

# *Phytoplankton* Diversity in the World Heritage Site of Indian Sundarbans: An Overview



**Atanu Roy<sup>1</sup>, Subrata Trivedi<sup>2</sup> and Abhijit Mitra<sup>3\*</sup>**

<sup>1</sup>Department of Biotechnology, Techno India University West Bengal, India

<sup>2</sup>Department of Biology, University of Tabuk, Saudi Arabia

<sup>3</sup>Department of Marine Science, University of Calcutta, India

\*Corresponding author: Abhijit Mitra, Department of Marine Science, University of Calcutta, India

Submission:  October 25, 2017; Published:  January 16, 2018

## *Phytoplankton* of Brackish Water System: An Overview

The pelagic environment of the ocean supports two basic types of marine organisms. One type comprises the plankton, or those organisms whose powers of locomotion are such that they are incapable of making their way against the current and thus are passively transported by currents in the aquatic system and the other type includes the nekton (free swimmers), which are free-floating animals that, in contrast to plankton, are strong enough to swim against currents and are therefore independent of water movements. The category of nekton includes fish, squid and marine mammals.

The word plankton has come from the Greek word “planktos”, meaning that which is passively drifting or wandering. Depending upon whether a planktonic organism is a plant or animal, a distinction is made between *phytoplankton* and *zooplankton*. Although many planktonic species are of microscopic dimensions, the term is not synonymous with small size as some of the *zooplankton* includes jellyfish of several meters in diameter. It is not necessary that all plankton are completely passive, most of them are capable of swimming too. *Phytoplanktons* are free floating tiny floral components that are widely distributed in the marine and estuarine environments. Like land plants, these tiny producers require sunlight, nutrients or fertilizers, carbon dioxide gas and water for growth. The cells of these organisms contain the pigment chlorophyll that traps the solar energy for use in photosynthesis. The photosynthetic process uses the solar radiation to convert carbon dioxide and water into sugars or high energy organic compounds from which the cell forms new materials. The synthesis of organic material by photosynthesis is termed primary production. Since *phytoplankton* is the dominant producers in the ocean, their role in the marine food chain is of paramount importance. Approximately, 4000 species of marine *phytoplankton* have been described and new species are continually being added to this total. *Phytoplankton* exhibit remarkable adaptations to remain in floating condition in the seawater. In fact, all marine *phytoplankton* tend to stay in the photic zone to utilize the solar radiation for performing the process of photosynthesis.

In order to retard the process of sinking, this group of organisms adopts various mechanisms. These include their small size and general morphology, as the ratio of cell surface area to volume determines frictional drag in the water. Colony or chain formation also increases surface area and slows sinking. Most species carry out ionic regulation, in which the internal concentration of ions is reduced relative to their concentration in seawater. Diatoms also produce and store oil and this metabolic by-product further reduce cell density. In experimental conditions, living cells tend to sink at rates ranging from 0 to 30m day<sup>-1</sup>, but dead cells may sink more than twice as fast. In nature, turbulence of surface waters is also an important factor in maintaining *phytoplankton* near the surface where they receive abundant sunlight.

*Phytoplanktons* present in the marine and estuarine environments use carbon dioxide for photosynthesis and hence play an important role in maintaining the carbon dioxide budget of the atmosphere. The larger the world's *phytoplankton* population, the more carbon dioxide gets pulled from the atmosphere. This lowers the average temperature of the atmosphere due to lower volumes of this greenhouse gas. Scientists have found that a given population of *phytoplankton* can double its numbers in the order of once per day. In other words, *phytoplankton* responds very rapidly to changes in their environment. *Phytoplankton* sometimes may cause adverse impact on the marine and estuarine environment. During excessive bloom of *phytoplankton*, the light energy is intercepted, which could otherwise reach fixed plants like eel grass (*Zostera* spp.) and kelp. Furthermore, when the *phytoplankton* eventually die back and break down, an excessive amount of oxygen is required to fuel this process, and hence areas may become deprived of oxygen. Excessive nutrients, and/or changes in their relative concentrations, may be one factor in a chain of events leading to changes in the species composition of the *phytoplankton* communities. Increased occurrence of toxic algal blooms may accelerate toxin production. Toxic *phytoplankton*, when consumed by shellfish or other species can affect the marine food chain, including poisoning of seabirds, mammals and even

