The Investigation of the Zooplanktonic Organisms of Delice River and Its Arms in Kızılırmak River Basin (Turkey)

Kızılırmak Havzası, Delice Nehri ve Kollarında Bulunan Zooplanktonik Organizmaların İncelenmesi

Research Article / Araştırma Makalesi

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ABSTRACT

In this study 34 species of Rotifera, 9 species of Cladocera and 1 species of Copepoda have been observed during the study between May 2007-May 2008 from Kızılırmak River, Delice, Kılıçözü, Malaközü and Budaközü Streams in the Kızılırmak River Basin in Turkey. During the study *Brachionus, Lecane, Cephalodella* belongs to Rotifera; *Bosmina longirostris* and *Cydorus sphaericus* belongs to Cladocera and *Eucyclops serrulatus* belong to Copepoda were the commonest genera and species. Also *Asplanchna priodonta, Brachionus quadridentatus, Brachionus calyciflorus, Euchlanis dilatata* and *Synchaeta pectinata* were the annual species.

Key Words
Zooplankton, Seasonal distribution, Kızılırmak River Basin

ÖZET

Kızılırmak Nehir Havzası, Delice, Kılıçözü, Malaközü ve Budaközü derelerinde Mayıs 2007-Mayıs 2008 döneminde yapılan çalışmada Rotifera'dan 34 tür, Cladocera'dan 9 tür ve Copepoda'dan 1 tür tespit edilmiştir. Çalışmada Rotifere'ya ait *Brachionus, Lecane, Cephalodella* Cladocera ya ait *Bosmina longirostris* ve Copepoda'ya ait *Cydorus sphaericus Eucyclops serrulatus* en yaygın görülen türler olmuştur. Aynı zamanda *Asplanchna priodonta, Brachionus quadridentatus, Brachionus calyciflorus, Euchlanis dilatata* and *Synchaeta pectinata* yıl boyu gözlenen türler olmuştur.

Anahtar Kelimeler
Zooplankton, Mevsimsel Dağılım, Kızılırmak Nehir Havzası

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INTRODUCTION

Although a lot of studies have been done on the zooplanktonic organisms, a few of them on the riverine zooplakton. These studies have been increased recently according to Water Framework Directive after the year of 2000.

The last checklist on Rotifers prepared by Ustaoğlu et al. [1] reported 341 rotifer taxa in Turkey and until now 93 species belong to Cladocera and 106 species belongs to Copepoda were identified [2-6].

There were no zooplankton study have been done on the Delice River and arms. Some studies are available in the near area. Yiğit and Altındağ [7], were determined totally 32 zooplankton species which of them 19 belongs to Rotifera; 9 belongs to Cladocera and 4 belongs to Copepoda in Hirfanlı Dam. Also Baykal et al. [8] were investigated the reletionship between phytoplankton and zooplankton density in Hirfanlı Dam Lake too.

MATERIALS AND METHODS

Samples were collected monthly from 10 different localities during May 2007-May 2008 using a standard plankton net (mesh diameter 44 μm) and fixed with formaldehyde [9] The rotifer species were identified according to [10-17]. Cladocera species were identified according to [18-22] For the copepoda [23,24] references have been used.

RESULTS AND DISSCUSSION

Samples from 10 freshwater sites in Kızılırmak river basin yielded 44 zooplankton species which of them 34 belongs to Rotifera; 9 belong to Cladocera and 1 species belong to Copepoda. (Table 1 and Table 2). The monthly distribution of the zooplankton species have been given in the Table 3-5 and also their distribution according to the stream locality have been given on the Table 6.

During the study Rotifera species number were higher than the other zooplankton due to their short generation time and high adaptation to different ecological condition [25]. Among rotifers some cosmopolitan genera like *Brachionus* (5 species), *Lecane* (4 species) and *Cephalodella* (4 species) were observed during the year.

Acharya et al [26] were observed that with smaller body cladoceran like *Bosmina* were highly abundant in the rivers generally. In the study area *Bosmina longirostris* was also abundant species while *Ceriodaphnia reticulata, Simocephalus vetulus, Alona rectangula* and *Scapholeberis kingi* were occured only in May 2007; *Moina micrura* was observed only in september 2007 and *Macrothrix*

Table 1. Sampling localities and coordinates [9].

