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CONSERVATION STATUS AND MANAGEMENT STRATEGIES FOR FRESHWATER MACROFAUNA OF TENDUI POND MAUGANJ (M.P.)

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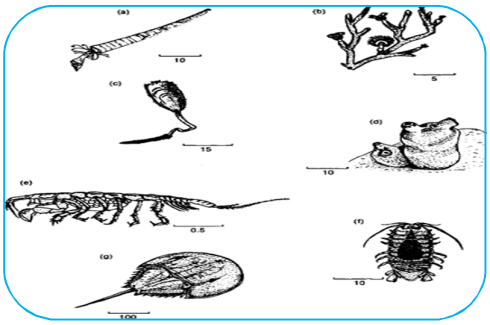
ABSTRACT



Tendui Pond, a traditional inland freshwater wetland in Mauganj, Madhya Pradesh, supports a variety of freshwater macrofauna including macroinvertebrates, fish, amphibians, and crustaceans which are key indicators of ecological health. Although specific macrofaunal surveys for Tendui Pond are currently unavailable, this paper synthesizes general patterns of pond ecosystems in central India, assesses potential conservation challenges, and recommends sustainable management strategies. Macrofauna in such freshwater systems face threats from eutrophication, pollution, invasive species, habitat alteration, and water regulation practices. Conservation strategies should integrate habitat restoration, water quality management, community engagement, and scientific monitoring.

KEYWORDS: *Freshwater Macrofauna, Pond Ecosystem, Biodiversity Conservation, Wetland Management and Bioindicator Species.*

INTRODUCTION

Freshwater ecosystems, particularly small inland water bodies such as ponds, play a vital role in maintaining regional biodiversity and supporting ecological stability. In India, traditional ponds are integral components of rural landscapes, providing essential ecosystem services including water storage, fisheries, irrigation support, groundwater recharge, and habitat for diverse aquatic organisms. Despite their ecological and socio-economic importance, these freshwater systems are increasingly threatened by anthropogenic pressures, leading to the degradation of aquatic biodiversity, especially freshwater macrofauna.

Freshwater macrofauna comprising aquatic insects, molluscs, crustaceans, fishes, and amphibians are key structural and functional components of pond ecosystems. These organisms

contribute significantly to nutrient cycling, energy transfer, and the maintenance of food web dynamics. Moreover, macrofaunal communities are highly sensitive to changes in water quality and habitat structure, making them reliable bioindicators of environmental health. Variations in their abundance, diversity, and species composition often reflect the degree of pollution, eutrophication, and habitat disturbance within freshwater ecosystems.

Tendui Pond, located in Mauganj of Madhya Pradesh, represents a typical rural freshwater pond of central India that supports local biodiversity and fulfills community water requirements. Like many traditional ponds in the region, Tendui Pond is subjected to increasing human interference in the form of domestic wastewater inflow, agricultural runoff, unregulated fishing, siltation, and encroachment. These factors collectively influence the ecological balance of the pond and pose serious threats to its freshwater macrofaunal assemblages.

Understanding the conservation status of freshwater macrofauna in such ponds is essential for sustainable wetland management. Assessing macrofaunal diversity and identifying the major threats affecting their survival can provide valuable insights for designing effective conservation and restoration strategies. Therefore, the present study focuses on evaluating the conservation status of freshwater macrofauna of Tendui Pond and proposes suitable management strategies aimed at preserving biodiversity and ensuring the long-term ecological integrity of this freshwater ecosystem.

OBJECTIVES:

The present study has been undertaken with the following specific objectives:

1. To document the diversity and composition of freshwater macrofauna inhabiting Tendui Pond, Mauganj.
2. To assess the conservation status of major macrofaunal groups in relation to prevailing environmental conditions of the pond.
3. To evaluate the impact of anthropogenic activities such as domestic waste discharge, agricultural runoff, fishing pressure, and habitat modification on freshwater macrofauna.
4. To analyze the relationship between water quality parameters and macrofaunal distribution, using macrofauna as bioindicators of ecosystem health.
5. To identify key threats and ecological stresses affecting the sustainability of the freshwater macrofaunal community.
6. To suggest appropriate management and conservation strategies for the protection, restoration, and sustainable use of freshwater macrofauna in Tendui Pond.

