Studies on Phytoplankton Diversity of Bay of Bengal at Puri Sea-Shore in Orissa

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Abstract- Seasonal variations of Phytoplankton dynamics were noted both quantitatively and qualitatively at Puri Sea Shore of Bay of Bengal. In total of Phytoplanktons, 45 species of Chlorophyta (53.60%), 17 species of Bacillariophyta (29.45%) and 12 species of Cyanophyta (16.75%) were identified. Phytoplanktons are producers or photosynthetic organisms as they bear photosynthetic pigments which converts solar energy into chemical sugars, consumed by consumers or heterophes. Thus they are vital to marine eco system.

Index Terms- Seasonal Variations, Phytoplankton, Dominance species, Chlorophyta

I. Introduction

The term plankton refers to those microscopic aquatic forms having little or, no resistance to the water current and are free floating and suspended in open or pelagic waters.The planktonic plants are referred to as "Phytoplankton (microscopic algae and Bacteria) occurs as unicellular, colonial or filamentous forms. Many carryon photosynthesis and are grazed upon by zooplankton and other aquatic organisms.The phytoplankton is an assemblage of heterogeneous microscopic algal forms of aquatic systems whose movement is more or less dependent upon water currents.

The present study deals with the marine resources (i.e. phytoplankton).

II. Materials and Methods

The planktons were collected by plankton net of standard bolting silk cloth no-25 (mesh size 0.03-0.04 mm) from different stations from 100 liter water sample on use of a plastic bucket of 15 liter capacity. Finally the planktons were collected from the plankton net tube and preserved in 4% formaldehyde solution. The sample was thereafter taken to the laboratory for qualitative and quantitative analysis in Sedgwick rafter type counting cell (1 ml capacity) and then the planktons were identified as per (Fritsch, 1965), (Adhikari, 2000) and (Adhikari & Sahoo 1992). After shaking the vial containing the concentrated plankton sample, a sub sample of 1 ml was quickly drawn with the help of a pipette and poured in the plankton counting cell. All organisms encountered were represented in absolute numbers. Three countings for each sample were made and the data represented in the text were average value of counting. The planktons were identified species wise and tabulated accordingly.

Puri is one of the coastal districts of Orissa, having a coastline of 155 Kms out of the total coast line of 480 Kms of the state. Puri is present between 18,450 E to 19,400W (Latitude) and 85,480N to 84,270S (Longitude).

III. Results and Discussion

Seasonal variations of phytoplankton was noted quantitatively and qualitatively. Table (1 - 4) of Fig. (1, 2).

Three groups of algae are identified viz. (1) Chlorophyta, (2) Bacillariophyta and (3) Cyanophyta. In total 45 species of Chlorophyta, 17 species of Bacillariophyta and 12 species of Cyanophyta were identified. Of the total species 53.6%, 29.45% and 16.75% belonged to Chlorophyta, Bacillariophyta and Cyanophyta respectively.At station 1, out of 26 species identified, 12 species belonged to Chlorophyta (46.15%) 6 species belonged to Cyanophyta (23.07%) and 8 species belonged to Bacillariophyta (30.76%).At S.2, out of 27 species, 10 species were of Chlorophyta (37.03%), 8 species were of Cyanophyta (29.62%) and 9 species were of Bacillariophyta (33.33%). Phytoplankton showed their peak growth during winter 279.96 n/l at S_1, 178.34 n/1 at S_2.

In the present study, findings about three groups of the phytoplanktons viz. Chlorophyta, Cyanophyta and Bacillariophyta (Diatoms), agree with the findings of Pahwa and Mehrotra (1966), David *et al.,* (1969) and Sreenivasan (1969).During the present investigation seasonal variations were observed in the compositions (n/l) of phytoplankton, with the maxima and minima of Chlorophyta, Cyanophyta and Bacillariophyta. The maximum number of the phytoplanktons during winter (November to January) and during spring (March to April) indicates favourable physico chemical condition in relation to the phytoplankton population Kant and Kachroo(1975), Kant and Anand(1979).The dominance in the number and the percentage composition of Chlorophytic elements followed by diatoms in the present study indicated that they are the major components of the phytoplankton.

