

# Studies on Zooplankton Abundance, Species Diversity Seasonal Variation in path of the Godavari River, Nath Sagar Dam, Paithan, Aurangabad, Maharashtra, India

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## ABSTRACT

The zooplankton community structure were studied on monthly surveys throughout an annual cycle From January 2022 to December 2022 in Area path of Godavari River Nag Ghat in Paithan. Utilizing a conventional methodology, Zooplanktonic diversity and abundance were assessed. The seasonal cycles and population dynamics of the dominant species are described and discussed. The sample consists of moderate biodiversity of total zooplankton with 17 species belonging to Five taxonomic groups. Out of 17 species 6 belonged to Rotifera, 4 to copepod, 4 to cladocera, 2 to Ostracoda and 1 to Protozoa. Rotiferan species have showed a high magnitude of biodiversity in comparative to other zooplankton subgroups. The present study aims at providing a preliminary knowledge on the productivity and diversity of zooplanktons which is beneficial for the production of Fish.

**Keyword:** Zooplanktons, seasonal abundance, Species, Dam, Rotifera

## I. INTRODUCTION

Zooplankton play an integral role and serve as a Bioindicators and Well suited for understanding pollution status of Water [1] Plankton population in any aquatic system is biological wealth of water for fishes and constitutes a vital link in the food chain. Zooplankton comprising of rotifers, copepod, ostracods and cladocerans are considered to be most important in terms of population density, biomass production, grazing and nutrient regeneration in an aquatic ecosystem. Plankton is the most sensitive floating community which is being the first target of water pollution, thus any undesirable change in

aquatic ecosystem affects diversity as well as biomass of this community. The plankton population on which the whole aquatic life depends directly or indirectly is governed by the interaction of a number of physical, chemical and biological conditions and the tolerance of the organisms to variations in one or more of these conditions. The water quality parameters and nutrient status of water play the most important role in governing the production of planktonic biomass.[2]

Zooplankton organisms occupy a central position in the food webs of aquatic ecosystem. They not only form an integral part of the lentic community but also

contribute significantly, the biological productivity of the fresh water ecosystem [3]. Zooplankton forms the microscopic animals that play an important role in an aquatic food chain as they are largely consumed by fishes and other higher organisms in food chain. 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 acts as a biological indicator of water pollution. The zooplankton constitute an important component of secondary production in aquatic ecosystems that play a key role in energy transfer from primary to higher level in the ecosystem. Zooplankton diversity is one of the most important ecological parameters in water quality assessment. Pesticides and other chemicals are used for the better production of grains has lethal to fish population since industrial agriculture practices has promoted extraordinary use of chemicals in the form of pesticides and insecticides[4]

The abundance and biovolume of both phytoplankton and zooplankton are largely regulated by the resource base and tend to increase with the trophic state of the lake[5] The tolerance, abundance, variety, and dominance of plankton communities in the habitat are all influenced by environmental changes, and they respond quickly to these changes. Plankton are very sensitive to environmental changes.[6] Because they are heterotrophic creatures, zooplankton play a significant role in the cycling of organic matter in aquatic ecosystems and are the most significant trophic link in the food chain. [7] Additionally, because to some species' capacity to recognize deterioration in water quality brought on by pollution or eutrophication, their diversity has been more well-known in recent years. The monitoring of zooplankton as biological indicators may serve as an early warning system when pollution impacts the food chain. [8] Zooplankton is the intermediate link between phytoplankton and fish. Hence qualitative

and quantitative studies of zooplankton are of great importance in Reservoir water body.