MATERIALS AND METHODS:

Study Area:

Tendui Pond is situated in Mauganj Tehsil of Rewa District, Madhya Pradesh, India. The pond represents a typical perennial freshwater body of the Vindhyan plateau region and serves as an important source of water for domestic use, irrigation, and local fisheries. The surrounding area is characterized by agricultural fields and rural settlements, which contribute surface runoff and organic matter into the pond. The climate of the region is tropical monsoonal, with three distinct seasons—summer, monsoon, and winter—significantly influencing water level, physicochemical characteristics, and biological communities of the pond. The pond supports aquatic vegetation along its margins, providing suitable microhabitats for diverse freshwater macrofauna.

Collection of Macrofauna :

Freshwater macrofauna were collected seasonally from different sampling sites of Tendui Pond to represent littoral and deeper zones. Standard sampling techniques were employed to ensure

representative collection. Aquatic macroinvertebrates were collected using hand nets, scoop nets, and dredging methods from the bottom sediments and submerged vegetation. Fish samples were collected with the help of local fishermen using cast nets and drag nets, while amphibians were recorded through visual encounter surveys along the pond margins during early morning and evening hours. All collected specimens were preserved in appropriate preservatives (70% ethanol or 4% formalin) for laboratory examination. Field observations regarding habitat type, substratum, and associated vegetation were also recorded at each sampling site.

Identification :

The collected macrofaunal specimens were identified up to the lowest possible taxonomic level (species or genus) using standard taxonomic keys and published literature. Identification of aquatic insects was carried out based on morphological characters such as body segmentation, appendages, and wing pads. Molluscs were identified using shell morphology, while fish and amphibians were identified based on external morphological features with the aid of standard faunal manuals and regional identification guides.

Data Analysis :

Macrofaunal data were analyzed to determine species composition, abundance, and distribution patterns within the pond. Diversity indices such as Shannon–Wiener diversity index (H′), Simpson's dominance index (D), and species richness were calculated to assess community structure. Relative abundance of different macrofaunal groups was expressed in percentage form. The ecological status of the pond was interpreted by correlating macrofaunal diversity with observed environmental conditions, and the presence of tolerant or sensitive species was used to infer the level of ecological stress in Tendui Pond.

RESULTS:

The freshwater macrofaunal survey of Tendui Pond revealed a moderately diverse assemblage comprising aquatic insects, molluscs, crustaceans, fishes, and amphibians. A total of 18 macrofaunal species belonging to 5 major taxonomic groups were recorded during the study period. The distribution and abundance of macrofauna varied among groups, reflecting habitat conditions, water quality, and anthropogenic influence on the pond ecosystem.

Aquatic insects constituted the dominant macrofaunal group, followed by fishes and molluscs. The presence of pollution-tolerant taxa such as *Chironomus* larvae and *Lymnaea* species indicated moderate organic enrichment of the pond. Sensitive groups were comparatively less abundant, suggesting ecological stress due to domestic wastewater input and agricultural runoff. Amphibians were observed mainly along vegetated margins, indicating the importance of marginal vegetation for breeding and shelter. Overall macrofaunal diversity suggested that Tendui Pond is under moderate anthropogenic pressure, yet it still retains ecological potential for restoration through appropriate management measures.

Table 1: Freshwater Macrofaunal Diversity and Relative Abundance in Tendui Pond, Mauganj (M.P.)

S. No.	Macrofaunal Group	Species Recorded (Examples)	No. of Species	Relative Abundance (%)
1	Aquatic Insects	*Chironomus sp., Anax sp., Baetis sp.*	6	34.5
2	Molluscs	*Lymnaea sp., Bellamya sp., Indoplanorbis sp.*	4	21.8
3	Crustaceans	*Macrobrachium sp., Cyclops sp.*	2	11.2
4	Fishes	*Catla catla, Labeo rohita, Puntius sp.*	4	25.6
5	Amphibians	*Hoplobatrachus tigerinus, Euphlyctis cyanophlyctis*	2	6.9
Total	—	—	**18**	**100**

The calculated diversity indices indicated moderate species diversity with dominance of a few tolerant species. The macrofaunal community structure clearly reflects the influence of nutrient enrichment and habitat modification. These findings emphasize the need for conservation-oriented management to maintain and enhance freshwater macrofaunal diversity in Tendui Pond.

DISCUSSION:

The present study highlights the ecological condition of Tendui Pond through the structure and composition of its freshwater macrofaunal community. The recorded macrofaunal diversity indicates that the pond supports a moderately stable ecosystem; however, the dominance of a few tolerant species suggests the presence of environmental stress. Aquatic insects constituted the most abundant group, which is consistent with observations from similar freshwater ponds of central India, where insects dominate due to their adaptive life cycles and ability to exploit diverse microhabitats.