During the present investigation, phytoplanktons reach at their peak during winter., During winter, due to the clear weather light penetrates without much hindrance and helps in photosynthesis, increasing there by the dissolved oxygen content of water. During rainy season how ever, due to the cloudy weather and maximum of solid matter in water, there is less of light penetration and this is not sufficient for the photosynthesis and the growth of the phytoplankton thus resulting in low dissolved oxygen content of water.

Chlorophytic population consists of maximum number of species. This observation is supported by the findings of,

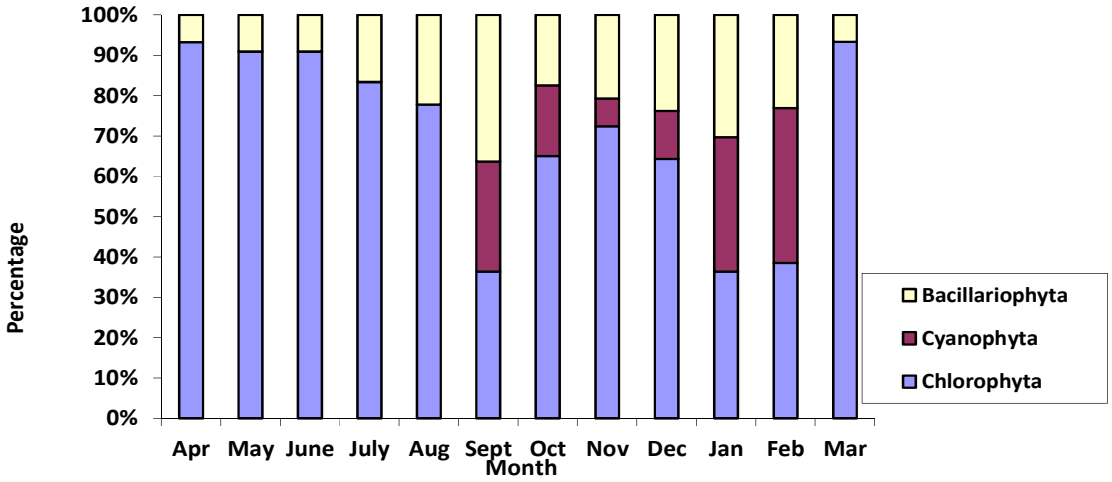
Munawar and Munawar (1976), Kant (1981) Kulkarni and Nibalkar (1981) in relation to other aquatic habitats.The concentration of dissolved oxygen and free carbonate are the controlling factors for the development of chlorophytic population and their distribution.

Table-1 : Number of total phytoplankton species identified and their percentage belonging to various taxonomic groups in S_1 and S_2 during 2009-2010.

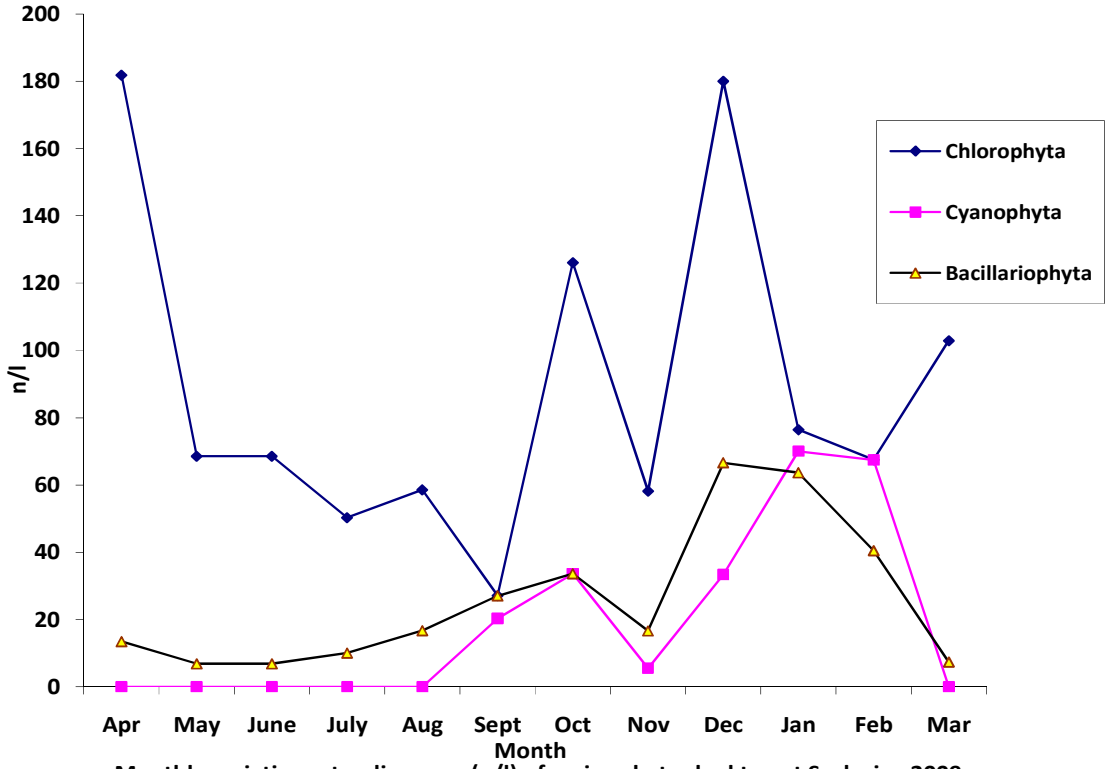
Species group	S_1		S_2	
	No. of Species	%	No. of Species	%
Chlorophyta	12	46.15	10	37.03
Cyanophyta	6	23.07	8	29.62
Bacillariophyta	8	30.76	9	33.33

