Chapter 5

Discussion

Productivity of aquatic water body is greatly influenced by physical, chemical and biological parameters. Fish and other aquatic organisms are also influenced by these parameters. Suitable water quality variables are prerequisite for primary productivity and healthy aquatic environment for fish production. According to (Rahman, 1992) physical, chemical and biological parameters regulate the productivity of waterbody.

5.1 Temperature

Temperature is one of the most important water quality parameters which has influence on all other parameters of water. Temperature has great importance on chemical and biological activities. Generally, chemical and biological activity may be double with the increase 10°C temperature. Organisms use dissolve oxygen twice and chemical reaction will also progress with the increase of each 10°C temperature. So, dissolve oxygen requirement for fish and other aquatic organisms is more critical in warmer water than cold water. In this present study, average temperature was 28.1°C, 28.53°C and 29°C in S_1 S_2 and S_3 respectively. According to Boyd (1990) aquatic organisms of tropical and sub-tropical region do not grow well below 26-28°C. So, temperature of Foy's Lake is suitable for fish growth.

5.2 Transparency

Boyd (1982) stated that transparency that means secchi disc visibility between 30cm to 60cm is suitable for fish growth and fish health. If transparency decrease below 30cm this may problem for dissolve oxygen quantity and if it will above 60cm, light penetrates to the higher depth which allows macrophytes growth. For this consequence phytoplankton growth decreases which serves as food for fish and other aquatic organisms. In this study average transparency was 91.6cm, 91.33cm and 90.83cm which was very high. In regards to secchi disc visibility productivity of Foy's Lake is not suitable. Water depth may be the reason of high secchi disc depth.

5.3 Water depth

Depth is another important parameter by which light penetration in water is vary. Upper 200m is called euphotic zone in which sunlight is available for primary productivity. There is no stratification occurs and depth is suitable for primary production and healthy environment of water body.

5.4 Dissolve oxygen

Dissolve oxygen may be the most critical water quality parameter in fish culture. Photosynthesis is the primary source of DO in water body and the second source is the atmosphere. The average value of DO of this study was 8.03 mgl^{-1}, 7.91 mgl^{-1}, 7.96 mgl^{-1}. According to Ellis et al. (1946) value of DO below 3 mgl^{-1} is lethal for fish and other aquatic organisms and more than 5 mgl^{-1} is suitable for fish production. In Foy's Lake, DO was more than 5 mgl^{-1} which is suitable for fish production.

When dissolve oxygen concentrations are low in water, then the presence of carbon dioxide obstructs the uptake of oxygen by fish. When concentrations of dissolve oxygen are very low, the carbon dioxide concentration become quite high. At low concentration of oxygen photosynthesis is not proceeding properly. This is because carbon dioxide is released and oxygen is used during respiration. Carbon released during respiration is not uptake by phytoplankton for photosynthesis. Boyd (1982) suggested that carbon dioxide level 1 to 10 mgl^{-1} is suitable for fish culture. In this present investigation carbon dioxide concentration were 4.01±0.49 mgl^{-1}, 4.01±0.33 mgl^{-1} and 4.05±0.42 mgl^{-1}. Concentration of carbon dioxide is in ideal range for fish culture.

5.5 pH

pH is the concentration of hydrogen ion (H^+) in water which is one of the important parameters of water quality. According to (Swingle, 1967) metabolic rate, growth rate and other physiological activity of fish are reduced by acidic pH. Boyd (1982) said that, pH range for fish culture should 7 to 9, result of present study match with Boyd. So, pH of Foy's Lake is suitable for fish culture.

5.6 Alkalinity

Alkalinity means the buffering capacity of water body which neutralize acids and bases and maintain a stable pH level. Carbon dioxide availability for plankton growth is related to total alkalinity. According to Boyd (1982) CO_2 is little available for plankton growth when alkalinity ranges from 15 to 20 mgl^{-1}. In alkalinity ranges between 20 to 150 mgl^{-1} suitable amount of carbon dioxide is available for plankton growth for fish culture. The value of alkalinity in present study lies in this ideal value that means availability of carbon dioxide is suitable for primary production.

5.7 Nitrate value

According to Boyd (1982) more than 1 mgl^{-1} of nitrate is lethal for fish. So, it can be said that, in this present investigation nitrate level is in suitable condition.

5.8 Ammonia

Ammonia is another important factor for fish culture, ammonia incorporated in water with faeces of fish and bacterial decomposition of organic matter. If concentration of ammonia increases in water, ammonia excreted by fishes diminishes and ammonia level in fish blood and other tissue increases. This elevated result increase blood pH level which has adverse effect on enzyme catalyze reactions. Ammonia increase oxygen consumption rate by tissue, damages gills and reduces oxygen transport ability of blood. According to Boyd and Tucker (1992) ammonia level between 0.4 to 2 mgl^{-1} is toxic for fish. In this present investigation average ammonia was 0.18±0.068 mgl^{-1}, 0.15±0.05 mgl^{-1} and 0.17±0.063 mgl^{-1} which was below the toxic level. There is less amount of organic waste matter that are coming from household activities of dwellers on adjacent hill but amount is not so much high. Main source of ammonia may be gaseous exchange with the atmosphere and nitrogen fixation.

5.9 Phosphorus

Phosphorus is the most important regulating factor for plankton growth in aquatic ecosystem but excess amount of phosphorus is harmful because it causes eutrophication in water body. Main source of phosphorus is soil erosion, ground water and run off. In this study area source of phosphorus is soil erosion though this is very low amount

because of proper plantation in adjacent hills. That is why phosphorus amount is very low. The amount phosphorus is not enough for primary production but it's under toxic level.

5.10 Primary productivity

In this study gross primary productivity and net primary productivity was minimum in monsoon and maximum in post monsoon. The lowest amount of productivity during monsoon may be due to inadequate sunlight, cloudy weather, higher water depth and turbidity by suspended solid resulting from soil erosion from adjacent hills. The highest productivity in post monsoon may be due to sufficient sunlight, temperature and photoperiod. Community respiration means subtracting net productivity from gross productivity and converted into carbon dioxide. In this present study community respiration was higher in summer this is may be due to higher amount of decomposition and water temperature because decomposition rate is higher with the increase of temperature.

Mathew (1975) estimated the ranges of net primary productivity between 0.002 $gCm^{-3}hr^{-1}$. and 0.14 $gCm^{-3}hr^{-1}$. and the ranges of gross primary productivity between 0.045 $gCm^{-3}hr^{-1}$. and 0.17 $gCm^{-3}hr^{-1}$.

Hepher (1962) investigated that the value of primary productivity was 0.17 to 0.41 $gCm^{-3}hr^{-1}$ at suitable light condition in a fish pond in Israel.

Sreenivasan (1964) reported that the lowest value as 0.25 $gCm^{-3}hr^{-1}$. in a pond, the fish production was satisfactory without any artificial fertilization.

On the basis of above discussion, I can say that primary productivity of Foy's Lake was in satisfactory level.