



## PHYTOPLANKTON AND ZOOPLANKTON DIVERSITY OF NATIONAL RIVER OF GANGA IN GARHMUKTESHWAR HAPUR UTTAR PARDESH INDIA

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### Abstract

A lot of research has been done on Algae in India. It has been studied mainly in Madras University and Banaras Hindu University. Professor M.O.P Iyengar is called the Father of Modern India Algology. Various types of phytoplanktons and Zooplankton are maintaining natural balance in two ghats on the banks of river Ganga in Garhmukteshwar in Hapur district situated in the state of Uttar Pradesh "Brijghat and Pushpawati pooth Ghat". This paper explores the phytoplankton and Zooplankton of Garhmukteshwar district, Hapur. Throws light on the traditional knowledge of their environmental balance and surrounding areas. For the study of different ecosystems, knowledge of the vegetation of any area and its environmental importance is essential. It is necessary for a responsible worker of the classification area to conduct field tests from time to time. The variety of phytoplankton and zooplankton in the Ganga River in 2022 is the primary topic of the study. The present investigation involved collecting samples of phytoplankton and zooplankton from the Ganga River on a regular basis, and then identifying these organisms under a microscope. Among the group's members, Chlorophyceae accounted for 50%, Bacillariophyceae for 37%, and Cyanophyceae for 13% of the time observed. Additionally, researchers discovered that plankton diversity peaked in the winter and then declined in the summer.

**Keywords :** Garhmukteshwar, Ganga River, Brijghat, Pushpawati Pooth, Phytoplanktons and Zooplankton

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### Introduction

#### The Ganga River and Phytoplankton and Zooplankton

Gangotri glacier is the source of Ganga near Gomukh at an altitude of 3,900 meters in Uttarkashi district of Uttarakhand. Here it is called Bhagirathi. The source of Alaknanda is in the Satopatha glacier (Alkapuri glacier) above Badrinath. Alaknanda is formed by the streams Dhauli and Vishnu Ganga, which meet at Joshimath or Vishnu Prayag. Another tributary of Alaknanda is Pindar, which joins it at Karna Prayag. Rudraprayag, the confluence of Alaknanda and Mandakini. The confluence of Rudraprayag Bhagirathi is situated at the confluence of Alaknanda and Mandakini or Alaknanda and Dev Prayag Kaliganga. Ganga river is named after Devprayag, where Alaknanda and Bhagirathi meet. Ganga enters the plains near Haridwar. From here it first flows towards the south, then towards the south-east and then towards the east. After Haridwar, river Ganga moves ahead via Bijnor via Garhmukteshwar. There is two Famous Ghat in Near Garhmukteshwar district Hapur is Brijghat and Pushpawati Pooth Ghat. The total length of river Ganga is 2525 kilometers. Fresh water algae / Countless types of algae are found in pure and low concentration water, such as ponds, pits, lakes, rivers, fresh water springs, canals, drains and stagnant waters. In etc. These algae are free swimming; Like Spirogyra or can be attached at one place with a hold fast, like Ulothrix etc. Some algae are in the form of microscopic phytoplankton and zooplankton, which turn the color of water green. In this, very microscopic unicellular,

colonial or filamentous algae are suspended in water. Members of Euglenophyta, Xanthophyceae, Cyanophyceae, Chrysophyceae, Diatoms and Conjugales are found in the soil on the lower surface or under water on the shore. Phytoplankton is used by aquatic animals. It has been observed that there is a direct relation between the amount of phytoplankton and fish on the western coast of India. In the field of fish production, special types of Algae are used as per the situation. It is new only as food for water animals but its presence Due to this they get plenty of oxygen.

