

Studies on Phytoplankton Diversity in the Estuarine Water of Bhayander and Naigaon, Thane, Maharashtra, India



Zoology

KEYWORDS : Phytoplankton, Cyclotella, Ditylum, Gyrosigma, Navicula.

Dr. Devdatta Lad

Department of Zoology Wilson College Chowpatty, Mumbai - 400 007

Dr. Shashikant Patil

Department of Zoology Mithibai College of Arts, Chauhan Institute of Science, & Amrutben Jivanlal College of Commerce and Economics. Vile Parle (West), Mumbai 400 056

ABSTRACT

The Phytoplankton has great significance in the biology of the estuary as they provide the principal source of primary nourishment. The Phytoplankton constitute 95% of the total marine production, so they form a vital source of energy of the first tropical tier and also serve as a direct source of food to several aquatic animals. They form an important link between the abiotic factors and the biota in the aquatic ecosystem. The present study revealed the species diversity of phytoplankton in the estuarine waters along the area of Bhayander and Naigaon during May 2008 to June 2009. A Total of 42 species of Phytoplankton belonging to 5 families were recorded at Station No. 1 Bhayander and Station No. 2 Naigaon. The family Bacillariophyceae being the dominant of all the families with 26 species alone belonging to it out of 42 species, followed by Dinophyceae and Cyanophyceae having 7 and 5 species respectively. The dominant genera in the estuarine area of Bhayander and Naigaon were Coscinodiscus, Navicula, Thalassiosira and Thalassiothrix.

INTRODUCTION

Estuaries are tidally influenced ecological systems where rivers meet the sea and freshwater mixes with seawater. Estuaries also form crucial transition zones between land and water that provide unique biological and geological functions like, they provide habitat to varieties of micro and macro organisms; nurseries to many marine organisms including commercially valuable fish species; filtration of nutrition and sediments from upland, flood control, etc. (Sreedharan T. P. 2002).

Inshore waters of Mumbai and region around, particularly Versova creek, Mahim creek, Ulhas estuary, Thane creek and Patalganga estuary are the examples of highly degraded environment because of anthropogenic perturbations. Several other inshore waters also reveal varying degrees of ecological deterioration and have drastically reduced the population of plankton and fishes. It has also caused considerable ecological imbalance and resulted in large-scale disappearance of their flora and fauna. Further, introduction of untreated municipal waste-water and industrial effluents into these water bodies leads to serious water pollution including heavy metal pollution, which gets biomagnified and reaches man through food-chain implications. (S. Baskara Sanjeevi et. al. 2004)

The Phytoplankton has great significance in the biology of the estuary as they provide the principal source of primary nourishment. The Phytoplankton constitute 95% of the total marine production, so they form a vital source of energy of the first tropical tier and also serve as a direct source of food to several aquatic animals. They form an important link between the abiotic factors and the biota in the aquatic ecosystem. (Saha et. al. 2000) In India, studies on marine Phytoplankton systematics, species composition, distribution and productivity in relation to environmental parameters were carried out by Gopinathan in 1975 from both the east and west coast.

Due to encroachments of human beings in the marine and estuarine regions, for various purposes, the biodiversity in certain areas is disturbed and under the threat of destruction. (Kathiresan, 2002) Several phytoplankton species have served as bioindicators and it is a well suited tool for understanding water pollution studies. If the phytoplankton population of the estuarine ecosystem is harmed because of any anthropogenic activity then directly the zooplankton population of the same estuarine ecosystem will also be at risk because the phytoplankton are a source of food for the zooplankton. (Ritakumari S. D. et. al., 2007) Phytoplankton of coastal water bodies have been studied by various workers like Santhanam et. al. (1975), Mani (1992), De et. al. (1994), Ramaiah

and Ramaiah (1998), Nassar, M. Z. and Hameed, M. A. (2003).

The present study revealed the species diversity of phytoplankton in the estuarine waters of Bhayander and Naigaon.

MATERIAL AND METHODS

Phytoplanktons were collected every month from both stations during high tide. A sample volume of 500 ml was collected using a wide mouth container from depth of 0.3 m from the surface. For immediate fixation, Lugol's iodine solution was used in the field and later 4 % formaldehyde was added for long term preservation and species diversity of phytoplankton was studied in the laboratory. (Krishna Pillai N., 1986)

Study Area

The present study was carried out at two stations Bhayander and Naigaon respectively.

Station 1: The first station at Bhayander is located 19° 19' N and 72° 51' E. (Google Earth 2008) The Bhayander is geographically surrounded by sea from the West side, by the estuary from the north side and by open and occupied land from the south and east side. The estuarine water is mainly from the buffering of Ulhas River with the Arabian sea which amalgamates its water in the Thane creek and Vasai creek.

