

Chapter I

INTRODUCTION

Phytoplanktons are the planktonic plants of an aquatic system which are photoautotrophic organisms and are mostly microscopic by nature. The term “Phytoplankton” was derived from the Greek word “Phyton” which means plant and “Plagktos” which means wandering or the drifters that float with and are unable to swim against the water currents (Begum, 2014).

Phytoplanktons are the assemblage of algae growing in oceans, seas, lakes, ponds, pools etc. (Kakati, 2011). The term algae have been derived from the Latin word “alga” which means Seaweed (Bordoloi, 2016). Linnaeus was one of the pioneer scientists who kept a distinct autotrophic plant group, termed as “Algae” in his artificial system of classification of plant kingdom. The study of the algae which is termed as “Phycology” (derived from the Greek word “Phykos” meaning algae) is an important branch of plant science today. It has tremendous contribution towards the welfare of mankind.

Algae are primitive thalloid groups, having no true roots, stems and leaves, or leaf-like organs. It has chloroplasts as its photosynthetic machinery (Prescott, 1962). Scientists like Smith (1955) and other contemporary workers suggested various definitions for algae but, Fritsch’s (1935) definition for algae was a well-accepted one till date. Fritsch (1935) designated algae as all the holophytic organisms which do not reach the differentiating characteristics of the archegoniate plants.

Algae are ubiquitous (Round, 1973) and one of the important features of algal flora is its cosmopolitanism. Their distribution varies from marine to freshwater lakes or ponds and hot

springs to ice capped mountains. A few are aerial or sub aerial or edaphic. However, they prefer to grow on wet condition and are abundantly found in the freshwater bodies (Bordoloi, 2015). They are found in different forms like unicellular, colonial, or extended filaments and exhibit vast diversity in the fresh water ecosystem (Sharma, 2003).

Only 0.01% of earth's water includes the fresh water ecosystems comprising of river systems, lakes, ponds and reservoirs (Gleick, 1996). The freshwater bodies are the inland water bodies classified as lotic and lentic aquatic ecosystems. Lotic aquatic bodies are rivers, streams and waterfalls etc. which are running water bodies. Whereas, lentic water body comprises of lakes, ponds, swamps and bogs which are stagnant in nature (Bordoloi, 2016).

Though the areas of the freshwater ecosystems are proportionately less, they play major ecological roles in the biosphere (Lieth and Whittaker, 1975). The relationship of algae with the aquatic habitats like ponds makes them an interesting tool for such study. They are important contributors to a pond aquatic system forming the base level of ecological pyramid in any aquatic food chains. They play a vital role of primary producers and help sustain life form maintaining ecological balance in the aquatic ecosystems (Kumar *et al.*, 2017).

Pond is a quiet water body which has a muddy and silty bottom with aquatic plants around its edges and throughout (Mitsch, 2007). One can identify pond as any small, compact water body either formed naturally or manmade. Ponds being the vital integral component of a village ecosystem are extensively used by the villagers or the rural people (Shimoda and Abe, 2001). They are of paramount importance to the beneficiary people living around for multiple activities like bathing, washing of clothes, utensils, swimming, besides fish farming, irrigation. Ponds too have aesthetic value in the traditional societies. Ponds provide high biodiversity among

freshwaters and are important from the view of conservation (Bhuyan, 2016).It also serves as important habitats for varieties of aquatic vegetation.

Sufficient studies on pond waters were done to procure baseline information of plankton communities(Rao, 1953; Munawar, 1974; Jana, 1973; Nasar & Kaur, 1982).The pond ecosystems exhibit higher algal diversity which is exclusively unique.Amount of water present and its quality always dictates the external conditions of the ponds to determine the algal communities therein. This results in the change of behavior of the living community too (Round, 1973).

Algae have always attracted researchers for its potential in producing non-conventional foods, commercial products, medicines etc. They are the easiest lucrative source of feed for the ornamental fishes. As a matter of fact, the role of algae is very crucial to the fishery culture, but the devotion and findings to the subject has been inadequate(Saikia, 2015). Yielding valuable sources algae play an important role in economy and commerce of a country (Rai *et al.*, 2000)

With the growing concern for water quality, it has been noticed that the multiple use of the water bodies by human population have been a reason for deterioration of water quality.Undoubtedly, effect on physico-chemical constituents on water bodies due to rapid urbanization, developing industries and modernization is quiet prevailing in India in general and Northeast in particular (Bordoloi,2016). Though the physico chemical parameters may be supportive determining the water quality and chemistry offreshwater bodies but cannot hold a clear picture of ecological condition of the water body due to lack of proper integration with the ecological factors (Bordoloi and Baruah, 2014).Methods for monitoring, assessing and managing

ecological integrity through the use of biological indicators of ecological change have been an earlier practice of the ecologists(Baruah *et al.*, 2013).

