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DIVERSITY AND ABUNDANCE OF ZOOPLANKTON IN HATTIKUNI RESERVOIR, YADGIR DISTRICT, KARNATAKA

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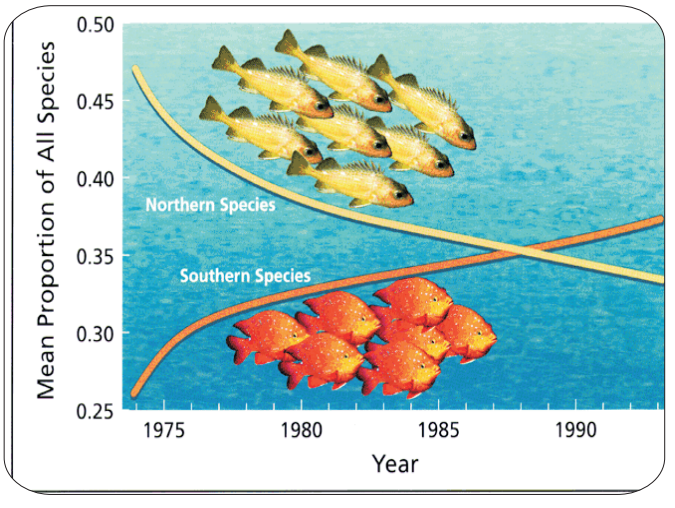


ABSTRACT

The paper deals with the diversity and abundance of zooplankton in Hattikuni reservoir, Yadgir District, Karnataka. Zooplanktons which are present in variety of habitats were studied with respect to their species diversity, distribution and seasonal abundance. The present study was undertaken for one complete year from January 2014 to December 2014. A total of 23 species were found in this reservoir. Among these 9 species belongs to rotifera, 6 species belongs to cladocera, 5 species belongs to copepod and 3 species belongs to ostracoda. Numerically rotifers were dominant group throughout the study period. Seasonal variations were observed in the distribution of zooplanktons. The study of season wise zooplankton analysis showed an average abundance of species in winter season, lower in monsoon and maximum occurrence in summer season , due to different environmental condition of water body.

KEYWORDS : Zooplanktons, Seasonal aundance, Hattikuni reservoir.

INTRODUCTION:

Aquatic ecosystem is the most diverse ecosystem in the world. The first life originated in the water and first organisms were also aquatic where water was the principal external as well as internal medium for organism.

Zooplanktons are microscopic and free-floating animals 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. Zooplankton is integral components of aquatic food webs and contributes significantly to aquatic productivity in freshwater ecosystem.

Many workers have studied the zooplanktons of fresh water bodies both in India and abroad and they have made the investigation to understand the various aspects of planktons such as plankton population, their percentage seasonal variation, productivity and their interrelationship between biological community and physicochemical parameters. Hence, the investigations on diversity and abundance of zooplankton will give us detailed information to understand ecological status of freshwater bodies.

The zooplanktons are classified in various groups viz., Rotifera, Cladocera, Copapoda, and Ostracoda. Planktons can determine the tropic status and quality of water of lakes and reservoir (Ganapati, 1962). The biodiversity of phytoplankton and zooplankton are also rich in nature (Kangasabapathi and Rajan, 2010). Zooplanktons are playing important role in bio-monitoring of water pollution (Tyor et al., 2014). The availability of food is more due to decomposition of organic matter and the density of zooplankton might be high due to fewer predators (Shivashankar et al. 2013). The study of zooplankton is necessary to evaluate the fresh water reservoir in respect to their ecological and fishery status (Goswami and Mankodi, 2012). The Zooplanktons community fluctuates according to physicochemical parameter of the environment, especially Rotifer species change with biotic factors (Karuthapandi et al., 2012).

The abundance and assemblage composition of zooplanktons are depends upon the dominance of water birds, fish, macro invertebrates and their food preference, (Russell et al., 2006). On the similar line Jafari et al. (2011) studied the zooplankton diversity and compositions are correlated to the physicochemical environment of the Haraz River.

