brachionus angularis</i> Gosse, 1851	-	+	+	-	-	+	+	+	+	-	+	-
<i>Brachionus bidentata</i> (Anderson, 1889)	+	+	-	-	+	-	+	+	+	-	-	+
<i>Brachionus caudatus</i> (Barrois & Daday, 1894)	+	+	-	-	-	+	+	-	-	-	-	-
<i>Brachionus quadridentatus</i> Hermann, 1783	+	-	+	+	-	-	+	+	-	+	-	+
<i>Colurella adriatica</i> Ehrenberg, 1831	-	-	+	+	-	+	+	-	+	+	-	+
<i>Colurella colurus</i> (Ehrenberg, 1830)	-	+	-	-	+	-	-	+	+	-	-	-
<i>Euclanis dilatata</i> Ehrenberg, 1832	+	+	-	-	-	-	+	-	+	-	+	-
<i>Filinia opoliensis</i> (Zacharias, 1898)	-	-	-	-	+	-	+	+	+	-	-	-
<i>Hexarthra fennica</i> (Levander, 1892)	+	+	-	-	+	-	-	-	+	+	-	-
<i>Hexarthra intermedia</i> Wierzejski, 1929	-	-	-	-	-	-	+	-	+	-	+	+
<i>Hexarthra mira</i> (Hudson, 1871)	-	+	-	+	-	-	-	-	-	+	-	+
<i>Kellicottia longispina</i> (Kellicott, 1879)	+	-	+	+	-	-	+	+	+	-	+	-
<i>Keratella cochlearis</i> (Gosse, 1851)	+	+	+	-	+	-	+	+	+	+	+	-
<i>Keratella tropica</i> (Apstein, 1907)	-	+	-	-	-	-	-	-	-	-	-	-
<i>Keratella quadrata</i> (Muller, 1786)	+	-	-	+	-	-	+	-	+	-	+	+
<i>Keratella tecta</i> (Gosse, 1851)	-	-	+	-	-	-	+	+	+	-	-	+
<i>Keratella valga</i> Ehrenberg, 1834	+	-	-	-	-	-	-	+	+	+	+	-
<i>Lecane bulla</i> (Gosse, 1886)	+	-	+	+	-	+	+	-	+	-	-	+
<i>Lecane luna</i> (Muller, 1776)	-	-	-	-	+	-	+	-	+	-	-	+
<i>Mytilina trigona</i> Harring, 1913	+	-	+	+	-	-	-	+	-	-	+	-
<i>Notholca squamula</i> (Muller, 1786)	-	+	+	-	+	-	+	+	+	+	-	+
<i>Philodina roseola</i> Ehrenberg, 1832	-	-	-	-	-	-	+	-	-	-	+	+
<i>Polyarthra dolichoptera</i> Idelson, 1925	+	+	+	-	+	-	+	+	+	+	+	+
<i>Pompholyx sulcata</i> Hudson, 1885	-	+	+	+	+	-	+	+	+	+	-	+
<i>Rotaria neptunia</i> (Ehrenberg, 1832)	-	+	-	-	-	-	-	+	+	-	-	-
<i>Rotaria rotatoria</i> (Pallas, 1766)	-	-	-	-	-	-	+	+	+	+	-	+
<i>Synchaeta stylata</i> Wierzejski, 1893	+	-	-	-	-	-	+	-	+	+	-	-
<i>Testudinella patina</i> Hermann, 1783	+	-	+	-	+	-	-	+	+	+	-	-
<i>Trichocerca similis</i> Wierzejski, 1893)	-	+	-	-	-	-	+	-	-	+	+	-
Cladocera												
<i>Alona rectangularata</i> Sars, 1862	+	-	+	+	-	-	-	+	-	+	-	+
<i>Bosmina longirostris</i> (Muller, 1785)	+	+	-	-	+	-	+	+	+	+	+	+
<i>Ceriodaphnia pulchella</i> Sars, 1862	+	-	-	-	-	-	-	+	+	-	-	-
<i>Ceriodaphnia reticulata</i> (Jurine, 1820)	+	+	-	+	-	-	+	+	-	+	-	+
<i>Chydorus sphaericus</i> (O. F. Müller, 1776)	+	+	+	-	+	+	+	+	+	-	+	+
<i>Daphnia birgei</i> Korinec, 1981	-	-	+	-	-	-	+	-	+	-	+	-
<i>Daphnia cucullata</i> Sars, 1862	-	-	+	-	-	-	+	+	+	-	-	+
<i>Daphnia longispina</i> O. F. Müller, 1785	+	+	-	+	-	-	-	+	+	+	+	-
<i>Disparalona rostrata</i> (Koch, 1841)	+	+	-	-	-	-	+	-	+	-	-	+
<i>Ledygia leydigi</i> (Schoedler, 1863)	-	+	-	-	+	-	-	+	-	-	+	-
Copepoda												
<i>Acanthodiptomus denticornis</i> (Wierjesky, 1887)	+	-	+	+	-	-	+	+	+	-	+	-
<i>Cyclops strennus</i> (Fisher, 1851)	+	+	-	-	+	-	+	+	+	-	+	+
<i>Cyclops vicinus</i> Uljanin, 1875	+	+	+	+	-	+	+	+	+	+	-	+
<i>Diacyclops bicuspidatus</i> Claus, 1857	-	+	+	-	-	-	+	-	+	+	-	+
<i>Macrocyclus albidus</i> (Jurine, 1820)	+	-	-	-	-	-	+	-	+	-	+	-
<i>Nitocra hibernica</i> (Brady, 1880)	-	-	-	-	-	-	+	+	+	-	-	-

Table 2. Seasonal average values of water temperature, dissolved oxygen and pH recorded in Sürgü Dam Lake.

