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A Preliminary Study on Zooplankton Species in Different Aquatic Habitats of Anatolia (Turkey)

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ABSTRACT

In this research, a preliminary study on zooplankton species was conducted a total of 7 in the freshwater areas in the Mediterranean, Aegean and Central Anatolia region of Turkey. Zooplankton sampling were collected one-time study between 2002 and 2012 from the study areas. Samples were taken using plankton net Hydrobios with a mesh size of 55 µm and preserved with 4% formaldehyde solution. At the end of the study, a total of 43 species were identified, including 20 species Rotifera, 18 species Cladocera, 5 species Copepoda. *Pleuroxus aduncus*, *Chydorus sphaericus*, *Bosmina longirostris*, *Leydigia leydigi*, *Keratella cochlearis* and *Asplanchna priodonta* were observed as intensive during the study area. All species have been recorded for the first time in this study regions.

Keywords: Rotifera, Cladocera, Copepoda, plankton, reservoir

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Anadolu'nun Farklı Sucul Habitatlarında Zooplankton Türleri Üzerine Bir Ön Çalışma (Türkiye)

Öz: Bu araştırmada, Türkiye de Akdeniz, Ege ve İç Anadolu Bölgelerinde toplam 7 tatlısu alanında zooplankton türleri üzerine bir ön çalışma yapılmıştır. Zooplankton örnekleri 2002 ve 2012 tarihleri arasında çalışma sahalarından bir kez alınarak toplanmıştır. Örnekler 55 µm göz açıklığındaki Hydrobios plankton kepçesiyle alınmış ve % 4'lük formaldehit solüsyonunda muhafaza edilmiştir. Çalışma sonunda Rotifera'dan 20, Cladocera'dan 18 ve Copepoda'dan 5 tür olmak üzere toplam 43 tür teşhis edildilmiştir. *Pleuroxus aduncus*, *Chydorus sphaericus*, *Bosmina longirostris*, *Leydigia leydigi*, *Keratella cochlearis* ve *Asplanchna priodonta* türleri çalışma alanında yoğun olarak gözlenmiştir. Tüm türler bu çalışma alanlarından ilk kez kayıt edilmiştir.

Anahtar kelimeler: Rotifera, Cladocera, Copepoda, plankton, rezervuar

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Introduction

Zooplanktonic organisms are the main food source of many fish in larval stage (Wetzel 2001). Zooplanktonic organisms, which have important role in fresh water ecosystems, are generally used as an indicator in determining the trophic condition of the water quality, and in eutrophication (Michaloudi et al. 1997; Bozkurt and Akın 2012). Some factors are influential in the distribution and variety of Rotifera from zooplankton. The most important of these is the deterioration of the water quality. Many different Rotifera species can be used as an indicator of acidic, oligotrophic and mesotrophic waters (Segers 2008). Among the Rotifera group organisms used as indicators in some lakes and rivers; while Brachionidae species are used as the indicator of eutrophic waters, *Trichocerca* species are used as the indicators of oligotrophic-mesotrophic waters (Nandini et al. 2016).

318 dam lake and 755 ponds are active in our country since the beginning of 2016 (DSI 2016a). In addition to the studies in natural lakes in Turkey, also studies in waters like streams, dams and ponds have started. Many studies have been made on Rotifera, Copepode and Cladocera faunas in many habitats as Demirköprü Dam (Demirhindi 1990), Kunduzlar and Çatören Dam Lakes (Altındağ and Özkurt 1998), Devegeçidi Dam (Bekleyen 2001), Tadım Pond (Saler and Şen 2002), Hirfanlı Dam (Yiğit and Altındağ 2005), Gelingüllü Dam (Kaya and Altındağ 2007), Alıç Pond (Güher and Erdoğan 2008), Tahtalı Dam (Özdemir Mis et al. 2009), Zernek Dam (Yıldız

