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Seasonal Variation of Rotifera Fauna of Cip Dam Lake (Elazığ-Turkey)

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Abstract: In this study, rotifera species and their seasonal variation were investigated together with physical and chemical parameters between April 1994 - March 1995 in Cip Dam Lake. Fifteen rotifera species belonging to 12 genera were recorded. The number of rotifers were decreased in winter months, whereas increased in summer and spring months. The relationship between number of rotifers and some physical and chemical parameters were determined statistically. The correlation between rotifer individual numbers, water temperature and total hardness were statistically significant while it was found unimportant with respect to Secchi depth, pH, dissolved oxygen and salinity. In conclusion, Cip Dam Lake was found to be a suitable habitat for rotifers.

Key words: Rotifera, seasonal variation, relative density, Cip Dam Lake, Turkey

Introduction

Rotifers are found in aquatic and semi-aquatic habitats, but are predominantly freshwater inhabitants. They are very important in these systems because of their incredible reproductive rates. Because of their high feeding and assimilation efficiencies, they play important roles in energy flow and nutrient cycling, accounting for more than 50% of the zooplankton production in some freshwater systems. Rotifers contribute to both the microbial loop and to higher trophic levels. In addition, species assemblages of rotifers are useful in characterizing lakes in relation to their trophic status (Grasse, 1965; Herzig, 1987).

The first study on rotifera fauna of Turkey was reported by Vavra (1905). After a long interval rotifera species were revealed in numerous publications by Dumont and De Ridder (1986), Tokat (1975, 1976), Ustaoglu and Balik (1987), Emir (1989, 1990, 1991), Segers *et al.* (1992), Altındağ and Sözen (1996), Göksu *et al.* (1987), Altındağ (1999, 2000), Altındağ and Yiğit (1999), Saler *et al.* (2000); Saler and Şen (2001).

Only a few studies on rotifera fauna of Turkey's Dam Lakes was conducted by Altındağ and Özkurt (1998) in Kunduzlar and Çatören Dam Lakes (Kırka-Eşkışehir), Bekleyen (2001) in Devegeçidi Dam Lake (Diyarbakır), Saler (2001) in Keban Dam Lake (Elazığ). The purpose of this paper was particularly to determine the seasonal variation of Rotifera fauna of Cip Dam Lake.

Materials and Methods

Cip Dam Lake which is used for irrigation since 1986 is located in 18 km north-west of Elazığ city center in North-east Anatolia. The dam was built soil stuffed type. Cip Dam Lake with 24 m elevation and 1.3 km² maximum reservoir fed by Cip Stream, rain and snow waters. The lake contains economically important fish species namely, *Leuciscus cephalus*, *Capoeta capoeta umbra*, *Capoeta trutta* and *Orthrias* sp. (Akbaş, 1987).

This study was carried out between April 1994-March 1995. Rotifer samples were collected monthly with 55 µ pore sized Hydro-Bios Kiel plankton net and water bottle. The samples that were taken using the water bottle were evaluated quantitatively, while plankton net samples were used for identification of the rotifer species. The samples were preserved in 4% formalin solution. During the sample period, the surface water temperature, pH, dissolved oxygen and Secchi-depth were measured on the sampling area using portable instruments (OR701 digital meter, Secchi disc), total hardness and salinity of the lake water determined using titrimetric methods (Anonymous, 1985).

The number of rotifers counted with a Leitz inverted microscope and monthly relative density of the species calculated. Rotifer species were identified according to Edmondson (1959) and Koste (1978 a, b).

For the statistical analysis SPSS 9.05 computer programme was used. The relationship between number of rotifers and some physical and chemical parameters were determined statistically. For correlation analysis Pearson correlation test was used (Sümbüloğlu and Sümbüloğlu, 1997).

Results

During the study 12 genera and 15 species were identified.

Polyarthra vulgaris was found the most important species as frequency of occurrence (determined in 9 months) *Philodina roseola* and *Cephalodella gibba* followed this species. *Rotatoria neptunia*, *Brachionus quadridentatus* and *Filinia terminalis* showed low frequency of occurrence during this period (Table 1).

