Chapter: 3

Materials and Methods

3.1 Study area

Foys lake is located in Pahartali, Chattogram, Bangladesh. It is situated at an altitude 9178 ft and lies between 22°22′06.90″-22°22′38.28″ N latitude and 91°47′11.81″ - 91°47′50.86″ E longitude. It is an irregular shaped lake with 320 acres area of land from which 48.75 acres is water body. The capacity of water containing of the lake is more or less 27.30 crore gallons and average depth is 25m. The lake has an inlet but it has one outlet for controlling water level. It receives water from precepitation. About four thausand dewellers live on the hill adjucent to the lake which act as a embankment of lake. The study was carried out from June to December of 2019.

Figure-1: Google map view of Foy’s Lake

3.2 Sampling procedure

Sample water was collected during morning between 10AM to 11AM and samples were collected fortnightly basis for laboratory analysis. Samples were carried out from three selected sites i.e. S_1, S_2 and S_3 respectively. Each sampling site was minimum 10m far from bank of lake so that sample was free from any types of aquatic vegetation and organic load. Water samples were drawn with plankton net under 1m from the surface and stored in separate light and dark polyethylene bottles. After that samples were incubated for 2 hours for laboratory analysis.

3.3 Physio-chemical variables

1. **Field analysis:** During sampling some physio-chemical variables like dissolved oxygen (DO), hydrogen-ion concentration (pH), atmospheric temperature and surface water temperatures were measured by using Hanna DO and pH meter. The depth of water of the lake was measured by using a rope provided with a weight at one end. The calculation was performed on each sampling day at a specific site. The water column transparency was measured by using a Secchi disc.
2. **Laboratory analysis:**

   Parameters like free carbon dioxide (CO_2), alkalinity, nitrate, phosphate, and ammonia were estimated according to the standard method of APHA (1998) and Trivedy and Goel (1986).

3.4 Primary production

Sample water was collected from the 1m depth of water column with the help of paddle boat between 10AM to 11AM in the duration of April to September 2019 in one-month interval. Total study duration is divided into three segments these are premonsoon (April-May), monsoon (June-July) and post monsoon (August-September). Primary production was measured according to light and dark bottle method (Gaarder and Gran, 1927). Samples were collected from three sites of the lake and every site was space out more or less 100m to 120m apart from each other. Collected samples were kept in two 500ml of dark bottles and one light bottle from the euphotic zone of the lake. Immediate after collection, samples were incubated for 1 hour, after that DO were calculated by Winkler's method.

Calculation of Gross Primary Productivity (GPP), Net Primary Productivity (NPP) and Community Respiration (CR) was done on the basis of changing in the content of oxygen in the light and dark bottles and the initial oxygen concentration. The primary production was calculated by following formula(Gaarder and Gran, 1927):

Gross Primary productivity (GPP) $= \frac{LB-DB}{Time\ of\ exposure} \times \frac{0.375}{PQ} \times 1000$ mgC $m^{-3}h^{-1}$

Net Primary Productivity (NPP) $= \frac{LB-IB}{Time\ of\ exposure} \times \frac{0.375}{PQ} \times 1000$ mgC$m^{-3}h^{-1}$

Community Respiration (CR) $= \frac{DB-IB}{Time\ of\ Exposure} \times \frac{0.375}{PQ} 1000$ mgC$m^{-3}h^{-1}$

Where,

LB = dissolve oxygen content of light bottle

DB = dissolve oxygen content of dark bottle

IB = dissolve oxygen content in the initial bottle

Time of exposure = 1h

0.375 = conversion factor (1 g of oxygen is equal to 0.375 g of carbon)

PQ (Photosynthetic Quotient) = 1 (PQ $= \frac{release\ of\ oxygen\ during\ photosynthesis}{assimilation\ carbon\ dioxide\ during\ photosynthesis}$

3.5 Phytoplankton analysis

Surface water samples were collected with the assistance of a plankton net fitted to an aluminum frame with 10μm mesh size by pulling in water surface so that at least 100L of water can pass through the net. Obtained samples were preserved with 5% ethanol for avoiding cell rupturing and keeping natural quality. Collected samples were stored in plastic bottles for laboratory analysis.

In the laboratory sample was brought and observed under microscope at 10X, 40X and 100X magnification for qualitative analysis. S-R (Sedgwick Rafter) cell was used for quantitative analysis. Sample was taken to the S-R cell like quantitative method and placed under microscope at 10X magnification. There were 1000 quadrates (square) in the S-R cell. From these ten squares of S-R cell were counted. The number of plankton cell was counted under microscope.