Sampling point	Rivers	Locality	Altitude (m)	GPS Coordinate	
1st Station	Kızılırmak River	Kırıkkale	671	39°55.300 N,	033°25.898 E
2nd Station	Delice Streams	Kırıkkale	649	39°52.497 N,	034°03.887 E
3rd Station	Delice Streams	Kırşehir	702	39°48.161 N,	034°06.139 E
4th Station	Delice Streams	Yozgat	1154	39°38.414 N,	034°28.183 E
5th Station	Kılıçözü Streams	Kırıkkale	759	39°39.574 N,	033°54.722 E
6th Station	Delice Streams	Kırıkkale	618	40°00.154 N,	034°04.879 E
7th Station	Budaközü Streams	Çorum	643	40°08.543 N,	034°11.785 E
8th Station	Delice Streams	Kırşehir	702	39°42.924 N,	034°15.379 E
9th Station	Delice Streams	Kırşehir	719	39°41.849 N,	034°21.858 E
10th Station	Malaközü Streams	Kırşehir	810	39°35.005 N,	033°53.894 E

Table 2. Identified zooplankton species from Kızılırmak River basin.

Şube: Rotifera
Sınıf: Bdelloidea
Sınıf: Monogononta
Takım: Ploimida
Familya: Brachionidae EHRENBERG 1838
Brachionus PALLAS 1766
Brachionus calyciflorus PALLAS 1766
Brachionus quadridentatus HERMANN 1783
Brachionus urceolaris O.F.MÜLLER 1773
Brachionus angularis GOSSE 1851
Brachionus plicatilis O.F. MÜLLER 1786
Keratella **BORY DE ST. VINCENT 1822**
Keratella quadrata O.F.MÜLLER 1786
Notholca **GOSSE 1886**
Notholca acuminata EHRENBERG 1832
Familya: Euchlanidae BARTOS 1959
Euchlanis EHRENBERG 1832
Euchlanis dilatata EHRENBERG 1832
Euchlanis incisa CARLIN 1939
Familya: Colurellidae BARTOS 1959
Colurella BORY DE ST. VINCENT 1824
Colurella adriatica EHRENBERG 1831
Colurella colurus EHRENBERG 1830
Familya: Lecanidae BARTOS 1959
Lecane NITZSCH 1827
Lecane elsa HAUER 1931
Lecane luna O.F.MÜLLER 1776
Lecane lunaris EHRENBERG 1832
Lecane stenroosi MEISSNER 1908
Lepadella BORY DE ST. VINCENT 1826
Lepadella patella O.F.MÜLLER 1786
Lindiidae REMANE 1933
Lindia DUJARDIN 1841
Lindia truncata JENNINGS 1894
Lindia torulosa DUJARDIN 1841
Familya: Notommatidae REMANE 1933
Cephalodella BORY DE ST. VINCENT 1826
Cephalodella catellina MÜLLER 1786
Cephalodella gibba EHRENBERG 1832
Cephalodella stenroosi WULFERT 1937
Cephalodella ventripes DIXON-NUTTALL 1901
Familya: Trichocercidae REMANE 1933
Trichocerca LAMARCK 1801
Trichocerca taurocephala HAUER 1931
Familya: Synchaetidae REMANE 1933
Synchaeta EHRENBERG 1832
Synchaeta oblonga EHRENBERG 1831
Synchaeta pectinata EHRENBERG 1832
Polyarthra EHRENBERG 1834
Polyarthra remata SKORIKOW 1896
Polyarthra vulgaris CARLİN 1943
Familya: Asplanchnidae HARRING & MYERS 1926
Asplanchna GOSSE 1850
Asplanchna priodonta GOSSE 1850 *Asplanchna sieboldi* LEYDIG 1854
Takım: Gnesiotrocha DE BEAUCHAMP 1965
Alt Takım: Floscullariacea REMANE 1933
Familya: Testudinellidae BARTOS 1959
Testudinella BORY DE ST. VINCENT 1826
Testudinella patina HERMANN 1783
Pompholyx **GOSSE 1851**
Pompholyx complanata GOSSE 1851
Familya: Hexarthridae BARTOS 1959
Hexarthra SCHMARDA 1854
Hexarthra fennica LEVANDER 1892
Familya: Filiniidae BARTOS 1959
Filinia BORY DE ST. VINCENT 1824
Filinia longiseta EHRENBERG 1834
Filinia terminalis PLATE 1886

