1. INTRODUCTION

Environment consists of five elements, air, water, land, flora and fauna that inextricably inter-linked. These tend to interact with each other continuously. Change in one of them may affect other elements and this disturbs the environmental balance.

Water is one of the most fundamental elements in the environment. It is considered as an essence of life. The use of water for various purposes including domestic, industrial and agricultural has no doubt increased in our life, which is vitally important abiotic component of the environment. Water exists in various forms in nature such as cloud, rain, snow, ice and fog. However; strictly speaking chemically pure water does not exist for any appreciable length of time in nature. By the time, it gets polluted severely and easily as it reaches us. It cannot escape pure while raining. It picks up small amount of gases, ions, dust and particular matter from the atmosphere. The quantity as well as the quality of water at given time and given space is very significant in relation to the life at that location at that time. It acts as a limiting factor and regulates in turn the diversity of biotic community and abundance of energy at various trophic levels. It also reflects upon the rate of succession.

Out of total volume of water (approximately 1.4 billion km$^3$) more than 97% is ocean water unsuitable for human use, 3% of the earth’s water is fresh. An estimated 77.2% of this is in frozen in the form of ice caps and glaciers. Most of the remaining freshwater (22.4%) is ground water and soil moisture. Rest of the freshwater is a very small amount of surface water. Out of this 0.35% is present in lakes and swamps and less than 0.01% in rivers and streams.

The amount of total water available for use in India is estimated to 1990 billion m$^3$ per year. About 86% of this comes from the surface runoff in river, streams, lakes and ponds, excluding ground water resources that still need to be tapped.

Water is one of the prime necessities of life. We can hardly live for a few days without water. Generally water contains Iron, Calcium, Manganese, Silica, Fluoride, Nitrite, Phosphate, Sulfates and Chlorides. When the quantity of these
components increases then it affects the body systems and cause distractions of health e.g. Arsenic salts can cause cancer, Cadmium affects kidney while Barium carbonate has bad effects on veins.

The study of freshwaters in all their aspects physical, chemical, and biological is termed Limnology (Odom 1971) or it is the study of freshwater or saline water which are contained within continental boundaries (Goldman and Horn 1983). Limnology is also described as “Hydrobiology or aquatic biology. According to Edgar Do Baldi a prominent Italian ecologist; limnology is the science dealing with internal action of processes and methods whereby matter and energy are transformed within the lake or pond. Welch (1952) stated it as the science dealing with biological productivity of water together with all casual influences on the qualitative and quantitative features along with its actual potential aspects. Wetzel (1975) defined limnology as “Study of the functional relationship and productivity of freshwater biotic environmental factors.”

Although limnological observation has a long history, they evolved only into distinct discipline during last two centuries. For the first definition of limnology one owe to, Forel (1892), a Swiss Professor, who has been called the ‘father of limnology’, his pioneering investigations were focused on Le Leman (Lake Geneva). He published three volumes on Lake Geneva in 1892, 1895 and 1904. In the first 40 years of the 19th century, Birge and Juday worked on Wis Consin Lake to become the first American limnologists. Thienemann and Naumann formed the International Association of limnology in 1992. Some important literature appeared in many languages such as Macan and Worthington (1951). Treatise on limnology by Hutchinson (1957, 1967 and 1975), Reid (1962). On tropical limnology by Beadle (1974), Wetzel (1975) and Cole (1983).

About 1500 years ago development had proceeded so far that an Aryan civilization in the dry zone of Sri Lanka relied on extensive exploitation of the stream of the low lands. The construction of system of reservoirs or lakes and channels started in the second century A. D. and reached a high technical level in the fourth century. Gradually much of low land of Sri Lanka was placed
under well-planned scheme of utilization of water. Damming of streams in India from ancient times mainly for irrigation and drinking water supply.

Human impact on nature is growing exponentially under the pressure of ever-larger technical projects. The streams and rivers are part of those natural systems, which produce easily exploitable energy, much appreciated for being clean and easy to handle compared to other forms and less disastrous to the ecosystem.

