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Diversity and Distribution of Phytoplankton From Some Estuaries in Sindhudurg District of Maharashtra

KEYWORDS: Phytoplankton,Diversity, Distribution, Sindhudurg district.

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ABSTRACT *Present work deals with diversity and distribution of phytoplankton at a few estuaries from Sindhudurg district along the west coast of Maharashtra during summer season (May). A total of 130 species belonging to 54 genera and five classes of phytoplankton namely, cyanophyceae, Chlorophyceae, Dinophyceae, Coccolithophoraceae and Bacillariophyceae have been reported. Out of these Achanthusbrevipes v. intermedia, Nitzschiaconstricta, N. nana, Skeletonemacostatum, andLicmophoraparadoxawere common at all sites. The density of phytoplankton was more at Adbandar estuary (39) and minimum at Mithbav estuary (27). The number of Bacillariophyceae members was maximum at all the sites. The result concluded that the selected estuaries are more fertile with rich phytoplankton productivity.*

Introduction

Marine phytoplankton is the most important component of living organisms in bays, estuaries, creeks, deep oceans and sediments. Organic substances produced by these tiny organisms determine the basic primary productivity of marine habitat. More than 400 species and 500 genera of marine phytoplankton have been described. This number is smaller in comparison to fresh water taxa which is around 15000 (Sournia *et al.*, 1991). Some species of phytoplankton help assessing the health of water body. Occurrence of a more number of cyanophycean members indicates organic pollution of the water. Similarly species like *spirulina* can be taken as an indicator of sewage pollution (Bhosale *et al.*, 2010).

Coastal habitats in the Sindhudurg district of Maharashtra along the west coast of India are important for fishery, boating, tourism, water games, as feeding grounds and nurseries for many birds and mammals. Estuaries are also used for swimming as yacht-clubs. Several estuaries present in this area harbor a variety of plant, animals and microbes. A few estuaries from Sindhudurg district are scanned in the present study to know the biodiversity and distribution of phytoplankton.

Materials and Methods:

Study area: Estuaries in the Sindhudurg district, selected for present study are listed below along with their co-ordinates. t

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 May, 2014 during the summer 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:

Microscopic observations of phytoplankton under light microscope revealed a total of 54 genera consisting of 130 species which belonged to five classes of phytoplankton namely Bacillariophyceae (106), Cyanophyceae (09), Chlorophyceae (09), Dinophyceae (05) and Coccolithophoraceae (01). Site wise variation in the number and species of phytoplankton is represented in Table.1. The number of species was maximum at Adbandar estuary (39) and minimum at Mithbav estuary (27). The most commonly encountered species were *Licmophora praradoxa* and *Nitzschia nana*. A few species were recorded only once and at one station only namely, *Cruciplacolithus neohelis, Actinocyclus, Hylodiscus, Climacospenia monoligera* etc.

Table 1: Occurrence of phytoplankton from Sindhudurg district during summer (May, 2014)

Sr. No.	Name of the species/site	Dong	Mtb	Adb	Ach	Knk
	Cyanophyceae					
01	*Aphanocapsa rivularis* Rabenhorst	+	-	-	-	-
02	*Aphanothece gelatinosa* (Henn.) Lemm	-	-	-	-	+
03	*Chroococcus limneticus* Lemm.	+	-	-	-	-
04	*C. turgidus* (kuetz.) Naegeli	-	-	-	-	+
05	*Lyngbya birgei* G. M. Smith	-	-	-	-	+
06	*L. major* Meneghini	-	-	-	-	+
07	*Oscillatoria curviceps* C.A.Agardh	-	-	-	+	-
08	*O. limosa (Roth)* C.A. Agardh	-	-	-	-	+