Table-2 : Standing Stock and % distribution of phytoplankton during different months of 2009-2010 at S_1 (in million liter)

Months	Total phytoplankton n/l	Chlorophyta		Cyanophyta		Bacillariophyta	
		n/l	%	n/l	%	n/l	%
Apr	195.31	181.87	93.22	Nil	Nil	13.43	6.68
May	75.34	68.50	90.91	Nil	Nil	6.84	9.09
Jun	75.34	68.50	90.91	Nil	Nil	6.84	9.09
Jul	60.24	50.23	83.37	Nil	Nil	10.01	16.63
Aug	75.24	58.55	77.81	Nil	Nil	16.69	22.19
Sept	74.37	27.07	36.37	20.27	27.27	27.03	36.36
Oct	193.30	126.08	64.71	33.61	17.39	33.61	17.39
Nov	80.24	58.12	72.43	5.52	6.88	16.60	20.69
Dec	279.96	180.04	64.31	33.32	11.90	66.60	23.79
Jan	210.03	76.41	36.37	70.00	33.33	63.64	30.30
Fab	170.34	67.48	38.48	67.40	38.44	40.46	23.08
Mar	110.26	102.90	93.33	Nil	Nil	7.36	6.67



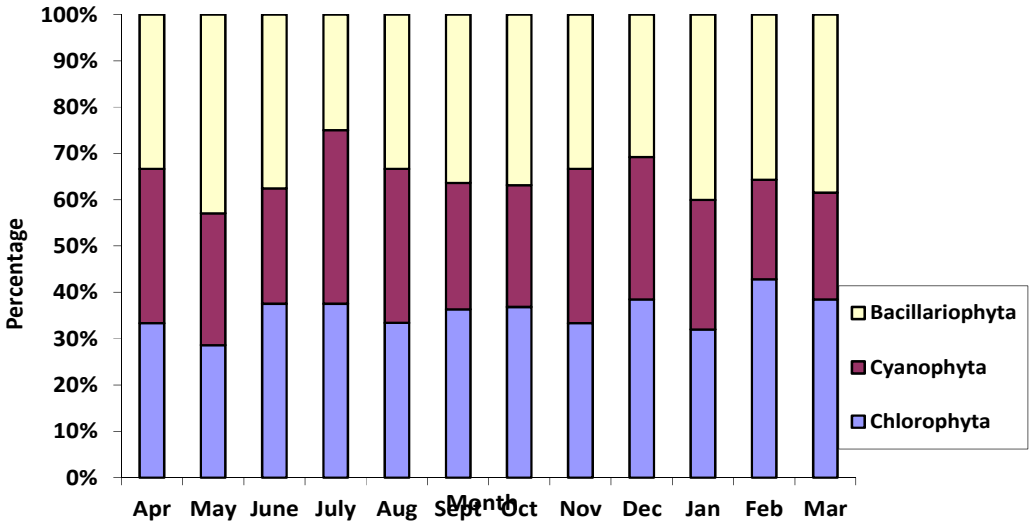
Percentage ofChlorophyta, Cyanophyta & Bacillariophyta during 2009-2010 at S_1



