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Present status of the seasonal marine algae at Visakhapatnam coast, East coast of India.

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Abstract:

Seasonal marine macro algae present along the coastal regions of Visakhapatnam was studied. A total of 14 species were identified during the period of investigation from June, 2015 to May, 2016. Members of Phaeophyceae and Rhodophyceae, except *Acrochaetium iyengarii* occurs from November to February/March months while all Chlorophyceae members occurs from July to October/November months. Minimum biomass (0.1g/m²) was reported for few species such as *Ecotocarpus mitchellae*, *Acrochaetium iyengarii, Centroceras clavulatum* and *Peyssonnelia conchicola.* And higher biomass values were recorded for the species *Dictyota dichotoma* and *Bryopsis pennata.*.

Keywords: Seasonal marine macro algae, Biomass, Visakhapatnam coast, East Coast of India.

Introduction

Visakhapatnam is a coastal city lies in between Chennai and Kolkata on the East Coast of India.Visakhapatanm and nearby coastal regions are sandy with outcrops of rocky boulders of different shapes and sizes. These rocky boulders act as substratum for the growth and development of various biological organisms within the intertidal regions. Ecological and sporulation studies on marine macro algae of Visakhapatnam and nearby areas were studies by several Investigators (Umamaheswara Rao and Sree Ramulu,1964; Umamaheswara Rao and Sree Ramulu,1970; Subba Rangaiah, 1983; Kaliaperumal and Umamaheswara Rao,1985;1986;1987; Narasimha Rao,1984; Narasimha Rao and Umamaheswara Rao,1986;Narasimha Rao, 1989a;1989b; 1991; Narasimha Rao and Subba Rangaiah,1991; Narasimha Rao,1992;1994;1995; Narasimha Rao and Subba Rangaiah, 2007; 2010a; 2010b; Prasanna Lakshmi and Narasimha Rao,2009; Satya Rao et al.,2011; Subba Rangaiah, et al 2012; Narasimha Rao et al.2012; Narasimha Rao,2014; Narasimha Rao and Srinivasa Rao,2016 and Narasimha Rao,2016). Over the years there is a sharp decline in number of species as well as quantity of biomass observed. Based on the above mentioned parameters, present investigation was carried out on the occurrence and distribution of the annual marine algal forms along the intertidal regions of the Visakhapatnam for a period of one year from June, 2015 to May, 2016.

Materials and Methods

Visakhapatnam lies between latitudes 17º 14’ 30” and 17º 45’ N at longitudes 83º 16’ 25” E with outcrops of rocky boulders in different places of the sandy coast of East Coast of India. Sampling was carried out with 0.25 X 0.25M quadrant which placed randomly on the intertidal rocky surfaces. Each fortnight (during low tide periods) 15 quadrant samples were collected and a total of 360 quadrant samples were gathered during the period study from January 2016 to December 2016. The algal samples present in the quadrants were carefully removed and identified with help of the annotated list provided by the Umamaheswara Rao and Sree Ramulu (1970). The macro algae present in quadrants was removed with help of the scalpel and the species were separated. The collections were sun dried and then dried to a constant weight in an oven at 60º C temperatures. Every fortnight collected samples separated and average values of biomass collected between June, 2015 to May, 2016 were expressed as g. dry. wt./m². Data was collected on only seasonal and annual algal species present during the period of investigation. Perennial algal samples present in the quadrant samples were not counted. Further all collected algal samples were preserved in the museum of Botany department, Andhra University. Frequency of the individual species was calculated based on the total number of samples in the study.

Results and Discussion

Intertidal regions of the Visakhapatnam coast was occupied by the several perennial algal genera like *Ulva, Enteromorpha, Caulerpa, Spongomorpha, Cladophora, Chaetomorpha, Gracilaria, Gratelopia, Gelidium, Gelidiopsis,Gigartina, Jania, Amphiroa* and some other seasonal algal forms such as *Padina,Lobhophora* and *Sargassum*. Present investigation was aimed to give the clear information about the seasonal annual algae present in the intertidal rocky surfaces of the Visakhapatnam coast. On the basis of presence and absence data, list of the seasonal marine algal forms was given Table.1. Out of the 14 algal forms, 2 belongs to class Chlorophyceae, 3 belongs to Phaeophyceae and remaining 9 species belongs to class to Rhodophyceae. Over the years there was gradual changes in occurrence as well as distribution of algae along the coastal regions of Visakhapatnam. Umamaheswara Rao and Sree Ramulu (1964 and 1970) reported 80 marine algae including epiphytes at Visakhapatnam coast. But in the present study loss of so many epiphytes and seasonal marine algae was observed (Table 1).

