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Diversity and distribution of aquatic insects in Sai River at Raebareli, U.P.

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Abstract

The present investigation will contribute towards the knowledge of the assessment of species diversity of aquatic insects of the Sai River at Raebareli district of U.P. Monthly sampling of aquatic insects was conducted at three sites of the river during July 2022 to December 2022. A total of 22 genera belonging to 6 orders and 18 families were identified. Among them, the order Hemiptera was the most dominant, followed by the order Odonta (5 genera), Diptera (3 genera), Coleoptera (2 genera), Trichoptera (2 genera) and Ephemeroptera (2 genera). The study shows many parts of the river started to deteriorate hence the complete absence or less abundance of sensitive/ pollution intolerant species are less in the study. Therefore, immediate attention and proper maintenance of the river is to be suggested.

Keywords: Diversity, Aquatic insects, Sai River.

Introduction

India is gifted with vast freshwater consisting 45,000 km of rivers, 26,334 km of canals, 2.36 million hectares of ponds and tanks, 2.05 million hectares of reservoirs and 5,82,86,000 hectares of wetlands (Rani and Kumar, 2020; Rani and Arya, 2021) ^[13, 12]. The wetland is associated with biodiversity and the biodiversity is influenced by climate change and anthropogenic activities (Prakash, 2021; Verma, 2021a; Prakash and Verma, 2022; Kumar and Gupta, 2022) ^[8, 18, 10, 6]. There is a necessity of ecological balance for widespread biodiversity and human survival (Verma, 2017a, Ashok, 2018) ^[15, 3].

Freshwater insects play important role in ecosystem functioning viz. nutrient cycling, primary production, decomposition and materials translocation. They are vital for riparian and flood plain food webs, processing organic matter and transporting energy along stream channels, laterally to the flood plains and even vertically down into the stream bed. In many streams, lake, river and associated ecosystems, activities of aquatic insects can alter water quality and influence energy flow patterns in different trophic levels; their biological interactions often have significant effects on community structure. The river water is useful both for sustainable and unsustainable agriculture but pollution not only badly affect the agriculture but also aquatic biota (Verma, 2017b) ^[16]. In general, rivers have good aquatic resources (Chakraborty *et al.*, 2021; Arya, 2021; Rani and Arya, 2021) ^[5, 1, 12].

Insecta is the largest class of animal kingdom (Verma and Prakash, 2020) ^[20]. Aquatic insects are present in some quantity in almost every type of habitat and many are habitat specialists so that they often make good indicators. Because of their differential responses to stimuli in their aquatic habitat and determining the quality of that environment aquatic insects are used for monitoring the health of aquatic environments. Some of these insects may be beneficial to human being, and some of them are quite harmful to us. At the larval stage, they constitute the principal nutritive fauna of fish (Bismi and Pillai, 2016) ^[4]. A review of literature revealed that many researchers have studied on various water bodies of Uttar Pradesh with respect to limnology and biodiversity of aquatic insects in U.P. including Prakash and Verma (2019) ^[11] and Prakash and Verma (2020) ^[9] but the aquatic insects of Sai River of U.P. at Raebareli district, the subject matter of present study, were never studied before.

Materials and Methods

Study area: River Sai is an important river of U.P., originated from village Bijgwan near Pihani in district Hardoi and travel about 600 km to form district boundary between Lucknow and Unnao.

After passing through HarDOI, Raebareli and Jaunpur district, it finally joins the Gomati River at Rajepur in Jaunpur district. The total course of the Sai River in the Raebareli district is about 100 km in length. The Sai catchment is bounded in north by Ghaghara catchment while in south by Ganga catchment. Throughout its journey Sai River travel in the alluvial terrain and transports the sediment derived from Himalayan terrain. In its long journey, the river receives water from other streams also namely Bhainsta, Loni, Sakarni and Bakulahi rivers (Kumari and Chaurasia, 2015) [7].

Methodology

The study was conducted during the post monsoon period of the year 2022. Three sampling stations (S1, S2 and S3) were selected in the Sai River at Raebareli, U.P. by the nylon pond net method (Subramanian and Sivaramakrishnan, 2007) [14]. The insects collected from all the three samples from each habitat type were pooled together and sorted in 70% alcohol. The specimens were sorted, counted, observed and identified by using standard keys.

