

Seasonal distribution of marine macro algae at Mutyalammapalem, Visakhapatnam district, East Coast of India.

G.M.Narasimha Rao and D.Srinivasa Rao

Department of Botany Andhra University, Visakhapatnam-530 003

Abstract: Marine macro algae present along the coastal belt of Mutyalammapalem beach was studied. A total of 28 species were identified in three seasons during 2012-2013. Most of the Chlorophyceae members were present throughout the year while Brown algal members and some of the Rhodophyceae were reported during the winter season only. Maximum number of marine algal species was reported in the winter season. Higher values of the biomass reported for the species such as *Amphiroa fragilissima* (14.2 g/m²) *Gracilaria corticata* (14.1 g/m²) and *Ulva fasciata* (9.2 g/m²) and minimum biomass values were reported for the species *Bangiopsis subsimplex* (0.3 g/m²), *Wrangelia argus* (0.3 g/m²) and *Chnoospora minima* (0.4 g/m²).

Keywords: Marine macro algae, seasonal distribution, Mutyalammapalem, East Coast of India.

I. Introduction

Several studies were made on the seasonal distribution of marine along the east coast of India (Umamaheswara Rao and Sree Ramulu 1964; Umamaheswara Rao and Sree Ramulu 1970; Umamaheswara Rao, 1972; Narasimha Rao, 1984; Kalimuthu et al, 1995; Rath and Adhikary, 2006; Sulekha and Panikkar, 2007; Prasanna lakshmi and Narasimha Rao, 2009; Satya Rao et al 2011) (1,2,3,4,5,6,7,8 and 9). Umamaheswara Rao and Sree Ramulu (1964) (1) reported the algal species present at Visakhapatnam coast, Narasimha Rao and Umamaheswara Rao studied the marine algal populations in a numerical approach. Satya Rao et al (2011) (9) reported the marine algae at Bhimili coast. So far there is no report on the marine macro algae at Mutyalammapalem beach of the Visakhapatnam district. So in the present study an attempt was made to investigate the marine algae present at Mutyalammapalem in relation to seasonal changes in biomass values along with the physico chemical parameters of the study site.

II. Material and Methods

Mutyalammapalem is coastal village nearly 45 KM away from the Visakhapatnam city. It lies between the 17.58N and 83.09 E, on the east coast of India. Rocky boulders in the study site offer growth of the marine micro algae and macro algae. Hydrographical parameters such as air and water temperature, salinity and pH were collected monthly from the study site during June 2012 to May 2013. Temperature, pH and salinity of the surface water were measured by using thermometer, portable pH meter and salinometer respectively. For estimation of biomass, quadrates of 0.25X0.25 M were used. Plants present in the quadrates were collected and brought to the laboratory. They were carefully separated from the other algae, sun dried and then dried to a constant weight in an oven at 60° C temperature. Each month 4 to 5 quadrat samples were collected randomly and average monthly values of biomass collected during June 2012 to May 2013 were expressed as gram dry weight/m².

III. Results and Discussion

Information collected on physico-chemical parameters of the study site at Mutyalammapalem coast was presented in Table 1. Environmental parameters of the study site varied seasonally, air and water temperatures were increased from February month and maximum temperature for both in air and water was recorded in the month of May. From July onwards temperature decreased and minimum temperature was recorded in the month of December (Table.1). Salinity of the coastal waters in the study region was varied seasonally from 31.0 to 32.5‰ with maximum salinity in the months of April and May and minimum salinity in December (Table 1). pH of surface waters varied seasonally from 7.5 to 7.8 with maximum pH in the month of April. DO of the study site varied from 6.8 to 7.2 ml/L. Satya Rao et al. (2011) studied the hydrographical features of the Bhimili coast in relation to seasonal growth of marine algae and the present study at Mutyalammapalem agrees with the hydrographical studies carried out by Satya Rao et al. (2011).

Information collected on the occurrence of marine algae at Mutyalammapalem coast was presented in the Table 2. A total of 28 marine algal forms reported from the study site. Out of the 28 marine algal forms, 10 species belongs to Chlorophyceae, 6 belongs to Phaeophyceae and remaining 12 species to Rhodophyceae. Seasonal changes in biomass of the marine algae were presented in the Table. 3. Higher values of the biomass

