Fluctuation of certain physico-chemical parameters in Bordowa beel of Nalbari district, Assam, India

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Abstract

The present study was carried out for the seasonal variation of certain physico-chemical parameters in Bordowa beel of Nalbari district during the period of 2009-2010. During this study physico-chemical parameters like DO, FCO₂, pH, total alkalinity, temperature show little seasonal variation. It is concluded that the physico-chemical parameters of this wetland was optimum in condition for sustainable growth of aquatic life.

Keywords: Fluctuation, physico-chemical parameter, Bordowa beel, Nalbari, Assam.

1. Introduction

Wetlands, being characteristically transitory between aquatic and terrestrial ecosystems, cover about six percent of total earth surface and constitute a rich natural resource (Mukherjee and Palit, 2002). The global extent of wetlands are extremely productive part of the landscape with average annual production above 1000 gmcm-2yr-1 in terms of nutrient recycling and storage, plant and animal harvest, and species conservation (Dugan, 1993 : Mitsch et al., 1994).

India has a rich variety of wetlands habitats. The total area of wetlands (excluding rivers) in India is 18.4% of the country (Miller, 1990). The wetlands of Assam are constitutes about 93% of the total lentic fish prone area of the state (Goswami and Goswami, 2007). According to Bhagabati et al., (2006) there are 68 wetlands with a total area of 1987.0 hectares in Nalbari district. The Bordowa beel is a marshy area of Nalbari district. It occupies a large area and harbours lots of aquatic vertebrate and invertebrate fauna as well as fauna.

There are a few reports on the physico-chemical parameters of beels and wetlands of Brahmaputra and Barak valley of Assam were documented. Among these works of Bhuyan (1970), Dey (1977), Dey (1981), Hazarika and Dutta (1994) are worth mentioning. But literature also reveals that there is a scare of sufficient knowledge about physico-chemical parameters of water in lentic ecosystems of Nalbari district of Assam. There is dirt of knowledge about physio-chemical parameters of Bordowa beel and therefore, it is important to surveying quality of water in this wetland.

2. Materials and methods

2.1. Study area

The Bordowa beel is a marshy wetland filled with water throughout the year. This wetland is located in the mid western corner of the Nalbari district of Assam. It lies between 26°25’N latitude to 91°25’E longitude. Bordowa beel occupies a total area of 35 bigha land.
2.2. Analysis of physico-chemical parameters

The study was carried out by systematic collection and analysis of water samples. The water samples were collected during the period of 2009-2010 in monthly intervals. Studies on different physico-chemical parameters of water like dissolved oxygen (DO), free carbon-dioxide (FCO₂), pH, total alkalinity (TA), total hardness (TH), total chlorides (TC), etc. were followed after APHA (1998). Transparency and water temperature were recorded with Secchi disc method and mercury bulb thermometer respectively.

3. Results and discussion

The values obtained for various physico-chemical parameters of water of Bordowa beel observed during 2009-2010 have been summarized in Table 1.

Temperature is an important biologically significant factor, which plays an important role in the metabolic activities of the organism (Varunprasath and Nicholas, 2010). During study period, water temperature ranged between 20.1°C (minimum) in the month of January and 30.4°C (maximum) in August.

Transparency is the penetration capacity of light in water, which is mainly influenced by the particulate impurities present in the water body. The value of transparency varied from a minimum 19.4 cm to a maximum of 30.4 cm in the month of July and March respectively.

The DO is the most important factor among all the parameters of any aquatic ecosystem. Dissolved oxygen is required for respiration by most aquatic animals. Apart from this, dissolved oxygen combined with other important elements such as Carbon, Sulphur, Nitrogen and Phosphorous that could have been toxicants in the absence of oxygen in water bodies to form carbonate, sulphate, nitrate and phosphate respectively that constitute the required compounds for aquatic organisms for survival (Araoye, 2009). The minimum value was noted 7.8 mg/l during August while the maximum value of DO was 11.3 mg/l in February month.

Free carbon-dioxide ranged between 0.9 mg/l (minimum) in November and 2.3 mg/l (maximum) in August. FCO₂ values were found to maximum during summer months. The higher values of FCO₂ in summer months might have been due to deoxygenation, a feature observed also by Talling (1957).

pH is an important limiting factor for the distribution and growth of aquatic flora and fauna. The livable pH range is from 5.5 to 10 (Moyle, 1993). A low pH can result in death as well as a variety of more subtle effects. Values less than 6 can result in a marked decrease in some fish oogenesis, egg fertility or growth of fry or egg hatchability and growth (Matthews, 1998). The most productive water, however, are those that are slightly alkaline (pH 8) (Moyle, 1993). The minimum value of 7 of pH was noted in the month of August and November, while pH showed maximum value of 7.8 during May.

