



PHYTOPLANKTON DIVERSITY OF SOME SELECTED STREAMS OF DEHRADUN DISTRICT OF UTTARAKHAND STATE

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ABSTRACT

Plankton is most sensitive floating community which is being the first target of water pollution thus any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community. this study was carried out to investigate the composition diversity of and physic-chemical parameters of some selected streams of Dehradun. Data were collected from selected streams viz. Shastradhara, Noon, Song and Sushwa upstream and Song and Sushwa downstream. The samples for phytoplankton, and water were collected in a sterile plastic container from water bodies by filtering the water through plankton net and preserved in the 5% formalin and the physico-chemical parameter for water sample taken 1 liter sterile containers and brought to the laboratory and analysed. At site-I, 17 genera of phytoplankton belonging to 11 families and 6 orders were reported. At site-II, a total of 15 genera of phytoplankton belonging to 10 families and 3 orders were reported. At site-III, total 15 genera, 10 families and 4 orders were recorded. During the present study maximum number of phytoplankton were recorded in upstream viz., Shastradhara, Song, Noon and downstream Song, Sushwa.

Key words: Phytoplankton, Dehradun, .Uttarakhand and diversity.

INTRODUCTION

Water is an important component of all living being, it is also perform unique and indispensable activities in earth ecosystem, Biosphere and biogeochemical cycles. The term plankton refers to those microscopic aquatic forms having little or no resistance to the water current and is free floating and suspended in open or pelagic waters. The planktonic plants are referred to as "phytoplankton (microscopic algae and bacteria) occurs as unicellular, colonial or filamentous forms.

The phytoplankton is an assemblage of heterogeneous microscopic algal forms of aquatic system whose movement is more or less dependent upon water currents. The plankton occur is all natural waters as well as in artificial

impoundment like ponds, tanks reservoir, irrigation channels etc. Phytoplankton are autotrophs and belonging to first trophic level. The primary production of organic matter is in the form of phytoplankton which are more intense is reservoir, lake than in river. The environmental variables such as temperature, pH and phosphate play a decisive role in altering the phytoplankton density.

Plankton is most sensitive floating community which is being the first target of water pollution thus any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community. The measurement of plankton productivity help to understand conservation ratio at varies tropical level and resources as an essential in put for proper management of aquatic water bodies. Therefore, this study was

carried out to investigate the composition diversity of and physic-chemical parameters of some selected streams of Dehradun.

MATERIAL AND METHODS

The present study was carried out in some selected streams of capital Dehradun of Uttarakhand state. The study was carried out during the Months of March, 2013 and April, 2013. Data were collected from selected streams viz. Shastradhara, Noon, Song and Sushwa upstream and Song and Sushwa downstream. The samples for phytoplankton, and water were collected in a sterile plastic container from water bodies by filtering the water through plankton net and preserved in the 5% formalin and the physico-chemical parameter for water sample taken 1 liter sterile containers and brought to the laboratory and analyzed with standard books APHA (1998). Identification of phytoplankton were identified with the help of standard reference books (Ward and Whipple, 1968).

RESULTS

Phytoplankton

Species composition in phytoplankton is documented in Table-1. A total of 36 genera belonging to 15 families and 6 orders were documented from the all selected study sites in the month of March. In the month of April, 42 genera belonging to 18 families, 2 sub families and 8 orders are recorded from the all selected study sites.

Upstreams

Shastradhara (Site-1):

At site-I, 17 genera of phytoplankton belonging to 11 families and 6 orders were reported during March, 2013. During April, 2013, a total of 21 genera belonging to 13 families and 2 subfamilies and 6 orders are recorded. During March, 2013 phytoplankton orders reported were Bacillariales, Chlorococcales, Zygnematales, Ulotrichales, Oedogoniales, Cladophorales, and Rhizochloridales. Fragilariaceae, Eunotiaceae, Cladophoraceae and Chlorotheciaceae were the families recorded. Genera recorded were *Ceratneis*, *Fragilaria*, *Actinella*, *Peronia*,