2012), Porsuk, Enne and Kayaboğazı Dams (Apaydın Yağcı et al. 2013), Karakaya Dam lakes (Gökçe and Özhan Turhan 2014), Süloğlu Dam (Güher and Çolak 2015), Kemer Dam (Tuna and Ustaoğlu 2016), other dam lakes in West Black Sea, Marmara and Central Anatolia regions (Ergönül et al. 2016). Dam lakes are important areas which protects residential areas and cultivated areas from floods, ensures the irrigation of cultivated areas adequately and seasonably, provides essential drinking, tap and industrial water regularly, produces hydroelectric energy, and contributes to fishery and fishing. The control of the water quality and contamination can be provided by observing the zooplanktonic organisms in dam lakes. The aim of this study is to analyse zooplanktonic species in some dams, ponds and streams; Apa, Sille (Konya), Yapraklı and Onaç (Burdur) Dam Lakes, Keçiborlu (Isparta) and Beylerli (Denizli) Ponds and Mancınık (Sivas) stream.

Materials and Methods

Sille Dam was constructed on Sille Stream in Konya province between 1953-1962 years for irrigation and flood control purposes; the lake area is 0.28 km^2. Apa Dam was constructed on Çarşamba Stream for irrigation purposes between 1957–1962 years; the lake area is 12.6 km^2. Yapraklı Dam was constructed on Horzum Stream in Burdur for irrigation purposes between 1985–1991 years; the lake area is 6.5 km^2. Onaç-2 Dam was constructed on Onaç Stream for irrigation purposes in Burdur between 1993–2006 years; the lake area is 35 km^2. Beyberli Pond, which has an 762 ha irrigation area in Çardak, Denizli; was constructed between 1997–2006 years (DSI, 2016b) Keçiborlu pond is a Dam Lake constructed on Uzun Stream and the stream known as Kısık Gate. Mancınık Stream is located in Sivas province. Zooplankton samples were collected between 2002–2012 years on study areas (Figure 1, 2) by single sampling. Samples were taken with 55µm mesh Hydro-Bios plankton net, and preserved in % 4 formaldehyde solution. Species was identified by invert, stereo and research microscope with the help of related sources (Koste 1978; Negrea 1983; Dussart 1967, 1969; Nogrady and Segers 2002). Zooplankton species are listed according to Ustaoğlu 2004.

Results

At the end of the study, 20 from Rotifera, 18 from Cladocera and 5 from Copepoda; totally 43 zooplankton species were identified. The distribution of the species are given in Table 1.

Figure 1. a) Sille Dam Lake b) Apa Dam Lake c) Yapraklı Dam Lake d) Onaç Dam Lake e) Keçiborlu Pond.