Alkalinity of water is a measure of weak acid present in it and of the cations balanced against them (Sverdrap et al., 1942). Total alkalinity of water is due to presence of mineral salt present in it. It is primarily caused by carbonate and bicarbonate ions (Singh et al., 2010). The minimum value of total alkalinity was found 37.9 mg/l during November while the maximum value of 48.2 mg/l was noted during September.

Total hardness is the parameter of water quality used to describe the effect of dissolved minerals (mostly Ca and Mg) determining suitability of water for domestic, industrial and drinking purposes and attributed to presence of bicarbonates, sulphates, chloride and nitrates of calcium and magnesium (Taylor, 1949). The minimum value of total hardness was noted 57.3 mg/l during August while the maximum value was 78.3 mg/l in March.

Chloride can be taken as an index of water pollution from sewage and other wastes in aquatic system. During this study, total chloride ranged between 8.8 (minimum) in December and 15.5 (maximum) in October.
### Table - 1: Physico-chemical parameters of water recorded during 2009-2010

<table>
<thead>
<tr>
<th>Months</th>
<th>Jan</th>
<th>Feb</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>20.1</td>
<td>21.2</td>
<td>21.23</td>
<td>23.6</td>
<td>25.8</td>
<td>27.7</td>
<td>30.2</td>
<td>30.4</td>
<td>28.55</td>
<td>27.3</td>
<td>26.6</td>
<td>22</td>
</tr>
<tr>
<td>Transparency (cm)</td>
<td>26.4</td>
<td>27.7</td>
<td>30.1</td>
<td>29.4</td>
<td>26.2</td>
<td>22.3</td>
<td>19.4</td>
<td>20.5</td>
<td>22.7</td>
<td>24.2</td>
<td>22.3</td>
<td>24.6</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>10.6</td>
<td>11.3</td>
<td>10.8</td>
<td>9.2</td>
<td>8.5</td>
<td>8.2</td>
<td>7.9</td>
<td>7.8</td>
<td>8.4</td>
<td>8.7</td>
<td>9.8</td>
<td>10.2</td>
</tr>
<tr>
<td>Free carbon-dioxide (mg/L)</td>
<td>1.2</td>
<td>1.4</td>
<td>1.43</td>
<td>1.2</td>
<td>1.6</td>
<td>1.7</td>
<td>2.1</td>
<td>2.3</td>
<td>1.3</td>
<td>1.2</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>pH</td>
<td>7.2</td>
<td>7.3</td>
<td>7.54</td>
<td>7.4</td>
<td>7.8</td>
<td>7.16</td>
<td>7.2</td>
<td>7.3</td>
<td>7.12</td>
<td>7</td>
<td>7</td>
<td>7.2</td>
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<tr>
<td>Total alkalinity (mg/L)</td>
<td>46.8</td>
<td>49.7</td>
<td>38.72</td>
<td>40.74</td>
<td>43.45</td>
<td>47.2</td>
<td>48.1</td>
<td>43.6</td>
<td>48.2</td>
<td>47.5</td>
<td>37.9</td>
<td>47.4</td>
</tr>
<tr>
<td>Total hardness (mg/L)</td>
<td>73.2</td>
<td>72.3</td>
<td>78.3</td>
<td>76.2</td>
<td>72.8</td>
<td>67.2</td>
<td>62.8</td>
<td>57.3</td>
<td>64.5</td>
<td>71.7</td>
<td>73.6</td>
<td>74.4</td>
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<tr>
<td>Total chloride (mg/L)</td>
<td>8.9</td>
<td>12.6</td>
<td>10.4</td>
<td>9.8</td>
<td>11.1</td>
<td>12.4</td>
<td>14.2</td>
<td>15.2</td>
<td>14.4</td>
<td>15.5</td>
<td>14.8</td>
<td>8.8</td>
</tr>
</tbody>
</table>

*Fig. 1: Seasonal variation in Temperature*
Fig. 2: Seasonal variation in Transparency

Fig. 3: Seasonal variation in Dissolved Oxygen

Fig. 4: Seasonal variation in FCO₂
Fig. 5: Seasonal variation in pH

Fig. 6: Seasonal variation in Total Alkalinity

Fig. 7: Seasonal variation in Total Hardness
4. Conclusion

From the present study it may be conclude that the physico-chemical parameters of this wetland was optimum in condition for sustainable growth of aquatic life. But due to anthropogenic stress total area of this wetland gradually decreases. It may shrink the breeding and feeding ground of local fish population as well as other aquatic organisms in near future. Therefore, to conserve such aquatic biodiversity management plans should be adopted.

References


