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POPULATION DYNAMICS OF MACROZOOBENTHOS OF CHITTAURA JHEEL, A WETLAND OF BAHRAICH DISTRICT, U.P. INDIA

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ABSTRACT

Wetlands are one of the richest habitats of biodiversity, provide food and shelter to organisms that thrive in. They are cradles of biological diversity, providing the water and primary productivity upon which countless species of plants and animals including fish, amphibians, reptiles, birds, mammals, and invertebrate species depend for survival. During the present investigation 28genera of macrozoobenthos were recorded. Out of 28, 9 genera belong to phylum annelid, 9 to arthropod and 10 to mollusca. The mean density shows that annelids dominates and constituted 35.80% of the total macrozoobenthos population was followed by molluscans (35.40%) and arthropods (28.80%)., Among the benthic population was chiefly constituted by *Tubifex* sp followed by *Gammarus* sp., *Pila* sp., *Branchiura* sp., *Lumbriculus* sp. and *Chironomus* sp.,

KEYWORDS: Macrozoobenthos, Chittaura Jheel, Wetland

Wetlands are areas where water is primary factor controlling the environment and the associated plants and animal life (Prakash and Yadav, 2016). They occur where the water table is at or near the surface of the land, or where the land is covered by water (Prakash and Singh, 2019). Wetlands are most productive environments for primary producer that help in the regulation of biological cycles, maintenance of water quality, nutrient movement and support for food chain (Ranjan and Prakash, 2020). They represent only a part of our land bases but they provide shelter to a great number of plant and animal species (Prakash and Yadav, 2020). Wetlands exhibit varied characteristics function as vital life and environmental supporting systems, they are extremely important for wildlife not only in terms of the sheer number of individuals but also for enormous diversity of species they support (Verma and Prakash, 2020). They support vast biodiversity of flora and fauna, provide food and shelter to organisms that thrive in (Prakash and Verma, 2019).Thus these are cradles of biological diversity, providing the water and primary productivity upon which countless species of plants and animals depend for survival (Prakash, 2020a,b).

Wetlands are important components of watersheds and provide many valuable functions to the environment and to society (Prakash and Singh, 2020). The economic importance of wetlands is attributed to this abundance and diversity of flora and fauna inhibiting them. However, overexploitations of its resources, urbanization and other developmental anthropogenic activities have been threatening the wetlands and are making the wetlands among the most threatened ecosystems. Wetlands form an important resource for humans and its conservation is essential in maintaining the environmental security. It is now essential that man recognizes the importance of wetlands, protect and conserve them.

Aquatic ecosystem provides a home to many species including phytoplankton, zooplankton, aquatic plants, annelids, insects, molluscans etc. They are organized at many levels from smallest building blocks of life to complete ecosystem, encompassing communities, population, species and genetic level. Benthic invertebrates occupy the bottom of water body. The composition, distribution of benthic organism over a period of time provides index of the ecosystem (Verma *et al*., 2019). Macrozoobenthos being diverse in nature, react strongly and often predictably to human influences in aquatic ecosystem. They act as a viable tool for biological monitoring of freshwater ecosystems as they have wide range of sensitivities to change in both water quality and habitats (Thoker *et al*., 2015).

Macrozoobenthos form the basis of the trophic level and any negative effect caused by pollution in the community structure can in turn affect trophic relationships. Macrobenthic invertebrates act as food for many aquatic birds and fishes. Different species comprises distinct functional groups that provide ecological integrity. In some cases, these functional groups may be represented by only a few species, so that any loss of species diversity could be detrimental to continued ecosystem functioning. Thus, it is increasingly

