DIVERSITY OF ZOOPLANKTON IN BHADRAKALI RESERVOIR, WARANGAL, ANDHRA PRADESH. INDIA

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ABSTRACT

Diversity of zooplankton in Bhadrakali reservoir was studied from June 2010 to May 2011. Samples were collected monthly using plankton net (Mesh size 50µm) at four different stations. A total of 30 species of zooplankton belonging to 16 species of rotifers, 7 species of cladocera, 4 species of copopeda, and 3 species of ostrocoda were recorded. Values of the indices ranged in between 1 to 3 indicated the characteristics of moderately polluted conditions. Diversity indices were good indicators of pollution in aquatic ecosystem. In the present study, diversity indices showed the Bhadhrakali reservoir was moderately polluted.

KEY WORDS: Bhadrakali reservoir, evenness diversity index (E), Shannon Wiener species diversity index (H), species richness (S), zooplankton diversity

INTRODUCTION

Zooplanktons occupy a central position in the food of aquatic ecosystem (Okogwu, 2010). They are one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter (Murugan *et al*., 1988, Park and Shin, 2007). They are often an important link in the transformation of energy from producers to consumers (Sharma *et al.*, 2010). Zooplanktons are being used as an indicator organism for physical, chemical and biological process in the aquatic ecosystem (Gajbhiye, 2002).

The distribution and diversity of zooplankton community depends on a complex of factors such as change of climatic conditions, physical and chemical parameters and regulation cover (Sharma 1998; Rocha *et al.,* 1999 and Neves *et al*., 2003). They serve as bioindicator and it is well suited for understanding water pollution status (Contreas *et al.,* 2009). The objective of the study was to determine the diversity and abundance of zooplankton in the Bhadrakali reservoir.

MATERIAL AND METHODS

The study was conducted to evaluate the diversity of zooplanktons in Bhadrakali reservoir, Warangal, Andhra Pradesh. Bhadrakali reservoir lies between North Latitude 18°.00' and East Longitude 79°.30'. The total area of the reservoir is about 120 hectares. The climatic condition of the study area was hot summer and cool winter. The present study was conducted at periodic temperature range with a minimum of 28ºC and a maximum of 37ºC. The reservoir receives water through Kakatiya Canal from Lower Manair Reservoir Karimnagar, Andhra Pradesh. The place got most of its rainfall from June to September during the monsoon. The average rainfall of the study area is 100 mm. The reservoir is used for drinking and supports fish culture.

Zooplanktons were collected monthly from four different station of the Bhadrakali reservoir from June 2010 to May 2011. Samplings were made between 9.00 am to 11.30 am. Each sample was collected by filtering 20 liters of water through plankton net. Filtrate was stored in 20 ml plastic bottles and 5 per cent formalin was added for sample preservation. The concentrated samples, thus, obtained were fixed with 4 per cent neutralized formalin, Lugol's solution (Lugol, 1829) and a few drops of glycerin, allowed to settle for overnight. Finally the quantitative analysis for the presence and dominance was done by using a Sedgwick-rafter cell method (Serfling, 1949). One ml of sample was transferred to Sedgwick-Rafter cell with a pipette; identification and enumeration were done by a Wild-stereo microscope. All the planktons present in cell were counted. The mean of five estimates was then calculated for each component occurring in the total count. The systematic identification of planktons were made by using standard keys of Edmondson (1959), Pennak (1968), Adoni, (1985), Michael and Sharma (1988), Dhanapathi (2000) and Altaff (2004).

The qualitative and quantitative analysis of planktonic organisms was carried out in terms of species Shannon-Wiener (diversity) index (H) (Shannon and Wiener, 1949), Evenness index (E) (Mulder et al., 2004) and Species richness (D) (Chao, 2005).

RESULT AND DISCUSSION

In the present investigation, 30 species of zooplanktons belonging to 21 genera, 14 families and 4 groups were recorded in Bhadrakali reservoir. Out of 30 species, 16 species of rotifera, 7 species of cladocera, 4 species of copepoda and 3 species of Ostracoda were noted (Table 1).

, The percentage of different zooplankton groups noted during June 2010 to May 2011 are presented in Figure 1 indicated that Rotifera, Cladocera, Copepoda and Ostracoda groups noted 12, 4, 81 and 3 per cent, respectively during the study period. Monthly percentage of different groups of zooplankton is presented in Figure 2. The maximum percentage of rotifer (14.07%) was recorded in July 2011 and minimum (8.4%) in October 2010. Similarly, the cladocera was maximum (7.84 %) in June 2011 and minimum (0.9 %) in October 2010; copepod was maximum (87.83 %) in October 2010 and minimum (70.88 %) in May 2011; and Ostracoda was maximum (6.44%) in May 2011 and minimum percentage (1.44%) in October 2010.