The Zooplankton abundance was declines due to connection with redistribution number of individual in a water body less possibilities to stay in eutrophic zone where photosynthesis occurs (Dhembare, 2011). Zooplanktons are important in nutritive level, temperature, and pollution used to determine the health of an ecosystem (Purushothama et al., 2011).

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, Karnataka. Zooplanktons are important in an environmental impact study. They are extremely responsive to change in the environment and thus indicate environmental changes and fluctuations that may occur. Zooplankton is the intermediate link between phytoplankton and fish. Hence qualitative and quantitative studies of zooplankton are of great importance in Reservoir water body.

Zooplankton study is of necessity in fisheries; aquaculture and paleo limnological research. So that the present investigation made an attempt to study the diversity and abundance of zooplanktons in Hattikuni Reservoir, Yadgir District, Karnataka.

Materials and Methods

Study area

Hattikuni is one of the Village in Yadgir District in Karnataka . It is located 10 km away from the Yadgir District. Hattikuni Reservoir is a perennial fresh water body located 01 km away from Hattikuni village. It lies between Longitude and Latitudes of 16052’50” North and 77010’21” East respectively. Its water spread area is 2145 hectares.

Studies on zooplanktons were carried out for one complete year from January 2014 to December 2014 to study the seasonal variations in the zooplankton diversity. Both qualitative and quantitative studies were under taken. Samples were collected, once in a month, from five stations of the reservoir during an early hours of the day (7am to 9am), and such samples were pooled together to consider a final sample for analysis. The plankton net is made by the bolting nylon silk (mesh- size 50µm) is used for collection of zooplankton and which is conical shape and reducing cone with the bottle at its end. For a precise collection of zooplankton, the plankton net is towed horizontally and obliquely (for Qualitative) in surface water of the study area and for quantitative analysis, 10 liters of water samples were filtered out through the net. After transferring the sample in air tight plastic bottles, it would keep carefully with labeling and preserved immediately using 5% formaldehyde. Later, the collected samples were brought to laboratory for qualitative and quantitative analysis. Zooplanktons were identified by using the methods given by Needham and Needham (1962), Michel (1973), Pennak (1978), Tonopi (1980), Battish (1992), Dhanapati (2000).

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

The present study reports the Diversity and Abundance of Zooplankton in Hattikuni Reservoir, Yadgir District, Karnataka. In total 23 species belonging to 4 different groups of zooplanktons were recorded in this reservoir. Among 23 species, Rotifera comprise of 9 species, Cladocera 6, Copepoda 5 and Ostracoda 3. The results are given in table 1 to 4.

Rotefera

Rotifers are microscopic, pseudocoelomate animals and forms important group of freshwater zooplanktons. Totally 09 rotifer species were recorded during the period of investigation. Rotifers were found to be dominant group throughout the study period. Rotifers represented 39.621 % of all zooplanktons recorded from the Hattikuni reservoir (Fig. 2). The maximum number of rotifers (535 cells/lit) was recorded at Station 5 during April 2014 and the number was minimum (175 cells/lit) at Station 4 in July 2014. Seasonally the number was highest during summer, followed by winter and lowest during monsoon (Fig. 3). 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 Gulbarga district, Karnataka. Rotifer was the dominant group throughout their study period. Highest count was recorded during summer.

Cladocera

Cladocerans are commonly called water fleas belong to the order cladocera of the subclass Branchiopoda of the subphylum crustacea. They mainly inhabits freshwater. The body of a typical cladoceran is divided into head, thorax, abdomen and post abdomen. Cladocerans have a carapace covering both sides of body but opening ventrally. Totally 06 Cladocera species were recorded during

the period of investigation. Cladocerans were the second largest group of zooplanktons representing 25.544 % of the total population of zooplanktons recorded from the Hattikuni reservoir (Fig. 2). Maximum number of Cladocerans (265 cells/lit) were recorded at station 2 during May 2014 and the number was minimum (148 cells/lit) at Station 5 in August 2014. Seasonally the number was highest during summer, followed by winter and lowest during monsoon (Fig. 4). Similar results are made by Rajashekar et al (2010) and Sivakami, (2015). Due to large aquatic vegetation with macrophytes and highly productive water body, this might be one of the reasons for the abundance of cladocerans. (Sontakke et al, 2010).