Therefore, in spite of the fact, the exploitation of streams goes on and will keep on going in the greater part of the world, majority of the economically exploitable running waters are already regulated or under construction for small and large scale irrigation project.

According to Water Frame Work Directive (WFD) some characteristics suggested for different type of lakes, each lake type reference conditions must be established representing, as far as possible, undisturbed conditions and including biological as well as hydro morphological and physicochemical baselines. The purpose is to identify reference biological communities against which other communities will be compared (Heinonen et al. 2001).

WFD gives standard definition for the classification of lakes into different ecological quality classes, such as high, good and moderate status. The ecological status of lake is based on its level of deviation from the reference biological population (which corresponds to high status) and includes Phytoplankton, Macrophytes, Phytobenthos, Benthic invertebrate and fish data.

Man has tried to cope up with this scenario and has rapidly advanced its efforts to counteract this Malady. In past few decades natural and polluted waters have been studied in detail all over the world and considerable data are now available on most kind of pollutants and their effects on ecosystem as well as on organisms. A large number of parameters signifying the quality of waters in various uses have been proposed. A regular monitoring of some of them not only prevents and hazards but also checks the water resources from going further polluted.
Reservoir is on unique man made ecosystem where fluviatile and lacustrine condition co exists according to Jhingran (1975). The dam Mahasangavi is 21 hectares. such a small and shallow freshwater body have been found to be much more productive than large impoundment (Holt 1966). Therefore priority should be given to the exploitation of these small water bodies.

Several researches from abroad have made contribution on hydrobiology on large natural lake and man made reservoirs of North America, Canada and Europe in temperate climatic conditions.


In India, worker like Chacko (1949, 1950), Ganapati (1940, 1956, 1957, 1962), Krishnamurthi (1965), Michael (1968) and Vijayaraghavan (1971, 1973) have done some hydrobiological work on historic shallow water bodies like moats temple tanks and villages ponds in South India. A few like David et al (1969) and Jhingran (1963) have worked on the large brackish water lakes and reservoirs. Sreenivason (1962-1972) reported a detailed account on the productivity of tropical waters of Tamil Nadu.


knowledge of physicochemical parameters along with biological characteristic can provide clear idea of the trophic status of any water body.

The primary productivity of the Phytoplankton is one of the most important sources of energy input in aquatic ecosystem. This productivity is largely dependent on the nutritional status of the aquatic body in relation with other physicochemical parameters. The process that contribute to primary productivity exhibit complex environmental relationship where radiant energy is converted to chemical energy with the help of other physicochemical parameters by the autotrophs via photosynthesis. Some workers such as Sreenivasan 1970, 1976, Gapnapati and Sreenivasan 1970, Vijayraghvan 1971, Vass and Zutshi 1978, M Babu Rao et.al 1981, Desai and Soni 1994, K Gurusamy and V. Ramadass 2000 have carried out studies on primary productivity of freshwater bodies in India.

In order to utilize a freshwater body it is very important to study the biotic and abiotic factor influencing the biological productivity of said water body. Research in this field is no doubt of indirect assistance but it will serve as a guideline to maximize the use of the productivity of water.

Such investigations estimate the productivity of any water body involves mapping the shape and depth of the water body, observation on the physical factors like temperature, turbidity, transparency and colour of water. Chemical factors like pH, dissolved oxygen, free carbon dioxide, and hardness of water. Biological investigations include study of micro and macro flora and fauna. It always provides the clear picture of the ecological relationship existing with water body.

