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Diversity of Zooplankton in Wakod Reservoir Fron Chh. Sambhajinagar, Maharashtra

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Abstract

The present study was carried out from October 2023 to September 2024, aimed to examine the zooplankton diversity of Wakod reservoir, situated in the Chhatrapati Sambhajinagar district of Maharashtra, India. This research sought to evaluate the ecological health and trophic status of the aquatic habitat while analyzing the diversity and seasonal fluctuations in the zooplankton populations of the reservoir, as their vast activities in interstitial environments brings a series of physic-chemical and biological changes in the properties of the sediment, which directly or indirectly affect ecosystem dynamics at Various scales, such as food-web dynamics, sediment stabilization and bioturbation, cycling of organic material and waste removal (Hubas et al., 2010; Nascimento et al., 2012; Bonaglia et al., 2014; D'Hondt et al., 2018; Deldicq et al., 2021). And can be used as indicator of water and environmental status. A total of 27 zooplankton species were identified, with rotifers being the most abundant group, comprising 13 species, followed by copepods and cladocerans, represented by 6 species each, and 2 species of ostracods. The findings of the present work suggest that the Wakod reservoir has enormous productivity and can serve as a major site which can be utilized for aquaculture on large scale and thus can serve as a natural source for the upliftment of the health and economic status of the local population by providing them a work and good quality of food, this can only be achieved by proper management of the site.

Keywords: *Wakod, Bioindicator, Ecology, Chhatrapati Sambhajinagar, Diversity.*

Introduction

To understand zooplankton's more desirable role within ecosystems, seasonal variation in their populations can be examined using various quantitative parameters, including population density, biological mass, and biochemical composition. As noted by Riccardi and Mangoni (1999), each parameter highlights specific characteristics that are crucial for assessing the ecological role of zooplankton in a given environment. In India, significant research has been conducted on the ecology and seasonal distribution of zooplankton compared to other tropical and subtropical regions (Battish, 1992; Ranga Reddy, 2001; Slathia and Dutta, 2013). Zooplankton play a vital role in nutrient cycling and energy transfer within aquatic ecosystems through their heterotrophic activity and serve as bioindicators for environmental quality. Monitoring their diversity and abundance provides valuable information about water quality, productivity, and ecological balance.

Wakod reservoir, situated on the Nagzari River near Phulambri in Chhatrapati Sambhajinagar District, is a freshwater body supporting agriculture, fisheries, and potable water supply. Despite its ecological and economic importance, limited research has been conducted on its zooplankton diversity. This study aims to bridge this knowledge gap by investigating the composition, abundance, and seasonal distribution of zooplankton in Wakod reservoir.

Materials and Methods:

Sampling and analysis: Samples were collected twice in a month from October 2023 to September 2024 to monitor seasonal variations by using a plankton net with a mesh size of 50 microns and the collected samples were preserved in a plastic bottles containing 4% formaldehyde and brought to the laboratory for analysis.
Identification was carried out under compound microscope using standard taxonomic keys of Pennak (1978), Edmondson (1992), Battish (1992) and Altaff (2004). Key features for identification includes the lorica, corona, and trophi for rotifers; antennules, postabdomen, spine arrangement and number, position of lateral setae, and rostrum for cladocerans; antennules, antennae, caudal setae, and endopodite for copepods; and antennae, valve shape, and setae for ostracods.
Population density was determined using the Drop Count Method proposed by Lackey (1938) and was calculated using the following formula:

N= n×v/V

Where,

N = Total number of organisms per liter of water filtered
n = Number of zooplankton counted in 1 ml of plankton sample
v = Volume of concentrate plankton sample (ml)
V= Volume of total water filtered through (L)

Physico-chemical parameters, including temperature, pH, dissolved oxygen, and nutrient levels, were recorded during each sampling session to assess their influence on zooplankton diversity.

Results:

A total of 27 species of zooplankton were identified in the wakod Reservoir. Among these, the Rotifera group was the most dominant, represented by 13 species, followed by Copepoda and Cladocera, each contributing 6 species, and Ostracoda with 2 species (Table 1). Seasonal variations in the zooplankton population are summarized in Table No. 2.

Rotifera: Rotifers, often referred to as "living capsules of nutrition" (Suresh Kumar *et al*., 1999), play a pivotal role in the trophic dynamics of freshwater ecosystems. In this study, they were the most dominant zooplankton group, comprising 13 species. This dominance has also been observed in several aquatic systems, such as lakes, ponds, and reservoirs (Kudari *et al*., 2005; Kanagasabhapati and Rajan, 2010). Seasonal analysis revealed that rotifer populations peaked during the summer (890 organisms/liter) and were lowest in winter (360 organisms/liter). The summer abundance is likely attributed to increased bacterial populations and the decomposition of organic matter, providing a rich food source (Majagi and Vijaykumar, 2009). Segers (2003) emphasized that rotifers thrive in warm water, which explains their seasonal fluctuations. The short reproductive cycles of rotifers enable them to rapidly increase in favorable environmental conditions (Dhanapathi, 2000).