humans. It has been established that *phytoplankton* naturally contains DMS (dimethyl sulphide), which is released from dead *phytoplankton* into the atmosphere. This compound can transform into sulphuric acid, which eventually may contribute to acid rain (<http://oceanlink.island.net/ask/pollution.html>).

### Brackish Water *Phytoplankton*: Major Types

Nearly all marine plants, whether unicellular or multicellular, even those attached to substrata (sessile) or free floating, pass some part of their life cycle in floating condition as *phytoplankton*. However, those organisms which always remain planktonic throughout the life cycle are

- Diatoms,
- Dinoflagellates,
- Coccolithophores,
- Selective species of blue-green algae and
- Some species of green algae.

### Diatoms

These floating plants are all microscopic in size and are characterised by the presence of shell or frustule. The shell or frustule is composed of translucent silica. The cell wall of diatom has two parts resembling a pillbox bottom and lid. The lid is called the epitheca and the bottom is known as hypotheca. These shells have great importance from the geological point of view and constitute the diatomaceous crust. The diatoms exhibit remarkable varieties and forms and many species possess beautifully sculptured shells. Depending on the nature of valves and pattern of ornamentation in the valve surface, the diatoms are grouped into centric and pennate diatoms. The major differences between these two groups are given in Table 1.

**Table 1:** Differences between centric and pennate diatoms.

Point	Centric Diatom	Pennate Diatom
Cell shape	Discoid, solenoid or cylindrical.	Elongated and fusiform, oval, sigmoid or roughly circular.
Ornamentation	Radial in nature i.e., the arrangement of markings is radiating from the centre.	Bilateral in nature i.e., the arrangement of the markings is on either side of the apical (main) axis.

**Table 2:** List of diatoms identified from the inshore waters of Bay of Bengal.

Sl. No.	Species	Taxonomic Position
1	<i>Coscinodiscus eccentricus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Cosinodiscineae
		Family: Cosinodisceae
		Genus: <i>Cosinodiscus</i>
		Species: <i>eccentricus</i>

### Dinoflagellates

These are important producers of the marine environment and rank second in importance in the economy of the sea. Typically, these are unicellular, some are naked while others are armoured with plates of cellulose. The dinoflagellates possess two flagella for locomotion. Several of them are luminescent and produce light. *Skeletonema costatum* and *Coscinodiscus eccentricus* are common dinoflagellates in marine and estuarine system.

### Coccolithophores

These are among the smallest category of *phytoplankton* having a size range between 5 to 20 microns. Some coccolithophores have flagella while others are devoid of them. Their soft bodies are shielded by tiny, calcified circular plates or shields of various designs. These are normally found in the open sea, but their profuse occurrence has been recorded in coastal waters. They form important diet components of filter feeding animals. Examples are *Isochrysis galbana* and *Coccolithus* sp.

### Blue-Green Algae

These include both unicellular and multicellular organisms. The blue colour in them is due to the presence of a pigment known as phycocyanin. Of the various organisms belonging to this category, the most important is *Trichodesmium erythraeum* because in certain seasons of the year its biomass increases greatly resulting in the formation of clumps.

### Green Algae

Microscopic green algae present in the planktonic community largely occur in coastal waters. The green colour in them is due to the presence of chloroplasts. They are widely distributed in the warmer (tropical) seas and only few species are found in the Arctic and Antarctic oceans. *Chlorella marina* and *Chlorella salina* are common green algae in estuarine waters.