Copepods

Copepods constitute one of the dominant groups of zooplanktons and it is the largest class of Entomostracan crustacea. They play a vital role as primary consumers in the aquatic ecosystems. Totally 05 Copepods species were recorded during the period of investigation. Copepods representing 21.259 % of the total population of zooplanktons recorded from the Hattikuni reservoir (Fig. 2). Maximum number of Copepods (220 cells/lit) were recorded at station 1 during April 2014 and the number was minimum (118 cells/lit) at Station 4 in July 2014. Seasonally the number was highest during summer, followed by winter and lowest during monsoon (Fig. 5). Similar results are made by et al A.N. Dede (2015).

Ostracoda

Ostracods are commonly known as “seed shrimps”. They are small crustaceans found in a wide range of aquatic habitats like lakes, pools and streams. They are commonly found in shallow waters where weeds or algae are abundant. Totally 03 Ostracods species were recorded during the period of investigation. They occupy lowest diversity and abundance in present study. Ostracods representing 13.576% of the total population of zooplanktons recorded from the Hattikuni reservoir (Fig. 2). Maximum number of Ostracods (138 cells/lit) were recorded at station 3 during April 2014 and the number was minimum (78 cells/lit) at Station 3 in August 2014. Seasonally the number was highest during summer, followed by winter and lowest during monsoon (Fig. 6). Similar observations were reported by Ramakrishna (2014) from Yelahanka Lake.

Table 1: Diversity of zooplanktons in Hattikuni Reservoir, Yadgir District, Karnataka.

Sl. No	Rotefera	Cladocera	Copepoda	Ostracoda
1	*Brachinous caudatus*	*Moina brachiata*	*Paracyclops fimbriatus*	*Hemicypris fossulate*
2	*Brachionus falcatus*	*Moina rectirostris*	*Nauplius*	*Spirocypris*
3	*Brachionus forficula*	*Moina macrocopa*	*Mesocyclops hyalinus*	*Heterocypris species*
4	*Brachionus calyciflorus*	*Diaphanosoma suarsi*	*Mesocyclops leuckarti*	
5	*Brachionus quadridentatus*	*Bosmina longirostris*	*Thermocyclops*	
6	*Brachionus angularia*	*Chydrous species*		
7	*Keratella tropica*			
8	*Keratella chochlearis*			
9	*Lacane species*			

Table 2: Monthly variations in zooplanktons (no. /lit) of water at five sampling stations of Hattikuni reservoir, Yadgir District, Karnataka from January 2014 to December 2014

Zooplankton groups	Sampling stations	Months												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Rotifera	I	230	310	430	480	445	180	186	210	242	360	200	210	3483
	II	210	300	470	500	470	200	199	225	235	345	225	195	3574
	III	230	286	465	510	505	190	202	215	230	380	240	205	3658
	IV	225	290	510	530	530	195	175	220	245	410	245	204	3779
	V	220	295	480	535	525	189	220	210	240	405	248	200	3767
	Mean	**223**	**296.2**	**471**	**511**	**495**	**196.4**	**190.8**	**216**	**238.4**	**380**	**231.6**	**202.8**	**3652.2**
Cladocera	I	190	205	256	255	255	160	170	185	180	175	190	188	2409
	II	185	215	260	260	265	170	168	175	192	190	198	194	2472
	III	195	200	245	245	246	164	180	184	180	187	180	182	2388
	IV	186	195	220	230	215	158	176	155	174	195	186	190	2280
	V	180	188	225	220	210	149	160	148	177	190	192	185	2224
	Mean	**187.2**	**200.6**	**241.2**	**242**	**238.2**	**160.2**	**170.8**	**169.4**	**180.6**	**187.4**	**189.2**	**187.8**	**2354.6**
Copepoda	I	165	190	210	220	215	150	150	152	142	159	160	166	2079
	II	158	180	204	200	220	145	164	150	135	165	166	164	2051
	III	150	165	200	215	216	142	158	154	148	150	158	160	2016
	IV	146	140	205	205	210	125	118	135	145	146	145	135	1855
	V	140	145	203	202	202	130	124	125	138	130	130	128	1797
	Mean	**151.8**	**164**	**204.4**	**208.4**	**212.6**	**138.4**	**142.8**	**143.2**	**141.6**	**150**	**151.8**	**150.6**	**1959.6**
Ostracoda	I	120	135	140	130	132	105	80	90	85	102	106	105	1330
	II	108	130	136	126	134	98	92	87	75	97	99	120	1302
	III	117	132	114	138	125	90	96	78	86	95	102	118	1291
	IV	115	115	110	112	116	85	89	84	89	90	90	105	1200
	V	105	110	106	102	110	79	86	82	80	92	80	103	1135
	Mean	**113**	**124.4**	**121.2**	**121.6**	**123.4**	**91.4**	**88.6**	**84.2**	**83**	**95.2**	**95.4**	**110**	**1251.4**