Then the total number of plankton cell was calculated by using following equation (Rahman, 1992) –

Number of plankton, N= $\frac{F \times C}{F \times V \times L} \times 1000$

Where,

V = Volume of the S-R cell field

F = Number of field count

C = Volume of final concentration of sample

A = Total number of plankton counted

L = Volume of original water

N = Number of plankton cells per liter

3.6 Zooplankton determination

Zooplankton population of lake water were estimated monthly. The counting of plankton was done with the help of Sedgwick-Rafter Counting Cell (S-R cell) under a compound microscope. The abundance of zooplankton population was estimated by using the formula of Rahman (1992).

Photo Gallery

Sample collection and laboratory analysis:

Plate 1: Sample collection

Plate 2: Preparing Sample

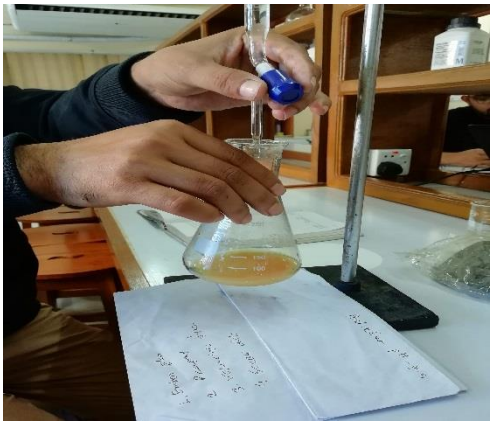

Plate 3: Titration of sample

Plate 4: Sample after titration

Phytoplankton:

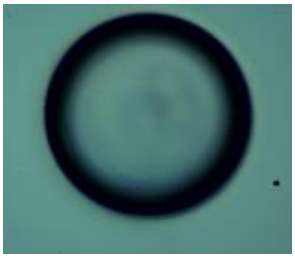

Plate 5: *Cyclotella*

Plate 6: *Navicula*

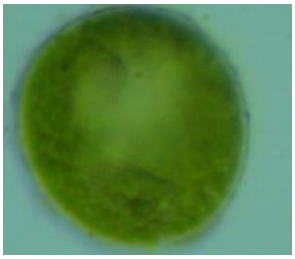

Plate 7: *Chlorella*

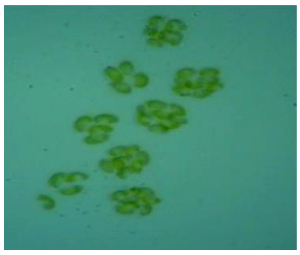

Plate 8: *Dictyosphaerium sp.*

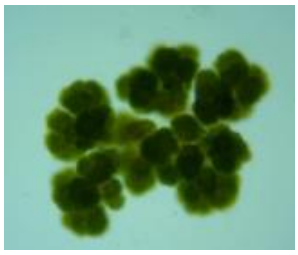

Plate 9*: Westella botryoide*s

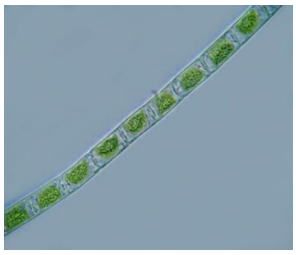

Plate 10: *Ulothrix sp.*

Plate 11: *Euglena sp.*

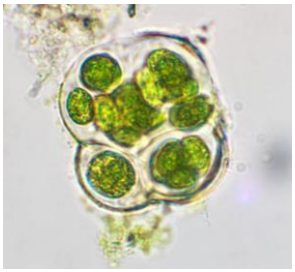

Plate 12: *Gloeocapsa sp.*

Plate 13: *Aphanizomenon sp.*

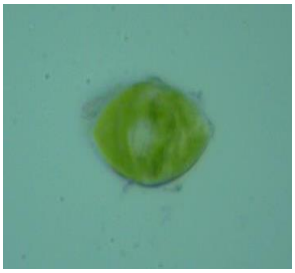

Plate 14: *Alexandrium sp.*

Zooplankton:

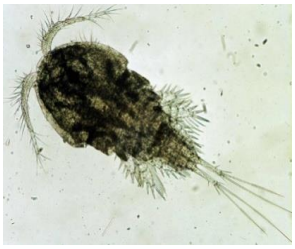

Plate 11: *Cyclops sp.*

Plate 12: *Daphnia sp.*

Plate 13: *Moyna sp.*

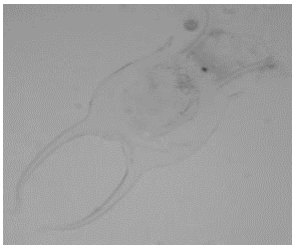

Plate 14: *Brachionus sp.*

Plate 15: *Philodina sp.*