



OCCURRENCE OF PHYTOPLANKTON OF SOME ESTUARIES FROM RATNAGIRI DISTRICT DURING RAINY SEASON

**Surekha Nivrutti
Dhumal**

Department of Botany, D K A S C college, Ichalkaranji Kolhapur.

ABSTRACT Occurrence, diversity and density of phytoplankton were recorded in five estuaries from Ratnagiri district of Maharashtra during rainy season. A total of 104 phytoplankton species belonging four division, viz, Cyanophyceae (11), Chlorophyceae (7), Dinophyceae (3) and Bacillariophyceae (83) were reported in the present study. Species diversity and density was recorded highest at Ranpar estuary and from Bacillariophyceae it was greater than other divisions. Diversity index is very high due to number of contributing species. He result concluded that the selected estuaries are more fertile with rich phytoplankton productivity.

KEYWORDS : Diversity Index, density, Phytoplankton, estuaries, Ratnagiri district.

INTRODUCTION:

The number of man made water bodies is increasing day by day. They need to be investigated for the biological parameters. The selected areas are surrounded by the catchment area which imparts characters to the water body. Some of the species of the phytoplankton can help assessing the health of water body. For instance more of cyanophycean members can indicate organic pollution of the water bodies.

MATERIALS AND METHODS:

Phytoplankton sample were collected with plankton net and preserved by using 0.5ml of formalin in 50ml sample collected after filtration of 50 litres of water. The phytoplankton were studied under the microscope and microphotographs were taken by using Nikon L-20 camera. The organisms were identified using books such as Prescott (1982), Fritsch (1965), Sarode and Kamat (1984), Marshal (1986), Tomas (1997), Al-Kandari *et al.*, (2009) and websites.

RESULTS AND DISCUSSION:

Detailed microscopic observation of phytoplankton under light microscope from Ratnagiri district revealed that there were four groups consisting of 104 species belonging to 56 genera of phytoplankton viz. Cyanophyceae 11, Chlorophyceae 07, Dinophyceae 03, and Bacillariophyceae 83.

The phytoplankton diversity in Ratnagiri district during rainy season has been presented in **Table 1**.

Table.1. Occurrence Of Phytoplankton In Ratnagiri District During Rainy Season.

Sr. No.	Name of the species/site	Bht	Gvk	Mrb	Nat	Rnp
Cyanophyceae						
01	<i>Aphanocapsa grevillei</i> (Hass.) Rabenhorst	-	-	-	-	+
02	<i>Chroococcus dispersus</i> (Keissl.) Lemmermann	-	-	-	-	+
03	<i>Chroococcus pallidus</i> Naegeli	-	-	-	+	-
04	<i>Merismopedia tenuissima</i> Lemmermann	+	-	-	-	+
05	<i>Nostoc communitum</i> Kuetzing	-	-	+	-	-
06	<i>Nostoc linckia</i> (Roth) Bornet & Thuret	-	+	-	-	-
07	<i>Oscillatoria</i> sp.	-	-	+	-	-
08	<i>Oscillatoria erythraea</i> (Ehrenb.) Geitler	-	-	-	-	+
09	<i>Paulinella chromatophora</i> Lauterb.	-	-	-	+	-
10	<i>Scytonema hofmanni</i> Ag.ex. Born.	-	-	-	-	+
11	<i>Syneccocus</i> sp.	-	-	+	-	-
Chlorophyceae						
12	<i>Cosmarium</i> sp.	-	-	+	-	-
13	<i>Dispora crucigenoides</i> Printz.	-	-	-	-	+
14	<i>Kirchneriella conferta</i> Schmidle	-	-	-	-	+
15	<i>Mougeotia indica</i> Randhava	-	-	+	-	-
16	<i>Spirogyra rhizobranchialis</i> Fao	-	-	-	-	+
17	<i>Staurastrum</i> sp.	-	+	-	-	-
18	<i>S. gracile</i> Ralfs	-	+	-	-	-