Table 3: Annual variations in zooplankton composition in Hattikuni reservoir, Yadgir District, Karnataka from January 2014 to December 2014

SI.NO	Zooplankton groups	Number of organisms	Percentage
1	Rotifera	3652.2	39.621
2	Cladocera	2354.6	25.544
2	Copepoda	1959.6	21.259
4	Ostracoda	1251.4	13.576

Table 4: Groupwise seasonal variations in zooplankton composition in Hattikuni reservoir, Yadgir District, Karnataka from January 2014 to December 2014

SI.NO	Season	Rotefera	Cladocera	Copepoda	Ostracoda
1	Summer	1773.2	922	789.4	490.6
2	Winter	1037.4	751.6	604.2	413.6
3	Monsoon	841.6	681	566	347.2

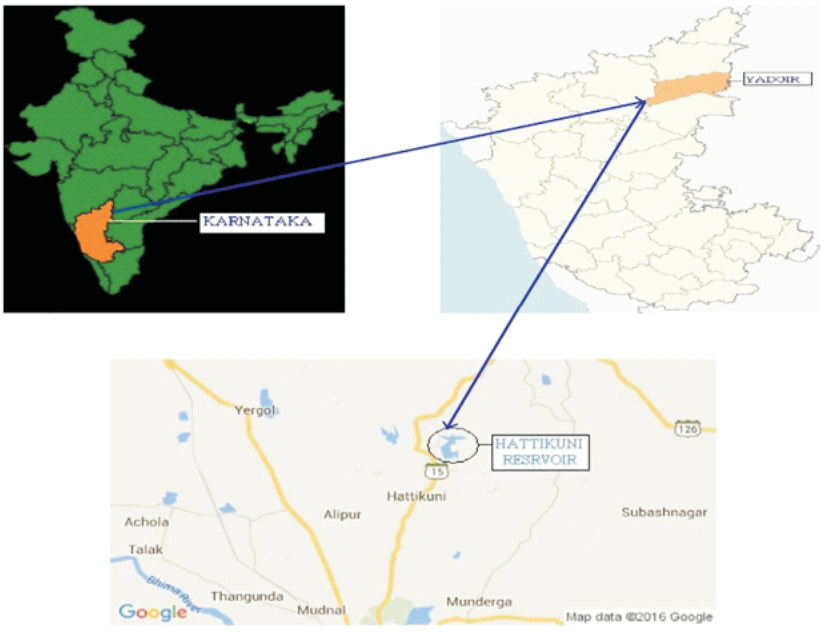
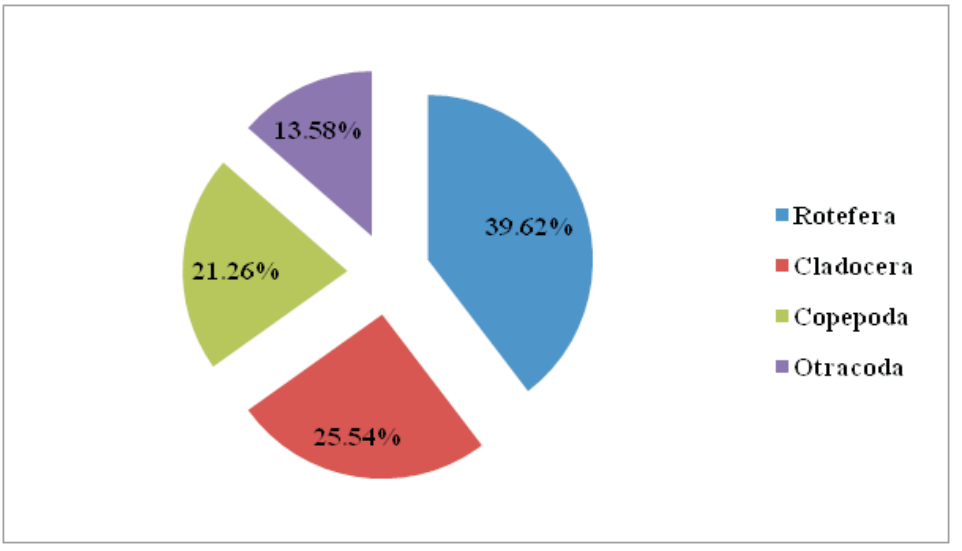


