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FULL PAPER TAM MAKALE

ZOOPLANKTON COMPOSITION OF TOHMA STREAM (MALATYA - TURKEY)

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Abstract:

This study was completed with periodical surveys in Tohma Stream between April 2013- May 2014 period seasonally. During the study, a total of 32 species (22 belong to genus Rotifera, 8 to Cladocera and 2 Copepoda) were identified in Tohma Stream. During the study period, *Keratella cochlearis* (Rotifera), was found in every station in all seasons. Also, it was found that the most common family in the study was Brachionidae (8 species) from Rotifera. All of the zooplanktonic species have been detected for the first time in Tohma Stream.

Keywords: Rotifera, Cladocera, Copepoda, Tohma Stream, Turkey

Introduction

Zooplanktonic organisms are a very important step in the construction of modern aquatic food weebs. Zooplankton provides an important food source for larval fish and shrimps in natural waters and in aquaculture ponds. Zooplankton play a crucial role in aquatic food webs both in terms of biamass and energy fluxes by exploiting and recycling microscopic phytoplankton (Vannier et al., 2003). They produce massive quantities of nutrient-rich particles that constitute a permanent and exploitable resource for benthic communities. It is therefore important to include the state of these communities in any investigation on a river system, whether in ecological studies or risk assessment of pollutants (Butterfield, 2002).

In freshwater ecosystems, three groups of zooplankton, namely Rotifera, Cladocera, and Copepoda, have been reported (Berzins and Pejler, 1987). Some species have been reported as characteristic indicators of water quality and trophic level of lakes (Sladecek, 1983; Herzig, 1987; Saksena, 1987).

Many studies were carried out on zooplanktonic organisms in Turkey. Özdemir and Şen (1994), Göksu et al. (1997, 2005), Saler and Şen (2002), Ustaoğlu (2004), İpek and Saler (2008), Saler and İpek (2009), Bozkurt and Güven (2010), Saler et al. (2011a, b), İpek and Saler (2012) , Bozkurt and Akın (2012) were some of them.

Tohma Stream is an important water source, because it supplies the major portion of irrigation and fisheries needs in its province. Therefore, we carried out this study to explain the zooplankton fauna of Tohma Stream as no previous relevant data were available.

Materials and Methods

Tohma Stream is an important tributaries of Eupharate River and 107 km far away from Malatya city center (URL, 2014). Sampling was made seasonally between April 2013- May 2014 period from three stations which were defined to characterize whole Tohma Stream The coordinates of the stations were given in Table 1. Zooplankton samples were collected with a standart plankton net (Hydrobios Kiel, 25 cm diameter 55 µm mesh size) vertical and horizontal hauls and the specimens were preserved in 4% formaldehyde solution in plastic bottles. Zooplankton species were examined under Leitz inverted microscope. Relevant literatures as Edmondson (1959), Scourfield and Hardig (1966), Dussart (1969), Flössner (1972), Harding and Smith (1974), Kiefer (1978), Koste (1978 a, b), Dumont and De Ridder (1987), Reedy (1994) were used for the identification and classification of the species. Water temperature and dissolved oxygen were measured with Oxi 315i/SET oxygen meter and pH with Lamotte (pH 5-WC) pH meter in situ.

Table 1. Coordinates of the stations in Tohma

Stations	Locations
1	$38^0 33' 57.97'' N\ 37^0 29' 37.77'' E$
2	$38^0 33' 59.69'' N\ 37^0 29' 36.72'' E$
3	$38^0 34' 02.68'' N\ 37^0 29' 31.16'' E$

Results and Discussion

In Tohma Stream, 32 zooplankton species were identified, including 22 Rotifera, 8 Cladocera and 2 Copepoda groups. Based on the number of individual's rotifers were the dominant group in the stream (69.69%) followed by Cladocera (24.24%) and Copepoda (6.06%). Dominant Rotifera species was *Keratella cochlearis* followed by *Polyarthra dolichoptera* and *Filinia longiseta*. *Ceriodaphnia reticulata* was the dominant Cladocera species. *Cyclops vicinus* was the dominant Copepoda species. The seasonal distributions of species are given in Table 2.

There was a decrease in total zooplankton species richness in winter (21 species) (Table 2). The most taxa were observed in autumn (31 species) In spring and summer 30 species were recorded. According to the stations, the most number of species were recorded in the third station in spring with 25 species (18 belonging to Rotifera, 5 to Cladocera and 2 to Copepoda) and which the least were in the third station in winter with 6 species (4 belonging to Rotifera, 1 to Cladocera and 1 to Copepoda).