reported for the species such as *Amphiroa fragilissima* (14.2 g/m²) *Gracilaria corticata* (14.1 g/m²) and *Ulva fasciata* (9.2 g/m²) and minimum biomass values were reported for the species *Bangiopsis subsimplex* (0.3 g/m²), *Wrangelia argus* (0.3 g/m²) and *Chnoospora minima* (0.4 g/m²). Out of the 28 species, some species occurs throughout the year with seasonal changes in their biomass (Table 3) while some species occur certain months of the year only. Species such as *Ectocarpus mitchellae*, *Padina tetrastromatica*, *Liagora visakhapatnamensis*, *Porphyra vietnamensis*, *Bangiopsis subsimplex* and *Rosenvingea nhatrangensis* occurs two to four months period only in the intertidal region of the study site (Table 3). Some species such as *Chnoospora minima*, *Sargassum vulgare*, *S. ilicifolium*, *Gracilaria textorii*, *Wrangelia argus* and *Boodlea struveoides* occurs five to nine months with changes in their biomass values (Table 3). Remaining species such as *Ulva fasciata*, *Enteromorpha compressa*, *Chastomorpha antininna*, *Cladophora socialis*, *Spongomorpha indica*, *Bryopsis pennata*, *Caulerpa taxifolia*, *Caulerpa racemosa*, *Caulerpa fastigiata*, *Gelidiopsis variabilis*, *Amphiroa fragilissima*, *Jania rubens*, *Gratiloupia lithophila*, *Grateloupia filicina* and *Gracilaria corticata* occurs throughout the year with monthly changes in their biomass values (Table 3).

Findings of the present study agree with the works of Untawale et al. (1989) (10) at Karnataka coast, Oza et al (1991) (11) along the west coast of India and Satya Rao et al (2011) (9) at Bhimili coast near Visakhapatnam. Narasimha Rao (1989) (12) studied the seasonal growth and biomass of the *Bangiopsis subsimplex* growing at Visakhapatnam coast and reported that species occur for a period of 9 months and higher biomass values were reported in the month of February. But in the present study on above species, this alga occurs only three months period with maximum biomass of 0.3 grams/m² only. Narasimha Rao (1991) (13) reported the seasonal growth of the *Ectocarpus mitchellae* from November to May with maximum biomass in the month of January. In the present study on growth of this alga was observed from November to February months with maximum biomass in the month of January. Narasimha Rao (1992) (14) studied the seasonality of the *Porphyra vietnamensis* at Visakhapatnam and observed the occurrence of this species from November to August with maximum biomass in February. In the present study the alga appears very limited period on the intertidal rocky surfaces of the Mutyalammappalem coast. The present study on the biomass of the different marine algae at Mutyalammappalem coast agrees with the findings of Satya Rao et al (2011) at Bhimili coast, east coast of India. Further reduction in the biomass of the different species and occurrence of the species in certain months of the year may be due to the climatic and anthropogenic activities.

Table 1. Physico-chemical parameters of the surface waters at Mutyalammappalem Coast

	Air Temperature (°C)	Water Temperature (°C)	Salinity (‰)	pH	DO ml/L
June 2012	30.5	25.5	32.0	7.7	6.8
July	27.5	25.0	31.0	7.6	7.0
August	27.0	24.5	31.5	7.7	6.9
September	27.5	24.5	31.0	7.6	7.1
October	27.0	23.0	31.5	7.7	7.2
November	25.5	22.0	31.5	7.6	6.9
December 2012	25.0	21.0	31.0	7.5	6.8
January 2013	25.5	21.5	32.0	7.6	7.0
February	26.5	22.0	31.5	7.6	7.1
March	27.0	23.5	32.0	7.7	7.2
April	28.5	24.5	32.5	7.8	7.0
May 2013	31.5	26.0	32.5	7.6	6.9

Table 2. List of the marine macro algae reported from the Coastal waters of Mutyalammappalem

S.No.	Name of the Species	Class
1	<i>Ulva fasciata</i> Delile	Chlorophyceae
2	<i>Enteromorpha compressa</i> (L) Greville	Chlorophyceae
3	<i>Chaetomorpha antennina</i> (Bory) Kützting	Chlorophyceae
4	<i>Cladophora socialis</i> Kützting	Chlorophyceae
5	<i>Spongomorpha indica</i> Thivy at Visalakshmi	Chlorophyceae
6	<i>Boodlea struveoides</i> Howe	Chlorophyceae
7	<i>Bryopsis pennata</i> Lmouroux	Chlorophyceae
8	<i>Caulerpa fastigata</i> J.Ag.	Chlorophyceae
9	<i>Caulerpa racemosa</i> J.Agardh	Chlorophyceae
10	<i>C.taxifolia</i> (Vahl.) C.Agardh	Chlorophyceae
11	<i>Ectocarpus mitchellae</i> Hamel	Phaeophyceae
12	<i>Chnoospora minima</i> (papenfuss)	Phaeophyceae
13	<i>Padina tetrastromatica</i> Hauck	Phaeophyceae
14	<i>Sargassum vulgare</i> C.Agardh	Phaeophyceae
15	<i>S.Ilicifolium</i>	Phaeophyceae
16	<i>Rosenvingea nhatrangensis</i>	Phaeophyceae
17	<i>Porphyra vietnamensis</i> , Tanaka et Ho	Rhodophyceae

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18	<i>Bangiopsis subsimplex</i> Schmitz	Rhodophyceae
19	<i>Gelidiopsis variabilis</i> Schmitz	Rhodophyceae
20	<i>Gelidium pusillum</i> Le Jolis	Rhodophyceae
21	<i>Amphiroa fragilissima</i> Camouroux	Rhodophyceae
22	<i>Jania rubens</i> Lamouroux	Rhodophyceae
23	<i>Grateloupia lithophila</i> Borgesen	Rhodophyceae
24	<i>Grateloupia filicina</i> J.Agardh	Rhodophyceae
25	<i>G.textorii</i>	Rhodophyceae
26	<i>Gracilaria corticata</i> J.Agardh	Rhodophyceae
27	<i>Liagora visakhapatnamensis</i>	Rhodophyceae
28	<i>Wrangelia argus</i>	Rhodophyceae

Table 3. Seasonal variations in the biomass of Marine algae present at Mutyalammapalem Coast during June 2012 to May 2013 (gram dry wt. /m²).