Dinophyceae						
19	<i>Alexandrium tamarense</i> (Lebour) Balech	-	-	-	+	-
20	<i>Glenodinium</i> sp.	-	-	-	-	+
21	<i>Peridinium inconspicuum</i> Lemmermann	-	-	-	-	+
Bacillariophyceae						
22	<i>Achnanthes brevipes</i> v. <i>intermedia</i> (Kutz) Cleve	+	+	+	-	+
23	<i>Achnanthes lanceolata</i> (Breb.) Grun.	+	-	-	-	-
24	<i>Amphora exigua</i> Gregory	-	-	-	-	+
25	<i>Amphora libyca</i> Ehrenberg	-	+	-	-	-
26	<i>Asterionellopsis glacialis</i> Castracane	-	+	-	-	-
27	<i>Bacillaria paxilifer</i> (Muller) Hendey	-	+	+	-	+
28	<i>Bacillaria socialis</i> (gregory) Ralfs	-	-	-	+	-
29	<i>Bacteriastrium delicatulum</i> Cleve	-	-	-	-	+
30	<i>Bacteriastrium hyalinum</i> Lauder	-	-	+	-	-
31	<i>Bidulphia pulchella</i> Gray	-	-	-	-	+
32	<i>Caloneis intermedia</i> H. P. Gandhi	-	-	-	-	+
33	<i>Caloneis silicula</i> v. <i>truncatula</i> (Grun.) Mayer	-	-	-	+	-
34	<i>Chaetoceros curvisetum</i> Cleve	+	-	-	+	+
35	<i>C. sociale</i> Lauder	-	-	-	-	+
36	<i>C. subtilis</i> Cleve	-	-	+	-	+
37	<i>Chaetophora dichchaeta</i>	-	-	+	-	-
38	<i>Cocconeis</i> cf. <i>guttata</i> Hustedt	-	-	-	-	+
39	<i>Coscinodiscus centralis</i> Ehrenberg	-	+	-	-	-
40	<i>C. granii</i> Gough	+	-	-	-	-
41	<i>C. lineatus</i> Ehrenberg	+	+	-	+	+
42	<i>C. lorenziana</i> Grunow	-	+	-	-	-
43	<i>C. radiatus</i> Ehrenberg	-	+	-	+	+
44	<i>C. wailesii</i> Gran et Angst	-	-	-	+	+
45	<i>Cyclotella antiqua</i> W. Smith.	-	+	-	-	-
46	<i>C. meneghiniana</i> Kuetz. Hustedt	+	-	+	-	+
47	<i>C. striata</i> (Kuetz.) Grun. Hustedt.	-	-	-	+	-
48	<i>C. stylorum</i> Brightwell	-	+	-	-	+
49	<i>Cymbella pusilla</i> Grun	-	-	-	+	-
50	<i>C. ventricosa</i> Kuetz	-	+	-	-	+
51	<i>Diploneis crabro</i> Ehrenberg	-	+	-	+	-
52	<i>D. ovalis</i> (Hilse) Cleve	+	-	-	+	+
53	<i>D. suborbicularis</i> (Gregory) Cleve	-	-	-	-	+
54	<i>D. subovalis</i> Cleve f. <i>robusta</i>	-	-	-	+	-
55	<i>Ditylum brightwellii</i> Ehrenberg	-	+	+	-	-
56	<i>Entomoneis sulcata</i> Müller	-	-	-	+	+
57	<i>Eumotia pectinalis</i> (Kuetz.) Rabh.	-	-	+	-	-
58	<i>E. praerupta</i> v. <i>inflata</i> Grun.	-	+	-	-	-
59	<i>Gomphonema gracile</i> v. <i>frichei</i> Gandhi	-	+	-	-	-
60	<i>G. longiceps</i> v. <i>subclavata</i> Grun	-	+	-	-	-
61	<i>G. montanum</i> v. <i>acuminatum</i> Mayer	-	+	-	-	+
62	<i>G. olivaceum</i> Hustedt.	-	+	-	+	-
63	<i>Gyrosigma bhusavalensis</i> Sarode et kamat.	-	-	-	-	+

