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Phytoplankton Diversity Along The Alibaug Coast, Maharashtra (India)

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Abstract:

Algae play an important role in maintaining the health of the ecosystem.Thus algae diversity and its role in understanding the wetland ecosystem dynamics is very important. The present work deals with the study of Phytoplankton diversity in along the in coastal area of Alibaugfora period of one year (January 2014 to December 2014). The study shows the presence ofseveralphytoplankton belonging to families Bacillariophyaece, Chlorophyceae and Cyanophyceae.It was noticed that members of Bacillariophyceae were dominant in the area of study throughout the period of one year. The data obtained in the present work may help to provide baseline information to evaluate the phytoplankton community in the coastal area of Alibaug. Total 26 species of phytoplankton were observed during the study period, comprising of diatoms, green algae, and bluegreen algae. Phytoplankton such as *Nitzschia sp., Rhizosollenia sp., Skeletonema sp.Thalassionema sp., Nevicula sp.*and *Grammatophora oceani* were dominant.

Keywords: Phytoplankton, Biodiversity,Water quality, Alibaug, Maharashtra.

Introduction:

Microalgae arecapable of performing photosynthesisand are important for life on earth. They produce approximately half of the atmospheric oxygen and simultaneously use the greenhouse gas, carbon dioxide to grow autotrophically. They constitute the basic link in the food chain of all aquatic organisms. Most of the aquatic organisms, including fishes, thrive on plankton for their growth and development. Plankton population represents the indices of health and productivity of an aquatic ecosystem (Prabhahar *et al.,* 2011) and the community determines the spatial and temporal changes in environment (Levandowsky, 1972; Figueredo and Giani, 2001). The abundance, species composition and succession of phytoplankton largely depend on the nutrient composition of the water (Chattopadhyay *et al.,* 2003), it has long been interested in ecology.

The biodiversity of microalgae is enormous and they represent an almost untapped resource. It has been estimated that about 200,000-800,000 species exist of which about 50,000 species are described. Over 15,000 novel compounds originating from algal biomass have been chemically determined. Most of these microalgae species produce unique products like carotenoids, polymers, antioxidants, fatty acids, enzymes, peptides, toxin, and sterols. Depending on the species, their size can range from a few micrometers (µm) to a few hundreds of micrometers.Phytoplankton's are microscopic organisms that play a crucial role in the food chain as they are a source of carbon. Phytoplankton's are not only important as a basic link of food chain but also ecologically significant as pollution indicators, which help in assessing the environmental condition of the ecosystem (Dalal *et.al,* 2012)

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Phytoplankton help maintain a healthy food chain in the aquatic ecosystem however they may create an imbalance if they exceed in number and some phytoplankton have a toxic effect as well (ref). However, phytoplankton serve as good pollution indicators (Kampala,2007). Marine algae have been historically, an exceptionally rich source of pharmacologically active metabolites with antineoplastic, antimicrobial and antiviral effects (Houseen and Jaspars, 2012; Blunt et. al., 2012).

However, most of these studies were of short and irregular duration, and no previously published information about the phytoplankton community composition in relation to nutrient concentration avilable from this region. Present article consist the phytoplankton community compostion at alibaug cost evaluated the influence of nutrient on phytoplankton species composition.

Material And Methode:

Sampling stations were selected in Alibaug near the shore region, tides. We collected all water and phytoplankton samples during the low tide. The environmental parameters were analyzed by using APHA, 2000. Phytoplankton diversity was measured using the Sedgwick-Rafter cell under an inverted microscope by fixing water sample in Lugol's solution, they were identified based on keys given by Desikachary(1987), Desikachary and Prema(1987), Desikachary et. al (1987) and Bellinger and Sigee(2010). The concentration of chlorophyll was determined spectrophotomerically using a HACH DR/5000 spectrophotometer (Parson et al., 1984). For preservation of phytoplankton the sample water was instantly fixed using 4% formaldehyde in Lugol's Iodine solution. The sample was left undisturbed for 24 hours to allow the settling of phytoplankton and then the settled part of the solution was transferred in other capped glass jar.
Seawater samples were collected at four sandy beachesnamely Madh, Juhu, Dadar and Girgaon (Figure 1) duringMay-June 1999 at 0.5 m depth over a tidal cycle (12 h)with 1 h frequency. They were analysed for temperature,pH, salinity, phosphate, nitrate, nitrite and ammonium(NH3+NH4) as per Grasshoff *el al'0.* Samples alsocollected for suspended solids (SS), Dissolved Oxygen(DO), Biochemical Oxygen Demand (BOD) andmicrobiology at full high tide (flood) and full low tide(ebb) were analysed by recommended procedures10,11. Thespectroscopic measurements were taken on Bausch andLomb - spectronic 20 spectrophotometer.

Results and Discussion :

Value of Do, salinity,pH, watertemperature, Nitrate, phosphate, chl-a reported throughtout the year. Table No. 1 shows all recorded value.Collected throughout year value were alienated in three groups Premonsoon(Jan, Feb, Mar, Apr), Monsoon(May, Jun, Jul, Aug), Postmonsoon (Sep, Oct, Nov, Dec).
The present study reported that the species contribution of diatoms was higher among all microalgal groups. The total 26 species found in alibaug intertidal area. Out of 26 diatoms comprised 22 species, Cyanophyceae 2, chlorophyta 1, Ochrophyata 1. The study shows that among the diatom group *Nitzschia sp., Rhizosollenia sp., Skeletonema sp.,Thalassionema sp., Nevicula sp.* and *Grammatophora oceani* graph no. 1were the dominant species throughout the year. Seasonal fluctuation of microalgae density was reported during the study period

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along the intertidal area.During premonsoonshows more density compare to post monsoon and monsoon season.

