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"STUDIES ON ECOLOGICAL FACTOR AFFECTING AQUATIC INSECTS"

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ABSTRACT:

Aquatic insect communities can be found on a gradient from very biologically heterogeneous to very homogeneous, in diversity and abundance that is influenced by environmental factors. These organisms require specific hydraulic, substrate and oxygen requirements that can cause spatially distinct communities. Aquatic insect community diversity and integrity are important due to the functional ecosystem roles they perform; therefore, landscape, biotic, abiotic, and anthropogenic factors can all influence the community composition. This issue will address how certain insect community composition responds to stream flow and anthropogenic impacts as drivers of community composition in disease ecology.

KEYWORDS: *Aquatic insect, Diversity and Important.*

INTRODUCTION

The advancement of our knowledge on the ecology and biology of aquatic insects is essential to improving our understanding of their roles in water quality, disease ecology, as indicators of climate change, biodiversity, as well as community structure and ecosystem functioning. Over the past 100 years, large strides in research have been made in the ecology and biology of aquatic insects that have expanded our knowledge on their diversity, life histories, potential as surrogates for ecosystem attributes, as well as ecosystem energetic. Aquatic insects are found within the interfaces of terrestrial and mainly freshwater ecosystems such as lentic systems, e.g., lakes, ponds, wetlands, bogs, as well as lotic systems, e.g., springs, streams, and rivers, while only a few occur in truly marine habitats. Aquatic insect communities can vary greatly within and among habitats but also according to how humans have altered adjacent lands, and these communities play significant roles within the freshwater ecosystems they inhabit whether through the cycling of nutrients or via their overall contribution to secondary production. Aquatic insects contribute to the trophic structure of the ecosystems by filling functional roles ranging from detritivores up to predators, along with being food sources for vertebrate and invertebrate predators. As many aquatic insects have both aquatic (larval and adult) and terrestrial (adult) life stages, their impact is not limited to the aquatic environment alone and stretches into the terrestrial riparian environment.

Aquatic insects are those insects that spend some part of their lifecycle closely associated with water, either living beneath the surface or skimming along on top of the water. The immature stages are truly aquatic while the adult is a winged terrestrial form. They are abundant in most freshwater habitat.

Different substratum like stones, muds, logs and in all type of fresh water habitat aquatic insects have high majority.

The insects comprise the most diverse group of organisms that exist on the earth. All over the world about 45000 species of insects are known to inhabit diverse freshwater ecosystems. 3% of all species of insects have aquatic stages and thirteen orders of insects contain species with aquatic or semi aquatic stages. In five of these orders (Ephemeroptera, Odonata, Plecoptera, Megaloptera, and Tricoptera), aquatic stages are possessed by all species. The remaining eight orders contain terrestrial as well as aquatic or semi aquatic representatives. Semi aquatic species live in damp marginal habitats (e.g., some Hemipterans), or are associated with the upper surface of the air-water interface (e.g., some Collembolans), or normally live above the water surface only submerging temporarily, perhaps for concealment (e.g., some Orthopterans). With the exception of a few rare and interesting examples, only aquatic beetles and bugs contain species in which both adult and immature stages occur under water, aerial adults characterize the other aquatic orders that are, therefore, amphibiotic (Ward,1996).

DISCUSSION:

Aquatic insects, an important component of aquatic ecosystems are very abundant and diverse group that inhabits a variety of aquatic environment (Zborowski and Storey, 1995). Aquatic insects serve as food for fish, amphibians, and water birds. They are known to play a very significant role in the processing and cycling of nutrients as they belong to several specialised feeding groups such as shredders, filter feeders, deposit collectors and predators (Lamberti and Moore, 1984). Cummins and Klug (1979) classified the aquatic insects into five trophic categories: collectors, who feed on fine particulate organic matter (FPOM), in which the size of the organic matter particles (usually plant debris) is smaller than 1mm; shredders, in which the food particles (plant) are larger than 1mm (CPOM, coarse particulate organic matter); scrapers, that ingest the periphyton; piercers, that feed on dissolved organic matter; and predators, that hunt other macro invertebrates, especially aquatic insects larvae. They are important organisms dwelling at the secondary trophic level of the ecosystem and have a significant role in the aquatic ecosystem functioning.

