Inventory of major wetlands of Sherpur Sadar with special reference to sediment characteristics

Shafikul Hasan AKM, Md. Simul Bhuyan, Md. Shafiqul Islam

Institute of Marine Sciences and Fisheries, University of Chittagong, Chittagong, Bangladesh

Corresponding Author:
Email: simulbhuyan@gmail.com
Tel: +8801849752555

Article History
Received: 13 August 2016
Accepted: 11 September 2016
Online First: 14 September 2016
Published: 1 October 2016

Citation

Publication License
This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note
Article is recommended to print as color digital version in recycled paper.

ABSTRACT
The present study was carried out on the inventory of wetlands along with major information on characteristics of sediment for preparing a database for effective management and monitoring of wetlands in the Sherpur Sadar. Samples were collected from fifteen (15) selected sites set in different wetlands: Boyra ferry ghat, Mrigi River, Ishli beel, Bhogai River, Sheri Khuat ghati ghat, Aura baura beel, Seven phakaya big beel, Shakramuddi dhondo beddi lisha beel, Beheari beel, Betmari beel, Khouta beel, Kaldanger dhola danger phakor danger beel, Chayra beel, Dashani River and Bhauli beel. The average value of organic matter was recorded 4.28%±3.36. The maximum organic matter was recorded at Ishli beel (14.43%) and the minimum organic matter was recorded at Khouta beel (0.79%). The average value of organic carbon was measured 2.25%±1.93. The highest amount of organic carbon was found at Ishli beel (7.59%) while the lowest amount of organic carbon was observed at Khouta beel (0.42%). Soil texture indicates the percentage composition of sand, silt and clay in sediment. The average concentration of sand, silt and clay was recorded as...
53±25, 30±17 and 17±11 respectively. Maximum concentration of sand was recorded at kaldanger dhola danger phaykor danger beel (92%) and minimum was recorded at Ishli beel (12%). Furthermore, the highest amount of was recorded at seven phakaya big beel (60%) and lowest was recorded at kaldanger dhola danger phaykor danger beel (4%). Likewise, premier value of clay was recorded at Ishli beel (52%) and least was recorded at kaldanger dhola danger phaykor danger beel (4%). There was significant difference among different wetlands in terms of organic carbon, organic matter, sand, silt and clay as (P<0.05) that was analyzed by One Way Analysis of Variance (SPSS v.22). All the wetlands are perennial in nature and have multifarious uses. The sampling stations were presented by map created by GIS (ArcMap v.10.1). Considering the results obtained in the present study and other technological facilities it may be concluded that sustainable development may be possible in this area but it needs to take proper management by the authority. The results of the present study indicate that the sediment quality of these wetlands is favorable for any culture.

**Keywords:** Inventory, Wetlands, Sediment, ANOVA, Beel, GIS.

1. INTRODUCTION

Ramsar convention in Iran in 1971 reported that “Wetlands are areas of marsh, fen, peat lands or water, whether natural or artificial, permanent or temporary with water that is static or flowing fresh, brackish or salt including areas of marine water the depth of which at low tide does not exceed six meters”. Wetland is a broad term that include inland, coastal and marine habitats [1]. Being an important renewable source of energy, it plays prevalent role in case of coastal protection, flood reduction, sediment accumulation, fish and crustacean nurseries [2] and affords a wide range of bio-network services (groundwater recharge, attenuated nutrient runoff, habitat generation, and contaminant stabilization) [3]. Moreover, it offers fisheries, fuel wood, timber, medicines and the local and global biodiversity [4] and serve as probable sinks for surplus nutrients in agricultural and urban surfeit [5, 6, 7]. Ecological processes [8], hydrological cycle [9] and the hydrology of wetlands are the most important elements that differentiate damp from terrestrial habitats [10]. Notwithstanding the wetlands are valuable resources but the environment or ecosystem of wetlands is being degraded day by day because of improper use of land and land cover [11]. The ultimate result of this unconsciousness uses led to alter the migratory patterns of birds, indigenous climate, and the makeup of plant and animal populations [12]. Islam [13] identified the causes (overuse of resources, lack of property rights, human encroachment and absence of effective enforcement of laws) of biodiversity declination. Moreover, Abramovitz [14] also reported that anthropogenic sources affect the freshwater ecosystem triggering menace to the quality of human life, the sustainability of the biosphere, ultimately the long-term subsistence of human society [15]. Wetlands of Bangladesh are characterized with some distinct features [16] and mostly serve as fodder [17] and finally as livelihood earnings [18]. But unfortunately there was no previous record of scientific research on Sherpur wetlands. This need compelled us to conduct this research with aim to identify and locate the major wetlands of Sherpur Sadar and to measure the sediment characteristics of the selected wetlands. This research also revealed that further research needed on different criteria of wetlands for future conservation purposes.

