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SEASONAL VARIATION IN ZOOPLANKTON DIVERSITY IN TIGHRA RESERVOIR, GWALIOR (MADHYA PRADESH)

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ABSTRACT

Zooplanktons which are present in a variety of aquatic habitats were studied with respect to their species diversity and seasonal distribution. Studies on zooplankton of Tighra reservoir, Gwalior (M.P.) were undertaken for one complete year (November 2010 to October 2011).Out of the total 20 species recorded during the study, 10 belonged to rotifera, 4 each to copepod and cladocera and 2 to protozoa. Rotifera was the most dominant group throughout the study period. Seasonal variations were observed in the distribution of zooplanktons. Seasonally, the number was highest during summer, followed by monsoon and lowest during winter.

KEYWORDS : Zooplanktons, seasonal variations, Tighra reservoir

Zooplanktons are minute aquatic organisms that are non-motile or are swimmers and they drift in water columns of an ocean, sea or fresh water bodies to move any great distance. They are heterotrophic in nature and play important role in food web by linking the primary producers and higher trophic levels. The fresh water zooplanktons comprise of protozoa, rotifers, cladocerans, copepods and ostracodes.

Many workers have made significant contribution in the study of biological parameters of fresh water bodies, both in India and abroad. Akin-oriola ,(2003) monitored zooplankton abundance, composition and environmental parameters in Ogunpa and Ona rivers, Nigeria.Sukand and Patil ,(2004) recorded four major groups of zooplanktons in their studies on Fort lake Belgaum, Karnatka. Rotifers constituted (52.38%) number of zooplanktons followed by copepods 26.5%, cladocerans 16.45% and ostracodes 4.67%.Sreelatha and Rajalakshmi, (2008) observed zooplankton diversity of Goutami Godavari Estury, Yanam, Pandicherry. Nogueina Marcos et al.,(2008) investigated zooplankton assemblage in a large tropical river in Brazil.Chattopadhyay and Barik, (2009) worked on zooplanktons of a fresh water lake at Burdwan. Recently,Ingole et al. ,(2011) studied the water quality of Majalgaon Dam with special reference to zooplanktons.

The Tighra reservoir is situated about 20 km west of Gwalior (Madhya Pradesh), near Tighra village. The reservoir is primarily used to fulfil the water supply of the city. The reservoir is also used to culture fishes by the fisheries department and for irrigation purpose.It lies on 26°13` N latitude and 78° 30' E longitude at an altitude of 218. 58 m . The reservoir is surrounded by hills from three sides. The hills on the north and western side are 300 m high and those on southern and south east side are about 225m high. At the south western side river Sank joins the reservoir through a gorge. About a dozen of small nallahas drain in the reservoir from the hill slopes. In the north east of the reservoir there is a concrete masonry wall.

Limnological studies of the reservoir were carried out to study the zooplankton diversity of the reservoir.

MATERIALS AND METHODS

Studies on zooplanktons were carried out for one complete year from November 2010 to October 2011 to study the seasonal variations in the zooplankton diversity. Both qualitative and quantitative studies were under taken. Samples were collected, once in a month, in the morning hours between 9.00 A.M. and 11.00 A.M. Samples were collected by filtering 50 litre surface water through a plankton net made up of bolting silk cloth no. 20. Extreme care was taken in order to keep water undisturbed at the time of sampling. The collected samples were preserved in 4 % formalin. The preserved samples were brought to the laboratory for qualitative and quantitative analysis. Zooplanktons were identified by using the methods given by Battish (1992)and Dhanapati, (2000).

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Quantitative studies were made by using Sedgwick rafter cell. Sample was properly agitated to distribute the organisms evenly. By using a pipette, one ml of sample was transferred onto the cell. The cover slip was placed properly, avoiding any air bubble. The planktons were allowed to settle for some time and counting was made under microscope. All the planktons, present in the cell were counted by moving the cell, vertically and horizontally, covering the whole area.

