

Study on Importance of Aquatic Beetles in Freshwater Ecosystem.

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Abstract: The insects are the most diverse and large group of organisms existing on the earth. Few of them spend most of or part of their lives in water and are distinguished as aquatic insects. Among these the order coleoptera or commonly known as water beetles represent about 30% of all the known beetles. These comprise not only a taxonomically diverse and ecologically important group but are also the most interesting animals in freshwater ecosystem. Aquatic ecosystem perform numerous valuable environmental functions with help of these aquatic beetles. They serve many purposes, they serve as food for many fish and other invertebrates. They help in processing and recycling of nutrients as they belong to many feeding groups such as shredders, deposit collectors and predators and are very good indicators of pollution and water quality. In spite of their importance as biomonitors, bioindicators predators and biocontrol agents conservations are unable to enlist all species which are under threat. Thus, this study is a little attempt to focus on the importance of such interesting aquatic insects in the freshwater ecosystem.

Keywords: *Ecosystem, Aquatic beetles, Predators, Bioindicators.*

Introduction

Freshwater ecosystems have been found to serve as the home for 45,000 species of insects all over the world¹. Freshwater includes both lentic and lotic habitats. To maintain the stability of aquatic ecosystem, its aquatic biodiversity is very essential^{2, 3}. The aquatic beetles play an important role in ecosystem functioning by virtue of their abundance and taxonomic diversity. Aquatic beetles are classified in the order Coleoptera which comprise about 350 species from several families. Members of the families Gyrinidae, Haliplidae, Dytisidae, Hydrophilidae, Noteridae, Hydraenidae, Dryopidae, Elmidae, Psephenidae and Amphizoidae are considered to be aquatic⁴. They are of great importance as they serve many purposes. They are food for many fish and other invertebrates⁵. Some of them are very sensitive to pollution and prefer good water quality which serves them as reliable indicator of ecological

characteristics of water⁶. They play a significant role in processing and cycling of nutrients as they belong to several feeding groups such as shredders, filter feeders, deposit collectors and predators⁷. The developments of new bio monitoring tools using aquatic insects are of great effort among the aquatic entomologists⁸. Thus it is very clear that aquatic beetles are good indicators of biological diversity and ecological quality of the aquatic ecosystem that they inhabit^{9, 10, 11}. In spite of this very little attention has been paid on the studies and conservation measures of these beetles. Thus the main objective of this study is to provide robust information on their importance in the freshwater ecosystem.

Aquatic beetles as Bio-indicators and biomonitors

Bio monitoring or Bio indication is the science in which organisms that live within the natural ecosystem are used to monitor the changes in that particular ecosystem. Monitoring water

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quality by conventional chemical methods can tell us very little about the effects of pollution on aquatic life. In contrast, biological monitoring gives an indication of past conditions as well as current condition^{12, 13}. The integration of biological parameters to physiochemical assessments has proven to be a more complete method to fully assess pollutant effects in aquatic ecosystem¹⁴. The most important biota used for bio assessment studies are benthic macro invertebrates. Among these, aquatic insects are one of the most common groups of organisms used to assess the health status of aquatic ecosystem¹⁵. Aquatic beetles also belong to these diverse groups of benthic fauna. They inhabit almost every type of aquatic ecosystem and have a number of features that make them as excellent indicator group. These include high species richness, wide ecological or habitat range, high functional diversity (reflecting multiple aquatic colonizations), relative ease of sampling and the fact that they are relatively well known taxonomically and biogeographically^{16, 17, 18}. Using beetles as indicator organisms is very beneficial because they have limited mobility or are sedentary and therefore they can become good assessors of pollution impact on a specific habitat. Moreover, using them as biondicators is environmental friendly and is less expensive. That is why they are generating great interest in researches regarding conservations of aquatic ecosystem.

Role of aquatic beetles in food chain

Aquatic beetles are an important part of freshwater ecosystem both in larval and adult stages. They are responsible for nutrient recycling and maintenance of the natural food webs of the ecosystem. They belong to different feeding groups such as shredders, filter feeders, deposit collectors and predators⁷. These beetles help in breaking down the leaf litters reaching the water bodies and this material provides the base of food chain in aquatic environment. Adult Hydrophilids commonly known as water scavenger beetles, scrape the

algae grown on the rocks, logs and stems of the plants and help in maintenance of oxygen production. Some of them filter fine particles suspended in water and help to keep water clean enough so that light can easily penetrate for the use of algae and other aquatic plants. These insects mix the soft bottom sediments as they burrow in search of food and shelter and thus make the bottom healthier for organisms as it provides oxygen from water to the bottom. Predators such as *Dytiscus* belonging to family Dytiscidae commonly known as great diving beetles reduce the number of other invertebrates and help to keep the balance among different kind of organisms and the food that is available. Thus due to different mode of feeding habits these beetles play a significant role in proper functioning of food chain in the aquatic ecosystem.

Aquatic beetles as bio-control agents:

Aquatic insects have been introduced worldwide to control the noxious weeds which create great problem for the native species and water bodies. *Berosus ingeminatus*, a hydrophilid beetle, found in California is a predatory specialist of epiphytic midges and thus are greatly used in the management of midges²⁰. Many herbivore species of insects have shown good results in this field. Further studies are going on to prove the usefulness of aquatic beetles as bio-control agents.

Conclusion:

The study provides a baseline about the importance of aquatic beetles in the freshwater ecosystem. It concluded that these are excellent indicators of water quality and perform valuable functions for the maintenance of the aquatic ecosystem. In spite of this, number of researchers working on beetles is very low making it difficult to achieve adequate knowledge on this group. Basic knowledge towards them is necessary as they can guide the formulation of conservation measures. In view

of this, there is need to encourage more and more works on beetles.

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