2. MATERIALS AND METHODS

2.1. Study area

Sherpur Sadar is located at 25°00’00″N and 90°01’00″E to 25.0000°N and 90.167°E in Mymensingh. Soil Samples were collected from fifteen selected stations: Boyra ferry ghat, Mrigi River, Ishli beel, Bhogai River, Sheri khuat ghari ghat, Aura baura beel, seven phakaya big beel, Shakramuddi dhasho beddi isha beel, Beheari beel, betmari beel, khoua beel, kaldanger dhola danger phaykor danger beel, Chayra beel, Dashani River and Bhauul beel (Fig. 1).

1. Sheri Khuat ghari ghat
2. Boyra ferry ghat
3. Ishli beel
4. Bhogai River
5. Chayra beel
6. Mrigi River
7. Aura-baura beel
8. Seven phakaya big beel
9. Shakramuddi dhasho beddi isha beel
10. Dashani River  
11. Bhauli beel  
12. Kaldanger dhola danger phaykor danger beel  
13. Khouta beel  
14. Betmari beel  
15. Beheari beel

![GIS map showing the sampling sites of Sherpur Sadar](image)

**Figure 1**: GIS map showing the sampling sites of Sherpur Sadar

### 2.2. Sampling Design

Of the several water body observed during field survey conducted in different parts of the districts as many as 9 were identified as wetlands, each having an area exceeding 10 acres. In this work an inventory of wetlands in Sherpur Sadar has been prepared in a way so to constitute a basic information system giving a precise account of its location (Geographical coordinate, water depth, sediment texture, use pattern etc.). The information collecting sheet used in this context was designed more or less adopting the ones used by Zalidis and Mantzavelas [19] while studying the Greek wetlands. Soil samples were collected from the study area by using transect method along with stratified random technique. Excellent discussion was provided in the literature to justify the use of transects when sampling along environmental gradients and the use of stratified techniques [20]. A preliminary survey of the study area was made to identify the sampling sites. A plot of measuring 50 x 350 m² size was drawn in the study area.

### 2.3. Sample Collection and Processing

For the assessment of sediment quality, surface sediments are more commonly collected. A large range of devices is available for the collection and reviews of their uses and suitability for different collection conditions are available [21]. Generally 2 kg of sediment from each site was collected for analyses of sediment texture (analysis of particle size) using Grab sampler. Geographical coordinates were taken using GPS. Water depth were taken by the help of meter scale (made of wood). Soil organic carbon (SOC) was measured
by Walkey and Black wet oxidation method modified by Haq and Alam [22] and organic matter by Storer [23]. Soil texture (% of sand, silt and clay) in the study area was analyzed by the hydrometer method described by Bouyoucos [22], modified from Bouyoucos [24].

2.4. Statistical Analysis

Map was drawn by Arc GIS (v.10.1) software. PRIMER (v.6) was used to show the similarity among the wetlands. One Way Analysis of Variance (SPSS v.22) was used to determine the difference among the wetlands. To draw different graphs MS Excel software was used.

3. RESULTS

Totally, 15 wetlands were recorded from Sherpur Sadar in the present study. In the present study there was significant difference was found among the wetlands in terms of organic carbon, organic matter, sand, silt and clay as the alpha level (p<0.05) though some relationship among wetlands prevail (p>0.05). Soil texture indicates the percentage composition of sand, silt and clay in a soil sample. It helps to determine the soil texture as well as characteristics of soil. During experiment maximum sand was recorded at Kaldanger dhola danger phaykor danger beel and it was 92% and minimum was recorded at Ishli beel and it was 12% (Table 1). Highest amount of silt was recorded at Seven phakaya big beel (60%) and lowest was recorded at Kaldanger dhola danger phaykor danger beel (4%). In the course of the study, maximum clay was recorded at Ishli beel (52%) and minimum was recorded at Kaldanger dhola danger phaykor danger beel and it was 4% (Figure 1). The organic matter of the investigated area ranged between 0.79% to 14.43% (Table 1). The supreme value of organic matter was recorded at Ishli beel (14.43%) and the minimum organic matter was recorded at Khouta beel (0.79%). The highest amount of organic carbon was found at Ishli beel and it was 7.59% and the lowest amount of organic carbon was observed at Khouta beel and it was 0.42% (Figure 2).

![Dendrogram showing the percentage of similarity among different wetlands of Sherpur Sadar that was prepared on the basis of soil texture](image)

**Figure 2** Dendrogram showing the percentage of similarity among different wetlands of Sherpur Sadar that was prepared on the basis of soil texture.
**Figure 3** Dendrogram showing the percentage of similarity among different wetlands of Sherpur Sadar that was prepared on the basis of soil texture.

