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# Diversity and richness of the freshwater zooplankton fauna of Visapur dam, Ahilyanagar (Maharashtra, India)

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**Abstract**
Freshwater zooplankton were studied for a period of two years from October 2022 to September 2024. Freshwater was studied for the presence or absence of zooplankton, including Rotifera, Cladocera, Copepoda, and Ostracoda. These organisms are important bioindicators and are known to indicate the physicochemical conditions of water. Their presence, absence, diversity, and abundance are important for understanding the water quality. These organisms play a crucial role in the food web, serving as primary consumers and food sources for larger aquatic species such as fish. They can also indicate eutrophic levels, type of pollutants, temperature, pH, etc. We present the data for 42 zooplankton, including 28 rotifers, eight cladocerans, four ostracods, and two copepods of the waterbody studied.

**Keywords:** Visapur dam, zooplankton, rotifer, Cladocera, biodiversity, conservation

## Introduction
The zooplankton in freshwater bodies are composed of cladocerans, copepods, ostracods and rotifers. These micro-invertebrates are abundant in freshwater bodies, such as lakes, ponds, reservoirs and rivers. They play crucial roles in aquatic ecosystems, serving as primary consumers that feed on phytoplankton, and as a vital food source for larger organisms such as fish and amphibians. Cladocerans, copepods, and rotifers exhibit diverse feeding strategies and life cycles, which contribute to the complex dynamics of freshwater food webs and nutrient cycling.

Visapur dam is well known for its tourtist valur (Salunke *et al*., 2021) [7]. Visapur Dam has been studied for its Bryozoa fauna Mokashe *et al*., (2015) [1] and fishes Pandharkar. Bhalsing and Pokale (2023; 2024) [2, 3] further studied the rotifer and zooplankton fauna, revealing 19 and 25 species, respectively. These studies have contributed to our understanding of the aquatic biodiversity in Visapur Dam. The presence of diverse Bryozoans, fish, rotifers, and other zooplankton species indicate a complex and thriving ecosystem. Such biodiversity studies are crucial for assessing the ecological health of freshwater bodies and can inform further conservation efforts and water management strategies.

Freshwater zooplankton were studied for a period of two years from October 2022 to September 2024. The research focused on four major groups of zooplankton: Rotifera, Cladocera, Copepoda, and Ostracoda. The study revealed a total of 42 zooplankton species, with Rotifera being the most diverse group, represented by 28 species. This was followed by Cladocera with eight species, Ostracoda with four species, and Copepoda with two species.

The presence and abundance of these zooplankton species can serve as indicators of water quality and ecosystem health. Rotifers, the most numerous in this study, are known for their rapid reproduction rates and ability to adapt to various environmental conditions. Cladocerans, commonly known as water fleas, are important consumers for algae and bacteria. Ostracods with their bivalve shells play a role in nutrient cycling and are sensitive to environmental changes. Although fewer in number here, copepods are crucial in marine and freshwater food webs. This comprehensive survey of zooplankton communities in dam water provides a baseline for future monitoring efforts and contributes to our understanding of the freshwater ecosystem dynamics.

## Materials and Methods

The study was conducted at the Visapur Dam near Shrigonda, Ahilyanagar (18.8035565°N, 74.5827484°E). The Visapur dam is an earthfill dam on the Hanga River in Ahilyanagar. Three stations were selected based on human interference, pollution status, and accessibility. The selected stations were monitored for selected environmental parameters for two years from October 2022 to September 2024. Zooplankton (Rotifera, Cladocera, Copepoda and Ostracoda) were collected using a plankton tow net (mesh size 50 micron). A known quantity of water (20 litres) was filtered using a plankton net, concentrated to 100 ml in plastic bottles, and preserved in 4% formalin. A drop of glycerine was added to each sample bottle. The sample bottles were properly labelled and preserved in the dark for future studies. Microcrustaceans (Cladocera, Copepoda, and Ostracoda) were examined and photographed under a stereo microscope. The detailed morphology of rotifers was studied under a compound microscope (Magnus) fitted with a digital camera.

All the latest monographs and keys (Sharma (1980-2022); Kulkarni *et al*., 2015 [5], Vanjare *et al*., 2010; 2017) were used for identification. Help was also taken of experts in respective zooplankton groups for identification. Richness and Diversity data were calculated using freely available software, such as MS Excel and PAST 5.2.2. Canva software was used to create the image plates.