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09	*Phormidium inundatum* Kuetzing	-	-	-	-	+
	Chlorophyceae					
10	*Botryococcus braunii* Kuetzing	-	-	+	-	-
11	*Coelastrum microporum* Naegeli	-	-	-	-	+
12	*C. scabrum* Reinsch	-	-	-	+	-
13	*Cosmarium brebissonii* Meneghini ex. Ralfs	-	-	-	-	+
14	*Hormodiopsis ellipsoidium* Prescott	-	-	-	+	-
15	*Microchaete goeppertiana* Kirchner	-	-	-	-	+
16	*Pediastrum simplex* v. *deodenarium* (Bailey) Rabenhorst	-	-	-	+	-
17	*Tetraedron minimum* (A. Brown) Hansg	-	+	-	-	-
18	*T. regulare* Kuetzing	-	-	-	-	+
	Dinophyceae					
19	*Glenodinium palustre* (Lemm.) Schiller	-	+	+	-	-
20	*Peridinium* sp.	+	-	-	-	-
21	*P. inconspicuum* Lemm.	-	+	+	-	-
22	*P. pusillum* (Penard) Lemm.	+	-	-	-	-
23	*Prorocentrum gracile* Schutt	-	-	-	+	-
	Coccolithophoraceae	-	-	-	-	-
24	*Cruciplacolithus neohelis* (Mcintyre & Be) Reinhardt	-	-	+	-	-
	Bacillariophyceae					
25	*A.brevipes* v. *intermedia* Agardh	+	-	+	+	-
26	*Actinocyclus octonaerius v. tenellus* (de Brebisson) Hendey	-	-	+	-	-
27	*Amphora exigua* Gregory	-	-	-	-	+
28	*A.delicatissima* Krasske	-	-	-	+	-
29	*A.holsaticas* Hustedt	-	+	-	+	-
30	*A.veneta v. capitata* E. Y. Haworth	-	-	+	-	-
31	*Anomoeoneis styriaca* (Grun)	-	-	-	+	-
32	*Asterionelopsis japonica* Cleve	-	-	-	+	-
33	*Bacillaria paradoxa* Gmelin	-	+	+	-	-
34	*Climacosphenia moniligera* Ehrenberg	-	-	+	-	-
35	*Coscinodiscus granii* Gough	-	-	+	-	-
36	*C. lineatus* Her	+	-	+	-	-
37	*C. radiates* Ehrenberg	-	+	+	-	-
38	*Cocconeis costata* v. *Costata* Gregory	-	-	+	-	+
39	C. pediculus	+	-	-	-	-
40	*Cyclotella sp.*	+	-	-	-	-
41	*C. meneghiniana* Kuetz	-	+	+	+	-
42	*C. stylorum* Brightwell	-	-	+	-	-
43	*Cymbella* sp.	-	+	-	-	-
44	*C. bharatensis* Sarode & Kamat	+	-	-	-	-
45	*C. chandolensis* Gandhi	-	-	+	-	-
46	*C. parva* (W. Smith) Cleve	+	-	-	-	-
47	*C. pusilla* Grun	-	+	-	-	-
48	*C. tumidula* Grun	+	-	-	-	-
49	*C. ventricosa* Kuetzing	+	-	-	-	-
50	*Diploneis crabro* (Ehr) Cleve	-	-	+	-	-
51	*D. coffaeiformis* (A. Schmidt) Cleve	-	+	-	-	-
52	*D. incurvata* v. *incurvata* Grun	-	-	+	-	-
53	*D. notabilis* (Greville) Cleve	+	-	-	-	-
54	*D. stroemii* Hustedt	-	-	+	-	+
55	*D. vacillans v. vacillans* (A. Schmids)	-	-	-	+	-
56	*D. brightwellii* (West) Grun	-	-	-	+	-
57	*Epithema zebra Ditylum (Ehr) Kuetz.* v. *porcellus* (Kuetz.) Grun	-	-	+	-	-
58	*Eunotia praerupta Ehr* v. *inflate* Grun	-	-	+	-	-
59	*Fragillaria* sp.	-	+	-	-	-
60	*Gomphonema* sp.	-	-	-	-	+
61	*G. hebridense* (Greg.) Fler.	+	-	-	-	-
62	*Gramatophora marina* (Lyngbye) Kuntz	-	-	-	-	+
63	*Gyrosigma balticum* (Ehr) Rabh.	-	-	+	-	-
64	*G. bhusavalensis* Sarode & Kamat	-	+	-	-	-
65	*G. strigile* W. Smith	-	+	-	-	-
66	*Haslea* cf. *baleaarica* Witkowski	-	-	-	-	+
67	*Hyalodiscus scoticus* (Kutzing) Grunow	-	-	-	-	+
68	*Licmophara flabellata* (Grewille) Agardh	-	-	-	-	+
69	*L. gracilis v. gracilis* Ehrenberg	-	-	-	-	+
70	*L. paradoxa* (Lyngbye) Agardh	+	+	+	-	+
71	*Mastigloia recta Hustedt v. nagpurensis* Sarode & Kamat	-	-	+	-	-
72	*M. smithii* Thwaites	-	+		-	-
73	*Melosira nummuloides* (Dillwyn) Agardh	-	-	+	-	-
74	*Navicula* sp.	+	-	-	-	-
75	*N. carinifera* Grunow in Schmidt	-	+	-	-	-
76	*N. digitoradiata* (Gregory) Ralfs	+	-	-	-	-
77	*N. exigua* (Gregory) O. Muller	+	-	-	-	-
78	*N. gracilis* Ehr.	-	-	-	-	+
79	*N. incertata* Lange. Bertalot	+	-	-	-	-