Table No.1. Occurrence of different species of Zooplankton in Wakod freshwater reservoir

Rotifera:

1. Brachionus calyciflourus (Pallas, 1834)
2. Brachionus caudatus (Barrois and Daddy, 1894
3. Brachionus forficule (Weirzejski, 1891)
4. Brachionus angularis (Gosse, 1851)
5. Brachionus bidentata (Jokubsky, 1912)
6. Brachionu diversicornis (Daday, 1883)
7. Brachionus ruben (Ehrenberg, 1834)
8. Trichotria tetractis (Ehrenberg, 1830)
9. Polyarthra major (Burckhardt, 1900)
10. Filinia terminalis (Plate, 1886)
11. Asplanchna priodonta (Gosse, 1850)
12. Lecane luna (Muller, 1776)
13. Trichocerca SPP. (Lamarck, 1801)

Cladocera:a

1. Moina macrocopa (Straus, 1820)
2. Moina micrura (Kurz, 1874)
3. Diaphanosoma excisum (Sars, 1865)
4. Daphnia longirimis (Sars, 1861)
5. Leydigo acanthocercoids (Fischer, 1854)
6. Ceriodaphnia cornuta (Sars, 1885)

Copepoda:

1. Heliodiaptomus viduus (Gurney, 1916)
2. Trpocyclop prasinus (Fischer, 1886)
3. Paracyclop fermbrialis (Fischer, 1853)
4. Mesocyclop leucarti (Claus, 1857)
5. Eodiaptomus japonicus (Burckhardt, 1913)
6. Mesocyclops hyalinus (Rehberg, 1880

Ostracoda:

1. Hemicypris fossulata (Baird, 1845)
2. Cyclocypris globosa (Baird, 1845)

Copepoda: Freshwater copepods are an integral component of zooplankton communities, serving as a crucial food source for higher trophic levels, including fish, and playing a significant role in ecological pyramids. This study identified 6 species of copepods. Their population density was highest during the summer (440 organisms/liter) and lowest during the monsoon season (36 organisms/liter). The reduced population in the monsoon can be attributed to decreased primary production and the dilution effect caused by rainfall. Previous studies, such as those by Salve and Hiware (2010) in Wan Reservoir and Sontakke and Mokase (2014) on Dekhu reservoir reported similar patterns. The high summer abundance of copepods suggests their importance in nutrient cycling and indicates a

higher trophic state of the water body. Seasonal fluctuations in copepod populations were also observed in Trigha Reservoir, Gwalior, by Mahor (2011).

Cladocera: Cladocerans, known for their nutritive value in the food chain, particularly for fish, were represented by 6 species in this study. Their population density peaked during the monsoon (40 organisms/liter) and declined slightly in winter (35 organisms/liter). These findings align with earlier observations by Pawar and Pulle (2005) in the Pethwadaj Dam of Nanded district. The seasonal abundance of cladocerans may be influenced by favorable breeding conditions and food availability during the monsoon.

Ostracoda: Ostracods exhibited the lowest diversity and population density among the zooplankton groups, with only 2 species recorded. Their population was highest in summer (23 organisms/liter) and lowest in winter (15 organisms/liter). Similar observations were made in Fort Lake, Belgaum (Sukand and Patil, 2004), and Rishi Freshwater Lake, Washim District (Kedar *et al.*, 2008). The limited diversity and density of ostracods suggest their marginal role compared to other zooplankton groups.

General Trends and Ecological Implications: Rotifers consistently displayed the highest diversity and population density across all seasons. Their dominance is linked to the continuous availability of organic matter and food resources, highlighting the eutrophic nature of the reservoir (Sukand and Patil, 2004; Naz and Najia, 2008). Copepods and rotifers collectively outnumbered cladocerans and ostracods throughout the year, a trend previously noted by Das (2002). Overall zooplankton populations were highest during summer and winter and lowest during the monsoon, primarily due to the dilution effect of rainfall and reduced photosynthetic activity.
The study concluded that the dominance of Rotifera and Copepoda reflects the eutrophic status of the Wakod Reservoir. This finding underscores the importance of zooplankton as indicators of ecological health and their role in nutrient cycling within aquatic ecosystems.

Seasonal Variations:

Table No.2. Seasonal variations in Zooplankton Population Density (org. /lit.) in Freshwater Reservoirs of Wakod during October 2023 to September 2024

Group of Organism/ Season	Summer	Monsoon	Winter
Rotifera	890	494	360
Cladocera	38	40	34
Copepoda	440	36	261
Ostracoda	23	19	15

(Numbers represents the total numbers of Organisms per liter of sample)

Environmental Correlations:
Temperature: Positively correlated with copepod abundance.
Dissolved Oxygen: Showed a significant influence on rotifer diversity.
Nutrients: High nitrate and phosphate concentrations during the monsoon promoted overall zooplankton productivity.

Discussion:

The diversity and seasonal patterns observed in the zooplankton community of Wakod Reservoir highlight its ecological significance. The dominance of Rotifera suggests a mesotrophic to eutrophic status, while the presence of sensitive species like *Daphnia* indicates moderate water quality. Seasonal changes in diversity and abundance were strongly influenced by environmental factors, including temperature and nutrient levels. The findings underline the importance of conserving this freshwater ecosystem to sustain its biodiversity and ecological services.

Conclusion:

The study of zooplankton diversity in Wakod Reservoir reveals a rich and varied community, reflective of the Reservoirs ecological conditions. Continuous monitoring and management are recommended to mitigate anthropogenic impacts and preserve the ecological integrity of this vital freshwater body.

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Conflicts of Interest
The authors declare that there are no conflicts of interest regarding the publication of this paper.

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