

Zooplanktons Diversity in Relation to Physico-Chemical Condition in Rishikesh Barrage

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Abstract

Plankton diversity and physico chemical parameters are important criteria for evaluating the suitability of water for irrigation and drinking purpose. The term "Plankton" was coined by the oceanographer Victor Hanson (1887) to designate the heterogenous assemblage of minute organisms and fine non-living materials known to occur in the water of the sea and top float at the null of waves and other water movements. In the research period, I tried to assess the zooplankton diversity and physico-chemical parameters. Four taxa were recorded : caddisfly Larvae, roundworms, cladocerans and copepods.

The Zooplankton population shows positive significant correlation with physico-chemical parameters, like temperature, alkalinity, pH and biological oxygen demand.

Keywords: Plankton diversity, zooplanktons, physico-chemical parameters, aquatic biology, ecosystem, micro-organisms.

Introduction

Limnology is an interdisciplinary science which involves a great deal of detailed as well as laboratory studies to understand the structural and functional aspects and problems associated with the freshwater environment from a holistic point of view (Adoni, 1985)¹

Aims of the study

Qualitative composition of Zooplanktons to observe and identify. Various zooplanktons in different water samples .

Zooplankton

Zooplanktons are a general term for drifting animal population in the water column, which are unable to maintain their position by swimming against water currents. Zooplanktons community is composed of both primary consumers, which eat phytoplankton and secondary consumers, which feed on other zooplankton (Rao, T.S.S., 1975)².

Zooplankton is distributed according to salinity and the availability of phytoplankton which is their main food. Like phytoplankton, zooplankton also make excellent indicators of environmental conditions because they are also sensitive to changes in water quality (Haridas, P.,1982)³. The different zooplankton found in Rishikesh barrage are :

Caddisfly Larvae

Caddisfly is an insect which has aquatic larvae and terrestrial adults. Caddisfly larvae are found in wide variety of water bodies of varying qualities. They are useful as bioindicators as they are sensitive to water pollution. Rich caddisfly larvae generally indicate clean water.

Roundworm

Round worms inhabit virtually every habitat in the seas, fresh water and on land. In aquatic habitat they live in the spaces between aquatic sediments or on the sediment surface. Non-parasitic nematodes are adapted to swimming along the bottoms of fresh water bodies.

Cladocera

The suborder Cladocera includes small crustaceans ranging in size from 0.2 to 6.0mm and is commonly known as water fleas. They are generally found in fresh water bodies. Daphina is the most common cladoceran. It is also an indicator genus because it may be used to test the effects of toxins on an ecosystem.



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Copepoda

Copepoda is one of the most important group of class Crustacea. They are small crustaceans found in abundance in nearly all fresh water and salt water habitat. They constitute an important source of protein in the water body.

The copepods are diverse group and although some are carnivores or omnivores, the majority are grazers (herbivores) feeding on phytoplankton. The most common example is Cyclops. They are often used as biodiversity indicator.

Material and Methods

Description of Study Site

Rishikesh barrage is located near the Veerbhadra Mahadev temple. It is also known as a gateway to the Himalaya and is located around 25 kilometres from the holy City Haridwar.

Rishikesh is located at 30.12degree N, 78.32degree E and has an average elevation of 334 m (1745 feet). It is situated at an altitude of around 1360 feet, above sea level.

Collection of Samples

The pond survey was carried out from May 2008 to Feb 2009. The plankton samples were collected by filtering 50 litres of water through standard plankton net and samples were fixed in 5% of formalin.

Methodology

Physico Chemical Analysis

Temperature (surface water) was recorded on the spot with the help of Centigrade Thermometer. The pH of the water samples was measured, with the help of pH meter.

Physico-chemical analysis of the sample was done according to standard methods (Apha, 1976)⁴.

Table: 1.1: Seasonal variation of physico-chemical parameters in Rishikesh barrage(2008-2009) :

Physico-chemical parameter	Summer	Rainy	Autumn	Winter	Spring
Temp.(°C)	22	21	18	17	17
pH (ppm)	8.0	9.1	7.2	7.1	9.0
Alkalinity(ppm)	71	98	42	90	82
DO(mg/l)	1.1	2.0	2.0	2.2	3.0
CO ₂ (ppm)	1.5	1.0	1.6	1.0	2.0

Biological Analysis

The identification of various species of zooplanktons was done with the help of standard references (Alfred et.al.,1973)⁵. In Rishikesh barrage, the dominant species were caddisfly larvae and roundworms.

Table: 1.2: Diversity and seasonal abundance of zooplankton in the Rishikesh barrage:

S N	Taxon	Summer	Rainy	Autumn	Winter	Spring
1.	Caddisfly larvae	+	+	-	+	+
2.	Round worms	-	+	-	+	+
3.	Daphnia	-	-	-	-	+
4.	Cyclops	-	+	-	+	-

Result and Discussion

The physico chemical parameters of water at Rishikesh barrage has been given in the table 1.1. The surface water temperature ranged from 17 to 22 degree centigrade. Temperature is one of the essential and changeable environmental factors, since it influences the growth and distribution of flora and fauna.

Water temperature ranging between 13.5 and 32 degree centigrade is reported to be suitable for the development of the planktonic organisms. Among the three ponds, the populations of zooplankton had a positive correlation with water temperature. Similar observations were made by Bhuiyan and Gupta(2007) and Park and Shine (2007). The increase in zooplankton population with the rise in temperature was observed in this investigation.

The pH value range between 7.1 to 9.1. High pH value was recorded during rainy season. This may be due to more photosynthesis resulting in high production of free carbon dioxide driving the equilibrium towards alkaline side. According to Kurbatova and Tanner et.al.(2005) the pH range between 6.0 and 8.5 indicates medium productive nature of a reservoir; more than 8.5 highly productive nature of a reservoir.

The alkalinity value range between 42 to 98. High alkalinity value was recorded during rainy season. Alkalinity shows significant positive correlation with zooplanktons diversity, thus the high value of total alkalinity means high planktonic yield. The CO₂ value ranges between 1.0 to 2.0. High CO₂ value was recorded during spring season.

Dissolved oxygen is an important aquatic parameter the measurement of which is vital in the context of culture of any aquatic animal as oxygen play a various crucial role in its life processes. Dissolved oxygen range from 1.1 to 3.0 milligrams per litre. High concentration of DO was recorded in the spring season. This may be due to low solubility at high temperature and high degradation of organic substances (Butcher, R.W1924)⁶.

Conclusion

From the above work it can be concluded that various physico-chemical parameters were greatly affected by seasonal changes and variations in the physico-chemical parameters greatly influenced the diversity of zooplankton.

Rishikesh barrage area, there is lot of human interference is the diversity of zooplankton was poor .

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References

1. Adonis, A., D.G. Joshi, K Ghosh, et al., A work book on Limnology (Pratibha publisher) Sagar (1985).
2. Rao, T.S.S., M.Madhupratap and P.Haridas, 1975. Distribution of zooplankton in space and time in a tropical history bulletin of the

Department of marine science, University of Cochin7:695-704.

3. Haridas, P., 1982 zooplankton studies in the coachin environments Ph.D. Thesis, University of Cochin 203 pp.
4. APHA, 1976 Standard Method for the Examination of water and water waste. 18th edition American public health association, Washington DC.
5. Alfred et al., 1973: Adoni et al: A workbook of Limnology (1985).
6. Butcher, R.W.1924. The plankton of the river Wharfe (Yorkshire). Naturalist, 1924 : 175-180;211-2