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80	*N. inconspicua* Grunow	-	-	-	+	-
81	*N. meniscus* Schumann	-	-	-	+	-
82	*N. minisculus* Schumann	-	-	-	+	-
83	*N. mutica* Kuetz	-	-	-	+	-
84	*N. Reinhardii* Grun	-	-	+	+	-
85	*N. terrestris* Boy. Pet	-	-	+	-	-
86	*N. transistans v. derasa f. delicatula* (Grunow) Cleve	+	-	-	-	-
87	*N. valida* v. *minuta* Cleve	-	+	-	-	-
88	*Neidium iridis* (Ehr.)Cleve *f. ambigua* Gonz. Et. Gandhi	-	-	+	-	-
89	*Nitzschia agnita* Hustedt	-	-	-	-	+
90	*N. amphibia f. amphibia* Grunow	-	-	-	+	-
91	*N. clausii* Hantzsch	-	+	-	-	-
92	*N. constricta* (Gregory) Grunow	+	+	-	+	-
93	*N. constricta* v. *subconstricta* Grunow	-	-	+	-	-
94	*N. dissipata v. media* (Kutz.) Grun	-	-	-	+	-
95	*N. flexa* Schumann	+	-	-	-	-
96	*N. fonticola* Grunow	+	-	-	-	-
97	*N. frustulum* v. *bulnheimiana* (Rab.) Grunow	+	-	-	-	-
98	*N. gracilis* Hantzsch	+	-	-	-	-
99	*N. heufleriana* Grunow	-	+	-	-	-
100	*N. lanceolata v. minuta* Grunow	+	-	-	-	-
101	*N. levidensis v. salinarum* Grunow	-	+	-	-	-
102	*N. linearis* (Agardh) W. Smith	+	-	+	-	-
103	*N. linearis v. tenuis* W. Smith	-	-	-	-	+
104	*N. nana* Grunow	+	+	-	-	+
105	*N. palea* Kutz. W. Smith	-	+	-	-	+
106	*N. paleaeformis* Hustedt	-	-	-	-	+
107	*N. polaris* Grunow	-	-	-	+	-
108	*N. recta* Huntzsch	-	-	-	+	-
109	*N. scalpeliformis* Grunow	-	+	+	-	-
110	*N. subacicularis* Hustedt	+	-	-	+	-
111	*N. subcohaerens v. scotica* Grunow	-	-	-	-	+
112	*N. sublinearis* Hustedt	-	-	+	-	-
113	*N. cf. sigma* (Kutz.) W.Smith	-	-	-	+	-
114	*N. sigmoidea* (Nitz.) W. Smith	-	-	-	+	-
115	*N. tubicola* Grunow	+	-	-	-	-
116	*Pinnularia viridis* v. *fallax* Cleve	-	+	+	-	-
117	*Pleurosigma* cf. *elongatum* W.Smith	-	-	+	-	-
118	*P. salinarum* Grun	-	-	-	+	-
119	*Rhizosolenia alata f. indica* Peragallo	+	-	-	-	-
120	*R. setigera* Brightwell	+	-	-	+	-
121	*Rhopalodia supre-semicirculata* (Legler & Krass.) Kram	-	-	+	-	-
122	*Skeletonema costatum* (Greville) Cleve	-	-	-	+	-
123	*Stauroneis obtusa* Largest f. *indica* Gonzalves	-	-	+	-	-
124	*Staurosirella piñnata* Her	-	-	+	-	-
125	*Surirella robusta* f. *minor* Gandhi	-	+	-	-	-
126	*Synedra affinis* Kutz	-	-	-	-	+
127	*Thalassionema frauenfeldii* Grunow	-	-	+	-	-
128	*T. nitzschioides* Hustedt	-	+	-	-	-
129	*Thalassiosira ecentrica* (Ehren.) Cleve	-	-	-	+	-
130	*T. oestrupii* (Ostenfeld) Hasle	-	-	-	-	+
Total no. of species		32	27	39	32	30

