



# Seasonal Variations in the Zooplankton Diversity of, River Uma District Chandrapur, (M.S.), India.

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## Abstract

Some of the heterotrophic Zooplankton are found floating in water. They serve as good indicators of changes in water quality. The present study was undertaken to observe the seasonal fluctuations in diversity of zooplanktons of River Uma. From a period of January 2013 to December 2013 were utilized for the both qualitative and quantitative analysis. Various Zooplankton community of Uma River consist of Cladocera, Copepoda and Rotifera. Cladocerans showed dominance both in number and diversity, followed by Copepods and Rotifers. This study also reveals that different groups of zooplanktons have their own peak periods of density, which is affected by local environmental conditions present at that time.

**Keywords-** Zooplanktons, seasonal variation, diversity, Uma River

## Introduction:

Zooplanktons are minute aquatic, non motile animals that are very weak swimmers. They contribute significantly to biological productivity of freshwater ecosystem. As the Zooplanktons are strongly affected by the environmental conditions, they serve as good indicator of changes in water quality, (Gannon and Stemberger, 1978). They are not only useful as bioindicators, but also helpful for ameliorating polluted waters. Zooplankton species are cosmopolitan in nature. They consist of fresh water, brackish and marine water forms. The freshwater zooplankton comprises Protozoans, Rotifers, Cladocerans, Copepods and Ostracods.

Rotifers, the microscopic animalcules and considered to be the nature's water purifier. They 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. Among the zooplankton, rotifers respond more quickly to environmental changes and used as changes in water quality (Gannon and Stemberger, 1978).

Cladocerans are tiny aquatic crustaceans and commonly known as water fleas. They are highly responsive against pollutants and hence serve as good biological indicators of water pollution. Copepods have been known to be the most abundant zooplankton in the River systems. They dominate most aquatic ecosystems because of their resilience and have the capacity to adapt to changing environmental conditions and ability to withstand varying environmental stresses (Barnes et al, 1988). The number of Zooplanktons is more in stable environmental conditions and the number decreases as pollution level increases (Das et al, 1996). Investigations of freshwater zooplankton community structure have significant potential for assessing aquatic ecosystem health. Their dominance and seasonality are highly variable in different water bodies according to nutrient status, age, morphometry and other locational factors. Therefore changes in aquatic environment accompanying anthropogenic pollution are a cause of growing concern and requires monitoring of surface waters and organisms inhabiting them. So the





present study was carried out to understand the diversity and seasonal variation of zooplanktons in Uma River.

## **Material and Methods:**

### **Study Site**

Uma River was selected for the present study. Chandrapur district is located in the eastern edge of Maharashtra in Nagpur division and forms the eastern part of 'Vidharbha' region. It is located between 19.30' N and 20.45' N latitude and 78.46'E longitude. It is the easternmost district of the state of Maharashtra. Owing to the geographical location and physical features, the climate of the district can be classified as a tropical hot climate with a high range of temperature throughout the year. Primarily there are two prominent seasons in the district - the very hot summer and moderate winter. The summer months are very hot and prolonged while winter is short and mild. The monsoon season starts immediately after summer and lasts until late September. The southwest monsoons bring a lot of rainfall during rainy season and there is no drought-prone area in the district (Ghonmode S.V., 2014) The water sample was collected from the site of Uma River, Neri, District Chandrapur, Maharashtra, from January 2013 to December 2013. The samples were then processed for the analysis of Zooplankton diversity.

### **Sampling and Analysis**

Monthly samples were collected from these study sites from January 2013 to December 2013 and the data were incorporated into seasonal data considering January, February, March as summer; April, May, June as pre monsoon; July, August September as monsoon; October, November and December as post monsoon. Qualitative sampling of zooplankton was done with the help of plankton net of mesh size 55-70 $\mu$ . Quantitative samples were collected by filtering 200 L water. The collected specimens were carefully transferred to a tube, anesthetized with 5% formalin and preserved in freshly prepared 5% formalin. They were sorted out into different groups using a dissection microscope in the laboratory. Taxonomic identification was done with the help of Olympus Stereoscopic Dissection Microscope and using relevant literatures (Petersen, 2010; Yule and Sen, 2004).

