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BIOLOGY, ECOLOGY AND LIFE CYCLE OF *BRACHIONUS PLICATILIS* MÜLLER, 1786 (ROTIFERA: BRACHIONIDAE) WITH SPECIAL REFERENCE TO KAMBAR TALAV, MAHARASHTRA, INDIA

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ABSTRACT

Brachionus plicatilis Müller, 1786 is a euryhaline rotifer widely distributed in brackish and eutrophic freshwater ecosystems across the world. The species plays a pivotal role in aquatic food webs and is extensively utilized in aquaculture and ecotoxicological studies. The present article provides a comprehensive account of the taxonomy, morphology, ecology, geographical distribution, and life cycle of *B. plicatilis*, with particular reference to its occurrence in water samples collected from **Kambar Talav**, Maharashtra, India. The species exhibits cyclical parthenogenesis involving alternation between asexual and sexual reproduction, enabling rapid population growth and long-term persistence through resistant resting eggs. Observations from Kambar Talav indicate that favorable physicochemical conditions such as moderate eutrophication, stable temperature, and abundant phytoplankton support the dominance of *Brachionus* species. The study highlights the ecological significance of *B. plicatilis* in Indian inland waters and emphasizes the need for species-level documentation using integrative approaches.

KEYWORDS: *Brachionus plicatilis*, Rotifera, life cycle, cyclical parthenogenesis, Kambar Talav, zooplankton, Maharashtra.

1. INTRODUCTION

Rotifers constitute one of the most important groups of microscopic metazoans in freshwater and brackish water ecosystems. They form a crucial link between primary producers and higher trophic levels and respond rapidly to environmental changes, making them reliable indicators of aquatic ecosystem health (Gómez et al., 2016).

Among rotifers, the genus *Brachionus* Pallas, 1766 is of particular ecological and applied importance due to its wide distribution, high reproductive potential, and tolerance to fluctuating environmental conditions. *Brachionus plicatilis* Müller, 1786 is one of the most intensively studied rotifers globally, primarily because of its extensive use as live feed in aquaculture and as a model organism in population biology and ecotoxicology (FAO, 1996; Huang et al., 2023).

In India, several studies have reported *Brachionus* species from ponds, reservoirs, lakes, and rivers, including inland water bodies of Maharashtra (Bhalsing & Pokale, 2023; Shaikh & Khan, 2025). The present article focuses on *B. plicatilis* with special reference to **Kambar Talav**, where the species was recorded from zooplankton samples, and provides a detailed account of its life cycle in relation to local environmental conditions.

2. STUDY AREA: KAMBAR TALAV, MAHARASHTRA

Kambar Talav is a perennial inland freshwater body located in Maharashtra, India. The pond is primarily used for domestic, recreational, and religious purposes and receives organic inputs from surface runoff and anthropogenic activities. Such conditions often result in **moderate eutrophication**, favoring the proliferation of planktonic organisms, particularly rotifers.

Zooplankton samples collected from Kambar Talav revealed a rich rotifer assemblage dominated by members of the family Brachionidae, with *Brachionus plicatilis* being one of the prominent species. The presence of abundant phytoplankton, stable water temperature, and relatively calm conditions provide an ideal habitat for rapid rotifer reproduction.

Fig1. *Brachionus plicatilis* Müller, 1786

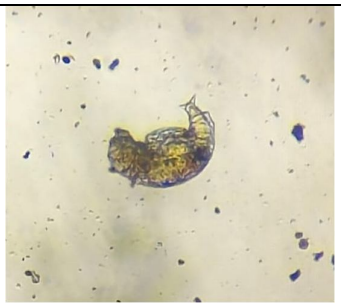


Fig2. *Brachionus plicatilis* Müller, 1786

Fig3. *Brachionus plicatilis* Müller, 1786

3. Taxonomy and Systematic Position

- **Phylum:** Rotifera
- **Class:** Monogononta
- **Order:** Ploima
- **Family:** Brachionidae
- **Genus:** *Brachionus*
- **Species:** *Brachionus plicatilis* Müller, 1786

The species belongs to the *B. plicatilis* species complex, which consists of several cryptic taxa exhibiting morphological similarity but genetic divergence (Gómez et al., 2016). This complexity necessitates careful ecological interpretation of field data.

4. MORPHOLOGY

Brachionus plicatilis is a small planktonic rotifer measuring approximately 200–350 µm in length. The body is enclosed within a flexible lorica bearing characteristic longitudinal folds. The anterior region possesses a well-developed **corona**, composed of ciliated bands responsible for locomotion and feeding. The mastax contains robust trophi adapted for grinding microalgae and detrital particles (FAO, 1996).