## Results

Studies on the diversity of zooplankton over a period of two years revealed a good diversity of the studied zooplankton. Twenty-eight rotifers, eight cladocerans, four copepods, and two ostracods were documented during this study (Table 1). The overall species richness was comparatively similar for both years, with 40 and 42 species for the years 2022-23 and 2023-24 respectively (Fig. 1).

Rotifers were 26 and 28 species for the years 2022-23 and 2023-24 respectively. All other groups, however, showed similar diversity (8- Cladocera, 4- Copepoda, 2- Ostracoda) during both years (Fig 2-4).

Rotifers are microscopic freshwater organisms found in all types of nutrient-rich habitats (Sharma, 2011). Among the rotifers, the family Brachionidae was the most diverse with 11 species. Among the different genera, *Branchionus* was the most dominant, with seven species. *Brachionus angularis* (12 &11) and *Brachionus quadridentatus* (12 & 12) were the most common species while the rarest *Macrochaetus sericus*, *Lecane luna* (six) and *Filinia* (five) occurrences for the two collection years, respectively.

Cladocerans are aquatic crustaceans belonging to the phylum Arthropoda (Sharma & Sharma, 2009). A total of eight species were found, of which *Leydigia* (7 and 10) and *Moina macrocopa* (8 and 9) were the most common species, whereas *Daphnia* was rare, with only six and three occurrences for the two collection years, respectively.

Among Copepods, *Cyclops* showed 24 occurrences (12 and 12), and Ostracod *Cypris* was present 22 times (11 and 11) during the two-year study. The copepod *Diaptomus* showed 14 occurrences (12 and 12), whereas the Ostracod *Stenocypris* showed 21 occurrences (10 and 11) during the two-year study.

The diversity of rotifers was comparatively lower during the monsoon and post-monsoon seasons. Good diversity was observed in the post-winter and post-summer seasons. The diversity of cladocerans was comparatively lower during the monsoon and post-monsoon seasons. Good diversity was observed during the winter and summer.