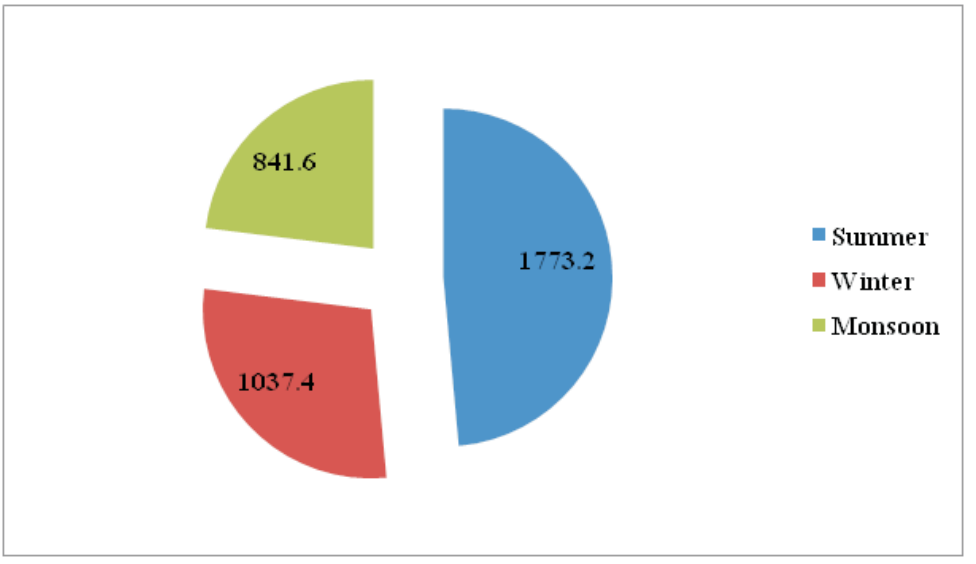
Fig : 1.Location of study area

Fig : 2



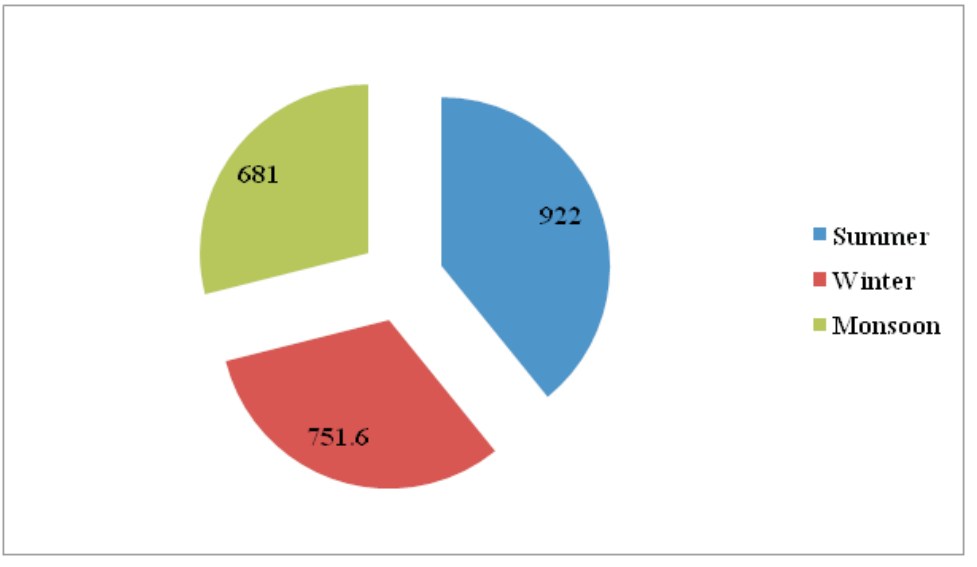
ANNUAL VARIATIONS IN ZOOPLANKTON COMPOSITION IN HATTIKUNI RESERVOIR, YADGIR