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"STUDIES ON BIODIVERSITY AND DISTRIBUTION OF AQUAITIC INSECT"

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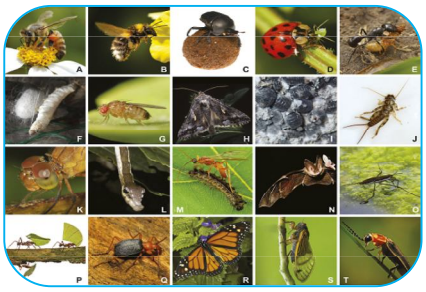
ABSTRACT:



Insects are important representatives of the biodiversity of ecosystems. A majority of the insect species lives in freshwater environments, such as swamps, ponds, lakes, springs, streams and rivers these are called aquatic insects. There are about 8600 species of insects, falling under 12 orders, 150 families, known to inhabit diverse freshwater ecosystems. They play important ecological roles in keeping freshwater ecosystems functioning properly. There are many different kinds of aquatic insects as almost every type of freshwater environment habitat from puddles to river to lakes, including both lentic and lotic habitats, can belong to various species of aquatic insects. Aquatic insects are considered as model organisms in analyzing the structure and function of the freshwater ecosystem because of their high abundance, high birth rate with short generation time, large biomass and rapid colonization of freshwater habitat. The aquatic biodiversity gets affected by several factors such as industrial pollution or anthropogenic activities. Hence, this chapter is discussing about the diversity, habitats, roles, constraints and conservation of aquatic insects.

KEYWORDS: *Diversity, Habitats and Aquatic Insect.*

INTRODUCTION:

India is one of the mega diverse countries, with a notable diversity of aquatic habitats of about 3,166,414 Km2 with significant variations in rainfall, altitude topography and latitude. Insects are the most diverse group of organisms in freshwater. Estimates on the global number of aquatic insect species derived from the fauna of North America, Australia and Europe is about 45,000, of this about 5,000 species are estimated to inhabit inland wetlands of India (Amaravathi *et al*., 2018; Rao *et al*., 2020). Aquatic insects of inland wetlands comprise some well-known groups like mayflies (Ephemeroptera), dragonflies (Odonata) and caddiesflies (Trichoptera). Aquatic insects such as dragonflies and damselflies (Odonata) are very colourful and prominent insects of the wetlands. Different functional feeding groups of aquatic insects such as shredders, scrapers, filter feeders and predators are important links in nutrient recycling (Subramanian and Sivaramakrishnan, 2007; Collins, 2012). Aquatic insects primarily process wood and leaf litter reaching the wetland from the surrounding landscape. Nutrients processed by aquatic insects are further degraded into absorbable form by fungal and bacterial action. Plants in the riparian zone absorb this nutrient soup transported through the wetlands. In addition to this significant ecosystem function, aquatic insects are also a primary source of food for fishes and amphibians.

The biodiversity and distribution of aquatic insects can vary depending on a range of factors, including habitat type, water quality, and geographic location. Aquatic insects are one of the most

diverse groups of organisms in aquatic ecosystems, with over 100,000 species worldwide. They are found in a wide range of aquatic habitats, from fast-flowing streams and rivers to stagnant ponds and lakes. Here are some key points about the biodiversity of aquatic insects:

Taxonomic diversity: Aquatic insects belong to a variety of taxonomic groups, including mayflies, stoneflies, caddisflies, dragonflies and damselflies, and aquatic beetles. Each of these groups has unique morphological, physiological, and behavioral adaptations that allow them to survive and thrive in aquatic habitats.

Functional diversity: Within each taxonomic group, there is also functional diversity, as different species may occupy different niches within aquatic ecosystems. For example, some mayflies are shredders, which feed on decaying plant material, while others are predators, which feed on other aquatic organisms.

Ecological importance: Aquatic insects play important roles in aquatic ecosystems, both as predators and as prey. They are a critical source of food for many larger aquatic organisms, including fish, amphibians, and birds. They also play important roles in nutrient cycling and in maintaining water quality.

