

Assessment of Zooplankton Community in the Kagina River Dam Kachur, Sedam Taluk, Kalaburagi District, Karnataka

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Abstract

Zooplankton plays a vital role in the aquatic food chain particularly for fishes and aquatic animals. The current study was conducted on community of Zooplankton in Kagina River Dam, Kachur, Sedam Taluk, Kalaburagi, Karnataka. Water samples were collected every month for one year i.e., October 2022 to September 2023. Twenty species of zooplankton are recorded and are belong to three groups such as rotifer (Eight species), Cladocera (Six species) and Copepoda (Six species). From the investigation, we can conclude that the Rotifera is the dominant group among the other groups of zooplankton recorded during the survey.



Article History

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Keywords

Cladocera; Copepoda; Kagina Dam; Rotifera; Zooplankton.

Introduction

Zooplankton are small, primarily microscopic, and often drifting aquatic organisms that form a crucial component of the plankton community in various aquatic ecosystems. In the aquatic food chain, zooplankton play a important job by transporting energy to larger aquatic organisms such as fish and other higher trophic levels from primary producers like phytoplankton. Zooplankton is a useful marker of alterations in water quality because they react fast to changes in water quality and are greatly impacted by environmental factors¹ and in freshwater ecosystems, these play a crucial role in aquatic food webs and greatly increases aquatic productivity,² further, these have essential function and acts as bioindicators, making it a useful tool for determining the level of water pollution.³ Since, zooplankton


sensitive to changes in the aquatic water body and deviation in their composition may result in significant change in ambient condition within aquatic system.⁴ An excellent method for evaluating biotic potential is zooplankton research, which also helps to estimate the general economic potential and fundamental characteristics of water bodies⁵ and.⁶

Several researchers have assessed the tropical condition of aquatic ecosystems using various zooplankton groupings. Notable scientists who have thoroughly examined several facets of zooplankton include.^{7,8,9,10,11,12,13} However, there is a lack of information about the zooplankton of the Kagina River Dam Kachur. Thus, the primary objective of this research is to assess the Zooplankton community in Kagina River Dam Kachur.

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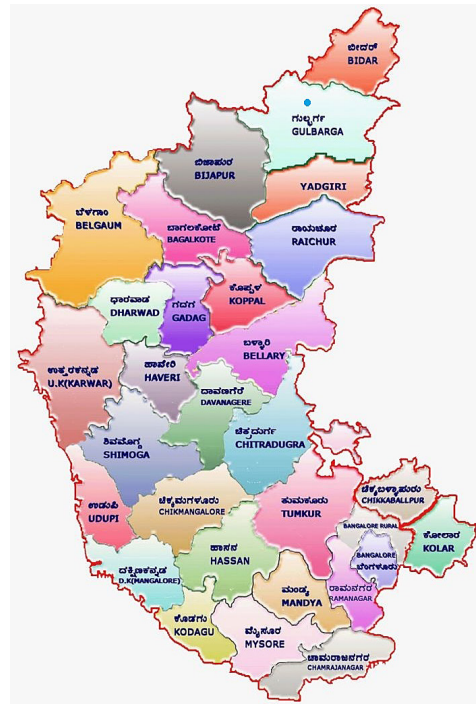
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Fig 1: a. India Map Showing Karnataka State