The temperature of Cip Dam Lake was changed between 2.9-27°C. The minimum Secchi depth was recorded 33.5 cm in October, whilst maximum Secchi depth was recorded 73 cm in December. The highest dissolved oxygen was determined 10.3 mg l⁻¹ in December. The correlation between number of rotifers and some physical and chemical parameters determined statistically.

Rotifer individual numbers - water temperature correlation was significant at 0.01 level, $r = 0.746$.

Rotifer individual numbers - Total hardness correlation was significant at 0.05 level, $r = -0.702$.

Rotifer individual numbers - Secchi depth ($r = 0.197$), dissolved oxygen ($r = -0.573$), pH ($r = -0.513$) and salinity ($r = 0.549$) correlation was nonsignificant.

Discussion

It was found that main part of identified species of rotifer is cosmopolitan and includes distinctive species of oligotrophic lakes. *B. plicatilis*, *C. uncinata*, *L. ovalis*, *L. luna*, *C. gibba*, *C. forficula*, *A. priodonta*, *P. vulgaris*, *F. terminalis* are among the cosmopolitan species. In addition, some species belonging to the genera *Notholca*, *Lepadella*, *Cephalodella*, *Rotatoria*, *Philodina* are littoral-periphytic forms.

The most important limiting factor that influences the distribution of rotifers is temperature. There is a relationship between reproduction ability of rotifers and temperature. Herzig (1987), recorded that, the embryonic development period of rotifers and reproduction rate decreased depending on temperature increases. Rotifers occurred in a great number during the high temperature period and there was an outstanding increase in species diversity and density in this period. The temperature of the dam lake water was increased between April and August. During this period, an increase was recorded in rotifer abundance. The abundance of rotifers were less in cold months. Some of the rotifer species have got a wide temperature tolerance as *Asplanchna priodonta*. This species occurred half of the study period (Table 1). In the statistic analysis the correlation between rotifer individual numbers and water temperature was found significant at 0.01 level. There was a linear relation between rotifer individual numbers and water temperature.

The total hardness of the dam lake was affected by the seasonal variation of rotifer species. The correlation found to be important at 0.05 level but, there was a negative relation between total

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Table 1: The relative density of Rotifers of Cip Dam Lake

Species	1994									1995		
	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan	Feb	Mar
<i>Philodina roseola</i>	-	-	1.63	11.43	24.07	76.47	58.34	-	60.00	37.50	30.00	-
<i>Rotatoria neptunia</i>	16.37	2.80	-	-	-	-	-	-	-	-	-	-
<i>Brachionus angularis</i>	-	1.86	1.63	0.71	3.70	-	-	9.09	-	12.50	-	2.95
<i>Brachionus plicatilis</i>	-	-	-	0.71	5.55	-	-	-	-	-	-	5.88
<i>Brachionus quadridentatus</i>	-	-	1.63	-	1.85	-	-	-	-	-	-	-
<i>Kellicottia longispina</i>	-	18.82	37.50	2.86	-	-	-	-	-	-	-	-
<i>Notholca squamula</i>	21.82	10.28	4.36	-	-	5.88	-	-	-	25.00	50.00	14.70
<i>Colurella uncinata</i>	-	8.41	6.52	35.72	35.18	-	-	-	-	-	-	-
<i>Lepadella ovalis</i>	14.54	-	-	24.28	3.70	2.94	-	45.45	-	-	-	-
<i>Lecane luna</i>	-	-	16.30	2.14	1.85	2.94	-	-	-	-	-	-
<i>Cephalodella forficula</i>	-	3.74	1.63	2.86	5.55	-	11.11	9.09	-	-	-	-
<i>Cephalodella gibba</i>	9.09	17.76	7.06	11.43	14.81	-	25.00	27.28	-	-	10.00	-
<i>Asplanchna priodonta</i>	38.18	29.91	10.33	5.00	-	-	5.55	9.09	-	-	-	-
<i>Polyarthra vulgaris</i>	-	6.55	11.41	2.14	3.70	11.77	-	-	40.00	25.00	10.00	76.67
<i>Filinia terminalis</i>	-	1.87	-	0.72	-	-	-	-	-	-	-	-

