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SEASONAL VARIATION OF ZOOPLANKTON DIVERSITY IN BABRIYA POND SEONI DISTRICT (M.P.)

Dr. Manisha Sonekar
Department of Zoology
P.M. College of Excellence, Govt. P.G. College Seoni (M.P.)

ABSTRACT:- The zooplanktons were represented by the Crustace, Rotifers and Protozoa. The Crustaceans were the most dominating group, followed by Rotifers and then protozoa. Zooplanktons are the smallest, acellular or metazoans in water bodies, ranging in size from about 0.05 to 10 mm. Protozoans, Rotifers, Crustaceans (i.e. Cladocera; Rotifers and ostracoda) and small insects constitution most zooplankton communities. Some of them are also acting as bio-indicator of organic and inorganic pollution of water body. Zooplankton populations are excellent indicators of the stability of the food chain. They serve as indicators of the physical, chemical, and biological processes occurring in aquatic systems due to their high densities. Present research is related with analysis and diversity of zooplanktons of Babriya pond of Seoni District (M.P.) for duration of two year from January 2024 to December 2024. The Babriya pond in district Seoni. It is situated 22.08°N 79.53°E. The surrounding area of the dam is semi-urban and partially agricultural. Zooplanktons communities were evaluated at five different study site (A,B,C,D,& E). During the present study total 38 species of Zooplankton belonging to five groups i.e. The average density of each species of zooplankton was determined for winter, summer and rainy seasons of Babriya pond Seoni (M.P.). In total 38 species of zooplankton were identified during present study. Out of 38 species of zooplankton 8 species belonged to Protozoa, 14 species to Rotifera, 5 species to Copepoda, 10 species to Cladocera and 1 species to Ostracoda. Rotifera forms the main bulk of zooplankton comprising 36.84% of species composition followed by Cladocera (26.32%), Protozoa (21.05), Copepoda 13.16% and Ostracoda (2.63%) during study period. It was noticed that Zooplankton population density of Babriya pond was maximum in summer and minimum in rainy season.

KEYWORD:- Zooplankton diversity, Seasonal variation, Babriya pond.

INTRODUCTION:-

The zooplankton consists of diverse assemblage of major taxonomic groups. Many of these forms have different environmental and physiological assemblage. The number type and distribution of these organisms present in any aquatic habitat provide a clue on the environmental condition prevailing in that particular habitat. The occurrence and abundance of zooplankton in the water body depends on its productivity which in turn is influenced by the physico-chemical parameters and level of nutrients. The zooplankton is an important group of micro-organisms which indicates the trophic status of water body.

Zooplanktons are the free floating and microscopic animal found in aquatic ecosystem. The word Zooplankton is derived from the Greek word zoon, meaning animal and planktons, meaning wonders or drifter. Zooplanktons are cosmopolitan in distribution and found in all types of water body, including polluted, industrial and municipal waste water. Zooplankton can survive under a wide range of environmental conditions. They are the indicator of the presence or absence of certain fish species and population densities of the zooplankton. They are also indicating the trophic status of a water body and some of them are bio indicator of organic and inorganic pollution. Zooplanktons are classified in various groups viz. Cladocera, Copepoda, Rotifera, Crustaceans and Protozoa.

The zooplanktons can also play an important role, indicating the presence or absence of certain species of fishes or in determining the population densities.

