

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

Negi R.K., Yadav N and Vishnoi V

Department Zoology & Environmental Sciences, Gurukula Kangri University,
Haridwar, India 245904

E-mail: negi_gkv@rediffmail.com

ABSTRACT

The present study was carried out to investigate the phytoplanktonic diversity in some selected streams of capital Dehradun of Uttarakhand state during the months of March and April, 2013 viz. Shastradhara, Noon, Song and Suswa upstream. 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. Bacillariales, Chlorococcales, Ulotrichales, Cladophorales, Rhizochloridales, Oedogoniales, Zygnematales, Charales were the orders recorded while Fragilariaceae, Eunotiaceae, Naviculaceae, Epithemiaceae, Nitzschiaceae, Oocystaceae, Mesotaeniaceae, Ulotrichaceae, Oedogoniaceae, Cladophoraceae, Chlorotheciaceae, Achnanthaceae, Cymbellaceae, Desmidiaceae, Cyndrocapsaceae were the families reported.

Key words: Phytoplankton, Streams, Dehradun, Uttarkhand.

INTRODUCTION

Water is an important component of all living being as it performs 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 and are autotrophs belonging to first trophic level. The planktonic plants are referred to as "phytoplankton (microscopic algae and bacteria) occurring as unicellular, colonial or filamentous forms which is an assemblage of heterogeneous microscopic algal forms. The plankton occur in all natural waters as well as in artificial impoundment like ponds, tanks, reservoir,

irrigation channels etc. The primary production of organic matter is in the form of phytoplankton which are more intense in reservoirs and lakes than in the river. The environmental variables such as temperature, pH and phosphate play a decisive role in altering the phytoplankton density. Plankton is the 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 helps to understand conservation ratio at various tropical levels and resources as an essential input for proper management of aquatic water bodies. Therefore, this study was carried out to investigate the

composition diversity of phytoplankton and physic-chemical parameters of some selected streams of district Dehradun of Utrakhnad state (India).

MATERIAL AND METHODS

The present study was carried out to investigate the phytoplanktonic diversity in some selected streams of capital Dehradun of Utrakhnad state during the months of March and April, 2013 viz. Shastradhara, Noon, and Song. 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 the help of APHA (1998). Identification of phytoplankton was carried out with the help of standard reference books (Ward and Whipple, 1962).

RESULTS

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.

Shastradhara (Site-1):

At site-I, 17 genera (*Ceratneis*, *Fragilaria*, *Actinella*, *Peronia*, *Amphipleura*, *Brebissonia*, *Diatomella*, *Navicula*, *Denticula*, *Bacillaria*, *Chlorella*, *Roya*, *Binuclearia*, *Ulothrix*, *Oedocladium*, *Cladophora*, and *Chlorothecium*) of phytoplankton belonging to 11 families (Fragilariaceae, Eunotiaceae, Naviculaceae, Epithemiaceae, Nitzschiaceae, Oocystaceae, Mesotaeniaceae, Ulotrichasceae, Oedogoniaceae, Cladophoraceae and Chlorotheciaceae) and 6

orders (Bacillariales, Chlorococcales, Ulotrichales, Cladophorales, Rhizachloridales, Oedogoniales) were reported during March, 2013. During April, 2013, a total of 21 genera (*Fragilaria*, *Meridion*, *Peronia*, *Eucoconeis*, *Frustulia*, *Gyrosigma*, *Amphiprora*, *Cymbella*, *Amphora*, *Epithemia*, *Rhopalodia*, *Closteriopsis*, *Roya*, *Closterium*, *Micrasterias*, *Hormidium*, *Stichococcus*, *Uronema*, *Cylindrocapsa*, *Cladophora*, and *Chlorothecium*) belonging to 13 families (Fragilariaceae, Eunotiaceae, Achnanthaceae, Naviculaceae, Cymbellaceae, Epithemiaceae, Oocystaceae, Mesotaeniaceae, Desmidiaceae, Ulotrichasceae, Cylindrocapsaceae, Cladophoraceae, and Chlorotheciaceae and 2 subfamilies (Amphiproroideae, Meridionioideae) and 6 orders (Bacillariales, Chlorococcales, Ulotrichales, Cladophorales, and Rhizachloridales and Zygnematales) are recorded.

