



DIVERSITY AND DENSITY OF PHYTOPLANKTON OF SINDHUDURG COAST OF MAHARASHTRA

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Abstract:

Occurrence, diversity and density of phytoplankton were recorded at five estuaries along coastal areas of Sindhudurg district of Maharashtra. A total of 121 species were recorded having in 52 genera during winter season, members of Cyanophyceae, Euglenophyceae, Chlorophyceae, Dictyochophyceae, Dinophyceae and Bacillariophyceae were observed in the study and dominance

The Bacillariophyceae members were maximum (99) while that of Dictyochophyceae members were minimum (01) at all sites. Cyanophyceae members were also report at all sites. Number of Euglenophyceae was significant at Kunakeshwar. The results indicated that selected estuaries were more fertile with rich phytoplankton productivity.

Keywords: Phytoplankton, diversity, density, estuaries

Introduction

Microalgae are the major primary producer at the first trophic level and are distributed in both pelagic & benthic environment. Extensive studies have been carried out on planktonic species however very little work has been done on the taxonomy, distribution, abundance & productivity of microalgae which contribute about 1/6 of total primary production in the world ocean.

Estuaries unique ecosystem because of their continuously changing environmental conditions. Some reports on marine planktonic flora from west coast of India are available (Subramanyam 1959, Ramaiah & Ramaiah 1998, Tiwari & Nair 1998). They also recorded seasonal variations in physico-chemical analysis. There are scanty or very few information about the composition of phytoplankton from Sindhudurg district of Maharashtra was available.

In the present work 5 estuaries from Sindhudurg district of Maharashtra have been investigated with respect to diversity & density of phytoplankton.

Materials and Methods

Study area:

Estuaries in the Sindhudurg district, selected for present study are listed below along with their coordinates.

Site	N' latitude	E' longitude
Mithbav	16° 17. 422'	073° 26. 241'
Achara	16° 12. 019'	073° 26. 620'
Adbandar	16° 13. 795'	073° 28. 021'
Dongarewadi	16° 13. 018'	073° 27. 257'
Kunakeshwar	16° 20. 032'	073° 23. 448'

Sampling:

Estuarine sites were visited in December, 2014 during the winter season for collection of water samples. Phytoplankton samples were

collected using a plankton net and preserved following the method described by Santhanam *et al.*, (1987) using 0.5 ml of 40% formalin. For sample collection 50 litres of surface seawater were filtered through the net for obtaining 50ml sample. Sample was observed under the light microscope and photomicrographs were taken using a Nikon L-20 camera. For identification books and monographs of Prescott (1982), Fritsch (1965), Biswas (1980), Sarode and Kamat (1984), Tomas (1997), Botes (2001) etc. were used. Information available on internet was also followed for the identification. Species density was calculated by using Lackey's drop method (1935).

Results and Discussion

Results of winter season for Sindhudurg are represented in **Table 1**. A total of 121 species distributed among 52 genera belonging to six classes were recorded at Sindhudurg during winter season.

The Bacillariophyceae members were maximum (99) while that of Dictyochophyceae members were minimum (1). Cyanophyceae members were observed at all sites. Dinophyceae was also well distributed to all the sites in Sindhudurg district. Number of Euglenophyceae was significant at Kunakeshwar. Bacillariophyceae was dominant at all sites.

Maximum number of species occurred at Kunakeshwar (45), followed by Mithbav (37) and at Dongarewadi lowest number (18) was seen. *Protoperdinium subinerme* and *Prorocentrum gracile* (Dinophyceae), *Achananthes brevipes v. intermedia* was common at all sites. *Nitzschia nana* and *Skeletonema costatum* (Bacillariophyceae) and *Oscillatoria* sp. (Cyanophyceae) were present at most of the

selected sites. Eight species of *Achnanthes*, six species of *Cocconeis* and *Cyclotella* were recorded in winter season at Sindhudurg district. *Nitzschia* exhibited the highest number (19) of species recorded in the district.

A few species were site specific which occurred at a particular location only, *Climacosphaenia moniligera*, *Hylodiscus* sp. and *Roperia tosselata* were seen only at Kunakeshwar. A diatom species of *Licmophora*

was found only at Kunakeshwar.

Density:

When class wise density was calculated during winter in Sindhudurg district, the Bacillariophyceae showed the highest density (2304/ml) and for Dictyochophyceae it was lowest (06/ml). The number of phytoplankton organisms was maximum (826/ml) at Kunakeshwar and minimum (427/ml) at Achara.