Freshwater zooplanktons are an important component in aquatic ecosystems, whose main function is to act as a primary and secondary links in the food chain (Hutchinson, 1967). Zooplankton are one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter (Murugan et al., 1998; Dadhick and Sexena, 1999; Sinha and Islam,2002; Park and Shin, 2007). The distribution of zooplankton community depends on a complex of factors such as, change of climatic conditions, physical and chemical parameters and vegetation cover (Rocha et al., 1999; Neves et al., 2003). According to Murugan et al. (1998) and Dadhick and Sexena (1999) the zooplankton plays an integral role and serves bioindicators and it is a well-suited tool for understanding water pollution status (Contreras et al., 2009). A number of studies have been carried out on ecological condition of freshwater bodies in various parts of India (Gulati and Schultz, 1980; Rana, 1991; Sinha and Islam, 2002). The higher abundance of zooplanktonic fauna recorded during summer, while lower value during rainy season. This fluctuation of zooplanktons is mainly due to environmental changes (Sunkad and Patil, 2004; Sheeba and Ramanujan, 2005). Zooplanktons are capable of concentrating large quantities of heavy metals from water bodies. These metals may be passed on and concentrated at higher trophic levels through the food chain. Thus it is necessary to understand whether the mortality is due to biomagnifications of heavy metals or pollutants. The fishery potential is fully related to the presence of zooplankton (Dubey et.al 2006). Nutrients mainly nitrogen and phosphorus act as bio-stimulants causing eutrophication or enhancement of the growth of zooplankton and phytoplankton. This can lead to luxuriant growth of unusual plankton blooms, that may or may not be toxic, but which on decay use up oxygen from the water which also cause deoxygenation. Phytoplanktons are representing the microscopic algal communities at primary level, whereas zooplankton at secondary level. They react quickly to limnological change of aquatic environment. They can be listed and used as pollution indicators (Telkhade et.al. 2008). Uncontrolled domestic wastewater discharge into the pond has resulted in the eutrophication of the pond as evidenced by substantial algal blooms, dissolved oxygen depletion in the subsurface waters, large fish kill and malodour generation. These conditions continued unabated and give rise to monoculture of water hyacinth (Eichhornia crassipes) which covered almost the entire pond area.

Present research is related with analysis and diversity of zooplanktons of Babriya pond Seoni District (M.P.) for duration of two year from January 2024 to December 2024. The Babriya pond in district Seoni. It is situated 22.08°N 79.53°E.

MATERIAL & METHODS:-

Study Area

The research was conducted at a selected reservoir over a two-year period, from January 2024 to December 2024. Five sampling stations were designated across various zones of the reservoir to capture its ecological and hydrological diversity. Station A represented the western inlet, Station B the outlet zone, Station C the central mixed zone, Station D the southern littoral zone, and Station E the eastern littoral zone. These stations were strategically selected to ensure a comprehensive analysis of zooplankton diversity and distribution.

Fig. 1. Satellite view of study site Babriya Pond Seoni (M.P.)

Sampling Procedure:

Zooplankton samples were collected monthly from each sampling station using plankton net with a 50-micron mesh size. A total of 20 liters of water was filtered through the net at each site, and the concentrated

zooplanktons were preserved in 4% formalin solution for further laboratory analysis. Each sample was carefully labeled with the date, time, and location to ensure accurate documentation and record-keeping.

Identification and Enumeration

In the laboratory, zooplankton samples were analyzed using a compound microscope. Identification was carried out up to the species level with the help of standard identification keys and literature specific to freshwater zooplankton taxonomy. The abundance of each species was determined by counting individuals in representative subsamples and extrapolating the counts to estimate the total population in the sample.

Data Analysis

The percentage contribution of each zooplankton group was determined based on the total species recorded during the study period. The relative abundance of each group—Protozoa, Rotifera, Copepoda, Cladocera, and Crustaceans—was calculated as a proportion of the total zooplankton population. Seasonal and spatial variations in zooplankton composition were analyzed to identify dominant groups across different stations and time periods.

Data Representation and Analysis

Descriptive statistics, including mean, percentage composition, and standard deviation, were applied to summarize the data for zooplankton groups. The findings were presented through tables and graphs to highlight the contribution of each group. This approach enabled the identification of trends in zooplankton diversity and provided insights into the ecological health and productivity of the reservoir.

