



A Study Of Zooplanktonic Diversity in Malsisar Dam In Jhunjhunun District Of Rajasthan (India)

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ABSTRACT:

In the parched Jhunjhunun district of Rajasthan, the Malsisar Dam provides much-needed water for irrigation of crops and animals as well as for the local population. Zooplankton play a pivotal role in aquatic ecosystems as primary consumers and indicators of environmental health. This study investigates the zooplanktonic diversity of Malsisar Dam, located in Jhunjhunun District, Rajasthan, India, a semi-arid region characterized by seasonal water fluctuations. Sampling was conducted monthly from JUNE 2023 to MAY 2024 to assess species composition, abundance, and seasonal variations in relation to physicochemical parameters. A total of 39 zooplankton species were identified, belonging to four major groups: Rotifera (08 species), Protozoa (06 species), Arthropoda (24 species), and Annelida (01 species). Arthropoda dominated the community (55% of total abundance), followed by crustacea (41.66%), Insecta (20.83%), Copepoda (16.66%), Brachiopoda (8.33%), Ostracoda (8.33%) and Cladocera (4.16%). Peak diversity and density were observed during the post-monsoon season (September–November), correlating with optimal temperature (20.5 – 29.2°C), pH (7.5–8.4), and dissolved oxygen (6.92–8.84 mg/L). The Shannon-Wiener Diversity Index ranged from 2.1 (monsoon) to 2.8 (post-monsoon), indicating moderate diversity with seasonal shifts. Physicochemical analysis revealed that nutrient levels and water temperature significantly influenced zooplankton dynamics. Anthropogenic pressures, including agricultural runoff and water extraction, were noted as potential stressors affecting water quality and zooplankton populations. This study provides baseline data for Malsisar Dam, highlighting its ecological significance and the need for conservation measures to sustain biodiversity in this arid-zone reservoir. Comparative analysis with other Rajasthan water bodies underscores regional variations in zooplankton assemblages, emphasizing the importance of localized studies.

Keywords: Zooplankton, Malsisar Dam, Jhunjhunun, Physicochemical Parameters, Seasonal Variation .

INTRODUCTION:

There is an example of a water body that acts as a significant ecological and economic resource in arid and semi-arid regions. This water body is the Malsisar Dam, which can be found in the Jhunjhunun district of Rajasthan. Dams and reservoirs, such as Malsisar, are not only necessary for human consumption, agriculture, and industry in regions where water scarcity is a continuous concern, but they also play a vital role in the preservation of the local biodiversity. Malsisar is an example of such a reservoir. It is vital to do study on the ecological health of these bodies of water, particularly with regard to the planktonic community, in order to get a more in-depth understanding of the water bodies' capability for sustainability and resilience. In aquatic ecosystems, the base of the food chain is comprised of plankton, which are comprised of microscopic organisms that are suspended in the water column. Zooplankton are microscopic aquatic organisms that form a critical link in freshwater food webs, transferring energy from primary producers (phytoplankton) to higher trophic levels, such as fish. Their diversity and abundance are influenced by environmental factors, including temperature, pH, dissolved oxygen (DO), and nutrient availability, making them valuable bioindicators of ecosystem health. In semi-arid regions like Rajasthan, where water bodies are subject to extreme climatic conditions and anthropogenic pressures, understanding zooplankton dynamics is essential for ecological monitoring and management.

Malsisar Dam, located in Jhunjhunun District (27.88°N, 75.28°E), is a man-made reservoir constructed for irrigation and domestic water supply in a region characterized by low rainfall (average 450 mm annually) and high evaporation rates. Despite its utilitarian purpose, the dam supports a diverse aquatic ecosystem, yet it remains understudied compared to larger Rajasthan lakes like Pichhola or Fatehsagar. This study aims to fill this knowledge gap by documenting the zooplanktonic diversity of Malsisar Dam, assessing seasonal variations, and exploring the influence of physicochemical parameters.