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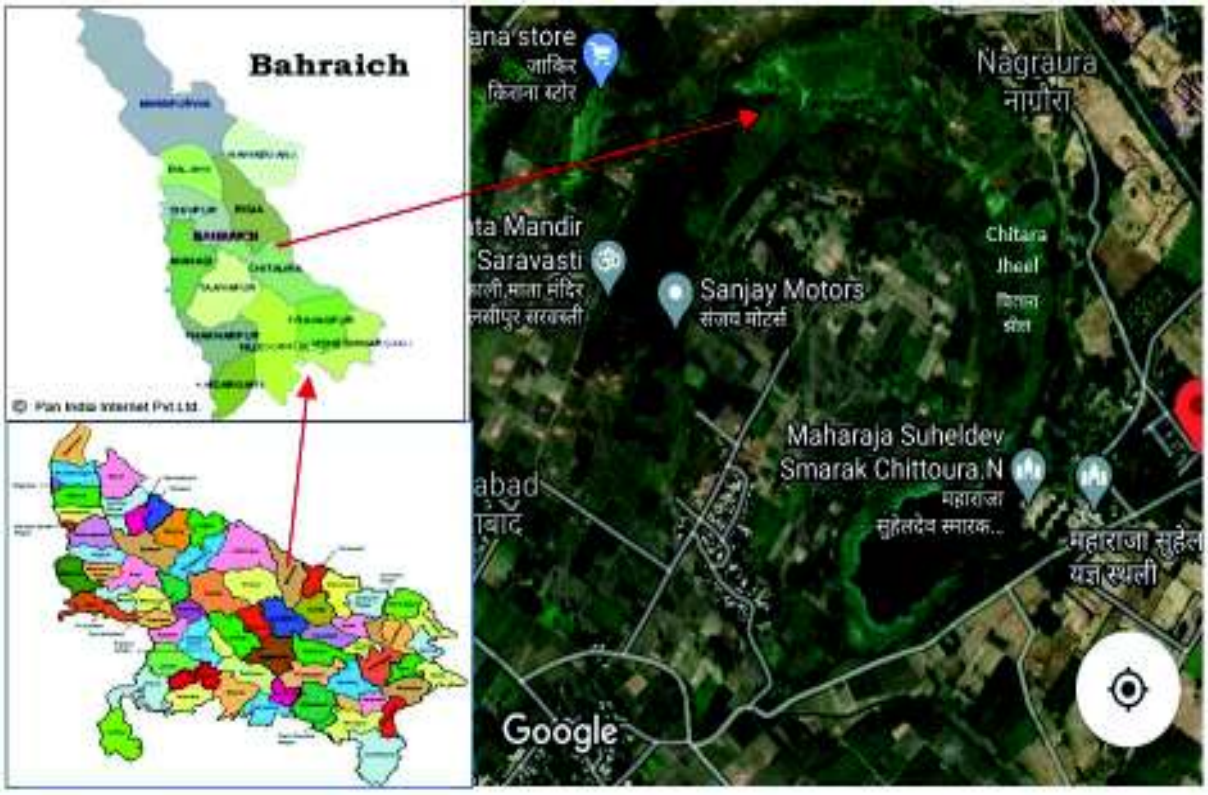
becoming important to protect macrozoobenthic communities owing to their immense importance in their natural habitats.

The macrozoobenthos of freshwater wetlands provide significant support to the aquatic food web and contribute to ecosystem stability through sustenance of cultivatable fish, aquatic birds and other aquatic life. Their composition, abundance and distribution pattern acts as an ecosystem index, thereby indicating trophic structure, water quality and eutrophication level of the waterbodies (Mehdi *et al*., 2005). Macrozoobenthos are also used as potent pollution indicators, so it is utmost important to document the benthic diversity. Benthic diversity of wetlands were studied by many ecologists in India (Siraj *et al*., 2010;Verma and Prakash, 2018; Singh *et al*., 2019; Prakash,2020) but no such information is available in fresh water body of Tarai region of eastern U.P. Keeping this mind an attempt has been made to document macrozoobenthic diversiy of Chittaura Jheel at Bahraich, U.P., India.

STUDY AREA

Chittaura Jheel, a wetland is a horse shoe shaped large shallow lentic waterbody. The area of wetland is about 15 ha with total catchment area of about 46 ha. It is situated in Chittaura villages, of Chittaura Block of district Bahraich and is rich in faunal and floristic diversity. It is situated between the latitude 28^0 24/N to 27^0 43/N, ltitude and $81^0$65/ E to $81^0$30/E longitude. The Taal is enriched with several type of vegetation such as *Nymphaea, Nelumbo* and Nymphya as well as aquatic birds like Duck, Saras and Bagula. Many migratory birds are also found. The abundant food attracts hundreds of resident and migratory birds including Siberian crane during winter season. The water of Taal is used for agriculture and fish culture. The abundant food attracts hundreds of resident and migratory birds including Siberian crane during winter season. As an important resort for the native faunal diversity and a beautiful habitat for the phytodiversity, it has never been a subject of scientific or geological study. Therefore, the present study was undertaken to evaluate the macrozoobenthic diversity as well as ecological significance for the area.



Satellite map of Chittaura Jheel of Chitaura Block of Bahraich District of U.P.