S.No.	Name of the Species	J	J	A	S	O	N	D	J	F	M	A	M
1	<i>Ulva fasciata</i>	6.2	6.7	6.6	6.8	7.2	7.6	8.0	8.8	9.0	9.2	8.1	7.2
2	<i>Enteromorpha compressa</i>	3.2	3.1	2.7	2.8	3.0	3.4	3.7	4.2	5.3	4.7	4.1	3.6
3	<i>Chaetomorpha anteninna</i>	2.8	2.6	2.9	3.2	3.4	1.9	1.3	0.8	1.2	1.6	1.9	2.2
4	<i>Cladophora socialis</i>	5.4	6.9	7.2	7.6	7.9	5.2	5.0	3.8	3.8	4.3	4.7	5.1
5	<i>Spongomorpha indica</i>	5.6	4.9	4.8	4.1	5.2	5.4	5.5	5.5	5.7	5.9	6.2	6.0
6	<i>Boodlea struveoides</i>	--	2.2	2.6	3.1	3.1	3.5	3.8	4.1	3.6	2.4	--	--
7	<i>Bryopsis pennata</i>	3.8	4.5	4.2	3.4	3.2	2.8	2.6	3.1	3.5	3.4	3.6	3.6
8	<i>Caulerpa fastigiata</i>	2.1	1.9	2.3	2.6	2.7	3.0	3.3	3.6	3.2	2.8	2.6	2.4
9	<i>Caulerpa racemosa</i>	1.3	1.7	1.9	2.0	2.1	2.3	2.6	2.5	2.0	1.8	1.6	1.6
10	<i>C.taxifolia</i>	1.9	1.9	2.1	2.5	2.7	2.8	3.4	3.8	3.0	2.7	2.5	2.1
11	<i>Ectocarpus mitchellae</i>	--	--	--	--	--	0.4	0.6	0.8	0.5	--	--	--
12	<i>Chnoospora minima</i>	--	--	--	--	--	0.3	0.6	1.0	0.8	0.4	--	--
13	<i>Padina tetrastromatica</i>	--	--	--	--	--	2.7	3.4	3.8	2.6	--	--	--
14	<i>Sargassum vulgare</i>	2.3	--	--	--	--	4.3	5.6	6.0	6.9	5.6	4.9	4.2
15	<i>S.llicifolium</i>	1.9	--	--	--	--	3.8	5.2	6.5	7.3	5.8	4.3	2.8
16	<i>Rosenvingea nhatrangensis</i>	--	--	--	--	--	--	0.9	0.7	--	--	--	--
17	<i>Porphyra vietnamensis</i> ,	--	--	--	--	--	--	1.1	1.6	0.9	--	--	--
18	<i>Bangiopsis subsimplex</i>	--	--	--	--	--	--	0.4	0.5	0.3	--	--	--
19	<i>Gelidiopsis variabilis</i>	2.4	2.7	2.5	3.1	3.6	3.8	3.8	3.5	2.3	2.1	1.8	2.0
20	<i>Gelidium pusillum</i>	1.9	2.2	2.2	2.3	2.5	2.6	2.8	2.5	2.1	2.1	2.0	1.9
21	<i>Amphiroa fragilissima</i>	9.5	10.5	10.8	11.2	12.1	12.5	12.8	13.6	13.9	14.2	12.3	12.1
22	<i>Jania rubens</i>	2.9	3.0	3.2	3.1	3.2	3.3	3.3	3.5	3.2	3.0	2.7	2.7
23	<i>Grateloupia lithophila</i>	2.3	2.1	2.3	2.5	2.6	2.8	3.0	3.3	3.1	2.9	2.7	2.5
24	<i>G. filicina</i>	2.7	2.5	2.8	2.9	3.0	3.1	3.4	3.7	3.8	3.6	3.2	2.9
25	<i>Gracilaria corticata</i>	11.8	10.1	11.2	11.4	11.7	11.9	12.3	12.8	14.1	13.2	12.9	12.6
26	<i>G.textorii</i>	--	--	--	--	--	7.2	8.5	8.7	7.8	7.4	6.1	--
27	<i>Liagora visakhapatnamensis</i>	--	--	--	--	--	--	2.8	3.4	2.1	--	--	--
28	<i>Wrangelia argus</i>	0.9	0.6	0.4	--	--	--	0.3	0.6	0.5	0.7	0.6	0.8

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