Recently, it was known that algae are one of the best tools for biomonitoring of water quality. They are the indicators of physico chemical status of any water bodies which serves to assess the pollution status of the water body (Mittal and Sengar, 1991). Algae has a short life span and quick response to pollutants and hence, are very rapid bio indicators in response to water quality. Algae are also very sensitive and habitat specific in nature. Different potent members of phytoplankton are explicit about their distribution and occurrence in relation to the water quality, where they reside (Kumar *et al.*, 2017). Their occurrence and species composition may signify different ambient condition of an aquatic body. Several researchers (Frempong, 1981; Sudhakar *et al.*, 1981; Tilman *et al.*, 1982) reported that algae are among the first organisms to react to environmental changes and nutrient fluctuations.

In the field of algal biomonitoring, Palmer was one of the prominent pioneer workers (Bordoloi, 2016). In the year 1969, Palmer identified a few algal species that are highly tolerant to organic pollution and thereby listed 80 algal species under 60 genera tolerant to organic pollution. In accordance to the list, Palmer also proposed a pollution index scale based on algal genus. This pollution index scale rates the water samples of low to high organically polluted water bodies. A pollution index score of 20 or more indicates high organic pollution, whereas the score of 19 to 15 indicate probable pollution and the score less than 15 indicates less organic pollution (Palmer, 1969).

Diatoms are relatively more selective in nature and are used in pollution studies (Werner, 1977). Presence of Desmids indicates good water quality (Prescott, 1982) whereas; algal genera like *Euglena*, *Oscillatoria*, *Scenedesmus*, *Navicula*, *Nitzschia* and *Microcystis* are found

basically in organically polluted water bodies. Due to inflow and outflow of nutrients there is normally a balance in pond, under no human influence. But, recently, mismanagement of surrounding areas of ponds created many problems including the water quality. Lacking self-cleaning capacity, the stagnant water bodies like pond have a complex and fragile ecosystem than the running water bodies (Rajane *et al.*, 2015).

Assam, one of the eastern most states of India is blessed with rich aquatic biodiversity. The freshwater ecosystems of Assam like the wetlands, beels and ponds etc. hold huge diverse array of algal flora supported by its eco-climatic favorable condition (Rahman *et al.*, 2016). Both manmade and natural water bodies are found throughout the state. North Guwahati region, the northern part of the city Guwahati is situated at the north bank of the mighty Brahmaputra in central Assam, India. Though the southern part of the city witnesses rapid urbanization, the northern part still stands with a rural ambience. Expansion of the city in near future would make the place into a new industrial destination within a decade or less. Therefore, the biological assessment in these emerging industrial cities is need of the hour (Rahman *et al.*, 2014).

Nevertheless, with its rich floral and faunal diversity, this place is an ecologically important region. The region abounds with historical places and temples with ponds. The unevenly distributed topography also made some water bodies in between valley and small hilly terrains in the area. The kings once ruled over entire Assam (s.l.) were attracted to North Guwahati rather than Guwahati to build their administrative center as it had both economic and strategic advantages. The headquarters of Ahom emperors was positioned here. (Das, 2015). The Ahom kings mobilized the military troops against the Mughal invaders in Agyathuri of North Guwahati. The famous “Saraighat battle” was fought in and around the North Guwahati town between the

Ahoms and the Mughals. The Ahom kings also dug a good number of small to large ponds in the nearby areas for the benefit of the stationed Ahom army and the local people there. The practice and strategy given by the Ahom kings to the local inhabitants of the area are followed even today for their day to day livelihood. Since then, people have been using these ponds for culturing fishes and in their day to day life. All water bodies of the North Guwahati are replenished with flood water of the Brahmaputra River during the rainy season.

The freshwater bodies of North Guwahati area have already been assessed for faunal diversity (Rahman *et al.*, 2014), ornamental fish diversity, but, so far, neither enumeration of algal diversity nor its documentation has been done in the region. In order to hammer out scientific conservation and strategies it is the need of the hour to document the algal diversity of North Guwahati area. Considering the above-mentioned facts, the present study was aimed to develop the freshwater algal diversity of North Guwahati area of Kamrup district with the following objectives:

1. Enumeration and identification of freshwater algal diversity in different fish ponds of North Guwahati area of Kamrup district.
2. To study the distribution pattern of the algal species in the different pond studied.
3. To assess the pollution status of the different ponds of the study area using Palmer's scale of pollution index.