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# Ichthyofaunal Diversity and Seasonal Physico-Chemical Variations of Charipunia Beel, Morigaon District, Assam

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***Executive Summary***

This study investigates the ichthyofaunal diversity, plankton community structure, and seasonal fluctuations in the physico-chemical parameters of Charipunia Beel, a significant floodplain wetland located in the Morigaon district of Assam. Conducted over a period of one year (May 2022 to April 2023), the study highlights the rich biodiversity and favorable ecological conditions of the wetland. Findings indicate the urgent necessity for sustainable management practices to ensure the continued productivity and ecological health of the beel.

## Introduction

Floodplain wetlands, commonly referred to as *beels* in Assam, represent one of the most dynamic and biologically productive aquatic ecosystems in the region. These wetlands are formed through natural processes such as river meandering, flooding, and sediment deposition, and are characterized by their seasonal or perennial connectivity with major rivers like the Brahmaputra and its tributaries. In Assam, beels not only serve as important biodiversity hotspots, supporting a wide range of aquatic flora and fauna, but also play a critical role in regulating hydrological cycles, recharging groundwater, and controlling floods. More importantly, they contribute substantially to the inland fisheries sector, providing an essential source of nutrition, income, and employment to local communities.

Charipunia Beel, one such floodplain wetland located in the Morigaon district of Assam, covers an area of approximately 7 hectares. It serves as a lifeline for the surrounding community, particularly the indigenous Tiwa community, whose socio-economic fabric is intricately linked

to the beel's resources. Around 250 families directly depend on the beel for their livelihood, engaging in traditional and community-managed fishing practices that have been passed down through generations. The beel not only provides fish as a staple food source but also supports ancillary activities such as fish trading, net making, and seasonal farming along its periphery, thus sustaining the local rural economy.

Despite its ecological and socio-economic significance, Charipunia Beel has remained largely unexplored in scientific literature, with limited studies addressing its biodiversity, ecological status, and environmental health. The absence of such baseline scientific information poses a serious challenge to the sustainable management and conservation of the beel, especially in the face of increasing anthropogenic pressures, climate variability, and habitat degradation. Recognizing this gap, the present investigation was undertaken with the primary objectives of assessing the ichthyofaunal diversity, analyzing the structure and composition of the plankton communities, and monitoring the seasonal variations in key physico-chemical parameters of the beel's water. The study aims to establish a foundational database that can inform future conservation strategies, resource management policies, and community awareness programs to ensure the sustainable utilization and preservation of Charipunia Beel for generations to come.

**Methodology**

Sampling activities were systematically conducted on a monthly basis at two strategically selected stations within Charipunia Beel to ensure a comprehensive representation of the wetland's ecological conditions. Fish specimens were collected during early morning hours, utilizing various traditional and standard fishing methods suitable for shallow wetlands. Identification of fish species was carried out using well-established taxonomic references, specifically the works of Talwar and Jhingran (1991) and Jayaram (2010), ensuring precise classification and nomenclature. To ascertain the conservation status of each species, cross-verification was undertaken using the latest International Union for Conservation of Nature (IUCN) Red List of Threatened Species (2023).

Simultaneously, plankton samples were collected by filtering water through a fine-mesh plankton net (28 μm), ensuring the capture of both phytoplankton and zooplankton communities. These samples were preserved in 4–5% formalin solution and subsequently identified up to the genus level using standard taxonomic keys and monographs.



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Water quality assessment formed a crucial component of the study. Parameters such as water temperature, pH, dissolved oxygen, total alkalinity, total hardness, free carbon dioxide concentration, turbidity, and total ammonia-nitrogen were measured following the standardized protocols outlined by the American Public Health Association (APHA, 2010). Measurements were taken in situ where applicable, and additional laboratory analyses were conducted to ensure accuracy.

To evaluate the ecological diversity and community structure within the beel, several biodiversity indices were employed. The Shannon-Weiner Index (H') was used to assess species richness and abundance, while the Simpson Index (1–λ) measured the dominance pattern among species. The Margalef's Richness Index (d) provided a quantitative estimation of species richness relative to the sample size, and Pielou's Evenness Index (J') was applied to determine the equitability of species distribution across samples. Together, these analytical tools provided a robust framework for understanding the biological complexity and ecological stability of Charipunia Beel.

## Results

### Ichthyofaunal Diversity

A total of 26 fish species belonging to 18 genera, 11 families, and 4 orders were recorded during the study period. The Cyprinidae family was the most dominant, representing 38.46% of the total species recorded. Prominent species included *Amblypharyngodon mola*, *Puntius sophore*, *Mystus tengara*, *Mystus vittatus*, *Cirrhinus mrigala*, and *Labeo rohita*. Conservation assessment revealed that 58.8% of the species were classified under the Least Concern (LC) category, while several species were identified as Vulnerable (VU) and Near Threatened (NT).

### Plankton Diversity

The phytoplankton community comprised 26 genera, predominantly from the Chlorophyceae class, while the zooplankton community was represented by 11 genera, with rotifers being the most abundant group.

