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Seasonal variations in ostracod species in two freshwater lakes in Yavatmal District (Maharashtra) India

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ABSTRACT

The diversity and density of ostracods (zooplankton) in two freshwater lakes in the Yavatmal district of Maharashtra, India, were studied from March 2021 to February 2022 to determine seasonal variations. Plankton net (64µ pore size) was used to collect the samples and analysis was performed using standard keys. In all, 11 species from 8 genera belonging to 3 families of Ostracoda were identified from Mama Lake and Singhada Lake of the Yavatmal district of Maharashtra, India. The overall population of Ostracoda is greater in Mama Lake than in Singhada Lake. Additionally, the species diversity was higher in the summer season and lowest in winter.

Introduction

Ostracods are tiny crustaceans that belong to the class Crustacea. They exist in all aquatic conditions and have a wide range of salinity tolerances. Only the benthonic species are preserved in the fossil record. They serve as helpful indices in geochronology, correlation, hydrocarbon exploration, paleogeographic reconstructions and interpretations. Ostracods are a key component of secondary energy transfer in the aquatic food web between autotrophs and heterotrophs, as observed by Deivanai *et al.* (2004). Freshwater ostracods are valuable biological indicators, as observed by Schneider *et al.* (2016). Ostracods are extremely sensitive to changes in their environment. Therefore, changes in species diversity or community composition can offer crucial indicators of environmental changes. Fisheries and reservoir health for the general public may be significantly impacted by a reservoir's zooplankton species composition, distribution diversity, and relative abundance, as suggested by Mustapha (2009). Ostracods are bivalve microcrustaceans that are one of the most diverse species of living crustaceans and are found practically everywhere in water, as observed by Sontakke and Mokashe (2014). Patil (2018) studied the abundance and diversity of zooplankton at Nandurmadhmeshwar Dam of Nasik district in Maharashtra and recorded 16 species belonging to 4 different groups, of which rotifers contributed 7 species, Cladocera reported 5 species, Copepodawith 3 species and Ostracoda by 1 species. Deshmukh *et al.* (2019) conducted a study on the correlation between abiotic factors and zooplankton diversity in wetlands and reported that phytoplankton significantly contribute to the development of zooplankton and fish diversity. The

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work of Khaire (2020) recounted monthly variations in zooplankton dynamics and their correlations with some physicochemical characteristics of Sina Dam and reported 17 genera from four major groups of zooplankton. Patel and Laharia (2021) reported the presence of 5 species from 5 genera of Ostracoda from freshwater perennial ponds in Wani city.

The percent composition and seasonal change in freshwater ostracods in various regions of India have been the subject of very little research. The current paper focuses on a comparative study of the diversity of ostracods in two freshwater lakes, Mama and Singhada, in the Yavatmal district of Maharashtra, India. This result helps to understand the current status of the ostracod fauna of freshwater lakes in India.

Material and Methods

Samples were collected from two different lakes, Mama and Singhada, from the Yavatmal district of Maharashtra between March 2021 and February - 2022. Mama Lake (34 km from Wani) is present near Mukutban. It is at 19°48' North latitude and 78°51' East longitude and at 249 meters above sea level. Singhada Lake is situated near Wani Tahsil of Yavatmal District. It is at 20°02' North latitude and 78°57' East longitude and 215 meters above sea level. Analysis was performed using standard keys of Edmondson, (1992), Meisch, (2000) and Altaff, (2004). Various diversity indices, such as the Shannon–Wiener index and richness index, were calculated.

