# THE AQUATIC INSECT COMMUNITY IN GWALIOR DISTRICT, MADHYA PRADESH: A BIODIVERSITY STUDY

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## Abstract
*Insects that spend a portion of their life cycle in water are said to be aquatic. Aquatic insects play a key role in the environment and are an important food source for fish and amphibians. More than 500 species of water insects, mostly Ephimeroptera, Odonta, and Trichoptera, may be found in India's inland marshes. From August 2019 to November 2019, the research was carried out in the early morning hours. For the research, three locations—a vegetation site, an agricultural location, and a damaged vegetation location—were chosen. The list of water insects that have been seen includes information on their taxonomy, order, family, scientific name, and common name. In three distinct locations, a total of 24 species of aquatic insects were discovered. The research of insect populations at several locations showed that abiotic and biotic variables controlled the number of aquatic insects.*

***Keywords***: *Diversity; Aquatic Insects; Environment; Habitat;*

## Introduction
The most varied class of creatures in freshwater are insects. Insects that spend a portion of their life cycle in water are said to be aquatic. About 45000 different bug species have been found to live in various freshwater habitats. In certain freshwater biotopes, where less than 3% of all bug species have aquatic stages, insects may make up more than 95% of all macroinvertebrate species or individuals. They maintain the health of freshwater habitats by playing significant ecological functions (Choudhary and Janak, 2015).

Diverse functional aquatic insect feeding groups, such as shredders, scrapers, filter feeders, and predators, are crucial linkages in the recycling of nutrients. Most of the wood and leaf litter that enters the marsh from the surrounding landscape is processed by aquatic insects. Aquatic insects break down nutrients into forms that may be absorbed, and this process is continued by fungi and bacteria. This nutrient soup that is conveyed through the wetlands is absorbed by plants in the riparian zone. Aquatic insects provide this important ecological role in addition to serving as a major source of food for fish and amphibians (Tachet et al., 2003).

It has been debatable where aquatic insects come from and if they were initially or afterwards adapted to watery environments. The progenitor of the Myriapod-insect group, which includes millipedes, centipedes, and insects, is widely believed to have resided in leaf litter regions along pond edges. Aquatic insects have their roots in the primitive insects of this humid habitat. Their Paleozoic period fossil record goes all the way back to the Devonian. The only insects having aquatic juveniles among extended aquatic insects are mayflies (Ephemeroptera) and dragonflies (Odonata), which are also the most rudimentary. Due to the scanty fossil record of freshwater creatures, it has been difficult to comprehend the evolution and phylogeny of aquatic insects. Aquatic insects may survive in any kind of climate

and can resist a tough environment (Polhemus, 1979). Aquatic insects sustain groups of higher creatures including fish, frogs, and others as well as the river's nutrient cycle via their feeding patterns (Kumar, 2014).

India is home to over 108276 different insect species and has a diverse ecosystem. According to Mittermeier et al. (1997), the Indian subcontinent is one of the world's mega biodiversity nations, ranking tenth in terms of freshwater mega biodiversity. More than 500 species of aquatic insects live in the inland wetlands of India, most of which belong to the Ephemeroptera (mayflies), Odonata (dragonflies), and Trichoptera (caddisflies) order (Subramanian and Sivaramakrishnan, 2007). The variety of water insects in Gwalior has been evaluated in the current research.

**Study Area**

The Ramaua Dam is located in Madhya Pradesh, India, on the eastern side of the city of Gwalior. situated close to the Ramaua settlement at the geological coordinates 78° 10' 58.1916" E and 26° 13' 5.8332" N.A mountainous terrain surrounds the dam.The Morar River is the one that runs beside it.

The size of this dam is around 3177 hectares, of which 4400 hectares are utilized to grow kharif crops and the rest area is used to grow rabi crops. Both the low and full reservoir levels are 214.88 and 225.55 meters, respectively.The maximum water level capacity is about 226.77 M, the dead storage water capacity is 0.141 cubic meters, and the difference between the two is 10.06 M (Figure 1).

**Methodology**

The research was carried out in the early morning hours. For the research, three locations—a vegetation site, an agricultural location, and a damaged vegetation location—were chosen. The aquatic entamofauna were sampled using kick nets with a mesh size of 500 m across a length of 100 m reach. Between each collecting station, a dip net was put. To get invertebrates stuck to rocks and detritus and into the kick net, substrates one meter above the stream bottom were kicked. Invertebrates were gathered when the container's contents were dumped onto the tray. Specimens adhering to plants, root mats, etc. along the border were captured using a kick net (Merit and Cummins, 1988). Jars filled with formalin were used to preserve the obtained specimens. With the aid of departmental specialists, they were located.