Shannon Wiener diversity index (H)

Zooplankton Shannon-Wiener diversity index are presented in Table 2. Shannon-Wiener index (H) of rotifera ranged from 2.25 to 2.64 during June 2010 to May 2011. The highest diversity was recorded in April 2011 and lowest in November 2010. The cladocera diversity index [Shannon-Wiener index (H)] ranged from 1.58 to 1.80 during June 2010 to May 2011. The highest diversity was recorded in June 2010 and lowest in January 2010. The ostracoda diversity index [Shannon-Wiener index (H)] ranged from 0.90 to 1.97 during June 2010 to May 2011. The highest diversity was recorded in October 2010 and lowest in May 2011. The copepoda diversity [Shannon-Wiener index (H)] ranged from 1.29 to 1.36 during June 2010 to May 2011. The highest diversity was recorded in July 2010 and lowest in September 2010.

Evenness diversity index (E)

Zooplankton evenness diversity index (E) presented in Table 2. The rotifera diversity index [Evenness index (E)] ranged from 1.37 to 2.82 from June 2010 to May 2011. The highest diversity was recorded in April 2011 and lowest in October 2010. The cladocera diversity index [Evenness (E)] ranged between 0.05 and 3.59 from June 2010 to May 2011. The highest diversity was recorded in June 2010 and lowest in April 2011. The ostracoda diversity index [Evenness (E)] ranged between 0.50 and 1.36 during June 2010 to May 2011.

The highest diversity was recorded in August 2010. The lowest Ostracoda diversity was recorded in June and July 2010. The copepoda diversity index [Evenness (E)] ranged from 0.28 to 0.37 during the months from June 2010 to May 2011. The highest diversity was recorded in July 2010 and lowest in October 2010.

Analysis of species richness

Zooplankton species richness is presented in Table 2. Species richness index of rotifera ranged from 3.46 to 3.98 during the months of June 2010 to May 2011. It was highest in February 2011 and lowest in June 2010. Species richness index of cladocera ranged from 1.57 to 2.73 during and it was highest in October and November 2010 and lowest in April 2010. Species richness index of ostracoda ranged from 0.70 to 1.44 during June 2010 to May 2011. It was highest in June and July 2010 and lowest in April 2011. During June 2010 to May 2011 richness of copepoda ranged from 0.50 to 0.59. It was highest in July 2010 and lowest in October and November 2010.

Zooplankton abundance of the Bhadrakali reservoir comprised rotifers, cladocera, copepods and ostracods. All these zooplankton were recorded throughout the years of investigation. However, zooplankton showed variations in their abundance during different months of the year. The peak period of rotifer were observed from July and August and minimum in October and November. Similar result reported by Lokhande and Shemberal, 2009.

Maximum Percentage of cladocera was in June and July and minimum in October and November. The percentage of Copepods was high in October and November, less percentage in May. The percentage of Ostracoda was maximum in May and minimum in October. These results are correlated with that of Chauhan (1993). Sharma and Pattanaik (1985) reported that the copepods were dominating in number in freshwater ponds. Generally copepods favour more stable environment and generally regarded as pollution sensitive taxa, as they disappearance water get polluted. In the presented investigation, the maximum numbers of copepod were observed during the winter months and minimum in summer months.

CONCLUSION

Species diversity indices such as species richness and evenness were studied in order to measure the status of water quality of Bhadrakali reservoir. Values of the indices ranged in between 1 to 3 indicated the characteristics of moderately polluted conditions. Diversity indices were good indicators of pollution in aquatic ecosystem. In the present study, diversity indices showed the Bhadhrakali reservoir is moderately polluted.

