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Seasonal Abundance of Micro Algae in Pandi Backwaters of Godavari Estuary, Andhra Pradesh, India

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Abstract

Gautami branch of Godavari River is a typical positive estuary and is in tidal communication with the open sea upto a point near Kapileswarapuram. This branch flows southwest and opens into Bay of Bengal at two places, namely Bhiravapalem and Kothapalem. The Gautami branch of Godavari is also connected to Pandi backwaters by a channel known as Pedderu, which starts at Kothapalem, Balusutippa area and enters Pandi back water system. Two stations were selected for collection of data. Hydrographical data were collected for one year from July 2006 to 2007 and the data on distribution of phytoplankton was studied in three seasons during 2006-2007. Hydrographical features of the two stations showed that lower values were recorded during October to February months, while higher values were reported from the month of March to September. A total 57 species of phytoplankton were identified from the two study sites of the Pandi backwaters Composition of phytoplankton varied seasonally in relation to salinity fluctuations and showed that two peak periods, one in June-July and another in between December and March. Present study indicates that diatoms are the dominant group followed by the Chlorophyceae and others. This study will aid the baseline data for aqua-culturists in nearby regions.

Keywords: hydrographical features, phytoplankton, seasonal distribution

Introduction

Estuaries offer a unique environment for the substenace of aquatic organisms. The meeting place of the land and sea is probably the most productive place on the earth. Various authors have studied the ecological, biological and physiological studies on estuarine algae and seagrasses of Gautami Godavari estuary (Narasimha Rao and Umamaheswara Rao, 1991; Narasimha Rao, 1995; Narasimha Rao *et al.,* 2000; Narasimha Rao *et al*., 2008; Narasimha Rao and Subba Rangaiah, 2008a, 2008b).

In the present study monthly data was collected on environmental and hydrographical characteristics of the Pandi backwaters along with abundance and seasonal distribution of phytoplankton in this region. Seasonal studies on distribution of phytoplankton will helpful for obtaining the information on fishery resources of the particular area.

Materials and methods

The river Godavari is the largest in south India and is held in reference as Dakshina Ganga. Gautami branch of Godavari is a typical estuary situated between 82°12' and 82°21' E and 16°31' and 16°54' N. where as study sites of the present study (Pandi back water) situated between 82°15' E and 16°45' N. In the present study two study sites were selected, station-1 was located near mouth and station-2 near Pedderu channel (Fig. 1). Water samples were collected from a boat using a bucket. The temperature, salinity and P^H of the surface water were measured by the Thermometer, Salinometer and pH meters respectively. Dissolved oxygen was estimated by the method given by (Strickland and Parsons, 1972). Water samples for phytoplankton studies were collected from two stations. At each station two liters water sample were collected and immedi-

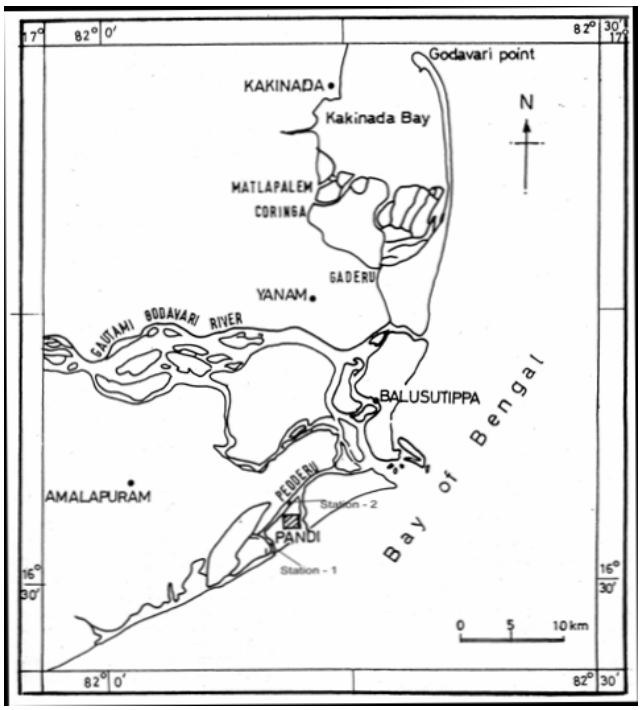

Fig. 1. Location map of the study area

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ately fixed with 5% formalin and centrifused at 3000 RPM for 15 minutes. The phytoplankton counting was made in replicate on sedgewick rafter counting chamber. The species of the phytoplankton were identified by following the keys provided by (Subramanyam, 1946; Desikachary, 1959; Prescott, 1951).

