



A study on the aquatic insect communities of diplai beel and dhir beel of chakrashila wildlife sanctuary in Kokrajhar District, BTR, Assam

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Abstract

Aquatic insects play a crucial role in freshwater ecosystems. This study surveyed aquatic insects from January 2024 to March 2024 across the two permanent water bodies mainly the Diplai Beel and Dhir Beel in Kokrajhar district, Assam. A total of 28 aquatic insect species were identified, spanning six orders and 18 families. The study highlights that different insect groups exhibit varying levels of tolerance to water quality conditions. Among the recorded orders, Hemiptera had the highest diversity, with nine families and 15 genera. Other orders included Coleoptera (three families, four genera), Odonata (two families, four genera), Diptera (two families, two genera), Ephemeroptera (one family, two genera), and Hymenoptera (one family, one genus). Water quality parameters across the different sites did not differ significantly. Diplai Beel had the highest dissolved oxygen levels and the greatest number of insect species, followed by Dhir Beel.

Keywords: Aquatic insects, diversity, water quality, environment, conservation

Introduction

Although insects are often regarded as pests in domestic and garden settings, the majority of aquatic insects found in natural water bodies are invaluable to their ecosystems. Aquatic insects, a diverse group of arthropods, are specially adapted to life in aquatic environments, spending significant portions of their life cycles in or on the surfaces of both lentic (still) and lotic (flowing) water bodies. These insects play a pivotal role in the ecology of freshwater ecosystems, serving as fundamental components of the aquatic food web and influencing various ecological processes.

Aquatic insects occupy a crucial niche within their environments, providing essential food resources for a range of aquatic organisms, including fish, amphibians, and waterfowl. Their larvae and adults are integral to the diet of these predators, contributing to the overall health and sustainability of aquatic food chains. Beyond their role as prey, some aquatic insects function as predators themselves, feeding on various forms of zooplankton, phytoplankton, and occasionally even small fish. This predatory behavior helps regulate populations of smaller aquatic organisms and maintains ecological balance.

In addition to their roles in predation and as prey, aquatic insects are instrumental in the decomposition and recycling of organic matter. They contribute to the breakdown of leaf litter and other organic detritus, transforming it into smaller particles that become available to other organisms in the aquatic environment. This process is vital for nutrient cycling and supports the growth of aquatic plants and algae, which, in turn, sustain other elements of the aquatic ecosystem.

Aquatic insects are found in a diverse array of aquatic habitats, ranging from stormwater drains and artificial ponds to natural lakes and rivers. Their presence and abundance can offer valuable insights into the health and quality of these water bodies. Aquatic insects are particularly useful as bioindicators, as they can reflect the conditions of their environment through their diversity and distribution. Specialized for filtering fine particles suspended in the

water, these insects help maintain water clarity, which is essential for the penetration of sunlight necessary for photosynthesis in aquatic plants. Their burrowing activities in soft sediments further contribute to oxygenation, promoting a healthier substrate for other bottom-dwelling organisms.

Different groups of aquatic insects exhibit varying degrees of tolerance to water quality conditions. For example, mosquito larvae are well-adapted to survive in environments with poor water quality characterized by high temperatures, low pH, and elevated nutrient levels. In contrast, other insect groups, such as mayflies and some caddisfly larvae, are highly sensitive to pollution and can only thrive in clean, well-oxygenated waters with low nutrient concentrations and stable pH levels. The sensitivity of these insects to changes in water quality makes them valuable indicators for assessing environmental conditions and detecting potential disturbances.

Despite the extensive research conducted on the ecology of many aquatic insect groups, particularly those recognized as bioindicators or disease vectors, there remain numerous species whose ecological roles and responses to environmental changes are not yet fully understood. The present study aims to address this gap by collecting comprehensive data on the distribution and diversity of aquatic insects in a specific region of the Kokrajhar District. By focusing on two distinct water bodies –Diplai Beel and Dhir Beel as study sites, this research seeks to enhance the understanding of the aquatic insect communities in this area, providing insights into their ecological roles and the impact of environmental factors on their distribution and abundance.

Study Area

The fieldwork for this study was conducted at two significant water bodies in Kokrajhar District, Assam: Diplai Beel and Dhir Beel locate in Chakrashila Wildlife Sanctuary. Both of these beels are integral to the region's aquatic and ecological landscape.

Diplai Beel

- **Location:** Diplai Beel is located in Kokrajhar District with approximate coordinates of 26.3750° N latitude and 90.3745° E longitude. This beel is a large, shallow

wetland area, providing essential habitat for a variety of aquatic species. Its extensive waters and rich biodiversity make it a key site for studying aquatic insects.