#### Brijghat and Pushpawati Pooth Ghat:

Brijghat site is situated on the banks of river Ganga, at a distance of about 35 km from the district headquarters Hapur on Delhi-Moradabad National Highway No. 24, at a distance of 05 km from the famous pilgrimage site Garhmukteshwar. This place has emerged as a new pilgrimage destination. A huge historical fair is organized at Ganga Ghat on Kartik Purnima in Brijghat and surrounding areas. The view of the evening aarti on the banks of Ganga at this place is very beautiful. Pushpawati is a village of Mahabharata period. This was a part of the capital of Pandavas. At that time there was a grand garden named Pushpawati, which was considered to be the resort of the rulers of Hastinapur. Queen Draupadi of Pandavas also used to visit Pushpawati often. This place is situated on a high mound. It has been the abode of Guru Dronacharya, the examination ground of Kauravas and Pandavas and the place of meditation of Ekalavya. Such evidence is found in scriptures. Pushpawati Pooth village is

situated on the banks of river Ganga so this Ghat name is Pooth Ghat.



**Brijghat site of study**



**Pooth Ganga ghat site of study**

<https://maps.app.goo.gl/3Vcot1P4SkXerSZ7>  
<https://maps.app.goo.gl/5HuAzGuiYgZGhNLF7>



**Brijghat site of study**



**Pooth Ganga ghat site of study**

### **Materials and Method**

Surface water samples were taken from two chosen locations—Brijghat Garhmukteshwar and Pushpawati Pooth Ghat Garhmukteshwar—in order to evaluate the Ganga River's plankton diversity. A concentrated sample of 200 ml was generated by filtering 100 liters of surface water using a plankton net of bolting silk No. 20, which has a mesh size of 76 meters. For the purpose of identification using standard keys (APHA, 1995, Edmondson, 1959), 100 cc of the sieved residue was transferred to a bottle and stored in 4% formaldehyde. From February 2021 through December 2021, samples were taken monthly at two different locations for the research. Phytoplankton and zooplankton were detected using a microscope in this investigation.



**Phytoplankton and Zooplankton in Flood Area of Pushpawati Pooth Ghat**

### **Results**

The variety of phytoplankton and zooplankton in the Garhmukteshwar Brijghat and Pushpawati Pooth Ghat sites was shown by the data collected in March and April. Phytoplanktons and zooplankton are more abundant in April compared to March. While March had a higher concentration of spirogyra in Brijghat and Pushpawati Pooth Ghat, April saw a greater concentration at Pushpawati Pooth Ghat. All through the time frame of the research, the genus Chlorella was abundant in the population. On the other hand, April had a single mild high. April was a month when nearly all of the sample sites examined included members of the genus Hydrodictyon. Variations in these communities of phytoplankton show how primary production is naturally managed throughout the year. In March and April, the majority of chlorophycean members reach their peak formation. All sample locations during the research period identified Microcystis and Pandorina genera. Throughout the course of the research year, a total of 38 different phytoplankton species and 22 different zooplankton genera were observed. Diversity of phytoplankton and zooplankton species as measured at two randomly chosen sites. The green algae family Chlorophyceae is home to fifteen different genera, including Ankistrodesmus, Chlamydomonas,

Cladophora, Closterium, Comarium Cosmarium, Euglena, Oedogonium, Pandorina, Pediatrum, Spirogyra, Tetrastora, Ulothrix, Uronema, and Volvox, and it accounts for the vast majority of phytoplankton diversity. In terms of phytoplankton diversity, the second major group is the Bacillariophyceae (diatoms), a brown algae family that includes eleven genera (Amphora, Bacillaria, Cyclotella, Cymbella, Denticula, Diatoma, Fragilaria, Frustulia, Gomphoneis, Navicula, and Nitzschia). The blue-green algae family, Cyanophyceae, had four genera (Anabaena, Nostoc, Spirulina, and Oscillatoria). The distribution of phytoplankton throughout the research period was as follows: Chlorophyceae > Bacillariophyceae > Cyanophyceae.

During the time frame of the investigation, the distribution of zooplankton was as follows: Rotifera> Protozoa> Cladocera> Copepoda.

### Conclusion:

Plankton communities exhibit a major biotic component of an aquatic ecosystem and emphasis has been given to identifying various plankton species as indicators of particular types of water pollution. The most important effect of organic pollution in a water body is due to the enrichment of nutrients and the total number of algal species. We conclude that there are several reasons for the higher diversity at Brijghat Ghat as compared to Pushpawati Ghat.