b. Karnataka map showing Kalaburagi District

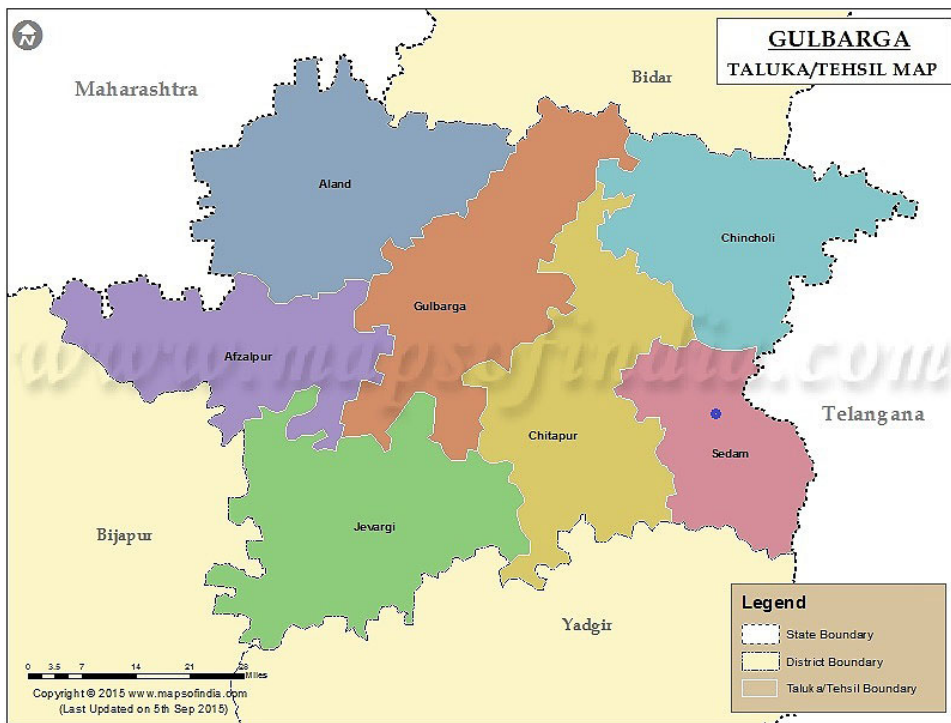
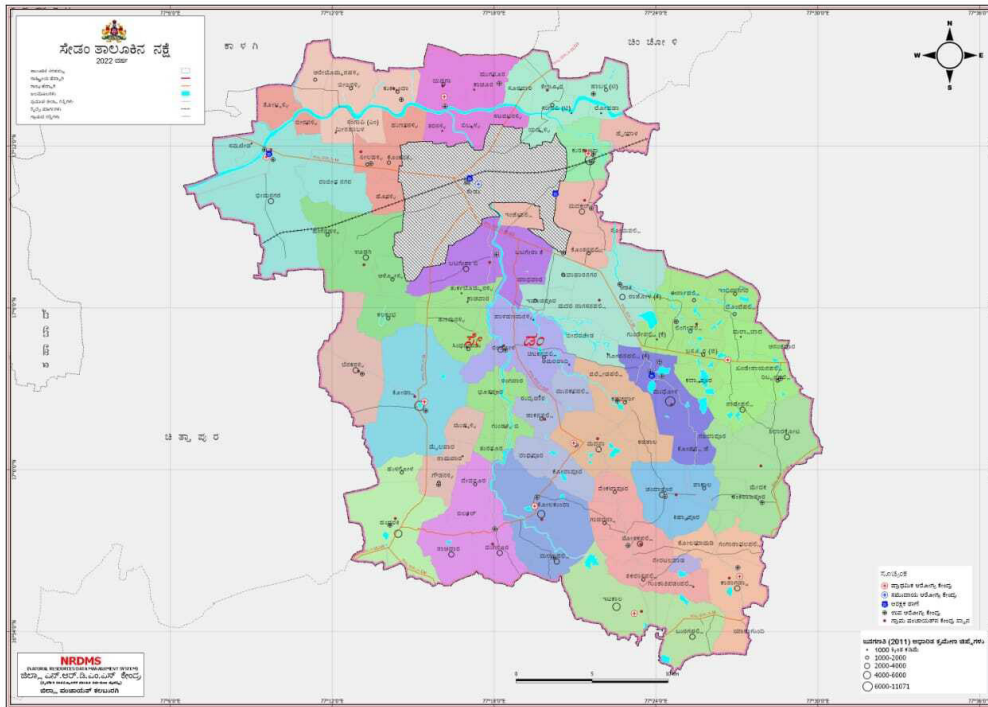


Fig 2: a. Talukas in Kalaburagi District



b: Villages in Sedam Taluk.

Materials and methods

Study Area

Kachur is a small village in Sedam Taluk in Kalaburagi District of Karnataka state, India. Kachur Dam is located near to the two adjoining villages namely Kachur and Biballi Sedam Taluk. There are five sampling stations are selected namely Kachur station I, Kachur station II, Kachur station III and Kachur station IV (Table.1).Kagina River Dam Kachur is a fresh water body located 500 m away from Kachur village. It lies between latitude and longitude of 17^o.22' North and 77^o.28' East respectively. The primary use for this body of water is agriculture. Water is also utilized for household chores and other human activities. The map of study area is shown in figure No.1 and 2. The maps and graphs are prepared by using Microsoft Paint and Excel.