Results and discussion

Seasonal data collected on hydrographical parameters of Station-1 and Station-2 of the Pandi backwaters was presented in Fig. 2 and Fig. 3 respectively. There is no much variation in hydrographical characteristics of two study sites of the Pandi backwaters system. Air temperature of these stations varied from 28.0°C to 33°C, maximum temperature was recorded in month of May (33°C) and minimum temperature in the month of January (28.0°C). Similarly temperature of surface waters ranged from 25.0°C to 28.0°C. Higher water temperature was recorded in the month of April and May, whereas lower

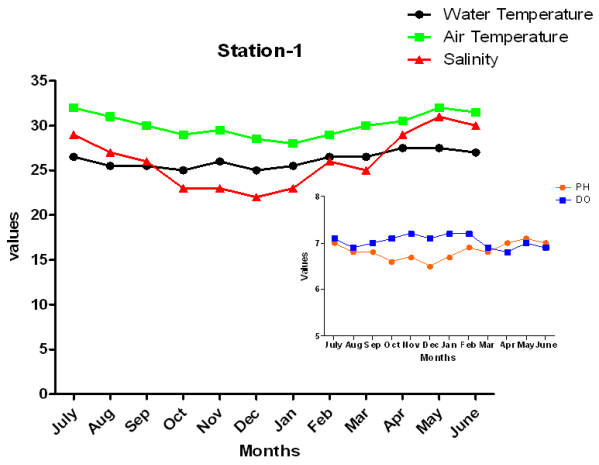

Fig. 2. Hydrographical features at station-1(Pandi backwaters) during July 2006-June 2007

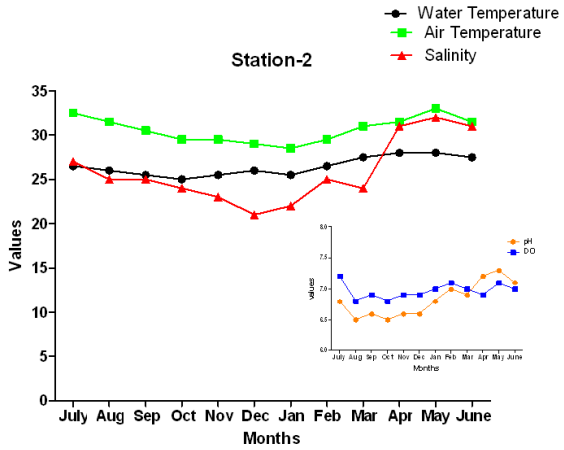

Fig. 3. Hydrographical features at station-2 (Pandi backwaters) during July 2006-June 2007

temperature was reported in the month of October (Fig. 2 and Fig. 3). Salinity of the surface waters varied from 21 to 33‰ in two study sites. Lower salinity were recorded during the southwest monsoons and higher values in salinity were recorded in the premonsoon season (Fig. 2 and Fig. 3). The pH of the surface waters varied seasonally and showed a positive relationship to the seasonal changes in the salinity. Minimum pH values were recorded in the month of December (6.3) and maximum in the month of May (7.3). No seasonal trend was noticed in the content of the dissolved oxygen in two study sites of the present investigation. Maximum values in D.O were observed in January and February months and minimum in the month of October.

A total 57 species of phytoplankton were identified from water samples collected from two stations of Pandi backwaters. Out of the 57 species, 17 species belongs to *Chlorophyceae* (Tab. 1). 12 species of *Bacillariophyceae (Centrales)* and 18 species of *Bacillariophyceae(Pennales)* (Tab. 2) 6 species belongs to *Cyanophyceae*, 5 species of *Euglenophyceae* and 3 species of *Dinophyceae* (Tab. 3).

From the composition of phytoplankton it is evident that pennales are more abundant than Centrales. Presence of *Cyanophyceae* and *Euglenophyceae* members indicate the occurrence of organic matter in the estuarine waters of Gautami branch of Godavari.

Composition of algae varied seasonally in relation to high and low salinity periods of the years. Many centrales and pennales members were restricted to high salinity season of the year (April-June/July). On the other hand *Chlorophyceae* members were predominant during the low salinity period or after flood season of the year. The absence of these forms in the higher salinity period clearly indicates the influence of salinity on the composition of phytoplankton.

The abundance of phytoplankton varied seasonally in the two selected stations with two peak periods, one in June-July and the other between December and March. To show the seasonal changes in the abundance of total phytoplankton, data collected from station-1 and 2 are given in Tab. 4.

