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A Study on Zooplankton Diversity of Budge Budge Railway Jhill in Kolkata of West Bengal, India

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ABSTRACT

Zooplankton acts as main sources of food for many fishes and plays an important role in early detection and monitoring the pollution of water. A number of studies has been carried out on the condition of ecology and freshwater bodies in various parts of West Bengal but in some parts of South 24 Parganas District, the ecological studies of freshwater bodies especially zooplankton studies is very scanty. The present investigation made an attempt to study the zoo planktons species in Budge Budge Railway Jhill. This Railway Jhill is situated beside the south part of Budge Budge Railway station and in front of Bogie Manufacturing factory, Kolkata, West Bengal. The quantitative studies of plankton diversity in Budge Budge Railway Jhill of Kolkata in West Bengal were carried out for the months of January 2021 to June 2022. The lowest zooplankton number (460/ltr.) was recorded in the month of June (summer) and the highest number (680/ltr.) in January (winter) due to different environmental and inflow characteristics of the water body. Zooplankton community of this Jhill in winter comprises of 10 species and in summer comprises of only 6 species belonging to Rotifera, Cladocera, Copepoda and Ostracoda collected from different zones, viz., littoral, pelagic and deepwater. Qualitatively the copepods (*Cyclopes sp*) and *(Cypris sp)* ware found to dominant species among the zooplankton community in winter and the rotifers *(Branchionus sp)* were found to dominant species among the zooplankton community in summer.

KEYWORDS: *Budge Budge Railway Jhill, Zoo Plankton diversity, Copepoda*

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INTRODUCTION

Zooplanktons are the smallest organisms present in almost all the water body and they can be observed only through microscope. They invariably form an integral component for fresh water communities and contribute significant to biological productivity. Zooplankton acts as main sources of food for many fishes and plays an important role in early detection and monitoring the pollution of water [1]. Zooplankton community distribution depends on some of the complex factors viz, change of climatic conditions, physical in distribution [2]. The planktonic study is a very useful tool for the assessment of water quality and productivity of any type of water body and also contributes to understanding of lentic water bodies [3-5].Plankton are microscopic organisms and float freely in the water from one place to another as they have small powers of locomotion. They drift in the water with the action of waves, current and other forms of water motion and equally distributed in the aquatic environment. Phytoplankton constitutes the very basis of nutritional cycles of an aquatic ecosystem [1]. They form a bulk of food for zooplankton, fishes and other aquatic organisms. Phytoplankton is one of the initial biological components from which the energy is transferred to higher organisms through food chain. Productivity in aquatic ecosystem is directly depends on density of plankton diversity and density is controlled by water quality and other biotic communities in a water bodies [6]. Zooplankton community constitutes an important component in the faunal composition of the water body [7]. Zooplanktons occupy a central position in the food webs of aquatic ecosystem. They do not only form an

integral part of the lentic community but also contribute significantly, the biological productivity of the fresh water ecosystem [8-10].

Several works have been done on the seasonal variations of plankton from lakes and small water bodies from West Bengal [6], but study related to plankton diversity status from this municipal area in Budge Budge area Kolkata, West Bengal is very rare. For that reason the present study was undertaken in selected ponds from municipal area to know the present plankton diversity status.

MATERIAL AND METHODS:

Study area: Budge Budge Railway Jill is located beside the south part of Budge Budge Railway station and in front of Bogie Manufacturing factory, Kolkata, West Bengal, India with latitude: 22.4927º N and longitude: 88.1949º E and approximate Area is 2 Acer. Some of the benefits getting from the reservoir storage are fisheries, drinking water supply and industrial use.

ZOOPLANKTON SAMPLE COLLECTION, PRESERVATION AND IDENTIFICATION:

Water samples were collected randomly in different locations of the Rail way Jhill during early hours of the day (7am to 9am) to a period of the months of January 2021 to June 2022 and such samples were pooled together to consider a final sample for analysis. The plankton net is made by the bolting nylon silk (mesh- size 50µm) is used for collection of zooplankton and which is conical shape and reducing cone with the bottle at its end. 5 liter of water is collected and the sample is sieved by plankton net. After sieving the water the net was washed by splashing water. 4% Formalin is added for preservation of plankton and allow to sediment for 24 hours. Sedimentation volume is recorded and then the content is diluted depending upon the concentration of Zooplankton populations. The dilution volume is also recorded. After uniform stirring 1ml. of sample is taken in Sedgwick-rafter counting chamber having thousands equal squares from which planktons are collected at random from 100sq. at a time. Number of different order of Zooplankton and total number of Zooplankton in 25sq. is counted and the data is recorded.

METHOD OF CALCULATION:

The Sedgwick-rafter counting chamber has 1000sq. with 1ml. capacity. The number of plankton count in 25sq. is converted into units of planktons present /ltr. of water by following formula.

$$\text{Number of Zooplankton/ltr.} = \frac{N \times 10 \times D}{C}$$

Where, N= Number of planktons in 25sq.
D= Dilution volume (100 ml.)
C= Total collected sample of water (50 ltr.)

$$\text{Zooplankton Density (\%)} = \frac{\text{Total No. of individuals of the species} \times 100}{\text{Total No. of observation studied}}$$

RESULTS:

Table-1: Zooplankton diversity in Budge Budge Railway Jhill, Kolkata, W.B.

Copepoda	Ostracoda	Cladocera	Crustacea	Rotifera
Cyclopes sp.	Cypris sp.	Daphnia sp.	Mysis sp.	Asplanchna sp.
Diaptomus sp.		Moina sp.		Brachionus sp.
		Diaphanosoma sp.		Keratella sp.