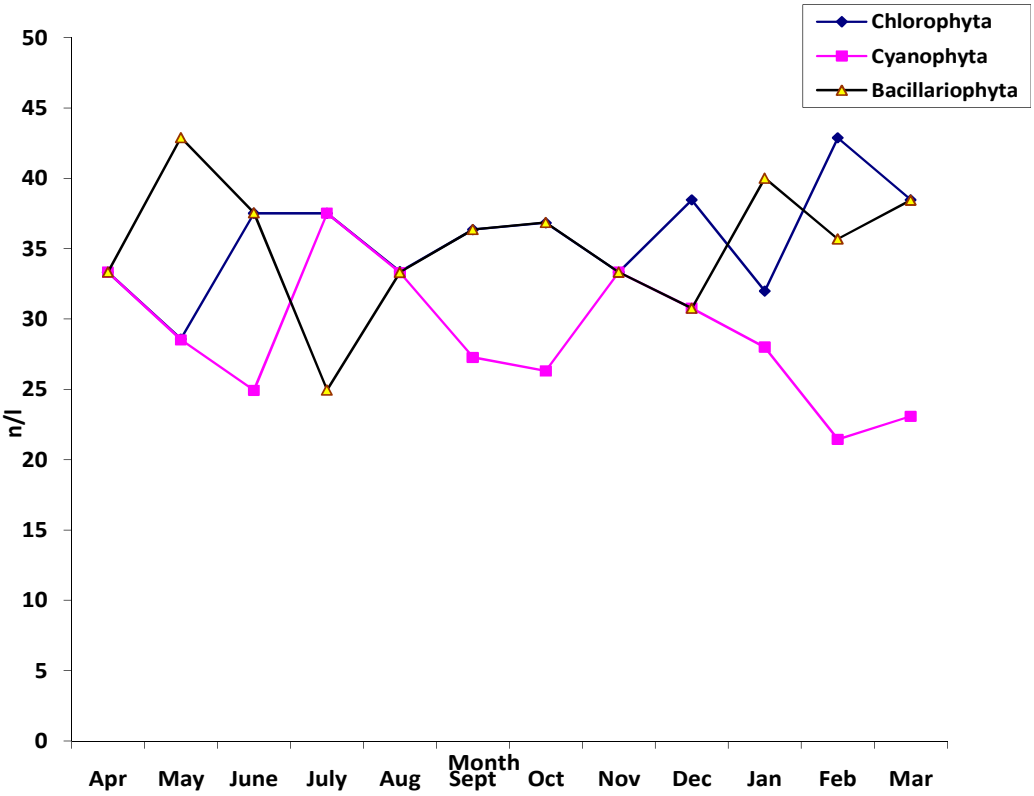
Monthly variations standing crop (n/l) of major phytoplankton at S1 during 2009-2010

Table – 3 : Standing Stock and % distribution of phytoplankton during different months of 2009-2010 at S_2 (in million liter)

Months	Total phytoplankton n/l	Chlorophyta		Cyanophyta		Bacillariophyta	
		n/l	%	n/l	%	n/l	%
Apr	80.36	26.78	33.33	26.78	33.33	26.95	33.34
May	48.64	13.90	28.59	13.86	28.52	20.88	42.89
Jun	52.32	19.62	37.52	13.04	24.93	19.66	37.55
Jul	52.96	19.86	37.52	19.86	37.52	13.24	24.96
Aug	42.24	14.10	33.38	14.06	33.30	14.08	33.32
Sept	75.24	27.36	36.36	20.52	27.27	27.36	36.37
Oct	128.46	47.32	36.84	33.78	26.30	47.36	36.86
Nov	145.97	48.65	33.33	48.66	33.34	48.66	33.33
Dec	178.34	68.58	38.46	54.87	30.77	54.89	30.77
Jan	168.64	53.95	31.99	47.21	28.00	67.48	40.01
Feb	95.47	40.92	42.87	20.46	21.44	34.09	35.69
Mar	86.65	33.34	38.47	19.99	23.08	33.32	38.45