Collection and Identification of Zooplankton

The water samples were collected on the monthly basis from Kachur dam for the period of one year, from October 2022 to September 2023. The zooplankton was collected using a nylon bolting silk plankton net (No. 25, mesh size 50 μ) that served as the filtering cone. Ten meters was the distance the

net was dragged. Samples that had been collected were put into vial bottles with labels and 4% formalin. The area of the net's mouth was multiplied by the reservoir's depth to get the volume of filtered water. Following sedimentation, 100 milliliters of the sample are centrifuged for 20 minutes at 1,500 rpm in order to be used for additional research. As stated by Needham,¹⁴ Standard keys Pennak,¹⁵ Tonapi,¹⁶ and¹⁷ are used to identify zooplankton using standard literature up to the generic level. As per the protocols provided by APHA.¹⁸ For both qualitative and quantitative analysis of planktons Sedgwick Rafter Cell was used.

Results and Discussion

Results

Twenty species of zooplankton, representing fourteen genera, eight families, and five orders, were identified based on the results of the current study. These species are classified into three groups: Rotifera, Cladocera and Copepod. Among these three groups Rotifera was the dominant one. The results are shown in the Table No.^{1, 2, 3} and Figure No.^{3,4,5} and.⁶

Out of 20 species, Rotifera comprises 8 species five genus i.e. *Anuropsis fissa*, *Asplanchnidae species*, *Brachionus calyciflorus*, *Brachionus plicatilis*, *Brachionus rotundiformis*, *Brachionus urceolaris*, *Lecane luna* and *Lepadella bicornis* belonging to four Family and one Order, respectively. Among these *Brachionus calyciflorus* dominant in the all the sites.

Seasonally the number was highest in premonsoon i.e 600/L followed by monsoon 420/L and lowest during post monsoon 300/L.

Cladocera comprises of 6 species four genus i.e. *Ceriodaphnia cornuta*, *Ceriodaphnia dubia*, *Daphnia carinata*, *Moina micrura*, *Moina species* and *Simocephalus vetulus* belonging to two order, two family, respectively. According to observation *Daphnia carinata* species is dominant.

Seasonally the number was highest in pre monsoon i.e 390/L followed by monsoon 300/L and lowest during post monsoon 210/L.

Copepoda comprises 6 species five genus i.e. *Cyclopoid nauplius*, *Cyclop species*, *Heliodiaptomus viduus*, *Mesocyclops leukarti*, *Neodiaptomus strigilips* and *Tropocyclops prasinus* belonging to two order, two families and respectively. Among these *Mesocyclops leukarti* species are very commonly found during investigation.

Seasonally the number was highest in pre monsoon i.e 450/L followed by monsoon 315/L and lowest during post monsoon 200/L.

Discussion

Rotifera

Eight species of rotifers were identified in the current investigation representing 1 order 4 families and 5 genus. Rotifers have been found to be the dominant group over the duration of the investigation. Due

to its small size, rapid reproduction, adaptability, resilience to adverse conditions, and versatile feeding habits of rotifers makes them well-suited to dominate in this freshwater body and Rotifer dominance was also attributed to the presence of alga in the pond.¹⁹ They play essential roles in nutrient cycling and the food web dynamics of these ecosystems. Seasonal variation showed that the number was high in pre monsoon, it might be the presence of food (phytoplankton) in the water body and the favorable environmental conditions may be responsible and low in winter it could be caused by a high level of turbidity and poor light. Comparable findings were given by earlier workers.^{2,20,21,22,23,24} and²⁵

Cladocera

Six cladocera species were identified in the current investigation representing 2 order 2 families and 4 genus. Seasonal variation showed that the number was high in pre monsoon and low in winter. This is due to the one of the most significant abiotic variables affecting zooplankton distribution and abundance is temperature. The main factors influencing the Cladocerans are temperature, food supply, and water turbidity.²¹ Similar results were given by various researchers.^{26,27,28,29} and³⁰

Copepoda

Six copepode species were identified in the current investigation representing 2 order 2 families and 5 genus. Seasonal variation showed that the number was high in pre monsoon and low in winter. This may be due to high temperature and increased water evaporation, which results in a concentrated density of producers. As a result, there is more food available for zooplanktons.

Similar observations are made by^{26,13,30,31} and³² reported that, the temperature, turbidity, rate of reproduction and wind altogether influence on the distribution and variation of copepoda population.

Table 1: Group wise variation in Zooplankton species in Kagina River Dam Kachur, Sedam Taluk, Kalaburagi District.

