

A Taxonomic Study on Zooplankton Fauna of Kiğı Dam Lake (Bingöl-Turkey)

Hilal BULUT

Fırat University, Faculty of Fisheries, Elazığ, Turkey

Geliş : 18.07.2017

Kabul : 10.10.2017

Araştırma Makalesi / Research Paper

Sorumlu Yazar: hilalhaykir@gmail.com

E-Dergi ISSN: 1308-7517

Abstract

The present study was conducted to determine zooplankton fauna of Kiğı Dam Lake during September 2012 and August 2013 seasonally. The zooplankton samples were collected by using plankton net with the mesh size of 55µm horizontally and preserved in 4% formaldehyde. Total 22 taxa (16 Rotifera, 4 Cladocera, and 2 Copepoda) were identified in Kiğı Dam Lake. *Ascomorpha saltans*, *Asplanchna priodonta*, *Brachionus angularis*, *Cephalodella gibba*, *Euchlanis dilatata*, *Kellicottia longispina*, *Keratella cochlearis*, *Keratella quadrata*, *Lecane luna*, *Lecane lunaris*, *Notholca squamula*, *Polyarthra dolichoptera*, *Rotaria rotatoria*, *Synchaeta pectinata*, *Synchaeta oblonga*, *Trichocerca capucina* from Rotifera species; *Bosmina longirostris*, *Chydorus sphaericus*, *Daphnia cucullata*, *Daphnia longispina* from Cladocera species; *Acanthodiptomus denticornis*, *Cyclops vicinus* from Copepoda species are new records for this dam lake. Zooplankton samples were consisted of 72.7% Rotifera, 18.2% Cladocera, and 9.1% Copepoda.

Keywords: Kiğı Dam Lake, species distribution, zooplankton.

Kiğı Baraj Gölü (Bingöl-Türkiye)'nün Zooplankton Faunası Üzerine Taksonomik Bir Çalışma

Özet

Kiğı Baraj Gölü'nün zooplankton faunasını belirlemek için Eylül 2012 - Ağustos 2013 arasında yapılan mevsimsel çalışmada zooplankton örnekleri, 55 µm göz açıklığına sahip plankton kepçesi yardımıyla horizontal olarak toplanmış ve %4'lük formolde tespit edilmiştir. Baraj Gölü'nde toplam 22 takson (16 Rotifera, 4 Cladocera ve 2 Copepoda) teşhis edilmiştir Rotiferlerden *Ascomorpha saltans*, *Asplanchna priodonta*, *Brachionus angularis*, *Cephalodella gibba*, *Euchlanis dilatata*, *Kellicottia longispina*, *Keratella cochlearis*, *Keratella quadrata*, *Lecane luna*, *Lecane lunaris*, *Notholca squamula*, *Polyarthra dolichoptera*, *Rotaria rotatoria*, *Synchaeta pectinata*, *Synchaeta oblonga*, *Trichocerca capucina*; kladoserlerden *Bosmina longirostris*, *Chydorus sphaericus*, *Daphnia cucullata*, *Daphnia longispina*; kopepodlardan *Acanthodiptomus denticornis*, *Cyclops vicinus* bu baraj gölü için yeni kayıttır. Zooplanktonik organizmaların % 72,7'sini Rotifera, % 18,2'sini Cladocera ve % 9,1'ini Copepoda oluşturmuştur.

Anahtar kelimeler: Kiğı Baraj Gölü, sür dağılımı, zooplankton.

INTRODUCTION

The majority of zooplankton (Copepoda, Cladocera and Rotifera) transform the phytoplankton to animal protein (Cirik and Gökpınar, 1993), and they play a significant role in food chain. It was reported that some species are the indicators of water quality, and eutrophication due to their sensitivity to environmental changes and therefore zooplankton studies on lakes have acquired significant importance (Berzins and Pejler, 1987; Mikschi, 1989).

Although the abundance of zooplanktonic organisms are important especially in terms of feeding of fry they are also used as indicators water quality eutrophication and pollution levels.

