



## Diversity of Seaweeds from Malvan and Kunakeshwar in Sindhudurg District of Maharashtra

## KEYWORDS

Seaweed, Diversity, Sindhudurg district

Surekha Rode

Department of Botany, Shivaji University, Kolhapur

Anjali Sabale

Department of Botany, Shivaji University, Kolhapur

## ABSTRACT

In the present work macro algal flora from the coastal regions of Kunakeshwar and Malvan in Sindhudurg district along the west coast of Maharashtra was investigated. The study revealed a total of forty species belonging to twenty four genera of green, brown and red seaweeds. Chlorophyceae members occurred in maximum number (16), followed by Rhodophyceae (14) and Phaeophyceae (10) at the study sites. Occurrence and distribution varied with taxa and location; however green algae dominated all the coastal regions of Sindhudurg in the present study.

## Introduction:

Seaweeds represent an extraordinary, sustainable resource in the marine ecosystem which is being used as a source of food, feed and medicine. Approximately 841 species of marine algae are found in both inter-tidal and deep water regions of the Indian coast. Edible seaweeds are widely consumed, especially in Asian countries, as fresh, dried, or as ingredients in prepared foods. Seaweeds are known to be one of the richest sources of minerals such as iodine, magnesium, calcium, phosphorus, iron, potassium, copper and fluoride (Ensminger *et al.*, 1995). An extensive survey of Indian marine algae has been made by Krishnamurthy and Joshi (1970). In recent years, a few workers have attempted to evaluate resource potentials of the Indian coast (Untawale and Dhargalkar, 1975). Bio-diversity of marine algae along the east and west coast regions of India has been studied by several workers (Borges, 1932; Biswas, 1945; Krishnamurthy, 1972; Srinivasan, 1973; Balkrishnan, 1981; Chaugule, 1989). Kirtikar (1986) documented marine algal flora from Ratnagiri coast in Maharashtra. In the present study seaweed flora from the coastal regions of Kunakeshwar and Malvan has been documented.

## Materials and Methods:

A survey of study area was carried out in order to know the diversity of macroalgae along the coastal areas of Malvan and Kunakeshwar in Sindhudurg district of Maharashtra. The rocky and sandy beaches of this area were frequently visited to record algal species in pre and post-monsoon period during a whole year. Seaweeds were handpicked from the intertidal region during low tide when exposed and brought to laboratory in polythene bags. Fresh samples were observed under light microscope for the identification of species. After careful rinsing and washing a few specimens were used for herbarium preparation. Identification of species was carried out using authentic floras and books (Srinivasan, 1969; Fritsch, 1977; Kaliperumal *et al.*, 1995; Mishra, 1996; Umamaheswara Rao, 2003). Occurrence of seaweeds was categorized as abundant (+++), less abundant (++) , sparse (+) and absent (-) based on the visible observation made at sampling sites.

## Results and Discussion:

Survey of coastal areas was carried out during the year 2013-2014. The region was visited every month for recording the algal species. The data are presented in Table 1.

Table 1. Documentation of seaweeds from Malvan and Kunakeshwar

Seaweeds/months	Oct 13	Nov 13	Dec 13	Jan 14	Feb 14	Mar 14	Apr 14	May 14	June 14	July 14	Aug 14	Sept 14
	Post-monsoon				Pre-monsoon				Monsoon			
• <i>Bryopsis plumosa</i>	-	-	-	-	+	+	-	-	-	-	-	-
<i>Caulerpa peltata</i>	-	-	-	-	-	++	+	+	-	-	-	-
* <i>Caulerpa taxifolia</i>	+	++	++	+++	+++	++	++	+	-	-	-	+
<i>Caulerpa sertularoides</i>	+	-	-	-	-	++	+	+	-	-	-	-
* <i>Caulerpa racemosa</i>	++	+	++	+++	+++	+	++	+	-	-	-	+
* <i>Caulerpa scalpelliformis</i>	-	+	-	-	-	-	-	-	-	-	-	-
* <i>Chaetomorpha antennina</i>	++	+	-	-	-	-	-	+++	-	-	++	+++
* <i>Chaetomorpha media</i>	++	++	++	+	+++	+++	+++	+++	++	-	-	+
* <i>Enteromorpha intestinalis</i>	++	++	+	+++	++	-	-	-	-	-	++	+++
<i>Enteromorpha flexousa</i>	+	+	-	-	-	-	-	-	-	-	-	-
<i>Enteromorpha compressa</i>	+	+	-	-	-	-	-	-	-	-	-	-
<i>Enteromorpha clathrata</i>	+	-	-	-	-	-	-	-	-	-	-	-

