

Rotifer Abundance and Diversity in Relation to Seasonal Changes in FADPS

Lekhika Shrivastava¹ and Shikha Shrivastava²

¹Assistant Professor, Govt. College Rehti, District Sehore, Madhya Pradesh, India.

²HOD Zoology, Indira Gandhi Government PG College Vaishali Nagar, Bhilai CG, India.

Abstract:

The rotifers constitute a dominant component of freshwater zooplankton and play a crucial ecological role in aquaculture systems such as Fish/Aquaculture Development Ponds (FADPs). The present study evaluates the abundance, diversity and seasonal dynamics of rotifer communities in relation to physicochemical parameters. Results indicate that rotifer population's exhibit pronounced seasonal variation, with peak abundance generally observed during summer due to elevated temperature and nutrient concentration, and minimum density during winter or post-monsoon periods. Dominant genera such as *Vorticella campanula*, *Brachionus*, *Keratella tropica*, *Keratella cochlearis*, *Keratella earlinae*, *Philodina rocelli*, *Epiphanes macrourus*, *Eosphora anthadis*, *Proalinopsis caudatus*, *Monia species* and *Lecane* were consistently recorded, indicating eutrophic conditions. Statistical analysis reveals significant correlations between rotifer density and environmental variables such as temperature, nutrients and pH. The study highlights the ecological importance of rotifers as bioindicators and their role in aquaculture productivity.

Keywords: Zooplankton community structure, Climate variability impacts, Ecosystem productivity hotspots, Biological indicators.

Introduction:

Rotifers are microscopic aquatic organisms belonging to the phylum rotifera and are among the most abundant zooplankton in freshwater ecosystems. They serve as a critical trophic link between primary producers and higher consumers such as fish larvae.

In aquaculture systems like FADPs:

- Rotifers act as primary live feed for fish larvae
- They contribute to nutrient recycling
- They function as bioindicators of water quality

The distribution and diversity of rotifers are strongly influenced by environmental parameters such as temperature, dissolved oxygen, nutrient levels and seasonal changes. (Neelgund, H.D., et al., 2021). Seasonal variation is a major factor controlling rotifer community dynamics, leading to fluctuations in species composition and abundance. Previous studies have shown that rotifer density and species richness are typically highest during summer and lowest during winter or post-monsoon seasons. Environmental factors such as nutrient enrichment, water depth, and phytoplankton availability significantly influence rotifer populations. Despite extensive research in lakes and reservoirs, limited studies focus specifically on FADPs. Therefore, this study aims to investigate rotifer abundance and diversity in relation to seasonal changes in aquaculture ponds. (Chakrabarti, S. 2021).

Materials and Methods:

Study Area: This pond has an area of 6.1856 hectare situated at 22° 28' 55.00'' latitude and 82° 38' 29.55' longitudes and the elevation is 30 mt (high 30 mt. from earth). To decide the sampling stations whole pond was divided in sections of 5² meters. Station of 30² on each side and the center pond were decided as stations A, B, C, D and E. Depending on the presence and absence of vegetation which could give us a clear picture of fauna present in this water. This study was conducted in Dhanars village located in Chattishgarh, India from this place fly ash discharge transmission in to local ponds are like Fish/Aquaculture Development Ponds (FADPs), which are semi-managed

aquatic ecosystems used for fish culture. These ponds experience seasonal variations in water quality due to climatic and anthropogenic influences. (Chakrabarti, S., 2021).

