



## **A preliminary study on the marine macro algal flora of West Bengal coast, India**

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### **Abstract**

Marine ecosystems are one of the important components of biodiversity. The coastline of west Bengal is c. 220 km in length and spread into three coastal districts *i.e.* East Midnapore, South 24 Parganas and North 24 Parganas in the Bay of Bengal. It is endowed with Sundarban Biosphere Reserves, a globally known and UNESCO heritage site. The marine macro algae, also known as seaweeds, play an important role in marine food chain and sustainability of the marine ecosystems. The present paper deals with a preliminary study on the marine macro algal diversity in the West Bengal coast.

**Keywords:** West Bengal coast, Chlorophyceae, Rhodophyceae

### **Introduction**

Algae are the primitive and usually aquatic thallophytes and play a very significant role in the sustainability of the aquatic ecosystems by providing food and shelter to the marine fauna and maintaining the level of Dissolved Oxygen (DO) in the water bodies. Therefore, its proper taxonomic study and documentation are prerequisite for understanding its importance and also for effective conservation. The marine macro algae, also popularly known as *seaweeds*, are those algae which are adapted to survive exclusively in the marine and estuarine ecosystems. Usually it grows on rocks, pebbles, mollusc shells, coastal wastes like ropes, nets, and also as epiphytes on mangroves, seagrasses etc. in shallow, intertidal and sub-tidal zones and even in deep waters of sea, up to a depth of 150 m or up to a depth that can receive more than 0.12% of the incident light (Markager & Sand-Jensen, 1992). Seaweeds are classified into three types *i.e.* Chlorophyceae, Phaeophyceae and Rhodophyceae, based on the its photosynthetic pigments, colours, and reserve food materials.

Presently, c.72, 500 taxa of algae have been estimated globally, of which c. 45,000 taxa of algae have been reported till now (Guiry, 2012). Among these, seaweeds constitute c. 11,000 taxa, consisting of c. 7,200 taxa of Rhodophyceae, 2,000 taxa of Phaeophyceae and 1,800 taxa of Chlorophyceae (<http://www.seaweed.ie/>). India, being a peninsular country, has a coastline of c. 7500 km of length, which support wide diversity of coastal habitats, From India, 865 taxa of seaweeds, comprising 442 taxa of Rhodophyceae, 212 taxa of Chlorophyceae and 211 taxa of Phaeophyceae (Rao & Gupta, 2015).

The coastline of West Bengal is c. 220 km in length (Dept. of Environment, Govt. of West Bengal) and spread into 3 coastal districts *i.e.* East Midnapore, South 24 Parganas and North 24 Parganas in the Bay of Bengal. It is the only state in India which touches Himalayas in the north and Sea in the south. It is also gifted with the world renowned and UNESCO heritage Sundarban Biosphere Reserves. The coastline is interrupted by a number of major rivers namely Bhagirathi and Hoogli, Malta, Saptamukhi, Haribhanga and many other tributaries of the Ganges.

The coastline of West Bengal stretches from Digha coast in southern part to the Sundarban Islands in the Northern part in the Bay of Bengal.

The scrutiny of literature reveals that considerable works have been done on the taxonomy and other aspects of the marine macro algae of many maritime states of the Indian states. However, many parts of the coastline are explored very sporadically and intermittently. The algal diversity of the West Bengal coast has been reported by various researchers (Naskar & Santra, 1985; Santra & Pal, 1988; Pal & al., 1988; Chattopadhyay & al., 1995; Pal, 2000; Naskar & al., 2000; Mukhopadhyay & Pal, 2002; Sen & Naskar, 2003; Saptati & al., 2012; Sengupta & Pal, 2016; Yadav & Majumdar, 2020; Yadav & al., 2020). Satpati & al. (2012, 2013) reported the morphotaxonomic account of few algal taxa from the Sundarban Mangrove forest area. Sinha & al., (2016) reported a green alga *Enteromorpha compressa* from Bakkhali coast. Recently, Yadav & Majumdar (2020) reported 5 species of seaweeds from Digha coast. In the present study, authors have undertaken a preliminary study and tried to document the seaweed resources from the West Bengal coastline.

