Short Communications

Natural phytoplankton communities in Pichavaram mangroves

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Phytoplankton community structure characteristics such as species composition, diversity, richness, evenness and dominance index were studied for 2 years in the Pichavaram mangroves. Pennate species such as Nitzschia closterium, Pleurosigma spp., Thalassionema nitzschioides and Thalassiothrix frauenfeldii dominated the population. Diversity, richness and evenness experienced decreasing trend from outer-edge of mangroves towards interior, while dominance index showed opposite trend.

Investigations on organisational structure of natural phytoplankton community are of much importance to understand stability, development, trophic status, productivity, etc. Such studies are few in the mangrove environment. The present study deals with species composition and structural characteristics of phytoplankton of Pichavaram mangroves, located near Portonovo, SE coast of India.

Three stations were selected in the Pichavaram mangroves (Fig. 1). During high tide phytoplankton samples were collected with net (no. 25 bolting cloth, mesh size 64 μm) for qualitative analysis. For quantitative study 1 litre surface water samples were collected in polyethylene bottles and immediately fixed with Lugol’s solution. The bottles were kept undisturbed for 2 to 3 days till complete sedimentation achieved. Plankton settled on the bottom of the bottles were used for numerical counts. Species diversity, richness, evenness and dominance index were calculated.

Ninety-four species of phytoplankton were identified, comprising of Bacillariophyceae (73), Dinophyceae (15), Cyanophyceae (3), Chlorophyceae (2) and Chrysophyceae (1). Genus Rhizosolenia was represented by more number of species (11) followed by Nitzschia (6), Ceratium (6), Coscinodiscus (6), Chaetoceros (5), Protoperidinium (5) and Pleurosigma (4). Interior mangroves (Sts 1, 2) recorded good number of pennate forms, with species such as Nitzschia closterium, Pleurosigma spp., Thalassionema nitzschioides and Thalassiothrix frauenfeldii playing dominant role. The predominance of pennate species might be related with high organic content and shallow nature of the mangroves with more freshwater inflow. Species such as Asterionella glacialis, Pleurosigma elongatum, Pleurosigma normanii, T. nitzschioides, Biddulphia mobilensis, Coscinodiscus centralis, Planktonilla sol and Skeletonema

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Fig. 1—Sampling stations in Pichavaram mangroves
costatum were recorded in wider salinity regime and form the main euryhaline component.

Diversity index showed wider fluctuations (range: 0.03-4.20 bits/individual; Table 1) related to many factors such as number of species, distribution of organisms among the species, planktonic blooms, etc. In general, diversity was found to be increasing with increasing species richness and evenness. Low diversity coincided with planktonic bloom or sudden outburst in the growth of one or two species which resulted in uneven distribution of organisms. The low diversity during summer and premonsoon seasons was associated with the blooms of N. closterium, Cocconeis disculoides, Rhizosolenia alata f. gracillima and T. frauenfeldii. Diversity was low (Table 1) at the interior mangroves (Sts 1, 2) than the outer-edge localities (St 3). Distinct spatial variation (except between Sts 1 and 2) was noticed among the stations (Table 2). This variation could be related with low species richness and evenness coupled with high dominance index at interior mangroves. Further, the inhibitory effect of tannins (released by the roots of Rhizophora) on the growth of phytoplankton, natural selection of species and exclusion of some species due to the 'ecotone' released during heavy growth of phytoplankton might also explain the lower diversity in the mangroves.

Species richness varied between 0.2 and 2.8. Low value in monsoon and high in other seasons during 1985-86 were coupled with lower and higher salinity values respectively. However, it was not so during 1984-85, indicating the influence of factors other than salinity in the variation of species richness. Spatial variation was similar to that of diversity.

Evenness values showed wider fluctuations (range: 0.01-0.99). Higher values during monsoon and postmonsoon coincided with low cell density. Lower values noticed mainly at the time of planktonic blooms (during summer or premonsoon seasons). Station 3 recorded higher evenness values than Sts 1 and 2. It would be worth mentioning here that the strong tidal flushing (at St 3) coupled with 'low residential time' (unfavourable conditions for bloom formation) resulted in the maintenance of the 'individuals' of the species at low

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>Annual Range</td>
<td>Annual Mean</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Species diversity</td>
<td>0.03-3.70</td>
<td>1.72</td>
</tr>
<tr>
<td>Richness</td>
<td>0.40-2.10</td>
<td>1.01</td>
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<tr>
<td>Evenness</td>
<td>0.01-0.93</td>
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<tr>
<td>Dominance index</td>
<td>37.5-99.80</td>
<td>75.42</td>
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<tr>
<td>Station 2</td>
<td></td>
<td></td>
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<tr>
<td>Species diversity</td>
<td>0.10-3.00</td>
<td>1.56</td>
</tr>
<tr>
<td>Richness</td>
<td>0.30-2.50</td>
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<tr>
<td>Evenness</td>
<td>0.02-0.92</td>
<td>0.50</td>
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<tr>
<td>Dominance index</td>
<td>47.00-99.60</td>
<td>79.41</td>
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<tr>
<td>Station 3</td>
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<tr>
<td>Species diversity</td>
<td>1.70-4.20</td>
<td>2.86</td>
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<tr>
<td>Richness</td>
<td>0.90-2.80</td>
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<tr>
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<td>23.30-88.00</td>
<td>55.53</td>
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A = Premonsoon (July to September), B = Postmonsoon (January to March), C = Monsoon (October to December), D = Summer (April to June)
Table 2—Analysis of variance for the difference in phytoplankton community structure characteristics among stations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>1-2</th>
<th>1-3</th>
<th>2-3</th>
<th>1-2-3</th>
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<td>Species diversity</td>
<td>0.03</td>
<td>37.46*</td>
<td>47.86*</td>
<td>26.46*</td>
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<tr>
<td>Richness</td>
<td>0.001</td>
<td>61.94*</td>
<td>53.04*</td>
<td>40.99*</td>
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<tr>
<td>Evenness</td>
<td>0.18</td>
<td>14.41*</td>
<td>11.64*</td>
<td>7.57*</td>
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<tr>
<td>Dominance index</td>
<td>0.17</td>
<td>25.01*</td>
<td>37.97*</td>
<td>20.30*</td>
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</table>

* = values significant at < 0.005 level

numbers, thus, enhancing the evenness in distribution. Dominance index showed a significant spatial variation (Table 2) with an increasing trend towards interior mangroves.

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References


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