<i>Ulva lactuca</i>	+	+	++	++	++	+	+	+	++	-	-	-
<i>Ulva fasciata</i>	+++	+	-	++	-	++	-	-	-	-	-	+++
<i>Ulva reticulata</i>	+	+	+	+	+	+	-	-	-	-	-	-
* <i>Valonia utricularis</i>	-	-	-	+	-	++	+	-	-	-	-	-
* <i>Caulerpa racemosa</i>	++	+	++	+++	+++	+	++	+	-	-	-	+
Phaeophyceae												
<i>Dictyota dichotoma</i>	++	++	++	+++	+++	+	++	++	++	-	-	-
<i>Dictyota maxima</i>	+	+	-	+	+++	++	++	-	-	-	-	-
<i>Ectocarpus siliculosus</i>	++	++	++	+	++	++	+	+	++	-	-	-
<i>Padina gymnospora</i>	-	-	-	-	+	-	+	+	-	-	-	-
<i>Padina tetrastromatica</i>	+	++	++	+	++	++	+	+	+	-	-	-
<i>Sargassum cinereum</i>	+	++	++	+	+++	+++	++	++	+	-	-	-
<i>Sargassum ilicifolium</i>	++	++	++	+	+++	+++	++	++	+	-	-	-
<i>Sargassum tenerrimum</i>	+	++	++	+	+++	+++	++	++	+	-	-	-
<i>Spatoglossum asperum</i>	-	-	+	+	++	++	+	-	-	-	-	-
* <i>Stoechospermum marginatum</i>	-	+	+++	-	-	-	-	-	-	-	-	-
<b>Rhodophyceae</b>												
* <i>Acanthophora spicifera</i>	-	++	+	+	++	+++	++	++	+	-	-	-
<i>Ahnfeltia plicata</i>	-	+	-	-	-	-	-	-	-	-	-	-
<i>Amphiroa anceps</i>	-	+	-	-	-	-	+	+	-	-	-	-
<i>Corallina berteroi</i>	+	+	+	+	+	+	+	+	+	-	-	-
<i>Hypnea musciformis</i>	-	+	-	+		+	+	-	-	-	-	-
* <i>Jania rubens</i>	+++	+++	+++	+	+++	+++	+	+	++	-	-	-
<i>Gracilaria corticata</i>	++	++	++	+	+	+++	+++	+++	-	-	-	-
<i>Gelidiella acerosa</i>	++	+++	+	+	++	+++	++	++	++	-	-	-
* <i>Grateloupia filicina</i>	-	-	-	-	+	-	-	+	-	-	-	-
* <i>G. lithophila</i>	-	-	-	-	+	-	-	-	-	-	-	-
* <i>G. filicina f. horrida</i>	-	-	-	-	+	-	-	-	-	-	-	-
* <i>Gelidium pussilum</i>	+	-	+	-	-	-	-	-	-	-	-	-
<i>Liagora albicans</i>	-	-	-	-	+	-	-	-	-	-	-	-
<i>Porphyra vietnamensis</i>	-	-	-	-	-	-	-	-	-	+	++	+++

+++ Abundant, ++ Less abundant, + Sparse, - Absent, \* Present only at Kunakeshwar, ● Present only at Malvan

A total of forty seaweed taxa were collected from two different stations, viz., Kunakeshwar and Malvan. Chlorophyceae was represented with 16 taxa, Rhodophyceae with 14 taxa and Phaeophyceae with 10 taxa. At the beginning of growing season in October a very complex community of green, brown and red algae was observed. In this competition, balance was attained among *Chaetomorpha antennina* and *Ulva fasciata*, but at the end of October the belt started to lose color and subsequently turned into a white belt presumably due to total absence of *Chaetomorpha antennina* (From December to April).

Species of *Caulerpa taxifolia*, *Caulerpa racemosa*, *Enteromorpha intestinalis*, *Ulva lactuca*, *Ectocarpus siliculosus*, *Stoechospermum marginatum* were abundant in post-monsoon season. (October to January) *Chaetomorpha media*, *Dictyota maxima* and *Padina tetrastromatica*, appeared frequently in pre-monsoon season. (February to May) Three species of *Sargassum* were dominant in the pre-monsoon season, but gradually decreased in post-monsoon. *Acan-*

*thophora spicifera* (a red alga) also was abundant in pre-monsoon season but reduced in post-monsoon. *Jania rubens*, *Gracilaria corticata*, *Gelidiella acerosa* were in appreciable number in both pre and post monsoon seasons.