## Materials and Methods

The present taxonomic study is mainly based on the field exploration and study of the relevant literature on algal diversity of the study area (Figure 1). The field

exploration to the West Bengal coast was undertaken during the low tides in the month of January, 2020. The seaweed vegetation were observed in the field and samples were collected from various algal substrata like rocks, coastal wastes, and from various parts of the mangroves like pneumatophores, barks, branches (Figure 2). During the study, 12 coastal localities were explored. All the seaweed samples were collected with proper care and field observations such as habit, habitats, nature of the field and its GPS position (using GARMIN 12 channel XL), and vegetation patterns etc. were recorded and photographed using digital camera (Nikon COOLPIX L120). The collected samples were preserved following the standard procedure (Srinivasan, 1969; Dhargalkar & Kavlekar, 2004). The processed seaweed samples were examined carefully and identified following the field observation and standard references such as *Phycologia Indica: The Icons of Indian Seaweeds* (Srinivasan 1969, 1973); *Rhodophyta* (Desikachary & al., 1990, 1998); *Catalogue of the Benthic Marine Algae of the Indian Ocean* (Silva & al., 1996); Krishnamurthy, 2000; Kraft, 2007 and other online resources such as Algaebase, (<http://www.algaebase.org>), WoRMS (<http://www.marinespecies.org>) and Macroalgal Herbarium Portal (<http://macroalgae.org>) etc.

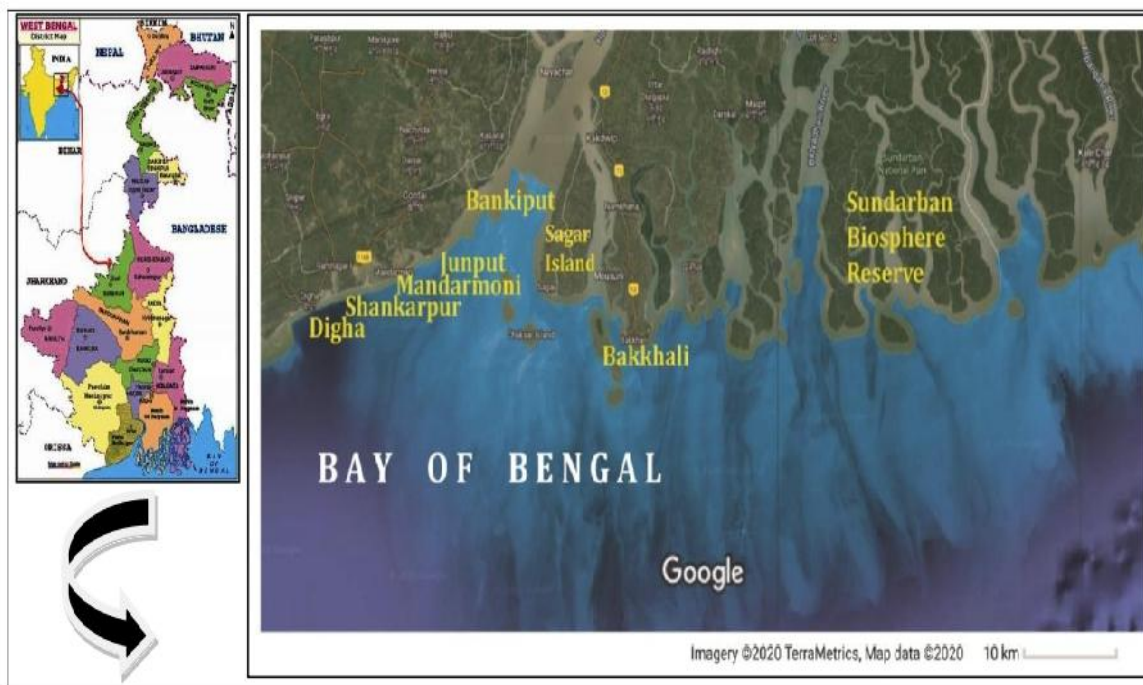


Fig. 1: Map showing West Bengal coastline in the Bay of Bengal

## Results and Discussion

During the present study, 12 coastal localities were surveyed and a total of 50 samples (field nos.) of seaweeds were collected (Table 1). The coastline of the state is mostly sandy, with limited distribution of natural scattered rocks and artificially laid stones along the coast. The mangroves in the Sundarban Biosphere Reserve act as excellent habitats for many seaweeds. Thus, seaweeds were found growing on varieties of substrata (Figure 2). The present study revealed nine species of seaweeds, comprising of seven species under Chlorophyceae (78 %) and two species under Rhodophyceae (22%) as shown in Table 2, Figure 3. The study also revealed that Sundarban

BR harbours the maximum diversity of seaweeds (Table 3, Figure 4). Because of the influx of several fresh water bodies in the Bay of Bengal, diversity and biomass of green seaweeds were observed more as compared to the red seaweeds. The study also revealed that due to the lack of abundance of rocky substrata, the diversity of seaweeds in West Bengal coast is less as compared to the southern maritime states. However, at places like Digha, Udaypur, Tajpur etc. the artificially laid stones were found supporting for algal growth. Therefore, with the passage of time and adaptations, these rocky substrata may boost the seaweed diversity along the coastal localities of the West Bengal.