Seasons Stations	Autumn			Winter			Spring			Summer		
	1	2	3	1	2	3	1	2	3	1	2	3
Parameters												
Temperature (°C)	14.3	14.6	14.5	8.5	8.1	8.0	15.8	16.1	16.0	24.0	23.6	23.7
Dissolved oxygen(mg/L)	9.0	9.3	10.0	11.2	10.7	10.9	8.8	8.2	8.7	7.3	7.0	7.6
pH	7.7	7.8	7.3	6.9	7.3	7.5	8.1	8.4	8.3	8.4	8.0	8.1

4. 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. squamula* is known as indicators of cold waters. *Hexarthra* species are known as indicator of high pH waters [22]. *K. cochlearis* and *P. dolichoptera* were determined in all seasons and *N. squamula* was observed in cold seasons, in autumn and winter in Sürgü Dam Lake.

Kolisko [22], reported that *P. dolichoptera* and *K. cochlearis* are perennial species while, *N. squamula* is a winter form. The results of this study have got a great accordance with her report. Species richness of Rotifera was found quite high when compared to Cladocera and Copepoda in Turkish inland waters [23]. In paralel with this result, in Sürgü Dam Lake 31 Rotifera species were found among 47 identified zooplankton species.

According to Stember and Gannon [24] Rotifera forms an important part of biomass in eutrophic water systems. In the present study, Rotifera appeared as dominant group (65.95%).

All the recorded Rotifer species in the present study are widely distributed around the world [25]. Also many of the recorded species are common in Turkey [3, 21]. Only 11 species of Cladocera were observed in dam lake. Among the identified species *Leydigia leydigi*, *Disparalona rostrata*, *Daphnia birgei* and *Ceriodaphnia pulchella* were rarely found in Sürgü Dam Lake. *Chydorus sphaericus*, *Bosmina longirostris*, *Ceriodaphnia reticulata* and *Daphnia longispina* were observed throughout all seasons. *Cyclops vicinus* and *Acanthodiptomus denticornis* were observed throughout all seasons but *Nitocra hibernica* was only recorded in spring. *Cyclops vicinus* and *Acanthodiptomus denticornis* are the common Copepoda species in Turkey inland water [4]. The ecological features of the recorded species show that most of them are cosmopolitan and littoral inhabiting [22].

Additionally, among the recorded species; *B. longirostris* and *C. vicinus*, *P. dolichoptera*, *K. cochlearis* are well known indicators of eutrophy [26]. *P. dolichoptera*, *K. cochlearis* are predominant in the dam lake. *Brachionus caudatus*, *Filinia opoliensis*, *Synchaeta stylata*, *Rotaria neptunia* and *Pompholyx sulcata* were rarely found in the study field. *Philodina roseola*, *Rotaria neptunia* and *Rotaria rotatoria* were recorded as the organisms of polluted waters [22, 26]. These three species were recorded in spring and summer period.

According to the results of this study, Rotifera is recorded as the dominant zooplankton group. The number of zooplankton species showed an increase in spring and autumn decrease in summer and winter. The zooplanktonic fauna structure of, Göksu Dam Lake [5], Kesikköprü Dam Lake [7], Keban Dam Lake [8], Kepeктаş Dam Lake [9] and Karakaya Dam Lake [10] were showed similarities with our findings. In all of these dam lakes, rotifers were found to be the dominant species as species richness and frequency of occurrence.

Cyclops vicinus was the dominant Copepoda spesies in Kunduzlar and Çatören Dam Lake. This species was found in throughout the sampling period in both dam lakes. In present study, similarly *C. vicinus* was observed every seasons as dominant Copepoda species. The other dominant organism of the present study *K. cochlearis* was observed in Keban Dam Lake and Kepeктаş Dam Lake in every seasons.

It was reported that pH has got a significant effect on the distribution of zooplankton and alkaline pH limit of zooplankton life stated as 8.5 [1]. In Sürgü Dam Lake pH were changed between 6.9-8.4. It is obvious that these values are appropriate for the life of zooplankton.

It is known that there is a positive correlation between temperature and species richness of zooplankton in aquatic enviroments [27,28,29]. In the present study, species richness of zooplankton is positively affected by increasing temprature so that this study supports the hypothesis that species richness of zooplankton is positively affected by increasing temperature.

Minimum dissolved oxygen level of water should not be below 5mg/L to sustain the aquatic life under aerobic conditions in freshwater ecosystems [30]. The values of dissolved oxygen were not found to be limiting factor for life in Sürgü Dam Lake.

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