**Table 1 Diversity of Chlorophyceae phyto plankton and seasonal variation at two sites Brijghat Ghat and Pushpawati Pooth Ghat.**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Phytoplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Ankistrodesmus</i>	+	+	+	+	+	+
2.	<i>Chlamydomonas</i>	+	+	+	+	+	+
3.	<i>Cladophora</i>	+	+	-	+	+	+
4.	<i>Closterium</i>	+	+	-	+	+	+
5.	<i>Comarium</i>	+	+	-	+	+	+
6.	<i>Cosmarium</i>	+	+	-	+	+	-
7.	<i>Euglena</i>	+	+	-	+	+	+
8.	<i>Oedogonium</i>	+	+	-	+	+	+
9.	<i>Pandorina</i>	+	+	-	+	+	+
10.	<i>Pediastrum</i>	-	+	+	-	+	+
11.	<i>Spirogyra</i>	+	+	+	+	+	-
12.	<i>Tetrastora</i>	+	+	-	+	-	-
13.	<i>Ulothrix</i>	+	+	+	+	+	+
14.	<i>Uronema</i>	-	+	+	-	-	-
15.	<i>Volvox</i>	+	+	+	+	+	+
16.	<i>Chara</i>	-	+	+	-	+	+

**Table 2 Diversity of Bacillariophyceae phytoplankton and seasonal variation at two sites Brijghat Ghat and Pushpawati Pooth Ghat.**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Phytoplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Amphora</i>	+	+	+	+	+	+
2.	<i>Bacillaria</i>	+	+	+	+	+	-
3.	<i>Cyclotella</i>	+	+	+	+	+	+
4.	<i>Cymbella</i>	+	+	+	+	+	+
5.	<i>Denticula</i>	+	+	+	+	+	+
6.	<i>Diatoma</i>	+	+	+	+	+	+
7.	<i>Fragilaria</i>	+	+	+	+	+	+
8.	<i>Frustulia</i>	+	+	+	+	+	-
9.	<i>Gomphoneis</i>	+	+	+	+	-	-
10.	<i>Navicula</i>	+	+	+	+	+	+
11.	<i>Nitzschia</i>	+	+	+	+	+	+

**Table 3 Diversity of Cyanophyceae phytoplankton and seasonal variation at two sites Brijghat Ghat and Pushpawati Pooth Ghat.**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Phytoplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Anabaena</i>	+	+	+	+	+	+
2.	<i>Nostoc</i>	+	+	-	+	+	+

3.	<i>Spirulina</i>	+	+	+	+	-	-
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**Table 4 Diversity of Zooplankton Cladocera two sites Brijghat Ghat and Pushpawati Pooth Ghat.**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Zooplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Arcella dentata</i>	+	+	+	+	+	+
2.	<i>Paramecium caudatum</i>	+	+	+	+	+	+
3.	<i>Vorticella campanula</i>	+	+	-	+	+	+

**Table 5 Diversity of Zooplankton Protozoa two sites Brijghat Ghat and Pushpawati Pooth Ghat.**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Zooplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Alona rectangula</i>	+	-	+	+	+	+
2.	<i>Bosmina longirostris</i>	+	+	+	+	+	-
3.	<i>Ceriodaphnia reticulata</i>	+	+	+	+	+	+
4.	<i>Daphnia carinata</i>	+	+	-	+	+	+
5.	<i>Moina brachiata</i>	+	+	+	+	-	+

**Table 6 Diversity of Zooplankton Copepoda two sites Brijghat Ghat and Pushpawati Pooth Ghat**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Zooplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Cyclops bicuspidatus</i>	+	+	+	-	+	+
2.	<i>Macrocylops albidus</i>	+	+	-	+	+	-