Fig 1: Diplai Beel

Dhir Beel

- **Location:** Dhir Beel is also located in Kokrajhar District, with approximate coordinates of 26.4250° N latitude and 90.4530° E longitude. Like Diplai Beel, Dhir Beel is a vital wetland that supports diverse aquatic life. It plays an important role in maintaining the ecological balance of the region and contributes significantly to local hydrology and agriculture.

for subsequent identification. Specimens were identified using online resources and standard reference books, and digital photographs were taken for documentation. Physico-chemical parameters of the water samples were measured as follows: Air and water temperatures were recorded using thermometers, while pH levels were determined with a universal indicator. Dissolved oxygen and free CO₂ concentrations were analyzed using standard titrimetric methods.



Fig 2: Dhir Beel

These beels are crucial for understanding the distribution and diversity of aquatic insect communities in the region. Their unique ecological attributes and the variety of species they support make them ideal for investigating the health and dynamics of freshwater ecosystems in Kokrajhar District.

Methods and Methodology

The present study was conducted over a three-month period from January 2024 to March 2024, covering the spring season. For the collection of floating and swimming insects from the littoral zones of Diplai Beel and Dhir Beel, circular hand-operated nets made from finely meshed polyester mosquito curtain fabric were utilized. The collected insects and water samples were transported to the Zoology Department laboratory at Kokrajhar Govt. College, Kokrajhar. The insects were preserved in 70% ethyl alcohol

Results and Discussion

Analysis of Physico-chemical parameters: The physicochemical parameters of the two aquatic ecosystems, Diplai Beel and Dhir Beel, are summarized in Table 1. This table includes a detailed overview of the following measurements for each beel:

- Air Temperature
- Water Temperature
- pH Levels
- Dissolved Oxygen
- Free CO₂ Concentration

These parameters are essential for evaluating the environmental conditions of Diplai Beel and Dhir Beel, as they affect the habitat quality for aquatic insects and other organisms. The data collected provides insights into the health and ecological status of these water bodies.

Table 1: Result of Water Analysis of Diplai Beel and Dhir Beel.

Study area	pH	Air temperature (0 C)	Water temperature (0C)	Dissolved O ₂ (mg/lit)	Free CO ₂ (mg/li)
Diplai Beel	8	24	23	12.8	8.4
Dhir Beel	7.5	27	26.5	10.5	8.9

Aquatic Insects Community: In this study, a total of 28 species of aquatic insects were recorded, classified into six orders: Hemiptera, Coleoptera, Diptera, Odonata, Ephemeroptera, and Hymenoptera, and 18 families. The

distribution of species across these orders is as follows:

- **Hemiptera:** This order had the highest species diversity, with nine families and 15 genera recorded.
- **Coleoptera:** Included three families and four genera.
- **Odonata:** Consisted of two families and four genera.
- **Diptera:** Comprised two families and two genera.
- **Ephemeroptera:** Featured one family with two genera.

- **Hymenoptera:** Contained one family and one genus.

The detailed distribution of these insect species is presented in Tables 2 and 3, which outline their specific occurrences and distributions within Diplai Beel and Dhir Beel.

Table 2: List showing number of insects' species according to collection site.

SI No.	Location	Number of species
1	Diplai Bheel	27
2	Dhir Beel	19

Table 3: Distribution of species according to their order, family and location.