The Shannon diversity index was calculated by the formula below:

$$\mathbf{H} = -\sum_{i=1}^{s}[(\mathbf{pi})\mathbf{x}\,\mathbf{ln}(\mathbf{pi})]$$

where H- Shannon diversity index
pi - proportion of individuals of i^{th}species in a whole community
ln- natural logarithm

Simpson's diversity index was calculated by the following formula:

$$\mathbf{D} = \sum_{i=1}^{s}\frac{\mathbf{ni}(\mathbf{ni}-\mathbf{1})}{\mathbf{N}(\mathbf{N}-\mathbf{1})}$$

where
D- Simpson's diversity index
ni - number of individuals in i^{th} species
N- Total number of individuals

However, the species richness was calculated by the formula given below:

Margalef Richness Index in Biodiversity = (S - 1)/Log (n)

where
S = Total Number of Species
n = Total Number of Individuals in the Sample

Results and Discussion

In all, 11 species from 8 genera belonging to 3 families of Ostracoda were identified from Mama Lake and Singhada Lake of the Yavatmal district of Maharashtra, India (Table 1). In the present study, 11 species from 8 genera of Ostracoda were observed, of which *Candonafaveolata* was observed to be the dominant species in both lakes. The highest diversity of ostracods was recorded in the summer season in Mama Lake (H – 1.609) and Singhada Lake (H – 1.606), while the lowest was observed in the winter season (H – 1.604) in Mama Lake and (H – 1.583). Simpson's index (D) was found to be very low, as all the diversity indices shown in Table 3 were below 0.5 in both lakes. The highest species richness was observed in the summer season, and the lowest was observed in the winter season in both lakes. (table-3). Antal *et al.* (2020) also recorded higher values of ostracod populations in summer and lower values in winter in Lake Mansar and Lake Surinsar. Most freshwater communities contain significant amounts of ostracods. The availability of suitable food for aquatic species affects the population of zooplankton. The nearby macrophytes and flora have a special impact on the abundance of ostracods. Ostracod populations may increase in the summer because of the abundance of food, which comes in the form of debris and organic materials due to the high rate of decomposition and suitable temperature. Mama Lake has a lower average species richness than Singhada Lake. According to Mukherjee (1997), a wider food chain indicates a higher species richness. The Simpson index of Mama Lake was higher than that of Singhada Lake. Poorer diversity in Mama Lake is indicated by higher Simpson index scores. Kulkarni *et al*. (2011) reported a similar discovery in Dharamtar, India. The ANOVA results (Table 4) showed that among

Table 1: Seasonal number of Ostracoda observed during 2021-2022 in two lakes in the Yavatmal district

Family	Genus/Species	Individuals observed in Mama Lake			Individuals observed in Singhada Lake		
		Summer	Rainy	Winter	Summer	Rainy	Winter
Cyprididae	*Chlamydotheca speciosa*	8	6	5	5	4	2
	Candonafaveolata	28	23	21	19	15	10
	Candonaparvula	19	16	14	8	6	9
	Candonajeaneli	15	11	10	3	2	0
	ParaCandonaeuplectella	5	4	4	3	2	1
Cytheridae	*Bicornucytherebisanensis*	7	5	3	5	3	1
Cypridae	*Cyprinotuspellucidus*	25	22	20	15	11	4
	Cypricercuspassaica	9	6	4	3	2	0
	Cyclocyprisforbesi	7	5	4	2	1	1
	Physocypriagibbara	5	4	3	2	0	1
	Rabilimisseptentrionalis	3	2	0	1	0	0
	Total	**131**	**104**	**88**	**66**	**46**	**29**

Table 2: Seasonal percentage of Ostracoda in the lakes studied during 2021-2022

Lakes	Seasons	individuals observed	Percent
Mama	Summer	131	41%
	Rainy	104	32%
	Winter	88	27%
	Total	**323**	
Singhada	Summer	66	47%
	Rainy	46	33%
	Winter	29	21%
	Total	**141**	

Table 3: Species diversity indices of Ostracoda in the lakes studied during 2021-2022.