**Table 7 Diversity of Zooplankton Rotifera two sites Brijghat Ghat and Pushpawati Pooth Ghat**

S.No.		Brijghat			Pushpawati Pooth Ghat		
	Zooplankton	Winter	Summar	Monsoon	Winter	Summar	Monsoon
1.	<i>Asplanchna intermedia</i>	+	+	+	+	+	+
2.	<i>Brachionus calyciflorus</i>	+	+	+	+	+	+
3.	<i>Brachionus caudatus</i>	+	+	+	+	+	+
4.	<i>Brachionus falcatus</i>	+	+	+	+	+	+
5.	<i>Brachionus plicatilis</i>	+	+	-	+	+	+
6.	<i>Brachionus quadridentatus</i>	+	+	+	+	+	-
7.	<i>Brachionus rubens</i>	+	+	-	+	+	+
8.	<i>Filinia longiseta</i>	+	+	-	+	+	+
9.	<i>Keratella cochlearis</i>	+	+	-	+	+	+
10.	<i>Keratella tropica</i>	-	+	+	-	+	+
11.	<i>Philodina citrina</i>	+	+	+	+	+	-
12.	<i>Polyarthra sp.</i>	+	+	-	+	-	-

## References

- Santra S.C.; Environmental Science, New Central Book Agency (P) Ltd.2005.
- Tiwari, Ashesh and Chauhan S. V. S. 2006. Seasonal phytoplanktonic diversity of Kitham lake, Agra. J. Environ B.
- Bilgrami, K. S., Dattamunshi, J. S., Siddiqui, E. N., & Singh, N. K.. Primary productivity of phytoplankton of the river Ganges. Biological Bulletin, 1, (1979) 39-42.
- Needham and Needham; A Guide to the study of Fresh Water Biology, Fifth edition.
- Zargar, S. and Ghosh, T. K. 2006. Influence of cooling water discharges from Kaiga nuclear power plant on selected indices applied to plankton population of Kadra reservoir. J. Environ. Biol., 27, 191-198.
- Parikh Ankita N. and Mankodi P.C., Limnology of SamaPond, Vadodara City, Gujarat, Res. J. Recent Sci., 1(1), (2012) 16- 21.
- Jha, D. N.. Influence of water pollution on the distribution of algae in the river Ganga at Kanpur. Ph.D. thesis. Kanpur University, Kanpur (1982).
- Chick, H. A study of unicellular green algae occurring in polluted water with special reference to its nitrogen metabolism. Proc. Roy. Soc. London. 71: (1902) 458-470.
- Singh Anand Prakash and Chaudhary B. R., Phonological diversity of chlorophycean algae from river Ganges at Varanasi, Uttar Pradesh, J. Algal Biomass Utln., 2 (1): (2011) 21 – 29.
- Khanna D.R., Bhutiani Rakesh, Matta Gagan, Singh Vikas and Bhadauriya Gaurav, Study of planktonic diversity of river Ganga from Devprayag to Roorkee,

- Uttarakhand (India), Environment Conservation Journal 13(1&2), (2012) 211-217.
- Palmer C.M., A composite rating of algae tolerating organic pollution, J. Phycology, (1969) 78-82.
- Upadhyay Rahul, Pandey K. Arvind, Upadhyay S.K., Assessment of Lake Water Quality by Using Palmer and Trophic State Index- A Case Study of Upper Lake, Bhopal, India, International Research Journal of Environment Sciences ISSN 2319– 1414 Vol. 2(5), May (2013) 1-8.
- Manual for Phytoplankton Sampling and Analysis in the Black Sea Dr. Snejana Moncheva, Dr. Bill Parr, Updated June 2010
- APHA 2005 Standard Methods for the Examination of Water and Waste Water (21St edition) American Public Health Association, Washington, D. C.
- Bilgrami, K. S. and Datta Munshi, J. S. 1985 Ecology of river Ganges (Impact of human activities and conservation of aquatic biota Patna to Farakka). Final Technical Report (May, 1982 – April, 1985). Submitted to D.O.En., New Delhi, and PP 97.
- Bilgrami, K. S. and Datta Munshi, J. S. 1988 Study of river Ganga (Munger to Farakka) Final Technical Report. Submitted to Ganga project Directorate, Govt. of India, New Delhi, PP. 152.
- Randhawa, M. S. 1959. Zygnemaceae, ICAR, New Delhi, pp. 478
- Sunil Kumar Singh, Lucent publications, The Holy river Ganga, page 109-110
- Dr A.K sharma and Dr Rajeshwari Sharma, Nageen Prakashan Meerut, About PHYTOPLANKTON, page no 608 -641