Status of Meiobenthic Faunal Diversity of Nathsagar Reservoir (Paithan) in Sustainable Development of Ecosystem

Rumana S. Shaikh[a], Atul R. Chourpagar[b],T. S. Pathan[c]
[a]Department of Zoology, Pemraj Sarada College, Ahmednagar ,Maharashtra State, India.
[b]Department of Zoology, Dadapatil Rajale Arts, Science and Commerce College, Adinathnagar, Tal. Pathardi, Dist. Ahmednagar ,Maharashtra State, India.
[c]Department of Zoology, Kalikadevi Art, Science and Commerce College, Shirur (K), Dist. Beed.

Abstract

The present study deals with the diversity of meiobenthic fauna of Nathsagar reservoir (Paithan) Dist. Aurangabad, Maharashtra, for a period of two years February 2008 to January 2009 and February 2009 to January 2010. Forty six 46 species of meiobenthic fauna consisting of Rotifera, Cladocera, Copepoda, Ostracoda, Protozoa and Other fauna were recorded in the present study. In the total meiobenthic faunal density, Copepoda constitute 27.62 % followed by Rotifera 24.88 %, Cladocera 17.10 %, Ostracoda 14.78 %, protozoan 10.61 % and other fauna 5.08%. Meiobenthic fauna are the major mode of energy transfer between phytoplankton and end users like finfishes, shellfishes etc. in sustainable development of ecosystem.

KEYWORDS: Community composition, Density, Diversity, Meiobenthic fauna, Nathsagar Reservoir (Paithan).

Introduction:-

Understanding the roles of meiofauna as a link between microbial food resources and macro organisms and agents in nutrient regeneration were identified by Hildrew (1992) as crucial for understanding energy flow in the food webs of streams. The meiofauna are defined as those benthic animals that pass through a 500-µm sieve but are retained on a 40-µm sieve (Higgins and Thiel, 1988). The past decade has seen a huge increase in interest in this fauna, which often dominates benthic animal communities in terms of numbers and species richness, and plays important roles in community and ecosystem processes (Robertson, et al. 2000; Rundle, et.al., 2002; Palmer and Rundle, 2007). Some meiofauna taxa ingest algae, e.g. copepods, rotifers, cladocerans, ostracods. (Carman 1990, Montagna 1995) and oligocheates (Mastrantuono, 1988) and when abundant can complete with macro invertebrates for a significant portion of primary productivity (Borchardt and Bott, 1995). Ecological patterns and processes occur and operate over a wide range of temporal and spatial scale (Levin 1992) and ecologists are now attempting to address how links between regional and local scales ecology may be manifested (Ricklef and Schluter, 1993). Most of the work done on the marine meiobenthic fauna and as there is less information regarding the freshwater meiobenthic fauna of this region so that present study was undertaken.

Material and methods:-

The present study was conducted for a period of two years from February 2008 to January 2010. Freshwater meiobenthic faunal samples were collected from Nath Sagar at Paithan two times in a month at an interval of 15 days. Sediment samples

were collected during the early hours of the day using an Ekman drag. From this sediment for meiobenthic faunal analysis was taken using a cut off plastic pipe (Diameter - 3 cm) 15 cm depth in four replicates. From each replicate of drag sediment sample were collected in plastic bag, for quantitative and qualitative analyses. Sediment sample were transported to the laboratory within an hour in plastic bag for studying morphology and taxonomy.

Quantitative analysis of meiobenthic sample using Sedgewick- Rafter chamber for counting and classification into higher taxa were carried out under stereoscopic microscope as per the method of Higgins and Hjalmar, (1988). In this study meiobenthic abundance was standardized as individuals per 10 cm^2, which is generally accepted unit in meiobenthic faunal studies .The abundance of taxa was calculated based on the individual number (n) recorded from sample and the original sample sized (3.14 X 1.5 X 1.5 cm^2), i.e.,

Abundance = (n X 10)/ (3.14 X 1.5 X 1.5 cm^2) individuals/10 cm^2

Meiobenthic faunal diversity and population dynamics were analyzed by various indices such as Species diversity indices, Shannon Wiener indices, Hill diversity indices, and Evenness indices as given by Bakus (2007).

Results and Discussion:

The observed meiobenthic faunal diversity is presented in six different groups such as Rotifera, Cladocera, Copepoda, Ostracoda, Protozoa and other fauna i.e. Gastrotricha, larval forms (zoea and krill), annelids and Turbellaria. The seasonal record and correlation coefficient of average of meiobenthic faunal density was observed during February 2008 to January 2010 (Table 1). The present study the occurrence of season wise meiobenthic faunal groups was dominant in the order Copepoda>Rotifera>Cladocera>Ostracoda>Protozoa>other fauna (Graph 1). In the total meiobenthic faunal density, Copepoda constitute 27.6 % followed by Rotifera 24.9 %, Cladocera 17.1 %, Ostracoda 14.8 %, protozoan 10.6 % and other fauna 5.08% (Graph 2).

Copepoda: Copepoda has significantly positive correlation with Ostracoda ($P < 0.01$) whereas there was no correlation with Rotifera and Cladocera (Table 1). Majagi (2005) reported that the copepod population in Karanja reservoir show significant positive correlation with Rotifera and Ostracoda. In the present study the copepoda showed maximum number of rotifers was seen during summer indicating the influence of temperature supported by positive correlation between temperature and rotifer population (Copepoda: summer > winter > monsoon). Similar observations are made by Somani and Pejavar (2004) in Masunda Lake. Absence of parthenogenetic form of copepod might be responsible for their low population density in mansoon season (Mustapha, 2009, Pawar, 2016).