Planktonic organisms play a vital role in aquatic environment. They form important links in the food chain and are capable of affecting the entire aquatic life. Information with regard to the freshwater planktonic organisms is scanty in India. The basic aspect of the knowledge of freshwater plankton is very limited and detailed study on their biological and ecological relations is required. However, the prominent contributions to the freshwater plankton in India are made by Allikunhi (1952), Arora (1931, 1966), Bhowmic (1968), Chacko and

Among the planktonic communities, zooplanktons occupy the key position in the food chain of lake determining its type grazing or detrital. Therefore, interactions between zoo and phytoplankton are accentual topic in plankton ecology. Zooplanktons are the microscopic free-swimming animal components of an aquatic ecosystem. These are primary consumers of phytoplankton. Zooplanktons provide the main food item to fishes and can be used as indicator of the trophic phase of water body (Mathew 1975, Verma and Datta Munshi 1987). Zooplanktons play integral role in transferring energy to the consumers, hence they form the next higher trophic level in the energy flow after phytoplankton. Therefore, in view of importance in studies related to their distribution zooplanktons have attracted the attention of several workers throughout the world.

The diversity of the zooplanktons in reservoirs is controlled by several physicochemical factors of water. The pattern of algal distribution and its density is the main biological factor affecting the diversity of the zooplanktons. Temperature, dissolved oxygen (DO) and organic matter are the important factors, which control the growth of zooplanktons (Hanazato and Yasuno 1985, Bhati and Rana 1987 and Takamura et. al 1989). Several researchers have used different zooplankton groups to evaluate the trophic status and pollution
potential of the freshwater bodies all over the world. Zooplanktons are also used as biological indicators of eutrophication.

Phytoplankton plays a very important role in regulating the dynamics of the aquatic food web and become a driving force in shaping the community structure of zooplankton (Xie et al. 1998).

Eutrophication is a global phenomenon associated with nutrient enrichment of aquatic ecosystems. In natural course it is slow process of dam aging which ultimately lead to succession. However, man is responsible for accelerating the process many folds endangering the very survival of water bodies all over the world. The Nutrients like Nitrates, Phosphates, Sulphates, Chloride are contributed to the process of eutrophication. Today in developing countries, sewage pollution from rapid urbanization is a major environmental issue. The dam of proper sewage treatment and disposal are the two factors responsible for gross pollution of ecosystems, particularly in urban environment.

Nutrient enrichment directly affects the water quality and lead to a number of consequences indicative of imbalance in the ecosystem.

The first and most visible symptom of nutrient enrichment is prolific growth of algal communities (Primary Producers) producing mono or polyspecific blooms. The main groups of hypertrophic phytoplankton are Cyanophyceae, Chlorophyceae, Cryptophyceae, and Euglenophyceae. Comparatively diatoms attain biomass lower than the preceding groups. Other groups like desmids occur in an oligotrophic system. Dianoflagellates, Chrysophyceae and Xanthophyceae are either absent or present in very low number in hyperthrophic lakes.

Blue green algal blooming is a global phenomenon and a lot of efforts at theoretical and practical levels are going on for the evolving effective strategies for its control. Environmentally the algal blooms are highly detrimental to ecosystem. They adversely affect the water quality, disrupt nutrient and energy cycles, alter trophic status, reduce biodiversity and are responsible for fish kills. Thus, water forming algal blooms is totally useless for aquaculture. Theoratically targeting the measures at life histories, environmental
requirements and ecological responses of the problematic species can control algal blooms.

Normally, well-balanced ecosystem maintains fairly constant bio-geochemical and energy cycles, trophic status and bio-diversity. Bio-diversity is markedly reduced and succession sets in. Fishes occupy high position in the food chain, moderately cool climate, high degree of precipitation and tropical ecosystem in lake, sustain significant fish fauna.

Present lake is extremely productive in terms of food, plants and animals, because the temperature of water was often lower than that of the surrounding air, it acts as valuable feeding havens during the cold. In addition it provides water for drinking, bathing and offers protection from land predators. It is not surprising therefore that this freshwater habitat is home of many bird species and visited by many other bird species not primarily adapted to aquatic life. Most of these are equally familiar in standing and flowing water, because of their size and the tendency of some types of flock together. Populations of aquatic birds are more likely to be found on lake, due to the amount of food needed to support them.