Table 1. Occurrence of phytoplankton in Sindhudurg district during winter season

Sr. No.	Name of the species/site	Ach	Adb	Don	Knk	Mtb
Cyanophyceae						
01	<i>Aphanothece saxicola</i> Nageli	-	+	-	-	-
02	<i>Gomphosphaeria aponina</i> Kuetzing	+	-	-	-	-
03	<i>Gloeocapsa</i> sp.	-	-	-	+	-
04	<i>Oscillatoria</i> sp.	+	-	+	+	-
05	<i>Oscillatoria</i> sp. 2	-	+	-	-	-
06	<i>Phaeocystis</i> sp.	-	-	-	+	-
Euglenophyceae						
07	<i>Lepocandis fusiformis</i> v. <i>major</i> Fritsch & Rich	-	-	-	+	-
08	<i>Phacus pleuronectus</i> (Muehl) Dujardin	-	-	-	+	+
09	<i>P. tortus</i> (Lemm.) Skvortzow	-	-	-	+	-
10	<i>Trachaelomonas varians</i> (Lemm.) Deflandre	-	-	+	-	-
Chlorophyceae						
11	<i>Closterium kuetzingii</i> Brebisson	+	-	-	-	-
12	<i>Coelastrum sphaericum</i> Naegeli	-	+	-	-	-
13	<i>Sphaerocystis planktonica</i> (Korshikov) F. Hindak	-	-	-	+	-
14	<i>Spirogyra wabashensis</i> Tiffny	-	-	-	+	-
15	<i>Staurostrum mucronatum</i> W. West and G. S. West.	-	+	-	-	-
Dictyochophyceae						
16	<i>Dictyocha fibula</i> Ehrenberg	-	-	-	-	+
Dinophyceae						
17	<i>Ceratium minutum</i> Jorgensen	-	-	-	+	-
18	<i>Procoentrum gracile</i> Schutt	+	-	-	+	+
19	<i>Peridinium bipes</i> F. stain	+	-	+	-	-
20	<i>Protoperidinium pellucida</i> (Gran.) Balech	-	+	-	+	-
21	<i>P. subineme</i> (Paulsen) Leoblich	+	+	-	-	+
22	<i>P. steinii</i> (Jorgensen) balech	-	+	-	+	-
Bacillariophyceae						
23	<i>Achnanthes</i> sp.	+	-	-	-	-
24	<i>Achnanthes affinis</i> Grun.	+	-	-	+	-
25	<i>A. angustata</i> Greville	-	-	-	-	+
26	<i>A. brevipes</i> v. <i>intermedia</i> (Kutz) Cleve	+	+	+	+	+
27	<i>A. coarctata</i> v. <i>parallela</i> (Kutz) Cleve	+	+	-	-	-
28	<i>A. groenlandica</i> (Cleve) Grunow	-	-	-	+	-
29	<i>A. minutissima</i> v. <i>jackii</i> (Kuetz.) Grun	-	-	-	+	-
30	<i>A. pseudogroenlandica</i> Hendey	-	-	-	-	+
31	<i>Bacillaria paxillifer</i> (Muller) Hendey	-	+	-	-	-
32	<i>Bidulphia</i> Sp.	-	-	+	+	-
33	<i>B. rhombus</i> (Ehr.) Wm. Sm.	-	+	-	-	-
34	<i>Caloneis bacillum</i> Grun.	-	+	-	-	+
35	<i>C. silicula</i> (Ehr.) Cleve	+	-	-	-	-
36	<i>Campylodiscus dypeus</i> v. <i>bicostata</i> Ehr.	-	-	-	-	+
37	<i>Climacosphaenia moniligera</i> Ehrenberg	-	-	-	+	-
38	<i>Cocconeis costata</i> v. <i>costata</i> Gregory	-	-	+	-	-
39	<i>C. costata</i> v. <i>pacifica</i> Grunow	+	-	-	-	-
40	<i>C. molesta</i> Kutz.	-	-	-	+	-
41	<i>C. placentula</i> v. <i>euglypta</i> Ehr.	-	-	+	+	-
42	<i>C. scutulum</i> Ehrenberg	-	-	-	+	-
43	<i>C. vestusta</i> A. Schmidt	-	-	+	-	-
44	<i>Coscinodiscus radiatus</i> Ehrenberg	-	-	+	-	-
45	<i>C. rothii</i> v. <i>subsava</i> Ehrenberg	-	-	-	-	+
46	<i>Cyclotella</i> sp.	-	+	-	-	-
47	<i>C. kuetzingiana</i> Thwaites	-	-	-	-	+
48	<i>C. meneghiniana</i> Kuetz. Hustedt	-	-	-	-	+

