

Abundance and Seasonal Variations of Cladoceran and Copepod Fauna of Kesikköprü Dam Lake in Turkey*

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Abstract: In this study, a total of 17 Cladoceran and Copepod species were identified in Kesikköprü Dam Lake (Ankara) between April 1995 and May 1996. The average individual number of copepod species was found to be 51279 Ind/m³. The highest number of copepod species was recorded in May 1995 and the lowest in February 1995. *Arctodiaptomus acutilobatus* was the most abundant copepod species with an average of 18541 Ind/m³. The average individual number of Cladoceran species was found to be 47282 Ind/m³. *Daphnia longispina* was found as the most abundant cladoceran species and its peak was observed in April 1995. The highest number of Cladoceran species was recorded in June 1995 and the lowest in January 1996.

Key Words: Zooplankton, Cladocera, Copepoda, seasonal variation, Kesikköprü dam lake

Kesikköprü Baraj Gölü (Türkiye) Cladocera ve Copepoda Faunasının Bolluğu ve Mevsimsel Değişimi

Özet: Kesikköprü Baraj Gölü'nde (Ankara) Nisan 1995 ve Mayıs 1996 yılları arasında yapılan bu çalışmada toplam 17 Cladocera ve Copepoda türü teşhis edilmiştir. Copepoda türlerinin ortalama birey sayısı 51279 BS/m³ olarak bulunmuştur. Copepoda türlerinin en yüksek değerleri Mayıs 1995 de ve en düşük değerleri de Şubat 1996 da görülmüştür. *Arctodiaptomus acutilobatus* ortalama 18541 BS/m³ değeriyle en bol bulunan copepoda türüdür. Cladocera türlerinin ortalama birey sayısı 47282 BS/m³ olarak bulunmuştur. *Daphnia longispina* en bol bulunan cladocera türüdür ve Nisan 1995' de pik yaptığı gözlenmiştir. Cladocera türlerinin en yüksek değerleri Haziran 1995 de ve en düşük değerleri de Ocak 1996 da kaydedilmiştir.

Anahtar Kelimeler: Zooplankton, Cladocera, Copepoda, mevsimsel değişim, Kesikköprü baraj gölü

Introduction

In the Lake ecosystems, zooplanktonic organisms, which form the second step of the food chain, are important food sources of some invertebrate animals and fishes. Also they play an important role in the water quality, eutrophication, pollution and productivity of a Lake. (Sharma 1983; Saksena 1987). The Cladocerans and Copepods are two groups of zooplankton. They have value as indicators of water quality and the structure of the biotic community (Gannon and Stemberger 1978).

Turkey is rich in freshwater sources with different ecological peculiarities. Many studies have been conducted with the purpose of identifying cladoceran and copepod species in Lakes and Dam Lakes. (Altındağ and Özkurt 1998, Ustaoğlu 1993, Ustaoğlu 1986, Ustaoğlu et al. 2001). Also, Demir et al. (2001), showed the influence of trout cage culture on water quality, plankton and benthos in Kesikköprü Dam Lake. The aim of this study is to determine the species composition and seasonal variation of cladoceran and copepod fauna in Kesikköprü Dam Lake.

Materials and Methods

Kesikköprü Dam Lake is located in 110 km south-east of Ankara, between the Kapulukaya and Hirfanlı Dam

Lakes. Its total volume is 9500hm³, maximum depth 30 m, and total area 650 ha. Kesikköprü Dam Lake is 750 m above sea level and is fed by the Kızılırmak River. This study was performed at five different stations of the Lake (Fig.1).

The plankton samples were collected from each station between April 1995- May 1996 on a monthly basis, using a 55 µm mesh size Hydro-Bios Kiel plankton net while making horizontal and vertical hauls. The zooplankton samples were immediately fixed in 4% formaldehyde. The samples were identified according to Scourfield and Harding (1966), Smimov (1974) and Dussart (1969). During the study period, water temperature, Secchi depth, dissolved oxygen and pH were measured.

Results

The temperature of Kesikköprü Dam Lake varied from 4 to 24 °C, Secchi depth 5.5 to 12 m, dissolved oxygen 8.0 to 12 mg/l and pH 7.2 to 8.6 (Table 1). During the research period, Cladocera are represented by 9 species and the Copepoda by 8 species in the Kesikköprü Dam Lake.

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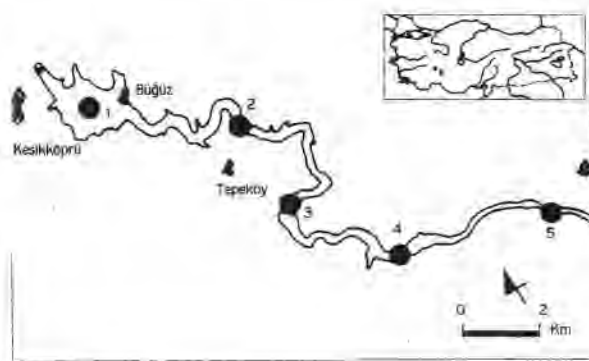