The phytoplankton dominance recorded in the present study was similar to that of Bay of Bengal studied by (Gouda and Panigrahy, 1996). The distribution of phytoplankton depends on the environmental and nutrient conditions. In Arabian sea Sawant and Madhupratap (1996) reported that the diatoms were the largest group (85%) followed by blue green algae (7%). Radhakrishna *et al.* (1978) reported that the Nitzschia, *Chaetoceros* and *Rhizosolenia* were the dominant forms in the parts of Bay of Bengal. In the present study changes in the distribution of phytoplankton may be due to changes in hydrographical conditions and light requirement of the species as reported by (Marshall, 1996).

Tab. 1. Table shows the Phytoplankton of *Chlorophyceae* in Station-1 and 2

S.No	Species	Station-1	Station-2
1	*Ankistrodesmus sigmoides*	+	+
2	*Ankistrodesmus convolutus*	+	-
3	*Ankistrodesmus falcatus*	+	+
4	*Pediastrum ovatum*	+	+
5	*Pediastrum duplex*	-	+
6	*Pediastrum tetras*	+	+
7	*Scenedesmus quadricauda*	+	+
8	*Scenedesmus obliquus*	+	+
9	*Scenedesmus dimorphus*	+	+
10	*Scenedesmus bijugatus*	+	-
11	*Actinastrum hantzschii*	+	+
12	*Closterium* sp.	+	+
13	*Gonium pectorale*	-	+
14	*Cosmarium* sp.	+	+
15	*Spirogyra* sp.	+	+
16	*Chodatella quadriseta*	+	+
17	*Schroederia* sp.	+	+

Tab. 2. Phytoplankton of *Bacillariophyceae*

S. No	Species	Station-1	Station-2
	Centrales		
1	*Melosira moliniformis*	+	+
2	*Melosia sulcata*	-	+
3	*Melosia dubia*	+	+
4	*Rhizosolenia stolterfothii*	+	-
5	*Rhizosolenia crassispina*	+	+
6	*Skeletonema costatum*	+	+
7	*Leptocylindrus minimus*	+	+
8	*Thalassiosira decipienns*	+	+
9	*Coscinodiscus sublineatus*	+	+
10	*Coscinodiscus* sp.	+	+
11	*Cyclotella meneghiniana*	+	+
12	*Hemiaulus* sp.	-	+
	Pennales		
13	*Asterionella japonica*	+	-
14	*Amphiprora paludosa*	+	+
15	*Pleurosigma balticum*	+	+
16	*Thalassiothrix frauenfeldii*	+	+
17	*Thalassionema nitzschioides*	-	+
18	*Nitzschia longissima*	+	-
19	*Nitzschia palea*	-	+
20	*Nitzschia sigma*	+	-
21	*Nitzschia obtuse*	+	-
22	*Nitzschia seriata*	+	+
23	*Nitzschia closterium*	+	+
24	*Nitzschia paradoxical*	-	+
25	*Nitzschia panduriformis*	+	+
26	*Nitzchia* sps	+	+
27	*Diploneis* sps	+	+
28	*Raphoneis amphiceros*	+	-
29	*Cocconeis* sp.	+	+
30	*Cymbella* sp.	+	+

Tab. 3. Phytoplankton of *Cyanophyceae*, *Euglenophyceae* and *Dinophyceae* in station-1 and 2

S. No	Species	Station-1	Station-2
	Cyanophyceae		
1	*Oschillatoria* sps	+	+
2	*Merismopedia glauca*	+	+
3	*Microcystis aeruginosa*	-	+
4	*Spirulina* sps.	+	+
5	*Anabaena* sps.	+	+
6	*Arthrospira* sps	+	+
	Euglenophyceae		
7	*Euglena acus*	+	+
8	*Euglena viridis*	+	+
9	*Strombomonas australis*	+	-
10	*Phacus triqueter*	-	+
11	*Distigma proteus*	+	+
	Dinophyceae		
12	*Peridium* sp.	+	+
13	*Ceratium* sp.	+	-
14	*Diplopsalis* sp.	-	+

Tab. 4. Seasonal changes in the abundance of total phytoplankton in Station-1 and 2

Month	Phytoplankton (Cells/lit)	
	Station-1	Station-2
January	396	427
February	576	782
March	4579	5784
April	75	89
May	185	167
June	415	566
July	1120	1270
August	481	576
September	425	482
October	291	217
November	55	83
December	2764	3287

Conclusions

The present study reveals that diatoms are the dominant group followed by the *Chlorophyceae* and other in the Pandi backwaters of the Gautami Godavari estuary. Maximum phytoplankton density and species diversity were observed during December to March months. Another peak in density and diversity of phytoplankton was reported in July. Hydrographical features of the water may not correlate the abundance and density of phytoplankton in the present study as reported by (Mani, 1992; Mohamed *et al.*, 2009). Present study will provide the baseline information for further investigation on density of phytoplankton in relation to nutrients and organic matter.

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