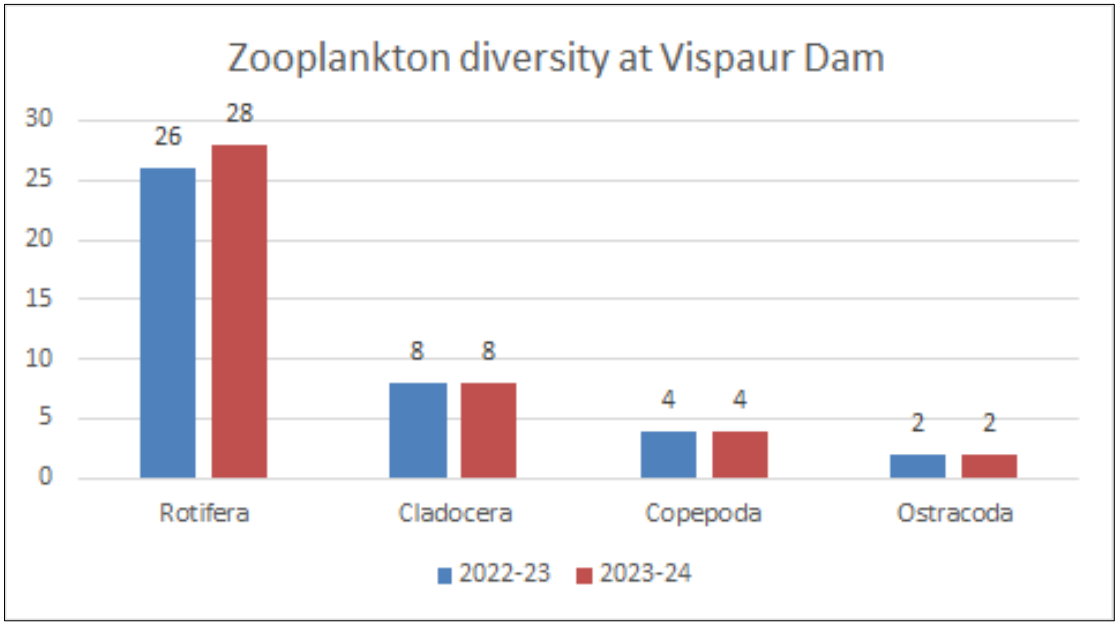


**Fig 1:** Diversity of zooplankton at Visapur Dam (2022-2024)

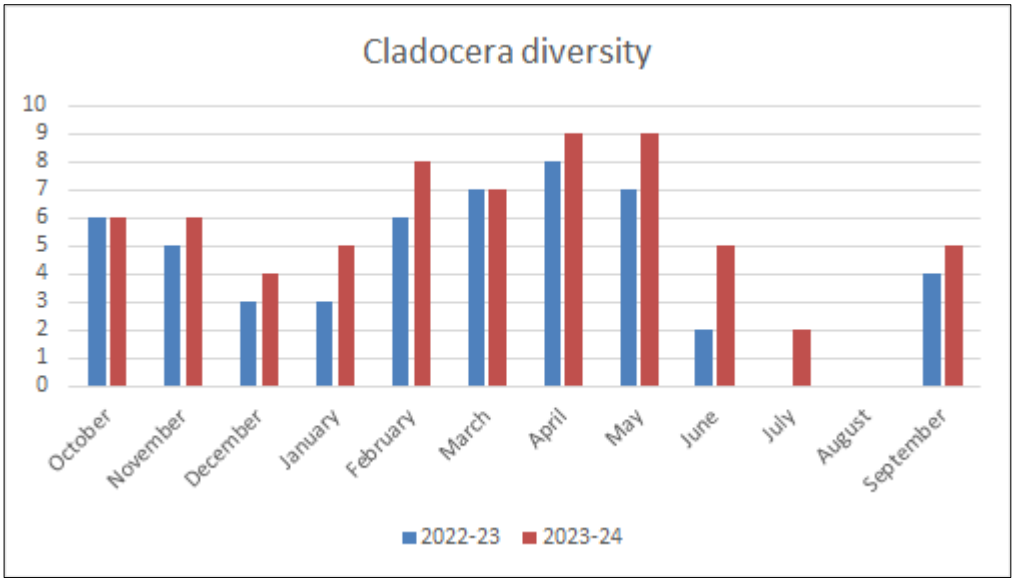


**Fig 2:** Diversity of cladocera at Visapur Dam (2022-2024)

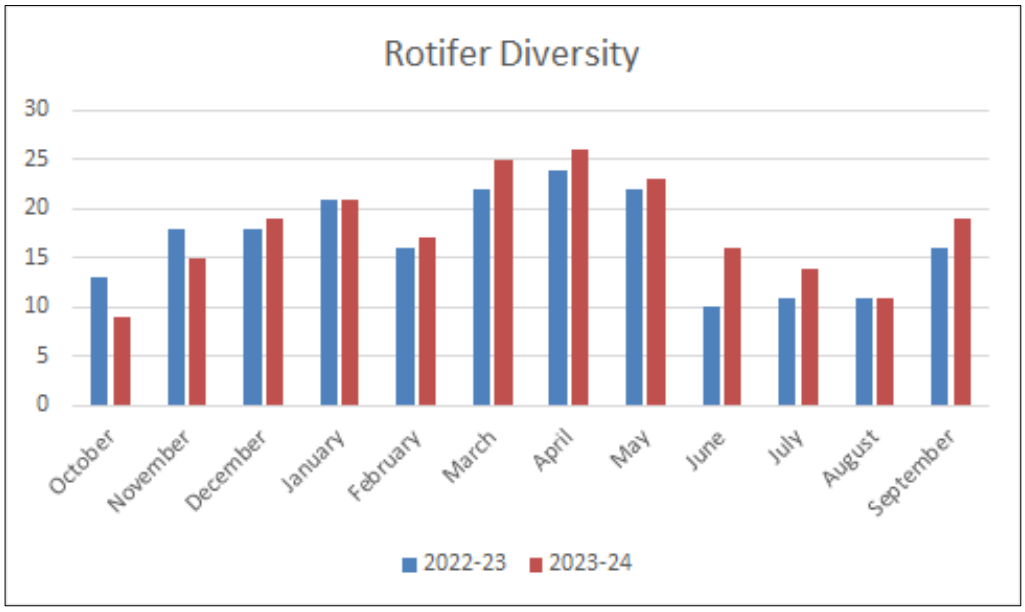


**Fig 3:** Diversity of Rotifers at Visapur Dam (2022-2024)

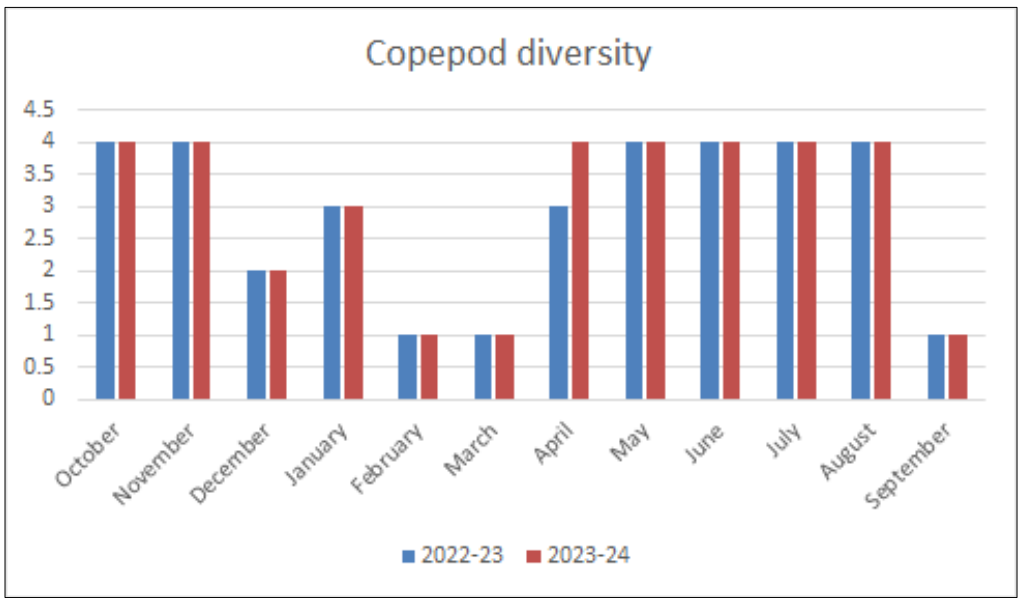


**Fig 4:** Diversity of Copepods at Visapur Dam (2022-2024)

## Discussion and Conclusion

Studies on zooplankton diversity over two years revealed twenty-eight rotifers, eight cladocerans, four copepods, and two ostracods. Species richness was similar for both years, with 40 and 42 species for 2022-23 and 2023-24 respectively. Rotifers increased from 26 to 28 species, while other groups maintained constant diversity (8-Cladocera, 4-Copepoda, 2-Ostracoda). Less number of Ostracods may be because they are benthic (Kulkarni *et al*., 2015) [5].

Among rotifers, family Brachionidae was most diverse with 11 species, with *Branchionus* being dominant (seven species). *Brachionus angularis* (12 &11) and *B. quadridentatus* (12 & 12) were most common, while *Macrochaetus sericus, Lecane luna* (six) and *Filinia* (five) were rare. Among eight cladoceran species, *Leydigia* (7 and 10) and *Moina macrocopa* (8 and 9) were common, while *Daphnia* was rare (six and three occurrences). For Copepods, Cyclops showed 24 occurrences (12 and 12), and Ostracod Cypris 22 times (11 and 11). *Diaptomus* had 14 occurrences, while *Stenocypris* showed 21 occurrences. Rotifer and cladoceran diversity were lower during monsoon and post-monsoon seasons but higher in post-winter and summer seasons.