Şube: Arthropoda
Sınıf: Branchiopoda
Alt sınıf: Diplostraca
Takım: Cladocera
Alt takım: Anomopoda
Familya: **Daphniidae** STRAUSS 1820
Simocephalus SCHOEDLER 1858
Simocephalus vetulus O. F. MÜLLER 1776
Ceriodaphnia DANA 1853
Ceriodaphnia quadrangula O. F. MÜLLER 1785
Ceriodaphnia reticulata JURINE 1820
Scapholeberis SCHOEDLER 1858
Scapholeberis kingi SARS 1903
Familya: **Moinidae** GOULDEN 1968
Moina BAIRD 1850
Moina micrura KURZ 1874
Familya: **Macrothricidae** NORMAN & BRADY 1867
Macrothrix BAIRD 1845
Macrothrix laticornis FISCHER 1851
Familya: **Bosminidae** BAIRD 1845
Bosmina BAIRD 1845
Bosmina longirostris O.F. MÜLLER 1785
Chydoridae STEBBING 1902
Alt-aile: **Chydorinae** STEBBING 1902
Cins: *Chydorus* LEACH 1816
Tür: *Chydorus sphaericus* O.F. MÜLLER 1785
Alt- Familya: **Aloninae** FREY 1967
Cins: *Alona* BAIRD 1843
Tür: *Alona rectangula* SARS 1862
Alt şube: Mandibulata
Sınıf: Crustacea
Alt sınıf: Copepoda
Takım: Cyclopoida
Familya:: Cyclopoidae G.O. SARS 1913
Alt- Familya: Eucyclopoinae KIEFER 1927
Eucyclops CLAUS 1893
Eucyclops serrulatus FISCHER 1851

Table 3. Monthly occurence of rotifers.

ROTİFERA	May'07	June'07	July'07	Aug'07	Sept'07	Oct'07	Nov'07	Dec'07	Feb'08	Mar'08	Apr'08	May'08
Brachionus calyciflorus	+				+	+	+			+		+
Brachionus quadridentatus	+	+	+	+	+	+	+			+		+
Brachionus angularis			+									
Brachionus urceolaris		+										+
Brachionus plicatilis	+		+				+					
Keratella quadrata			+							+		
Notholca acuminata								+	+	+		
Euchlanis dilatata	+	+	+	+		+	+					+
Euchlanis incisa			+									
Colurella adriatica												
Colurella colurus		+	+	+								
Lecane luna		+	+	+								
Lecane stenroosi												
Lecane lunaris			+									
Lecane elsa			+									
Lepadella patella		+										
Lindia truncata	+											
Lindia torulosa												
Cephalodella catellina												
Cephalodella gibba	+		+							+		
Cephalodella ventripes					+							
Cephalodella stenroosi				+								
Trichocerca taurocephala			+									
Synchaeta oblong			+	+	+	+						
Synchaeta pectinata	+	+	+	+	+	+						
Polyarthra remata		+										
Polyarthra vulgaris	+	+										
Asplanchna priodonta		+	+	+	+	+		+	+		+	
Asplanchna sieboldi	+											
Testudinella patina	+							+				
Pompholyx complanata	+	+		+								
Hexarthra fennica		+	+		+							
Filinia longiseta		+	+									
Filinia terminalis	+		+									

Table 4. Monthly occurence of Cladoceran species.