### *Phytoplankton* Spectrum of Indian Sundarbans

A field study was undertaken during September, 2017 in the Thakuran River to scan the *phytoplankton* spectrum in the aquatic phase. A total of 73 species was identified (Table 2) in a salinity range between 12psu to 18psu. The relatively low salinity compared to average salinity in this region during summer (~29psu) is due to precipitation and subsequent run-off from the adjacent land masses, which is a characteristics feature of the lower Gangetic delta complex [1,2].



2	<i>Coscinodiscus jonesianus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>jonesianus</i>
3	<i>Coscinodiscus lineatus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>lineatus</i>
4	<i>Coscinodiscus radiates</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>radiates</i>
5	<i>Coscinodiscus gigas</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>gigas</i>
6	<i>Coscinodiscus oculus-iridis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>oculus-iridis</i>
7	<i>Coscinodiscus concinnus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>concinnus</i>



8	<i>Coscinodiscus perforates</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>perforates</i>
9	<i>Coscinodiscus asteromphalus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>asteromphalus</i>
10	<i>Coscinodiscus thorii</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>thorii</i>
11	<i>Coscinodiscus granii</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Sub-order: Coscinodiscineae
		Family: Coscinodisceae
		Genus: <i>Coscinodiscus</i>
		Species: <i>granii</i>
12	<i>Cyclotella sp</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Coscinodisceae
		Type: <i>Cyclotella sp</i>
13	<i>Cyclotella striata</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Coscinodisceae
		Genus: <i>Cyclotella</i>
		Species: <i>striata</i>
14	<i>Cyclotella stylorum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Coscinodisceae
		Genus: <i>Cyclotella</i>
		Species: <i>stylorum</i>



15	<i>Thalassiosira subtilis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Thalassiosira</i>
		Species: <i>subtilis</i>
16	<i>Thalassiosira sp.</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Type: <i>Thalassiosira sp.</i>
17	<i>Thalassiosira decipiens</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Thalassiosira</i>
		Species: <i>decipiens</i>
18	<i>Thalassiosira punctigera</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Thalassiosira</i>
		Species: <i>punctigera</i>
19	<i>Thalassiosira hyaline</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Thalassiosira</i>
		Species: <i>hyaline</i>
20	<i>Thalassiosira eccentric</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Thalassiosira</i>
		Species: <i>eccentric</i>
21	<i>Skeletonema costatum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Skeletonema</i>
		Species: <i>costatum</i>
22	<i>Paralia sulcata</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Paralia</i>
		Species: <i>sulcata</i>



23	<i>Planktoniella sol</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Planktoniella</i>
		Species: <i>sol</i>
24	<i>Planktoniella blanda</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Cosinodisceae
		Genus: <i>Planktoniella</i>
		Species: <i>blanda</i>
25	<i>Rhizosolenia setigera</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>setigera</i>
26	<i>Rhizosolenia alata</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>alata</i>
27	<i>Rhizosolenia hebetata</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>hebetata</i>
28	<i>Rhizosolenia styliformis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>styliformis</i>
29	<i>Rhizosolenia robusta</i>	Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>robusta</i>
		Division: Thallophyta
30	<i>Rhizosolenia stolterfothii</i>	Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>stolterfothii</i>
		Division: Thallophyta



31	<i>Rhizosolenia cylindrus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>cylindrus</i>
32	<i>Rhizosolenia shrubsolei</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>shrubsolei</i>
33	<i>Rhizosolenia imbricata</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Rhizosolenia</i>
		Species: <i>imbricata</i>
34		Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Soleniae
		Genus: <i>Lauderia</i>
		Species: <i>annulata</i>
35	<i>Bacteriastrum sp.</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Type: <i>Bacteriastrum sp.</i>
36	<i>Bacteriastrum delicatulum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Bacteriastrum</i>
		Species: <i>delicatulum</i>
37	<i>Bacteriastrum varians</i>	Division: Thallophyta
		Class: <i>Bacillariophyceae</i>
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Bacteriastrum</i>
		Species: <i>varians</i>

