

ASSESSMENT OF SEASONAL FLUCTUATIONS IN ZOOPLANKTON COMMUNITIES OF MUL LAKE, CHANDRAPUR, MAHARASHTRA

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Abstract

Mul lake, located in Chandrapur district of Maharashtra, is an important freshwater body supporting diverse aquatic life, including a variety of zooplankton species. Positioned near the town of Mul at coordinates approximately 20.0699"N and 79.6783"E, the lake plays a crucial role in the local ecology and economy by providing water for irrigation and supporting fisheries. The zooplankton community in Mul lake comprises major groups such as Rotifera, Cladocera, Copepoda, and Ostracoda, which form a vital component of the lake's food web. These organisms are essential for maintaining the aquatic ecosystem's balance as they serve as primary consumers feeding on phytoplankton and, in turn, act as prey for higher trophic levels like fish. Studies conducted in Mul lake over extended periods have documented the abundance and diversity of zooplankton, highlighting seasonal variations influenced by physico-chemical parameters such as temperature, dissolved oxygen, and nutrient levels. Understanding the fluctuation of zooplankton populations in Mul lake, aids in assessing the lake's ecological health and informs conservation and management efforts in this agriculturally important region of Maharashtra.

Keywords: *Mul lake, zooplankton, ecology and economy, fluctuation*

Introduction

Monitoring zooplankton communities provides valuable insights into the health and functioning of freshwater bodies, helping inform conservation and management strategies. Zooplankton diversity and abundance are crucial indicators of the ecological status and water quality of lentic ecosystems (Telkhade *et al.*, 2008). As key components of freshwater ecosystems, zooplankton significantly contribute to the biological productivity and energy flow within water bodies. Zooplankton communities mainly consist of groups like rotifera, cladocera, copepoda, and ostracoda serve as vital bioindicators to assess water quality and ecological health because they respond quickly to changes in environmental conditions (Ingale *et al.*, 2016). Zooplanktons are the heterotrophic component of the planktonic group that drifts in the water body. Zooplanktons are useful ecological indicators and are occasionally ingested in greater numbers to understanding and improving the functioning of aquatic ecosystems requires knowledge of zooplankton abundance, distribution, and community composition (Ingale *et al.*, 2024). They offer a direct conduit between upper trophic levels, such fish, and primary producers.

Materials and Methods

From July 2021 to June 2022, the ongoing investigation from Mul lake was carried out. The

three primary research periods were the monsoon, winter, and summer seasons. At random, 100 liters of water were passed over a bolting silk plankton net in order to collect zooplankton samples. The zooplankton specimens were kept in 4% formalin in a suitable glass container. A thorough observation and study of the zooplanktons was performed using an Olympus inverted stereoscopic microscope (MLXB). The Sedgwick Rafter plankton method's counting cell was used to quantitatively analyze zooplankton (Adoni 1985). Zooplankton was identified using the standard literature key (Battish 1992 and Altaff 2004).

Results and Discussion

Due to differences in physicochemical conditions and habitat features, the quantity and distribution of zooplankton frequently fluctuate spatially among different sampling locations in aquatic environments. The greatest abundance of zooplankton was observed at station M1, followed by stations M2 and M3, in this study. Due to site-specific zooplankton population differences brought about by variables such nutrient availability, temperature, and water clarity, station M4 had the lowest counts of all the stations and exhibited lower abundance than stations M1, M2, and M3 (The results are summarized and illustrated in Tables 1–4 and Figures 1–4, respectively). This spatial variation is consistent with the results of similar lake and dam water research done in Maharashtra, such as Telkhede *et al.*, (2008) from Masala Lake, Distt. Chandrapur, Maharashtra. Telkhede *et al.*, (2008) from Tadoba lake.

The seasonal observation that rotifers, cladocerans, and copepods peaked during the winter season, with the exception of ostracods, which were more common in the summer, reflects well-documented seasonal dynamics. While rotifers tend to flourish in the summer because they are benthic and adapted to warmer climates, ostracods are more prevalent in the cooler months because they correlate with favorable temperature and food supplies (Jadhav *et al.*, 2017). Factors such as nutrient availability, temperature, and water clarity all play a role in the site-specific variations in zooplankton populations (Kadam and Babar, 2016). Reduced primary productivity, lower temperatures, and other limiting environmental conditions unique to winter could also be related to the generally low abundance of all zooplankton groups during that season (Rathod *et al.*, 2016). From Bhiwapur lake Nagpur, Maharashtra, Ingale *et al.*, (2018) provided observations that are consistent with the current results.