MATERIALS AND METHODS

The sediment sample were collected monthly from the bottom at three station were collected during morning time by using Peterson Grabe mud sampler, collected samples were sieved through 0.5 mm sieve (Singh and Prakash, 2021) the material which retained on

sieve were collected and from it benthic organisms were stored out with the help of forceps and brush and were collected in narrow mouthed plastic bottle, containing 4% formalin and 70% alcohol as preservative depending upon the type of organisms to be preserved. The soft-bodied organisms were preserved in 70% alcohol while the shelled organisms like mollusks in 4% formalin (Borror *et al,*1976). All macro fauna of bottle were identified with the help of available key and manuals Neetham and Needham(1962), Borror *et al*(1976) and Pennak (1989) under the light microscope. The population of organisms was counted and number of individuals of a species per sample and was expressed as number/m^2 .

RESULTS AND DISCUSSION

With increasing the human population, interference of human in and around the water bodies increases, leading to the deterioration of their water quality. Large quantities of nutrients are added through the human sewage, industrial wastes and agricultural runoff. When this occurs for a long time, most of aquatic organisms perish/replaced by a few specialized organisms, which are tolerant to such conditions. Since the water body is a complete ecosystem, any change in physical or chemical conditions also affects the occurrence and abundance of the organisms living there (Dar, *et al*., 2010).

Macrozoobenthos are good indicators of long term habitat quality rather than instantaneous conditions. In the present study the benthic population of the wetland was estimated to be 500 nos/m^2 during four month study period in monthly sampling. Benthic population of all the three sites is given in Table. During the present study, total 28 genera of benthos were identified which belonged to 3 phylum and 8 classes. Among the macrozoobenthos collected from three sites of wetland, phylum annelid was dominant (35.80%) and followed by mollusca (35.40%) and arthropoda (28.80%). The collected benthos including their classes, zoological names and their annual mean density are shown in the table.

In normal condition the distribution of macro benthos fauna has been reported to be dependent on the availability and distribution of preferably food items. In fact, their capacity to exploit areas with optimum food supply might be explained by their abundance (Singh and Prakash, 2021). Shrivastava (1997), Vyas and Bhat (2010), Prakash (2020) and Singh and Prakash (2021) reported 845nos/m^2, 1782 nos/m^2, 454 nos/m^2 and 450 nos/m^2, respectively in different lentic fresh waterbodies of India.

In the present investigation 28 genera were identified throughout the study period. Out of 28, 9 species belonged to annelids, 9 belonged to arthropods 10 belonged to molluscans. The pattern of dominance of various macrozoobenthic forms in terms of their mean density at Chittaura Jheel was as follows:

Mean density of annelids was *Tubifex* sp. (18.00 nos/m^2) > *Branchiura* sp. (8.66 nos/m^2)> *Lumbriculus* sp. (8.66 nos/m^2)> *Erpobdella* sp. (7.66nos/m^2)> *Poecilobdella* sp.(5.0 nos/m^2)> *Limnodrilus* sp.(4.66 nos/m^2)> *Nais* sp. (3.33 nos/m^2)> *Petopdella* sp.(2.66 nos/m^2)> *Glassiphonia* sp. (1.33 nos/m^2).

Mean density of arthropods was *Gammarus* sp. (16.33nos/m^2)> *Chironomus* sp. (8.00nos/m^2)>*Caenis* sp (7.00nos/m^2)> *Polycentropus* sp. (6.00 nos/m^2)>*Psephenus* sp. (3.66)>*Hydrophilus* sp. (3.33nos/m^2), *Philopotamus* sp. (3.00 nos/m2)> *Dolomedes* sp. (3.00nos/m^2) > *Acari* sp. (1.00nos/m^2).

Mean density of molluscan was *Pila* sp. (11.33 nos/m^2)> *Lymnaea* sp. (10.00 nos/m^2)> *Lamellidens* sp. (8.00 nos/m^2)> *Thiara* sp. (7.66 nos/m^2)> *Corbicula* sp. (7.00 nos/m^2) *Tarebia* sp. (6.00 nos/m^2)> *Gyralus* sp. (3.66 nos/m^2)> *Planorbula* sp. (3.00 nos/m^2) >*Promentus* sp. (1.66 nos/m^2) > *Bellamya* sp. (1.00 nos/m^2).

Among the benthic population was chiefly constituted by *Tubifex* sp followed by *Gammarus* sp., *Pila* sp., *Lymnaea* sp., *Branchiura* sp., *Lumbriculus* sp, *Chironomus* sp., *Lamellidens* sp., and *Thiara* sp. These were found in all three sampling sites and all months.

