

## Biodiversity of Khanwari pond of Kaushambi district of U.P. with special reference to aquatic insects

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### Abstract

Diversity of aquatic insect fauna of Khanwari pond has been studied during July, 2019 to June, 2020. The study revealed that the pond was rich in terms of diversity of aquatic insects, which was represented by 20 species belonging to 6 orders and 20 families from three sampling sites of the Khanwari pond. The results of the present study reveals great diversity of aquatic insects in freshwater body and suggest the possibility of using insects effectively for biomonitoring programmes.

**Keywords:** biodiversity, insect fauna, wetland, conservation, Khanwari pond.

### Introduction

Biodiversity is the 'foundation of human life' on earth because each organism plays an important role and helps in producing more productive and stable ecosystem (Verma and Prakash, 2020) [15]. Environmental changes have had enormous impacts on biodiversity patterns in the past and will remain one of the major drivers of biodiversity patterns in the future (Prakash and Srivastava, 2019) [16]. It plays an important role in the function of an ecosystem by providing many services like nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plants, regulation of climate, as well as pest and pollution (Prakash, 2017) [27]. The biodiversity helps to maintain the ecological balance (Ashok, 2017) [1]. There is a necessity of ecological balance for widespread biodiversity and sustainable development (Ashok, 2018, 2019) [2, 3]. The climate change has a huge impact on biodiversity and farmers' practices (Mandal and Singh, 2020) [7].

Aquatic insects are those which live a part of their life cycle in water. They play important role in ecosystem functioning by virtue of their abundance, taxonomic diversity and form an important link in many food chains (Prakash and Verma, 2019) [16]. Aquatic insects make up 3-5% of all insect species, they are taxonomically diverse and play a critical role in stability and maintenance of ecosystem, especially in nutrient dynamics (Prakash and Yadav, 2016) [17]. They also present striking features in periodicity of occurrence, life cycle and great adaptability to the environmentally stress condition. The presence or absence of aquatic insects can indicate whether a particular ecosystem is healthy or polluted.

Aquatic insects are good indicators of human impact on the freshwater ecosystem. They are suited for use in environmental impact assessment (EIA) and act as reliable indicators of water quality of the water body. The insect order Ephemeroptera, Plecoptera and Trichoptera are the pollution sensitive groups and are used extensively for aquatic insect biomonitoring programmes (Prakash and Verma, 2018) [12].

The aquatic insects form an important component of the food chain and energy flow pathways and comprise of a high proportion of biomass in fresh water ecosystems. At the larval stage, they constitute the principal nutritive fauna

of fish and are known to play a significant role in the processing and cycling of nutrients as they belong to several feeding groups such as filter feeders, deposit collectors and predators (Prakash and Verma, 2020) [15].

Wetlands support vast biodiversity of flora and fauna, provide food and shelter to organisms that thrive in. They occur where the water table is at or near the surface of the land, or where the land is covered by water. Wetlands are among the world's most productive environments (Verma and Prakash, 2018a) [28]. Wetlands are extremely suitable ecosystems to assess the effect of climate change on the density of aquatic insects. Inland wetlands of India serve as the habitat for more than 500 species of aquatic insects which are mainly from Ephemeroptera (mayflies), Odonata (dragonflies) and Trichoptera (caddis flies) (Subramanian and Sivaramakrishnan, 2007) [18].

Several works on aquatic fauna have been published in India of them some works are those by Subramanian and Sivaramakrishnan (2007) [18], Kumar (2014) [6], Choudhary and Janakahi (2015) [4], Prakash and Yadav (2016) [17], Prakash and Verma (2018, 2019 and 2020) [12, 16, 15]. The Khanwari pond and village is studied by Verma and Prakash (2017) [27], Prakash and Verma (2019a) [13], Verma (2019) [16] for biodiversity point of view while Verma (2018a, 2018b and 2020) [28, 29, 30] studied the chordate biodiversity of other places. But nothing has been known about the aquatic insect diversity of Kaushambi district of U.P. Thus the present study was aimed to study the faunal diversity of aquatic insects of Khanwari pond a wetland of Kaushambi district of U.P.

### Material and methods

The pond (photograph) under exploration is situated in Khanwari village, which is located in block and tahsil of Sirathu of Kaushambi district of Uttar Pradesh (image). The pond is more than 75 km away from Allahabad, 10 km from Manjhanpur (headquarter of district Kaushambi) and 270 km from Lucknow by road. Its nearest railway station is Sirathu at a distance of 15 km and nearest airport Bamrauli (Allahabad) is at a distance of 60 km. It is situated between the latitude 25°32'32.58"N- 81°18'09.66"E and 25°32'31.01"N- 81°18'18.19"E.



**Image:** Location of study area in Kaushambi (U.P.)

Aquatic insects were collected monthly from three sites (located in three different villages) during July, 2019 to June, 2020 by using dipnet (0.3 x 0.3m) having mesh size 500µ.

