Biospectra : ISSN: 0973-7057, Vol. 15(1), March, 2020, pp. 155-158

An International Biannual Refereed Journal of Life Sciences

Animal Science

ISSN : 0973-7057

Int. Database Index: 663 www.mjl.clarivate.com

Role of aquatic insect diversity in monitoring water pollution in Hatma pond, Morabadi, Ranchi, Jharkhand

Neetu Kumari*

University Department of Zoology, Ranchi University, Ranchi, Jharkhand, India

Received : 19th December, 2019 ; Revised : 13th February, 2020

Abstract: Aquatic insects are very versatile biotic components of water bodies in the lithosphere. They play important role in monitoring water pollution. Unfortunately, very little attention has been given to these creatures in understanding their vital role related to the dynamics of water bodies. In general, these are helpful in management of health and water quality through their qualitative and quantitative existence in terms of species richness and abundance which are the integral components of species diversity. In other words species diversity of these aquatic insects has been found to be directly related with the health and hygiene of water bodies. In the present paper, the results of statistical computation of species richness and abundance have been inferentially discussed by presence absence (+,-) checkerboard of eight aquatic insects with eleven physic-chemical of the perennial water body called Hatma pond situated behind Ranchi College Campus Building presently known as Dr. Shyama Prasad Mukherjee University, Morabadi, Ranchi, Jharkhand (India).

Keywords: Hatma Pond, aquatic insects, richness, abundance, pollution monitoring

INTRODUCTION

Water is one among the prime necessities of life required for growth and activity of all living beings on globe. Only small amount of water that occurs in fresh water rivers, streams, lakes and tanks is available for the terrestrial life. Insects are the most diverse group of organisms in freshwater. Insects being an important biotic component of aquatic ecosystems are very abundant and diverse group that inhabits a variety of water bodies.[1] Aquatic insects are therefore used as bioindicators frequently helpful in biological assessment of water quality. The number and type of species of aquatic insects present in certain water sampled the quality of the water body site from which they have been collected (Metcalfe, 1989)[2]. Some studies reported that aquatic insects are very good bioindicators in detecting water quality and useful degree of anthropogenic disturbance (Clarke *et al.* 2002)[3].

*Corresponding author :
Phone : 8084491502
E-mail : neetukumari7775@gmail.com

Most of the water bodies around the world are gradually drying out due to over exploitation. The situation is particularly aggravated by the high level of pollution resulting from various human activities which has further led to destruction or degradation of the aquatic ecosystem by various exotic species.

The use of aquatic insects for biomonitoring the health of aquatic ecosystems has many advantages. Aquatic macro invertebrates constitute an important component of an aquatic ecosystem and they exhibit differential tolerance to changes in environmental condition. They include

insects, annelids, oligochaetes, crustaceans, molluscs and gastropods. Of all these groups macro invertebrates the number and diversity of aquatic insects are greater than other animals that share the same habitat with them. The distribution of most aquatic insects is nevertheless influenced by several biotic and physico-chemical factors in both lentic and lotic ecosystem.

MATERIALS AND METHODS

Study area and Sampling site

Hatma Pond (23°23'27"N 85°19'13"E) located behind Ranchi College campus, Morabadi, Ranchi district of Jharkhand. The diverse eco-systems of Hatma Pond support various aquatic species. Aquatic insects and water samples in were collected seasonally during 2018-19 by different methods such as "all out search" method, "a nylon pond net" method etc.

Aquatic insects were identified using insect identification books.[4-6] All aquatic insects were identified until family level.

Sampling procedures

Aquatic insects were sampled once in every fortnight during the study period using a stratified random sampling design. The reservoir was divided into four parts: which were east, west, north & south. Several methods were used to collect the aquatic insects which include hand picking technique, stone rubbing technique etc.

Table 1:- Observation on physico chemical parameters of water samples from three stations of Hatma Pond, Morabadi, Ranchi, Jharkhand

Sl. No.	Water Parameters	Sampling Station- I	Sampling Station- II	Sampling Station- III
1.	Temperature	28.84±0.212	24.15±0.021	24.46±0.006
2.	pH	6.38±0.035	5.47±0.015	6.46±0.040
3.	Dissolved oxygen (mg/L)	5.62±0.015	7.98±0.006	8.16±0.030
4.	Turbidity (NTU)	2.15±0.285	3.35±0.249	2.18±0.017
5.	Biological oxygen demand(mg/L)	1.63±0.015	1.01±0.012	2.37±0.200
6.	Conductivity (ms/cm)	0.036±0.000	0.030±0.000	0.022±0.000
7.	Total dissolved oxygen (mg/L)	0.026±0.000	0.019±0.000	0.020±0.000
8.	Total suspended solid (mg/L)	0.005±0.005	0.006±0.005	2.31±1.995
9.	Velocity (s)	17.16±0.763	45.33±9.386	25.90±2.128
10.	Depth (m)	0.314±0.036	0.691±0.102	0.472±0.033
11.	Width (m)	0.161±0.005	0.638±0.024	0.390±0.015