RESULTS AND DISCUSSION:-

Present research work is analysis and diversity of zooplanktons of Babariya pond of Seoni District (M.P.) for duration of January 2024 to December 2024. The average density of each species of zooplankton was determined for winter, summer and rainy seasons of Babariya pond Seoni (M.P.). In total 38 species of zooplankton were identified during present study. Out of 38 species of zooplankton 8 species belonged to Protozoa, 14 species to Rotifera, 5 species to Copepoda, 10 species to Cladocera and 1 species to Ostracoda as given Below:

Group -Protozoa

Amoeba sp., Arcella sp., Chilodonella sp., Diffusia sp., Epistylis sp., Euglena sp., Euglepha sp., Paramecium sp.

Group - Rotifera

Asplanchna brightwelli,Asplanchna sp., Brachionus angularis, Brachionus bidentata, Brachionus caudatus , Brachionus patulus, Brachionus quadridentatus , Brachionus rubens, Filinia longiseta , Filinia terminalis, Keratella tropica, Lecane aculiata, Monostyla sp., Trichocerca similis.

Group – Copepoda- *Cyclops sp., Diaptomus sp., Gammarus sp., Mesocyclops sp., Nauplii.*

Group - Cladocera

Alona affinis, Alonella sp., Biapertura affinis, Bosmina sp., Ceriodaphnia sp. ,Daphnia carinata , Daphnia sp., Moina sp., Monodaphnia sp., Sida sp.

Group – Ostracoda -*Cypris sp.*

Table-1 The number and percentage contribution of different groups of zooplankton are as follows:

S. No.	Groups	Number of Species	Percentage
1	Protozoa	8	21.05
2	Rotifera	14	36.84
3	Copepoda	5	13.16
4	Cladocera	10	26.32
5	Ostracoda	1	2.63
	Total	**38**	**100.00**

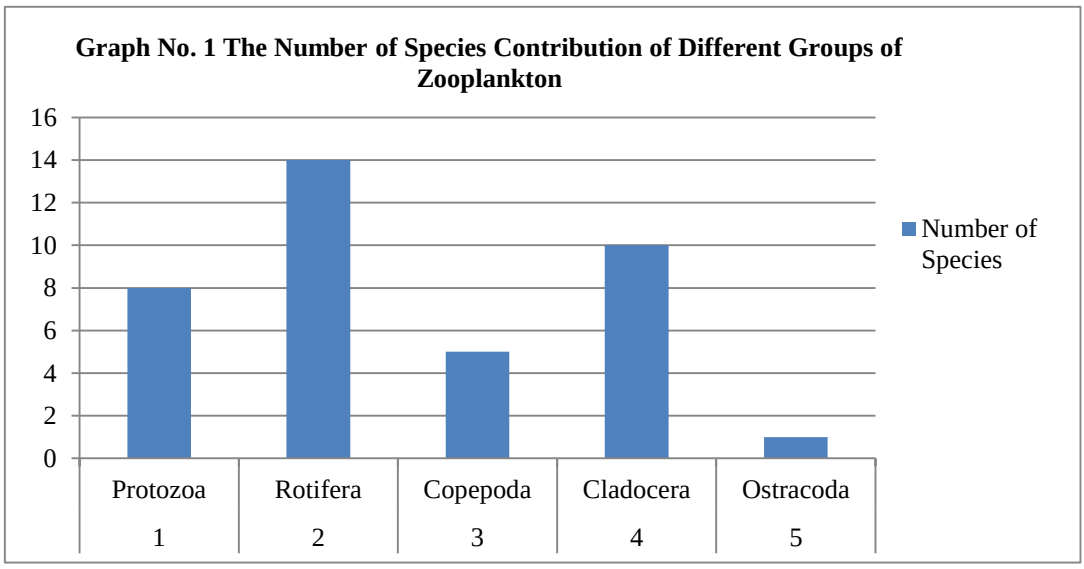
Rotifera forms the main bulk of zooplankton comprising 36.84% of species composition followed by Cladocera (26.32%), Protozoa (21.05), Copepoda 13.16% and Ostracoda (2.63%) during study period.

