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Research Article

# ZOOPLANKTON DIVERSITY IN FRESHWATER RESERVOIR OF YADIGIR DISTRICT, KARNATAKA STATE

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***Abstract***

In the present work, we provide quantitative information on the diversity of zooplankton from a perennial reservoir in the Yadgir district, Karnataka State. In the study period (2013-14) we have recorded 23 genera of zooplankton, of which 13 genera belong to rotifera, 5 genera belong to cladocera , 4 genera belong to copepod and 2 genera were belong to ostracoda. Among zooplankton, particularly rotifera was the dominant group throughout the study period and highest count was recorded in the northeast monsoon season, followed by summer and winter season. The remain groups were presented in all the seasons of the study period. The results state that the distribution and density of zooplankton species influenced reservoir physical and chemical variables.

***Key Words:*** Mailapur reservoir, diversity, diversity indices

## INTRODUCTION

Freshwater has been of little importance to human beings and other organisms of the environment for sustenance of life and maintaining the balance of the nature; hence "*water is the lifeblood of the earth*" *(www.afn.ca)*. Reservoirs and lakes are becoming very important resources throughout the world because of the primary concern of man were thought to be for meeting his basic requirements.

Around the world, freshwater habitats are being subjected to increased levels of human disturbance (Saunders *et al.,* 2002). A recent assessment of the status of inland water ecosystems shows that globally most threatened river catchments are to be found in the Indian subcontinent (WCMC, 2000). An overview of throughout the world, freshwater environments are experiencing serious threats to both biodiversity and ecosystem stability (Suski and Cooke 2006), and many strategies have been proposed to solve this crisis (Williams *et al.,* 1989; Warren and Burr 1994; Cowx 2002; Suski and Cooke 2006).

Zooplankton referred to as living machines transforming plant material into animal tissue. Hence they play an important role as the intermediaries for nutrients/ energy transfer between primary and tertiary trophic levels. The seasonal changes in zooplankton species are clearly related to the physico-chemical and biological parameters of aquatic environment.

Hence, the investigations zooplankton diversity and composition will give us detailed information to understand ecological status of freshwater bodies. Very scatter information is available on freshwater bodies of north Karnataka region. In the present study an attempt has been made to investigate diversity and abundance of zooplankton community in freshwater reservoir of Yadgir District, Karnataka.

## MATERIALS AND METHODS

The qualitative estimation of zooplankton communities was carried out in the laboratory. Samples were kept for setting for a period of 48 hours. Three equal aliquots were taken from the settled samples. Proportionate samples were taken from above three aliquot and transferred on to Sedgwick-Rafter cell and planktonic organisms numerically counted and identified. The identification of zooplankton species was done by the Zoological Survey of India, Kolkata and the same was confirmed by Needham and Needham (1962), Michel (1973), Pennak (1978), Tonopi (1980), and Battish (1992).

The following diversity studies (Dominance, Shannon, Simpson_1-D, Evenness ) have been calculated for all the groups of zooplankton to find out the zooplankton diversity of present reservoir .

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## RESULTS AND DISCUSSION

Among the zooplankton four groups of zooplankton communities were identified namely rotifera, cladocera, copepoda and ostracoda and each group's annual and seasonal fluctuation in the composition and density were described and individual species abundance has been observed in the present study.

Rotifers are prominent group among the zooplankton of a water body irrespective of its trophic status. This may be due to the less specialized feeding, parthenogenetic reproduction and high fecundity (Sampio *et al.,* 2002). Among the zooplankton rotifers respond more quickly to the environmental changes and used as a change in water quality (Gannon and Stemberger 1978). Rotifers are regarded as bioindicators of water quality (Sladecek, 1983; Saksena, 1986) and high rotifer density has been reported to be a characteristic of eutrophic lakes (Sendacz, 1984).

The diversity and seasonal variation in abundance of zooplalnkton has been presented in table No.1, 2 and diversity index values are presented in table No. 3 respectively

The higher populations of rotifera were recorded during summer season, while low density was observed in southwest monsoon season of study period. The total number of individuals of rotifer group was consist of 1073 ind/l (summer season), 881 ind/l (northeast monsoon season), 362 ind/l (southwest monsoon season),

During the study period the maximum number of rotifera taxa was recorded in northeast monsoon seasons , whereas, minimum taxa was recorded during the south west monsoon. The Dominance values of rotifera were observed 0.485, the values of Shannon index was 2.631, Simpson dominance index values of rotifera about 0.9131 and evenness values of rotifera is 0.818 respectively.

From the ecological point of view cladocerans considered to be most important components of zooplankton community. The group appears to proliferation more in ponds, lakes and reservoir. This group occupies a prime place in pisciculture activity because of two seasons viz., 1) They attain a maximum population within a short time that the parthenogenic reproduction. 2) This crustaceans forms an important food source for various kinds of fishes. Further, due to psychlomorphic characters it has attracted several taxonomist to the study and to designate various species.