Table.1 List of the annual marine macro algae at intertidal rocky surfaces of Visakhapatnam

S.No	Name of the species	Class
1	*Bryopsis pennata*	Chlorophyceae
2	*Psedobryopsis mucronata*	Chlorophyceae
3	*Ecotocarpus mitchellae*	Phaeophyceae
4	*Rosenvengea nthrangensis*	Phaeophyceae
5	*Dictyota dichotoma*	Phaeophyceae
6	*Liagora erecta*	Rhodaphyceae
7	*Liagora visakhapatnamensis*	Rhodaphyceae
8	*Porphyra vietnamensis*	Rhodaphyceae
9	*Bangiopsis sibsimplex*	Rhodaphyceae
10	*Acrochaetium iyengarii*	Rhodaphyceae
11	*Polysiphonia ferulacea*	Rhodaphyceae
12	*Centroceras clavulatum*	Rhodaphyceae
13	*Ceramium cruciatum*	Rhodaphyceae
14	*Peyssonnelia conchicola*	Rhodaphyceae

Table 2 shows biomass of the seasonal marine algal forms including epiphytes during the period of investigation. Seasonal brown algae such as *Ectocarpus mitchellae, Dictyota dichotoma, Rosenvingea nhatrangensis*, and red algae such as *Porphyra, Bangiopsis, Liagora, Acrochaetium, Peyssonnelia, Polysiphonia, Ceramium, Centroceras,* and other green algal members *Bryopsis pennata* and *Pseudobryopsis mucronata* occur in different months of the year. All phaeophyceae members and Rhodophyceae members, except *Acrocahetium* occurs in winter season from November to February/March months while all Chlorophyceae occurs in monsoon season from July to October/November months. Biomass of these species varied monthly and minimum biomass (0.1 g/m²) was reported for many species like *Ecotocarpus mitchellae*, *Acrochaetium iyengarii, Centroceras clavulatum* and *Peyssonnelia conchicola.* Higher biomass values (4.6 and 3.5 g/m²) were reported for *Dictyota dichotoma* and *Bryopsis pennata* respectively. Umamaheswara Rao and Sree ramulu (1964) studied the ecological observations on marine algae at Visakhapatnam coast and reported distribution of marine algae and seasonal changes in biomass of various marine algal forms. 80 marine algal forms were reported by Umamaheswara Rao and Sree Ramulu (1970), Narasimha Rao (1984) reported 45 marine algae at Visakhaptanm with less biomass values. Narasimha Rao (1989) reported the seasonal growth and biomass of *Bangiopsis subsimplex* at Visakhapatnam coast and observed this species occurred 9 months but in the present study this species occurs for 4 months only with higher biomass (0.6 g/m²). Narasimha Rao (1991) studied the seasonal growth and biomass of *Ectocarpus mitchellae* and reported that this species was occurred for 7 months but in the present study above species occurs for 5months with maximum biomass (1.0 g/m²). Seasonal growth of *Porphyra vietnamensis* was studied by Narasimha Rao (1992) and reported the presence of this species from November to August months, in the present study this species was occurred from November to February with higher biomass value (1.4 g/m²). Prasanna Lakshmi and Narasimha Rao (2009) studied the distribution and biomass of marine algae at Visakhaptnam and reported less than 45 species with decreased

biomass. Satya Rao et al (2011) studied the marine algae of Bhimili coast near Visakhapatnam and recorded the low biomass values. Present study support the findings of the above investigators regarding decline in the number of species and gradual decrease in the biomass of the marine algae at Visakhapatnam coast.

Table 2. Seasonal variations in the biomass of Marine algae at Visakhapatnam Coast during

June 2015 to May 2016 (gram dry wt. /m²).

S.No.	Name of the Species	J 2015	J	A	S	O	N	D	J	F	M	A	M 2016
1	*Bryopsis pennata*		2.4	3.1	3.5	2.2	0.7	--	--	--	--	--	--
22222	*Psedobryopsis mucronata*	--	0.5	1.2	0.7	0.4	--	--	--	--	--	--	--
23	*Ecotocarpus mitchel*	--	--	--	--	--	0.2	0.7	1.0	0.6	0.1	--	--
4	*Dictyota dichotoma*	--	--	--	--	--	3.7	4.6	4.1	3.6	2.8	1.1	--
5	*Rosenvingea nhatrangensis*	--	--	--	--	--	0.6	1.1	0.5	--	--	--	--
6	*Porphyra vietnamensis,*	--	--	--	--	--	0.5	1.4	1.2	0.8	--	--	--
7	*Bangiopsis subsimplex*	--	--	--	--	--	0.3	0.6	0.4	0.2	--	--	--
8	*Liagora visakhapatanamensis*	--	--	--	--	--	--	3.1	3.6	2.4	--	--	--
9	*Liagora erecta*	--	--	--	--	--	--	2.9	3.3	2.5	--	--	--
10	*Acrochaetium iyengarii*	--	0.1	0.2	0.2	0.1	0.1	--	--	--	--	--	--
11	*Polysiphonia ferulac*						0.3	0.5	0.5	0.2			
12	*Centroceras clavula*						0.2	0.4	0.1	0.1			
13	*Peyssonnelia conch*					0.1	0.2	0.2	0.1				
14	*Ceramium cruciatum*							0.3	0.4	0.2			

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