RESULTS AND DISCUSSION

Results are given in table 1-3. The zooplanktons, in Tighra fresh water reservoir, comprised of protozoa, rotifers, cladocerans and copepods.Among all the zooplanktons, recorded in Tighra reservoir, rotifers were found to the most dominant group (Fig.,1). The group was represented by *Brachionusangularis, B. quadridentatus, B. falcatus, B. calyciflorus, B. caudatus, Keratellatropica, Lepadella patella, Polyarthra*sp.,*Rotaria sp.* and*Filinalongista.* Rotifers were found to be dominant throughout the study. Rotifers represented 39% of all zooplanktons recorded from the Tighra reservoir. The maximum number of rotifers (525 cells/lit) was recorded at Station 4 during May 2011 and the number was minimum(185 cells/lit) at Station 4 in December 2010. Seasonally the number was highest during summer, followed by monsoon and lowest during winter(Fig.,2). Deshmukh ,(2001) recorded 28 species of rotifers from Chhatri Lake of Amravati with maximum number of species in summer. Akin-Oriola,(2003) observed rotifera as the most dominant zooplankton in Ogunpa and Ona rivers, Nigeria. The dominance of rotifer was attributed to their short development rate and fish predation on large zooplanktons.Rajshekhar et al., (2010) recorded 24 species of zooplanktons in a fresh water reservoir of Gulberbarga district, Karnataka. Rotifer was the dominant group throughout their study period. Highest count was recorded during summer.

Copepods were represented by *Naupilus*sp., *Mesocyclopshyalinus, Cyclopoid*sp. and *Mesocyclopsleukarti.* Copepod was the second largest group of zooplanktons representing 24.95 % of the total population of zooplanktons. Maximum number of copepods were collected during May 2011(265 cells/lit) at Station 2. The number was minimum (130 cells/lit) in September 2011(Fig.,3).

Cladocera was represented by four genera: *Daphnia pulex, Moinamicrura, Macrothrix sp.* and*Ceriodaphniareticulata.* The number of Cladocera was found to be more during the months April, May, June and July 2011. Total number of Cladocera, recorded during the study period, was 2011cells/lit which represented 21.92% of total population of zooplanktons. The zooplankton mass varied from season to season. It was higher during April, May and June (summer), followed by monsoon and lowest during winter (Fig.,4).

The group Protozoa was mainly represented by *Diffugiamuriformis*and*Arcelladiscoides*.Total protozoa found during the period of study was 1287.5 cells/lit. The maximum number was of *Diffugia*. The protozoans were collected in maximum number (160 cells/lit) January2011 at Station 1 and the minimum number (70 cells/lit) occurred during September 2011, also at the same station. Protozoa represented 14.04% of the total population of zooplanktons recorded in the Tighra reservoir.

The study indicates seasonal variations in the distribution of zooplanktons. Rotifera, cladocera and copepoda were found in maximum number during summer, followed by winter and minimum during monsoon. In case of protozoa, maximum number was recorded during monsoon, followed by summer and least in winter (Fig.,5). Jhingran ,(1989) recorded cladoceran population to be most abundant in February, followed by July and October in Ramgarh reservoir in Rajasthan. Sharma and Diwan ,(1993) studied plankton dynamics of YeshwantSagar reservoir in which the Cladocera showed maximum density in June. They reported rotifers to form a dominant group during summer in YeshwaniSagar reservoir. Khare ,(2005) observed an increasing trend in the months of winter season with peak during summer months - March to June. He recorded minimum population during rainy season. Kadam et al., (2006) observed maximum number of rotifers during summer season.