Ecological factors are any abiotic or biotic factor which influences living organisms. In lotic ecosystem aquatic insects are affected by various ecological factors (chemical and physical) such as water temperature (WT), pH, water velocity, Concentration of Dissolve Oxygen (DO), Free Carbondioxide (CO_2), Total Alkalinity (TA) and other various factors. When changes occur in abiotic ecological factors that directly affects the distribution, abundance and diversity of aquatic insect fauna (Bream *et al*. 2017).

Various insect species are depending in water temperature (WT) for their emergence, metabolism and respiration. The order Hemiptera is temperature dependent species, as this favors their rate of feeding and metabolism (Oben 2000). Similarly WT has been a significant determinant of the structure and distribution of aquatic beetle communities (Taher and Heydarnejad 2019). Mayflies are greater demand of WT for their egg development, low thermal conductivity affect the proper development of eggs (Brittain 1990). The emergence and survivable of various insect species affected by water pH, the pH of water decreases, the percentage of aquatic insects which emerge successfully also decreases (Bell 1970). Some species of Trichoptera can tolerate low pH in water and survive well. Water velocity is one of the most important abiotic factors influencing the survival of aquatic insects in rivers and streams. Hydropsychidae were most affected taxa caused by the heavy water flow and their distribution was low in rainy season (Ridzun *et al*. 2020).

Freshwater stream with highest dissolved oxygen have greater number of benthic insects. Concentration of oxygen levels below 2 mg/L may reduce the fitness and chances of survival for many aquatic insects. Dissolved oxygen (DO) play significant role in the diversity of benthic insects, where their number was greater with highest dissolved oxygen (Arimoro and Ikomi 2009). The sensitive group of insects that Ephemeroptera, Plecoptera, Trichoptera (EPT) were very sensitive to concentration of DO in water. TA values of 20-200 mg/L are common in fresh water ecosystems and TA below 10 mg/L indicates poorly buffered rivers. These rivers are least capable of resisting changes in

pH, therefore they are more susceptible to problems which occur as a result of acidic pollutants (Biggs 1995). When free carbon dioxide (CO2) levels increase in fresh water creates weak acidification. These weak acidification influences freshwater biota and ecosystems (Hasler *et al*. 2018).

Objectives :

Main objectives of the present study are:

(1) To assess the aquatic insects from study area.
(2) To find out the relationship between aquatic insect assemblages and environmental variables.
(3) To assess the health of the Sidhi with the help of presence or absence of aquatic insects.
(4) To compare the pre and post monsoon variation of abundance and diversity in aquatic insects.
(5) To determine the relation of aquatic insects with water quality parameters (Temperature, pH, Velocity, Dissolve oxygen (DO), Free Carbondioxide (CO2) and Alkalinity).

Relationship between Insect and Water quality

The relationship between the composition of the aquatic community and water quality has long been recognized. Two commonly used methods for evaluating water quality by looking at macroinvertebrates are indicator organisms and diversity indices. The concept of indicator organisms is based on the fact that every species has a certain range of physical and chemical conditions in which it can survive. Some organisms can survive in a wide range of conditions and are more "tolerant" of pollution. Others are very sensitive to changes in conditions and are "intolerant" of pollution. Some examples of pollution-sensitive organisms are mayflies, stoneflies, some caddisflies, riffle beetles, and hellgrammites. Examples of pollution tolerant organisms are sludge worms, leeches, and certain midge larvae.

In spite of their importance as biomonitors, bioindicators, predators and bio-control agents, conservationists are far from able to enlist all species under threat and the analytic method for the identification of biodiversity hotspot omits invertebrates which are largely un-documented but probably make up at least 95% of all species, the bulk of them insects.

CONCLUSION:

In conclusion, ecological factors such as water quality, temperature, and flow rate are critical for understanding the abundance and diversity of aquatic insects in freshwater ecosystems. These factors play important roles in the growth, development, behavior, and distribution of insect populations. Poor water quality, changes in temperature, and alterations to flow rate can have significant impacts on aquatic insect populations, which in turn can have cascading effects on the entire freshwater ecosystem. Understanding these ecological factors and their interactions is essential for effective management and conservation of aquatic insect populations and their habitat. As human activities continue to alter freshwater ecosystems, it is increasingly important to understand and mitigate the impacts of these changes on aquatic insects and other aquatic organisms. By studying the ecological factors affecting aquatic insects, we can better understand the complexities of freshwater ecosystems and work towards sustainable management and conservation practices.

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