Results and Discussion

Table 1: Distribution of aquatic insects' species in three sampling sites of Sai River at Raebareli

| S. No. | Genus (Family) | Site-1 | Site-2 | Site-3 |
|----------------------|--|--------|--------|--------|
| Order: Diptera | | | | |
| 1 | <i>Anophiles</i> sp. (Anophilinae) | ++ | + | + |
| 2 | <i>Culex</i> sp. (Culicidae) | + | ++ | - |
| 3 | <i>Tanytarsus</i> larvae (Chironomidae) | ++ | - | + |
| Order: Coleoptera | | | | |
| 4 | <i>Dineutus</i> sp. (Gyrinidae) | ++ | + | - |
| 5 | <i>Laccophilus</i> species (Dytiscidae) | + | + | + |
| Order: Hemiptera | | | | |
| 6 | <i>Anisops</i> sp. (Notonectidae) | ++ | + | + |
| 7 | <i>Aquarius</i> sp. (Gerridae) | - | + | - |
| 8 | <i>Hebrus</i> sp. (Hebridae) | + | - | + |
| 9 | <i>Mesovelia</i> sp. (Mesoveliidae) | ++ | + | + |
| 10 | <i>Neoplea</i> sp. (Pleidae) | + | ++ | ++ |
| 11 | <i>Ranatra</i> sp. (Nepidae) | ++ | - | + |
| 12 | <i>Belostoma</i> sp. (Belostomatidae) | ++ | + | - |
| 13 | <i>Cloeon</i> sp. (Baetidae) | + | ++ | - |
| Order: Odonata | | | | |
| 14 | <i>Acisoma</i> sp. (Libellulidae) | ++ | - | + |
| 15 | <i>Brachythemis</i> sp. (Libellulidae) | + | + | - |
| 16 | <i>Pantala</i> sp. (Libellulidae) | - | + | + |
| 17 | <i>Ischnura</i> sp. (Coenagrionidae) | ++ | + | + |
| 18 | <i>Ceragrion</i> sp. (Coenagrionidae) | + | - | + |
| Order: Trichoptera | | | | |
| 19 | <i>Hydropsyche</i> sp. (Hydropsychidae) | + | - | + |
| 20 | <i>Polycentropus</i> sp. (Polycentropodidae) | + | + | - |
| Order: Ephemeroptera | | | | |
| 21 | <i>Baetis</i> species (Baetidae) | ++ | ++ | - |
| 22 | <i>Caenis</i> species (Caenidae) | + | - | + |
| Total No. of Species | | 20 | 15 | 14 |

The present study indicated that all the three sites of Sai River are rich in aquatic insects (Table 1). The diversity of insect fauna of these three sites of Sai River was represented by 22 genera belonging to 18 families and 6 orders. Among the aquatic insects collected from three sites of Sai River Raebareli, the order Hemiptera (8 genera) was dominant and followed by order Odonata (5 genera), Diptera (3 genera), Coleoptera (2 genera), Trichoptera (2 genera) and Ephemeroptera (2 genera).

The Order Diptera was represented by three families viz., Notonectidae, Gerridae, Hebridae, Mesoveliidae, Pleidae, Nepidae, Belostomatidae and Baetidae, and each family was represented by only one genus. Midge larvae of *Tanytarsus* were in enormous number in the polluted site of where oxygen is often depleted. Most of the Dipterans inhabited in the marginal polluted site of Sai River. The order Coleoptera were represented by two families viz., Gyrinidae and Dytiscidae and each family was represented by only one genus.

The Order Hemiptera was represented by eight families viz., Anophilinae, Culicidae and Chironomidae and each family was represented by only one genus. Insect order Odonata was represented by two families viz., Libellulidae (3 genera) and Coenagrionidae (2 genera). The order Trichoptera was represented by two families viz., Hydropsychidae and Polycentropodidae and each family was represented by only one genus. The order Ephemeroptera was represented by two families viz., Baetidae and Caenidae and each family was represented by only one genus.

Many aquatic insects are very sensitive to changes in levels of pollutants in the water and are therefore used as indicators of the ecological well-being of these river systems (Bismi and Pillai, 2016) [4]. They should be preserved as they play a significant role in maintaining the health of the ecosystems by being part of the food chain.

In the present study pollution sensitive groups (Ephemeroptera and Trichoptera) were represented by *Baetis*, *Caenis*, *Hydropsyche* and *Polycentropus*, which indicate the pond's health. The biodiversity of aquatic insect communities in a given pond ecosystem reflect the environmental conditions. The sensitive species inhabiting the habitats of the adverse environmental conditions are gradually eliminated and the tolerant species establish their colonies and grow in abundance that may affect the growth of edible fishes (Verma, 2021b) [19]. Many areas of the river began to deteriorate, which is why there are less sensitive or intolerable species in the research or they are absent entirely. Therefore, immediate attention and proper maintenance of the river is to be suggested, however the concept of sustainable development and environmental ethics should also be taken into consideration (Ashok, 2017; Verma, 2019) [2, 17].

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