Abundance and composition of zooplankton are closely related with water quality parameters and zooplankton abundance changes depending on trophic levels of lakes (Canfield and Jones, 1996).

Many studies were carried on zooplankton in Turkey (Özdemir and Şen, 1994; Göksu et al. 1997, 2005; Saler and Şen, 2002; Bozkurt and Sagat, 2008; Bulut and Saler, 2013a, 2013b; 2014a, 2014b; Saler et al., 2015a, 2015b). No previous research about zooplankton of Kiğı Dam Lake has been recorded. In this study zooplankton species and their seasonal variations of Kiğı Dam Lake have been investigated.

MATERIAL and METHODS

Kiğı Dam Lake was built on Peri Stream between 1997 and 2003. The maximum water capacity is 507.55 hm³ and has surface area 8.35 km² and maximum depth of 168 m (URL, 2016) (fig.1).



Figure 1. Stations of Kiğı Dam Lake

Table 1. Coordinates of stations in Kiğı Dam Lake

I. Station	II. Station	III. Station
39 ^o 22'10.27"N	39 ^o 22'19.03"N	39 ^o 22'24.01"N
40 ^o 20'47.75"E	40 ^o 21'0.71"E	40 ^o 20'52.34"E

In this research distribution of zooplankton were determined during September 2012 and August 2013 seasonally. The zooplankton samples were collected with a standard plankton net (Hydrobios Kiel, 25 cm diameter 55 µm mesh size) horizontally and the specimens were preserved in 4% formaldehyde solution. The species were identified according to Edmondson (1959), Flössner (1972), Ruttner-Kolisko (1974), Kiefer (1978), Koste (1978), Negrea (1983), Segers (1995), and Einsle (1996). Temperature and dissolved oxygen were measured by an Oxi 315i/SET oxygen-meter, pH by a Lamotte (pH 5-WC) model pH meter in situ.

RESULTS

A total of 22 taxa consisting of 16 Rotifera, 4 Cladocera and 2 Copepoda species were identified in the Dam Lake (Table 2).

Table 2. Seasonal distribution according stations of zooplankton fauna in Kiğı Dam Lake

Species	Autumn			Winter			Spring			Summer		
	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>Brachionus angularis</i> Gosse, 1851	+	+	+	-	-	-	+	+	-	+	+	-
<i>Cephalodella gibba</i> (Ehrenberg, 1830)	-	-	-	-	-	-	+	+	-	-	+	-
<i>Euchlanis dilatata</i> Ehrenberg, 1832	-	+	+	-	-	-	-	+	+	-	-	+
<i>Kellicottia longispina</i> (Kellicott, 1879)	-	-	-	-	-	-	+	+	-	+	+	+
<i>Keratella cochlearis</i> (Gosse, 1851)	+	+	+	-	+	+	+	+	-	+	+	+
<i>Keratella quadrata</i> (Müller, 1786)	+	+	+	-	-	-	-	-	+	+	+	-
<i>Lecane luna</i> (Müller, 1776)	-	+	+	-	-	-	-	+	-	-	-	-
<i>Lecane lunaris</i> (Ehrenberg, 1832)	-	+	-	-	-	+	-	+	-	+	-	-
<i>Notholca squamula</i> (Müller, 1786)	-	-	-	-	+	+	-	-	-	-	-	-
<i>Polyarthra dolichoptera</i> Idelson, 1925	+	-	+	-	+	-	+	+	+	-	+	+
<i>Rotaria rotatoria</i> (Pallas, 1766)	-	-	+	+	-	-	-	+	-	-	-	-
<i>Synchaeta oblonga</i> Ehrenberg, 1832	+	-	-	-	-	-	+	+	-	-	+	+
<i>Synchaeta pectinata</i> Ehrenberg, 1832	+	-	+	-	-	+	+	-	+	-	+	-
<i>Trichocerca capucina</i> (Wierzejski & Zacharias, 1893)	-	-	-	-	-	-	-	+	-	-	-	-
Cladocera												
<i>Bosmina longirostris</i> (Müller, 1785)	+	+	-	+	-	-	+	-	+	+	-	-
<i>Chydorus sphaericus</i> (Müller, 1776)	-	-	-	-	-	-	-	-	-	-	+	-
<i>Daphnia cucullata</i> Sars 1862	-	-	-	-	-	-	-	-	-	-	+	-
<i>Daphnia longispina</i> Müller, 1875	-	+	-	-	-	-	+	-	-	-	-	-
Copepoda												
<i>Acanthodiptomus denticornis</i> (Wierzejski, 1887)	-	+	-	+	+	-	-	-	-	-	-	-
<i>Cyclops vicinus</i> Uljanin, 1875	+	-	-	-	+	-	-	+	-	+	+	-