The macrozoobenthic communities of three study sites belonged to more or less similar taxonomic groups, although the number of individuals within each group varied considerably. The maximum density (212 nos/m^2) and diversity (28 genera)of macrozoobenthos were found at site S1, moderate density (144 nos/m^2) and diversity (26 genera) at site S3 and moderate density (144 nos/m^2) and minimum diversity (24 genera) at site S2. The mean population density at different stations varies between 144-212 individuals/m^2. This variability in the diversity and density of benthos at different sites might be due to the substrate type, velocity, depth and anthropogenic activities (Thoker *et al*, 2015). Presence of pollution tolerant species in all the stations is directly related to the high quantity of organic matter in the water (Dar *et al*., 2010). Relatively high species density and species composition of macrozoobenthos at Site S1 seems to be correlated with macrophytic species richness because they spent much of their life cycle on host plants (Prakash, 2020).

Table: Macrozoobenthos recorded in the Chittaura Jheel during Jan. to June, 2021

S.N.	Class/Genera of Macrozoobenthos	Mean Density of Macrozoobenthos (Number/m^2) in different sampling stations			Mean Density of Macrozoobenthos (Number/m^2) in Bhagda Taal
		S-1	S-2	S-3	
Phylum- Annelida (.35.80%)					
	Class 1:Oligochaeta				
1	*Branchiura* sp.	10	9	7	8.66
2	*Limnodrilus* sp.	9	1	4	4.66
3	*Lumbriculus* sp.	9	8	9	8.66
4	*Tubifex* sp.	20	22	12	18.0
5	*Nais* sp.	7	0	3	3.33
	Class 2: Hirudinidae				
6	*Glassiphonia* sp	2	0	2	1.33
7	*Erpobdella* sp.	9	8	6	7.66
8	*Pentopdella* sp.	6	1	0	2.33
9.	*Poecilobdella* sp.	5	3	7	5.00
Total Density (Mean Density)		**77**	**52**	**50**	**179 (59.66)**
Phylum- Arthropoda (28.80%)					
	Class 1: Insecta				
10	*Caenis* sp.	8	11	2	7.00
11	*Chironomus* sp.	10	8	6	8.00
12	*Hydrophilus* sp.	6	0	4	3.33
13	*Polycentropus* sp.	7	5	6	6.00
14	*Philopotamus* sp.	4	2	3	3.00
15	*Psephenus* sp	6	2	3	3.66
	Class 2: Crustacaea				
16	*Gammarus* sp.	22	15	12	16.33
	Class 3: Arachnida				
17	*Dolomedes* sp.	5	0	4	3.00
18	*Acari* sp.(Water mites)	2	1	0	1.00
Total Density(Mean Density)		**70**	**44**	**30**	**144(48.00)**
Phylum- Mollusca (35.40%)					
	Class 1: Gastropoda				
19	*Lymnaea* sp.	11	8	11	10.00
20	*Pila* sp.	12	11	11	11.33
21	*Thiara* sp.	9	5	9	7.66
22	*Tarebia* sp.	8	3	7	6.00
23	*Bellamya* sp.	1	1	2	1.33
24	*Gyralus* sp.	4	3	4	3.66
	Class 2: Pelecypoda				
25	*Corbicula* sp.	7	6	8	7.00
26	*Planorbula* sp.	3	2	4	3.00
27	*Promentus* sp.	2	1	2	1.66
	Class 3: Bivalvia				
28	*Lamellidens* sp.	10	8	6	8.00
Total Density(Mean Density)		**65**	**48**	**64**	**177(59.00)**
Total Density & Diversity		**212(28)**	**144(24)**	**144(26)**	**500**

CONCLUSION

The presence of *Chironomous* sp., *Limnodrilus* and *Tubifex* indicates a characteristic eutrophic stage of the present Jheel. They are referred as classical "Pollution indicators". These species are able to survive period of anoxia, such as occurs in wetlands during summer months. The presence of pollution indicator macrozoobenthic species, allows us to conclude that the Chittaura Jheel, wetland has evolved over the years as a eutrophic ecosystem and merits urgent attention for eco-restoration and sustainable management.

In view of the aforementioned facts, it may be concluded that the Chittaura Jheel, a wetland is getting eutrophicated and the eutrophic character of Jheel affects the distribution of the macrozoobenthos.

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