Percentage of Chlorophyta, Cyanophyta & Bacillariophyta during 2009-2010 at S_2



Monthly variations standing crop (n/l) of major phytoplankton at S2 during 2009-2010

Table -4 : List of available species of phytoplankton identified from 3 different stations (S_1 and S_2) during 2009-2010. Present (+), Absent (-)

CHLOROPHYTA	S_1	S_2
Euglena spirogyra Ehrenb	+	+
Euglena acns Ehrenb	-	-
Euglena *viridis* Ehrenb	-	+
Euglena eliganas Ehrenb	+	-
Volvox globater (L) Ehrenb	-	-
Pandorina morum Mull	-	+
Volvox aureas Klenin	+	-
Chlorococcum humicolum (Naeg) Rabenh	-	-
Hydrodictyon idium lyenger	-	-
Cladophora profunda Brand	+	-
Cladophora glomerata (L) Kutz	+	-
Cladophora ephiophila Magnus and Wile	-	+
Cladophora callicoma Ag	+	-
Oedogonium coreatematum Wittr	-	+
Zygnema vanans Kutz	-	-
Zygnema peliosporum Wittr	-	-
Zygnema pectinatum Vauch	-	-
Spriogrya fluviatilis Holse Var Africana	-	-
Desmidium cylindricum Grev.	-	-
Spriogyra varians Kutz	-	-
Spirogyra sctiformis (Reth) Kutz	+	-
Sprogyra longata Vauch	+	-
Spirogyra weberi Kutz	-	+
Spirogyra majuscule Hilse	+	-
Cosmarium sp.	-	-
Closterium lannceolatum Kutz	-	+
Cosmarium botrylis Menegh (after Dobarb)	-	-
Cosmenum reniforme (Ralfs) Arch	-	-
Clopterium parvulam Naeg	+	-
Closterium venus Kutz	-	+
Clopterium paravulam Naeg	+	-
Closterium venus Kutz	-	+
Closterium cambicum Arch	-	-
Closterium ehrenbergii Menegh (after Lutman)	-	-
Closterium leibleinii Kutz (after Steinecke)	-	-
Closterium striolatum Ehrenb (after west)	-	-
Estella botryoides W. West	-	-
Scenedesmus quardricauda Lurb	-	-
Ankistrodesmus spinulosam Naeg	-	-
Sphaerozosma rotate Grev	-	-
Ulothrix rodia Kutz	+	-
Ulothrix variablilis Kutz	-	+
Ulothrix oscilatoria Kutz	-	-
BACILLARIOPHYTA		
Amphora ovallis Kutz	-	+
Cylotella comla (Her) Kuz var. affiris gum	-	-
Baillaria paradoxa Gnel.	-	+
Cymbella cistuba (Hempa) Grun	+	-
Navicula mutica Kutz	+	+
Gomphonema lanceolatum Ehrenb	+	-
Pinnularia gibba f. Subandulata Mayr	+	+
Kelosira ganulata (E hr) Raif.	+	-

Cyclotella comata (E hr) Kutz.	-	-
Navicula laterostrate Hust.	-	+
Gyrosignma attenuatum Kutz	-	-
Gomphonema ventricosum. Greg.	+	-
Pleurosignma spenceri Karston	-	-
Pennularia major Kutz	-	+
Pinnularia vindis Kutz	+	+
Navicula cuspidate Kutz	+	+
Pleurosigma gigantum Gran	-	+
CYANOPHYTA		
Phormidium favosum (Bory) Gom.	-	-
Anbaena circinalis Rabenh.	-	+
Anabaena biasolatiana	+	+
Synechocystis salansis Skuja	-	-
Oscillatoria borneti Zukal	+	+
Oscillatoria amphigranulata Van Goor	-	+
Oscilatoria lenuis Ag.	+	+
Microcystis aeruginosa Kutz	+	+
Nostoc linckia (Rolth) Bornd Flah	+	+
Nostoc commune Vauch	-	+
Rivularia minulula (Kutz.) Bornd Flah	+	-
Rivularia biasolettiana Monegh	-	-

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