Average annual density:-

The average annual density of zooplankton and their percentage contribution observed during study period are

represented on Table 02. Rotifera showed their dominance followed by Cladocera, Copepoda, Protozoa and Ostracoda during study year.

Zooplanktons are considered to be the ecological indicators of water bodies (Gajbhiye and Desai 1981). Factors such as light intensity, food availability, dissolved oxygen and predation effect the population dynamics of zooplankton. Low pH or higher salinity can reduce their diversity and density (Horn and Goldman, 1994). The samples from five sampling sites have been analyzed for spatial and temporal distribution. It shows the presence of 54 species, out of which 17 species belong to rotifera, 10 species are of cladocera 5 species are of copepod, crustacean 14 and 8 species protozoa. The zooplankton assemblage of this pond consists primarily of rotifera followed by cladocerans, copepods, crustaceans and protozoa. Seasonal variation of the zooplankton populations of Babriya pond correlate to changes in environmental factors.



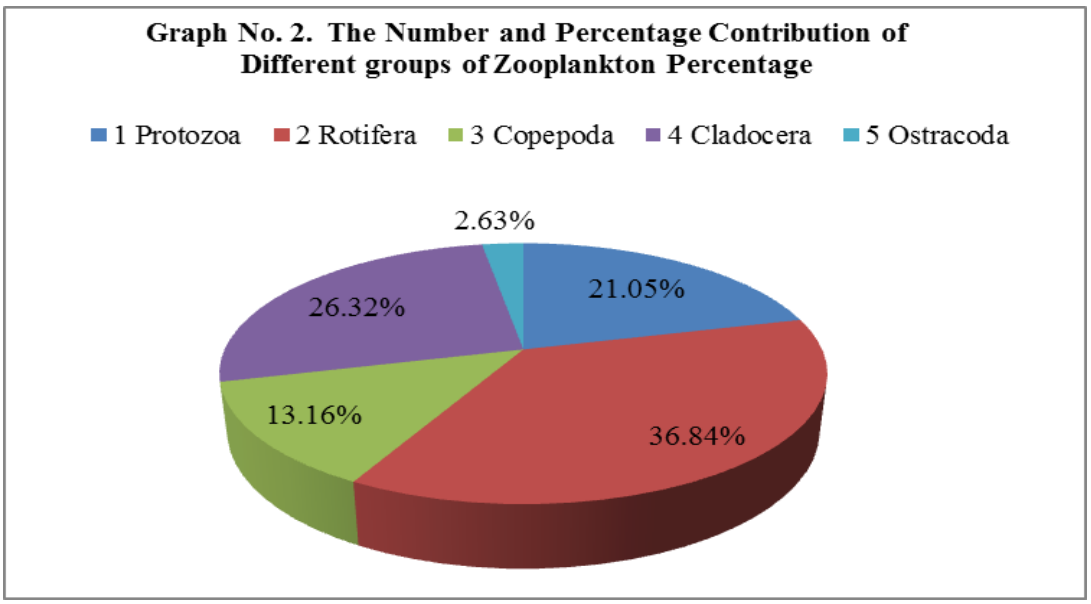
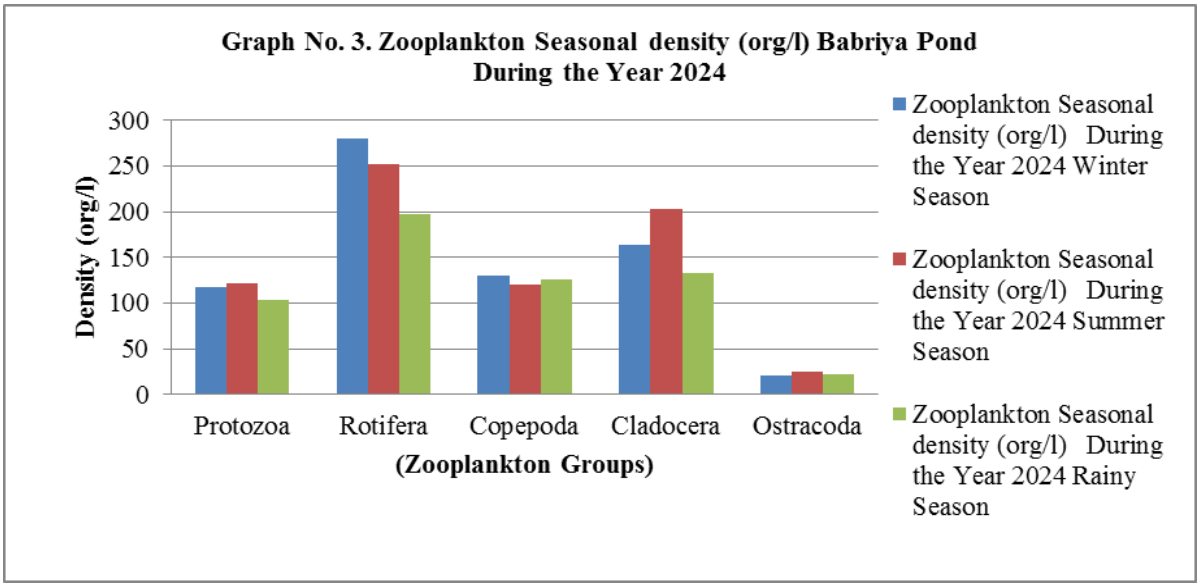