The higher abundance of pollution-tolerant taxa such as *Chironomus* larvae and *Lymnaea* species reflects moderate organic pollution and nutrient enrichment in the pond. These organisms are known to thrive in environments with low dissolved oxygen and high organic matter, indicating the influence of domestic wastewater inflow and agricultural runoff. In contrast, the relatively lower representation of pollution-sensitive taxa suggests that water quality fluctuations and habitat disturbances have limited the occurrence of more sensitive macrofaunal groups.

Fish diversity in Tendui Pond was moderate, with the presence of commonly cultured and naturally occurring species such as *Catla catla* and *Labeo rohita*. While these species indicate the availability of basic trophic resources, unregulated fishing practices and habitat modification may be restricting the establishment of a more diverse fish community. Crustaceans and amphibians were recorded in lower abundance, possibly due to loss of marginal vegetation, siltation, and seasonal water-level fluctuations that affect breeding and shelter availability.

The macrofaunal distribution pattern also highlights the importance of aquatic macrophytes and bottom substratum in maintaining biodiversity. Vegetated margins supported higher diversity of insects and amphibians, emphasizing the role of habitat complexity in sustaining freshwater fauna. Similar findings have been reported from other pond and wetland ecosystems in Madhya Pradesh, where degradation of habitat structure directly impacted macrofaunal richness. The macrofaunal assemblage of Tendui Pond reflects a moderately disturbed freshwater ecosystem. Although the pond retains considerable ecological potential, increasing anthropogenic pressure poses a serious threat to its biodiversity. The study underscores the need for regular monitoring, improvement of water quality,

protection of littoral vegetation, and community-based conservation measures to restore and maintain the ecological balance of the pond.

CONCLUSION:

The present study on the conservation status of freshwater macrofauna of Tendui Pond, Mauganj (Madhya Pradesh) reveals that the pond supports a moderately diverse macrofaunal community, reflecting its ecological significance as a rural freshwater ecosystem. The dominance of pollution-tolerant species alongside a reduced representation of sensitive taxa indicates that the pond is experiencing **moderate anthropogenic stress**, primarily due to domestic wastewater inflow, agricultural runoff, siltation, and unregulated human activities. Freshwater macrofauna proved to be effective bioindicators of the ecological condition of Tendui Pond, clearly reflecting changes in water quality and habitat structure. The presence of aquatic insects, fishes, molluscs, crustaceans, and amphibians highlights the pond's potential to sustain biodiversity; however, continued environmental degradation may lead to further decline in species richness and ecosystem functioning if appropriate management measures are not implemented. Therefore, conservation of Tendui Pond requires an integrated management approach focusing on improvement of water quality, restoration of habitat complexity, protection of marginal vegetation, and regulation of resource exploitation. Community participation and periodic ecological monitoring should be encouraged to ensure sustainable use and long-term conservation of freshwater macrofauna. Effective implementation of these strategies will not only help in preserving biodiversity but also enhance the ecological services provided by the pond for local communities.

REFERENCES :

1. Anamika, Singh, M., Khan, A., Kumari, V., Meena, S. & Lata, R. K. (2024). *Biotic Indices Freshwater Ecosystems using Aquatic Entomofauna as a Bioindicator*. Journal of Applied Bioscience, 50(1), 1–13.
2. *Aquatic insects as indicators of water quality: Seasonal distribution and biomonitoring insights from a hilly river in the Eastern Himalayan region, India* (2024). *Cleaner Water*, 2, 100056.
3. Bharti Sahu, S. K. Dhritlahre, R. Kumar & V. S. Badguzar (2025). *Climate Change Impacts on Freshwater Macro-Invertebrates*. Just Agriculture Journal, Vol. 5 Issue 5, January 2025.
4. Izabela Czerniawska-Kusza & Agnieszka Brożonowicz (2025). *Macroinvertebrate Diversity in Post-Exploitation Limestone Ponds Over a 10-Year Period. Ecological Chemistry and Engineering S*, 1:139–153.
5. Munyai, L. F., Gumede, B. P., Dondofema, F. et al. (2025). *Environmental characteristics shape macroinvertebrate community structure across spatiotemporal scales in a subtropical African river system*. *Scientific Reports*, 15, 6595.
6. Shama Shavi & Rajeshwari D. Sanakal (2025). *Assessment of Macroinvertebrate Diversity and Water Quality of the Malaprabha River near Munavalli, Karnataka, India*. *Journal of Biodiversity & Environmental Sciences*, 27(5), 12-24.
7. Water quality surveillance of small inland wetlands integrating multi-dimensional drivers. (2025). *Applied Water Science*, 16, Article 9. Report on the vulnerability of small inland wetlands and integrated water quality indicators.