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# Planktonic algae based ecological assessment of a fresh water lentic water body of Altara in Mankundu of Hooghly district in West Bengal

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**Abstract**

Planktonic algae or phytoplankton are free floating, photosynthetic, freshwater and marine organisms. These minute creatures are very much important in the aquatic environment and they establish themselves as the basic component of the aquatic food chain. This present study reveals the diversity status and species composition of these microscopic organisms from a freshwater lentic water body. The study also pinpoints the ecological scenario in terms of indicator species and biomonitoring approach. The maximum Shannon-diversity ( H ) value (2.49) was encountered in post-monsoon, followed by pre-monsoon (2.46) and monsoon (2.28) season respectively. Among the 26 planktonic algae, 7 indicate organic pollution and 2 of them namely *Nitzschia palea* and *Euglena viridis* form algal bloom in the post-monsoon season. The overall consequences indicate a moderate pollution status and we have to introduce proper planning to mitigate the problem.

Plankton is composed of microscopic plants, the phytoplanktons, which are predominantly autotrophic and are the primary producers in aquatic habitats and the microscopic animals, the zooplankton, which depends on the previous one for nutritional purpose. According to size the phytoplankton are sorted as net plankton or macroplanton and microplankton. Net plankton or macroplankton are usually collected in fine plankton nets. Microplanktons (20- 200 µm) are collected by ultrafine plankton nets and by bottle samplers. The Microplanktons are classified further on the basis of their size as follows: Nannoplankton (10-20µm), Ultraplankton (2-10µm) and Picoplankton (0.2-2µm).

Existence of an organism in a particular environment depends on its surroundings. The surroundings include the climate, food resources, predators, association and many more things. Presence or absence of an organism or a group of organisms in an ecosystem therefore reflects its environment and in this case these indicate the ecological status of a particular water body.

Table-1. Phytoplankton sample showing their classes and abundance value

| Phytoplankton sample | Phytoplankton Class | Pre-monsoon | Mon-soon | Post-monsoon |
|---|---|---|---|---|
| *Pandorina morum* (O.F.Müller) Bory | Chlorophyceae | 20 | 32 | 16 |
| *Pediastrum angulosum* Ehrenberg ex Meneghini | Chlorophyceae | 0 | 32 | 6 |
| *Coelastrum microporum* Nägeli | Chlorophyceae | 0 | 33 | 32 |
| *Kirchneriella lunaris*(Kirchner) Möbius | Chlorophyceae | 0 | 0 | 33 |
| *Selenastrum minutum* (Nägeli) Collins | Chlorophyceae | 2 | 0 | 16 |
| *Chlorogonium euchlorum* (Ehrenberg) Ehrenberg | Chlorophyceae | 5 | 22 | 8 |
| *Volvox aureus* Ehrenberg | Chlorophyceae | 0 | 64 | 0 |
| *Scenedesmus obliquus* (Turpin) Kützing | Chlorophyceae | 3 | 16 | 64 |
| *Cosmarium angulatum* (Perty) Rabenhorst | Zygnematophyceae | 0 | 18 | 28 |
| *Closterium parvulum* Nägeli | Zygnematophyceae | 5 | 0 | 0 |
| *Oocystis lacustris* Chodat | Trebouxiophyceae | 0 | 48 | 32 |
| *Actinastrum hantzschii* Lagerheim | Trebouxiophyceae | 22 | 0 | 55 |
| *Anabaena circinalis* (Rabenhorst) Bornet and Flahault | Cyanophyceae | 12 | 2 | 3 |
| *Gloeotrichia echinulata* P. Richter | Cyanophyceae | 22 | 0 | 0 |
| *Oscillatoria princeps* Vaucher ex Gomont | Cyanophyceae | 6 | 1 | 6 |
| *Spirulina major* Kützing ex Gomont | Cyanophyceae | 12 | 0 | 0 |
| *Cylindrospermum majus* Kützing ex Bornet and Flahault | Cyanophyceae | 25 | 0 | 12 |
| *Aphanocapsa muscicola* (Meneghini) Wille | Cyanophyceae | 30 | 0 | 20 |
| *Merismopedia punctata* Meyen | Cyanophyceae | 32 | 0 | 0 |
| *Aulosira fritschii* Bharadwaja | Cyanophyceae | 8 | 2 | 0 |
| *Nitzschia palea* (Kützing) W. Smith | Bacillariophyceae | 1 | 23 | 135 |
| *Pinnularia major* (Kützing) Rabenhorst | Bacillariophyceae | 2 | 0 | 3 |
| *Synedra capitata* Ehrenberg | Bacillariophyceae | 0 | 0 | 6 |
| *Meridion circulare* (Greville) C. Agardh | Bacillariophyceae | 0 | 0 | 12 |
| *Eugulena viridis* Ehrenberg | Euglenophyceae | 1 | 14 | 120 |
| *Lepocinclis ovum* (Ehrenberg) Lemmermann | Euglenophyceae | 0 | 3 | 26 |