*Adb- adbandar, Mith-mithbav, Kunk-kunakeshwar, Dong-dongarewadi, Ach-achara Density of phytoplankton at five estuaries varied and was highest at Adbandar estuary (470/ml) and lowest at Mithbav (270/ml) (Fig.1). The number of Bacillariophyceae members was maximum at all the estuaries, while that of coccolithophoraceae was the least (Fig.2).

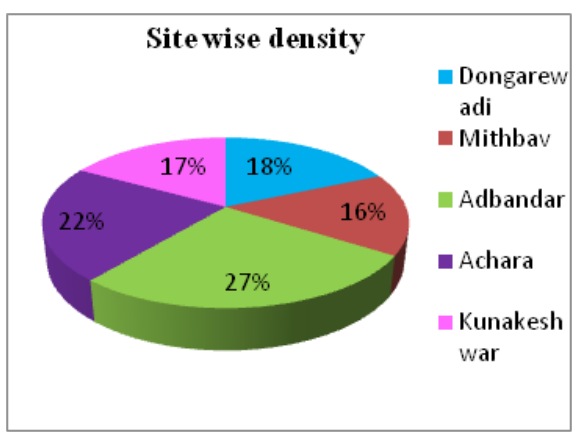

Fig1. Site wise density of phytoplankton

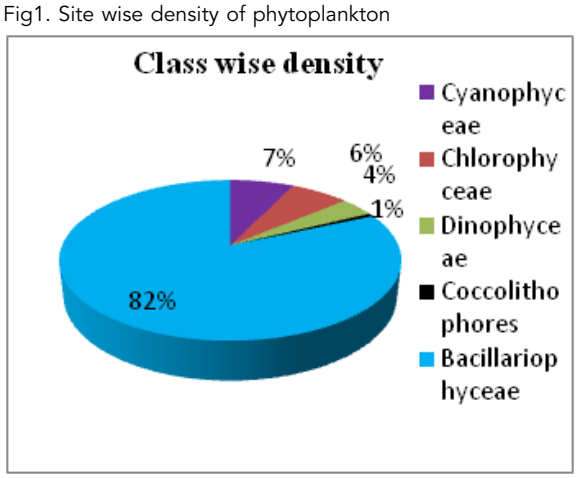

Fig 2. Class wise density of phytoplankton

Photographs of some species from different classes are shown in Plate 1.