Low numbers during the monsoon may be due to dilution by rain and high-water levels (Tyor *et al*., 2014) (Fig 2- 4). High temperatures enhance the rate of decomposition as the water becomes nutrient-rich, increasing the population of rotifers (Arak & Mokashe, 2015; Shivashankar and Venkataramana, 2013) [1, 8]. It has been frequently observed that high diversity during summer and winter, and the lowest diversity was observed during the monsoon season is present. The abundance of rotifers tends to fluctuate seasonally, with peaks often observed during warmer months. This pattern can be attributed to the increased availability of food sources and favourable environmental conditions for reproduction. However, factors such as predation pressure and competition with other zooplankton species may also influence rotifer population dynamics throughout the year.

A literature review of zooplankton in Maharashtra's dams and reservoirs (Bhalsing and Pokale, 2024) [2] revealed significant research focused on the diversity and abundance of key zooplankton groups: rotifers, cladocerans, copepods, and ostracods. These studies have contributed to a comprehensive understanding of zooplankton communities in these aquatic ecosystems, providing valuable insights into their composition, distribution, and population dynamics. While emphasis on diversity and abundance has been crucial, there is potential for expanding the scope of research to include other aspects of zooplankton ecology. Future studies could explore seasonal variations in zooplankton communities, their role in the aquatic food web, and their responses to environmental changes, such as water quality fluctuations or climate-related impacts (Vanjare *et al*., 2023) [1]. Additionally, investigating the interactions between zooplankton and other aquatic organisms as well as their potential as bioindicators of ecosystem health could provide a more holistic understanding of these important freshwater habitats in Maharashtra.

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