Temperature, dissolved oxygen and pH values of the Tohma Stream were recorded in the field and shown in the Table 3.

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, species from Rotifera as *Keratella cochlearis* and *Polyarthra dolichoptera* are indicators of productive habitats, while *Notholca acuminata*

and *Notholca squamula* are indicators of cold waters (Kolisko, 1974). All of these species were detected in Tohma Stream. *K. cochlearis* and *P. dolichoptera* were observed in every seasons. *N. acuminata* and *N. squamula* were observed in cold seasons (autumn and winter). In lotic habitats, true plankters often predominate and fast growing rotifers are often dominant (Hynes, 1970). One of the fast growing rotifers, *K. cochlearis* was observed in every sampling period. Species richness of Rotifera was found quite high when compared to Cladocera and Copepoda in Turkish inland waters (Saler and İpek, 2009; Saler et al. 2011,a,b; Bozkurt and Güven 2010, Gaygusuz and Dorak, 2013). In this study 22 species were found to belong to Rotifera among 32 zooplankton species .

According to Stember and Gannon (1978), Rotifera forms an important part of biomass in eutrophic water systems. In Tohma Stream this data was supported with Rotifera species dominance in every seasons.

Table 2. Seasonal distribution of zooplankton in the stations of Tohma Stream

Seasons	Autumn			Winter			Spring			Summer		
Stations	1	2	3	1	2	3	1	2	3	1	2	3
SPECIES												
Rotifera												
Ascomorpha saltans Bartsch,1870	-	+	-	-	-	-	-	+	+	-	-	+
Asplanchna priodonta Gosse,1850	-	+	+	-	+	-	-	+	+	-	+	+
Brachionus angularis Gosse,1851	-	-	+	-	+	-	+	+	+	+	-	+
Brachionus quadridentatus Hermann, 1783	-	+	+	-	-	-	-	+	+	+	-	-
Cephalodella forficula (Ehrenberg, 1830)	+	+	-	-	-	-	+	+	-	-	+	-
Cephalodella gibba (Ehrenberg, 1830)	+	-	+	-	-	-	+	-	+	-	+	-
Colurella uncinata (Müller, 1773)	-	+	-	-	-	-	-	+	+	+	-	-
Euclanis dilatata Ehrenberg,1832	-	+	-	+	-	-	+	-	+	+	-	+
Epiphanes senta (Müller, 1773)	+	+	-	+	-	-	-	+	+	+	-	+
Filinia longiseta (Ehrenberg,1834)	+	+	+	+	-	-	+	+	+	+	+	+
Kellicottia longispina (Kellicott,1879)	+	-	-	+	-	-	+	+	+	+	+	+
Keratella cochlearis (Gosse,1851)	+	+	+	+	+	+	+	+	+	+	+	+
Keratella quadrata (Muller,1786)	+	-	-	-	-	-	+	-	+	+	-	-
Keratella valga (Ehrenberg, 1834)	+	-	+	-	-	+	+	+	+	-	+	+
Lepadella acuminata (Ehrenberg, 1834)	+	-	+	-	-	-	-	+	+	+	-	-
Lepadella patella (Müller, 1773)	-	+	+	-	+	-	+	+	+	-	-	+
Notholca acuminata (Ehrenberg, 1832)	+	-	+	+	+	+	-	-	-	-	-	-
Notholca squamula (Müller,1786)	+	-	-	-	+	+	-	-	-	-	-	-
Philodina roseola Ehrenberg,1832	-	+	+	-	-	-	+	+	+	-	+	+
Polyarthra dolichoptera Idelson, 1925	+	+	+	+	-	-	+	+	+	+	+	+
Pompholyx sulcata Hudson, 1885	-	+	+	+	-	-	+	-	+	-	+	+
Rotaria rotatoria (Pallas, 1766)	+	+	-	-	+	-	+	+	-	+	+	+
Cladocera												
Bosmina longirostris (Müller,1785)	-	+	+	-	-	-	+	+	-	+	-	+
Ceriodaphnia reticulata (Jurine,1820)	+	+	-	-	+	-	+	+	+	+	+	-
Coronatella rectangulata Sars,1861	-	+	+	-	+	-	+	-	+	-	-	+
Daphnia cucullata Sars,1862	-	-	-	+	-	-	-	+	-	-	+	-
Daphnia magna (Straus, 1820)	+	+	-	-	+	-	-	+	+	-	+	-
Disparalona rostrata (Koch,1841)	-	+	-	-	-	-	+	-	+	+	-	-
Leptodora kindtii (Focke, 1844)	+	-	+	+	-	+	-	-	-	-	+	+
Leydigia leydigi (Schoedler,1863)	-	-	+	-	-	-	+	-	+	+	-	-
Copepoda												
Acanthodiaptomus denticornis (Wierzejski, 1887)	+	-	+	-	+	-	+	+	+	+	-	+
Cyclops vicinus Uljanin, 1875	+	+	+	+	-	+	+	+	+	+	+	+