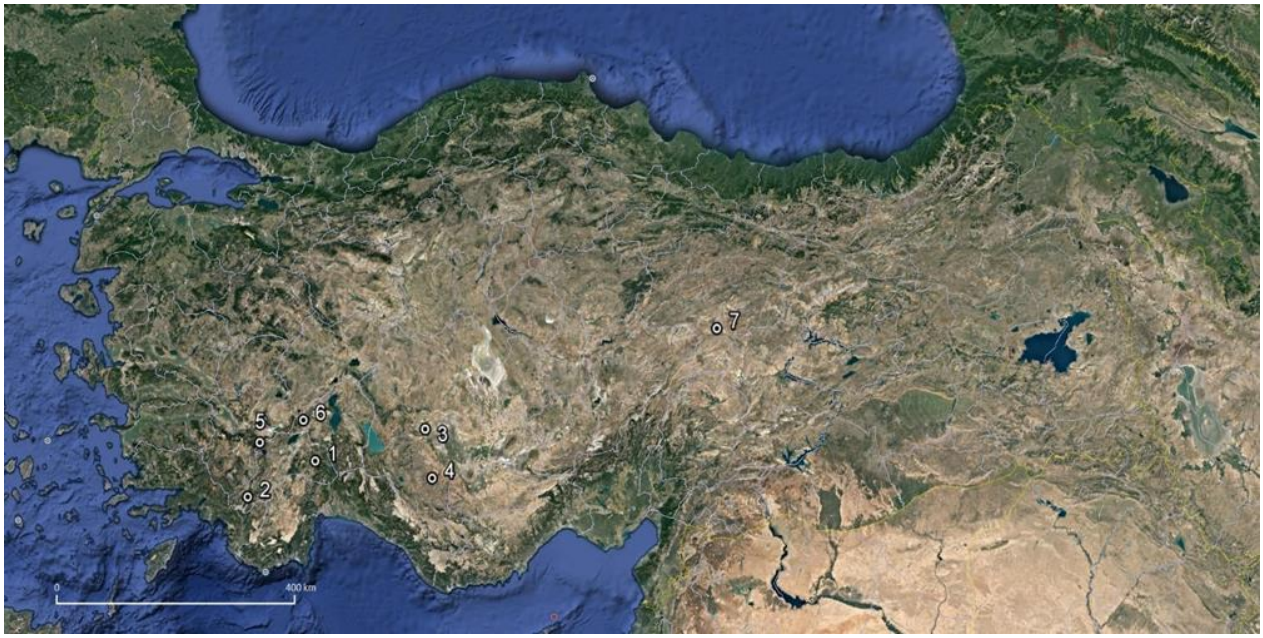

Figure 2. Study site map.

Some of the zooplankton species are known as the indicator of eutrophication (e.g; *Brachionus calyciflorus, Brachionus angularis, Keratella quadrata, K. cochlearis, Polyarthra dolichoptera, Filinia longiseta, Lecane luna, B. longirostris, C. sphaericus, Daphnia* sp., *Ceriodaphnia* sp., *Cyclops vicinus*).

Discussion

Zooplankton community in Jaguari and Jacareí Reservoir rivers in Brazil was used as indicator of trophic condition in these sources (Neto et al. 2014). While there is a distribution of zooplankton in littoral habitat, oxygen and temperature tolerances are wide among peripheral variables (Thomasen et al. 2013). It is thought that zooplankton is an important element in quality management purposes (Sartori et al. 2009). Cladocerans have important role in fresh waters (Ustaoğlu 2015), estuarine areas, eutropic environment; (Paranaguá et al. 2005), while Rotifera group of organism indicates the contamination level of the water, they are also used as an indicator of the changes in peripheral conditions (Gutkowska et al. 2013).

Among the species identified in the study; *K. quadrata, B. calyciflorus, P. dolichoptera, F. longiseta, Testudinella patina, C. sphaericus, B. longirostris, C. vicinus* ve *Nitokra hibernica* are reported as cosmopolit and possessing a wide distribution in many inland water (Bozkurt and Akın 2012). *B. calciflorus, F. longiseta, L. bulla, A. pridonta, K. quadrata, C. quadrangula, B. longirostris* and *C. strenuus* species which were identified in Onaç, Apa, Sille Dam Lakes, Beylerli and Keçiborlu ponds, were also encountered in Tahtalı, Kemer and Kayaboğazı, Porsuk and Enne Dam Lakes (Özdemir Mis et al. 2009; Apaydın Yağcı et al. 2013; Tuna and Ustaoğlu 2016). *T. patina* species found in Mancınık Stream, was also found in Hasan Uğurlu and Suat Uğurlu Dam Lakes (Bozkurt and Akın 2012).

B. quadridentatus species which was found in Hirfanlı Dam Lake (Yiğit and Altındağ 2005) was also encountered in Mancınık Stream. In addition to this, *A. priodonta* species existing in Süloğlu Dam Lake (Güher and Çolak 2015) was identified in Sille Dam and Keçiborlu pond in study area. Also *B. calyciflorus* species found in Gelingüllü Dam Lake which was not found in our study area Mancınık Stream, but we found in Onaç Dam and it is thought to be an indicator of eutrophication (Kaya and Altındağ 2007). *K. quadrata* species found in Yapraklı and Apa Dam Lakes and *Synchaeta pectinata* species found in Keçiborlu Pond were also encountered accordingly in Tadım Pond (Saler and Şen 2002). *B. calyciflorus, B. angularis, Trichocerca similis, S. pectinata, P. dolichoptera, F. longiseta, A. priodonta* ve *A. sieboldii* species found in Devegeçidi Dam Lake (Bekleyen 2001), were also identified in Onaç Dam Lake and Keçiborlu Pond. Dam lakes are primarily affected by environmental pollution as they are constructed on rivers carrying the load gathered from many residential sites. These contaminants affects negatively the creatures living in the water at first, then reaches even to human beings by food chain. Therefore studies on Dam Lakes increased remakably.