Sl. No	Zooplankton groups	Species	Sampling stations					
			I	II	III	IV		
1	Rotifera	<i>Anueropsis fissa</i>	+	-	+	+		
		<i>Asplanchnidae species</i>	+	+	+	-		
		<i>Brachionus calyciflorus</i>	+	+	+	+		
		<i>Brachionus plicatilis</i>	-	+	+	+		
		<i>Brachionus rotundiformis</i>	+	-	+	+		
		<i>Brachionus urceolaris</i>	-	+	+	+		
		<i>Lecane luna</i>	+	+	-	+		
		<i>Lepadella bicornis</i>	+	+	+	-		
		2	Cladocera	<i>Ceriodaphnia cornuta</i>	-	+	-	+
				<i>Ceriodaphnia dubia</i>	-	-	+	+
<i>Daphnia carinata</i>	+			+	+	-		
<i>Moina micrura</i>	+			-	-	+		
<i>Moina species</i>	-			+	+	-		
<i>Simocephalus vetulus</i>	+			+	-	-		
3	Copepoda	<i>Cyclopoid nauplius</i>	-	+	-	-		
		<i>Cyclop species</i>	+	-	-	-		
		<i>Heliodiaptomus viduus</i>	-	-	+	-		
		<i>Mesocyclops leukarti</i>	-	+	-	+		
		<i>Neodiaptomus strigilips</i>	+	-	-	-		
		<i>Tropocyclops prasinus</i>	-	-	+	-		
Tota			11	12	12	10		

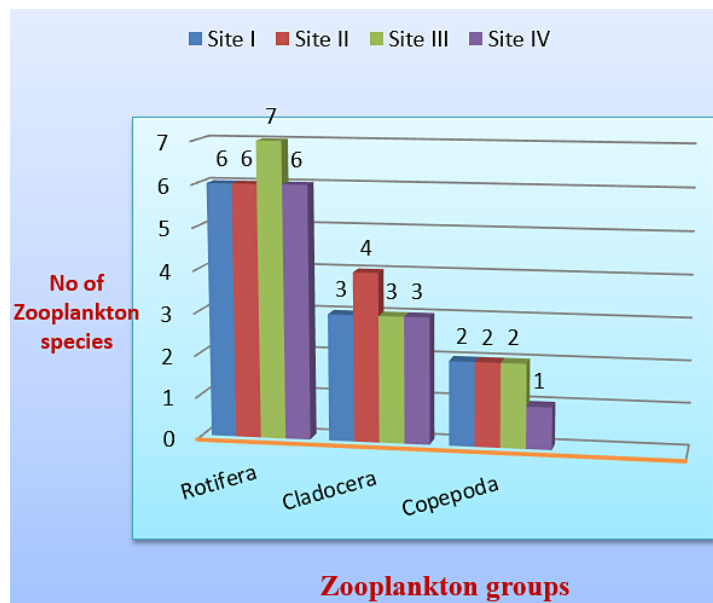


Fig 3: No of Zooplankton species reported at different sampling sites

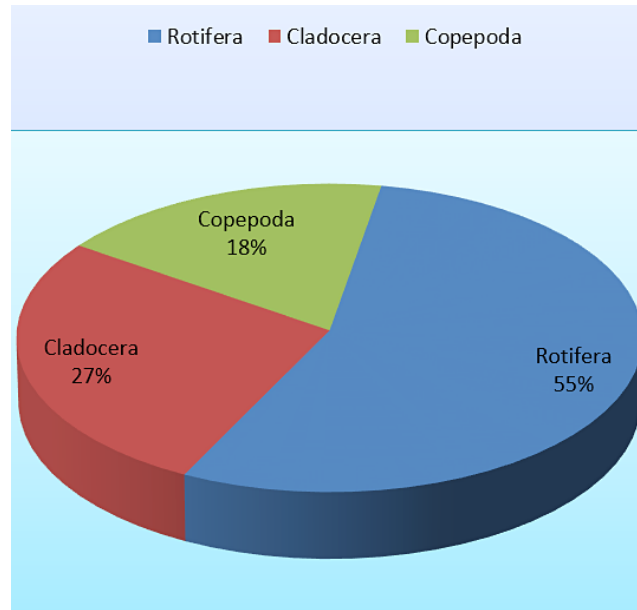


Fig. 4: Percentage of Zooplankton species reported at different sampling sites

Table 2: Order and family wise variation in Zooplankton species in Kagina River Dam Kachur, Sedam Taluk, Kalaburagi District