**Table 1** Soil texture results in different wetlands in Sherpur Sadar

<table>
<thead>
<tr>
<th>Name of wetlands</th>
<th>% of sand</th>
<th>% of silt</th>
<th>% of clay</th>
<th>Soil type</th>
<th>% of organic matter</th>
<th>% of organic carbon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boyra ferry ghat</td>
<td>84</td>
<td>4</td>
<td>12</td>
<td>sandy soil</td>
<td>1.09</td>
<td>0.57</td>
</tr>
<tr>
<td>Mrigi river</td>
<td>36</td>
<td>48</td>
<td>16</td>
<td>Loam</td>
<td>3.03</td>
<td>1.59</td>
</tr>
<tr>
<td>Ishli beel</td>
<td>12</td>
<td>36</td>
<td>52</td>
<td>clay</td>
<td>14.43</td>
<td>7.59</td>
</tr>
<tr>
<td>Bhogai river</td>
<td>60</td>
<td>28</td>
<td>12</td>
<td>Sandy loam</td>
<td>2.53</td>
<td>1.33</td>
</tr>
<tr>
<td>Sheri Khuat ghari ghat</td>
<td>56</td>
<td>28</td>
<td>16</td>
<td>Sandy loam</td>
<td>2.78</td>
<td>1.46</td>
</tr>
<tr>
<td>Aura-baura beel</td>
<td>44</td>
<td>44</td>
<td>12</td>
<td>Sandy loam</td>
<td>3.14</td>
<td>1.65</td>
</tr>
<tr>
<td>Seven phakaya big beel</td>
<td>20</td>
<td>60</td>
<td>20</td>
<td>Silt loam</td>
<td>9.14</td>
<td>4.81</td>
</tr>
<tr>
<td>Shakramuddi dhondo beddi ilsha beel</td>
<td>36</td>
<td>36</td>
<td>28</td>
<td>Clay loam</td>
<td>5.56</td>
<td>2.93</td>
</tr>
<tr>
<td>Beheari beel</td>
<td>80</td>
<td>12</td>
<td>8</td>
<td>Loamy sand</td>
<td>2.08</td>
<td>1.09</td>
</tr>
<tr>
<td>Betmari beel</td>
<td>28</td>
<td>48</td>
<td>24</td>
<td>Clay loam</td>
<td>7.04</td>
<td>3.71</td>
</tr>
<tr>
<td>Khouta beel</td>
<td>84</td>
<td>8</td>
<td>8</td>
<td>Loamy sand</td>
<td>0.79</td>
<td>0.42</td>
</tr>
<tr>
<td>Kaldanger dhola danger</td>
<td>92</td>
<td>4</td>
<td>4</td>
<td>Sandy Soil</td>
<td>1.16</td>
<td>0.61</td>
</tr>
</tbody>
</table>
4. DISCUSSION
A total of 15 wetlands were identified as most important in Sherpur Sadar. Zalidis and Mantzavelas [19] mentioned that wetlands are important productive resources. Organic matter and organic carbon remain within the optimum level for satisfactory growth of culture species specially fish culture. Wetlands plays an important role in the balance of a cultural system and consequently on the growth and survival of aquatic organisms. The sediment can act as a buffer and provides the water with nutrients serve as a biological filter. Sandy clay loam to SL (sandy loam) is favorite for the semi intensive and intensive culture where artificial food is used as the main source of food. In the present research, 7 wetlands soil were sandy loam that indicate the suitability of the soil for culture. Highest total of organic matter was found in Ishli beel (14.43%) and the lowest total of organic matter was found from...
Khouta beel (0.79%). This results were similar to optimum level (10-15%) [25] and it is well known that low organic matter of wetlands water is suitable [26]. Wetlands being important for ecosystem it is urgent to conserve immediately and for this it is needed to disseminate the application of performance prediction models to siting, design, and assessment of wetland restorations [27, 7, 29, 30, and 31].

5. CONCLUSION

Wetland plays an important role in the balance of any cultural system and consequently on the growth and survival at aquatic organisms. From the present study various important features were extracted from the selected wetlands and these information may be very valuable and prevalent in the formation of an inventory to redirect the present standing of wetlands. Moreover, a comprehensive sediment quality monitoring program is urgently needs and it is important to establish a relationship between environment quality and culture species in this area. All data were collected from Sherpur Sadar and then analyzed which will provide assistance as an important tool for sustainable management of wetlands. Systematic study was carried out on the wetlands resources and a comprehensive inventory of wetlands resources should be carried out covering different eco-regions of the country. It must be done prior to damage of the resources base. This research consider as a preliminary stage of the next specific research work to establish a major considering issue from the wetlands of Sherpur district.

REFERENCE

2. CM Finlayson and NC Davidson, Global review of wetland resources and priorities for wetland inventory. 2012.