## **Results and Discussion:**

Zooplankton community of Uma River comprised of Cladocera, Copepoda and Rotifers (Table. 1). Rotifers were dominated followed by copepods and cladocera. The cladocerans marked higher abundance during pre monsoon and monsoon while copepods formed the dominant group during post monsoon season.

### **A. Cladocera**

The Cladoceran population identified from Uma River during the present study was represented as follows. In this study, minimum numbers of cladocerans were reported in summer (28N/L) and post monsoon season (29N/L). This observed maximum pre monsoonal density may be due to high phytoplankton density. Similar observation was earlier made by Santhanam and Perumal (2003). Seasonal





variation may result in the decrease in the density of cladocerans. Therefore, a clear seasonal fluctuation was observed in the density of cladoceran population of Uma River. These seasonal variations in the density of cladocerans are statistically significant ( $P < 0.05$ ).

### B. Copepoda

The Copepod population identified from Uma River during the present study was represented as follows. Copepods exhibit highest peak during post monsoon season and the seasonal mean peak value was 45N/L. may be due to settling of rainwater and returning of the favorable condition. The minimum number was found in monsoon season with seasonal mean value of 21 N/L. Similar observation was earlier made by Padmavati and Goswami (1996). This decrease in the density of copepod may be due to environmental fluctuations. So there exists seasonal variation in the density of copepod population of Uma River. The seasonal variations in the density of copepods are statistically significant ( $P < 0.05$ ).

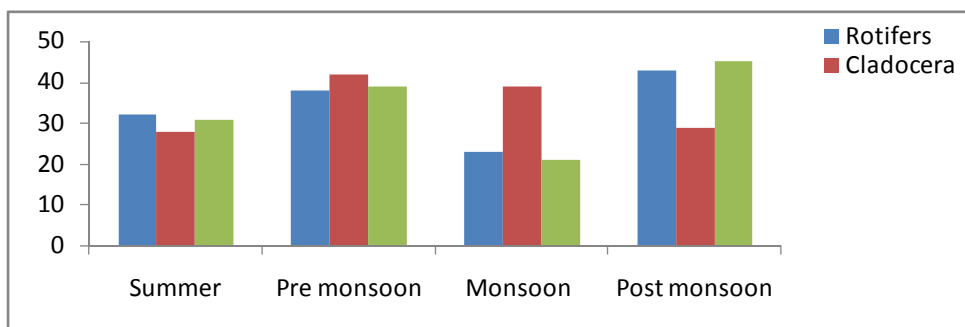
### C. Rotifera

The Rotifer population identified from Uma River during the present study was represented as follows. Quantitative analysis during the period of study showed that there was maximum number in Post Monsoon. In this study, minimum numbers of rotifers were reported in monsoon (23N/L). Arora and Mehra (2003) while analysing seasonal dynamics of rotifers in relation to physico chemical conditions of lotic water body made similar observations in increased densities in summer and reduced densities in winter. As there is no fresh water in Summer, water brings stability to the water body. Due to organic matter and decomposition the availability of food is more. These factors contribute for high species density.

**Table. 1-** Seasonal variations in the density of Rotifers, Copepods and Cladoceran population in Uma River during the study.

Season	Rotifers	Cladocera	Copepoda
Summer	32	28	31
Pre monsoon	38	42	39
Monsoon	23	39	21
Post monsoon	43	29	45
<b>Annual Mean±SE</b>	34±2.14	34.5±1.17	34±1.09

$p < 0.05$



**Figure. 1-**





## Conclusion:

As a result of different zooplankton groups in most of the aquatic ecosystem it acts as one of the major primary consumer which results in their diversity, abundance and seasonality and also affects the other biotic components present in that ecosystem. The zooplankton population of the concerned habitat was found to be dominated by cladocerans both in number and diversity followed by copepods and rotifers. Therefore the present study on qualitative and quantitative changes occurring in the riverine ecosystems is necessary in order to understand and preserve the biodiversity of Uma River.

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