Station 2: The second station Naigaon is located 19° 20' N and 72° 51' E. (Google Earth 2008) Naigaon is a small town in the Thane District of the Maharashtra state and situated diagonally opposite to Bhayander on the another side of the estuary. The approximate distance between Bhayander and Naigaon is about 5 Km.

RESULT AND DISCUSSION

Name of the Species	Status at Station No. 1 Bhayander	Status at Station No. 2 Naigaon
Bacillariophyceae (Diatoms)		
1) <i>Asterionella glacialis</i>	++	++
2) <i>Bacillaria paradoxa</i>	++	++
3) <i>Odontella sinensis</i>	++	+++
4) <i>Odontella mobiliensis</i>	+	+
5) <i>Odontella reticulum</i>	+	+
6) <i>Chaetoceros affinis</i>	+	+
7) <i>Chaetoceros curvisetus</i>	+	+
8) <i>Chaetoceros coarctatus</i>	+	+
9) <i>Coscinodiscus centralis</i>	+++	+++
10) <i>Coscinodiscus gigas</i>	+++	+++
11) <i>Coscinodiscus radiatus</i>	+++	+++

12) <i>Cyclotella striata</i>	++	+
13) <i>Ditylum brightwellii</i>	++	++
14) <i>Gyrosigma balticum</i>	++	+++
15) <i>Navicula henneydii</i>	+++	+++
16) <i>Netrium digitus</i>	+	+
17) <i>Planktoniella sol</i>	+	++
18) <i>Pleurosigma angulatum</i>	+	+
19) <i>Pleurosigma elongatum</i>	+	+
20) <i>Pleurosigma normanii</i>	+	+
21) <i>Rhizosolenia robusta</i>	++	+
22) <i>Rhizosolenia cylindrus</i>	+	+
23) <i>Skeletonema costatum</i>	++	+
24) <i>Thalassiosira subtilis</i>	+++	+++
Name of the Species	Status at Station No. 1 Bhayander	Status at Station No. 2 Naigaon
25) <i>Thalassiothrix frauenfeldii</i>	+++	+++
26) <i>Triceratium favus</i>	++	++
Dinophyceae (Dinoflagellates)		
27) <i>Amphisolenia bidentata</i>	++	++
28) <i>Ceratium furca</i>	++	+
29) <i>Ceratium fusus</i>	+	+
30) <i>Ceratium macroceros</i>	+	+
31) <i>Dinophysis caudata</i>	+	+
32) <i>Noctiluca scintillans</i>	+	++
33) <i>Pyrophacus steinii</i>	+	++
Cyanophyceae (Blue green algae)		
34) <i>Anabena sp.</i>	++	+
35) <i>Microcystis sp.</i>	++	+
36) <i>Nostac sp.</i>	++	+
37) <i>Oscillatoria sp.</i>	++	+
38) <i>Spirulina major</i>	+	+
Chlorophyceae (Green algae)		
39) <i>Chlorella sp.</i>	+	+
40) <i>Spirogyra sp.</i>	++	++
41) <i>Volvox sp.</i>	++	++
Chrysophyceae (Silicoflagellate)		
42) <i>Dictyocha sp.</i>	+	+

+++ Abundant, ++ Moderate, + Rare.

Table 1: Species composition and distribution of Phytoplankton in the estuarine water of Bhayander and Naigaon.

A Total of 42 Phytoplankton species belonging to 5 families 1) Bacillariophyceae, 2) Dinophyceae, 3) Cyanophyceae, 4) Chlorophyceae and 5) Chrysophyceae (Table 1) were recorded at Station No. 1 Bhayander and Station No. 2 Naigaon. Similar kind of work is been carried out by Kulkarni et. al. (2005). They have reported 45 phytoplankton species at Bhatye estuary, Ratnagiri, Maharashtra, including Bacillariophyceae, Cyanophyceae and Xanthophyceae. The dominant genera reported by them were *Coscinodiscus* species, *Thalassiosira* species, *Navicula* species and *Rhizosolenia* species. The present study results are coinciding with them. The family Bacillariophyceae being the dominant of all the families with 26 species followed by Dinophyceae and Cyanophyceae having 7 and 5 species respectively. Genus like *Coscinodiscus*, *Navicula*, *Thalassiosira* and *Thalassiothrix* were found abundantly at both the stations Bhayander and Naigaon, whereas genus *Asterionella*, *Bacillaria*, *Ditylum*, *Triceratium*, *Amphisolenia*, *Spirogyra* and *Volvox* were found to be moderate. The rare genus at both the stations were *Odontella*, *Chaetoceros*, *Netrium*, *Pleurosigma*, *Rhizosolenia*, *Ceratium*, *Dinophysis*, *Spirulina*, *Chlorella* and *Dictyocha*. Thus it can be concluded that estuarine water of Bhayander and Naigaon sustains fairly abundant phytoplankton community with relatively higher diversity.

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