Specimens observed from Kambar Talav exhibited typical morphological features of *Brachionus*, indicating healthy and actively reproducing populations.

5. ECOLOGY AND FUNCTIONAL ROLE

Ecologically, *B. plicatilis* functions as a **primary consumer**, feeding on phytoplankton, bacteria, and fine organic detritus. In Kambar Talav, its abundance suggests high nutrient availability and productive conditions.

The species contributes significantly to energy transfer within the aquatic food web by serving as prey for insect larvae, small crustaceans, and fish fry. Its rapid response to nutrient enrichment also makes it a useful indicator of trophic status in pond ecosystems (Huang et al., 2023).

6. LIFE CYCLE OF *BRACHIONUS PLICATILIS*

The life cycle of *B. plicatilis* is characterized by **cyclical parthenogenesis**, involving alternation between asexual and sexual reproduction depending on environmental conditions (FAO, 1996).

6.1 Asexual Phase (Amictic Reproduction)

Under favorable conditions such as those prevailing in Kambar Talav (adequate food supply, moderate population density):

- Amictic females produce **diploid eggs** by mitosis.
- These eggs develop directly into diploid females without fertilization.
- The generation time is very short (1–2 days), resulting in exponential population growth.

This mode of reproduction accounts for the high density of *Brachionus* observed in plankton samples.

6.2 Sexual Phase (Mictic Reproduction)

When environmental stress occurs, such as crowding or reduced food quality:

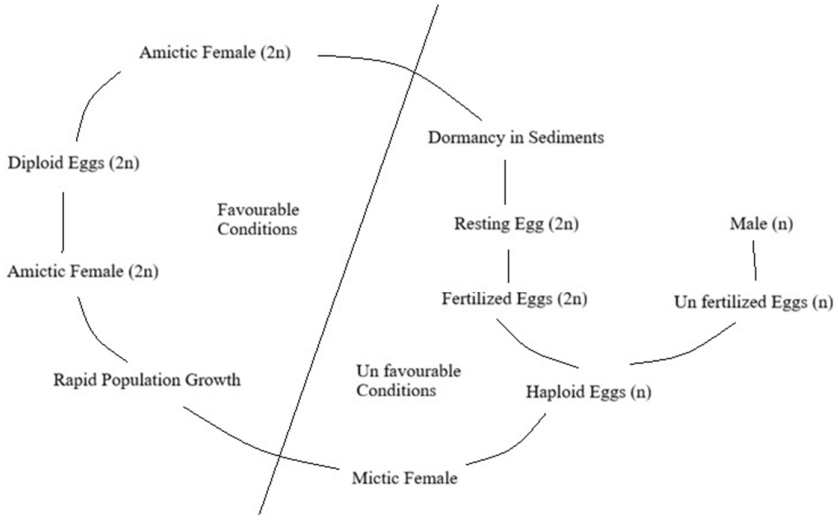
- Amictic females produce **mictic females**.
- Mictic females produce **haploid eggs**.
- Unfertilized haploid eggs develop into haploid males.
- Fertilized haploid eggs develop into **diploid resting eggs** (Gómez et al., 2016).

6.3 Resting Eggs and Dormancy

Resting eggs possess thick protective walls and are highly resistant to desiccation, temperature extremes, and adverse chemical conditions. These eggs sink into bottom sediments of ponds like Kambar Talav and can remain dormant for long periods. When favorable conditions return, they hatch into amictic females, reinitiating the population cycle.

7. DIAGRAMMATIC REPRESENTATION OF LIFE CYCLE

Life Cycle of *Brachionus plicatilis*



Life cycle of *Brachionus plicatilis*

8. APPLIED AND ECOLOGICAL SIGNIFICANCE

Brachionus plicatilis is widely used as a live feed organism in aquaculture due to its appropriate size, high nutritional value, and ease of mass culture (FAO, 1996; Sharma et al., 2018). Its presence in Kambar Talav highlights the potential of local water bodies as natural reservoirs of live feed organisms.

Additionally, its sensitivity to pollutants and rapid life cycle make it a valuable organism for environmental monitoring and ecotoxicological assessments (Huang et al., 2023).

9. CONCLUSION

The occurrence of *Brachionus plicatilis* in Kambar Talav reflects favorable ecological conditions supporting rotifer proliferation. The species' unique life cycle involving cyclical parthenogenesis ensures rapid population growth as well as long-term survival through resting eggs. While global knowledge of *B. plicatilis* is extensive, localized studies such as the present review contribute valuable insights into its ecological role in Indian inland waters. Further molecular and quantitative studies are recommended to resolve cryptic diversity and assess seasonal population dynamics in Maharashtra.

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