## II. METHODS AND MATERIAL

### Study Area path of the Godavari River

The Godavari River is known as the Dakshin Ganga, behind the skull, it is the largest river in India and has a great history and culture. Godavari river originated in the Trimbakshwar mountain in Nashik district of Maharashtra and its length is about 500 km. In Maharashtra, Many dams on the Godavari River is constructed in which one of them is Nathsagar Dam Paithan District Aurangabad. Dam is a multipurpose used for different activities like drinking, irrigation, fisheries, Cattle etc. The water from the reservoirs is also supplied to nearby towns and cities for other purposes. It is an one of the largest Dam in Asia. The reservoir formed as result of the dam is called Nathsagar. The Water Sample is collected from path of the Godavari River Area Nag Ghat in Paithan, Aurangabad, and Maharashtra, India

### Collection of sample, preservation, Identification:-

Because the population density of zooplankton represents the number of individuals in a given volume of water, one of the first essentials in quantitative plankton sampling is to know the volume of water sampled. In many cases this is simple but in some cases it is not easy to measure this accurately, and only a rough value can be estimated (e.g. when net hauls without current meters are used). Furthermore, no single device exists that can make quantitative collections of the complete spectrum of pelagic zooplanktonic organisms. Criteria for selection depends upon the volume of water to be sampled, the depths of strata, the kinds of organisms and whether integrated or point samples are needed. Bottles can be used for collecting these samples. A variety of water-collection bottles can be used conveniently for a period of one year from January 2022 to December 2022. Collection of Zooplankton was carried out by

using plankton net. Sampling was made between 9.00 am to 11.30 am. By Plankton net (mesh size 25 mm) was swept through surface water at Nag Ghat area of Godavari River. 150 lit of surface water were sieved through the plankton net and filtered sample were transferred to plastic containers and 5% formalin was added for sample preservation. These samples were then brought to laboratory for further studies. The systematic identification of plankton was made by using standard keys of Adoni (1985) [09], Michael and Sharma (1988), [10] Krishnaswamy (1973), [11] Edmondson (1959). [12]

### III. RESULTS AND DISCUSSION

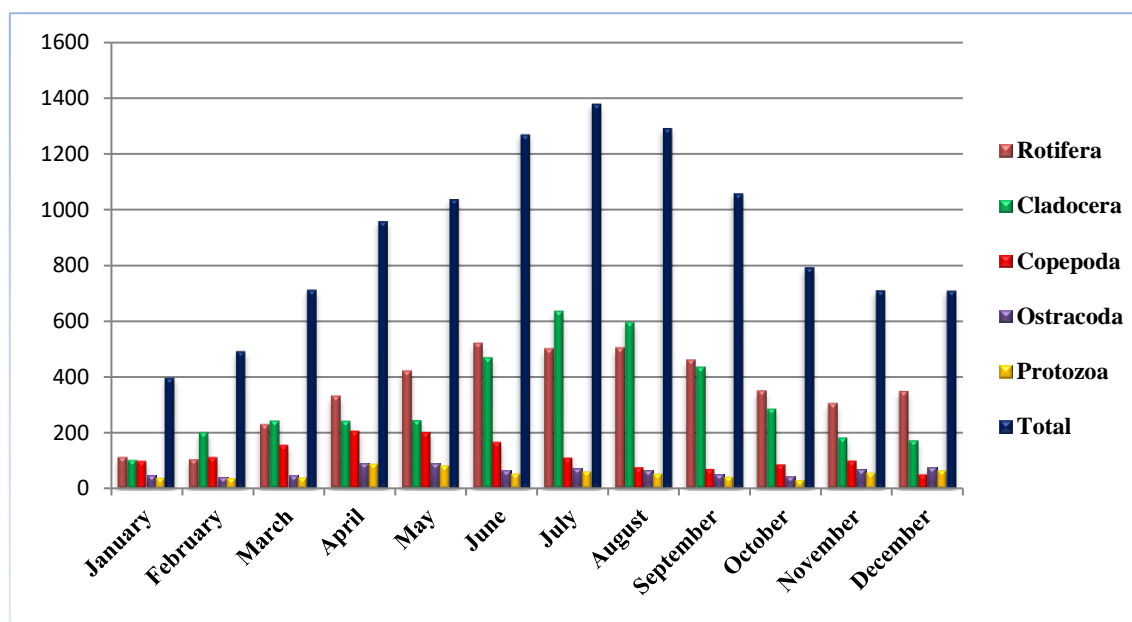
A total 17 species of zooplankton were recorded from path of the Godavari River Area Nag Ghat in Paithan. Among 17 species, Rotifera was dominant with 06 species followed by 4 species of Cladocera, 04 species of Copepoda, 02 species of Ostracoda and 01 species of Protozoa. Water samples were collected randomly in selected site i.e. Nag Ghat area of Paithan on monthly basis for a period of one year from January 2022 to December 2022 (Table No.1). The total numbers of species (Fig.1) recorded were 10819 of which Rotifera are 4187 (38.70%), Cladocera are 3810 (35.21%) Copepoda 1432 (13.23%), Ostracoda 750 (6.93%) and protozoa 640 (5.91%) in Table 2 (Fig.2).