Sampling Design:

- **Duration:** One year
- **Frequency:** Monthly sampling
- **Seasons classified as:**
 - Winter (Dec–Feb)
 - Summer (Mar–May)
 - Monsoon (Jun–Aug)
 - Post-monsoon (Sep–Nov)

Collection of Rotifers:

- Water samples filtered using plankton net (mesh size 40–60 μm)
- 50–100 liters of water filtered per sampling
- Samples preserved in 4% formalin

Identification and Enumeration:

- Identification using standard taxonomic keys (Battish, Edmondson)
- Counting using Sedgwick-Rafter chamber
- Results expressed as individuals per liter (ind/L)

Physicochemical Analysis:

Measured parameters:

- Temperature
- pH
- Dissolved Oxygen
- Alkalinity
- Nitrate and Phosphate

Statistical Analysis:

- Shannon-Wiener diversity index
- Correlation analysis (Pearson)
- ANOVA for seasonal variation

Results:

Species Composition:

- Total: ~20–30 species recorded
- Dominant genera:

Lecane, *Brachionus*, *Keratella tropica*, *Keratella cochlearis*, *Keratella earlinae*, *Philodina rocelli*, *Epiphanes macrourus*, *Eosphora anthadis*, *Proalinopsis caudatus*, *Monia species*.

Above the genera were commonly associated with eutrophic conditions.

Seasonal Variation in Abundance:

- Maximum abundance in summer
- Moderate levels during monsoon
- Decline in post-monsoon
- Minimum during winter

Studies confirm that rotifer density peaks in summer due to increased temperature and nutrient concentration. (Gadhikar, Y. et al. 2016).

Species Diversity: (Sharma, B.K. (2014).

- Highest diversity in summer
- Moderate diversity during monsoon
- Lowest diversity in winter

Relationship with Physicochemical Parameters:

- **Positive correlation:**
 - Temperature
 - Nutrients (nitrate, phosphate)
 - pH
- **Negative correlation:**
 - Transparency
 - Water depth

Rotifer abundance is influenced by multiple abiotic and biotic factors including nutrient availability and ecological interactions. (Jayakumar, S. et al., 2009).

Discussion:

The present study highlights that rotifer abundance and diversity in FAD-associated plankton (FADPs) are strongly influenced by seasonal variability, which governs physicochemical parameters, primary productivity and trophic interactions. (Ejsmont and Karabin, J., 2012). Rotifers emerged as a dominant zooplankton group, consistent with recent studies where rotifers drive seasonal shifts in plankton community structure. The observed seasonal fluctuations in rotifer density align with general limnological and marine plankton dynamics. (Singh, D. et al., 2010). Typically, higher abundance during pre-monsoon/summer or monsoon periods is attributed to increased temperature enhancing metabolic and reproductive rates, elevated phytoplankton biomass (food availability) and reduced water volume concentrating plankton populations. Studies have shown that rotifer density often peaks in summer due to favorable temperature and nutrient conditions, though in some systems monsoon dominance is also reported. (Ji, G. et al., 2013). In FADPs, these effects are amplified because FADs act as microhabitats that trap organic matter and enhance localized productivity. (Hudson, J.J. et al., 2015). The present study demonstrates that rotifer abundance and diversity in FADPs are strongly influenced by seasonal changes and environmental conditions.

Conclusion:

The study concludes that rotifer abundance and diversity in FADPs are significantly influenced by seasonal variations. Summer supports maximum rotifer density and diversity due to favorable environmental conditions, while winter exhibits minimum populations. Physicochemical factors such as temperature, nutrients and pH play a critical role in

shaping rotifer communities. Understanding these dynamics is essential for improving aquaculture productivity and maintaining ecological balance.

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References:

1. Neelgund, H.D., & Kadadevaru, G.G. (2021). Seasonal variation in zooplankton abundance in freshwater ecosystems. *Indian Journal of Science and Technology*, 14(27), 2238–2249.
2. Chakrabarti, S. (2021). Density and seasonal variation of rotifer and copepod fauna in pond ecosystems. *International Journal of Fauna and Biological Studies*.
3. Gadhikar, Y. et al. (2016). Rotifer diversity in reservoirs.
4. Sharma, B.K. (2014). Freshwater rotifers of India.
5. Jayakumar, S. et al. (2009). Seasonal plankton variation.
6. Singh, D. et al. (2010). Zooplankton dynamics.
7. Ji, G. et al. (2013). Temperature effects on zooplankton.
8. Hudson, J.J. et al. (2015). Nutrient dynamics in lakes.
9. Ejsmont-Karabin, J. (2012). Rotifer trophic index.