49	<i>C. ocellata</i> Pantoscek	-	-	-	-	+
50	<i>C. pseudostelligera</i> Hustedt	-	+	-	-	-
51	<i>C. stylorum</i> Brightwell	+	+	-	-	-
52	<i>Cylindrotheca closterium</i> Ehrenberg	-	-	-	+	-
53	<i>Cymbella chandolensis</i> Gandhi	-	+	-	-	-
54	<i>C. tumidula</i> Grun	+	-	-	-	-
55	<i>C. turgida</i> (Greg.) Cleve	-	-	+	-	-
56	<i>Diploneis crabro</i> Ehrenberg	-	+	-	-	-
57	<i>D. coffaeiformis</i> (A. Schmidt) Cleve	-	-	-	-	+
58	<i>D. smithii</i> (Brebisson) Cleve	-	-	-	-	+
59	<i>D. vacillans</i> (A. Schmidt) Cleve	-	-	+	-	-
60	<i>Entomoneis</i> sp.	-	-	-	-	+
61	<i>Eunotia</i> sp. 2	-	-	-	-	+
62	<i>Eunotia pectinalis</i> f. <i>intermedia</i> (Kuetz.) Rabh.	-	+	-	-	+
63	<i>Fragillaria construens</i> (Ehr.) Grun.	-	-	-	-	+
64	<i>Gomphonema gracile</i> v. <i>naviculoides</i> W. Sm. Grun.	-	-	+	-	-
65	<i>G. montanum</i> Schum.	-	+	-	-	-
66	<i>G. subtile</i> Ehrenberg	-	+	-	-	-
67	<i>Gramatophora marina</i> (Lyngbye) Kutzing	-	-	-	+	-
68	<i>Gyrosigma Spencerii</i> v. <i>nodifera</i> (W. Smith) Cleve	-	-	-	-	+
69	<i>Hyalodiscus scoticus</i> (Kuetz.) Grun.	-	-	-	+	-
70	<i>Licmophara flabellata</i> (Carmichael) Agardh	-	-	-	+	-
71	<i>L. gracilis</i> (Ehr.) Grunow	-	-	-	+	-
72	<i>L. hyalina</i> (Kutz.) Grunow	-	-	-	+	-
73	<i>L. paradoxa</i> (Lyngbye) Agardh	-	-	-	+	+
74	<i>Melosira islandica</i> O. Mue ll	-	-	-	+	-
75	<i>M. moniliformis</i> (O. F. Muller) Agardh	-	-	-	-	+
76	<i>Navicula</i> sp. 2	-	-	-	+	-
77	<i>N. cruciculoides</i> Brockmann	+	-	-	-	-
78	<i>N. cryptocephala</i> Kuetz.	-	+	+	-	-
79	<i>N. exifuga</i> Gregory	-	-	-	+	-
80	<i>N. humerosa</i> Brebisson	-	-	+	-	-
81	<i>N. radiosa</i> v. <i>tenuella</i> (Breb. ex Kuetz.) Grun.	-	+	-	-	-
82	<i>N. stankovicii</i> Hustedt	-	-	-	+	-
83	<i>N. transistans</i> v. <i>derasa</i> (Grun) Cl.f. <i>delicatula</i> heimdal	-	-	+	-	-
84	<i>Neidium densestrictum</i> (Ostrup) Krammer	-	+	-	-	-
85	<i>Nitzschia</i> sp. 1	-	-	-	-	+
86	<i>Nitzschia</i> sp. 2	-	+	-	-	-
87	<i>N. clausii</i> Hantzsch	+	-	-	-	-
88	<i>N. dosterium</i> W. Smith.	-	-	+	-	-
89	<i>N. communis</i> Rabenhorst	-	-	-	+	-
90	<i>N. constricta</i> Ralfs in Pritchard	-	+	-	+	-
91	<i>N. filiformis</i> (W. Smith) Hustedt	-	-	-	-	+
92	<i>N. frustulum</i> (Kutz.) Grunow	-	-	-	+	-
93	<i>N. gracilis</i> Hantzsch	-	-	-	+	-
94	<i>N. longissima</i> (Brebisson) Ralfs	-	-	-	+	-
95	<i>N. nana</i> Grunow	+	+	-	-	+
96	<i>N. obtusa</i> v. <i>obtusa</i> W. Smith	-	-	+	-	-
97	<i>N. perminuta</i> Grunow	-	-	-	+	-
98	<i>N. perspicua</i> Cholnoky	-	-	-	+	-
99	<i>N. scalpeliformis</i> Grunow	-	-	-	-	+
100	<i>N. subangula</i> Ehrenberg	-	-	-	-	+
101	<i>N. spathulata</i> W. Smith	-	-	-	-	+
102	<i>N. vermicularis</i> (Kuetzing) Hantzsch	-	-	-	-	+
103	<i>Paralia sulcata</i> (Ehrenberg) Cleve	+	-	-	-	-
104	<i>Pinnularia</i> sp.	+	-	-	-	-
105	<i>P. conica</i> Gandhi	-	-	-	-	+
106	<i>P. maharashtrensis</i> Sarode et Kamat	-	-	-	-	+
107	<i>P. microstauron</i> (Ehr.) Cleve	-	-	-	-	+
108	<i>Pleurosigma elongatum</i> W. Smith	-	-	-	+	-
109	<i>P. rigidum</i> W. Smith	-	-	-	-	+
110	<i>P. f. strigosum</i> W. Smith	-	-	-	-	+
111	<i>Rhizosolenia longiseta</i> O. Zacharias	-	-	-	+	-
112	<i>Rhopalodia musculus</i> (Kutz.) O. Muller	-	-	-	-	+
113	<i>R. pacifica</i> Krammer	-	+	-	-	-
114	<i>Roperia tosselata</i> (Roper) Grunow	-	-	-	+	-
115	<i>Skeletonema costatum</i> (Greville) Cleve	-	+	+	+	+
116	<i>Stauroneis obtusa</i> f. <i>indica</i> Gonzalves et Gandhi	+	-	-	-	-
117	<i>Sunirella bohémica</i> Maly	-	-	-	-	+
118	<i>Synedra acus</i> Kutz. v. <i>acula</i> (Kuetz.) V. H.	-	+	-	-	-