Sr.No.	Group/Class	Species	Total Number
1.	Rotifera	<i>Brachionus caudatus</i>	4187
		<i>Brachionus forficule</i>	
		<i>Brachionus calyciflorus</i>	
		<i>Brachionus diversicornis</i>	
		<i>Keratella tropica</i>	
		<i>Keratella crassa</i>	
2.	Cladocera	<i>Moina brachiata</i>	3810
		<i>Moina micrura</i>	
		<i>Daphnia sps.</i>	
		<i>Diaphanosoma excisum</i>	
3.	Copepoda	<i>Mesocyclops hyalinus</i>	1432
		<i>Nauplius</i>	
		<i>Microcyclop</i>	
		<i>Heliodiaptomus viduus</i>	
4.	Ostracoda	<i>Hemicypris fossulata</i>	750
		<i>Heterocypris</i>	
5.	Protozoa	<i>Paramecium cadatum</i>	640

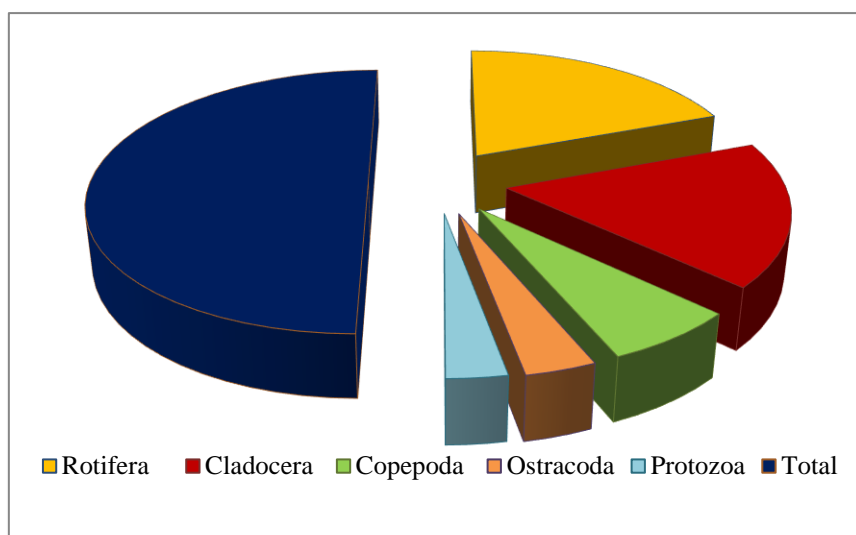
**Table 1:** List of Recorded Zooplankton species during Study in Nathsagar Dam, Paithan and its abundance in temporary water habitat

Class → Month ↓	Rotifera	Cladocera	Copepoda	Ostracoda	Protozoa	Total	%
January	112	102	98	47	38	397	3.66947
February	104	201	112	40	36	493	4.556798
March	230	243	156	45	39	713	6.590258
April	332	242	206	91	88	959	8.864035
May	421	244	202	89	82	1038	9.594232
June	520	470	166	63	52	1271	11.74785
July	501	636	110	73	61	1381	12.76458
August	504	596	76	64	53	1293	11.9512
September	460	436	70	52	41	1059	9.788335
October	350	286	86	42	30	794	7.338941
November	305	182	100	68	56	711	6.571772
December	348	172	50	76	64	710	6.562529
Total	4187	3810	1432	750	640		
% Total	38.70043442	35.21582401	13.235974	6.93224882	5.915519		

**Table 2 :** Month wise list of abundance of Zooplankton species ( unit per litre) during Study in Nathsagar Dam,Paithan



**Fig 1:** Graphical Representation of Month wise No of abundance of Zooplankton species (unit per litre) in Nathsagar Dam,Paithan.



