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An Assessment of Rotifer Diversity in Tikhol Dam, Parner Tehsil, Ahmednagar, MS, India

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ABSTRACT

The present research explores the diversity and dispersal of rotifer fauna inside Tikhol Dam at Tikhol, District Ahilyanagar (Ahmednagar). Seasonal sampling was conducted at multiple sites across the dam for a year and species identification was performed using standard taxonomic keys. The study recorded a rich diversity of rotifers, with species composition slightly varying across seasons and sampling sites—the significant seasonal variation in rotifer populations, with peak diversity observed at the time of winter period. The genus *Brachionus* (family Brachionidae) dominated the rotifer community, indicating a freshwater ecosystem with moderate to high nutrient levels (mesotrophic to eutrophic conditions). A total 5 number of genera with 12 species were reported from the dam.

INTRODUCTION

Despite over a century of research on Indian rotifer, significant knowledge gaps persist regarding their ecosystem diversity across various aquatic habitats, largely due to insufficient studies, inadequate sampling methods, incomplete species cataloguing, and a shortage of taxonomic specialists (Sharma & Sharma 2017). Rotifers exhibit a widespread distribution, inhabiting a diverse array of aquatic and semi-aquatic ecosystems, ranging from the shallowest littoral zones to the lowest level of vast ponds and even tiny pools. (Patra, 2022). Among monogonont rotifers, Brachionus stands as one of the oldest and most primitive genera, boasting a rich evolutionary history (Sharma and Sharma, 2005). The Brachionidae family is highly adaptable and resilient, growing successfully in varied conditions. As such, it is often the most abundant rotifer family (Sharma, 1987). Freshwater rotifer distribution and diversity are primarily driven by declining water quality, with secondary influences from eutrophication and salinization, which collectively shape their ecological patterns. Rotifers' exceptional adaptability to varied aquatic and semi-aquatic habitats, coupled with their rapid population growth, renders them an exemplary model for ecological research and a valuable asset for investigating population dynamics. (Ekhande et al., 2013). The study of rotifer diversity provides insights into the ecological conditions of aquatic habitats and can help inform sustainable management practices.

Tikhol Dam, located in Parner Tehsil, Ahmednagar district Maharashtra, is an essential water reservoir supporting agricultural activities, fisheries, and local biodiversity. Despite its ecological and socio-economic importance, limited research has been conducted on the dam's zooplankton diversity, particularly on rotifers. Understanding the diversity and distribution of rotifer species in Tikhol Dam is crucial for evaluating the reservoir's ecological status and discovering potential environmental stressors. The goal of this analysis is to assess the diversity and richness of rotifer species in Tikhol Dam. This research will provide baseline data for future biodiversity assessments and contribute to the sustainable management of Tikhol Dam's freshwater ecosystem.

MATERIALS AND METHODS

Study Site: The Tikhol dam is situated on the Kalu River in the central segment of the Parner tehsil of Ahmednagar district (M.S.) India. It occupies the space between 19°8′31″N latitudes and 740 14' 16" to 74°25′28″E longitudes.

Study Period: The study was carried out from January 2024 to January 2025.

Sample Collection and Preservation: Zooplankton samples were collected from various locations across the dam over a one-year period using a 53 µm plankton net.. Morning sampling sessions were conducted seasonally and the collected samples were immediately transported to the laboratory for thorough examination. The samples were treated with 4% formalin to preserve them for later identification and enumeration.

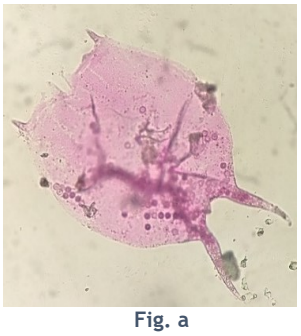
Biological Identification: Rotifer species identification was based on standard references, specifically Sharma (1992), Segers (1995), Dhanapathi (2000), and Sharma and Sharma (2008).

RESULT AND DISCUSSION

This analysis reports 12 Rotifer species categorized as three orders, four families and five genera from Tikhol Dam.

Table No. 1. Identified Rotifer Species from Tikhol Dam: Classification and Taxonomy