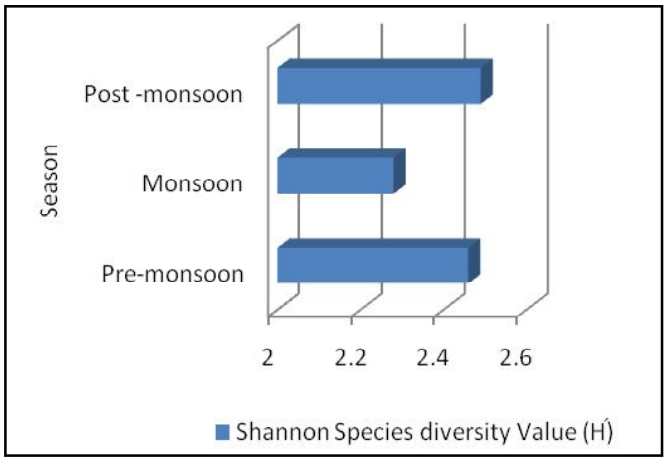


Figure1. Shannon Diversity Index value for the fresh water lentic water body under study

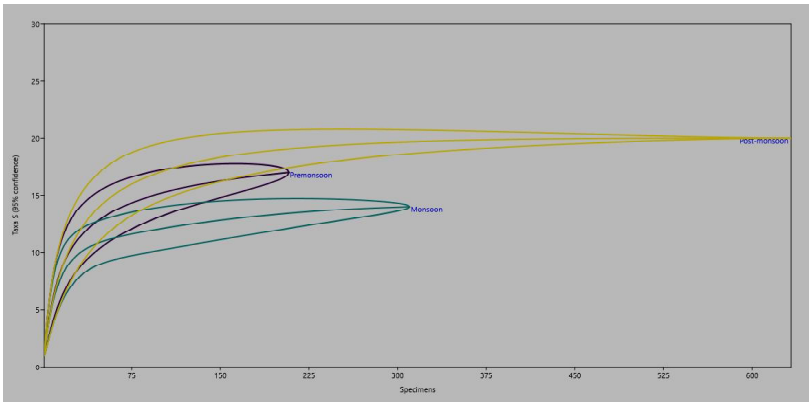


Figure 2. Individual rarefaction curve

A water body therefore could be assessed by studying its organisms. Physico-chemical parameters can add additional information for such assessments. Study of its organisms in a particular body of water to understand its quality is called biomonitoring. Objective of this study is to examine of this water body through phytoplankton species composition, diversity analysis, study of indicator species. For the preparation of the manuscript, relevant literature[1-13] has been consulted.

In this study a lentic water body was selected within Altara area of Mankundu, Hooghly to evaluate the phytoplankton diversity and their fluctuation in seasonal pattern. Planktonic samples were taken in between 10 a.m. to 11 a.m. in post monsoon, pre-monsoon and monsoon season respectively. Here all the samples were taken in 500ml amber colour bottles. Lugol's Iodine was used as fixative in 1:100 ratios. Lugol's Iodine step ups the sedimentation process and also stains

the delicate parts of the phytoplankton. The samples were retained overnight for sedimentation. The supernatant part was pipette out and the sample being concentrated to 5ml for analysis. For quantitative estimation of phytoplankton "Drop Count Method" [12] was used. Here PAST software (V3.19) was used[7,9] for calculation of Species diversity index (H). Identifications of the phytoplankton were exercised using standard literature[1-6, 8, 11].

In the present study, 26 phytoplankton taxa were registered from a lentic water body of Mankundu (Table-1). Six algal classes develop the phytoplankton spectra. Among the 26 planktonic algae, 7 indicate organic pollution (*Pandorina morum, Coelastrum microporum, Scenedesmus obliquus, Actinastrum hantzschii, Nitzschia palea, Eugulena viridis* and *Lepocinclis ovum* ) and 2 of them namely *Nitzschia palea, Euglena viridis* form algal bloom in the post-monsoon season. All these species indicate high organic pollution and these reflected in the low Shannon Species diversity value (H) (2.46, 2.28, 2.49 for pre-monsoon, monsoon and post-monsoon season respectively).

Table 2. Relationship between Shannon Diversity and pollution status

| Species diversity | Conditions |
|---|---|
| >3.0 | Clean water |
| 1.0-3.0 | Moderately polluted |
| <1.0 | Heavily polluted |

This particular water body is consociated with various anthropogenic actions, like fishing, washing of garments, cattle washing etc. The water body also colligated with the drainage system of surrounding houses. This gradually increases the organic load. This leads to reduction in the self purification property of the water and the modified condition support few organisms to develop in a massive amount, especially adjacent with drainage outlet area. The Shannon diversity value can also pinpoint the pollution condition of this particular water body and it revealed moderate pollution status[13] Individual rarefaction analysis (Figure 2) also indicates the species richness in three seasonal period and they differed in temporal attributes. Here maximum diversity found in post-monsoon season where maximum phytoplankton species have encountered and it increases the diversity value .Here the number of individuals also increased by bloom formation. On the other hand monsoon season indicate lowest phytoplankton diversity. In this season due to dilution effect there is a fluctuation in the environmental gradients and usually this leads to decrease in the diversity. In monsoon season only 14 phytoplankton species have found. So in this study I try to pinpoint the ecological status by two specific approach one by indicator species study or bioindication and another by biomonitoring. In future we can study its regulating factors by observing the limnological attributes and can correlate the diversity fluctuation also. Finally we have to take appropriate steps to check this organic pollution. Suitable planning and management approaches can only maintain the biodiversity of this concerned water ecosystem and its ecological balance.

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*Conflicts of Interest :*

The author declares that there is no conflict of interest.

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