Conclusion

From both an ecological and an environmental standpoint, this work is extremely significant. At all Mul lake stations during the research period, the population densities of rotifers, cladocerans, and copepods were highest during the winter, followed by the summer. Rotifera, cladocera, and copepods are present year round. They are a decent food source for fish. This should, in turn, guarantee high fish output.

Table no. 1: Seasonal Average Mean Values of Zooplankton groups at Station – M1 Mul lake, Chandrapur district during July 2021- June 2022.

Seasons → Name of the Group ↓	Monsoon		Winter		Summer	
	Mean	Se	Mean	Se	Mean	Se
Rotifera	47.5	13.00	107.25	4.767	79.75	5.75
Copepoda	12	5.115	32.5	1.936	19.25	2.954
Cladocera	13.25	3.037	40.75	3.037	23.25	3.966
Ostracoda	0.75	0.478	0.75	0.75	8.25	1.108

Table no. 2: Seasonal Average Mean Values of Zooplankton groups at Station – M2 Mul lake, Chandrapur district during July 2021- June 2022.

Seasons → Name of the Group ↓	Monsoon		Winter		Summer	
	Mean	Se	Mean	Se	Mean	Se
Rotifera	29.75	10.42	82	3.341	54.25	6.342
Copepoda	8.5	4.406	29.5	1.190	16.5	3.227
Cladocera	10.75	2.061	31.5	2.061	20.25	4.069
Ostracoda	0.5	0.288	0.5	0.5	6.5	0.957

Table no. 3: Seasonal Average Mean Values of Zooplankton groups at Station – M3 Mul lake, Chandrapur district during July 2021- June 2022.

Seasons → Name of the Group ↓	Monsoon		Winter		Summer	
	Mean	Se	Mean	Se	Mean	Se
Rotifera	18.5	6.512	68.5	4.092	39.25	4.956
Copepoda	5.5	2.629	23	1.414	16	2.345
Cladocera	7	3.427	25.5	3.427	17.25	3.198
Ostracoda	0.5	0.288	0.25	0.25	4	0.707

Table no. 4: Seasonal Average Mean Values of Zooplankton groups at Station – M4 Mul lake, Chandrapur district during July 2021- June 2022.

Seasons → Name of the Group ↓	Monsoon		Winter		Summer	
	Mean	Se	Mean	Se	Mean	Se
Rotifera	9.5	4.663	49.25	4.956	30.5	5.678
Copepoda	3.25	1.973	19.75	1.887	8.75	2.428
Cladocera	4	3.227	18.5	3.227	9.25	4.130
Ostracoda	0.5	0.288	0	0	2.5	0.5

Fig. no. 1: Pie diagram Shows Seasonal values % of Zooplankton groups at Station - M1 Mul lake, Chandrapur district during July 2021 - June 2022.