38	<i>Bacteriastrum comosum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Bacteriastrum</i>
		Species: <i>comosum</i>
39	<i>Bacteriastrum hyalinum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Bacteriastrum</i>
		Species: <i>hyalinum</i>
40	<i>Chaetoceros dydymus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Chaetoceros</i>
		Species: <i>dydymus</i>
41	<i>Chaetoceros curvisetus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Chaetoceros</i>
		Species: <i>curvisetus</i>
42	<i>Chaetoceros diversus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Chaetoceros</i>
		Species: <i>diversus</i>
43	<i>Chaetoceros messanensis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Chaetoceros</i>
		Species: <i>messanensis</i>
44	<i>Chaetoceros peruvianus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocereae
		Genus: <i>Chaetoceros</i>
		Species: <i>peruvianus</i>





45	<i>Chaetoceros eibonii</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>eibonii</i>
46	<i>Chaetoceros lorenzianus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>lorenzianus</i>
47	<i>Chaetoceros compressus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>compressus</i>
48	<i>Chaetoceros decipiens</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>decipiens</i>
49	<i>Chaetoceros atlanticus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>atlanticus</i>
50	<i>Chaetoceros subtilis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>subtilis</i>
51	<i>Chaetoceros convolutus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>convolutus</i>

52	<i>Chaetoceros holsaticum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>holsaticum</i>
53	<i>Chaetoceros gracile</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>gracile</i>
54	<i>Chaetoceros cinctum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>cinctum</i>
55	<i>Chaetoceros affinis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>affinis</i>
56	<i>Chaetoceros danicus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>danicus</i>
57	<i>Chaetoceros constrictus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Chaetocerae
		Genus: <i>Chaetoceros</i>
		Species: <i>constrictus</i>
58	<i>Ditylum sol</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiese
		Genus: <i>Ditylum</i>
		Species: <i>sol</i>



59	<i>Ditylum brightwelli</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Ditylum</i>
		Species: <i>brightwelli</i>
60	<i>Lithodesmium undulatum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Lithodesmium</i>
		Species: <i>undulatum</i>
61	<i>Triceratium favus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Triceratium</i>
		Species: <i>favus</i>
62	<i>Triceratium reticulatum</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Triceratium</i>
		Species: <i>reticulatum</i>
63	<i>Triceratium sp.</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Type: <i>Triceratium sp.</i>
64	<i>Biddulphia sinensis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Biddulphia</i>
		Species: <i>sinensis</i>
65	<i>Biddulphia mobiliensis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Biddulphia</i>
		Species: <i>mobiliensis</i>
66	<i>Biddulphia regia</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Genus: <i>Biddulphia</i>
		Species: <i>regia</i>

67	<i>Eucampia zodiacus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Biddulphiaceae
		Species: <i>zodiacus</i>
68	<i>Hemidiscus cuneiformis</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Centrales
		Family: Euodidae
		Species: <i>cuneiformis</i>
69	<i>Climacosphenia elongata</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Pennales
		Family: Fragilarioideae
		Species: <i>elongata</i>
70	<i>Fragilaria oceanica</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Pennales
		Family: Fragilarioideae
		Species: <i>oceanica</i>
71	<i>Rhaphoneis amphicerus</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Pennales
		Family: Fragilarioideae
		Species: <i>amphicerus</i>
72	<i>Thalassionema nitzchioides</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Pennales
		Family: Fragilarioideae
		Species: <i>nitzchioides</i>
73	<i>Thalassionema sp.</i>	Division: Thallophyta
		Class: Bacillariophyceae
		Order: Pennales
		Family: Fragilarioideae
		Type: <i>Thalassionema sp.</i>

## References

- Mitra A, Zaman S (2014) Carbon Sequestration by Coastal Floral Community. In: Mitra A, Zaman S (Eds.), Carbon Sequestration by Coastal Floral Community. Published by The Energy and Resources Institute (TERI) TERI Press, India.
- Mitra A, Zaman S (2015) Blue Carbon Reservoir of the Blue Planet. In: Mitra A, Zaman S (Eds.), Published by Springer, India.