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Table 1: Diversity of zooplankton groups recorded in Bhadrakali reservoir during study period

Groups	**Family**	**Species**
. Rotifera	Brachionidae	*Brachionus caudatus* (Haner 1937) *Brachionus bidentatus* (Anderson) *Brachionus angularis* (Gosse 1851) *Brachionus falcatus* (Zacharias 1898) *Brachionus forficula* (Wierzejski 1891) *Brachionus quadridentatus* (Hermann 1783) *Brachionus calyciflorus* (Pallas 1766) *Brachionus diversiconis* (Daday 1883) *Keratella tropica* (Apstein 1907) *Anuraeopsis fissa* (Gosse 1851)
	Hexarthidae	*Hexartha mira*
	Asplanchnidae	*Asplanchna bright welli* (Gosse 1850)
	Testudinellidae	*Filinia longiseta* (Ehrenberg 1834)
	Synchaetidae	*Polyarthra indica* (Segers and Babu 1999)
	Lecanidae	*Lecane bulla* (Gosse 1887)
	Trichocercidae	*Trichocerca ruttneri*
Cladocera	Moinidae	*Moina micrura* (Kurz)
	Daphnidae	*Ceriodaphinia* sp. (Sars 1885)
.		*Bosmina longiroslris* (Muller 1985)
	Chydoridae	*Chydorus parvus* (Daday 1898)
		Chydorus barroisi
	Sididae	*Dioaphonosama sarsi* (Richard 1895)
		Alona stetulosa (Sars 1862)
Ostracoda	Cyprididae	*Cypris subglobosa* (Swerby 1840)
		Cyprinotus nudus (Brady 1885)
		Heterocypris
Copepoda	Diaptomidae	*Diaptomous*
	Cyclopidae	*Cyclops sp.* *Mesocyclops leuckarti*(Claus 1857) *Nauplious larva*

Table 2: Diversity indices of Zooplankton in Bhadrakali Reservoir (June 2010 to May 2011)

Months	Rotifera			Cladocera			Ostracoda			Copepoda		
	H	E	S	H	E	S	H	E	S	H	E	S
June -10	2.41	1.94	3.46	1.80	3.59	2.00	1.03	0.50	1.44	1.35	0.33	0.55
July - 10	2.38	2.09	3.82	1.72	2.01	2.01	1.03	0.50	1.44	1.36	0.37	0.59
Aug - 10	2.50	2.23	3.85	1.66	2.23	1.95	1.07	1.36	1.03	1.31	0.33	0.56
Sep - 10	2.62	2.44	3.63	1.76	2.2	2.09	1.07	0.99	1.03	1.29	0.32	0.54
Oct - 10	2.38	1.37	3.85	1.73	1.45	2.73	1.97	0.58	0.96	1.30	0.28	0.50
Nov - 10	2.25	2.13	3.7	1.73	1.45	2.73	1.02	1.01	0.86	1.30	0.28	0.50
Dec - 10	2.55	2.22	3.92	1.72	1.00	2.41	0.89	0.68	0.96	1.32	0.29	0.50
Jan-11	2.45	2.11	3.66	1.58	0.26	2.28	0.91	0.66	0.83	1.30	0.29	0.50
Feb - 11	2.56	2.36	3.98	1.69	0.61	1.85	1.08	0.92	0.86	1.35	0.31	0.52
Mar - 11	2.61	1.51	3.87	1.65	1.47	1.76	1.05	0.77	0.78	1.32	0.31	0.53
Apr - 11	2.64	2.82	3.89	1.58	0.05	1.57	1.00	0.65	0.7	1.32	0.32	0.54
May - 11	2.38	1.78	3.96	1.64	1.10	1.59	0.90	0.64	0.69	1.32	0.33	0.56