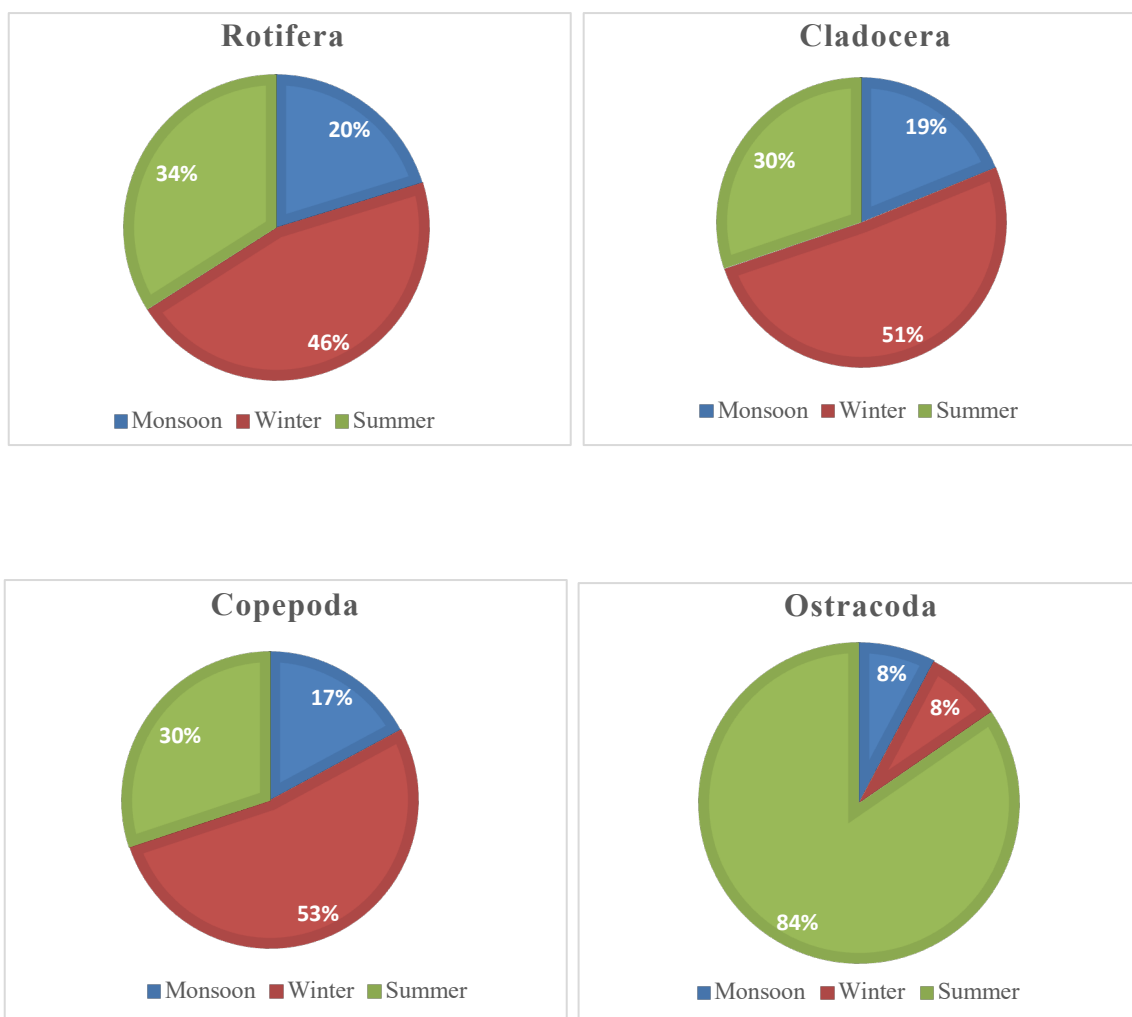


Fig. no. 2: Pie diagram Shows Seasonal values % of Zooplankton groups at Station – M2 Mul lake, Chandrapur district during July 2021 - June 2022.