Rajasthan's water bodies exhibit unique ecological characteristics due to their arid setting, with zooplankton communities often dominated by resilient groups like Rotifera, which thrive in fluctuating conditions. Previous studies in the region (e.g., Sharma et al., 2007) have reported high rotifer abundance in eutrophic systems, suggesting that Malsisar Dam may follow similar patterns. However, localized factors such as agricultural runoff, seasonal water level changes, and sediment dynamics could shape its zooplankton assemblage differently.

OBJECTIVES:

1. To analyze the diversity, abundance, and seasonal distribution of the zooplankton communities.
2. To understand the relationship between water quality and plankton population dynamics.
3. To correlate zooplankton dynamics with physicochemical parameters.

MATERIAL AND METHODS :

In the section under "Materials and Methods," you will find a condensed explanation of the manner in which you carried out your exploration. To put it another way, what actions did you do in order to answer the research question that you posed? In this section, you are required to specify any materials that were employed for the study as well as any things that were the topic of several tests. You have the option of including a full explanation of the research or experiment that you carried out. One of the most essential aspects of a technique is the fact that it is possible for another person to replicate your research and carry out the same methods as you do. For example, if you did a search utilizing the internet, it is not adequate to just mention that you "searched the internet." You need to include more specific information. One would need to be aware of the search engine that you used in addition to the keywords that you input in order to comprehend what you have written.

STUDY AREA :

The purpose of this study was to investigate the impact that nitrate has on the variety, density, and productivity of planktonic organisms that are found in water bodies that are located in the southern region of Rajasthan. Specifically, the objectives of this research were to explore the relationship between nitrate and these three factors. The relationship that exists between nitrate and all of the limnological parameters, as well as the primary production, density, and variety of plankton that are found in aquatic settings, has received a great deal of attention. This is because of the connections that have been made between these three factors. The dam that was constructed as a part of the Kumbha Ram Arya raise canal project is the source of the project's water supply. A short distance from the town of Malsisar is where you will find the dam, which is situated in the Jhunjhunun district of Rajasthan. The lift irrigation project, which was built at a cost of 588 crore rupees and had begun distributing drinking water in its first phase, was able to transport water from the Himalayas to the Jhunjhunun area by way of the INDIRA GANDHI CANAL. This was accomplished when the project was in its first phase. As a result of the project's capacity to distribute water, this objective was successfully realized. In the beginning, the project's principal objective was to supply water to 1,473 villages, in addition to the municipalities of Malsisar, Khetri, Jhunjhunun, and Sikar. This was the primary goal of the project. Beginning in the month of August in 2013, this objective was supposed to be realized.



Fig. 01- When the Malsisar Dam was full with water

METHOD :

The Malsisar dam, which is located in close proximity to the Jhunjhunun area, will serve as the location for the research. During the course of the dam, two research sites will be identified, and at regular intervals of one month, samples of water and biota will be collected from these study stations. A sample of water will be obtained from the littoral section of the body of water and placed in polythene bottles that have been appropriately labeled. The plankton net will be used for the collection of zooplankton. The use of formaldehyde and Lugol's solution as preservatives is going to be implemented. In order to conduct a chemical analysis of water, we shall conform to the standard analytical procedures that have been defined by the APHA – AWWA WPCF (1981). Na, K, Ca, and Mg are going to be investigated among the cations. The first two cations will be determined using flame photometry, and then two titrimetrically among anions, bicarbonates, carbonates, chloride, and sulfates will be determined through titrametric analysis. Physical and chemical parameters, such as temperature, pH, total dissolved solids, dissolved oxygen, electrical conductivity, alkalinity, salinity, and hardness of the medium, will also be recorded in addition to ionic components. Through the use of a microscope, zooplankton will be recognized and counted. These will be identified in accordance with Edniondson (1966), Michael (1973), Needham & Needham (1978), and Tonapi (1980). The population density

of both species of plankton will be determined when the number one has been reached. In order to verify that there is a link between the ionic components and other parameters and the planktonic composition and population dynamics, a statistical analysis of the data will be performed, specifically with the application of correlation.