*Grateloupia filicina*, *Gelidium pussilum*, *Enteromorpha flexuosa*, *Enteromorpha compressa* occurred twice in a year, while *Grateloupia lithophila*, *Grateloupia filicina f. horrida*, *Liagora albicans*, *Caulerpa scalpelliformis* appeared only once in the year.

Algal vegetation is usually luxuriant from October to February along the western coast of Maharashtra. In summer months (March, April) it vanishes and almost negligible. Certain forms like *Porphyra* and *Ulva* grow luxuriantly only during the monsoon. Most of the other species start growing from October onwards. Species like *Jania rubens*, *Gracilaria corticata*, *Gelidiella acerosa* occur throughout the year. An extensive survey of Indian marine algae has been made by Krishnamurthy and Joshi (1970). For the

entire coast of India they recorded 122 species belonging to 36 genera of Chlorophyta, 117 species belonging to 33 genera of Phaeophyta and 252 species belonging to 95 genera of Rhodophyta. Phanase (2000) mentioned 56 species and 37 genera from this region. In the present work 40 species were reported from the coastal regions of Kunakeshwar and Malvan. It was interesting to notice the presence of *Bryopsis plumosa*, a green alga in this region. Similarly, *Ahnfeltia plicata* and *Liagora albicans* were also found during study period. Qasim and Wafar (1979) have recorded a total of 72 seaweeds from Ratnagiri, Malvan and Reddi along the west coast of Maharashtra. More than half numbers of the species were reported at Malvan and Kunakeshwar in the present study.

#### Conclusion:

The coastal regions surveyed support a rich biodiversity of seaweeds. The occurrence and distribution of seaweeds species varied with the location. This study will provide a baseline data for future studies on diversity of seaweeds from the west coast of Maharashtra.

#### REFERENCE

- Balkrishnan, (1981): A taxonomic account of Indian Ectocarpales and Ralfesiales. *Seaweeds Res. Utilin.* 4(2): 52 | Biswas, (1945): A general review of marine algae of west coast of India. 45(5):515-630 | Boergesen, F. (1932): Some Indian green and brown algae: Especially from the shores of Presidency of Bombay. II, *J Indian Bot. Soc.*11 (1): 51-70. | Chaugule, B. B. (1989): Siphonaceous green alga at Konkan coast, *Seaweed Res. Utilin.* 11(2): 107-115. *Phycol*, 14(Suppl.):12 | Ensminger, A. H., Ensminger, M. E., Konlande, J. E., and Roobson, J. R. K. (1995): *The Concision cyclopedia of Foods and Nutrition*. CRC Press, Boca Raton Florida. | Frisch, F. E. (1935); *The Structure and Reproduction of Algae*, Vol-I. Cambridge University Press. 767p. | Kaliaperumal, N., Kalimuthu, S. and Ramalingam, J. R. (1995): Economically important seaweeds. Dr. M. Devaraj (Ed.), Special publication 62. Central Marine Fisheries Research Institute, Indian Council of Agricultural Research, Post Box. No. 1603, Cochin – 682014, India, pp 1-35. | Kirtikar, (1886): A new species of algae *Conferva Thermalis* Birdwood. *J. Bomb. Nat. Hist. Soc.* (1): 135-138. | Krishnamurthy, V. (1972): The species of *Enteromorpha* of India *Bot. J. Linn. Soc.*65 (1):119-128. | Krishnamurthy, V. and Joshi, H. V. (1970): A check list of Indian marine algae. Central Salt and Marine Chemical Research Institute. Bhavnagar, pp: 36. | Misra, J. N. (1966): *Phaeophyceae in India*. ICAR, New Delhi, pp.1-97 | Phanase, S. S. (2000): *Biology of Marine algae of Konkan*, Dissertation for M.Sc. by research | Redekar, P. D. (2000): *List of Marine Algae along Ratnagiri coast – Salt. Ros. Ind.* 14(1):1-10. | Srinivasan, K. S. (1973): *Phycologia Indica*. Vol. II. Botanical Survey of India, Culcutta, p.1-52 | Srinivasan, K. S. (1969): *Phycologia Indica*. Vol. I. Botanical Survey of India, Culcutta, p.1-60 | Umamaheswara Rao, M. (2003): New species of *Gracilaria* (Gracilariaceae, Rhodophyta) from Indian shores. *Seaweed Res. Utilin.*, 25 (1&2): 1-12. | Untawale, A.G. and Dhargalkar, V. K. (1975): Seaweeds resources of the Goa coast. *Nat. Inst. Oceanography Reports*, pp: 1-10. | Qasim, S. Z. and Wafar, M. V. M. (1979): Occurrence of living corals at several places along the west coast of India. *Mahasagar*. 12 (1): 53-58. |