Sl. No	Zooplankton groups	Order name	Family Name	Name of the species
1	Rotifera	Ploima	Asplanchnidae Brachionidae	<i>Anueropsis fissa</i> <i>Asplanchnidae species</i> <i>Brachionus calyciflorus</i> <i>Brachionus plicatilis</i> <i>Brachionus rotundiformis</i> <i>Brachionus urceolaris</i>
2	Cladocera	Cladocera and Anomopoda	Lecanidae Lepadellidae Daphnidae Moinidae	<i>Lecane luna</i> <i>Lepadella bicornis</i> <i>Ceriodaphnia dubia</i> <i>Ceriodaphnia cornuta</i> <i>Daphnia carinata</i> <i>Simocephalus vetulus</i> <i>Moina micrura</i> <i>Moina species</i>
3	Copepoda	Calanoida Cyclopoida	Cyclopidae Dioptomidae	<i>Heliodyptomus viduus</i> <i>Neodyptomus strigillips</i> <i>Cyclopoid nauplius</i> <i>Cyclop species</i> <i>Mesocyclops leukarti</i> <i>Tropocyclops prasinus</i>

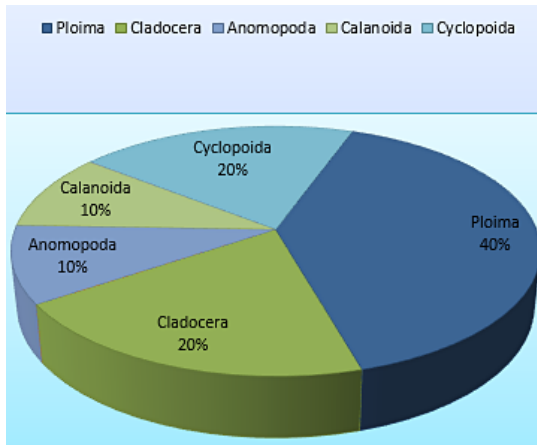


Fig. 5: Percentage of Zooplankton species reported with respect to order

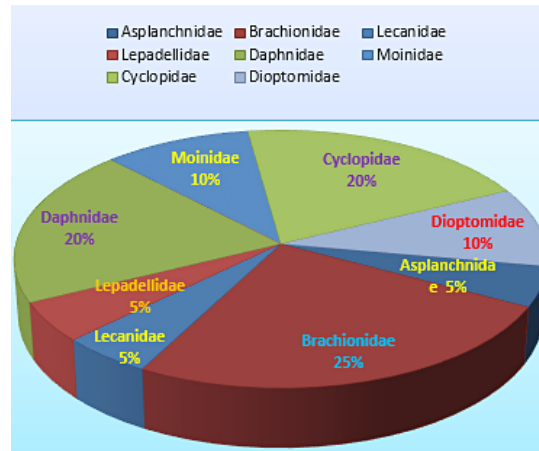


Fig. 6: Percentage of Zooplankton species reported with respect to their Families

Table 3: Seasonal Variation of different Groups of Zooplankton

Sl. No	Zooplankton Group	Pre Monsoon	Monsoon	Post Monsoon	Total
1	Rotifera (No per Ltr)	600	420	300	1320
2	Cladocera (No per Ltr)	390	300	210	900
3	Copepoda (No per Ltr)	450	315	200	965
4	Total Zooplankton (No per Ltr)	1440	1035	710	3185

Conclusion

As per the findings of this investigation zooplankton diversity is crucial to the health of freshwater ecosystem. Of the 20 zooplankton species that we identified, 8 are Rotifera species, 6 are Cladocera species and 6 are Copepoda species. Seasonally the zooplanktons were maximum in pre monsoon moderate in monsoon and minimum in post monsoon has been observed. This study has determined that the diversity of rotifers is dominant in all the season, followed by Copepoda and Cladocera. Higher number of rotifer species shows that the water body is highly eutrophic The aquatic zooplankton population provided crucial information about available life sources for the growth of fisheries. These days, pollution and human activity are putting biodiversity at risk. Therefore, it is imperative to maintain current knowledge of the richness of all aquatic organisms since biodiversity conservation is concerned.

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Conflict of Interest

The authors declare no conflict of interest.

Authors' Contribution

This work is carried out in collaboration between three authors.

First Author: Siddaram L Poojari – Wrote the first draft of the manuscript and managed analysis of the study.

Second Author: Siddharam Kottalagi - Designed the study and performed the statistical analysis.

Third Author: Chaitra Kollur - Managed the literature and wrote the protocol.

Ethics Approval Statement

The study did not involve an experiment on humans and animals.

Data Availability Statement

The manuscript incorporates all datasets produced or examined throughout this research study.

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