RESULTS AND DISCUSSION :

ZOOPLANKTONS:

The zooplanktons, which are the most important trophic link, are the organisms that connect the upper trophic levels and the primary producers to one another. There are many different kinds of algae that are included in the category of freshwater zooplankton rotifers, copepods, ostracods, arthropoda , annelida and protozoa. An extensive number of different types of zooplankton may be found in the Malsisar Dam, which is located in the Jhunjhunun region of Rajasthan, as shown by the results of the contemporary study. A total of 39 zooplankton species were identified, belonging to four major groups: Rotifera (08 species), Protozoa (06 species), Arthropoda (24 species), and Annelida (01 species). Arthropoda dominated the community (55% of total abundance), followed by crustacea (41.66%), Insecta (20.83%), Copepoda (16.66%), Brachiopoda (8.33%), Ostracoda (8.33%) and Cladocera (4.16%).

**Table 1- Abundance of Zooplankton species (No./Lit.) of Malsisar dam, Jhunjhunun
From June-2023 to May-2024**

Sr. no.	GROUPS	SPECIES	JUN E 2023	JUL 2023	AUG 2023	SEP 2023	OCT 2023	NOV 2023	DEC 2023	JAN 2024	FEB 2024	MAR 2024	APR 2024	MAY 2024
A.	PROTOZOA	<i>Paramecium caudatum</i>	02	04	09	22	07	18	03	01	05	02	01	01
		<i>Vorticella campanulla</i>	00	01	03	12	08	21	01	01	04	00	02	01
		<i>Oxytricha ovalis</i>	01	00	01	03	04	06	02	00	01	00	00	00
		<i>Trachelius ovum</i>	00	03	04	06	09	01	01	00	02	03	00	00
		<i>Lacrymaria olor</i>	01	01	00	08	01	02	00	00	01	00	01	01
		<i>Ophryoglena flava</i>	01	00	01	01	02	00	01	00	00	00	00	01
B	ROTIFERS	<i>Brachionus calcyflorus</i>	00	00	00	00	01	04	08	01	01	01	01	01
		<i>Brachionus forficula</i>	00	00	00	00	00	02	04	01	01	01	00	00
		<i>Kertella tropica</i>	00	00	00	00	00	00	00	00	00	00	00	00
		<i>Notholca spp.</i>	00	00	00	00	00	00	04	00	01	00	00	00

		<i>Lacane spp.</i>	00	00	00	00	00	05	01	00	00	01	00	00
		<i>Monostylla bulla</i>	00	00	00	00	00	04	01	00	00	00	00	00
		<i>Scaridium longicaudum</i>	00	00	00	00	00	01	00	00	01	00	00	01
C	ANNELIDA	<i>Tubifex (benthos)</i>	00	00	04	03	00	00	00	02	01	00	00	00
D	ARTHROPODA													
	1.INSECTA	<i>Chironomous</i>	24	18	06	01	01	00	00	00	00	01	00	12
		<i>Agabus</i>	04	09	01	00	00	00	00	00	00	00	00	04
		<i>Culicoids</i>	07	02	00	00	00	00	00	00	00	00	00	05
		<i>Stone fly</i>	09	02	01	00	00	00	00	00	00	00	00	09
		<i>Tendipes</i>	02	00	00	00	00	00	00	00	00	00	00	06
	2.CRUSTACEA	<i>Straptocephalus dicotomus</i>	01	02	00	00	01	00	01	00	00	00	00	00
		<i>Trios longicaudatus</i>	04	00	00	00	01	03	01	00	00	00	00	00
		<i>Daphnia carinata</i>	06	09	01	00	04	04	04	00	00	00	00	00
		<i>Nuplius larva</i>	08	07	01	01	06	09	08	00	00	01	01	01
		<i>Ostracoda</i>	00	00	00	00	00	00	00	00	00	00	00	00
		<i>Heliodiaptomus viddus</i>	00	00	00	00	00	00	00	00	00	00	00	00
		<i>Phyllodiaptomus annae</i>	00	00	00	00	00	00	00	00	01	00	00	00
		<i>heterocypris</i>	01	00	00	00	00	00	00	00	00	00	00	01
		<i>Mesocyclops lukert</i>	01	00	00	00	00	02	00	00	01	00	00	00
		<i>Mesocyclops hyalinus</i>	00	00	00	00	00	00	00	00	00	00	03	00
	3.BRANCHIOPODA	<i>Ceriodaphnia reticulate</i>	00	00	00	04	01	00	01	00	06	06	01	00
		<i>eubranchiopus</i>	00	00	00	01	01	00	00	00	02	05	01	00
	4.OSTRACODA	<i>Cypris</i>	02	01	00	00	00	00	05	01	00	00	08	07