Table 2: Some physycal and chemical parameters of Cip Dam Lake

Months	Temperature (°C)	Secchi depth cm	pH	Dissolved Oxygen mg l ⁻¹	Tot. Hardness F° H	Salinity %
April	16.5	66.0	7.9	8.4	19.0	0.3
May	19.0	63.0	7.6	8.2	20.3	0.3
June	22.3	62.0	8.0	8.2	19.7	0.4
July	27.0	41.5	7.9	8.0	19.2	0.5
August	26.2	41.0	8.0	7.8	19.6	0.5
September	22.0	36.0	8.1	8.2	21.2	0.4
October	15.7	33.5	8.1	8.3	23.0	0.4
November	12.0	49.0	8.2	8.9	21.3	0.3
December	3.5	73.0	7.9	10.3	20.9	0.3
January	2.9	44.0	8.1	12.1	22.8	0.3
February	7.8	44.5	8.5	9.5	22.5	0.2
March	10.3	47.5	8.3	8.8	21.6	0.3

Table 3: Correlation between number of rotifers and some physical and chemical parameters

Correlations	Rotifer	Temperature	S. depth	pH	Dis. oxygen	Hardness	Salinity
Rotifer	Pearson Correlation	1,000	,746**	,197	-,513	-,573	-,702*
	Sig. (2-tailed)		,005	,137	,088	,052	,011
	N	12	12	12	12	12	12

** Correlation is significant at 0.01 level (2-tailed)

* Correlation is significant at 0.05 level (2-tailed)

hardness and rotifer individual numbers. The number of rotifers was decreased while total hardness of dam lake increased (Table 1, 2).

Barnes (1974) recorded that rotifers prefer water which have 6.5-8.5 pH. The pH values of Cip Dam Lake (7.9-8.5) shows an accord with this record (Table 2). Statistically the correlation between rotifer individual numbers and pH was not significant.

Most of the rotifer species are euribios and have got wide oxygen tolerance. Although the oxygen concentration in aquatic habitats is a limiting factor, some rotifer species as *Polyarthra vulgaris* could show a tolerance to low oxygen concentration (Barnes, 1974). During the study period *P. vulgaris* was the most abundant species and occurred in 9 months. There wasn't a significant correlation between rotifer numbers and dissolved oxygen statistically in Cip Dam Lake.

A large number of Rotifer species living in lakes can be considered as an indicator of eutrophic status (Saunders-Davies, 1989). Example of these species, that were observed in Cip Dam Lake were *Asplanchna priodonta*, *Polyarthra vulgaris*, *Filinia terminalis*. One of the eutrofication index *Brachionus* species were found in the study region. Three species belonging to *Brachionus* genus (*B. plicatilis*, *B. quadridentatus*, *B. angularis*) were determined (Table 1). *Kellicottia longispina* (the indicator of oligotrophic lakes) (Herzig, 1987) was recorded in May, June and July and has got a high abundance during this period (Table 1).

Temel and Ongan (1990), mentioned that, *Colurella uncinata* appears during hot months. This species was recorded in spring and summer in Cip Dam Lake.

Polyarthra vulgaris was the most abundant species during the study and showed its maximum during spring and summer months (Table 1).

Although, Akbay (1987), recorded *Keratella cochlearis*, *Filinia longiseta*, *Dicranophorus* sp., *Keratella quadrata*, *Pompholyx* sp., *Conochilus* sp. and *Conochiloides* sp., in the same dam lake in 1987, these species could not be determined in this study. This may be because of changes in some physical, chemical and biological parameters during passed years.

In conclusion, during the study species belonging to *Polyarthra*, *Philodina*, *Cephalodella* and *Asplanchna* were the most abundant species of Cip Dam Lake. Rotifers were determined all seasons. There was an increase in abundance of rotifer species in spring and summer months.

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