

Seasonal Diversity of Zooplankton with Special Reference to Cladocera Diversity in Rajsamand Lake, Rajasthan

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Abstract

The present investigation was carried out to study the seasonal diversity of zooplankton with special reference to Cladocera in Rajsamand Lake, Rajasthan. The study was conducted from October 2019 to May 2021 at selected sampling sites of the lake. Cladocera formed an important component of the zooplankton community and showed marked seasonal fluctuations. Maximum diversity and density of Cladocera were observed during winter season while minimum population was recorded during monsoon season. Species such as *Daphnia*, *Moina*, *Ceriodaphnia*, *Bosmina* and *Diaphanosoma* were commonly observed. The abundance of cladocerans indicated mesotrophic to eutrophic condition of the lake. The present study highlights the ecological importance of zooplankton as biological indicators of freshwater ecosystems and provides baseline information for conservation and management of Rajsamand Lake.

Key words : Zooplankton, Cladocera, Rajsamand Lake, Seasonal variation, Limnology, Freshwater ecology.

Freshwater ecosystems are important natural resources that support biodiversity and human civilization. Zooplankton are microscopic aquatic organisms that play a major role in aquatic food chains and nutrient cycling^{5,3}. They act as a connecting link between phytoplankton and higher trophic levels such as fishes. Among the zooplankton groups, Cladocera are ecologically important because of their sensitivity to environmental changes and water quality fluctuations^{10,9}.

Rajsamand Lake is one of the historically

important freshwater lakes of Rajasthan. The lake receives water mainly from Gomti, Kelwa, and Tali rivers and supports fisheries, irrigation, and domestic activities. Increasing anthropogenic pressure and eutrophication may influence the biological productivity of the lake^{1,6}. Therefore, the study of seasonal diversity of Cladocera becomes essential for understanding the ecological status of the lake.

Previous studies have shown that zooplankton diversity is closely related to physicochemical characteristics of water

bodies^{8,9}. Cladocerans are considered useful bioindicators of trophic status and pollution in freshwater ecosystems. The present study aims to evaluate seasonal diversity and distribution of cladoceran zooplankton in Rajsamand Lake.

Study Area :

Rajsamand Lake is situated in Rajsamand district of Rajasthan at latitude 25.0667° N and longitude 73.8833° E. The lake was constructed during the reign of Maharana Raj Singh and is one of the major freshwater lakes of Rajasthan. The lake supports irrigation, fisheries, tourism, and domestic activities.

Sampling Sites :

Five sampling sites were selected around the lake considering aquatic vegetation, human activities, fishing zones, and water accessibility. Sampling was carried out monthly from October 2019 to May 2021.

Collection of Water Samples :

Surface water samples were collected from 10 cm depth in clean plastic containers. Physico-chemical parameters were analyzed using standard methods recommended by APHA (1985).

Collection of Zooplankton :

For zooplankton analysis, 100 liters of surface water were filtered through plankton net made of bolting silk No. 25. Samples were preserved in 4% formalin and analyzed in laboratory using Sedgwick Rafter Counting Cell under microscope.

Identification of Cladocera :

Cladoceran species were identified using standard taxonomic keys. Major genera identified during the study (figure 1) included:

- Daphnia magna
- Moina mircura
- Ceriodaphnia cornuta
- Diaphanosoma Sarsi
- Diaphanosoma excium

Diversity Indices :

Zooplankton diversity was calculated using^{2,7}:

Shannon-Weaver Diversity Index

$$H' = -\sum p_i \ln p_i$$

Menhinick's Diversity Index

$$D = \frac{S}{\sqrt{N}}$$

Where :

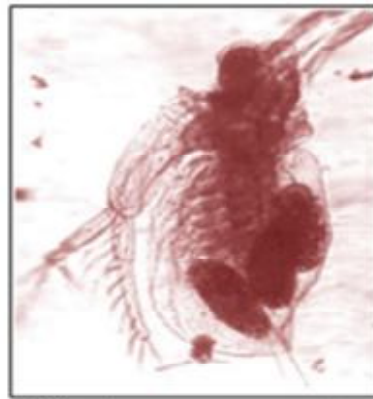
- S = Number of species
- N = Total number of individuals

