



# Studies on Zooplankton Diversity in Diwanshah Lake, Maharashtra, India with reference to its fishery status and conservation

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## Abstract

*The present work focuses on availability and seasonal variation on zooplanktons diversity in Diwanshah Lake, Bhiwandi. Studying zooplankton, even of a specific area is an extensive, complicated & laborious work due to environmental, physical, geographic and chemical variation involving ecological factors. Zooplanktons encompass the microscopic animal species that freely float in aquatic ecosystem. They encompass a vast variety of taxonomic groups; of which the members belonging to Protozoa, Rotifera, Cladocera and Copepoda are most common and often dominate the entire consumer communities. They have many remarkable characteristics and are often armored with appendages such as spines, rostrum etc. which prevent their predation by next higher organisms. They are highly mobile and this ability of movement not only provide them an effective defense benefit but also enable them to actively search and feed upon the phytoplankton and establish the aquatic food chain. Hence, studying the members of zooplankton communities is important for their role in tropic dynamics and energy transfer in the aquatic ecosystem. They serve as a food for fishes in the freshwater ponds, lakes, tanks and other aquatic reservoirs and play a significant role in the fish production.*

**Key words:** Diwanshah pond, Zooplankton diversity, cladocerans, Rotifer, Copepods, Aquatic food chain.

## 1. Introduction

Marshland is region soaked with water is the principal factor controlling the environment and supports all forms of life. Wetlands are of the essence for human survival too (WASH, 2010). They are among the world's most productive environments niche; a store house of biological diversity that provides the water and productivity upon which numerous plants, animals and microbial species depend for their endurance reproduction and maintenance (Medagam Thirupati et al. 2018). Bhiwandi city is situated in the district of Thane, in the western state of Maharashtra, in India, located 20 km to the north east of Mumbai and 15km to the north east to the Thane city. The proper location of Bhiwandi is 19.296664°N 73.06121°E. The Diwanshah Lake is situated 2 km away from Bhiwandi and is second largest water body after Varhala Lake and is around 50 years old and approximately 1.03 hectare and 5.4 meters depth (Suvarna Rawal & Momin Shakir, 2017, [www.bhiwandiinfo.com](http://www.bhiwandiinfo.com), 2011). It is being used for composite culture and include fishes such as *Rohu*, *Catla*, *Tilapia* and Chinese carp as these fishes has great demand in the nearby local fish market for human consumption. The fishes are captured thrice in a week which reflects its good productivity. Therefore an attempt has been made to analyze the productivity of the lake in a scientific way. The seasonal fluctuations of the zooplankton population are a well-known phenomenon and zooplankton exhibits bimodal oscillations with a spring and autumn in the temperate lakes and reservoirs (Daniel and Lepedes, 1974).

The zooplanktons comprises of micro animals species encompasses a wide range of both unicellular and multi cellular animals suspended in water with restricted power of locomotion. Zooplanktons are microorganisms that share animal-like features. Some are as large as 5 mm long and the smallest are just one thousandth of this size. They actively and freely float, drift or swim in the water. In reality,

the word plankton derived from the Greek word 'planktons' which means 'wanderer' or 'drifter'. Freshwater zooplanktons are found in the aquatic ecosystem such as lakes, streams and swamps etc. They are most abundant nearly close to the water surface as they eat phytoplankton (microscopic plants) which needs light to photosynthesis. Many species move into shallower waters at night in order to avoid exposure to UV and/or predators and metabolic advantages are some of the possible reasons for this downward vertical movement. While most zooplanktons are 'heterotrophs' and they obtain their energy by feeding prefabricated organic compounds, such as algae or other smaller zooplankton. Other zooplankton, such as the dinoflagellates, may be completely or partially photosynthetic, absorb their energy, as plants do, from sunlight. They play fundamental role in aquatic food chain and food web and helps in establishing the aquatic ecosystem.

Freshwater zooplanktons are subjugated by 4 major groups of animals: protozoan, rotifer and two subclasses of the Crustacea, Cladocerans and Copepods. The microscopic planktonic protozoa have some degree of locomotion, on contrary rotifers, cladocerans, copepod, microcrustaceans, and certain immature insect larvae often move extensively in quiescent water (S. A. Manjare, 2015). Many pelagic protozoa (5-300  $\mu\text{m}$ ) are meroplanktonic, in that only a portion, usually in the summer, of their life cycle is planktonic. (S. A. Manjare, 2015).

Zooplankton is a vital component of freshwater food webs. The smallest zooplanktons are eaten by the larger zooplankton which, in turn, is eaten by small fish, aquatic insects and so on. Herbivorous zooplanktons graze on phytoplankton or algae, and help maintain the natural balance of algae.