Cladocerans are a crucial group among zooplanktons and form the most useful nutritive group of crustaceans. Cladocerans feed on small zooplanktons,

Table1: Monthly variations in zoo planktons (no./lit) of water at four stations of Tighra reservoir, Gwalior for November 2010 to October 2011

		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	TOTAL
Rotifera	STATION1	180	190	220	240	300	420	475	440	356	210	205	225	3461
	STATION2	195	195	230	240	290	465	490	465	340	220	190	210	3530
	STATION3	205	210	210	226	275	450	500	500	379	242	200	220	3617
	STATION4	190	185	220	250	289	500	525	520	400	240	200	215	3734
	MEAN	**192.5**	**195**	**220**	**239**	**288.5**	**458.75**	**497.5**	**481.25**	**368.75**	**228**	**198.75**	**217.5**	**3585.5**
Copepoda	STATION1	170	172	186	185	200	250	256	250	178	145	150	185	2327
	STATION2	175	170	180	190	210	260	265	260	195	160	155	190	2410
	STATION3	160	185	185	178	190	240	245	240	185	145	140	185	2278
	STATION4	165	160	150	175	190	225	225	210	190	132	130	188	2140
	MEAN	**167.5**	**167.5**	**175.25**	**145.6**	**197.5**	**243.75**	**247.75**	**240**	**187**	**145.5**	**143.75**	**187**	**2288.75**
Cladocera	STATION1	155	155	160	140	185	215	205	212	210	145	152	160	2094
	STATION2	140	160	152	136	175	195	200	222	210	165	156	156	2067
	STATION3	142	160	149	142	162	210	201	210	200	155	145	142	2018
	STATION4	130	125	132	140	145	201	204	205	198	120	125	140	1865
	MEAN	**141.75**	**150**	**148.25**	**139.5**	**166.75**	**205.25**	**202.5**	**212.25**	**204.5**	**146.25**	**144.5**	**149.5**	**2011**
Protozoa	STATION1	105	110	160	125	140	145	125	120	135	82	70	80	1397
	STATION2	101	110	132	110	130	125	130	110	120	90	85	75	1318
	STATION3	95	100	125	121	125	123	132	100	112	95	88	76	1292
	STATION4	85	80	110	102	110	95	110	98	100	90	85	78	1143
	MEAN	**96.5**	**100**	**131.75**	**114.5**	**126.25**	**122**	**124.25**	**107**	**116.75**	**89.25**	**82**	**77.25**	**1287.5**

Table :2:Annual variation in zooplankton composition in Tighra reservoir from november 2010 to October 2011

	Number of Organisms	Percentage
Rotifera	3585.5	39.088
Copepoda	2288.75	24.95
Cladocera	2011	21.92
Protozoa	1287.5	14.036

Table 3: Groupwise seasonal variation in zooplankton composition in Tighra reservoir from november 2010 to October 2011

SEASON	Rotifera	Copepoda	Cladocera	Protozoa
Summer	1726	929	786.75	479.5
Monsoon	1013	663.25	644.75	365.25
Winter	846.5	655.85	579.5	625.5