### Physico-Chemical Parameters

The physico-chemical parameters of the beel demonstrated a conducive environment for aquatic life. Water temperature ranged between 18.6°C and 29.3°C, pH values varied from 5.5



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to 7.9, and dissolved oxygen levels fluctuated between 4.5 mg/L and 7.6 mg/L. Other parameters such as total alkalinity (42.3–67.1 mg/L), total hardness (51.3–70.2 mg/L), free carbon dioxide (5.5–9.3 mg/L), turbidity (3.1–4.6 NTU), and ammonia-nitrogen (0.14–0.32 mg/L) remained within acceptable ranges for fish productivity.

**Discussion**

The findings underscore the significance of Charipunia Beel as a biologically diverse and ecologically vibrant aquatic ecosystem. The high level of biological diversity in the area indicates a variety of species thriving in the habitat, which is beneficial for maintaining ecosystem balance and resilience. Among the fish species found, the Cyprinidae family (which includes carps, minnows, and related species) is particularly dominant, suggesting that these species are well-adapted to the local environmental conditions.

Moreover, a substantial number of species in Charipunia Beel are classified as Least Concern on the IUCN Red List, meaning they are not currently facing significant risk of extinction. This is an encouraging indicator of the overall health of the fish community within the ecosystem, as a high proportion of Least Concern species suggests that the area is providing favorable conditions for fish populations to thrive.

However, the presence of species that are classified as Vulnerable or Near Threatened raises important concerns. These species face increased risks and may require focused conservation efforts to prevent further decline. The finding calls attention to the fact that while the ecosystem is generally healthy, there are certain species that are at greater risk and might need special protection.

Water quality parameters measured in the study also suggest that the Beel supports a healthy aquatic community. Factors such as dissolved oxygen levels, pH, turbidity, and other indicators of water quality were found to be within the range that can sustain diverse aquatic life. However, the study points out that seasonal fluctuations in water quality are present, which may impact the survival and distribution of species throughout the year. Such fluctuations could be driven by changes in rainfall, temperature, or human activity, which can alter the dynamics of the ecosystem.

The findings emphasize the importance of continuous monitoring of both water quality and species populations in Charipunia Beel. Adaptive management strategies should be



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implemented to address the potential impacts of seasonal changes, as well as to ensure that conservation measures are in place for the more vulnerable species. This approach would allow for timely interventions and help maintain the ecological integrity of the Beel over time.

**Conclusion**

Charipunia Beel exhibits rich ichthyofaunal diversity and maintains favorable ecological conditions suitable for sustainable fish production. However, anthropogenic pressures and unregulated fishing could threaten its biodiversity in the future. Proactive management strategies are essential to preserve the ecological integrity and socio-economic benefits derived from the beel.

**Recommendations**

 **Implementation of closed fishing seasons during critical breeding periods to allow natural recruitment of fish populations**:

- During certain times of the year, many fish species undergo breeding or spawning, which is crucial for their population sustainability. By establishing closed fishing seasons during these critical periods, fish populations are allowed to reproduce without the additional stress of fishing pressures. This strategy helps maintain healthy fish stocks by ensuring that a sufficient number of juveniles are naturally recruited into the population, leading to a more stable and sustainable fish community in the long term.

 **Protection and restoration of breeding and feeding grounds for indigenous fish species**:

- Indigenous fish species often rely on specific habitats for breeding and feeding, such as shallow waters, wetlands, or submerged vegetation. The protection of these critical areas ensures that fish can complete their life cycles and maintain healthy populations. Restoration efforts could involve habitat restoration, such as replanting aquatic vegetation, cleaning up pollution, or preventing the destruction of these key habitats due to development or human activities. Safeguarding these areas helps ensure that fish species can continue to thrive and that biodiversity is maintained.

 **Regular monitoring of water quality and biodiversity parameters to detect ecological changes at an early stage**:

- Monitoring water quality (such as dissolved oxygen, pH, turbidity, etc.) and biodiversity parameters (such as species composition and population health) is essential to



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understanding the overall state of the ecosystem. Regular monitoring allows for the early detection of negative trends, such as deteriorating water quality or the decline of certain species, enabling swift action to address emerging threats. This proactive approach supports adaptive management and ensures that the Beel remains a suitable habitat for aquatic life.

 **Community-based awareness programs to promote sustainable fishing practices and habitat conservation**:

- Engaging local communities in conservation efforts is essential for long-term success. Community-based awareness programs can educate fishermen and other stakeholders about the importance of sustainable fishing practices, such as avoiding overfishing, using eco-friendly gear, and following closed fishing season rules. Additionally, these programs can raise awareness about the need to protect local habitats and promote responsible actions that support biodiversity. When local communities understand the value of conservation and are directly involved in managing resources, conservation efforts are more likely to succeed.

 **Development of a scientific management plan in collaboration with local stakeholders to ensure long-term sustainability**:

- A scientifically-based management plan that involves local stakeholders (such as fishermen, local governments, conservationists, and researchers) ensures that decisions about resource use and conservation are based on the best available data and address the needs of both the environment and the community. This collaborative approach allows for more effective management, as local stakeholders will have a vested interest in the success of the plan and its recommendations. Additionally, the plan can include measures for adaptive management to respond to changes in environmental conditions or species populations over time, ensuring the long-term sustainability of Charipunia Beel.

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