Lakes	Indices	Summer	Rainy	Winter
Mama	Richness (S)	2.23	2.15	2.05
	Shanon-Weiner (H)	1.609	1.608	1.604
	Simpson (D)	0.200	0.201	0.202
Singhada	Richness (S)	2.97	2.61	2.39
	Shanon-Weiner (H)	1.606	1.598	1.583
	Simpson (D)	0.205	0.201	0.210

Table 4: ANOVA between ostracod species and between seasons in Mama Lake

Source of Variation	*SS*	*df*	*MS*	*F*	*P value*	*F crit*
Between Species	1808.8485	10	180.884848	215.495	4.18E-18	2.347878
Between Seasons	85.8788	2	42.9393939	51.155	1.37E-08	3.492828
Error	16.7879	20	0.83939394			
Total	1911.5152	32				

***Significance at the 0.05 level**

Table 5: ANOVA between ostracod species and between seasons in Singhada Lake

Source of Variation	*SS*	*Df*	*MS*	*F*	*P value*	*F crit*
Between Species	623.8788	10	62.38788	17.257334	9.83E-08	2.347878
Between Seasons	62.3636	2	31.18182	8.6253143	0.001991	3.492828
Error	72.3030	20	3.61515			
Total	758.5455	32				

***Significance at the 0.05 level**

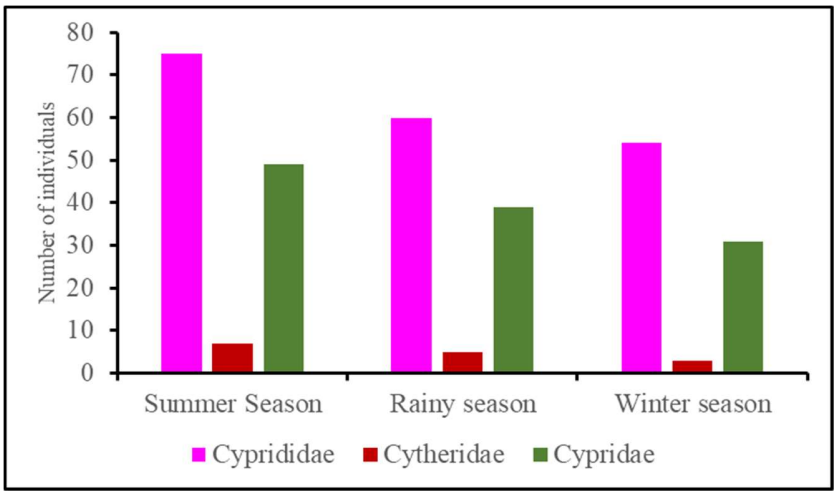

Figure 1: Seasonal variation in families of Ortracods studied in Mama Lake during 2021-2022

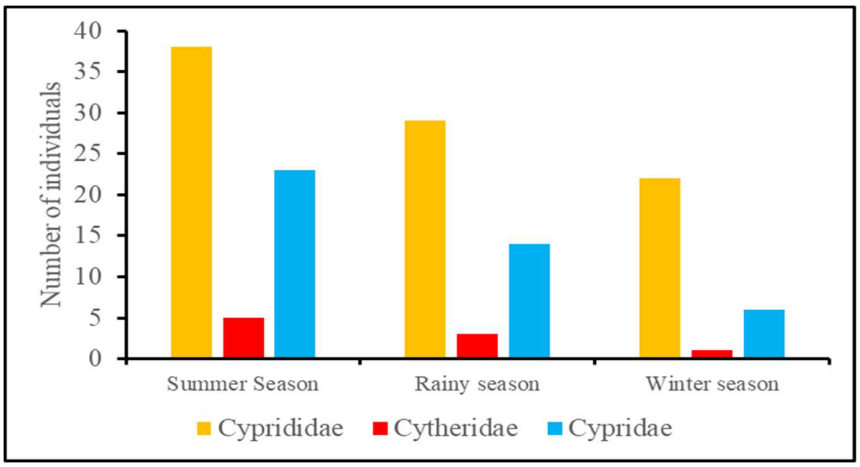

Figure 2: Seasonal variation in families of Ortracoda studied in Singhada Lake during 2021-2022

Ostracods, there was a significant difference at Mama Lake, as the obtained 'f' value of 215.495 was greater than the 'f' critical value of 2.347, whereas among different seasons, it was also found to be significant, as the obtained 'f' value of 51.155 was greater than the 'f' critical value of 3.492. The ANOVA results (Table 5) showed that among Ostracods, there was a significant difference at Singhada Lake, as the obtained 'f' value of 17.257 was greater than the 'f' critical value of 2.347, whereas among different seasons, it was also found to be significant, as the obtained 'f' value of 8.625 was greater than the 'f' critical value of 3.492. In comparison to Singhada Lake, Mama Lake has greater Shannon–Wiener index values. The diversity increases as the value increases. There is less conflict between species when there is a situation with higher diversity, as observed by Colinvaux (1973).