DISTRICT, KARNATAKA FROM JANUARY 2014 TO DECEMBER 2014

Fig : 3



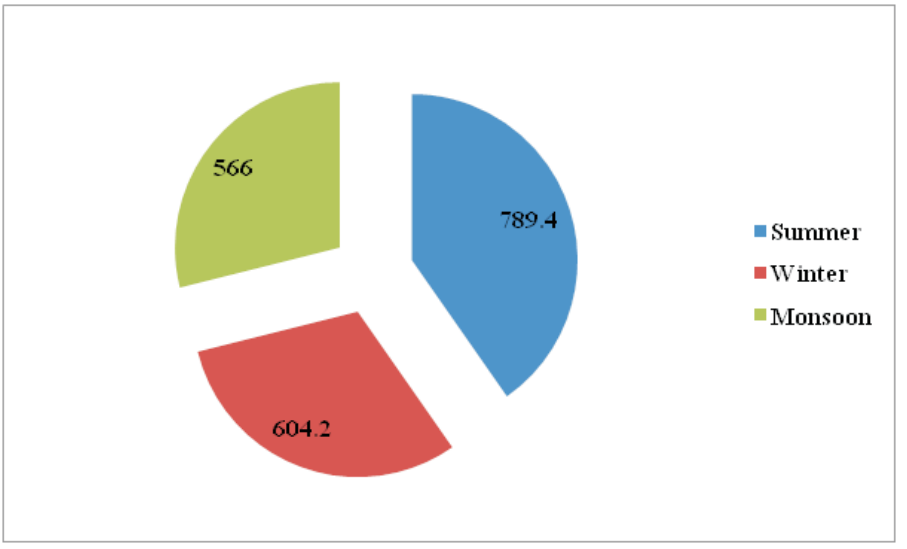
SEASONAL VARIATIONS AND ABUNDANCE OF ROTIFERA (CELLS/LIT) IN HATTIKUNI RESERVOIR, YADGIR, DISTRICT, KARNATAKA

