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Original Research Article

Marine Fouling Diatoms Identified in the Vellar Estuary of Porto Nova, Cuddalore District, Tamil Nadu, India

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Abstract: Marine fouling is an undesirable deposition of abiotic and biotic materials on manmade engineering structures in the marine environment especially contact with sea water. All forms of fouling are detrimental to the marine structures. After molecular fouling habitually the biofouling starts with microfoulers such as bacteria, micro algae, etc., then macro foulers such as algae, plants, mollusk, barnacles, etc will be followed. This study reports the diversity of diatoms involving in the fouling processes in the Vellar estuary of Parangipettai, south east coast of Indian subcontinent using different test panels. Seven species of diatoms such as *Skeletonema costatum, Triceratium reticulatum, Rhizosolenia setigera, Pleurosigma elongatum, Nitzschia longissima, Thalassione manitzschioides, and Thalassiothrix frauenfeldii* were recorded during this study.
Keywords: Biofouling, Vellar estuary, Porto Nova, Microfouler, Diatoms.

INTRODUCTION

Marine fouling is an undesirable deposit of abiotic and biotic materials on natural and artificial substrates in the marine environment especially contact with sea water [1, 2]. The attachment of abiotic materials such as organic and inorganic molecules on immersed surfaces called molecular fouling [3] the attachments of biotic materials are called biofouling [4]. All form of accumulations is most deleterious to marine industries and causes massive structural and economic losses [5-7].

There are more than 250 genera of existing diatoms with possibly 2,00,000 species ranging across three orders of magnitude in the size of 5 µm to 2mm. This rich diversity shows the ability of their adaptation to various environmental conditions. They may be either as free floating or sessile communities [8]. The sessile diatoms are playing vital role in the ecology of fouling communities [9]. However, there were very few work only found on this aspects. Hence, this current study an attempt was made to identify the diatoms which fouled on the test panels of the study area of Vellar estuary.

MATERIALS AND METHODS

Study area

The study area Vellar estuary is located exactly in the Lat. 11º 29' N; 79º 49' E at Parangipettai, south east coast of Indian subcontinent. The origin of Vellar river on Shervarayan Hills from Salem and travels about 480 kms distance and finally drains into Bay of Bengal at Parangipettai thus forming the Vellar estuary. The average depth of this estuary is 2.5m and the maximum depth noticed during spring tide is 3.75m. The tidal amplitude is about one meter and its influence extends to a distance of 14km up to Bhuvanagiri. The maximum width of the estuary on its mouth is 200m. The Vellar estuary is divided into Marine zone, Gradient zone, Tidal zone, and fresh water zone. The location of present study zone gradiently falls opposite to CAS in Marine Biology institution (Faculty of Marine Sciences) of Annamalai University which is 1.6 km upstream from the mouth of estuary. It is one of the important fish landing centers of this district.

Construction, processing and Deployment of panels

Triplicates of the pieces (10 X 15 X 1.5 cm) of *T. paniculata* were procured from Pandian Depot, Tindivanam and aluminum pieces (15 X 20 X 1.5 cm) were procured from Dock Engineers OT, Cuddalore, Tamil Nadu. The pieces were fixed firmly with nylon rope of about 10 m and used them as a test panel. Both the panels were sterilized by 10% HC1, rinsed through with distilled water, dried in hot air oven at 40ºC for 24hrs and kept in a dry place. Triplicates of the freshly processed panels were immersed about 1 meter depth in surface waters (~l m) of the Vellar Estuary at low tide mark.

Isolation of diatoms

The diatom samples were also collected from the experimental panels on 5th and 7th days of experiment with sterile swabs and then the samples were stored in 5% formalin solution. The isolated diatoms from the panels were identified using the keys given by Sournia [10].

RESULT

In the present study an attempt was made to find out the diversity of diatoms fouled on all the four experimental panels during seven days of immersion period. The diatoms recorded during the course of experiment were grouped. The overall results indicated a heterogeneous occurrence of diatom on the experimental panel. Seven species of diatoms such as *Skeletonema costatum, Triceratium reticulatum, Rhizosolenia setigera, Pleurosigma elongatum, Nitzschia longissima, Thalassione manitzschioides, and Thalassiothrix frauenfeldii* were identified in both the wooden and aluminum panels.