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, Ulotrichasceae, and Cylindrocapsaceae. *Diatoma*, *Eunotia*, *Brebissonia*, *Gyrosigma*, *Stauroneis*, *Amphora*, *Cymbella*, *Epithema*, *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, Ulotrichasceae, Oedogoniaceae and Characeae were the families reported. Genera were *Actinella*, *Rholocosphenia*, *Amphipleura*, *Frustulia*, *Gyrosigma*, *Navicula*, *Stauroneis*,

Table 1. Phytoplankton diversity of some selected of stream March and April, 2013

S.No	Phytoplankton taxa	March,2013			April,2013		
		(S - I)	(S-II)	(S-III)	(S-I)	(S -II)	S- III
(A)	Order – Bacillariales						
(a)	Family-Fragilariaceae						
1	<i>Ceratneis</i>	+					
2	<i>Diatoma</i>		+				+
3	<i>Fragilaria</i>	+			+		+
	Subfamily- Meridioniodeace						
	<i>Meridion</i>				+		
(b)	Family – Eunotiaceae						
1	<i>Actinella</i>	+				+	+
2	<i>Eunotia</i>		+	+			+
3	<i>Peronia</i>	+			+		
(c)	Family – Achnantheaceae						
1	<i>Eucoconeis</i>			+		+	
	<i>Rholocosphenia</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						
	Family- Chlorococcaceae						
	<i>Chlorococcum</i>						+
(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						
1	<i>Cyndrocapsa</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>	+			+		
	Order – Charales						
	Family – Characeae						
	<i>Chara</i>					+	

Amphora, *Rhopalodia*, *Bacillaria*, *Roya*, *Stichococcus*, *Oedogonium* and *Chara*.

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, Ulotrichaceae, Cyndrocapsaceae and Oedogoniaceae. Genera were *Eunotia*, *Eucoconeis*, *Amphipleura*, *Brebissonia*, *Diatomella*, *Frustulia*, *Cymbella*, *Epithemia*, *Rhopalodia*, *Chlorella*, *Closteriopsis*, *Roya*, *Uronema*, *Cyndrocapsa* 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,

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).

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 (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, Suswa. During the present study maximum number of phytoplankton were recorded in upstreams viz., Sahastradhara, Song, Noon and downstream Song, Suswa.

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. Faranani *et al.* (2006) studied on Jajerod river is one of the freshwater river in Iran seasonal changes in phytoplankton composition and physico-chemical factor were investigated and recorded a total of 53 taxa belonging to four algae classes bacillariophyceae, chlorophyceae, cyanophyceae and dinophyceae. Bacillariophyceae appeared to be dominant.

Mathivanan *et al.* (2003) studies on plankton of river Cauvery water, Mettur, Salem district Tamilnadu and recorded Myxophyceae 41% Eugliniae 14% bacillariophyceae 16% chlorophyceae 29% and myxophyceae were observed to be most dominant. Jayabhaye *et al.* (2006) also worked on the phytoplankton diversity in Swana dam Maharashtra India and recorded five classes viz., chlorophyceae, bacillariophyceae, cyanophyceae, Euglenophyceae and Chlorophyceae. Heary *et al.* (2012) worked on the fluctuation in plankton abundance and diversity of the Ima river in Etche ,a Niger delta region and recorded 43 genera of the phytoplankton and dominant phytoplankton were the Bacillariophyceae 53.25% followed in order by Cyanophyceae (4.84%), Pyrrophyceae (4.57%), Xanthophyceae (3.39%) and Euglenophyceae (2.42%) . Mahor and Beena (2009) studied on the diversity and

seasonal fluctuation of phytoplankton and has recorded 44 species of following 4 groups Chlorophyceae, Bacillariophyceae, Myxophyceae and Euglenophyceae from the Tighra reservoir at Gwalior (M.P.). Fonge *et al.* (2012) worked on the phytoplankton community and abundance in Ndop wetland plain Cameroon and recorded 8 division of phytoplankton Chlorophyta (26.42%), Bacillariophyta (20.76%), Phyrrophyta (20.76%), Cyanophyta (15.09%) Chrysophyta (1.87%), Xanthophyta (3.77%) Rhadophyta (1.87%) and Euglenophyta (7.55%) the most abundant species were *Microcystis Aerginosa*, *Anacystis sp.*, *Chlorococcus disperses* and *Peridinum sp.*

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