

# Ecological Study of Rotifers from Chandrabhaga River, Kalmeshwar, Dist. Nagpur

A. M. Watkar 

Bhalerao Science College, Saoner, Dist. Nagpur, India

Received 23 April 2026 | Revised 06 May 2026 | Accepted 03 June 2026 | Available Online 05 June 2026

\*Corresponding Author: A. M. Watkar | Email Address: [amitawatkar2@gmail.com](mailto:amitawatkar2@gmail.com)

**Citation:** A. M. Watkar (2026). Ecological Study of Rotifers from Chandrabhaga River, Kalmeshwar, Dist. Nagpur. *Life Science Review*. DOI: <https://doi.org/10.51470/LSR.2026.10.01.136>

## Abstract

Rotifers represent an important component of freshwater zooplankton and serve as a valuable natural food source for fish larvae because of their suitable size range and high nutritional value. The present investigation was conducted to evaluate the diversity and seasonal abundance of rotifers in the Chandrabhaga River at Kalmeshwar, Nagpur District. Water samples were collected over a one-year period from June 2017 to May 2018, and various physicochemical characteristics, including temperature, dissolved oxygen, biological oxygen demand, pH, alkalinity, hardness, and total dissolved solids, were examined in relation to rotifer abundance. A total of eleven rotifer species were identified during the study period. Species belonging to the genus *Brachionus* constituted the dominant component of the rotifer community. The highest rotifer density was observed during winter, whereas the lowest abundance occurred during the monsoon season. Seasonal variation indicated a positive association between water temperature and rotifer abundance, while increased water flow appeared to reduce population density. The study highlights the ecological importance of rotifers and their usefulness as indicators of freshwater ecosystem conditions.

**Keywords:** Rotifera, Freshwater Ecology, Zooplankton Diversity, Chandrabhaga River, Seasonal Variation.

## 1. INTRODUCTION

Rotifers are microscopic aquatic invertebrates that occupy a significant position in freshwater ecosystems. They are commonly known as wheel animals because of the circular movement created by the cilia present on the corona at the anterior end of the body. These organisms are distributed throughout a variety of aquatic habitats, including rivers, lakes, ponds, and wetlands, where they contribute substantially to ecosystem functioning.

As an important component of zooplankton communities, rotifers participate in nutrient recycling and facilitate the transfer of energy from primary producers to higher trophic levels. Their rapid reproduction, short generation time, and high nutritional value make them particularly important as live feed for fish larvae in aquaculture operations. Because of these characteristics, rotifers have attracted considerable attention from both ecological and fisheries researchers.

Zooplankton communities respond rapidly to changes in environmental conditions, making them useful indicators of aquatic ecosystem health. Factors such as nutrient enrichment, dissolved oxygen concentration, water

temperature, and pH can significantly influence the diversity and abundance of zooplankton populations. Consequently, changes in rotifer assemblages often reflect variations in water quality and trophic status. Seasonal fluctuations in environmental parameters frequently alter the structure and composition of zooplankton communities. Therefore, investigations of rotifer diversity and abundance provide valuable information regarding ecological processes occurring within freshwater environments. The present study was undertaken to assess the seasonal distribution, species composition, and population density of rotifers in the Chandrabhaga River and to evaluate their ecological significance.

## 2. MATERIALS AND METHODS

The study was carried out in the Chandrabhaga River located near Kalmeshwar in Nagpur District, Maharashtra. Zooplankton samples were collected regularly between June 2017 and May 2018 to determine the composition and abundance of rotifer populations.

For quantitative analysis, 50 litres of river water were filtered through a plankton net fabricated from bolting silk cloth (No. 25) with a mesh size of 63 µm and a mouth diameter of 30 cm. The concentrated samples obtained after filtration were preserved immediately by adding 4% formalin solution.

Laboratory examination of zooplankton samples was performed using a Sedgwick–Rafter counting chamber following standard limnological procedures described by Welch (1948). Identification of specimens was carried out under a binocular microscope at appropriate magnifications. Species determination was based on standard taxonomic literature and identification keys provided by Dhanapathi (2000) and Altaff (2004). The abundance of organisms was calculated and expressed as the number of individuals per litre of water.

### 3. RESULTS AND DISCUSSION

Zooplankton form a vital link in aquatic food webs by transferring energy from phytoplankton and microorganisms to fish and other higher consumers. Their abundance and species composition often reflect prevailing environmental conditions and therefore provide useful information regarding ecosystem health.