Physico-Chemical Characteristics :

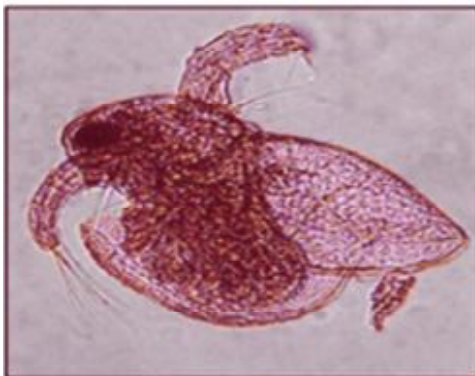
Seasonal variations were observed in all limnological parameters. Water temperature was highest during summer and lowest during winter. Dissolved oxygen was comparatively higher in winter season due to lower temperature and increased photosynthetic activity. Nutrient concentration increased during monsoon due to runoff from surrounding areas.



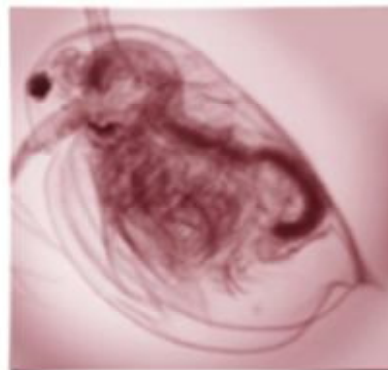
Diaphonasoma sarsi



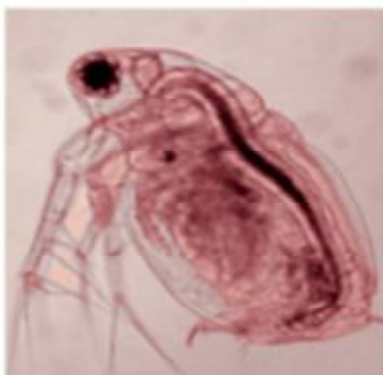
Diaphonosoma excium



Ceriodaphnia cornuta



Daphnia magna



Moina micrura

Figure 1. Diversity of Cladoceran Species Recorded from the Study Area

The pH of lake water remained alkaline throughout the study period. Transparency was reduced during monsoon because of suspended particles and increased turbidity.

Seasonal Diversity of Cladocera :

Cladocera represented a significant portion of total zooplankton population. Seasonal abundance followed the order:

Winter > Summer > Monsoon

The dominant cladoceran species recorded were:

- *Daphnia* sp.
- *Moina micrura*
- *Ceriodaphnia cornuta*
- *Bosmina longirostris*
- *Diaphanosoma sarsi*

Higher abundance during winter may be due to favorable temperature, higher dissolved oxygen, and increased phytoplankton availability. Monsoon season showed comparatively low diversity because of dilution effect and turbidity.

Diversity Indices :

The Shannon-Weaver diversity index indicated moderate to high species diversity in Rajsamand Lake. Menhinick's index also showed rich zooplankton diversity indicating mesotrophic condition of the lake.

The present investigation revealed considerable seasonal variation in cladoceran diversity. Similar observations have been

reported in other Indian freshwater lakes where winter season supported maximum zooplankton abundance.

The dominance of Cladocera indicates favorable ecological conditions and availability of organic nutrients. Increased nutrient loading during monsoon and summer may influence productivity and species composition.

Cladocerans are highly sensitive to environmental fluctuations and therefore can be used as biological indicators of water quality. The occurrence of species such as *Daphnia* and *Moina* suggests mesotrophic nature of the lake with moderate productivity. Anthropogenic activities around Rajsamand Lake such as domestic discharge, agricultural runoff, and tourism may affect water quality and zooplankton diversity in future.

The study demonstrated that Rajsamand Lake possesses rich zooplankton diversity with Cladocera as an important component of aquatic ecosystem. Seasonal variation significantly affected the distribution and abundance of cladoceran species.

Winter season showed maximum diversity due to favorable ecological conditions while monsoon recorded minimum diversity because of dilution and turbidity effects. The diversity indices suggested mesotrophic status of the lake.

Regular monitoring of zooplankton and limnological parameters is necessary for sustainable management and conservation of Rajsamand Lake.

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