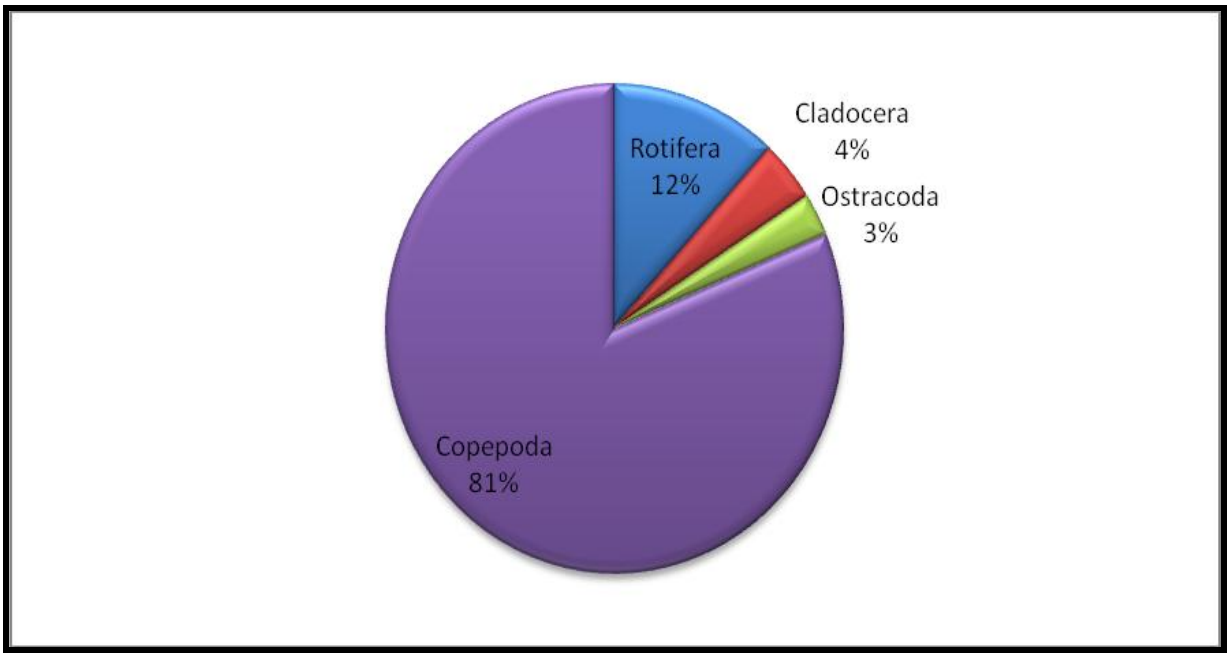

Fig. 1: Species composition of Zooplankton and relative percentage of each group (June 2010 to May 2011)

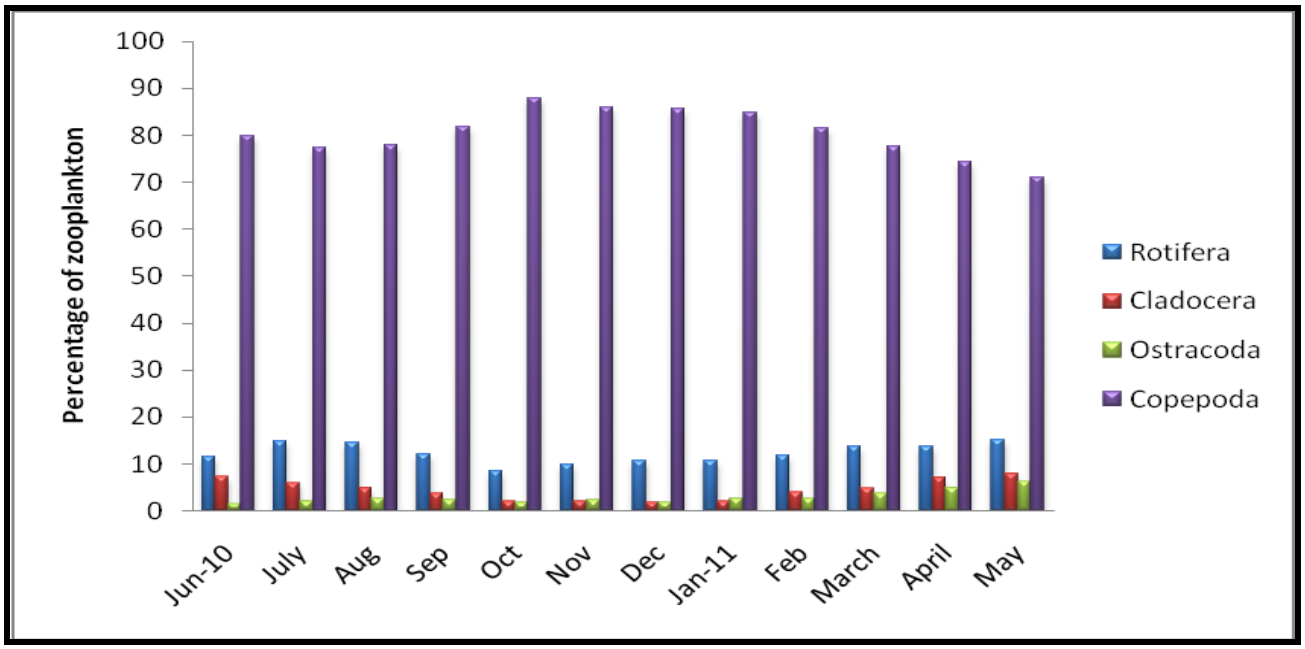

Fig. 2: Monthly percentage of different groups of zooplankton (June 2010 to May 2011)

[MS received: July 07, 2013] *[MS accepted: August 16,2013*