Amphipleura, *Brebissonia*, *Diatomella*, *Navicula*, *Denticula*, *Bacillaria*, *Chlorella*, *Roya*, *Binuclearia*, *Ulothrix*, *Oedocladium*, *Cladophora*, and *Chlorothecium*. In April, 2013, phytoplankton orders reported were Bacillariales, Chlorococcales, Zygnematales, Ulotrichales, Cladophorales and Rhizochloridales while families recorded were Fragilariaceae, Eunotiaceae,

Achnanthaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Oocystaceae, Mesotaeniaceae, Desmidiaceae, Ulotrichaceae, Cyndrocapsaceae, Cladophoraceae, and Chlorotheciaceae. Subfamilies were Amphiprotozoideae, Meridioniodeae. Genera reported were *Fragilaria*, *Meridion*, *Peronia*, *Eucoconeis*, *Frustulia*, *Gyrosigma*, *Amphiprora*, *Cymbella*, *Amphora*, *Epithemia*, *Rhopalodia*, *Closteriopsis*, *Roya*, *Closterium*, *Micrasterias*, *Hormidium*, *Stichococcus*, *Uronema*, *Cylindrocapsa*, *Cladophora*, and *Chlorothecium*.

Song Stream (Site-II):

At site-II, a total of 15 genera of phytoplankton belonging to 10 families and 3 orders were reported in March, 2013. Orders reported were Bacillariales, Chlorococcales and Ulotrichales while families recorded were Fragilariaceae, Eunotiaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Nitzschiaceae, Oocystaceae, Desmidiaceae, Ulotrichaceae, and Cyndrocapsaceae. *Diatoma*, *Eunotia*, *Brebissonia*, *Gyrosigma*, *Stauroneis*, *Amphora*, *Cymbella*, *Epithemia*, *Rhopalodia*, *Nitzschia*, *Closteriopsis*, *Micrasterias*, *Binuclearia*, *Uronema* and *Cylindrocapsa* were the genera reported during this month. In April 2013, a total of 14 genera, 9 families and 5 orders were recorded. Bacillariales, Zygnematales, Ulotrichales, Oedogoniales and Charales were the five orders documented while Eunotiaceae, Achnanthaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Nitzschiaceae, Mesotaeniaceae, Ulotrichaceae, Oedogoniaceae and Characeae were the families reported. Genera were *Actinella*, *Rholocosphenia*, *Amphipleura*, *Frustulia*, *Gyrosigma*, *Navicula*, *Stauroneis*, *Amphora*, *Rhopalodia*, *Bacillaria*, *Roya*, *Stichococcus*, *Oedogonium* and *Chara*.

Table 1. Phytoplankton diversity represented of March, 2013

Sl. No.	Phytoplankton taxa	UPPER STREAM			DOWN STREAM	
		(S - I)	(S-II)	(S-III)	(S-I□)	(S - □)
(A)	Order – Bacillariales					
(a)	Family-Fragilariaceae					
1	<i>Ceratneis</i>	+				+
2	<i>Diatoma</i>		+			
3	<i>Fragilaria</i>	+				+
(b)	Family – Eunotiaceae					
1	<i>Actinella</i>	+			+	
2	<i>Eunotia</i>		+	+		
3	<i>Peronia</i>	+				+
(c)	Family – Achnanthaceae					
1	<i>Eucocconeis</i>			+	+	
(d)	Family – Naviculaceae					
1	<i>Amphipleura</i>	+		+		
2	<i>Anomoenesis</i>				+	+
3	<i>Brebissonia</i>	+	+	+	+	+
4	<i>Caloneis</i>				+	+
5	<i>Diatomella</i>	+		+	+	
6	<i>Frustulia</i>			+		
7	<i>Gyrosigma</i>		+			+
8	<i>Navicula</i>	+			+	+
9	<i>Pinnularia</i>				+	
10	<i>Stauroneis</i>		+			
(e)	Family – Cymbellaceae					
1	<i>Amphora</i>		+		+	
2	<i>Cymbella</i>		+	+		+
(f)	Family – Epithemiaceae					
1	<i>Denticula</i>	+				
2	<i>Epithemia</i>		+	+		
3	<i>Rhopalodia</i>		+	+	+	+
(g)	Family – Nitzschiaceae					
1	<i>Bacillaria</i>	+			+	
2	<i>Nitzschia</i>		+			+
(B)	Order – Chlorococcales					
(h)	Family – Oocystaceae					
1	<i>Chlorella</i>	+		+	+	
2	<i>Closteriopsis</i>		+	+		+
(i)	Family – Mesotaeniaceae					
1	<i>Roya</i>	+		+	+	
(j)	Family – Desmidiaceae					
1	<i>Micrasterias</i>		+			+
(C)	Order – Ulotrichales					
(j)	Family – Ulotrichaceae					
1	<i>Binuclearia</i>	+	+		+	
2	<i>Ulothrix</i>	+				
3	<i>Uronema</i>		+	+		+
(k)	Family – Cyndrocapsaceae					