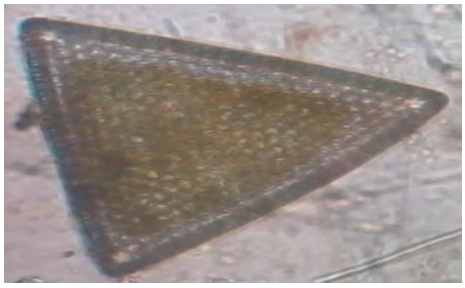

Fig-1: *Skeletonema costatum*

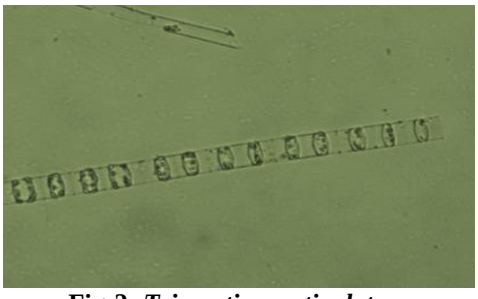

Fig-2: *Triceratium reticulatum*

Fig-3: *Rhizosolenia setigera*

Fig-4: *Pleurosigma elongatum*

Fig-5: *Nitzschia longissima*

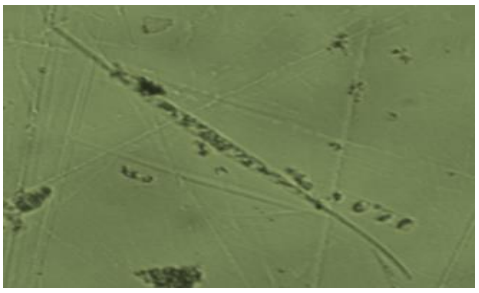

Fig-6: *Thalassione manitzschioides*

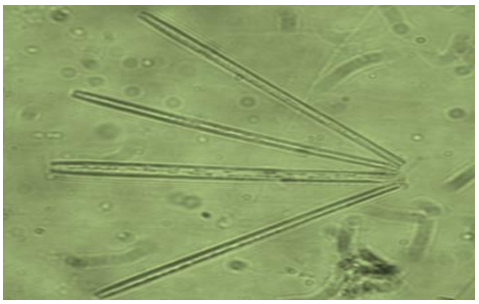

Fig-7:*Thalassiothrix frauenfeldii*

DISCUSSION

Any surfaces immersed in marine environment were rapidly covered by various nonliving and living molecules forming a layer. The initial coats were generally abiotics and the bacteria as well as micro algae. Bacteria and Diatoms secrete diversified structural components called exopolymeric substances (EPS) in which cells are embedded during biofilm development [11-15]. Diatoms were the eukaryotic colonizer during this process [16]**.** These micro algal communities play a vital role in the development of the subsequent macrofouling community [17-20]. In marine industry, biofilms can have a detrimental impact

on account of the undesirable effect of corrosion promoted by microbial cell accumulation at interfaces [21]. However, there were only few studies only have focused on the fouling diatoms in the oceanic system [22-24].

In this study a preliminary step was taken to record the diversity of initial fouling diatom communities for a short duration of seven days in the Vellar estuary, Parangipettai, Southeast coast of India using wooden panels of *Terminalia paniculata* a chiefly used material for the marine vessel constructions and aluminum panels. The result showed that there were *Skeletonema costatum, Triceratium reticulatum, Rhizosolenia setigera, Pleurosigma elongatum, Nitzschia longissima, Thalassione nitzschioides, and Thalassiothrix frauenfeldii* initially formed on these panels. Exopolymeric secretions and sessile properties were well established in the *S. costatum, T. reticulatum, R. setigera, P. elongatum, N. longissima, T. nitzschioides, and T. frauenfeldii* and confirmed their sessile nature [25-30].

CONCLUSION

This current study further concludes that the fouling diatoms's identified at Vellar estuary needed to be studied their ecological role and impact on the fouling processes to establish the control of economic losses owing to biofouling crisis successfully and use them beneficially for mankind.

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