Sl. No.	Order	Family	Species	Location
1	Hemiptera	Corixidae	<i>Micronecta scutellaris</i>	Diplai Beel & Dhir Beel
2			<i>Sigara alternate</i>	Dhir Beel
3		Pleidae	<i>Plea liturata</i>	Diplai Beel & Dhir Beel
4		Notonectidae	<i>Notonecta undulate</i>	Diplai Beel & Dhir Beel
5		Naucoridae	<i>Pelocoris femoratus</i>	Diplai Beel & Dhir Beel
6		Mesovellidae	<i>Mesovelia vittigera</i>	Diplai Beel & Dhir Beel
7		Belostomatidae	<i>Diplonychus rusticus</i>	Dhir Beel
8			<i>Belostoma sp</i>	Diplai Beel & Dhir Beel
9		Nepidae	<i>Ranatra filiformes</i>	Diplai Beel & Dhir Beel
10			<i>Ranatra varipes</i>	Diplai Beel
11			<i>Nepa apiculata</i>	Dhir Beel
12		Gerridae	<i>Gerris species</i>	Diplai Beel & Dhir Beel
13			<i>Neogerris parvula</i>	Dhir Beel
14			<i>Limnogonis nitidus</i>	Diplai Beel & Dhir Beel
15		Veliidae	<i>Microvelia species</i>	Diplai Beel & Dhir Beel
16	Diptera	Chironomidae	<i>Chironomous species</i>	Diplai Beel & Dhir Beel
17		Culicidae	<i>Culex species</i>	Diplai Beel
18	Coleoptera	Dytiscidae	<i>Cybister fimbriolatus</i>	Diplai Beel & Dhir Beel
19			<i>Laccophilus indicus</i>	Dhir Beel
20		Gyrinidae	<i>Dineutus spinosus</i>	Diplai Beel & Dhir Beel
21		Hydrophilidae	<i>Hydrophilus species</i>	Diplai Beel & Dhir Beel
22	Odonata	Libellulidae	<i>Libellula lydia</i>	Diplai Beel & Dhir Beel
23			<i>Pantala flavescens</i>	Diplai Beel & Dhir Beel
24			<i>Neurothemis species</i>	Diplai Beel & Dhir Beel
25		Coenagrionidae	<i>Ischnura species</i>	Diplai Beel & Dhir Beel
26	Ephemeroptera	Baetidae	<i>Cloeon species</i>	Diplai Beel
27			<i>Baetis sp</i>	Diplai Beel & Dhir Beel
28	Hymenoptera	Formicidae	<i>Polyrhachis sokolova</i>	Diplai Beel & Dhir Beel

In the present study, Hemiptera emerged as the most diverse and abundant order of aquatic insects in both Dhir Beel and Diplai Beel. This order was followed by Coleoptera, which also showed significant diversity but was less prevalent compared to Hemiptera. The observed differences in the diversity of aquatic insects between Dhir Beel and Diplai Beel can be attributed to variations in physicochemical parameters, habitat complexity, vegetation, and water depth at each site.

Hymenoptera and Ephemeroptera were found in relatively lower numbers in both beels. This scarcity can be attributed to the fact that these orders are highly sensitive to changes in water quality and environmental conditions. Their reduced presence in both beels may indicate a higher level of environmental stress or pollution sensitivity.

Among the two Beels, Diplai Beel demonstrated a greater richness in species diversity compared to Dhir Beel. This difference could be due to more favorable water quality and environmental conditions at Diplai Beel. For instance, the

dissolved oxygen levels in Diplai Beel were found to be higher than in Dhir Beel, which generally supports a more diverse aquatic community. The better water quality in Diplai Beel likely provides a more suitable habitat for a variety of aquatic insects, contributing to its higher species count.

In contrast, Dhir Beel's lower dissolved oxygen levels may suggest less optimal conditions for certain aquatic insects, leading to reduced species diversity. The water quality in Dhir Beel could be influenced by various factors, such as nutrient load, pollution, or habitat alterations, which might be impacting the aquatic insect populations.

These findings highlight the significant role that water quality and environmental conditions play in shaping the diversity and distribution of aquatic insect communities. Continuous monitoring and further research are essential to gain a deeper understanding of the factors affecting these ecosystems and to develop effective management strategies for the conservation of aquatic resources in the region.



Fig 3: Insects collected from the sites of Diplai Beel and Dhir Beel

Conclusion

This study on the aquatic insect communities of Diplai Beel and Dhir Beel in Kokrajhar District, Assam, has provided valuable insights into the diversity and distribution of aquatic insects in these freshwater ecosystems. The research revealed a total of 28 species across six orders, with Hemiptera being the most diverse and abundant order, followed by Coleoptera.

Diplai Beel exhibited higher species richness and diversity compared to Dhir Beel, attributed to its more favorable water quality and environmental conditions. The higher dissolved oxygen levels in Diplai Beel support a richer aquatic community, making it a more conducive habitat for a variety of insect species. In contrast, Dhir Beel's lower dissolved oxygen levels and potential water quality issues could be limiting factors for certain aquatic insects, leading to reduced species diversity.

The findings underscore the importance of water quality in determining the diversity and abundance of aquatic insect communities. Species such as Hymenoptera and Ephemeroptera, which are highly sensitive to pollution, were found in lower numbers, indicating that the health of the water bodies is crucial for maintaining diverse insect populations.

Overall, this study highlights the need for continuous monitoring and management of aquatic ecosystems to

preserve their ecological balance. Understanding the factors influencing aquatic insect diversity can inform conservation strategies and help protect these vital components of freshwater ecosystems. Future research should focus on long-term monitoring and explore additional factors affecting aquatic insect communities to ensure the sustainability and health of these important habitats.

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Conflict of Interest

The author declares no conflict of interest.

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