Rotifera: The rotifera showed their higher population during monsoon and summer season, while the lower population was observed in winter season (Rotifera: monsoon > summer > winter). Singh (2005) observed abundant rotifers in summer and Pawar (2016) observed lower population of rotifera in winter. Rotifera show significantly positive correlation with Cladocera and ostracoda ($P<0.01$), whereas negative correlation with copepoda. Majagi (2005) has reported significantly positive correlation of rotifera with copepoda and ostracoda in Karanja reservoir Karnataka. The positive correlation of rotifera with copepoda and negative correlation with Cladocera and ostracoda in Ramsagar reservoir, Armori, Gadchiroli (Chavhan, 2010).

Cladocera: The Cladocera population density shows significantly positive correlation with rotifera and copepoda ($P<0.01$) whereas no correlation with ostracoda. Majagi (2005) reported no correlation of Cladocera with Rotifera, Copepoda and Ostracoda in Karanja reservoir, Karnataka. In the present study Cladocera population was recorded maximum in summer and monsoon season, minimum during winter season (Cladocera: summer > monsoon > winter). Abundance has also been earlier reported in summer season and lowers in winter by Yeole, et. al. (2008) from Yedshi Lake, Maharashtra, Dushyantkumar Sharma (2012) in Thigra Reservoir Gwalior (M.P.) and Pawar (2016) reported from Majalgaon reservoir.

Ostracoda: Ostracoda has significantly positive correlation with Copepoda ($P < 0.01$) whereas there was no correlation with Rotifera and Cladocera. Kudari (2005) reported positive correlation of ostracoda with rotifera, copepoda and cladocera in Attiveri reservoir of Mundgod town of Uttar Khannada district. In the present study ostracoda population was recorded maximum in summer and winter season, minimum during monsoon season (Ostracoda: summer > winter > monsoon). This result has also been observed by Sukand and Patil (2004) in Fort Lake of Belgaum and Kedar et al. (2008) in Rishi freshwater lake of Washim district.

Protozoa: Protozoan had positive correlation with water temperature, transparency, pH and Free CO_2. The protozoans are represented by Paramecium sp., Vorticella sp., Euglena sp., Phacus, Stentor and Euplotes. In the present study protozoan population was recorded maximum in winter and summer season, minimum during monsoon season (Protozoa: summer > winter > monsoon). The reduction during monsoon may be due to dilution of water caused by monsoon rain. Such observation was also recorded Patil, et. al., (2008) in Yedshi Lake, Maharashtra, Shivshankar and Venkatramana (2013) at Bhadra reservoir, Karnataka.

Other Fauna: Other Fauna including Gastrotricha sp., Larvae, Hydra sp., Aeolosoma sp. [Annelida], Suomina sp. [Turbillaria]. In the present study total percent composition of other fauna collectively was recorded maximum in summer and winter, minimum during monsoon season (Other fauna = summer > winter > monsoon).

Conclusion:

Meiobenthic fauna are the major mode of energy transfer between phytoplankton and end users like finfishes, shellfishes etc. in sustainable development of ecosystem.

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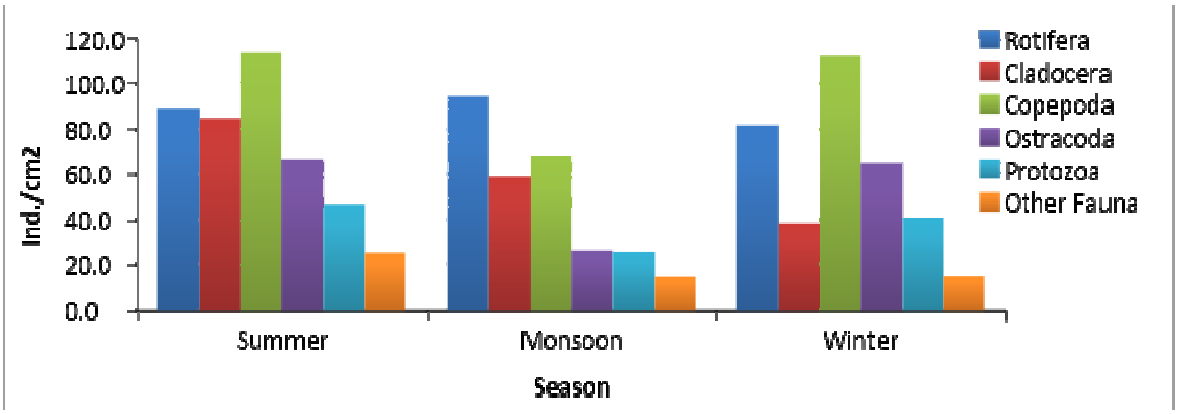
Table 1. Correlation coefficient of average monthly record of meiobenthic fauna of Nath Sagar (Paithan) during Feb 2008 to Jan 2010.

Meiobenthic Fauna	Rotifera	Cladocera	Copepoda	Ostracoda
Rotifera	1.000			
Cladocera	0.239	1.000		
Copepoda	-0.241	0.035	1.000	
Ostracoda	-0.341	0.221	0.777**	1.000

Significant at * $P < 0.05$ [r = 0.396] and ** $P < 0.01$ [r = 0.505] and [-] negative correlation

Graph 1. Showing aaverage of seasonal record of meiobenthic faunal density Individual/10cm^2] of Nath Sagar (Paithan) during Feb 2008 to Jan 2010.



Graph 2. Showing percent composition of meiobenthic fauna of Nath Sagar during February 2008 to January 2010.