**Fig 2:** Graphical Representation total No. of abundance of Zooplankton species ( unit per litre) in Nathsagar Dam, Paithan.

### Rotifera

In the zooplankton community's four groups (Rotifera, Cladocera, Copepoda, and Ostracoda), rotifers showed a greater species abundance[13] Rotifers play a vital role in the trophic tiers of freshwater impoundments and serve as living capsule of nutrition[14] In the present study we Recorded with 06 species Rotifers as compared to other groups of zooplankton. Most rotifers were present throughout the summer and monsoon seasons (July to September). In a perennial freshwater lake and reservoir in the Dharmapuri District of Tamil Nadu, India, 19 species of Rotifera species of rotifera were found by Manickam et.al.in 2014.[15] According to observation the Brachionus species are very common in temperate and tropical waters indicates alkaline nature of water.[16] Excess growth of rotifers in lakes and reservoirs indicates due to the eutrophic conditions.

### Cladocera

This group we have recorded 04 species of cladocera from the Godavari Dam .The populations of these species peaked in the summer and declined during the monsoon. Water fleas are a member of the Cladocera genus, which is present in almost all freshwater habitats. These are an essential component of the

aquatic food chain because they offer young and adult fishes, as well as prawn larvae, a nourishing diet. Sandhya et.al.[17]described the 7genera of Cladocera. Cladocera (Class Branchiopoda) is a dominant group of the microcrustaceans in freshwater ecosystem. These animals inhabit pelagic, littoral, and benthic zones of lakes, ponds, rivers and swamps, frequently attaining high frequencies and biomasses [18]. These crustaceans have become globally studied for many purposes, including systematics, ecological, environmental, genetic, and evolutionary biology researches.[19]

### Copepoda

The Copepoda diversity was represented by 4 species. Copepoda are an essential component of the aquatic food chain. Between small and large organisms, as well as bacteria, algae, and protozoa, they are in the intermediate trophic level. Total copepod group was found to be highest species with 21found by Ayyanna et.al.in 2017 [20] during the summer, rising temperatures caused more water to evaporate, which was followed by rich nutrients and an increase in the amount of zooplankton in the lake. However, during the monsoon due to pond dilution brought on by rains, zooplankton abundance decreased [21].

### Ostracoda

They occur in all kinds of freshwater and marine environments. The abundance of these provides a good food for aquatic organisms[22] In the present investigation two species of ostracods were recorded. The population of the two ostracod species that were discovered in the current study peaked in the summer. The current study shows that water temperature might favourably boost zooplankton population variety because of the strong positive correlation between temperature and plankton density.

### Protozoa

Protozoa are characterized by their small size, high reproduction rates, semi-permeability of the plasma-membrane and consequently the close contact with the surrounding environment. Therefore, protistan organisms react more quickly to environmental changes than most of other eukaryotic individuals and thus serve as bioindicators of the water quality.[23] One species had been reported from the NatSagar Dam. where density was maximum in Summer, while it was minimum in Winter. They are both herbivores and consumers in the decomposer link of the food chain. They also control bacteria populations and biomass to some extent.[24]

### IV. CONCLUSION

The present water body has exhibited a significant seasonal changes and species biodiversity of zooplankton species with their maximum values during summer and minimum in rainy and winter season. Rotifers are the predominant groups of zooplankton found in the majority of reservoir. Zooplankton is the intermediate link between phytoplankton and fish, which are the secondary producers in the aquatic environment. Zooplanktons are good indicators of changes in water quality, because they are strongly affected by environmental conditions and responds quickly to change in environmental quality. Hence, qualitative and

quantitative study of zooplanktons is of great importance. The information contributed by this investigation will be highly significant and useful in order to create a general awareness in the people to prevent further water pollution and improve aquaculture which is beneficial for Fish production and other uses of such valuable water sources in the near future.

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