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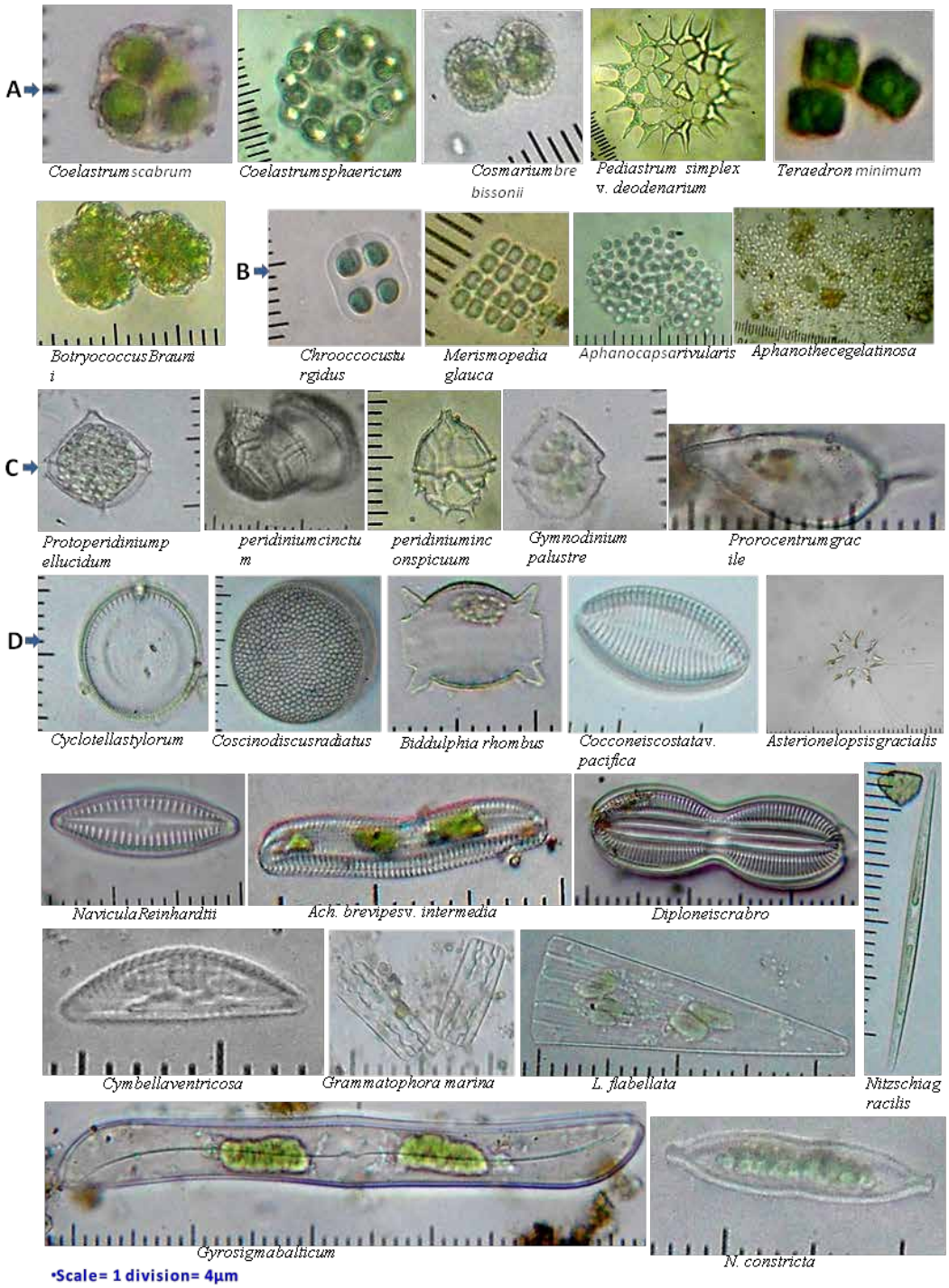
Plate



•Scale= 1 division= 4µm

A- Chlorophyceae B- Cyanophyceae, C-Dinophyceae, D-Bacillariophyceae

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. Suggesting a high rate of primary production.

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