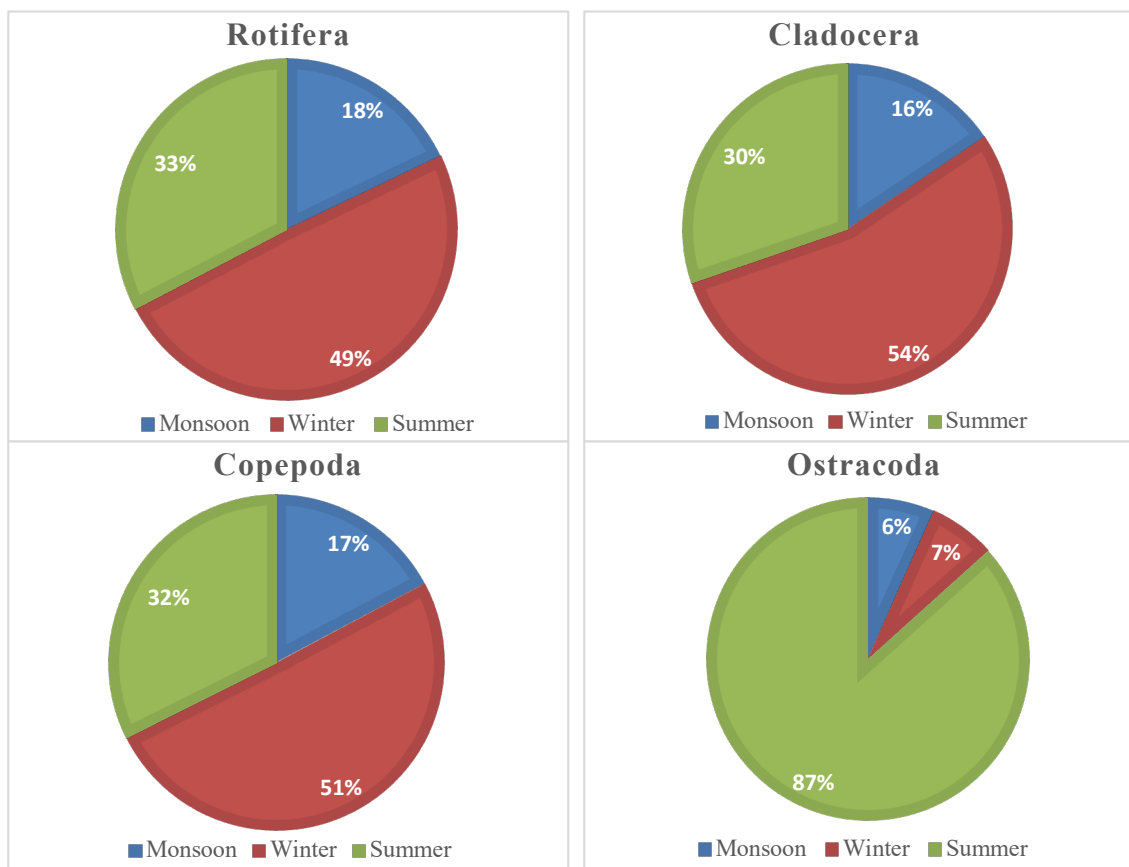
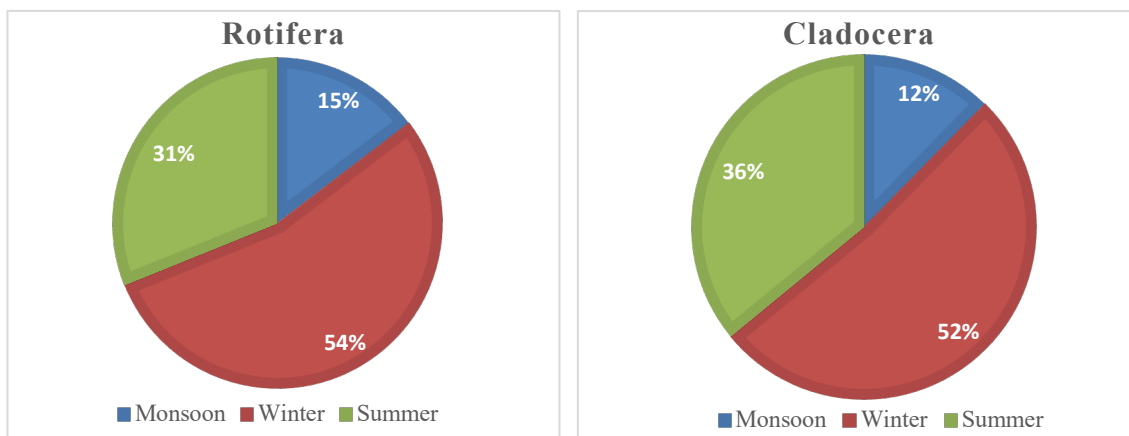


Fig. no. 3: Pie diagram Shows Seasonal values % of Zooplankton groups at Station – M3 Mul lake, Chandrapur district during July 2021 - June 2022.