		<i>Eucypris spp.</i>	01	00	00	00	00	00	01	00	00	00	10	02
	5.CLADOCERA	<i>Daphnia spp.</i>	00	00	00	02	11	01	18	24	01	00	00	00
	6.COPEPOD	<i>Cyclops varicans</i>	06	28	18	28	20	20	09	04	03	01	00	00
		<i>Diptomus</i>	03	24	09	10	01	01	01	02	04	00	00	00
		<i>Eucyclops</i>	02	03	07	05	02	01	03	00	00	00	00	00
		<i>Mesocyclops leukarti</i>	02	02	02	05	01	00	01	00	01	00	00	00
	TOTAL NUMBER OF ZOOPLANKTONS		82	116	68	112	82	105	79	37	37	22	29	53

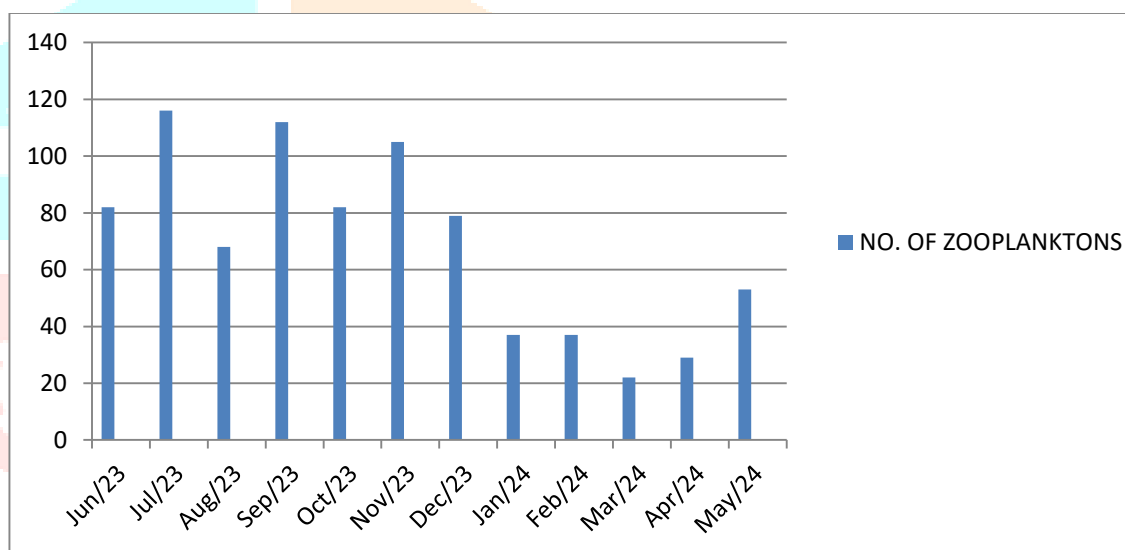


Fig.02- Monthly variation in number of zooplanktons

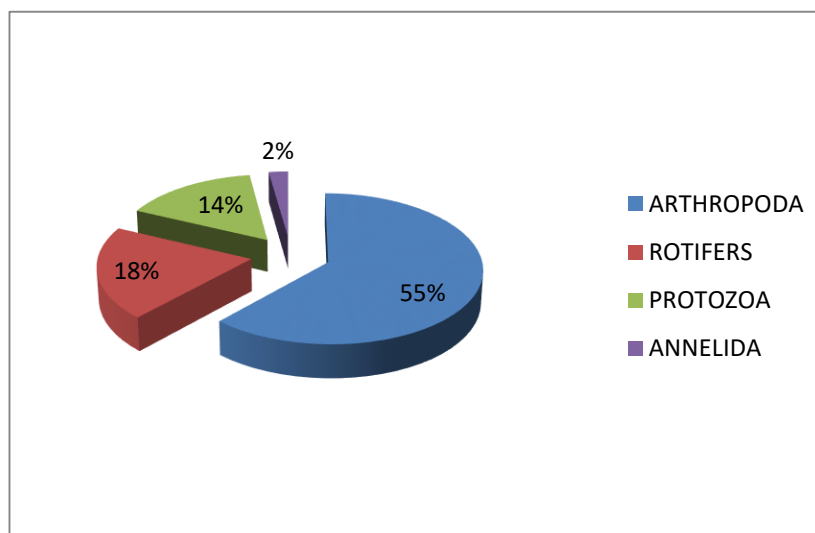


Fig.02- Group wise Zooplankton species composition (%)

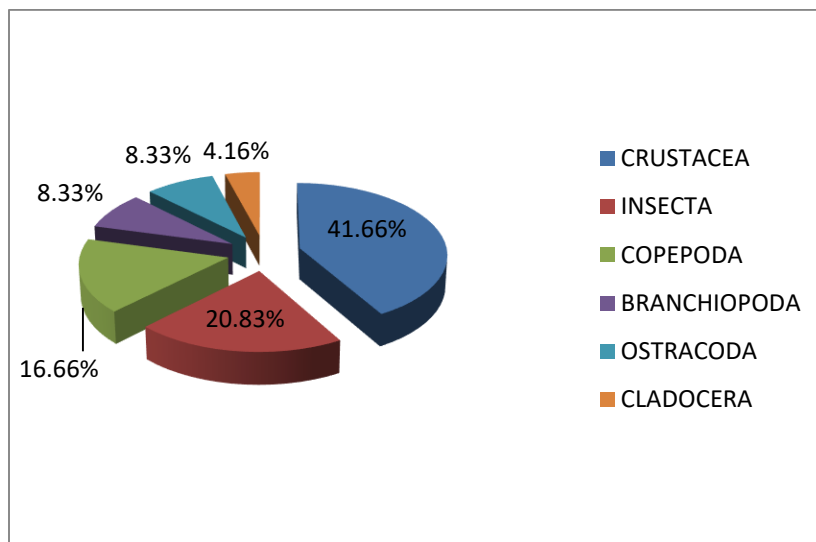


Fig.03- Species of Arthropoda (%)

CONCLUSION :

Important insights into the biological dynamics of Malsisar Dam's water supply in Rajasthan's desert region have been supplied by the present study on water quality and planktonic community. Results show that planktonic community composition is a good indicator of aquatic ecosystem health and production, and that water quality characteristics have a direct impact on this. Plankton variety and abundance are impacted by seasonal fluctuations in the water's physical and chemical properties. A more diverse planktonic community, including more zooplankton species, was seen in the season after the monsoon, indicating that the dam's biological balance may reestablish itself if environmental stresses are alleviated. The study highlights how human actions, such as farming and water use, impact the dam's ecological condition. study on Malsisar dam exhibit Arthropods and Rotifers are important group of Zooplanktons which is Dominated throughout the study period can be considered as a valuable component of fresh water ecosystem.. Zooplanktons particularly rotifers are known to be the best food for the fish larvae for aquaculture. their community structure can be used as bio-indicator of water quality assessment whereas their long term changes need to be monitored. In light of the importance of freshwater ecosystems in Rajasthan's dry zones and the pressing need to better understand and mitigate the effects of climate change and human activity on these precious bodies of water, this study lays the groundwork for future research in this area.

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