To benefit effectively from the inland water sources, the necessity to know the biologic capacities, food sources they carry, and ecology of these sources have arisen.

Table 1. Yapraklı, Apa, Sille and Onaç Dam, Beylerli, Keçiborlu Ponds and Mancınık Stream Zooplankton Species.

Species	Study Areas						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
ROTIFERA							
Asplanchna priodonta Gosse, 1850			▲			▲	
Asplanchna sieboldii (Leydig, 1854)	▲						
Brachionus angularis Gosse, 1851						▲	
Brachionus calyciflorus Pallas, 1766	▲						
Brachionus quadridentatus Hermann, 1783							▲
Filinia longiseta (Ehrenberg, 1834)	▲						
Keratella cochlearis (Gosse, 1851)	▲		▲			▲	
Keratella quadrata (O.F. Müller, 1786)		▲		▲			
Keratella valga (Ehrenberg, 1834)	▲						
Lecane bulla (Gosse, 1851)					▲		▲
Lecane clostrocerca (Schmarda, 1859)	▲						▲
Lecane luna (Müller, 1776)					▲		▲
Lecane sp.						▲	
Lophocharis salpina (Ehrenberg, 1834)							▲
Polyarthra dolichoptera Idelson, 1925						▲	
Synchaeta pectinata Ehrenberg, 1832						▲	
Synchaeta sp.			▲	▲			
Testudinella patina (Hermann, 1783)							▲
Trichocerca similis (Wierzejski, 1893)	▲						
Trichotria pocillum (O.F. Müller, 1776)							▲
CLADOCERA							
Alona guttata Sars, 1862				▲			
Acroperus harpae (Baird, 1835)				▲			
Biapertura affinis (Leydig, 1860)							▲
Bosmina longirostris (O.F. Müller, 1776)			▲	▲	▲	▲	
Ceriodaphnia pulchella Sars, 1862		▲					
Ceriodaphnia quadrangula (O.F.Müller, 1785)	▲						
Chydorus sphaericus (O.F. Müller, 1776)		▲	▲	▲	▲		
Coranatella rectangula (Sars, 1861)		▲					
Daphnia obtusa Kurz, 1875				▲			
Daphnia pulicaria Forbes, 1893		▲					
Disparalona rostrata (Koch, 1841)		▲					
Eurycercus lamellatus (O.F. Müller, 1776)		▲					
Leydigia leydigi (Schoedler, 1863)		▲					
Macrothrix laticornis (Jurine, 1820)		▲	▲				
Moina branchiata (Jurine, 1820)	▲						
Pleuroxus aduncus (Jurine, 1820)			▲	▲			▲
Pleuroxus trigonellus (O.F. Müller, 1776)							▲
Scapholeberis kingi G.O Sars, 1888		▲					
COPEPODA							
Acanthodiaptomus denticornis (Wierzejski, 1887)				▲			
Cyclops strenuus Fischer, 1851				▲			
Cyclops vicinus Ulianine, 1875		▲			▲		
Eucyclops macruroides (Lilljeborg, 1901)			▲				
Nitokra hibernica (Brady, 1880)				▲			

[1]: Onaç Dam Lake 11.08.2009 [2]: Yapraklı Dam Lake 11.05.2002 [3]: Sille Dam Lake 31.01.2004
[4]: Apa Dam Lake 31.03.2004 [5]: Beylerli Pond 12.11.2008 [6]: Keçiborlu Pond 22.10.2012
[7]: Mancınık Stream 21.08.2008

Therefore, especialy studies on ecology and biology of zooplanktonic organisms in dams, ponds and streams in the scope of biological studies on inland waters will be important. Zooplanktonic species identified in this study were recorded for the first time from Apa, Sille, Yapraklı and Onaç Dam Lakes, Keçiborlu, Beylerli Pond and Mancınık Stream. Besides, these species will contribute to the biodiversity of Turkey and will enlighten the later studies.

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