Sl. No.	Phytoplankton taxa	UPPER STREAM			DOWN STREAM	
		(S - I)	(S-II)	(S-III)	(S-I□)	(S - □)
1	<i>Cylindrocapsa</i>		+	+		
(D)	Order – Oedogoniales					
(l)	Family – Oedogoniaceae					
1	<i>Oedogonium</i>				+	
2	<i>Oedocladium</i>	+		+		+
(E)	Order – Cladophorales					
(m)	Family – Cladophoraceae					
1	<i>Cladophora</i>	+			+	
(F)	Order – Rhizachloridales					
(n)	Family – Chlorotheciaceae					
1	<i>Chlorothecium</i>	+				+

Noon Stream (Site-III):

In March 2013, total 15 genera, 10 families and 4 orders were recorded where Bacillariales, Chlorococcales, Ulotrichales and Oedogoniales were the orders recorded. Families were Eunotiaceae, Achnanthaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Oocystaceae, Mesotaeniaceae, Ulotrichasceae, Cylindrocapsaceae and Oedogoniaceae. Genera were *Eunotia*, *Eucoconeis*, *Amphipleura*, *Brebissonia*, *Diatomella*, *Frustulia*, *Cymbella*, *Epithemia*, *Rhopalodia*, *Chlorella*, *Closteriopsis*, *Roya*, *Uronema*, *Cylindrocapsa* and *Oedocladium*. In April 2013, total 18 genera belonging to 12 families and 6 orders were reported. Bacillariales, Chlorococcales, Zygnematales, Ulotrichales, Oedogoniales and Rhizachloridales were the orders recorded. Families reported were Fragilariaceae, Eunotiaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Nitzschiaceae, Chlorococcaceae, Oocystaceae, Desmidiaceae, Ulotrichasceae, Oedogoniaceae and Pleurochloridaceae. Genera were *Fragilaria*, *Diatoma*, *Actinella*, *Eunotia*, *Anomoenesis*, *Diatomella*, *Cymbella*, *Rhopalodia*, *Bacillaria*, *Chlorococcum*, *Closteriopsis*, *Closterium*, *Micrasterias*, *Binuclearia*, *Uronema*, *Oedocladium* and *Chlorocloster*.

DOWN STREAM

Song Stream (Site-IV):

In March 2013, 16 genera belonging to 11 families and 5 orders were documented. Bacillariales, Chlorococcales, Ulotrichales, Oedogoniales and Cladophorales were the orders recorded while Eunotiaceae, Achnanthaceae,

Fragilariaceae, Eunotiaceae, Achnanthaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Desmidiaceae, Ulotrichasceae, Cylindrocapsaceae, Oedogoniaceae, Cladophoraceae, Pleurochloridaceae, and Chlorotheciaceae. Genera were *Fragilaria*, *Meridion*, *Actinella*, *Eucoconeis*, *Frustulia*, *Gyrosigma*, *Stauroneis*, *Cymbella*, *Denticula*, *Micrasterias*, *Hormidium*, *Stichococcus*, *Ulothrix*, *Cylindrocapsa*, *Oedocladium*, *Cladophora*, *Chlarocloster* and *Chlorothecium*.