FIGURE 1

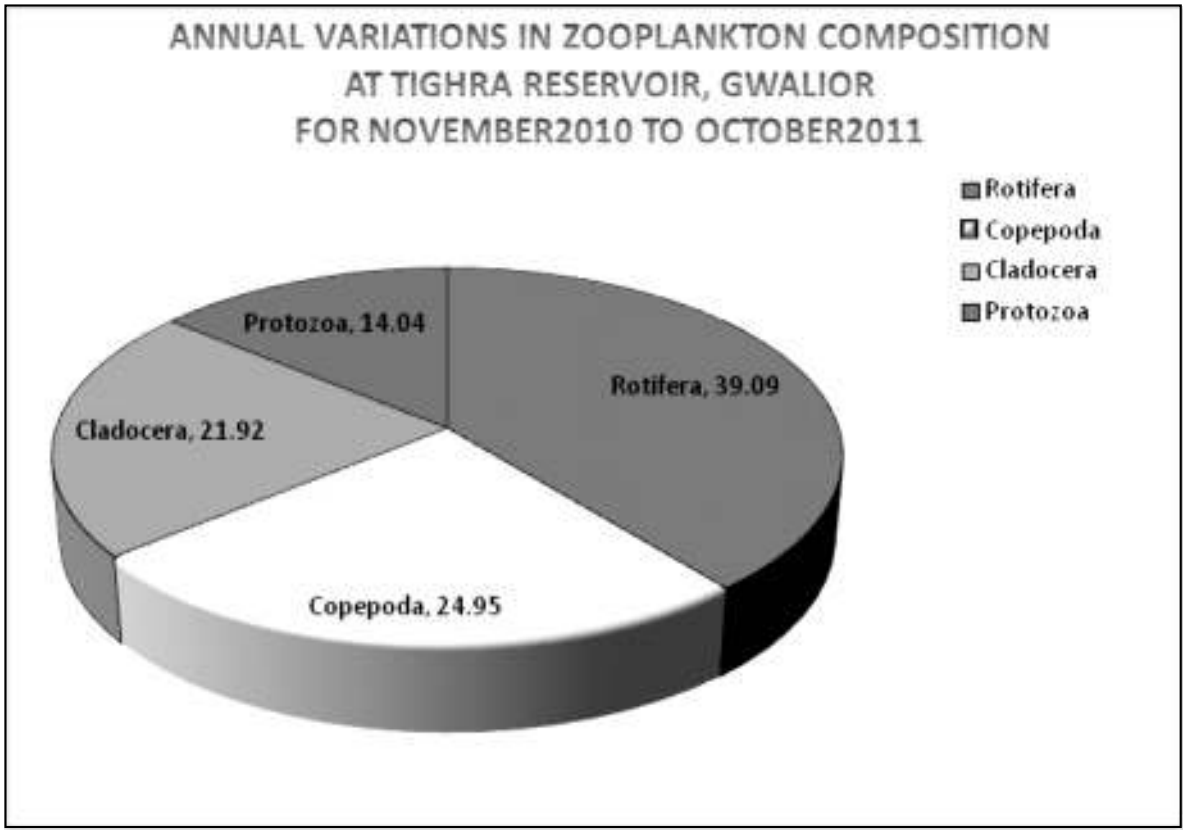


FIGURE 2

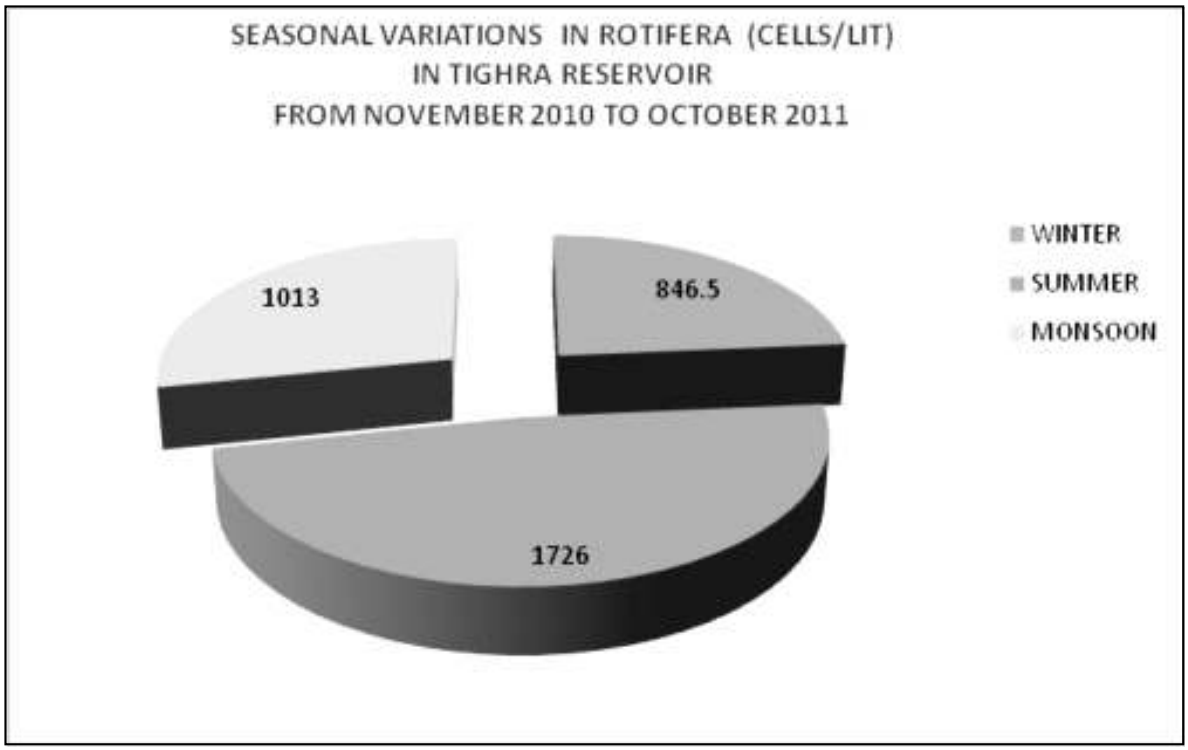


FIGURE 3

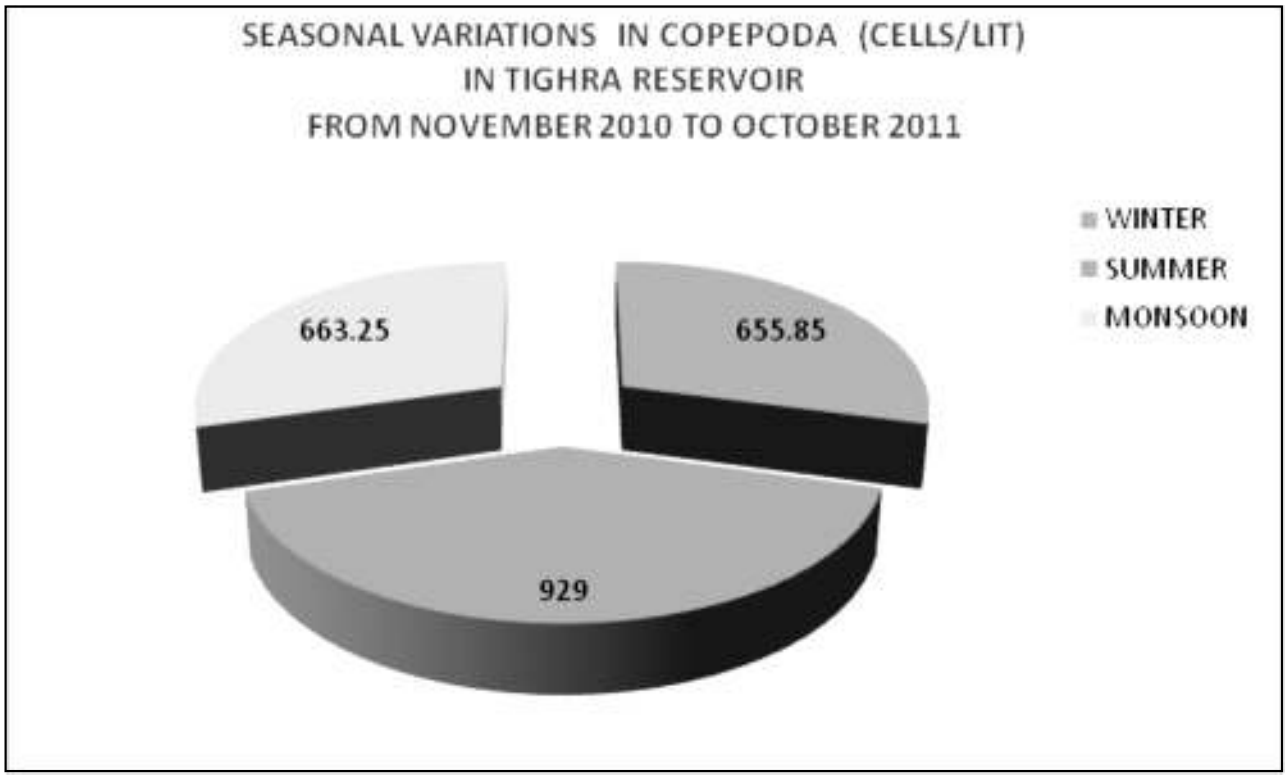


FIGURE 4

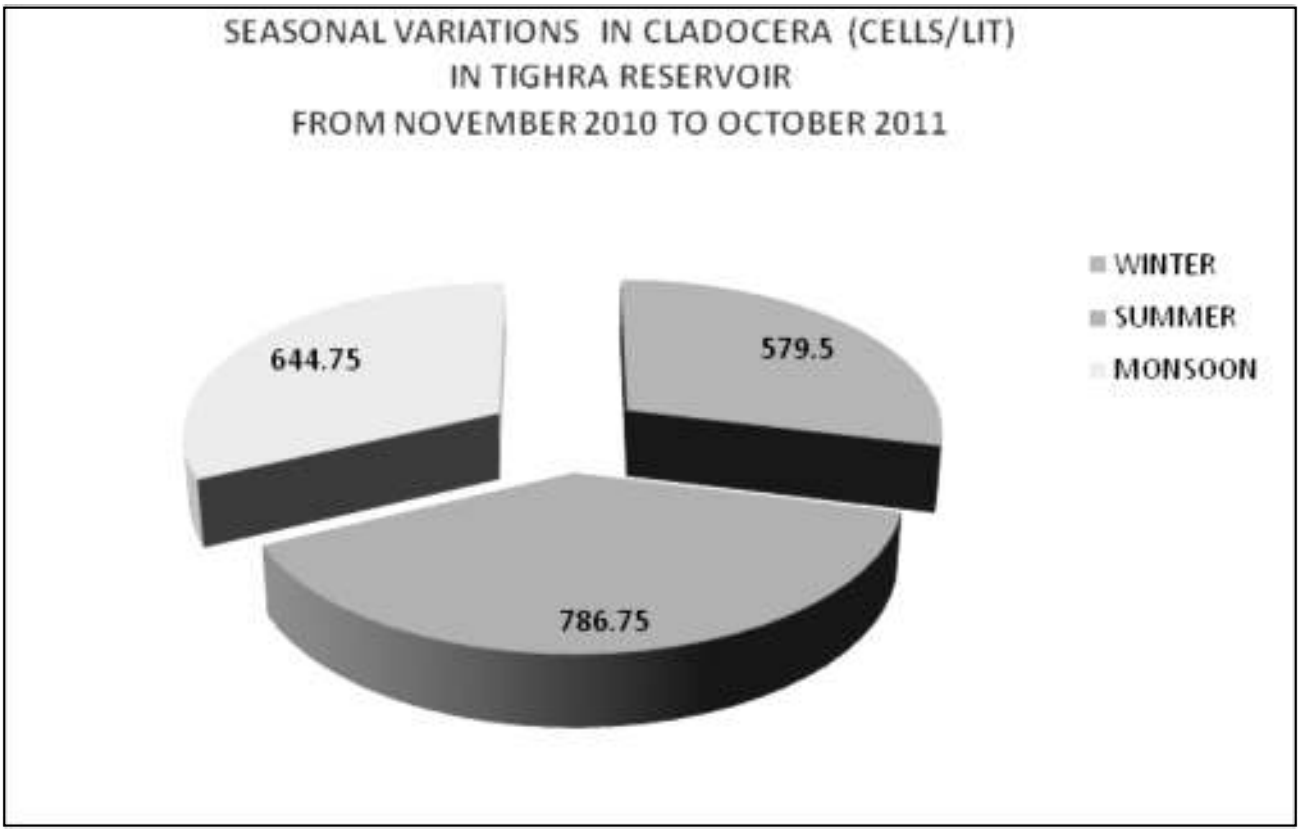
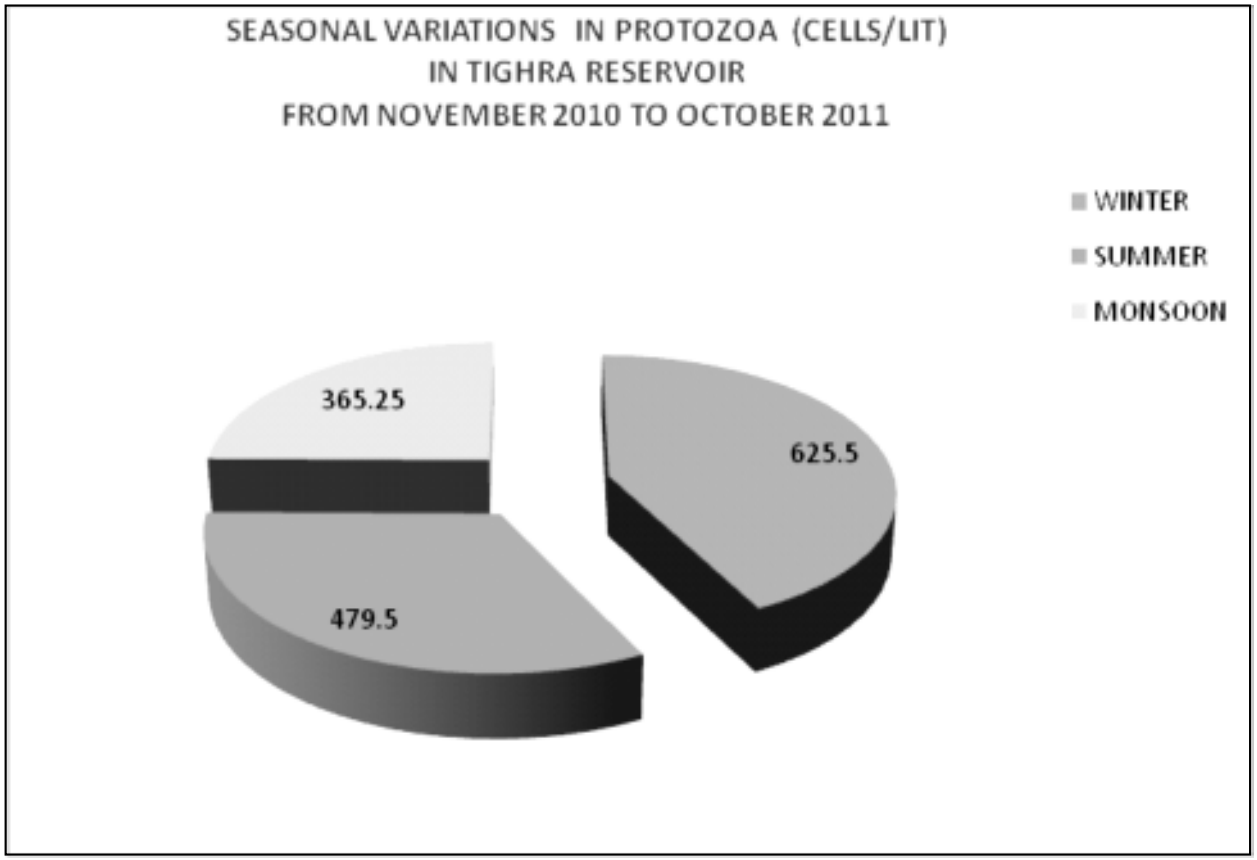


FIGURE 5



bacterioplanktons and algae. They are highly responsive to pollutants and even react against the low concentration of contaminants. Among all the zooplanktons, copepods have the toughest exoskeleton and the longest and strongest appendages.VasanthKumar et al.,(2011) recorded a total of 61 species of zooplanktons, in three ponds of Karwar district, Karnataka, with rotifer being the dominant group.

CONCLUSION

The present study reveals seasonal variation in the diversity and distribution of zooplanktons in Tighra reservoir. All four groups of zooplanktons were recorded throughout the study period. The number was highest during summer and lowest during winter. The study indicates that temperature has important role in the distribution of zooplanktons in a fresh water habitat.

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