Phylum	Class	Order	Family	Genus	Species
Rotifera	Monogonota	Ploima	Brachionidae	*Brachionus*	*caudatus*
				Brachionus	*calyciflorus*
				Brachionus	*falcatus*
				Brachionus	*diversicornis*
				Brachionus	*forticula*
				Brachionus	*variabilis*
				Brachionus	*urceolaris*
				Keratella	*tropica*
			Euchlanidae	*Euchlanis*	*triquetra*
				Euchlanis	*proxima*
	Eurotatoria	Collothecacea	Collothecidae	*Collotheca*	*quadrinodosa*
		Ploima	Proalidae	*Proales*	*paguri*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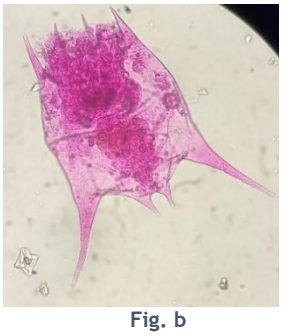
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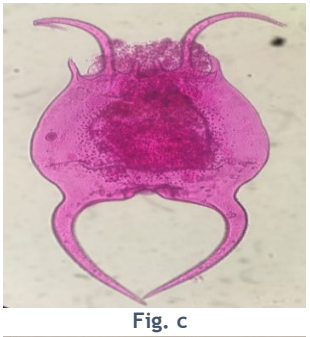
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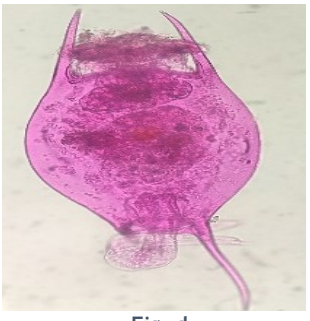
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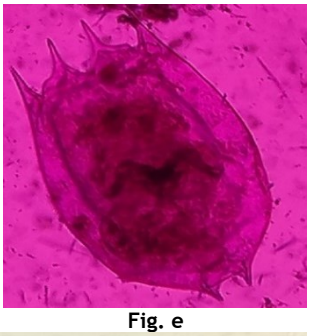
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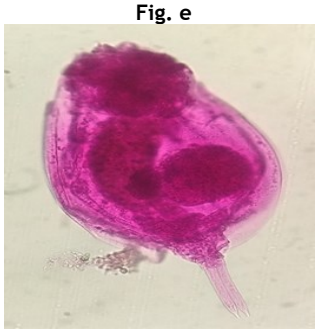
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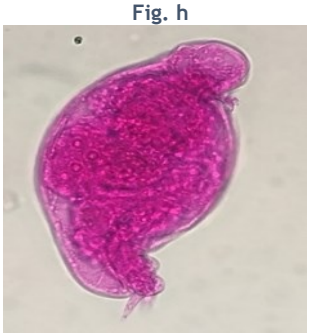
Fig. l

Figure 1. a. *Brachionus caudatus*, *b. Brachionus calyciflorus*, c. *Brachionus falcatus*, d. *Brachionus diversicornis*, e. *Brachionus variabilis*, f. *Brachionus forficula*, g. *Brachionus urceolaris*, h. *Keratella tropica*, *i. Euchlanis triquetra*, *j. Euchlanis proxima*, *k. Collotheca quadrinodosa*, *l. Proales paguri*

Table No 2: Identified Species of Rotifera from Tikhol Dam: Morphological Characteristics