The collected material was washed by running water through the nets two or three times to detach the insects/larvae adhered in the nets. The samples were then transferred to white trays in small quantities for handpicking aquatic insects using forceps and fine brushes. The handpicked samples were then preserved in 4% formalin and brought to the laboratory for further analysis. The collected insect fauna was examined under a dissecting microscope and identified with the help following the pertinent literature (Needham and Needham, 1962; Edmondson, 1966; Vazirani, 1970; Tonapi, 1980; Subramanian and Sivaramakrishnan, 2007) [8, 5, 20, 19, 18]. The family level identification was done according to proper insect manual.

**Result and discussion**

The present investigation indicated that Khanwari pond is rich in aquatic insect fauna. During the present study a total of 20 species of aquatic insects belonging to 6 orders and 20 families have been recorded from the three sampling sites of the study sites. Among the aquatic insects collected from Semara Taal the order Hemiptera (8 genera) was dominant and followed by order Diptera (4 genera), Coleoptera (3 genera), Odonta (2 genera), Ephemeroptera (2 genera), and Lepidoptera (1 genus). The insect of the order Hemiptera, Diptera and Coleoptera showed high species richness (Table1). Prakash and Verma (2018) [12] also reported 20 species of aquatic insects from Semara Taal, a wetland of district Siddharthnagar, U.P. 21 species of aquatic insects belonging to 6 orders and 21 families were reported in Baghel Taal of Bahraich, U.P. by Prakash and Yadav (2016) [17].

Prakash and Verma (2019) [16] recorded 32 species of aquatic insects belonging to 5 orders and 24 families from Guthia Taal of district Bahraich, U.P.

**Table 1:** Diversity of Aquatic Insect in Khanwari Pond During Study Period

S. N.	Order	Family	Zoological Name
1	Hemiptera (40%)	Belostomidae	<i>Belostoma</i> sp.
2		Hydrometridae	<i>Hydrometra</i> sp.
3		Gerridae	<i>Gerris</i> sp.
4		Mesoveliidae	<i>Mesovelia</i> sp.
5		Corixidae	<i>Sigara</i> sp.
6		Notonectidae	<i>Anisops</i> sp.
7		Vellidae	<i>Microvelia</i> sp.
8.		Pleidae	<i>Neoplea</i> sp.
9	Diptera (20%)	Chironomidae	<i>Chironomus</i> Larvae
10		Ceratopogonidae	<i>Culiconles</i> sp. larvae
11		Syrphidae	<i>Eristalis</i> sp.
12		Ephidridae	<i>Ephydra</i> sp.
13	Coleoptera (15%)	Hydrophilidae	Berosus larvae
14		Dytiscidae	Hyphydrus sp.

15		Gyrinidae	<i>Dineutus</i> sp.
16	Odonata (10%)	Coenagrionidae	<i>Ischnura</i> sp.
17		Petaluridae	<i>Tachopteryx</i> sp.
18	Ephemeroptera (10%)	Siphonuridae	<i>Ameletus</i> sp.
19		Baetidae	<i>Baetis</i> sp.
20	Lepidoptera (5%)	Pyralidae	<i>Ostrinia</i> sp.

Overall species diversity revealed that the insects belong to order Hemiptera were dominant and that of Lepidoptera was the least dominant in the Khanwari pond. Aquatic insect taxa from orders Trichoptera, Ephemeroptera and Odonata were very low in diversity contributing only 5 and 10 %, however the taxa from orders Hemiptera, Diptera and Coleoptera were found dominant throughout the study period with a percentage composition of 40%, 20 % and 15 %, respectively. In the present study, the presence of pollution sensitive groups (Ephemeroptera) indicates that health of waterbody was not very good and healthy. Dominance of hemipteran, odonata and coleoptera insects suggested that the Khanwari pond is relatively less polluted. The results of the present study revealed greater diversity of aquatic insects in Khanwari pond with a possibility of water pollution and suggest effectively for stringent biomonitoring programmes. Besides, authors also recorded sarus crane in the study area, which is the state bird of Uttar Pradesh and well known for eternal symbol of marital fidelity (Verma, 2018c, 2018d; Verma and Prakash, 2018b, Prakash and Verma, 2016, 2019b)<sup>[23, 24, 22, 17, 14]</sup>.

### Conclusion

This study documents the composition of aquatic insect communities in different sites of Khanwari pond. It shows the effect of natural and manmade interferences on the diversity of aquatic insects. There is scanty information on the abundance and diversity of aquatic insects in freshwater bodies of Uttar Pradesh. Therefore, it is imperative to make continuous investigation, census and research activities on the taxonomy and diversity of aquatic insects, so that knowledge regarding this important group can be utilized by future researchers as baseline data for further research and conservation planning.

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