Table 3. Seasonal values of temperature, dissolved oxygen and pH recorded in Tohma Stream

Seasons	Autumn			Winter			Spring			Summer		
Stations	1	2	3	1	2	3	1	2	3	1	2	3
Parameters												
Temperature (ºC)	11.0	9.6	8.9	6.4	5.9	6.1	14.1	15.3	14.9	21.0	19.9	21.2
Dis. Oxygen(mg/L)	8.1	8.7	8.2	10.3	9.6	9.3	8.6	8.5	7.9	7.6	7.5	7.9
pH	7.6	7.4	7.2	7.9	8.1	7.9	8.3	8.5	8.1	7.9	8.0	7.7

All the recorded zooplankton species in the present study are widely distributed around the world. Also many of the recorded species are common in Turkey (Gündüz 1997, Ustaoğlu, 2004, Ustaoğlu et al, 2012).

Only 8 species of Cladocera were observed in stream. Among the identified species *Leydigia leydigi, Daphnia cucullata* and *Disparalona rostrata* were rarely found in the stream. *Ceriodaphnia reticulata*, *Coronatella rectangulata* and *Daphnia magna* were observed throughout all seasons. *Cyclops vicinus* and *Acanthodiaptomus denticornis* were the representatives of Copepods. Both species were recorded in all seasons.

The ecological features of the recorded species show that most of them are cosmopolitan and littoral inhabiting (Kolisko, 1974). Additionally, among the recorded species, *Bosmina longirostris* and *Cyclops vicinus, Polyarthra dolichoptera, Keratella cochlearis* are well known indicators of eutrophy (Ryding and Rast, 1989). Brachionus and Keratella species are inhabitants of moderately mesotrophic waters (Saksena 1987). In Tohma Stream *Keratella cochlearis* was observed in all seasons in every station. Studies in the literature revealed the fact that *Cyclops vicinus* is the indicator of eutrophic state, *Bosmina longirostris* and *Ceriodaphnia reticulata* are the indicators of oligotrophic-eutrophic waters (Makarewicz, 1993). *C. vicinus* and *C. reticulata* were recorded in the stream in all seasons.

Acharya, et al. (2005), were observed that with smaller body cladoceran like *Bosmina* were highly abundant in the rivers generally. In Tohma Stream *Bosmina longirostris* was recorded in every seasons except winter.

According to the results of this study, the frequency of occurrence of zooplanktonic species was showed an increase in autumn. The number of species in spring and summer, showed near values with the number of taxa in autumn. The zooplanktonic species seasonal diversities of some lotic systems as Haringet Stream, Seli Stream, Pülümür Stream, Asi River, Kürk Stream, Peri Stream and Görgüşan Stream were showed similarities with our findings (Özdemir and Şen, 1994; İpek and Saler, 2008; Saler et al., 2010; Bozkurt and Güven 2010, Saler et al., 2011a, b; İpek and Saler, 2012). In all of these streams number of zooplankton taxa were increased in spring and summer months and decreased in winter months.

Akbulut and Yıldız (2005), 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 many of these species were same with Tohma stream zooplankton species. In Tohma Stream species from Brachionidae were recorded with 9 species.

Water temperature were changed between 5.9-21.2ºC, dissolved oxygen 7.5-10.3 mg/L, pH 7.2-8.5 (Table 3). These values were convenient for zooplankton life in aquatic habitats (Kolisko, 1974)

Conclusion

Zooplankton of Tohma Stream consist of Cladocera, Copepoda and Rotifera groups. Rotifers were dominant zooplanktonic group in Tohma Stream and represented with 22 species.

Rotifera has also showed higher diversity in all stations when compared to the other groups. No previous study was previously carried out on the zooplankton fauna of Tohma Stream. Present study, will be a base for further studies and acquirements of Turkey's lotic habitats biodiversity.

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