CLADOCERA	May'07	June'07	July'07	Aug'07	Sept'07	Oct'07	Nov'07	Dec'07	Feb'08	Mar'08	Apr'08	May'08
Simocephalus vetulus	+											
Ceriodaphnia quadrangula					+							
Ceriodaphnia reticulata	+											
Scapholeberis kingi	+											
Moina micrura					+							
Macrothrix laticornis							+					
Bosmina longirostris	+	+	+	+	+		+			+	+	
Chydorus sphaericus	+						+			+	+	+
Alona rectangula	+											

Table 5. Monthly occurence of Copepoda species.

	COPEPODA						CLADOCERA					
	May'07	June'07	July'07	Aug'07	Sept'07	Octr'07	Nov'07	Dec'07	Feb'08	Mar'08	Apr'08	May'08
Eucyclops serrulatus	+				+		+					

Table 6. The distribution of the zooplankton species according to sampling locality.

ROTİFERA	Kızılırmak River	Delice Stream	Budaközü Stream	Kılıçözü Stream	Malaközü Stream
Brachionus calyciflorus	+	+		+	
Brachionus quadridentatus	+	+			
Brachionus angularis	+				
Brachionus urceolaris		+	+		
Brachionus plicatilis		+	+		
Keratella quadrata		+		+	
Notholca acuminata		+		+	
Euchlanis dilatata	+	+			+
Euchlanis incisa		+			
Colurella adriatica					
Colurella colurus		+		+	+
Lecane luna	+	+	+		+
Lecane stenroosi		+			
Lecane lunaris		+			
Lecane elsa		+			
Lepadella patella					+
Lindia truncata	+				
Lindia torulosa	+				
Cephalodella catellina			+		
Cephalodella gibba		+			
Cephalodella ventripes			+		
Cephalodella stenroosi					+
Trichocerca taurocephala	+				+
Synchaeta oblonga	+				
Synchaeta pectinata	+				
Polyarthra remata					+
Polyarthra vulgaris	+				
Asplanchna priodonta	+	+			
Asplanchna seboldi	+				
Testudinella patina	+	+		+	
Pompholyx complanata	+				
Hexarthra fennica	+				
Filinia longiseta	+	+			
Filinia terminalis	+	+			
CLADOCERA					
Simocephalus vetulus		+			
Ceriodaphnia quadrangula	+				
Ceriodaphnia reticulata	+				
Scapholeberis kingi		+			
Moina micrura			+		
Macrothrix laticornis		+			
Bosmina longirostris	+	+		+	+
Chydorus sphaericus		+		+	+
Alona rectangula	+				
COPEPODA					
Eucyclops serrulatus	+	+			

laticornis was occured only in November 2007 samples. In the Copepods *Eucyclops serrulatus* was only one species. Most of the specimens were naupliar stages and copepodits due to high predation pressure on the bigger zooplanktonic organisms in the rivers too [27].

Güher [28] identified 21 Cladocera, in the 18 different localities in the Thrace Region; Bozkurt et al [29] observed 36 rotifera in the Asi River and *Brachionus* (8 species) was the dominant species like Kızılırmak Basin. Bozkurt [30] was identified 46 species of rotifers, 14 species of Cladocera and 8 species of Copepoda in 6 different rivers in Mediterranean. Amoung them *Lecane* (9 species), *Brachionus* (5 species), *Trichocerca* (4 species) and *Keratella* (4 species) also *B. longirostris* were the common species and genera.

Akbulut and Yıldız [31] were observed 40 rotifera species in the 5 different localities from Euphrates River Basin, and *Brachionus* (6 species) *Lecane* (5 species) were the abundant genera and species the same as our study results. Göksu et al [32] were identified totally 22 zooplankton species 15 belongs to Cladocera and 7 belongs to Copepoda and *B. longirostris* was dominant cladoceran species like in the Kızılırmak Basin

According to the studies *Brachionus, Keratella* and *Lecane* were the common genera in Turkish freshwater [33] During the study *Brachionus, Lecane* and *Cephalodella* were common genera subsequently. During the study Identified cladoceran species were also most common species according to the studies of [2,34,28,35,30,32] *Eucyclops serrulatus* was only one species which is identified from study area is also cosmopolitan species [36] This species was observed in the Gediz River [35] Edirne, Tekirdağ and Kırklareli [37].

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