## 2. Materials and methods

Water samples for planktonic study were collected from Diwanshah Lake at different sites situated in Bhiwandi. Sampling was done on monthly basis from January 2017 to December 2017. The net with mesh size 50 $\mu$  were used to collect the plankton samples from the water by filtering 100 liters of the water in a wide mouthed glass bottle. The zooplankton sample were immediately preserved in a 5% formaldehyde solution in plastic sample bottles and transported to Department of Zoology in G. M. Momin Women's college laboratory for further studies. Binocular light microscope attached camera was used for observation & identification of plankton was done as described by Michael (1984), Tonapi (1980), Trivedy and Goel (1984).

## 3. Observations

Through microscopic examination of water sample at different site of lake, following types of zooplankton were recorded and identified. The result showed monthly & seasonal variation in the diversity of planktons highest during March to June (summer season) & lowest during July to October (Monsoon season). Most frequently observed are the large size Cladocerans which moves by rowing action of their large size antennae in a series of jerks. Their bodies are enveloped by a translucent shell (bivalve carapace) because of which animal undergoes moulting periodically to shed their exoskeleton in order to grow, mature and reproduce. *Ceriodaphnia* are abundant in water sample followed by rotifer.



Figure- 1: *Moina micrura* (40X)



Figure- 2: *Acanthocyclop bicuspidatus* (40X)

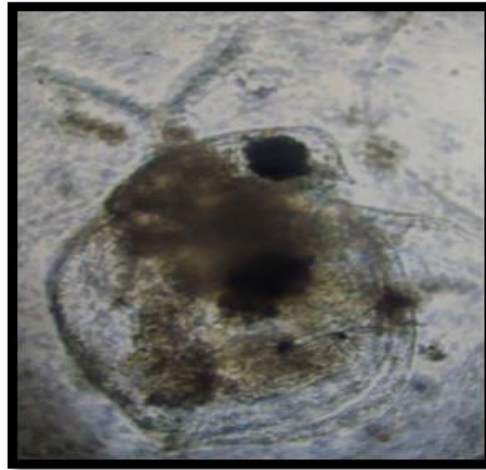


Figure- 3: *Ceriodaphnia cornuta* (40X)

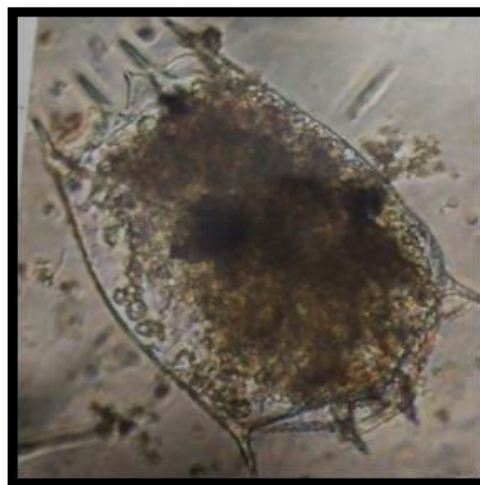


Figure-4: *Brachionus calyciflorus* (40X)

#### 4. Results and discussions

Occurrence & abundance of zooplanktons biomass are primarily regulated by phytoplankton distribution and community structure. The predator–prey relation of phytoplankton and zooplankton & their sequence of eating and being eaten facilitate organic export and energy transfer to higher order food chain. Zooplanktons serve as an important food source for a vast variety of carnivorous fishes and fish larvae. Therefore, zooplankton density serves as an important factor in prediction of potential fishery grounds (Mansor et al., 2001). Zooplanktons density and their distribution are directly influenced environmental variables including light, temperature, salinity, pH, dissolved oxygen, turbulence and food availability.

Planktons, those are very sensitive and respond quickly to any changes in the environment which affects the plankton communities in terms of tolerance, abundance, diversity and dominance in the habitat. Therefore, it is observed that plankton act as pollution indicators to assess the pollution status of aquatic bodies (Onkar singh and Sunil kumar, 2015). Increase in the population of zooplanktons during summer season probably due to evaporation of water molecule and increased in the level of organic material on which they feed. On contrary their low number during monsoon may be due to dilution of water body (due to the rainfall) and decreased level of organic matter.

Presence of planktons in any water bodies is a good reflection of healthiness of aquatic ecosystem. They are the primary consumer & play a significant role in energy transfer in aquatic food web and also good for fishery point of view. Presence of all these zooplanktons in the water sample indicated that the Diwanshah Lake is good for fisheries and it should be conserve, rejuvenate and maintain as far as humanitarian and environment is concerned.

#### 5. Conservation strategies

Implementation of bioremediation method for detoxification of polluted water bodies, harvesting of biomass, reduction in waste input, display of warning board around lake and prevention of land encroachment for human welfares, involvement and awareness of common people about the important of the lake are some of the strategies that can be adopted by local municipal corporation in order to conserve wetland.

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