Figure 1. Map showing the locations of Kesikköprü Dam Lake and sampling sites

Table 1. Mean physico-chemical parameters of Kesikköprü dam lake

| Months | Temperature (°C) | Secchi depth (m) | O ₂ (mg/l) | pH |
|--------------|------------------|------------------|-----------------------|-----|
| April 1995 | 13.6 | 7 | 9.5 | 8.1 |
| May | 17.2 | 6.1 | 9.4 | 8.5 |
| June | 19.8 | 7.7 | 8.6 | 7.8 |
| July | 22.2 | 8.9 | 8.0 | 7.8 |
| August | 23 | 9.6 | 8.3 | 8.1 |
| September | 18.4 | 7.1 | 8.4 | 8.2 |
| October | 14.5 | 6.6 | 8.8 | 8.8 |
| November | 9.7 | 7.6 | 9.9 | 8.2 |
| December | 5.2 | 8.6 | 9.7 | 8.0 |
| January 1996 | 4.0 | 10.8 | 10.6 | 7.8 |
| February | 4.4 | 9.2 | 11.2 | 7.8 |
| March | 10.4 | 7.0 | 9.0 | 8.0 |
| April | 12.0 | 6.0 | 8.8 | 8.3 |
| Annual means | 13.4 | 7.9 | 9.2 | 8.0 |

Cladocera

Diaphanosoma lacustris Korinek, 1981
Daphnia magna Straus, 1820
Daphnia pulex Leydig, 1860
Daphnia longispina O.F. Müller, 1785
Bosmina longirostris (O.F. Müller, 1785)
Macrothrix laticornis (Fischer, 1848)
Disparalona rostrata (Koch, 1841)
Chydorus sphaericus (Müller, 1776)
Monospilus dispar Sars, 1861

Copepoda

Cyclops vicinus Uljanin, 1875
Diacyclops bicuspidatus (Claus, 1857)
Megacyclops viridis (Jurine, 1820)
Cyclops abyssorum Sars, 1863
Eucyclops serrulatus (Fischer, 1848)
Arctodiaptomus acutilobatus (Wierzejski, 1887)
Acanthodiaptomus denticornis (Wierzejski, 1857)
Nitocra hibernica Brady, 1880

The average individual number of all copepod species in the Dam Lake was found to be 51,279 Ind/m³. Species-wise percentages were as follows; *Arctodiaptomus acutilobatus* 37.37%, *Eucyclops serrulatus* 12.75%, *Cyclops abyssorum* 11.59%, *Nitocra hibernica* 10.46%, *Megacyclops viridis* 8.91%, *Acanthodiaptomus denticornis* 8.04%, *Diacyclops bicuspidatus* 5.50% and *Cyclops vicinus* 5.38%. Specimens were found most abundant at station V (mean: 57495 Ind/m³) and least abundant at station II (mean: 34932 Ind/m³). The highest number of copepod species (86876 Ind/m³) was recorded in May 1995 and the lowest (12261 Ind/m³) in February 1996. Peaks were observed in spring (April, May) and autumn (September, October). In contrast, the population density decreased in winter (January, February) and in summer (July, August). *Arctodiaptomus acutilobatus* was the most abundant species with an average of 18541 Ind/m³ and 37.37%. Its peak was observed in May 1995 with 35311 Ind/m³ and the lowest number was recorded in February 1996 with 2190 Ind/m³.

Eucyclops serrulatus was found at all stations and was the second most abundant species, with an average of 6329 Ind/m³ and 12.75%. The highest number of this species was recorded in May 1995 with 19825 Ind/m³, and the lowest in August 1995 with 1314 Ind/m³.

Cyclops abyssorum was found at all stations except station II and is the 3rd most abundant species with an average of 5750 Ind/m³ and 11.59%. The peak in this species was observed in October 1995 with 17198 Ind/m³ and the lowest number in July 1995 with 1314 Ind/m³. *Nitocra hibernica* was found at I, II. and V. stations. It has an abundance of 5189 Ind/m³ and 10.46%. The highest number of this species was recorded in May 1995 with 10589 Ind/m³ and lowest in October 1995, February 1996 with 3503 Ind/m³. *Megacyclops viridis* was mostly found at all stations except station IV. It has an abundance of 4423 Ind/m³ and 8.91%. The highest number was observed in April with 12341 Ind/m³ and the lowest in February 1996 with 1314 Ind/m³. *Acanthodiaptomus denticornis* was observed at all stations with 3987 Ind/m³ and 8.04%. The highest number (18034 Ind/m³) was determined in October 1995 and the lowest (876 Ind/m³) in September, December 1995. *Diacyclops bicuspidatus* was found at all stations except station V. with 2731 Ind/m³ and 5.50%. The peak (10112 Ind/m³) was observed in May 1996 and the lowest number (1314 Ind/m³) was found in February 1996. *Cyclops vicinus* was recorded at all stations except station III. Its individual number and percentage were 2670 Ind/m³ and 5.38% respectively. The highest number (17198 Ind/m³) was observed in April 1996 and the lowest in June 1995 (1752 Ind/m³).