Sr. No.	Name of Species	Characteristics
1.	*Brachionus caudatus* (Barrois and Daday, 1894)	The lorica features two median spines with a distinctive V-shaped notch on the anterodorsal margin, accompanied by well-developed posterolateral spines. Notably, the lateral spines exceed the median spines in length (Fig. 1a). Key measurements: Total length, 286 µm; Maximum width. 156µ; Length without spine 169µ.
2.	*Brachionus calyciflorus* (Pallas, 1766)	Key features comprise two pairs of occipital spines with broad bases and pointed tips, longer anteromedian spines, and the optional presence of posterior spines; (Fig.1b). Key measurements: Total length 221µ; maximum width 156µ; Length Without spine 169µ.
3.	*Brachionus falcatus* (Zacharias, 1898)	The species exhibits a dorsoventrally compressed lorica with six unequal spines on the anterodorsal margin. Long posterior spines are widely separated at their base, and the foot opening is unfranked, situated between the posterior spines. Median and lateral spines are approximately equal in length; (Fig.1c). Key measurements:Total length 338µ; maximum width 130µ; Length Without spine 143µ.
4.	*Brachionus diversicornis* (Daday, 1883)	The lorica dorsoventrally compressed; anterodorsal margin with six unequal spines; posterior spines are long and separated by a wide distance at their base. The foot opening is unfranked and positioned between the bases of the posterior spines, with median spines being almost as long as the lateral spines. (Fig.1d). Key measurements: Total length 273µ; maximum width 117µ; Length Without spine 169µ.
5.	*Brachionus variabilis* (Hempel, 1896)	The lorica is moderately dorsoventrally compressed, with a smooth to faintly striated surface; the anterior margin typically has six spines, which may vary in size and arrangement. Median spines are often longer than lateral spines. Posterior spines are generally short and positioned close to each other at the base. (Fig.1e). Key measurements: Total length 273µ; maximum width 156µ; Length Without spine 247µ.
6.	*Brachionus forficula* (Wierzejski, 1891)	The lorica is moderately compressed along the dorsoventral axis, featuring four occipital spines. Notably, the anterolateral spines are longer than the anteromedian spines. The lorica terminates in two long, stout, subsquare spines that are widely separated at their base and taper to blunt points; (Fig.1f). Key measurements: Total length 182µ; maximum width 91µ; Length Without spine 65µ.
7.	*Brachionus urceolaris* (Muller, 1773)	The lorica exhibits a unique pitcher-shaped, elongated morphology, with six occipital spines and no posterior spine. Small lateral projections are present at the foot opening and the anteromedian spines are notable for being the longest and straight. (Fig.1g). Key measurements: Total length 198µ; maximum width 162µ; Length Without spine 164µ.
8.	*Keratella tropica* (Apstein, 1907)	Lorica dorsally arched and dorsoventrally compressed; anterior dorsal margin typically with three prominent spines—two lateral spines and a median spine; posterior dorsal spines are long and may be equal or unequal in length. (Fig.1h). Key measurements: Total length 156µ; maximum width 78µ; Length Without spine 130µ
9.	*Euchlanis triquetra* (Ehrenberg, 1830)	Lorica broadly oval and dorsoventrally flattened; anterior margin rounded without pronounced spines; posterior end tapering to a bluntly pointed tip; lateral edges smooth and unarmed; foot opening located at the posterior end with a narrow, unfranked margin. (Fig.1i). Key measurements: Total length 273µ; maximum width 130µ; Length Without spine 208µ
10.	*Euchlanis proxima* (Leydig, 1854)	Lorica dorsoventrally compressed; anterior margin rounded with small, unequal spines; lateral margins smooth, lacking prominent spines; posterior end tapering to a rounded or slightly pointed tip; foot opening located at the posterior end, unfranked and positioned centrally. (Fig.1j). Key measurements: Total length 234µ; maximum width 117µ; Length Without spine 195µ
11.	*Collotheca quadrinodosa* (Summerfield-Wright, 1961)	Lorica is transparent and elongated, comprising four prominent lobes; the dorsal lobe is rectangular and robust, while the lateral lobes are triangular with sharp median points; the ventral lobes are well-rounded; the corona forms a funnel that is narrower compared to related species. (Fig.1k). Key measurements: Total length 936µ; maximum width 117µ; Length Without spine 936µ
12.	*Proales paguri* (Murray, 1910)	Lorica Soft and flexible, elongated, and cylindrical, typically lacking sculpturing or spines; body Shape slender, tapering towards the posterior; spines no distinct spines present; foot prominent, extending from a narrow, unfranked opening at the posterior. (Fig.1l). Key measurements: Total length 130µ; maximum width 65µ; Length Without spine 117µ

Zooplankton's sensitivity to environmental changes makes it an excellent indicator of water quality, as it quickly responds to variations in environmental conditions. Rural communities frequently use unfiltered and untreated water from natural sources like rivers, lakes, and wells for consumption and domestic use. Rotifers play a vital ecosystem-based role in freshwater habitats, functioning as efficient filter feeders that capture suspended particles of varying sizes. Their adaptable feeding strategies enable them to exploit diverse food sources, leading to classifications as either generalist or specialist species, depending on their dietary preferences and foraging behaviors (Sonia and Ramanibai, 2012). As the critical intermediary from the foundation of the aquatic food web to the top predators zooplankton acts in a pivotal position in marine food webs, making qualitative and quantitative investigations of their dynamics essential for understanding ecosystem functioning and health (Prasanna S Joshi 2011). Consequently, comprehensive analyses of zooplankton are crucial. According to a status report by the Zoological Survey of India, approximately 20% of India's total fauna are aquatic, with the majority inhabiting freshwater ecosystems. (Anonymous,1991). India's rotifer fauna has been the subject of extensive research. Brachionidae was the most dominant family. Five species from this family were identified, followed by single representatives from Lecanidae, Euchlanidae, and

Notommatidae. The taxonomic dominance of Rotifers has been reported in several studies, including those by Cavalli et al. (2001), Sampaio et al. (2002), and Neves et al. (2003). Gaurvi et al. (2003) similarly noted that Rotifer populations thrive in summer, reaching maximum densities while experiencing a decline during the monsoon season. Their study revealed that rotifers thrive and become dominant in summer when temperatures soar. Variations in population dynamics and periodicity among rotifer species can be attributed to complex biotic interactions and differences in lake nutrient composition (Shashikant R. Sitre 2013).

CONCLUSION

The present study on rotifer diversity in Tikhol Dam, located in Ahmednagar district, highlights the rich biodiversity. A total 12 species of rotifer belonging to 5 genera were recorded during the assessment, reflecting the ecological richness of the dam's aquatic ecosystem. The observed rotifer diversity in Tikhol Dam is comparable to other freshwater ecosystems in India. The dominance of species such as *Brachionus falcatus* and *Brachionus diversicornis,* suggests that these species are well adapted to the prevailing environmental conditions in the dam. The presence of diverse rotifer taxa highlights the favorable environmental conditions, nutrient availability, and overall water quality of the dam. Further studies focus on long-term studies integrating physicochemical parameters and the impact of climate change, as well as anthropogenic activities on rotifer diversity, which will provide sustainability of aquatic ecosystems.

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