Table-2: Total Number of Zooplankton

Order	Genus	Winter	Total Zooplankton/ltr.	Summer	Total Zooplankton/ltr.
Copepoda	Cyclopes sp.	12	680	05	460
	Diaptomus sp.	01		06	
Ostracoda	Cypris sp.	10		02	
Cladocera	Daphnia sp.	01		-	
	Moina sp.	01		02	
	Diaphanosoma sp.	02		-	
Mysida	Mysis sp.	03		01	
Rotifera	Asplanchna sp	01		-	
	Brachionus sp.	01		07	
	Keratella sp.	02		-	

Table-3: Density of different Zooplanktons In different Season

Name of Zooplankton	Individual Zooplankton Density(%) in Winter	Individual Zooplankton Density(%) in Summer
Cyclopes sp.	35.29	21.73
Diaptomu sp.	2.94	26.08
Cypris sp.	29.41	8.69
Daphnia sp.	2.94	-
Moina sp.	2.94	8.69
Diaphanosoma sp.	5.88	-
Mysis sp.	8.82	4.34
Asplanchna sp.	2.94	-
Branchionus sp.	2.94	30.43
Keratella sp.	5.88	-

DISCUSSION:

The obtained zooplankton forms were represented by five groups of Phylum viz Rotifera, Cladocera, Copepoda, Ostracoda and Mysida. Among these, Rotifera comprise of 3 species, Cladocera 3 species, Copepoda 2 species, Ostracoda 1 and Mysida 1 species. The total numbers of species recorded in winter were 10 of which total nos. of *Cyclops sp.* 12 (35.29%), *Cypris sp.* 10 (29.41%), *Mysis sp.* 3 (8.82%), *Keratella sp.* 2 (5.88%), *Diaphanosoma sp.* 2 (5.88%), *Asplanchna sp.* 1 (2.94%), *Branchionus sp.* 1 (2.94%), *Diaptomus sp.* 1 (2.94%), *Daphnia sp.* 1 (2.94%), *Moina sp.* 1 (2.94%). The total numbers of species recorded in summer were 6 of which *Branchionus sp.* 7 (30.43%), *Diaptomus sp.* 6 (26.08%), *Cyclops sp.* 5 (21.73%), *Cypris sp.* 2 (8.69%), *Moina sp.* 2 (8.69%), *Mysis sp.* 1 (4.34%).

All the dominant group of zooplankton was present throughout the year. It is reported that zooplankton population of Budge Budge Railway Jhill is greater in winter season rather than in summer season. In winter season three genera of *Rotifera*, three genera of *Cladocera*, two genera of *Copepoda*, one genera of *Ostracoda*, one genera of *Mysida* were found where as in summer two genera of Rotifera (*Asplanchna* and *Keratella*) and two genera of Cladocera (*Daphnia* and *Diaphanosoma*) are totally absent. While analyzing seasonal dynamics of zooplanktons [2, 5, 6] in relation to physic-chemical conditions [6, 12, 13, 14] of lotic water body increased densities of zooplanktons in winter and reduced densities in summer was reported. In winter season, the absence of inflow of the water brings stability to the water body. The availability of food is more due to production of organic matter and decomposition [15]. In this study the occurrence of zooplankton groups was in the following increasing order.

Summer:

Rotifera>Ostracoda>Copepoda>Cladocera>Mysida

Winter: Copepoda>Ostracoda> Rotifera>Cladocera >Mysida

Rotifers: These are considered as the most important soft bodied invertebrates and they play a major role in aquatic food chain and major food for fishes [1]. In rotifers zooplanktons *like Branchinous sp.* found to be present throughout the year. According to observation the *Branchionus species* are very common in temperate and tropical waters, indicates alkaline nature of water. Excess growth of rotifers in lakes and reservoirs indicates eutrophic conditions. Except *Branchionus species* others two species – *Asplanchna sp.* and *Keratella sp.* were recorded.

Cladocerons: *Cladocera* is an order of small crustaceans commonly they are called by "water fleas". It has been reported that the density and biomass of cladocerans was primarily determined by food supply [1]. In the present study, similar observations were made where cladocerans were abundant when the food supply (phytoplankton) was maximum. During summer the cladoceron population was moderate due to dense growth of rotifers and thus avoiding competition. It is found that the temperature is the primary factor affecting the occurrence and distribution of cladocerons. The three species of cladocerans-*Daphnia sp., Moina sp. and Diphanosoma sp.* were recorded.

Copepods: These constitutes a major zooplankton communities occurring in almost all the water bodies, which serve food for many fish and play a vital role in ecological pyramids [1]. Nearly 120 species recorded from India. The important factors which controlled the distribution of copepods were rainfall, river discharge and decreased phytoplankton abundance due to increased turbidity. In our studies the dominant species of Copepods recorded were *Cyclops sp., and Diaptomus sp.*

Ostracods: The Ostracods are bivalve crustaceans found in both fresh and marine water [1]. About 1700 known species are freshwater forms which inhibit a wide variety of freshwater like pool, pond swamps, streams and polluted areas. In the present study, only

one species of *Ostracods* were found and these are represented by *Cypris sp*ecies.

Mysida: These are the very diverse group of Crustacea. We have recorded only one species of Mysida (*Mysis sp*).

CONCLUSION:

The overall view in this study reveals that the fluctuation of zooplankton occurs distinctly in the study area and normally in rainy season there is a less population due to the dilution factors and its effects leads to less photosynthetic activity by primary producers. In this particular observation the density of zooplanktons showed distinct seasonal variation. All the groups have shown their own maximum and minimum peaks in which the density of copepods was maximum during winter (dominant species *Cyclops sp.*) and rotifers was maximum during summer (dominant species *Branchionus sp*)

CONFLICT OF INTEREST:

None

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