Fig : 4



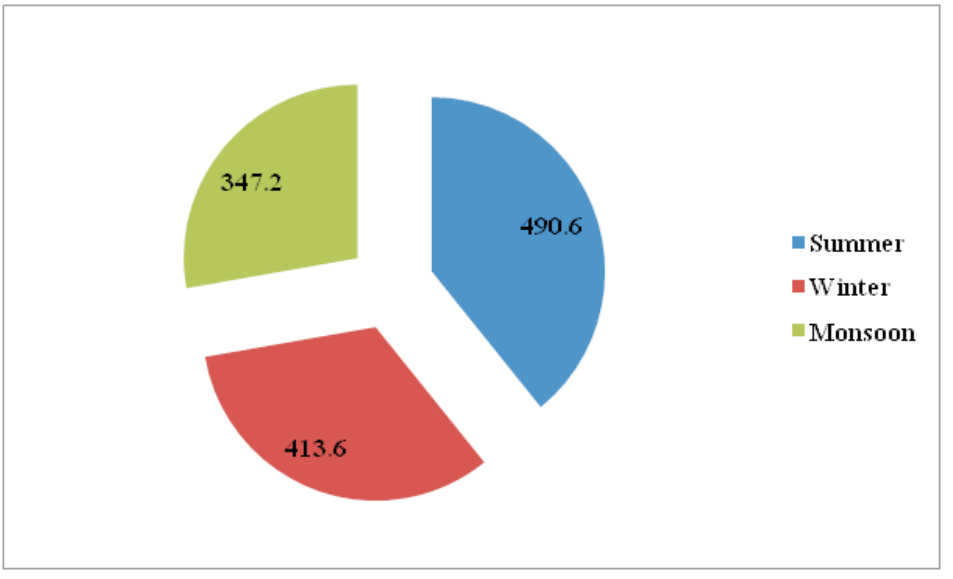
SEASONAL VARIATIONS AND ABUNDANCE OF CLADOCERA (CELLS/LIT) IN HATTIKUNI RESERVOIR, YADGIR, DISTRICT, KARNATAKA

Fig : 5



SEASONAL VARIATIONS AND ABUNDANCE OF COPEPODA (CELLS/LIT) IN HATTIKUNI RESERVOIR, YADGIR, DISTRICT, KARNATAKA

Fig : 6



SEASONAL VARIATIONS AND ABUNDANCE OF OSTRACODA (CELLS/LIT) IN HATTIKUNI RESERVOIR, YADGIR, DISTRICT, KARNATAKA

The study indicates seasonal variations in the distribution of zooplanktons. Rotifera, cladocera , copepoda and Ostracoda were found in maximum number during summer, followed by winter and minimum during monsoon.

Seasonal variation and abundance of zooplankton were observed during the study period.

In the summer Rotifera (1773.2 cells/lit), in winter (1037.4 cells/lit) and in monsoon (841.6 cells/lit), Fig. 3. In the summer Cladocera (922 cells/lit), in winter (751.6 cells/lit) and in monsoon (681 cells/lit), Fig. 4. In the summer Copepoda (789.4 cells/lit), in winter (604.2 cells/lit) and in monsoon (566 cells/lit), Fig. 5. In the summer Ostracoda (490.6 cells/lit), in winter (413.6 cells/lit) and in monsoon (347.2 cells/lit). Fig. 6. Similar observations were reported by Manickam et al. (2014) from Thoppaiyar reservoir Dharampuri district, South India, Gayathri et al. (2014) from Doddavoderhalli Lake, Bangalore, and Karnataka and A.N. Dede and A.L. Deshmukh et al. (2015) from Bhima River Near Ramwadi Village, Solapur District (Maharashtra), India The study shows that temperature has important role in the distribution of zooplanktons in a fresh water habitat.

CONCLUSION

The result of present study indicated that all four groups of zooplanktons were recorded throughout the study period. The population density, composition and abundance of zooplanktons varies according to the season and type of freshwater body.

The zooplanktons were maximum during summer season because inflow is less to compare with other seasons resulted in stability of water body and availability of food is more due to decomposition of organic matter and the density of zooplankton might be high due to less predators.

An average abundance of species in winter season during winter season due to favorable environmental conditions and presence of excess of food in the form of bacteria and suspended detritus, Lowest during monsoon season due to the dilution factors and its effects leads to less photosynthetic activity by primary producers. The study indicates that temperature has important role in the distribution of zooplanktons in a fresh water habitat.

The present information on diversity and abundance of zooplankton from the Hattikuni Resrvoir, Yadgir district, Karnataka is helpful for further diversity and conservation studies of invertebrates from Hattikuni reservoir . It will be also useful in the awareness of water pollution and maintenance of such aquatic ecosystem in future.

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