In Kesikköprü dam lake, the average individual number of all cladoceran species was found to be 47282 Ind/m³. Species-wise percentages were as follows; *Daphnia longispina* 23.52%, *Daphnia pulex* 21.36%, *Diaphanosoma lacustris* 14.14%, *Daphnia magna* 13.43%, *Chydorus sphaericus* 8.29%, *Bosmina longirostris* 8.08%, *Monospilus dispar* 5.04%, *Disparalona rostrata* 3.17% and *Macrothrix laticornis* 2.96%. Specimens were found most

abundant at station IV (mean: 61320 Ind/m³) and the least at station III (mean: 33468 Ind/m³). The highest number of cladoceran species (86080 Ind/m³) was recorded in June 1995 and the lowest number (8758 Ind/m³) in January 1996. Peaks were observed in spring (May, June) and autumn (September, October). But the population density decreased in winter (January, February) and in summer (July, August). Among the cladoceran species; *Daphnia longispina*, (the most abundant species), was found at all stations except station II. Its peak was observed in April 1995. The lowest number was recorded in January 1996. *Daphnia pulex* was found at all stations and was the second most abundant species, with an average of 9964 Ind/m³ and 21.36%. The highest number of this species was recorded in June 1995 with 16773 Ind/m³, and the lowest in December 1995 with 2627 Ind/m³. *Diaphanosoma lacustris* was found at all stations and it is the 3rd most abundant species with an average of 6599 Ind/m³, and 14.14%. The peak in this species was observed in October 1995 with 18538 Ind/m³ and the lowest number in February 1996 with 1314 Ind/m³. *Daphnia magna* was also found at all stations except station III. Its peak was observed in May 1996 with 15844 Ind/m³. The lowest number of this species was recorded in December with 2627 Ind/m³. *Chydorus sphaericus* was found at all stations with an average of 4218 Ind/m³ and 8.29%. The peak in this species was observed in June 1995 with 15884 Ind/m³ and the lowest number in August 1995 with 876 Ind/m³. During the study, *Bosmina longirostris* was found only at stations II and V. Its peak was determined in May 1996 with 13217 Ind/m³ and the lowest number in November 1995 and February 1996 with 1314 Ind/m³. *Monospilus dispar* was also found at all stations except station I. It has an average of 2352 Ind/m³ and 5.04%. Peak was observed in October 1995. The lowest number was recorded in December 1995. *Disparalona rostrata* was determined to have an abundance of 1477 Ind/m³ and 3.17%. The highest number was observed in June 1995 with 4406 Ind/m³ and the lowest in December 1995 with 1314 Ind/m³.

The last species, *Macrothrix laticornis*, was observed at all stations but low numbers. It has an abundance of 1381 Ind/m³ and 2.96%. The highest number of this species was recorded in April 1996 with 8635 Ind/m³ and lowest in January 1996 with 1314 Ind/m³.

Discussion

The crustacean zooplankton community in Kesikköprü Dam Lake is dominated by a few species. According to Welch (1935), it is well known that annual fluctuations occur in zooplankton biomass as well as two increases, in spring and autumn, and decreases in summer and winter. Copepods have the highest density with values up to 86876 Ind/m³ at their maximum in May. *Arctodiaptomus acutirostris* was the most abundant copepod species observed during the study period. *Eucyclops serrulatus* was the second dominant copepod species which reached as 12.75%. The main value was found as 6329 Ind/m³ in the Lake. In the study of Ustaoglu et al. (2001), *Eucyclops serrulatus* was the most abundant copepod species during the study period. In addition to this, *Chydorus sphaericus*

was the second abundant cladoceran species, observed in 11 months of the research period. But, in this study, *Chydorus sphaericus* was found as the fifth dominant species. *Cyclops vicinus* was the dominant species of the Kunduzlar Dam Lake (11.94%) and *Cyclops vicinus* was again common species of Çatören Dam Lake (16.99%) (Altındağ and Özkurt 1998). This species was found throughout the sampling period in both Dam Lakes. In present study, in contrast *Cyclops vicinus* was found in the lowest numbers during the study period (2670 Ind/m³ and 5.38%). In Karamuk Lake, *Acanthodiaptomus denticornis* was the common copepod species and its individual number (in summer and autumn) was recorded very high (Emir and Demirsoy, 1996). Similarly, in present study, the same copepod species reached at the highest density in summer, autumn and spring seasons. *Daphnia pulex*, *D. longispina* and *D. magna* were generally common species which found in Turkish Lakes and reservoirs. These species were nearly found at all stations and all months. Gündüz (1987), recorded the *Daphnia longispina* in Karamuk and Hoyran Lakes. Also he found *Daphnia magna*, *D. longispina* and *D. galeata* in the Bafra Balık Lake. Kesikköprü Dam Lake is an oligotrophic lake because of the high oxygen concentration and Secchi depth in all seasons.

This study will be a resource for future studies in Kesikköprü Dam Lake.

Conclusion

In Kesikköprü Dam Lake, Cladocera and copepoda biomass exhibited two peaks. Generally, peaks were observed in spring (April, May, June) and autumn (September, October). In contrast, the population density decreased in winter (January, February) and in summer (July, August).

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