119	<i>S. tabulata v. tabulata</i> (C. A. Agardh)	+	-	-	+	-
120	<i>Thalassionema mediterranea v. pacifica</i> Pavillard	-	-	-	+	-
121	<i>Thalassiosira ecentrica</i> (Ehrenberg) Cleve	+	-	-	-	-
Total No. of species		22	29	18	45	37

Ach-Achara, Adb-Adbandar, Don-Dongarewadi, Knk-Kunakeshwar, Mtb-Mithbav.

‘+’ Present, ‘-’ Absent

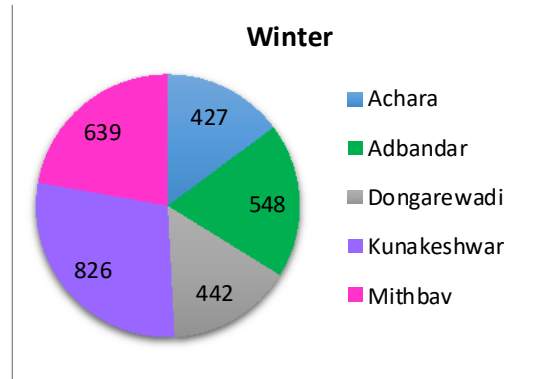
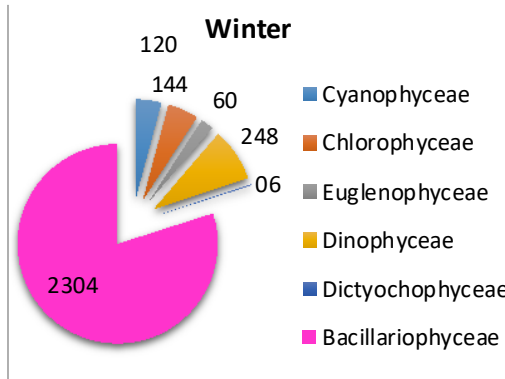


Fig.1. Class wise density of phytoplankton from Sindhudurg district during winter season

Fig.2. Sitewise density of phytoplankton from Sindhudurg district during winter season

Conclusion:

An appreciable number of diatoms found in the present study indicated an optimum spatial distribution of bloom forming species of phytoplankton at the estuaries of Sindhudurg district. Suggesting a high rate of primary production and some species indicating pollution condition of water.

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