Table No. 1

Sr. No.	Parameter	Premonsoon	Monsoon	Postmonsoon
1	DO (ppm)	6.9-7.4	6 - 6.5	6.5 - 7.3
2	Salinity (ppt)	33.4-33.8	31.5 – 34.4	32.4 -33
3	pH	8.0 - 8.1	8.2-8.4	7.8-8.3
4	Water temperature (°C)	22.2 - 28.3	24.6 – 28.5	20 – 27.7
5	Nitrate (mg L^{-1})	4.4 - 5.5	4.4-6.8	5.6-6.2
6	Phosphate (mg L^{-1})	1.3 - 1.5	1.3 – 1.4	1.2 -1.4

Identified microalgal taxa from Alibag intertidal area

Alibaug Taxon

Sr. No.	**Bacillariophyta**	**Sr. No.**	**Cyanophyta**
1	*Nitzschia sp.*	23	*Oscillatoria sp.*
2	*Surirella sp.*	24	*Phormidium sp.*
3	*Licmophora sp.*		**Chlorophyta**
4	*Pseudo nitzshia sp.*	25	*Chlorella sp.*
5	*Navicula sp.*		**Ochrophyta**
6	*Rhizosollenia sp.*	26	*Nannochloropsis sp.*
7	*Biddulphia SP.*		
8	*Synedra Sp.*		
9	*Skeletonema sp.*		
10	*Guinardia Sp.*		
11	*Pleurosigma sp.*		
12	*Rhabdonema sp.*		
13	*Gyrosigma sp.*		
14	*Achnanthes sp.*		
15	*Amphora sp.*		
16	*Podocystis sp.*		
17	*Cymatopleura sp.*		
18	*Grammatophora oceani*		
19	*Thalassionema sp.*		
20	*Synedra capitata*		
21	*Cyclotella sp.*		
22	*Odontella sp.*		

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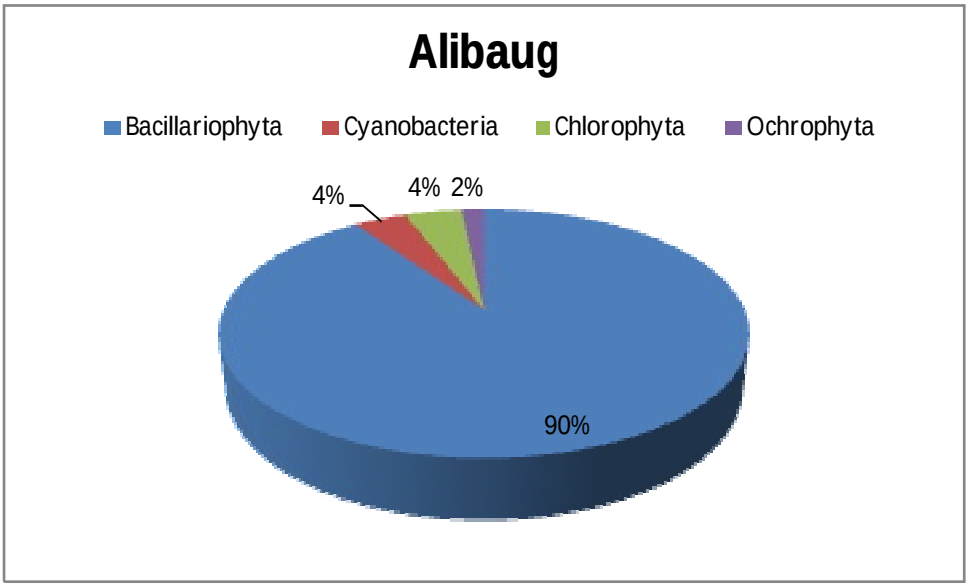
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dominance_D	0.3109	0.3476	0.3693	0.2866	0.2571	0.3938	0.3797	0.4196	0.4132	0.2938	0.2606	0.3039
Simpson_1-D	0.6891	0.6524	0.6307	0.7134	0.7429	0.6062	0.6203	0.5804	0.5868	0.7062	0.7394	0.6961
Shannon_H	1.266	1.076	1.047	1.314	1.372	1.01	1.022	0.9525	0.9528	1.296	1.365	1.261
Evenness_e^H/S	0.8871	0.9776	0.9498	0.9303	0.9859	0.9155	0.9263	0.864	0.8643	0.9141	0.9793	0.8823
Equitability_J	0.9136	0.9794	0.9532	0.9479	0.9898	0.9196	0.9303	0.867	0.8672	0.9352	0.9849	0.9096



Graph No. 1

Conclusion :

The analysis indicated that the water, though not extremely polluted, shows impact of anthropogenic interference in the seawater ecosystem which is further indicated by presence of highest amount of nitrates during the post monsoon season when the water should be most dilute. Also, in depth analysis of the phytoplankton, Diatoms were present in maximum amount.

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