Aristotle (384-327 B.C.) is said to be the founder of Ichthyology. Day (1878) mentioned that the first modern writer on Indian fishes was Bloch, whose splendid work ‘Auslendiche fische’ was published in 1785. King Somesvara, the son of King Vikramaditya VI in 1127 A.D. composed a book titled ‘Manaslotara’ in which the first time he recorded the common sport fish of India. He classified these fishes into two group mainly marine and fresh water reverine forms (Hora, 1951).

“If you give a man fish, you feed him for a day”

“If you teach a man to fish, you feed him for life.”

The message is carved on a polished slab of Mahogany in businessman’s office in a lovely corner of Micronesian island. No doubt, the above message indicates the importance of both fish and fisheries.

One of the incarnations of God Matsa Avathara in profuse reference to fish is available in the great Epics of the country. The great epic Mahabharata
also refers about fish. Fish remains, indicative of their use as food by the people were obtained in excavation at Mohenjo-Daro and Harappa of Indus valley civilization (2500-1500 B.C.) Songs of the sangam age (1\textsuperscript{st}-4\textsuperscript{th} century A.D.) refer to the fish, their trade and fishermen community. In holy book Quran the reference of fish is seen it six place. AL-A’raf (Surah no. 7 Verse 163) AL-Kahaf (Surah no. 68. verse 10), while ornamental fish ponds appear in painting from ancient Egypt. The roman started costal fish farming in which still exists in Italy (Shepherd and Bromage, 1988). Historically fish farming was intended to make fresh products available to the people and their families or local communities. But now it is considered as effective contribution to national economy and source of highly nutritive food to mankind. Fishery also tries to solve the food problems of the country and provide employment. To achieve the goal it is obligatory to utilize the knowledge of all persons of all discipline to produce optimum yield. The present of research shows that the yield from fisheries can be raised many more times but it requires synchronization between demands therefore in the present context the meaning of fishery has been changed and now it becomes inter disciplinary.

Sir Francis Day studied the systematic of India fish in depth for over 20 years. In 1868, he published a report on the migration of fishes. The ever increasing demand for food calls for equal attention to aquaculture as is being given to land production, fisheries will result in an increase of per capita income, per capita production, per capita consumption and better socio-economic condition of the people.

Fish is one of the most important sources of animal protein. The per capita food consumption of eggs, meat, poultry and fish in India is 6kg and the consumption of fish alone 3.5kg contribute more than half of this, but there are number of other socio-economic reasons for which fisheries deserve special attention.

Water can also be cultivated to produce rich protein food. As described by Lone (1988) aquaculture is an under water agriculture. Water is the basic requisite for development of fisheries, fish can only be raised if sufficient water
is available either from rain or surface flow or underground. Rainfall in most part of the country is from June to September which constitutes main sources of water to natural water bodies like river, reservoirs, lakes, canals, drains, ponds, etc.

Fisheries form an important in the Indian economy which can substantially contributes to our foreign exchange help in generating in employment, raising nutritional resources and augmenting exports. Fishery is a valuable product has plays an important role in the economy of country. The fish has valued because it is not only satisfies the hunger but it also provides several essential amino acids. Fishes forms rich source of food and also provide several byproducts to us. Fish catches are mainly for human diet enriched by proteins, fats and vitamin A and Vitamin D. The phosphorus and other elements present in it give good taste and are easily digestible. Fish plays an important role it is not only useful for food but also be used biological control etc. The greatest value of fish is commercial use as industrial product and food. The fisheries have now become highly industrialized as it also plays an important role in poultry, piggery, and agro based industries as it has rich protein source.

The work on systematic and distribution of Ichthyo fauna remained fragmentary till early forties except the comprehensive work of the Day (1889), Linnaeus (1758) and Pallas (1767) described some Indian fishes. Russel (1803) made an attempt to undertake a systematic study on the Indian fish fauna. Day (1889) publishes “The fauna of British India” in which identified 351 genera and 1418 species of Indian fishes.

