

Deep water calcareous algae from submerged banks of India

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ABSTRACT

Altogether 8 genera with 15 species of calcareous algae were collected by dredging at four submerged banks located in the Arabian sea (off Central west coast of India). Plants were found luxuriantly at the depth range of 15 - 72 m. Calcareous red algae were dominant in the collection. *Halimeda gracilis*, *Galaxaura marginata* and *Padina pavonica* were the dominant forms. The distribution of calcareous algae at deeper depths is presented in this paper.

Introduction

Most of the literature available regarding the distribution of marine algae is from the intertidal region. Very few reports are available on subtidal flora of India (Jagtap, 1987; Untawale *et al.*, 1989 a; Kaliaperumal *et al.*, 1998). Untawale *et al.* (1989 a) and Ambiye and Untawale (1991) listed number of marine algae from various other banks located in the Arabian sea. Such data are important for distribution, physiology and reproduction point of view.

It is well known that calcified algae are very significant as far as their ecological and economical importance is concerned. They comprise the oldest fossil known and are the major lime producer (Wray, 1977). Many of them are known for the production of bioactive substances (Hay *et al.* 1988).

In the present paper an attempt is made to study the calcified algae from an unique habitat i.e. bank which is a shallow bottom area in the oceanic region. The present study is carried out at four banks situated in the Arabian sea, off central west coast of India. Calcified algae collected from these banks are listed in this paper with their respective depth of occurrence. The flora is compared with the various habitats like mainland of the neighbouring areas and Oceanic Islands of India with the available literature (Krishnamurthy and Joshi, 1970; Untawale *et al.* 1983).

Materials and Methods

Study area

Dredging was undertaken at four submerged banks off West coast of India in the Arabian sea Viz. Angria, Bassas de-Pedro, Cora-Divh and Sessotris banks (Fig. 1). Angria bank is situated approximately 135 km off Vijaydurg,

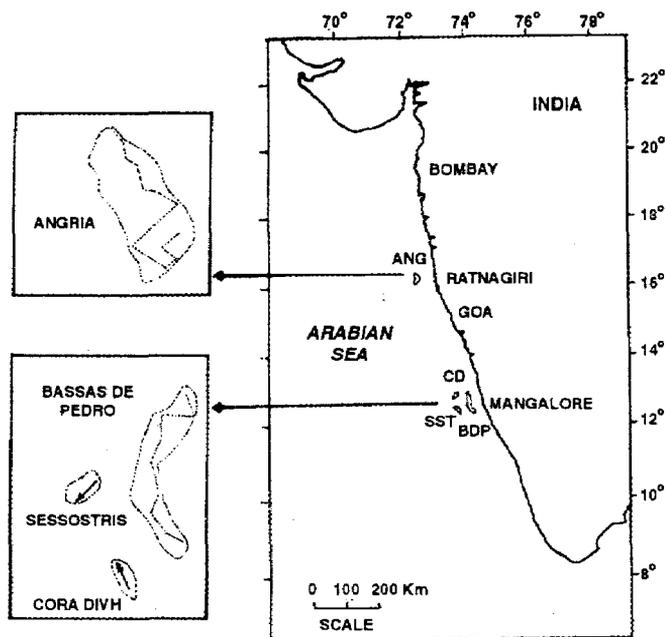


Fig. 1. Map showing stations studied

Maharashtra ($16^{\circ} 27' N$; $72^{\circ} 05' E$) and has an area of 540 km^2 . Bassas de-Pedro, Cora -Divh, and Sessostris banks are located in the Arabian sea off Mangalore, Karnataka ($13^{\circ}30'N$ and $73^{\circ}35'E$; $13^{\circ}45'N$ and $72^{\circ}15'E$; $12^{\circ}55'N$ and $72^{\circ} 05'E$ respectively). Bassas de - Pedro has an area of 2198 km^2 while Cora Divh and Sessostris banks have areas of 296 and 347 km^2 respectively. Dredging was undertaken at various depths ranging from $18-75 \text{ m}$. Floor of these banks is mostly a mixture of sand, mud, shells and shell fragments, calcareous lime-stones and dead coral pieces etc. Mid water temperature was found to be ranging between $24.8 - 27.8^{\circ}\text{C}$; Salinity fluctuated between 35 and 36×10^{-3} ; significantly high calcium concentration ($1035 - 1915 \text{ ppm}$) is reported (Nair *et. al.* 1966).