When seasonal distributions of species were examined, Rotifera was higher than Cladocera and Copepoda. According to the number of taxa, rotifers were the dominant group in the dam lake (72.7%) followed by Cladocera (18.2%) and Copepoda (9.1%). The highest of numbers of taxa were found in spring at station 2 (14 species) followed by autumn at station 2 (10 species). The lowest numbers of taxa were recorded in winter at first stations (4 species). Some water quality parameters (pH, dissolved oxygen, and surface water temperature) were measured at study field (Table 3).

Table 3. Seasonal changes of water quality parameters in Kiğı Dam Lake

	Autumn	Winter	Spring	Summer
Water temperature (°C)	16	7.2	17.2	22.5
pH	7.0	6.8	6.9	7.3
D.O (mgL ⁻¹)	6.2	7.3	6.0	5.2

Keratella cochlearis and *Polyarthra dolichoptera* from Rotifera were dominant. *Bosmina longirostris* was dominant, belong to Cladocera species. Dominant Copepoda species were found as *Cyclops vicinus*. *A.priodonta*, *K.cochlearis*, *L.lunaris*, *P.dolichoptera*, *S.pectinata* from Rotifera; *B. longirostris* from Cladocera and *C. vicinus* from Copepoda were identified in all seasons. *N.squamula* (winter) and *T.capucina*

(spring) from Rotifera; *C.sphaericus* (spring) and *D.cucullata* (spring) from Cladocera were recorded only one season.

DISCUSSION

Zooplankton is known as the indicator of trophic status of aquatic habitats. They are also used to signify the water quality in freshwater systems. *K. cochlearis* and *P. dolichoptera* from Rotifera are indicators of productive habitats, while *N. acuminata* and *N. squamula* are indicators of cold waters (Kolisko, 1974). In Kiğı Dam Lake *K. cochlearis*, *P. dolichoptera* and *N. squamula* were observed.

In Murat River (Bulut and Saler, 2014a), Kalecik Dam Lake (Bulut and Saler, 2013b), Peri Stream (Saler et al., 2011), that were located in the same region with Kiğı Dam Lake, rotifers were recorded as dominant species as to number of individuals and abundance, followed by Cladocera and Copepoda species.

In Beyhan Dam Lake (Bulut and Saler, 2014b), that is located in the same river with Kiğı Dam Lake dominant Rotifera species was *Keratella cochlearis* followed by *Polyarthra dolichoptera*. The similar results were observed in Kiğı Dam Lake.

K. cochlearis, *P. dolichoptera*, *B. longirostris* and *C. vicinus* are well known indicators of eutrophic waters (Ryding and Rast, 1989). Brachionus and Keratella species are inhabitants of moderately mesotrophic waters (Saksena, 1987). *K. cochlearis*, *P. dolichoptera*, *B. longirostris* and *C. vicinus*, were recorded in all seasons in Kiğı Dam Lake. Besides, *K. cochlearis*, *P. dolichoptera* are reported to be found in many aquatic environment and cosmopolite species and have got wide distribution habitats (Kaya and Altındağ, 2007; Saler et al., 2011; Bulut and Saler, 2014b).

Only four species from Cladocera were identified in the lake. *B. longirostris*, was observed in all seasons. *C. sphaericus* and *D.cucullata* were rarely found in Kiğı Dam Lake.