The Indian Ichthyologist Chaudhari (1916), Hora (1936) made an extensive contribution in the field of Systematics particularly on Indian cyprinoid fishes.

India is rich in fish fauna a series of attempts have been made to explore fish fauna (Moitra, 1956, Malaviya, 1961, Srivastava, 1968, Tandon and Johal, 1972)

A bird has been described as a “Feathered Biped.” This description is apt and precise, and can apply to not other animals.

Stories on birds are a part of our culture. The Ramayana, Mahabharata and Rigveda are full of such interesting stories in every language of our country, bird’s names are found. Sanskrit, the mother of most Indian languages refers a very good description of birds.

Among all the groups of animals in the world, birds are the most like because of their rich colouration, songs, easy recognition and liveliness. Moreover, birds are present everywhere in forest, grasslands wetlands, crop fields and even in city gardens. With proper care, we can even attract birds to our balcony or veranda. Fortunately, our country is very rich in bird life. It is estimated that there are more than 9,000 different kinds of birds of the world.

Birds occupy an important position in the animal kingdom especially in relation to man. Economically, they are both useful and harmful to human interest. Some of the uses to men are as biological control, as scavenger, as pollinators as seed disperser and fertilizer.

The waste products of birds act as a rich manure. Many more advantages can be listed – birds such as Vultures, Crows and Eagles etc. are scavengers i.e. they feed up on the bodies of the dead and thus keep the environment clean. Some birds are food for men.

Conventional method of fresh water food webs assumes that fish occupy the top trophic level. These are the most important biotic determination of trophic abundance lower down in the food web. (Vannote et.al. 1980, Fry 1991, Well Born et.al. 1996) However many terrestrial predators including many bird species, feed on aquatic system and therefore are components of trophic level in aquatic food webs. (Steinmetz, 2003)
Water birds are commonly grouped into several categories based on their behaviors: Gulls, shore birds, wading birds, waterfowl and terns (Eleanor C. Foerste, 2000). One of the most common diving birds seen locally is the Coot. These small birds are dark gray to black with white bill.

Migration can be regular and seasonal long distance movement animals between different geographical areas. In the case of mountain birds, this distance can be short. Some birds winter from very cold to warmer climate. This is known as altitudinal migration.

Large migratory flocks grouped on local lakes during the winter. They appear to walk on the water before they get up enough life to fly. Coot eats aquatic plants, including Hydrilla and insects. A variety of ducks that are commonly found on the water, they are belonging to waterfowl. Wading birds are especially adapted to the dry weather and feed on fish that are trapped in shallow water pool. The Great Blue Heron is one of the largest wading birds. This bird has great eyesight and spears fish with its sharp bill. Large wading birds including Storks, Ibis, Spoonbill and Flamingoes wade in shallow water or across mud flats, Wet fields or similar environment to find food.

Many adaptations in birds to life around water are related to feeding style (Storer, 1971) example includes the traditional Pelecaniformes with their wadding around all four toes totipalmate feet. Further more, the five living species of Flamingo show many unique characters related to their unusual filter feeding life style in tropical saline water (Olson and Feduccio 1980, Zweers et.al. 1994).

The Shoebill and Hamez Kop are two additional enigmatic species, which shows a blend of morphological characters shared with either wader or non waders.

The monitoring of water resources through regular analysis has become crucially important feature. It is essential for exploration, exploration and conservation of the potentials of the water bodies. Keeping this in view, we have made an attempt to evaluate the important physico chemical and biological parameters along with the diversity of avifauna from Mahasangavi Dam.
The principle objectives of present study

The assessment of water quality is necessary because of many reasons

1) To help for providing pure water to the public for drinking and domestic purposes

2) To study the quality of surface water during different seasons of the year

3) It will play an important role in planning activation about biodiversity.

4) To study pollution status of the water in these water bodies.

5) To study the development of community which is directly or indirectly dependent on the water bodies, like fishes and wetland birds