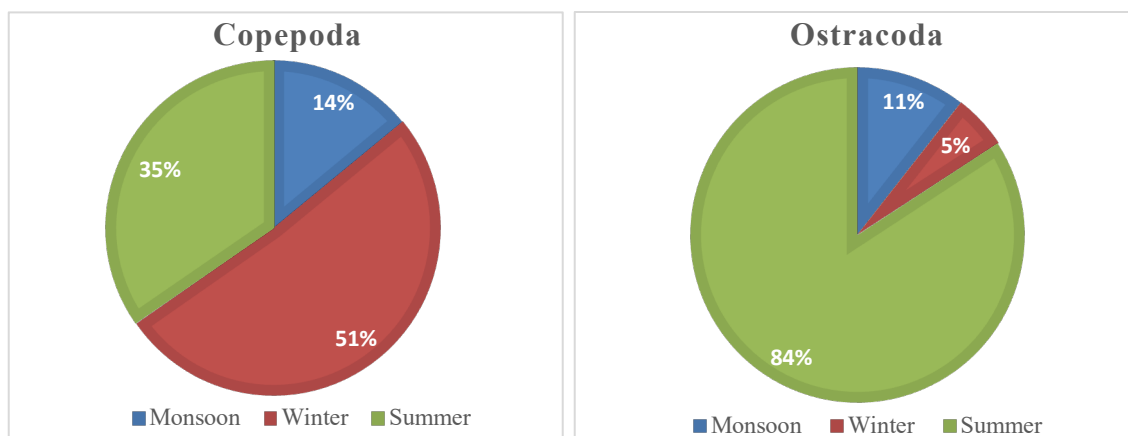
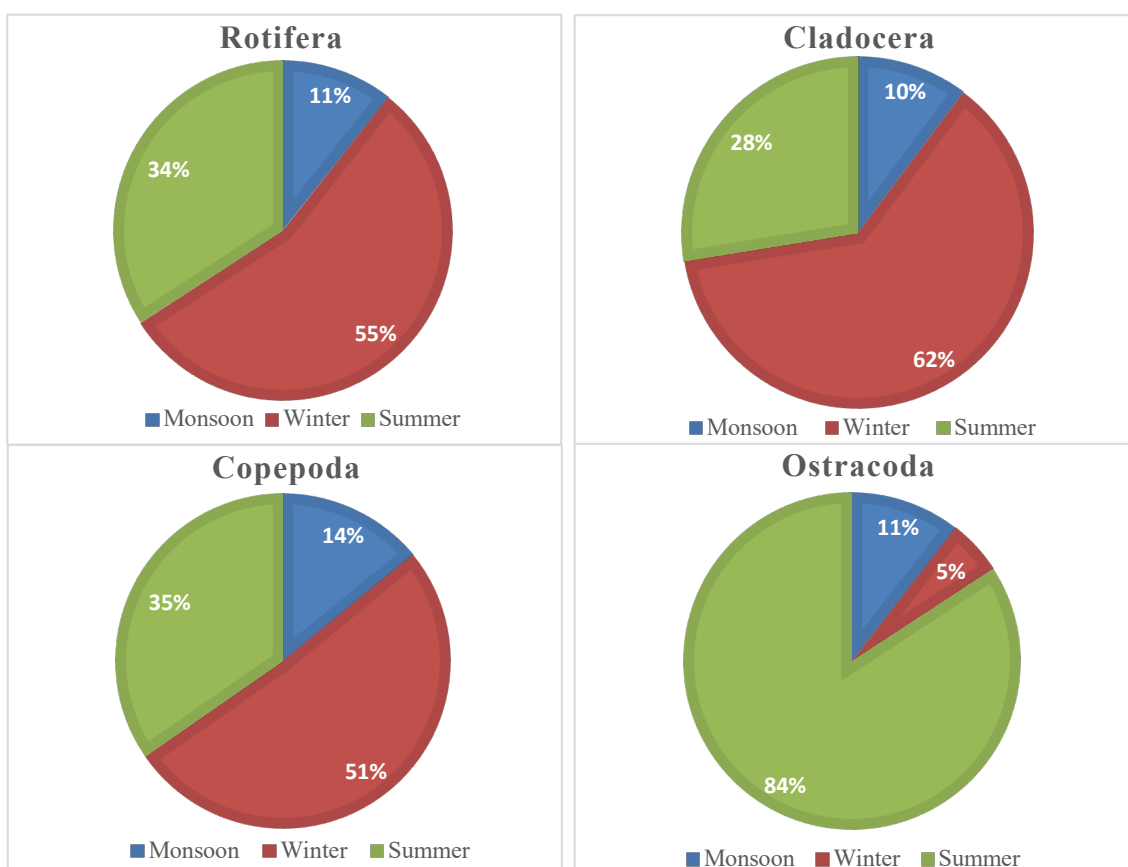


Fig. no. 4: Pie diagram Shows Seasonal values % of Zooplankton groups at Station – M4 Mul lake, Chandrapur district during July 2021 - June 2022.



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