64	<i>G. fasciola</i> (Ehrenberg) Cleve	-	-	-	-	+
65	<i>Licmophara</i> sp.	-	-	-	-	+
66	<i>Lyrella atlantica</i> (A. Schmidt) Mann	-	+	-	-	-
67	<i>Mastogloia erythroa</i> Grun.	-	-	-	-	+
68	<i>Melosira nummuloides</i> (Dillwyn) Agardh	+	+	+	+	+
69	<i>Navicula cocconeiformis</i> Kuetz.	-	+	-	-	-
70	<i>N. digitoradiata</i> (Gregory) Ralfs	-	-	+	-	-
71	<i>N. exifuga</i> Gregory	-	-	-	+	+
72	<i>N. incertata</i> Lange-Bertalot	-	-	-	+	-
73	<i>N. mutica</i> f. <i>goeppertiana</i> (Bleisch) Grun.	-	+	+	-	+
74	<i>N. transitans</i> v. <i>deresa</i> f. <i>delicatula</i> heimdal	+	+	+	+	+
75	<i>N. viriduloides</i> v. <i>lanceolata</i> Gandhi	-	-	-	+	-
76	<i>Neidium iridis</i> (Ehr.) Cleve	-	-	-	+	-
77	<i>Nitzschia amphibia</i> Grun.	-	-	+	-	+
78	<i>N. clausii</i> Hantzsch	+	+	+	+	+
79	<i>N. closterium</i> W. Smith.	+	+	+	+	+
80	<i>N. coarctata</i> Grunow	-	+	-	+	-
81	<i>N. cuspidata</i> Kutzing	-	-	-	-	+
82	<i>N. obtusa</i> v. <i>scalpelliformis</i> f. <i>parva</i> Hustedt	-	-	-	-	+
83	<i>N. cf. sigma</i> Ehrenberg	+	-	-	+	+
84	<i>N. solita</i> Hustedt	-	-	-	-	+
85	<i>Odontella mobiliensis</i> (Baillly) Grunow	-	-	-	-	+
86	<i>Paralia sulcata</i> (Ehrenberg) Cleve	-	+	-	-	-
87	<i>Pinnularia brebissonii</i> (Kuetz.) Cleve	-	-	-	-	+
88	<i>Pleurosigma aestuarii</i> (Breb.) W. Smith	-	-	-	-	+
89	<i>P. directum</i> Grunow	+	-	-	-	-
90	<i>P. diverse-striatum</i> F. Meister	-	-	-	+	+
91	<i>Pseudo-nitzschia seriata</i> Cleve	-	+	-	-	-
92	<i>Rhizosolenia</i> sp.	-	-	-	+	-
93	<i>R. hebetata</i> Bailey	+	+	-	-	+
94	<i>Sellaphora pupula</i> (Kutzing) Mereschkovsky	-	-	+	-	-
95	<i>S. seminulum</i> (Grunow) D. G. Mann	-	-	+	-	-
96	<i>Skeletonema costatum</i> (Greville) Cleve	+	+	+	+	+
97	<i>Stauroneis anceps</i> f. <i>linearis</i> (Ehr.) Cleve	-	+	-	-	-
98	<i>Surirella fastuosa</i> (Ehrenberg) Kutzing	-	-	-	+	-
99	<i>Synedra ulna</i> v. <i>subaequalis</i> Grun.	-	-	-	-	+
100	<i>Thalassionema nithschioides</i> Hustedt	-	+	-	-	-
101	<i>Thalassiosira ecentrica</i> (Ehrenberg) Cleve	+	-	-	+	+
102	<i>Thalassiosira oestrupii</i> v. <i>venrickae</i> (Ostenfeld) Hasle	-	+	-	-	-
103	<i>Thalassiosira subtilis</i> (Ostenfeld) Gran	-	+	-	-	+
104	<i>Thalassiothrix frauenfeldii</i> Grunow	-	-	+	-	-
	Total No. of species	17	37	24	31	54

*Bht-Bhatye, Gvk-Gavkhadi, Mrb-Miryabandar, Nat-Nate, Rnp-Ranpar.

The species of Bacillariophyceae were in maximum number while those of Dinophyceae had the least number. There were present equal number of genera of cyanophyceae and chlorophyceae in the district. Cyanophyceae members were 11 while, Chlorophyceae members were represented by 7 species. Ranpar showed presence of five species of Cyanophyceae whereas only one species was reported from Gavkhadi. At the Bhatye and Nate estuaries Chlorophyceae members were not found during rainy season. Dinophyceae group occurred only at Ranpar. Maximum number of phytoplankton species were recorded at Ranpar (54) and very few at Bhatye (17).

Species of Bacillariophyceae viz. *Melosira nummuloides*, *Navicula transitans* v. *deresa*, *Nitzschia closterium*, *N. clausii*, and *Skeletonema costatum* were common to all the sites in Ratnagiri district. A few species were site specific and occurred at a particular location only.

Paulinella chromatophora (Cyanophyceae) and *Alexandrium tamarensis* (Dinophyceae) at Nate, *Dispora crucigenoides* (Chlorophyceae) at Ranpar and *Lyrella atlantica* and *Paralia sulcata* (Bacillariophyceae) at Gavkhadi. These species were noticed only in the rainy season in Ratnagiri district. Diatom genera *Navicula* and *Nitzschia* exhibited the maximum number of species (7 and 8 respectively) in the present study.