Table 2: Seasonal presence absence checkerboard of different species of aquatic insects in Hatma Pond

Sl.No.	Scientific name	Common name	Family	Order	Status			
					Summer	Rainy	Winter	Autumn
1	*Gerris tristan*	Water strider	Gerridae	Hemiptera	+	+	+	+
2	*Metrocoris indicus*	Water siphoner	Gerridae	Hemiptera	+	+	+	+
3	*Onychotrechus rhexenor*	Water cricket	Gerridae	Hemiptera	-	-	+	-
4	*Hydrometra greeni*	Water stick	Hydrometrideae	Hemiptera	+	+	-	-
5	*Notonecta glauca*	Back swimmers	Notonectidae	Hemiptera	+	+	+	+
6	*Nepa cinerea*	Water scorpion	Nepidae	Hemiptera	-	+	-	+
7	*Hydrophilus olivaceous*	Water beetle	Hydrophilidae	Coleoptera	-	-	+	-

Fig. 1. ***Gerris tristan*** **(Gerridae)**
Water strider/ Pond Skater

Fig. 2. ***Metrocoris indicus*****(Gerridae)**
Water siphoner

Fig. 3 ***Onychotrechus rhexenor*** **(Gerridae)**
Water cricket

Fig.4. ***Hydrometra greeni*** **(Hydrometrideae)**
Water stick

Fig. 5. ***Notonecta glauca*** **(Notonectidae)**
Back swimmers

Fig. 6. ***Nepa cinerea*** **(Nepidae)**
Water Scorpion

Fig. 7. ***Hydrophilus olivaceous*** **(Hydrophilidae)**
Water Beetle

DISCUSSION

Observation table 2 reflects that species no. 1, 2 & 5 are very abundant & effective in all the seasons to act as pollution indicator with respect to their predatory and feeding functions in the pond. Species no. 3 & 7 is represented only in winter season hence exhibiting low profile participation in the control of the pollution of water body, Taxonomically family Gereidae represented by three different species is the most efficient group in pollution monitoring of the water body.

CONCLUSION

The study revealed the presence of 7 species of aquatic insects, 6 belonging to 4 different families of order Hemiptera and 1 belonging to family Hydrophilidae of order Coleoptera (Table 2). In summer season 4 species belonging same order Hemiptera were encountered while 5 species of Hemiptera were also recorded in monsoon season. In winter also, 5 species were recorded and those were of two orders i.e., Hemiptera & Coleoptera.

Aquatic insects are important for biological control. These insects play an important role in transmission of human and animal diseases. They play an important ecological role in keeping freshwater ecosystems functioning properly. Therefore ecological study on aquatic insects is essential and can provide information about ecology of insects in an area for any decision making policy for the management of water body. In recent years the conservation of natural resources and biodiversity has become urgent issue. For attaining an environmentally sustainable future we should conserve natural resources. The improvement and development of existing and new biomonitoring tools using aquatic insects are a major effort among aquatic entomologists. Hence a long term monitoring programme and use of diversity and biotic indices may throw light on the management strategies of the fresh water bodies that can also influence government policies of conservation.

ACKNOWLEDGEMENT

The author is extremely thankful to the Director Prof. B. Mukherjee, Centre of environment & water analysis in the Department of Zoology, Ranchi University, Ranchi, Jharkhand

REFERENCES

1. **Zborowski P, Storey R. 1995.** A Field Guide to Insects in Australia, Reed Books Chatswood, New South Wales.
2. **Metcalfe, J.L. 1989.** Biological water quality assessment of running waters based on micro invertebrates communities. History and present status in Europe. *Environmental Pollution.* **60:**101-139.
3. **Clarke R.T., Furse, M.T., Gunn R.J.M., Winder J.M. and Wright J.F. 2002.** Sampling variation in macro invertebrate data and implications of river quality indices. *Freshwater Biology.* **47:**1735-1751.
4. **Merrit R W and Cummins K W. 1996.** An Introduction Aquatic Insects of North America New York (US): Kendall/Hunt Publishing Company
5. **Edmondson W T. 1959.** *Freshwater Biology*. New York (US): John Wiley & Sons)
6. **Clifford H F. 1991.** *Aquatic Invertebrates of Alberta* (Alberta (US): University of Alberta Press.