Introduction
CHAPTER - 1

INTRODUCTION

Water is one of the most vital factors in the existence of living organisms. Water covers about 70% of the earth of which more than 95% exists in gigantic oceans. A very less amount of water is contained in lakes and rivers, which comprises most valuable freshwater resources. The distribution of water in various components of biosphere are oceans with 13000 geogram (96.42%), ice sheets with 240 geogram (1.78%), lakes with 1.89 geogram (0.01%), atmosphere with 0.13 geogram (0.001%) rivers with 0.02 geogram (0.00015%) and biological water (contained in living organisms) with 0.01 geogram (0.00007%) of water ($G = 10^{20}g$). These water bodies differ so widely in their physico-chemical characteristics that it is a true fact to state that no two water bodies are alike. One feature that we may find in common in all bodies of water is the presence of some algal growth in equilibrium with the physico-chemical characteristics.

Limnology is the study of the functional relationship and productivity of freshwater communities as they are affected by their physical, chemical and biotic environment. Limnological study derives knowledge from varied disciplines as physics, chemistry, biology, geology, geography & applied sciences. It also involves a great deal of detailed field and laboratory techniques to understand the structural and functional aspect of fresh water environments.

On the basis of the salt content, their position on the earth, the water bodies are classified into four major categories as marine, freshwater, brackish and inland salt water.
The fresh water bodies are inland waters with a low concentration of salts (< 500mg / l) and are further classified into lentic and lotic ecosystems. Lentic waters are the stagnant water and comprise water bodies such as lakes, ponds, swamps and bogs. Forel (1892) defined pond as a lake of slight depth. It is generally a small, shallow, quiet standing waterbody.

The study of lakes and ponds as a science started as early as 1887 when the lake is described as a "microcosm" a little world within itself. Forel (1901) for the first time designated these studies as limnology hence he is referred as "the father of limnology". He wrote an inspiring book "The science of lakes" which provided an impetus for investigators on fresh water and many workers entered into this field. Among the pioneers, the contributions of Naumann, Welch, Birge, Juday, Thienemann, Ohle, Pearsall, Hutchinson and Ruttner had laid down firm foundation to limnology.

Freshwater systems of India received due scientific attention rather late the pioneering works of Prasad, Pruthi, Ganapathi, Chacko, Zafar, Krishnamurthy & Sreenivasan are the milestones in the history of Indian limnology. Progress in the limnological field since about 1910, particularly since 1918 has been more rapid and far reaching, also during that period limnology became more complicated and integrated, coherent branch of science.

In an aquatic environment, for that matter in any environment, the biotic and abiotic factors are not isolated but are interdependent. If changes take place in one system, it leads inevitably to changes in the other.

The biotic components in an aquatic ecosystem can be grouped variously on the basis of their life forms. They are plankton, benthos, periphyton, nekton & neuston. The plankton comprise all those aquatic organisms whose power of
locomotion are insignificant to enable them to move against the water currents & thus they are mainly suspended. The plant plankton are called phytoplankton.

The distribution and diversity of the aquatic organisms are affected by many factors such as temperature, transparency, concentration of oxygen, carbon-di-oxide, nutrients and other salts, dissolved organic substances like vitamins and growth factors.

Biological parameters are perhaps of greatest importance from human point of view. All natural waters contain a variety of organisms, both plants and animals as the natural flora and fauna. Unwanted biological growth of algae is also of utmost importance. Such algal growth are of common appearance in eutrophicated water and are due to nutrient enrichment.

One method of classifying water bodies is by referring to their trophic level. The waterbody is described as oligotrophic when the nutrient level is low, dissolved oxygen is appreciably high and dissolved organic matter is very low or absent. Such a waterbody, naturally, cannot sustain a massive growth of algae, not to speak of other organisms. On the other hand, a waterbody in which mineral nutrients are high can support a rich algal growth both in quantity and in species diversity, besides other organisms. Such a waterbody is described as eutrophic.

It is well known that during the development of lake, it may pass from an oligotrophic to an eutrophic state by acquiring more dissolved matter which may enrich its mineral contents and inturn increase the growth of organisms, primarily the algae. The process is known as eutrophication.

Eutrophication in a waterbody may take place by one or more natural processes. In an oligotrophic waterbody, the few algae present will generate
organic matter by photosynthesis and subsequently metabolic activities. These will accumulate in the waterbody and by microbial decomposition become converted into mineral water. The process is slow to begin with, but may increase with multiplication of algal forms. The increased nutrients in their turn will lead to an increase in biomass in the ecosystem. Then the waterbody passes on to an eutrophic state in which the water is nutrient rich and supports a rich algal biomass. This type of eutrophication is totally internal to the waterbody and the increase in nutrients is by an autochthonous process.

A second process of eutrophication is by an allochthonous increment of nutrients. This takes place by a flow of nutrients from surrounding areas, either in the form of minerals or in the form of organic matter, due to their being washed down into the waterbody by rain.

The phenomenon of eutrophication is a process of biological changes taking place in the water with more than one group of microorganisms are involved. The ultimate goal of eutrophication process is the increment of mineral nutrients by a process of microbial mineralisation. The mere addition of organic matter to a waterbody does not constitute eutrophication. In fact, it is the increase in mineral nutrients, either by direct addition or by microbial activity that contributes eutrophication.

The relation between the trophic state of a waterbody and the algal organism inhabiting it has been the subject of much study and speculation.

The algae of the open water of lakes, ponds and streams, the phytoplankton consists of a diverse assemblage of nearly all major taxonomic groups. Many of these forms have different physiological requirements and vary in response to physical and chemical parameters such as light, temperature and nutrient contents. Despite these diversities, many algal species coexist in the
same water volume. However dominant genera in algal groupings, change not only spatially but seasonally as physical, chemical and biological condition in the waterbody change. A general pattern of seasonal algal succession correlated with environmental factors has been described for many lakes, although the precise reasons for most of these changes are not well known.

Phytoplankton ecology has been one of the most popular areas of aquatic ecology in recent years and many inroads have been made in understanding algal light, temperature and nutrient requirements, biology regulation, competition, productivity and the effects of predation on phytoplankton. However large voids still exist in our knowledge of the many complex mechanisms that result is the wide array of planktonic algal communities observed worldwide. Further investigations, particularly in the areas of algal-microbial, algal-algal and algal-herbivore interactions, are most needed. The present study deals with the interaction between algal-algal and algal-physicochemical parameters.

The biological indicators of water quality are well recognized in public health engineering, science & technology, pollution control. Nygaard (1949) used algal indices to assess the trophic status of a waterbody. Kolkwitz (1950) made a concept of the "Biological indicators of pollution". Algae have been found to be one of the best parameters for the assessment of the trophic status of the waterbody. The trophic status can be assessed by compound index (Nygaard 1949), plankton abundance (Welch 1952), dominant phytoplankton species (Rawson 1956, Talling 1965,) and primary productivity (Rodhe 1969). Palmer (1980) demonstrated that algal assemblages could be used as indicators of clean water or polluted water.
A number of biotic indices were used for the assessment of water quality, which was studied by earlier workers like Beck (1955), Palmer (1980) Mason (1981), and Illangovan (1986).

Thus the earlier limnological literature shows that there exists a clean and distinct correlation between algal organisms and water quality, therefore algae are treated as bio-indicators. Determination of water quality will be of practical and immediate use to the people, as this will enable them to decide the usage of water for various activities.

There appears to be no limnological report on the ponds at Erode. Investigations were therefore undertaken to evaluate the water quality and the prevailing trophic status of 5 ponds located at Erode.