The present study revealed the occurrence of eleven species of rotifers in the Chandrabhaga River. Monthly fluctuations in population density demonstrated considerable seasonal variation. Rotifer abundance increased progressively from the monsoon months toward winter, reaching a maximum value of 75 individuals per litre during November. Thereafter, the population gradually declined during the summer months.

Seasonal analysis showed that winter recorded the highest mean density of rotifers ( $62.5 \pm 13.20$  units/L), followed by summer ( $33.25 \pm 9.54$  units/L), while monsoon exhibited the lowest mean abundance ( $23.5 \pm 14.84$  units/L). The annual mean population density was calculated as  $39.75 \pm 20.30$  units/L.

Among the recorded taxa, species of *Brachionus* were particularly abundant and constituted the dominant component of the rotifer community. The prevalence of this genus may be related to its adaptability to varying environmental conditions and its ability to utilize available nutrient resources efficiently.

The higher abundance observed during winter could be associated with favourable temperature conditions and increased food availability in the form of bacteria, phytoplankton, nanoplankton, and suspended organic matter. In contrast, reduced densities during the monsoon season may be attributed to increased water current, dilution effects, and habitat instability caused by rainfall and runoff.

Previous investigations have reported that physicochemical variables such as temperature, dissolved oxygen, pH, nitrogen compounds, and phosphate concentrations significantly influence zooplankton populations. The findings of the present study are generally consistent with earlier reports indicating that rotifers attain greater abundance under stable environmental conditions with adequate nutrient availability.

The dominance of rotifers, particularly *Brachionus* species, further suggests that these organisms can serve as effective indicators of ecological conditions within freshwater systems. Their seasonal fluctuations reflect environmental changes and provide valuable information for water-quality assessment and biological monitoring programmes.

### 4. CONCLUSION

The present investigation demonstrated that rotifers constitute an important component of the zooplankton community in the Chandrabhaga River. Eleven rotifer species were recorded during the study period, with members of the genus *Brachionus* showing the greatest abundance and dominance.

Marked seasonal variation was observed in population density, with winter supporting the highest abundance and monsoon exhibiting the lowest values. These fluctuations appear to be associated with seasonal changes in environmental conditions, including water temperature, nutrient availability, and hydrological characteristics.

The study confirms the ecological significance of rotifers in freshwater ecosystems and highlights their usefulness as biological indicators of water quality. The information generated through this research contributes to the understanding of zooplankton ecology in the Chandrabhaga River and may serve as baseline data for future monitoring and conservation programmes. Long-term ecological assessments are recommended to evaluate changes in biodiversity and environmental quality within the river ecosystem.

**Table 1: Population Density of Rotifers (Monthly Variation) of Chandrabhaga River during June 2017- May 2018 (Units/l)**

Months	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Nos	8	13	19	39	62	75	56	46	45	35	29	22

**Table 2: Seasonal Mean value of Rotifers of Chandrabhaga river during June 2017- May 2018 (Units/l)**

Season	Mean S. D.
Monsoon	23.5±14.84
Winter	62.5±13.20
Summer	33.25±9.54
Annual	39.75±20.30

Table 3: Month wise species of Rotifers of Chandrabhaga river during June 2017- May 2018 (Units/l)

Sr. No.	Species Name	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Asplanchna sp.	0	0	1	4	5	4	4	3	3	2	3	2
2	Brachionus angularis	1	4	2	2	5	6	4	4	3	3	2	2
3	Branchionus calciflorus	1	0	2	3	4	6	3	5	3	3	2	2
4	B. divesicornis	0	0	0	3	5	9	7	2	4	3	2	1
5	Brachionus forficula	0	0	0	5	7	10	4	6	7	5	4	2
6	B. ruben	2	4	3	3	8	8	5	1	1	0	1	0
7	Conochilus volvox	1	2	3	2	7	6	8	7	3	4	2	3
8	Gastropus sp.	0	1	2	1	3	6	7	6	7	4	2	3
9	Filnia sp.	1	2	4	7	9	9	5	6	4	5	3	2
10	Keratella tropica	2	0	1	5	4	7	5	3	7	4	5	3
11	Monostyla sp.	0	0	1	4	5	4	4	3	3	2	3	2
	Total	8	13	19	39	62	75	56	46	45	35	29	22

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