Sushwa stream (Site-V):

During March 2013, 16 genera, 11 families and 5 orders were documented where Bacillariales, Chlorococcales, Ulotrichales, Oedogoniales and Rhizachloridales. Families reported were Fragilariaceae, Eunotiaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Nitzschiaceae, Oocystaceae, Desmidiaceae, Ulotrichasceae, Oedogoniaceae and Chlorotheciaceae. Genera were *Ceratneis*, *Fragilaria*, *Peronia*, *Anomoenesis*, *Brebissonia*, *Caloneis*, *Gyrosigma*, *Navicula*, *Cymbella*, *Rhopalodia*, *Nitzschia*, *Closteriopsis*, *Micrasterias*, *Uronema*, *Oedocladium* and *Chlorothecium*. In April 2013, total 19 genera belonging to 13 families and 7 orders were recorded, out of which Bacillariales, Chlorococcales, Zygnematales, Ulotrichales, Oedogoniales, Charales and Rhizochoridales were the orders reported. Families reported were *Fragilariaceae*, *Eunotiaceae*, *Naviculaceae*, *Cymbellaceae*, *Epithemiaceae*, *Nitzschiaceae*, *Chlorococcaceae*, *Oocystaceae*, *Mesotaeniaceae*, *Ulotrichasceae*, *Oedogoniaceae*, *Characeae*,

Pleurochloridaceae. Genera observed were *Creatoneis*, *Fragilaria*, *Diatoma*, *Actinella*, *Peronia*, *Brebissonia*, *Diatomella*, *Navicula*, *Amphiphora*, *Amphora*, *Epithemia*, *Bacillaria*, *Chlorococcum*, *Closteriopsis*, *Roya*, *Uronema*, *Oedocladium*, *Chara* and *Chlorocloster*.

DISCUSSION

The phytoplankton of rivers was dominated by *Diatoms* while, blue-green algae, green algae and Dinoflagellates were less significant (Kadri, 2004) reported the highest phytoplankton genus number during the in summer season.

Centric *Diatoms* are one of the best adapted algal groups to turbulent and turbid system (Izaguirre *et al.*, 2001), whereas, pinnate *Diatoms* are regarded as benthic forms. It has been reported that pinnate *Diatoms* were richer in number of taxa than centric forms in the phytoplankton of many shallow river (Kardi, 2004; Gonolol, 1985).

The seasonal variations of phytoplankton are due to variable aquatic environmental factors in aquatic environmental (Wu and Chou, 1999). Water temperature and transparency are among the most important physical factors, affecting the distribution and seasonal variations of phytoplankton in rivers (Simon and Hildrev, 1998).

The effects of a water temperature on phytoplankton have been examined in many freshwater ecosystems and it was found that water temperature strongly regulates the seasonal variations of phytoplankton (Lund 1965; Richardson *et al.*, 2000 Izaguirre *et al.*, 2001). Light is a major resource for the phytoplankton and has a complex pattern of a spatial and temporal variability (Lichman, 2000).

Suspended matter in river water increases in winter and spring, resulting in minimum transparency. During the summer the transparency was its maximum level. There was also a significant correlation between the growth of phytoplankton and transparency in

Sahastradhara, Song, Noon in upstream and downstream river Song, Sushwa.

During the present study maximum number of phytoplankton were recorded in upstreams viz., Sahastradhara, Song, Noon and downstream Song, Sushwa. Patra *et al.* (2012) worked on seasonal variation of phytoplankton dynamics were observed at Puri sea shore of Bay of Bengal. In total of phytoplankton 45 species of chlorophyta (53.60%), 17 species of bacillariophyta (29.45%) and 12 species of cyanophyta were identified.

Pailwan *et al.* (2008) evaluate of limnological feature, plankton diversity and fishery status of three freshwater perennial tanks at Kagal, Kaneriwadi and Kandalgoan of Kolhapur district (M.S) India. This study revealed 67 species of phytoplankton recorded.

Malik *et al.* (2013) studied on the plankton diversity and biological productivity of stream Sahastradhara and recorded 40 taxa from different classes of plankton.

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