Blacher (1984), reported that cyclopoids could be more abundant in eutrophic lakes when compared with calanoids. Our data indicate that *C. vicinus* (belong to copepod) was present for every season of Kiğı Dam Lake

Saler and Haykır (2011), Saler et al. (2011) and Ipek Alish and Saler (2016), reported in winter there was decrease in zooplankton species abundance and a significant increase in spring and autumn. Similar results were found in this study. In spring the most number of species was recorded in the 2nd station with 14 species, whereas the least species number was recorded in winter in the 2nd and 3rd station. Only 5 species were recorded in the both stations in this season.

Temperature is known as one of the limiting factors for zooplankton abundance and distribution (Mikschi, 1989). It is known that there is a positive correlation between water temperature and species richness of zooplankton in aquatic environments (Hessen et al., 2007). In Kiğı Dam Lake water temperature measurements were in the range of 7.2-22.5 °C, 6.8-7.3 for pH and 5.2-7.3 mgL⁻¹ for dissolved oxygen values. Species richness of zooplankton is positively affected by an increase in temperature. Zooplankton distribution of Kiğı Dam Lake supports this hypothesis that species richness of zooplankton increased in warm months in spring and autumn.

REFERENCES

- Berzins, B. & Pejler, B. (1987). Rotifer occurrence in relation to pH. *Hydrobiologia*, 147, 107-116.
- Blacher, E.C. (1984). Zooplankton trophic state relationships in North and Central Florida Lakes. *Hydrobiologia*, 109, 251-263.
- Bulut, H. & Saler, S. (2013a). Ladik Gölü (Samsun) zooplanktonu üzerine ilk gözlemler. *Su Ürünleri Mühendisleri Dergisi*, 51,74-78.
- Bulut, H. & Saler, S. (2013b). Kalecik Baraj Gölü (Elazığ- Türkiye) zooplanktonu. *Fırat Üniversitesi Fen Bilimleri Dergisi*, 25 (2), 99-103.
- Bulut, H. & Saler, S. (2014a). Zooplankton variation of Murat River (Elazığ-within the borders Palu district). *Turk J Agrie-Food Sci Tech.*, 2(1),13-17.
- Bulut, H & Saler, S. (2014b). Zooplankton of Beyhan Dam Lake (Elazığ-Turkey). *Turkish Journal of Science & Technology*, 9(1), 23-28.
- Bozkurt, A. & Sagat, Y. (2008). Vertical distribution of Birecik Dam Lake (Turkey) zooplankton. *Journal of Fisheries Sciences*, 2(3), 332-342.
- Canfield, T.J. & Jones, J.R. (1996). Zooplankton abundance, biomass, and size distribution in selected Midwestern waterbodies and relation with trophic state. *Journal of Freshwater Ecology*, 11, 171–181.
- Cirik, S. & Gökpınar, Ş. (1993). Plankton Bilgisi ve Kültürü. Ege Üniversitesi Su Ürünleri Fakültesi. Yayınları: 19, İzmir.
- Einsle, U. (1996). Copepoda: Cyclopoida, Genera Cyclops, Megacyclops, Acanthocyclops. Guides to the Identification of the Microinvertebrates of the Continental Waters of the World No.10 SPB Academic Publishing. pp 82 (in London).
- Edmondson, W.T. (1959). Fresh Water Biology. Second edition, University of Washington. Seattle, pp.1248.
- Flössner, D. (1972). Krebstiere, Crustacea. Kiemen und Blattfüsser, Branchiopoda, Fischlause, Branchiura., Tierwelt Deutschlands, 60. teil, veb Gustav Fischer Verlag, Jena, 501 p
- Göksu, M.Z.L., Çevik, F., Bozkurt, A. & Sarıhan, E. (1997). Seyhan Nehri'nin (Adana il merkezi sınırları içindeki bölümünde) Rotifera ve Cladocera faunası. *Turkish Journal of Zoology*, 21, 439-443.
- Göksu, M.Z.L., Bozkurt, A., Taşdemir, M. & Sarıhan, E. (2005). Asi Nehri (Hatay, Türkiye) Cladocera ve Copepoda faunası. *Ege University Journal of Fisheries and Aquatic Sciences*, 22(1-2), 17-19
- Hessen, D.O., Bakkestuen, V. & Walseng, B. (2007). Energy input and zooplankton species richness. *Ecography*, 30, 749-758.
- Ipek Alış, N. & Saler, S. (2016). Zooplankton Fauna of Özlüce Dam Lake (Bingöl-Turkey). *BEU Journal of Science*, 5(1), 86-90.
- Kaya, M. & Altındağ A. (2007). Zooplankton fauna and seasonal changes of Gelingülü Dam Lake (Yozgat. Turkey). *Turkish Journal of Zoology*, 31, 347-351.
- Kiefer, F. (1978). Das Zooplankton der Binnengewasser 2. Teil. Freilebende Copepoda. Die Binnengewasser Band XXVI E. Schweizerbart'sche Verlagbuchhandlung, Stuttgart. 315 p.
- Koste, W. (1978). Rotatoria, Die Radertiere Mitteleuropas. Ein Bestimmungswerk, begründet von Max Voigt. Überordnung Monogononta. Berlin, Germany: Gebruder Borntraeger (in German)
- Negrea, S.T. (1983). Fauna Republici Socialiste Romania, Crustacea Cladocera. Academia Republici Socialiste.399 pp (in Romania).
- Mikschi, E. (1989). Rotifer distributions in relation to temperature and oxygen content. *Hydrobiologia*, 186-187, 209-214.
- Özdemir, Y. & Şen, D. (1994). Keban Baraj Gölü Uluova bölgesi zooplanktonunun mevsimsel dağılımı. *Fırat Üniversitesi Fen ve Mühendislik Bilimleri Dergisi*, 6, 154–162.