**Table 1** Zooplankton composition in Mailapur reservoir during 2013-14

| S.No | Zooplankton species |
|---|---|
| **I** | **Rotifera** |
| 1 | *T. cylindrical* |
| 2 | *T. longiseta* |
| 3 | *T. ruttus* |
| 4 | *Brachionus calyciflours* |
| 5 | *B. rubens* |
| 6 | *B. falcatus* |
| 7 | *Karatella tropica* |
| 8 | *K.chohelaris* |
| 9 | *Filinia longiseta* |
| 10 | *F.terminalis* |
| 11 | *Macrothaetus serica* |
| 12 | *Rotaria sp* |
| 13 | *Lecane luna* |
| **II** | **CLADOCERA** |
| 1 | *D. laevis* |
| 2 | *D. carinata* |
| 3 | *Euryyalona oreientalis* |
| 4 | *Monia brachiata* |
| 5 | *M.reticularis* |
| 6 | *Diaphanosoma excisum* |
| **III** | **COPEPODA** |
| 1 | *Mesocyclops leukerri* |
| 2 | *Cyclopoid nauplii* |
| 3 | *Rhineadiaptomus indicus* |
| 4 | *Paracyclops fimbriatus* |
| **III** | **OSTRACODS** |
| 1 | *Eucypris bispinosa* |
| 2 | *Hemicypris fossulata* |
| 3 | *Spirocypris* |

**Table 2** Seasonal abundance of Zooplankton in Mailapur reservoir

| Zooplankton/seasons | 2013-14 NEM | SUMMER | SWM |
|---|---|---|---|
| Rotifera | 881 | 1073 | 362 |
| Cladocera | 462 | 752 | 223 |
| Copepoda | 252 | 403 | 61 |
| Ostracoda | 9370 | | 32 |

**Table 3** Diversity indices of all the zooplankton groups of Mailapur reservoir

| Zooplankton/ Diversity indices | ROTIFERA | CLADOCERA | COPEPODA | OSTRACODA |
|---|---|---|---|---|
| Taxa_S | 13 | 5 | 4 | 3 |
| Dominance_D | 0.485 | 0.131 | 0.201 | 0.071 |
| Shannon_H | 2.631 | 1.303 | 1.102 | 1.06 |
| Simpson_1-D | 0.9131 | 0.861 | 0.792 | 0.622 |
| Evenness_e^H/S | 0.8181 | 0.905 | 0.893 | 0.930 |

During the study period the Cladocera were maximum population during summer season and minimum population was observed during southwest monsoon season of study period. The maximum taxa of cladocera were observed in northeast monsoon season followed by summer season and southwest monsoon season. The diversity studies reveals that the Dominance index values of cladocera were 0.131, Shannon diversity index was 1.303, Simpson diversity index was about 0.861 and Evenness index value was 09.5 respectively.

In this present study the observation of *Diaphanosoma excisum* in lake can also be considered as an

indication of increased organic content high quantity. Similar reports are made by Kirk and Gilbert, (1990) reported that the decrease in the water level, live stock disturbances and anthropogenic activities increase the turbidity and thus inhibits the competitive abilities of Daphnia species.

Copepods are considered as important food item for various kinds of fish, play a key role in the energy transformation at different trophic levels. It is reported that calanoid copepods best adapt to oligotrophic lakes, and cyclopoid copepods best adapt to eutrophic lakes (Gannon and Stremberger, 1978). In addition to rotifers, a low density and diversity of copepods in the water body provides additional evidence of the presence of high amount of organic components.

The composition and total number of individuals of copepoda northeast monsoon season of 2013-14 were 252 ind/l, 403 ind/l were recorded during summer season and lowest individuals were noticed in southwest monsoon season respectively. The Dominance index values of copepoda group was 0.201, Shannon diversity index and Simpson diversity index were 1.102 and0.792 respectively.

Ayyappan and Gupta (1980) observed seasonal and spatial distribution of copepods in the perennial tank situated in Dakshina Kannada, Karnataka. Sharma and Saxena (1981) and Saksena and Kulkarni, (1984) studied zooplanktonic survey of perennial water bodies of Gwalior. The present study results are fall in same line of earlier studies.

During the present investigation, the ostracoda was occupied last position in terms of population and diversity aspects.
Majority of them are free living and few are commensels on the gills of cry fishes and in the intestine of fishes and amphibians about 1700 species of ostracods of which 550 inhibit freshwaters, have been recorded all over the world. Approximately 100 species are known from the inland water bodies of the Indian subcontinent. Kumar, (1993) studied on the species composition, total abundance periodicity of dominant ostracoda species in relation to certain physico-chemical factors in subtropical pond of Jammu and observed a direct correlation of ostracods with protozoa and rotifera. Rajashekhar et al, (2010) studied on the seasonal variations of physico-chemical parameters and zooplankton communities of reservoir of Gulbarga District. The low diversity and abundance of ostracoda group may be due to soft nature of water in reservoir.

During northeast monsoon season ostracoda population was 93 ind/lit, in summer season the total population of ostracoda was 70 ind/lit and lowest number of individuals were observed in southwest monsoon season. The diversity values of ostracod of Mailapur reservoir were, 0.071 (Dominance Index), 1.06 (Shannon Index), 0.622 (Simpson Index) and 0.93 (Evenness).

## CONCLUSION

The overall view in this study reveals that the fluctuation of zooplankton occurs distinctly in the study area and normally in southwest monsoon season there is a less abundance due to the inflow of runoff water in to the reservoir from the surrounding agricultural field and its leads to less photosynthetic activity by primary producers. The diversity and density increased during northeast monsoon season due to favorable environmental conditions and presence of nutrients, detritus matter, whereas in summer season the abundance is less to due to low water in the reservoir and availability of food.

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