Some toxic species were noticed in the present study viz. *Alexandrium tamarensis* and *Pseudonitzschia seriata*, belonging to Dinophyceae. *Alexandrium* produces neurotoxins that cause poisoning to fish, animal and indirectly to humans also.

Diversity Index:

Shannon diversity index (H) combines species richness and species evenness as overall index of diversity (Shinde *et al.*, 2011). According to May (1975) the Shannon diversity index is related to both the total number of species and their relative abundance.

In the Ratnagiri district Shannon index 'H' varied from 1.23–1.78. Ranpar estuary exhibited greater diversity of phytoplankton and at Bhatye estuary the 'H' value found decreased (Fig.1). Ratnagiri district exhibited more occurrence and diversity of phytoplankton during rainy season.

According to Wilhm and Dorris (1966) and Mason (1998) diversity indices are good indicators of pollution in aquatic ecosystem. Diversity index greater than 3 indicates clean water, values in the range of 1-3 characterize moderately polluted condition and values less than 1 characterize heavy pollution. In the present study diversity indices calculated for both the districts ranged between 1.23–1.73 and indicated the polluted condition of water bodies under investigation.

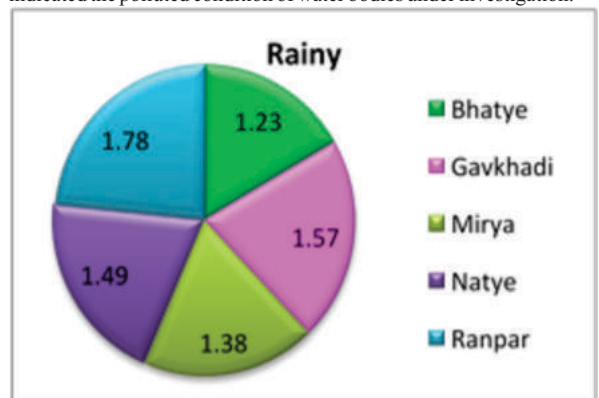


Fig.1. Diversity index of phytoplankton from Ratnagiri district during rainy season.

Density:

Density of phytoplankton was determined by using Lacky's drop method. When class wise density was calculated, Bacillariophyceae was on the top with 2459 individuals/ml and the least density was recorded for Dinophyceae group (32/ml).

A class wise observation of phytoplankton density in Ratnagiri district revealed the maximum number of Bacillariophyceae (3268/ml) and minimum number was recorded for Dinophyceae group (68/ml) (Fig.2). Ranpar estuary represented the highest number of individuals (1282/ml), and minimum was at Bhatye (419/ml) (Fig.3).

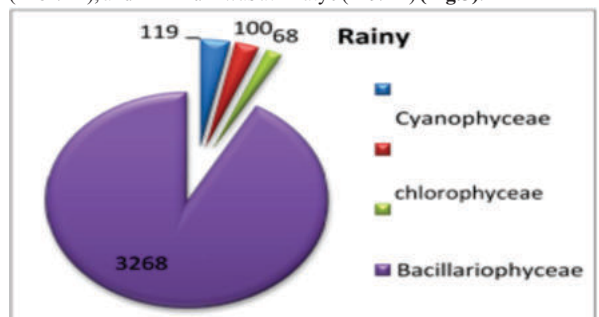


Fig.2. Class wise density of phytoplankton from Ratnagiri district during rainy season

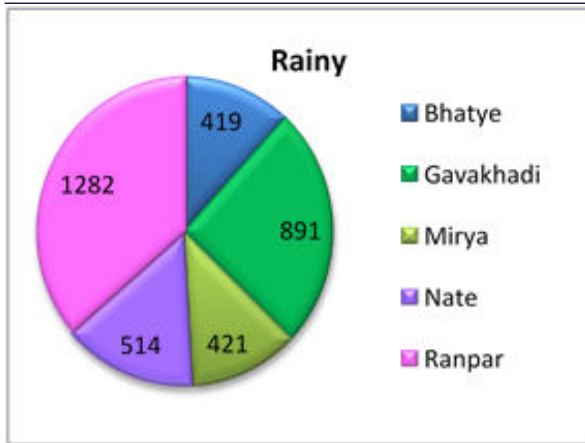


Fig.3. Site wise density of phytoplankton from Ratnagiri district during rainy season

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