**Table 1:** List of the places surveyed for collection of marine macro algae

Sl. No.	Place	GPS of collection site	Algal vegetation	No. of samples collected
1.	Jhorkhali	22° 01' 15.6" N & 88° 40' 292.6" E	-	-
2.	Dobanki camp area, Sundarban BR	21° 59' 33.5" N & 88° 45' 24.4" E	+	1
3.	Sundarban BR Island site 1	22° 00' 63.4" N & 88° 43' 88.2" E	+	4
4.	Sundarban BR Island site 2	22° 00' 63.4" N & 88° 43' 88.2" E	+	13
5.	Udaipur Coast	21° 36' 62.8" N & 87° 29' 00.1" E	+	1
6.	New Digha Coast	21° 37' 01.4" N & 87° 30' 13.4" E	+	4
7.	Old Digha Coast	21° 37' 33.5" N & 87° 31' 43.4" E	+	10
8.	Mohana coast	21° 38' 63.2" N & 87° 36' 69.4" E	+	5
9.	Tajpur Port coast	21° 38' 23.8" N & 87° 34' 80.0" E	+	6
10.	Shankarpur coast	21° 38' 14.3" N & 87° 34' 16.1" E	-	-
11.	Mandarmani coast	21° 38' 83.4" N & 87° 39' 20.5" E	+	4
12.	Junput coast	21° 43' 11.7" N & 87° 48' 94.3" E	+	2

+ *Present*; - *Absent*

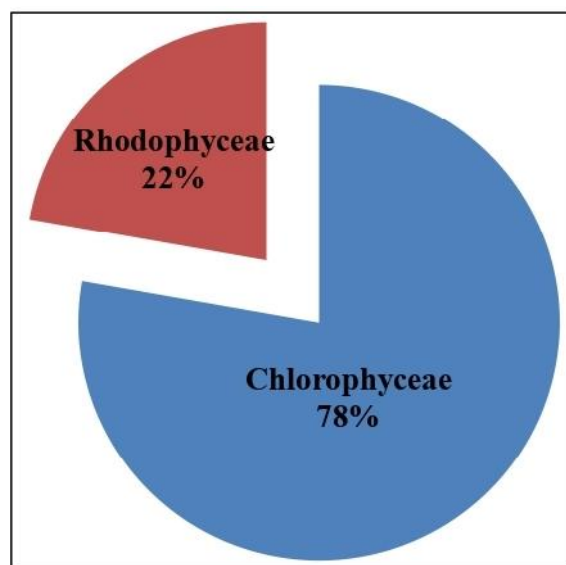


**Fig. 2:**A. Panoramic view of Sundarban Mangrove forest; B. Mangroves supporting as substrata for algal growth; C. Dominant growth of *Ulva* spp. on rocky substrata at Digha coast; D. *Ulva flexuosa* Wulfen (young stage) growing on waste nets at Mandarmoni coast; E. *Ulva compressa* L.; F. *Ulva flexuosa* Wulfen growing on coastal wastes ropes at Mohana coast.

**Table 2:** List of seaweeds taxa collected during the present study

Sl. No.	Name of the taxa	Family
<b>Class: Chlorophyceae</b>		
1.	<i>Ulva clathrata</i> (Roth) C. Agardh	Ulvaceae
2.	<i>Ulva compressa</i> L.	Ulvaceae
3.	<i>Ulva lactuca</i> L. [ <i>Ulva fasciata</i> Delile]	Ulvaceae
4.	<i>Ulva flexuosa</i> Wulfen	Ulvaceae
5.	<i>Ulva linza</i> L.	Ulvaceae
6.	<i>Ulva prolifera</i> O.F. Muell.	Ulvaceae
7.	<i>Chaetomorpha aerea</i> (Dillwyn) Kuetz. [ <i>Chaetomorpha crassa</i> (C. Agardh) Kuetz.]	Cladophoraceae
<b>Class: Rhodophyceae</b>		
8.	<i>Catenella caespitosa</i> (With.) L. Irvine [ <i>Catenella repens</i> (Lightf.) Batt.]	Caulacanthaceae
9.	<i>Catenella nipae</i> Zanardini	Caulacanthaceae