Table 2.
Average annual density (org/l) of zooplankton and percentage contribution of Babriya pond Seoni (M.P.) during January 2024 to December 2024.

S. No.	Taxonomic group	2024 year annual density (org/l)				
		Winter Season	Summer Season	Rainy Season	Mean annual density (org/l)	%
1	Protozoa	116.75	121.75	102.75	113.75	16.94
2	Rotifera	279.75	252.25	197.75	243.25	36.23
3	Copepoda	129.75	120.75	125.25	125.25	18.65
4	Cladocera	163.75	203.50	132.75	166.67	24.82
5	Ostracoda	20.75	24.75	22.00	22.50	3.35
	Total	**710.75**	**723.00**	**580.50**	**671.42**	**100.00**



Ghosh (1997) observed that among total zooplanktonic population, cladocera come second in order of abundance in Husan Sagar reservoir. Zooplankton community dynamics is also altered with environmental degradation. Presence of higher density of copepod and harpacticoid indicates their tolerance of higher salinity of water. Among Zooplanktons, the member of Protozoa, Rotifers, Copepoda Cladoceran and Crustaceans were present in all months. Among these the Rotifers were the most abundant throughout the study period. The present investigation also supports the findings of Sharma and Capoor (2010). Dominance of protozoan and rotiferan communities indicates water quality deterioration and onset of eutrophication at alarming rate (Sharma et al, 2010).

Govind (1969) reported a rotifer peak in February (24.7%) out of the total zooplankton from shallow zone of Tungbhadra reservoir. Gupta (1989) reported a major rotifer peak in August and in February from two ponds

near Jodhpur. Sheeba et. al. (2004) Qualitative and quantitative study of zooplankton in Ithikkara river, Kerala. These exhibited a bimodal pattern with a major peak in December and a minor peak in August. The second group of zooplankton, Copepoda, also exhibited two maxima (April & August) and two minima (February, March and September).

CONCLUSION:-

The present study revealed that zooplankton productivity was found to be higher in the Babriya pond when the temperature was increased in summer season. It indicates that the temperature has influence on the zooplankton diversity. Therefore, increased temperature due to global climate change might have influence on the zooplankton production. Assessment of zooplankton diversity will be useful to monitor the health (water quality) and wealth (fishery productivity) of this lentic system in the near future.

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