Conclusion

From the comparative study of Mama Lake and Singhada Lake, it can be concluded that Singhada Lake has high diversity compared to Mama Lake. The study also revealed that there was variation in Ostracod diversity and abundance between the two lakes, which might be due to some differences in abiotic conditions.

Conflict of interest

The authors declare that they have no conflicts of interest.

References

Altaff, K. (2004). *A Mannual of Zooplankton. University grants commission*. New Delhi. 134-145.

Antal, N., Kour, S. and Sharma, K. (2020). A Comparative study of Zooplankton diversity and abundance of two Ramsar sites (Lake Mansar and Lake Surinsar) of Jammu Region, J & K. *ESSENCE International Journal for Environmental Rehabilitation and Conservation* XI (SP2), 183-197.

Colinvaux, P. A. (1973). *Introduction to Ecology*. John Wiley& Sons, New York–London–Sydney–Toronto: ix, 621.

Deivanai, K., Arunprasath, S.,Rajan, M. K. and Baskaran, S. (2004). "Biodiversity of phyto and zooplankton in relation to water quality parameters in a sewage polluted pond at Ellayirampannai, Virudhunagar District." In: *The proceedings of National Symposium on biodiversity resources management and sustainable use*, organized by the center for biodiversity and Forest studies, Madurai Kamaraj University. Madurai.

Deshmukh, K.C., Patel, N.B. and Chavada, N.B. (2019). Study on Relation Between Zooplanktons And Abiotic Factors of Sodav Bandharan Wetland, Kodinar, *Research Journal of Life Sciences, Bioinformatics, Pharmaceuticals and Chemical Science*, 5(3), 196-204.

Edmondson, W. T. (1992). *Freshwater Biology, 2nd Edition*, John Willey and Sons. London, 657-734.

Khaire, B. (2020). Seasonal Fluctuations in Zooplankton Dynamics and their Correlations with Physicochemical Characteristics of Sina Dam in Maharashtra (India), *Our Heritage One Day National Conference on Recent Advances in Sciences*, 68(38),1236-1243.

Kulkarni, V. A., Naidu, V.S. and Jagtap, T. G. (2011). Marine ecological habitat: A case study on projected thermal power plant around Dharamtar creek, India. *Journal of Environmental Biology*. 32, 213-219.

Meisch, C. (2000). *Freshwater Ostracoda of Western and Central Europe.* Spectra Academischer, Heidelberg, Berlin, 522.

Mukharjee, B. (1997). *Environmental Biology*. Tata McGraw Hill Publishing Company Limited, New Delhi. 168.

Mustapha, M. K. (2009). Zooplankton assemblage of Oyun reservoir, Offa, Nigeria. *Revista de Biología Tropical*. 57(4), 1027-1047.

Patel, P., and Laharia, R. (2021). Zooplankton diversity of a fresh water perennial pond in wani city of Yavatmal district in Maharashtra, India. *Journal of Emerging Technologies and Innovative Research*. 8(12), 42-52.

Patil , R.B.(2018). Diversity and Abundance of Zooplankton in Nandur Madhmeshwar Dam from Nasik District, Maharashtra, India, *International Journal of Research*. 7(9), 1263-1267.

Schneider, A., Wetterich, S., Schirrmeister, L., Herzschuh, U., Meyer, H., and Pestryakova, L.A. (2016). Freshwater ostracods (Crustacea) and environmental variability of polygon ponds in the tundra of the Indigirka Lowland, north–east Siberia. *Polar Research* 35, 25225.

Sontakke, G., and Mokashe, S. (2014). Ostracod Density of Two Freshwater Lakes in India: A Comparative Study. *Indian Journal of Applied Research*. 10, 591-593.