**Result and Discussion**

Table 1 lists the taxa, orders, families, scientific names, and popular names of the aquatic insects that have been seen. In all, 24 species of aquatic insects from 6 orders and 18 families have been identified from the three sample locations used in the current research.

The site 1 of the water body, where the most of the macrophytes were present, was where the bulk of the aquatic bug species (17 in all) were discovered. A total of 11 and 15 species, respectively, were noted from sites 2 and 3 (Table 2). occurrence of many bug species due to refuge, nesting grounds, and food sources provided by the lush aquatic flora, which has also been seen at site 1.

105 individuals of the greatest total number of species were recorded at site 1 throughout the research period, whereas 64 and 68 individuals of the same species were reported at sites 2 and 3, respectively. Beetles of the Hydrophilidae family live in shallower areas of bodies of water that are

rich in macrophytes and typically eat detritus, algae, and dead plant material (Khan and Ghosh, 2001).

From Lakhabanjara Lake in Sagar, Choudhary and Janakahi (2015) found 12 species of aquatic insects. From Kishanpura Lake in Indore, Sharma et al. (2010) found 12 species of aquatic insects. (Venkateswarju, 1969) found similar findings from Hyderabad's Moosi River. Anthropogenic activities disrupted sites 2 and 3, which explains why there was a lack of insect variety there. According to Hepp et al. (2013), habitat loss and changes in water chemistry may result in a decrease in the variety of aquatic macroinvertebrates.

Table 4 lists the family-wise recorded species from the research region, and Figure 1 displays the family-wise proportion of species reported. The Coenagrionidaes family has the greatest proportion, while the other three species in the family have the lowest percentages. Insects from the order Hemiptera were found to be the most prevalent, while those from the order Lepidoptera were found to be the least prevalent, according to the overall species diversity.

the proportion of recorded bug species from different families. However, the species from orders Hemiptera and Diptera were found to be prominent throughout the research period with a percentage composition of 38% and 24% respectively. Aquatic insect taxa from orders Lepidoptera and Ephemeoptera were relatively low in diversity contributing just 5 and 9%.

**Table 1: Checklist of aquatic insect recorded from study area during study period**

| S. No. | Order | Family | Scientific name | Common name |
|---|---|---|---|---|
| 1 | Coleoptera | Hydrophilidae | Tropisternus lateralis | Hydrophilid beetle |
| 2 | | Notoridae | Hydrocanthus sp. | Burrowing water beetle |
| 3 | Hemiptera | Belostomidae | Diplonychus indicus | Water bug |
| 4 | | | Lethocerus indicus | Giant water bug |
| 5 | | Corixidae | Sigara alternate | Water boatman |
| 6 | | Nepiidae | Nepa sp. | Water scorpion |
| 7 | | | Ranatra sp. | Water stick insects |
| 8 | | Veliidae | Microvelia sp. | Common pond skater |
| 9 | | Naucoridae | Pelocoris sp. | Creeping water bugs |
| 10 | | Notonectidae | Notolecta undulate | Grouse winged back swimmer |
| 11 | Diptera | Syrphidae | Eristalis sp. | Rat tailed |

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|---|---|---|---|---|
| | | | | maggots |
| 12 | | Chironomidae | Diamesinae sp. | Non-biting midges |
| 13 | | | Chironomus sp. | Blood worm |
| 14 | | Ephidridae | Brachydeutera sp. | Shore flies |
| 15 | | | Ephydra sp. | Brine flies |
| 16 | | Psychodidae | Telmatoscopus sp. | Lake flies |
| 17 | | Stratiomyidae | Euparyphus sp. | Soldier flies |
| 18 | Odonata | Coenagrionidaes | Ischnura sp. | Blue tailed damsel fly |
| 19 | | | Enallagma | Bluets |
| 20 | | | Ischnura aurora | Golden dartlet |
| 21 | | Petaluridae | Tachopteryx | Damsel flies |
| 22 | Lepidoptera | Pyralidae | Ostrinia sp. | Aquatic moth |
| 23 | Ephemeroptera | Leptophlebiidae | Leptophlebia | Black and blue quills |
| 24 | | Siphlonuridae | Ameletus | Brown dun |