[ ] synonym



**Fig. 3:** Pie chart showing diversity of seaweeds during the present study

**Table 3:** Distribution of seaweeds at different collection sites during the present study

Sl. No.	Name of the taxa	1	2	3	4	5	6	7
1.	<i>Ulva clathrata</i> (Roth) C. Agardh	+	-	-	-	-	-	-
2.	<i>Ulva compressa</i> L.	+	-	+	+	+	+	+
3.	<i>Ulva lactuca</i> L.	+	-	-	-	-	-	-
4.	<i>Ulva flexuosa</i> Wulfen	+	-	+	+	+	+	+
5.	<i>Ulva linza</i> L.	-	-	+	+	+	-	-
6.	<i>Ulva prolifera</i> O.F. Muell.	+	+	+	+	-	-	-
7.	<i>Chaetomorpha aerea</i> (Dillwyn) Kuetz.	+	-	+	+	+	+	-
8.	<i>Catenella caespitosa</i> (With.) L. Irvine	+	-	-	-	-	-	-
9.	<i>Catenella nipae</i> Zanardini	+	-	-	-	-	-	-

[1. Sundarban BR; 2. Udaipur; 3. Digha; 4. Mohana; 5. Tajpur; 6. Mandarmani; 7. Junput; + Present; - Absent]

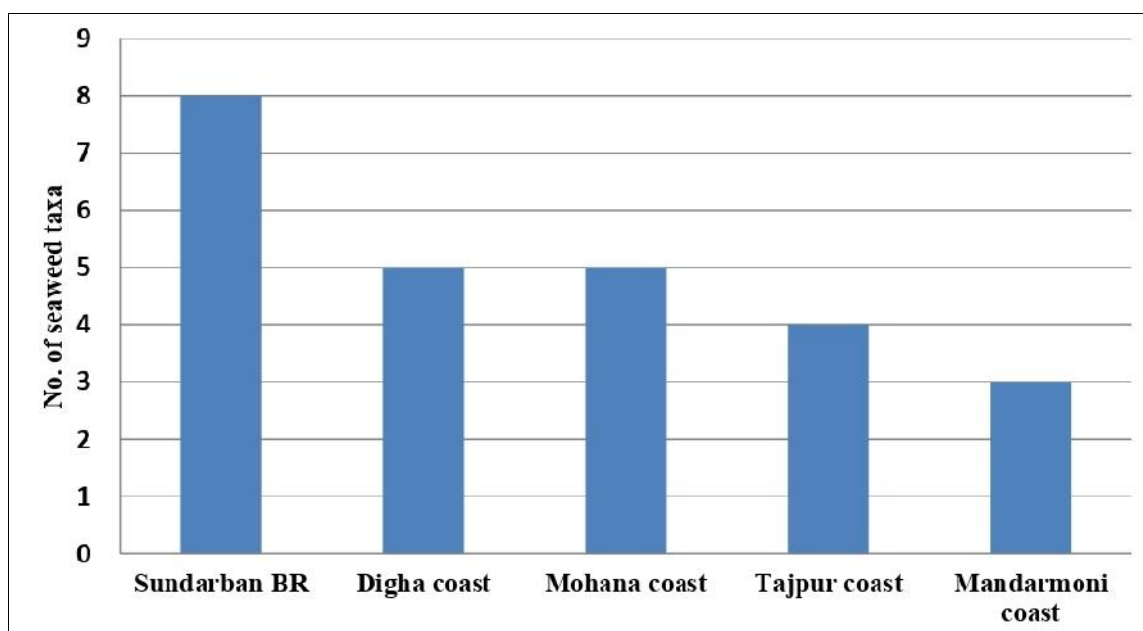


Fig. 4: Graph showing localities with dominant seaweed vegetation in West Bengal coast

## Conclusion

Seaweeds are one of the integral components of the marine biodiversity. The growth and diversity of seaweeds depends on the many factors like availability of suitable substrata, coastal topography, salinity etc. In the present preliminary study, 9 species of seaweeds have been recorded. However, with more explorations and further research, the diversity of seaweeds is supposed to increase.

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**Online web portals:**

Algaebase, (<http://www.algaebase.org>),  
 Macroalgal Herbarium Portal (<http://macroalgae.org>).  
 Sundarban Biosphere Reserves web page  
[http://www.sundarbanbiosphere.org/html\\_files/sunderban\\_biosphere\\_reserve.htm](http://www.sundarbanbiosphere.org/html_files/sunderban_biosphere_reserve.htm)  
 WoRMS (<http://www.marinespecies.org>)

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