- Ruttner-Kolisko, A. (1974). Plankton Rotifers, Biology and Taxonomy. Die Binnengenwasser, Volume XXVI/I, Supplement. Stuttgart, Germany: E. Schweizerbart'sche Verlagsbuchhandlung
- Ryding, S.O. & Rast, W. (1989). The Control of Eutrophication of Lakes and Reservoirs. (Man and the Biosphere) Parthenon Publication Group.
- Saksena, N.D. (1987). Rotifers as indicator of water quality. *Hydrobiology*, 15, 481-485.
- Saler, S. & Şen, D. (2002). A taxonomical study on the rotifera fauna of Tadım Pond (Elazığ). *Ege Üniversitesi Su Ürünleri Dergisi*, 19, 474-500.
- Saler, S. & Haykır, H. (2011). Zooplankton composition of Pulumur Stream (Tunceli, Turkey). *Journal of Animal and Veterinary Advances*, 10(11), 1401-1403.
- Saler, S., Eroğlu, M. & Haykır, H. (2011). Peri Çayı (Tunceli-Türkiye) zooplanktonu, *e Journal of New World Sciences Academy*, 6(2), 14-20.
- Saler, S., Bulut, H., Örnekci, G.N. & Uslu, A.A. (2015a). Ulaş Gölü (Ulaş-Sivas) zooplanktonu. *Int. J. Pure Appl. Sci.*, 1(2):112-121.
- Saler, S., Bulut, H., Birici, N., Tepe, R. & Alpaslan, K. (2015b). Karasu Nehri (Erzincan)'nin zooplanktonu. *Eğirdir Su Ürün Fak Derg.*, 11(1),10-16.
- Segers, H. (1995). The Lecanidae (Monogononta). In: Nogrady T. (ed) Rotifera 2. In: Dumont HJ (ed) Guides to the Identification of the Continental Waters of the World 6. SPB Academic, pp 226 The Hague, The Netherlands.
- URL,2016.https://tr.wikipedia.org/wiki/K%C4%B1%C4%9F%C4%B1_Baraj%C4%B1_ve_Hidro_elektrik_Santrali.