**Table 2: Presence of aquatic insect at different selected sites**

| S. No. | Common name | Site 1 Rich Vegetation | Site 2 Agricultural | Site 3 Disturbed |
|---|---|---|---|---|
| 1 | Tropisternus lateralis | + | - | - |
| 2 | Hydrocanthus sp. | + | - | - |
| 3 | Diplonychus indicus | - | - | + |
| 4 | Lethocerus indicus | + | + | + |
| 5 | Sigara alternata | + | - | + |
| 6 | Nepa sp. | + | + | + |
| 7 | Ranatra sp. | + | + | + |
| 8 | Microvelia sp. | + | - | - |
| 9 | Pelocoris sp. | - | - | + |
| 10 | Notolecta undulate | + | - | - |
| 11 | Eristalis sp. | - | + | + |
| 12 | Diamesinae sp. | + | + | + |
| 13 | Chironomus sp. | + | + | + |
| 14 | Brachydeutera sp. | + | - | - |
| 15 | Ephydra sp. | + | - | - |
| 16 | Telmatoscopus sp. | - | - | + |
| 17 | Euparyphus sp. | + | - | + |
| 18 | Ischnura sp. | + | - | + |
| 19 | Enallagma | - | + | + |
| 20 | Ischnuraaur | + | + | - |

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|---|---|---|---|---|
| | ora | | | |
| 21 | Tachopteryx | + | + | + |
| 22 | Ostrinia sp. | - | + | - |
| 23 | Leptophlebia | + | + | - |
| 24 | Ameletus | - | - | + |
| Total | | 17 | 11 | 15 |

**Table 3: Abundance of recorded species at selected sites**

| S. No. | Common name | Site 1 Vegetation rich | Site 2 Agricultural site | Site 3 Disturbed site |
|---|---|---|---|---|
| 1 | Tropistern us lateralis | 3 | 0 | 0 |
| 2 | Hydrocant hus sp. | 5 | 0 | 0 |
| 3 | Diplonych us indicus | 0 | 0 | 2 |
| 4 | Lethoceru s indicus | 8 | 6 | 4 |
| 5 | Sigara alternata | 7 | 0 | 2 |
| 6 | Nepa sp. | 5 | 5 | 4 |
| 7 | Ranatra sp. | 4 | 3 | 4 |
| 8 | Microveli a sp. | 1 | 0 | 0 |
| 9 | Pelocoris sp. | 0 | 0 | 5 |
| 10 | Notolecta undulate | 3 | 0 | 0 |
| 11 | Eristalis sp. | 0 | 5 | 5 |
| 12 | Diamesina e sp. | 3 | 1 | 2 |
| 13 | Chironom us sp. | 1 | 3 | 1 |
| 14 | Brachydeu tera sp. | 5 | 0 | 0 |
| 15 | Ephydra sp. | 6 | 0 | 0 |
| 16 | Telmatosc opus sp. | 0 | 0 | 3 |
| 17 | Euparyph us sp. | 5 | 0 | 3 |
| 18 | Ischnura sp. | 10 | 0 | 5 |
| 19 | Enallagma | 0 | 7 | 13 |
| 20 | Ischnuraa urora | 14 | 0 | 0 |
| 21 | Tachopter yx | 10 | 7 | 10 |
| 22 | Ostrinia sp. | 0 | 8 | 0 |
| 23 | Leptophle bia | 15 | 12 | 0 |
| 24 | Ameletus | 0 | 7 | 5 |
| Total | | 105 | 64 | 68 |

**Table 4: Family wise recorded species in study area**

| S. No. | Name of family | Total No. of recorded species |
|---|---|---|
| 1 | Hydrophilidae | 1 |
| 2 | Notoridae | 1 |
| 3 | Belostomidae | 2 |
| 4 | Corixidae | 1 |
| 5 | Nepiidae | 2 |
| 6 | Vellidae | 1 |
| 7 | Naucoridae | 1 |
| 8 | Notonectidae | 1 |
| 9 | Syrphidae | 1 |
| 10 | Chironomidae | 2 |
| 11 | Ephidridae | 2 |
| 12 | Psychodidae | 1 |
| 13 | Stratiomyidae | 1 |
| 14 | Coenagrionida es | 3 |
| 15 | Petaluridae | 1 |
| 16 | Pyralidae | 1 |

| | | |
|---|---|---|
| 17 | Leptophlebiidae | 1 |
| 18 | Siphlonuridae | 1 |

## Conclusion

The makeup of aquatic insect populations at the various research locations is described in this paper. The impact of both natural and artificial interferences on the variety of aquatic insects is shown. The capacity of aquatic insects to identify the water quality in a certain location is arguably their best-known trait. One may determine the health of the ecosystem by analyzing a sample of aquatic insects in a certain location to determine which species are sensitive and which species are tolerant.

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