Mode of collection and preservation

Data were collected during four cruises of R.V. Gaveshani in the cruise nos. 159, 169, 173 and 206. A bucket dredge (size $0.7 \times 0.5 \times 0.25$) was used for collecting the samples along the pre-planned transects to represent maximum surface area. Dredging was undertaken at various depths ranging from $18-75 \text{ m}$. Algal samples were cleaned and preserved as herbaria and also in 5% sea-water formalin and were deposited at Marine algal Reference Centre of N.I.O. Dona-Paula, Goa. Known standard procedures were adopted to carry out decalcification of various calcareous algal genera and identification was carried out using related research articles, monographs etc.

Result and Discussion

Survey has resulted into the discovery of 15 species belonging to 8

genera of calcareous algae. These plants were found to be growing at various depths ranging from 18-75 m. Groupwise representation is as follows :

Chlorophyta - 3 genera, 6 species

Phaeophyta - 1 genus, 1 species

Rhodophyta - 4 genera, 8 species

Halimeda gracilis, *Galaxaura marginata*, *Padina pavonica* were found to be the dominant species. Genus *Galaxaura* was represented by maximum number of species. Calcified algae collected from these banks with their respective depths of occurrence are listed in Table 1. The flora showed little resemblance to the main land (Krishnamurthy, 1972 and Untawale *et. al.*, 1989 b). Articulated corallines were rare in collection. Flora showed great similarity to lagoon flora of Lakshadweep and Andamans.

Studies on distribution of organisms are important as it gives information regarding the spatial occurrence of organisms, their diversity and also about their adaptations to the environment. Submerged banks is very unique habitat as it is free from destruction by waves and man made changes. As mentioned earlier, calcareous algal flora of Angria and other three banks showed less similarity with that of mainland i.e. Ratnagiri and Karnataka coast respectively. Flora of intertidal and subtidal of above mentioned localities shows complete absence of *Halimeda*, *Udotea*, *Galaxaura* etc. The poor algal flora of Karnataka coast can be correlated with lack of intertidal expanse, strong influence of wave action and pollution (Agadi, 1986). Rich diversity of calcified algae at these banks can be attributed to absence of such adverse conditions at these banks.

Substratum is very significant factor in the distribution of plants. Many rooting algae *Halimeda* and *Udotea* prefer sandy substratum because of their burrowing and creeping habit which explains the abundance of long holdfast bearing calcareous algae. In all four banks articulated corallines were rare in collection. These algae require high light intensity for accretion. Positive co-relation between exposure and abundance of articulated corallines (Pears, 1972) was found.

Similarity in the flora of all these banks and lagoon flora may be due to the similar environmental conditions like absence of wave action and similar suitable substratum, clear water like that of lagoons. This can be explained with the theory put forth by Milliman and Emery (1968). According to holocene transgression of the sea resulted in the rise of sea level at the rate of about 1-1.3 cm. yr⁻¹. This rise in the sea level is applicable to the entire western continental margin of India resulting into the submergence of coral reef. Because of the phenomenon, there is a formation of banks in the Arabian sea. It is evident that various submerged plants in the Arabian Sea are rich in algal flora and further exploration like SCUBA diving may result into the dicoverly of many more taxa.

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Table 1. Distribution of calcified algae from submerged banks.

Name of Algae	Name of the banks	Depth of occurrence (m)
CHLOROPHYTA		
<i>Halimeda discoidea</i>	Ang, Bdp, SSt, CD	20 to 50
<i>H. gracilis</i>	Ang, Bdp, SStg, CD	20 to 50
<i>H. tuna. f. platydisca</i>	Ang, Bdp, SSt.	18 - 60
<i>Udotea flabellum</i>	SSt.	31
<i>U. indica</i>	Ang.	22
<i>Neomeris annulata</i>	Ang.	31
PHAEOPHYTA		
<i>Padina pavonica</i>	Ang. SSt.	31
RHODOPHYTA		
<i>Galaxaura lapidescens</i>	Ang. Bdp	22 to 40
<i>G. lenta</i>	Ang., SSt.,	18 to 31
<i>G. marginata</i>	Ang., SSt.,	18 to 31
<i>G. oblongata</i>	Ang., SSt.,	18 to 31
<i>G. rugosa</i>	Ang., SSt.,	18 to 31
<i>Amphiroa anceps</i>	Ang., SSt.,	18 to 31
<i>Jania rubens</i>	Ang., SSt.,	18 to 31
<i>Cheilosporum spectabile</i>	SSt.,	18 to 31

Ang-Angria; Bdp-Bassas de-Pedro; CD-Cora-Divh; SSt-Sessotris

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