Chapter 2

Review of Literature

Before conducting any research, it is prime concern of gathering information of previously conducted related research. For this purpose, some previously conducted research is reviewed here. A lot of research regarding the variation of primary productivity of a freshwater sub-tropical lake according to physical and chemical variable in pre monsoon, monsoon and post monsoon season have been carried out. This following information has reviewed in favor of the present study.

Mruthyunjaya *et al.* (2016) reported that the lowest yield was observed in pre-monsoon season when it was 4.572 gCm^3day^{-1} it is due to the decrease in the water level. The higher production was observed in monsoon season when it was 9.1464 gC/m3/day due to high phytoplankton content.

According to the study of Wetzel and Likens (1979) Basically, aquatic ecosystems' primary productivity depends on the photosynthetic behavior of autotrophic species.

Reynolds (1984) conducted a research which refers in many aquatic environments, phytoplanktons are the main primary producers and are valuable food for consumers.

Talling and Lemoalle (1998) reported that an array of chemical, physical, and biological variables influence the primary productivity and biomass of phytoplankton. In general, there is no question that the more often a lake is stirred to the bottom by waves, the faster the nutrients are recycled from the mud into the photosynthetic region, where they will speed up the productivity rate.

Hecky and Kilham (1988) stated from their research, it is not always possible to find the different nutrients needed by algal cells for growth and multiplication in the relative proportions needed by phytoplankton. Melack (1976) found the significant correlation between the primary productivity level and changes in the level of water.

Liang *et al.* (1981) reported that for lakes and ponds, a significant relationship exists between fish yields and gross photosynthesis by phytoplankton.

Hiroki *et al.* (2020) Documented primary production, defined environmental variables responsible for its instability and analyzed the relationship between primary production and fish production in nine large body of water. They reported primary production ranged approximately 40 to 302 $gC/m^3/y$ and was usually greater in the rainy season than in the summer months.

Ahmad *et al.* (2005) they conducted a research on primary production and fish yield in Meghna river. They estimated Net Primary Productivity (NPP) and gross Primary Productivity (GPP) ($gC/m^3/h$) in the euphotic zone of Meghna river 0.089 ± 0.021 and 0.161 ± 0.025 respectively. Yearly estimated fish production in comparison to gross carbon synthesis was 7kg $fish/m^3/year$.

Rathod *et al.* (2016) they carried out a study about the primary productivity rate in relation to physico-chemical properties. In June, July and August 2015, gross primary productivity (GPP) during the monsoon was 0.07-0.11 $gC/ m^3/ hr$ that was very poor while GPP were increased during post monsoon season. The results showed that organic load comes with water into the reservoir during the monsoon season, but phytoplankton growth is limited due to heavy rain and the flushing rate was high from the downstream of the reservoir. Primary productivity increased during the post monsoon season.

Wondie *et al.* (2007) stated from their conducting research that, the highest production rates were recorded in the post-rainy season (Oct–Nov), which associated with the flowering of *Microcystis* and higher levels of chlorophyll. This high seasonal production is possibly due to the relatively high availability of nutrients in combination with favorable lighting conditions. This efficient post-rainy season is relatively short (2 months) and the efficacy of the transfer of substance between the Lake ecosystem's first and second trophic levels would therefore be low.

Feresin *et al*. (2010) conducted an experiment on primary productivity of the phytoplankton in a tropical Brazilian shallow lake. The study showed that higher primary productivity in the water column of the lake took place during the transition periods when thermal stratification is unsteady and lower primary productivity in winter season due to inadequate mixing and mid-summer due to stratification.

Koli and Ranga, (2011) carried out a study about Physicochemical Status and Primary Productivity, in which showed that Primary productivity and physico-chemical values of the lake were found high, mainly due to sewage discharged, industrial effluents and the agricultural runoff by surrounding city population.

Sontakke and Mokashe, (2014) studied about Seasonal variation in primary productivity of two freshwater lakes Kagipura lake and Mombatta lake. They found in their study the productivity of Kagzipura Lake is relatively higher than Mombatta Lake. Kagzipura Lake's increased productivity showed that its food chain and food web is in good condition. It also means that the water body was polluted and contributes to eutrophication. Kagzipura Lake 's rich productivity may be due to the shallowness of

the lake, which is partly more productive than deep lakes because of sediment-regulating nutrients and the extent of attached macrophyte development.

Radwan (2005) stated from his investigation among the factors, temperature and dissolve oxygen are more affecting primary productivity.

Ellis (1937) showed that dissolve oxygen concentration below 3mg/l lead to asphyxia to fish and 5 mg/l is optimum for proper fish growth.

Mookerjee and Bhattracharya (1949) reported that sudden fall of alkalinity of a freshwater body may occur as a result of water dilution which due to heavy rainfall. They also stated that optimum level of pH which was 6.5 to 8.5 for any aquatic life.

Ismail *et al.* (1974) recorded that neither long photoperiod nor high temperature was in favor of algal growth. Temperature ranges from 29 C to 30 C and photoperiod ranges from 5.2 to 6.8 hours day^{-1} is optimum for algal growth.

Ahmed *et al.* (1999) was recorded that from their study, Dissolved oxygen (DO) (6.4-9.1 mg/L) and free carbon dioxide (4.7-6.0 mg/L) contents showed suitable condition for aquatic lives.

Villadolid *et al.* (1954) stated that the range of water pH from 4.8 to 8.4 is optimum for plankton growth. They stated that the low level of pH adversely affected the growth of plankton and fish.

Synudeen Sahib (2002) recorded that the peak score of GPP and NPP was in the month of April at the Parapper reservoir in the Kollam district of Kerala.

Mandal *et al.* (2005) also stated that the gross and net productivity was increasing gradually from late winter and reaching peak in the late summer in Karwar lake, Bihar.

Kumar *et al.,* (2015) showed that the gross primary productivity (GPP) of reservoir Udai Sagar was 0.50 g C m3 h-1 in surface water. On the basis of average primary productivity, the fish production potential of reservoir Udai Sagar showed considerable scope for the augmentation of present average production.

Hujare *et al.,* (2007) were reported from two perennial tanks in the Kolhapur district. The highest values of GPP and NPP were recorded in the month of April and the lowest in September.

Khan (1980) recorded seasonal variation in gross primary productivity in Dharuria lake. The first peak value was estimated during March and the second during November. Relatively low values were recorded during monsoon.

Nakul *et al.* (2014) conducted a study on the fish and phytoplankton biodiversity with relationship to primary productivity. The study showed that average Gross Primary Productivity (GPP) of the study area was 0.52 g C m^3 h^{-1} in the surface.

During the period of study, the catch was dominated by Indian major carps, representing 90 per cent of the total landings from this lake.

Among the Indian major carps, the *Catla catla* (70 per cent) dominated the groups accompanied by *Labeo rohita* (25 per cent) and *Cirrhinus mrigala* (5 per cent).

On the basis of average primary productivity, the capacity of fish production of reservoir showed considerable potential for the improvement of the present average output.