Threats to biodiversity: Aquatic insect biodiversity is threatened by a range of factors, including habitat loss and degradation, pollution, climate change, and invasive species. These threats can impact the distribution and abundance of aquatic insects and can lead to declines in population sizes and even extinctions.

Importance of conservation: Conservation efforts are critical for maintaining the biodiversity of aquatic insects. By protecting and restoring habitats, reducing pollution, and managing invasive species, conservation efforts can help to support healthy and diverse aquatic ecosystems and ensure the continued survival of aquatic insects and other aquatic organisms.

The distribution of aquatic insects can vary widely depending on habitat type, water quality, and geographic location. For example, some species of aquatic insects are adapted to fast-flowing, oxygen-rich streams and rivers, while others are adapted to more stagnant, nutrient-rich ponds and lakes. Some species may also have restricted geographic distributions, while others may be more widely distributed across different continents.

DISCUSSION:

Aquatic insects are adapted to either running waters (streams and rivers) or standing waters (ponds and lakes). These habitats can also be viewed as erosional habitats frequently colonize lake shorelines. Similarly, many species of depositional habitats are common in flood plain pools and backwaters. The habitats for the aquatic insects can be visualized within the framework of various spatial-temporal scales. At a spatial scale, it ranges in size from particles of few millimeters to the entire drainage basin, which extends to squares of kilometers. Temporally, the changes in the habitats can be visualized from days to thousands of years. The permanence of the physical structures of the habitats varies with the spatial scale. This ranges from few days for individual grain and microhabitat to thousands of years for the drainage network. Insect communities of the wetlands respond to this spatial temporal variation as well. Within a given habitat, aquatic insects maintain their location by clinging, swimming, skating or burrowing into the habitat (Hershey *et al*., 2010).

Distribution of aquatic insects within a habitat is determined by intricate interplay between substrate, flow, turbulence and food availability. The habit (mode of locomotion, attachment or concealment) of a given species determines the frequency of movement within the habitat Substrate, an important physical component of habitat is very complex. The water current and the nature of the available parental material determine the physical nature of the substrate. The organic detritus adds

complexity to the substrata and can strongly influence the organism's response to the substrate. It has been established across continents and biomes that the faunal composition changes with the substrate. Sand is a relatively poor habitat with low (streams and rivers) or depositional (ponds and lakes). Both stream/river currents and lake shoreline waves create erosional habitats while lake basins, river flood plain pools and stream/river backwaters provide depositional conditions. Species adapted to erosional abundance and diversity (Subramanian and Sivaramakrishnan, 2007).

Relatively, the diversity is high in silty sand and biomass may be high and diversity low in muddy substrata. The presence of sand and silt reduces and changes fauna. At least in stony substrata it is known that the space available for colonization determines species abundance. In general, diversity and abundance increase with substrate stability and the presence of organic detritus (Collins, 2012).

CONCLUSION:

In conclusion, the diversity of aquatic insects is vast and impressive, with a wide range of species that inhabit freshwater ecosystems such as streams, rivers, lakes, and wetlands. These insects have adapted to various aquatic environments and play vital roles in freshwater ecosystems, including as primary consumers and decomposers of organic matter. Aquatic insects come in different shapes and sizes, with a wide range of adaptations to their aquatic lifestyle. For example, some species have flattened bodies that allow them to cling to rocks and other surfaces in fast-moving streams, while others have streamlined bodies that enable them to move quickly through the water. The diversity of aquatic insects also has significant ecological and economic importance, as they serve as important indicators of water quality and provide crucial services such as pollination and pest control. In addition, many aquatic insects are used as a food source for fish and other aquatic animals, making them an important component of freshwater food webs. Aquatic insects play complex and important roles in aquatic ecosystems, contributing to the health and functioning of these unique and diverse habitats.

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