Discussion
The Konder lake of Gonda District of eastern Uttar Pradesh on which ecological studies has been carried out represents a special type of habitat. It is a shallow, eutrophic lake, supports a rich aquatic vegetation of both micro- and macrophytes. The monthly/seasonal changes of different physico-chemical and biological conditions of the lake has already been described in the preceding chapters. The salient features of finding of all parameters have been discussed below:

Ecological study of the lake.

The various physico-chemical characteristics of water and mud sample of the lake in relation to periodic changes have been described earlier in the chapter IV. Their interrelationships, interdependence and modifications with particular reference to the biology of the lake are discussed here.

A very close analogy exists between the depth and the transparency on one hand and the depth clarify it on the other hand. Both of them go hand in hand and are to some extent inversely proportional to the temperature of
water. Further, the greater fluctuation in the water level of the lake favours the formation of large littoral regions.

An intimate relationship exists between the air and water temperature (Table IV.2) as both differ slightly and tend to rise and fall together. Sometimes they show a wide divergence when the bright sun light up the water surface and the accompanying cold wind lowers down the air temperature.

The fluctuation of the water temperature in any aquatic habitat has little to do with the distribution of the species, but it does influence the physico-chemical characteristics of the habitat. The high temperature from March onward initiates rapid decomposition of the organic matter in the substrate and consequently the mineral content rises in the lake water during the following months (Table IV.16).

The recent opinions suggest that the pH is less important as a limiting factor for the life in aquatic environment. In the present investigation, high pH value (Table IV.5) obtained coincided with the winter maximum of the dissolved oxygen, when concentration of several other factors like chloride, calcium, nitrate and phosphate was minimum. The pH consequently cannot be considered as an index of chemical factors prevailing in the water. This observation is in concurrence with those of Abbasi et al. (1996) and Allen and Kramer (1972).

Further, an inverse correlation was found between the pH and the temperature which is contrary to the observations of Lande and Sinha (1996)
and Vyas and Kumar (1968).

Juday et al. (1935) have pointed out, with respect to the lakes of north eastern Wisconsin, that the annual variation in the pH value of these lakes was usually less than 3 and the difference between the pH of surface and bottom waters was also 3. In the present findings, whereas the annual change in pH was up to 2.4, the maximum difference between the surface and bottom water was 1.85 only.

Although the amount of air dissolved in water is richer in oxygen than the atmospheric air, yet under normal condition the amount of oxygen dissolved in a unit volume of water does not exceed more than 5% of that present in an equivalent volume of the atmosphere, because the total amount of air held in aqueous solution in very small. Moreover, the rate of diffusion of oxygen in water is several times less than that in air. Oxygen concentration, therefore, is a much more critical factor in aquatic environment than in the aerial one. Hence the low oxygen supply or even anoxia may confront both the planktonic and benthic organisms at certain times.

Rawson (1939), while reviewing data involved in the metabolism of lakes, reported that changes in dissolved oxygen concentration of a given volume of water which receives no tributaries, are mainly caused by three processes (a) an interchange of oxygen between the atmosphere and water, (b) consumption of oxygen by the direct chemical oxidation and by aerobically respiring bacteria, plants and animals in water and substratum and (c) production of oxygen by the photosynthesis of plants in water and
on the surface of the substratum.

The dissolved oxygen (Table IV.7), in the present investigation, was plentiful during winter months, when submerged macrophytes were luxuriant and in monsoon months, when there was rich microplanktonic vegetation and addition of excess oxygen from intensive rainfall. The oxygen production during these periods exceeded many times than the oxygen consumed by the organisms as has also been observed by Ganpati (1941) and Sreenivasan et al. (1964) for the reservoirs of Madras.

As stated earlier, the difference in the values of dissolved oxygen in the surface and bottom waters was more during winter months than the summer months, when due to high temperature and fast blowing hot winds, the diffusion of gases was more rapid. This caused a uniform distribution of dissolved oxygen.

The free carbon dioxide was detected mainly from the polluted region during the winter and monsoon months. Its absence from the littoral and pelagic state regions of the lake suggested that probably all the carbon dioxide produced during the respiration of living organisms was either utilized in photosynthesis of the autotrophs or was converted into the bound forms of mono- and bicarbonates—a feature reported earlier by Rawson (1939).

The free carbon dioxide varies according to the photosynthetic activity of autotrophs in the lake water. These organisms are able to utilize the free as well as the bound form of carbon dioxide. When only the free
form is utilized, its bound form got precipitated (Rawson 1939). The low amount of carbonate in the bottom water of the lake was probably due to the availability of insufficient amount of free carbon dioxide for photosynthesis.

The alkalinity of water (dissolved carbonate and bicarbonate content) is often used as an arbitrary basis for classifying waters into nutrient types (Chartrth, 1992) observed that in south Scottish lakes, 40% had 1 to 15 ppm- a class the regarded as nutrient poor, 40% had 16 to 60 ppm-which he considered as moderately rich and only 20% had more than 60 ppm which he deemed as nutrient rich. Since in the present lake 102 to 380 ppm of alkalinity was obtained during different months of the year, hence it could be classified as a nutrient rich lake (Chartrath, 1992).

Calcium is also of fundamental importance for the plant nutrition. In lakes, it undergoes an active circulation and may be lost either temporarily or permanently by precipitation as lime or calcium carbonate. Ohle (1934) considered lakes with less than 10 mg/l of calcium as poor, with 10 to 25 mg/l as medium and with more than 25mg/l as rich. Westlake (1960) made an useful observation that if no macroscopic lime encrustations are visible on plants, etc., the water is poor in calcium, if they are visible medium, and if abundant encrustation and concretions occur the water is rich in calcium. In the Kondar lake, there was an abundant growth of macrophytes and a few of them had deposits of calcium oxalate crystals inside their stem. In addition, the macroscopic encrustations were fairly distributed on
the floating leaves, submerged stems and shells of molluscs. This indicates that the lake water is rich in calcium.

The significance of calcium content in determining the trophic nature and the classification of lake has been stressed by Rawson (1939). According to him the typical eutrophic lake is rich in calcium and the typical oligotrophic lake, poor in calcium. In the present investigation the calcium content ranged between 76.0 to 250.0 ppm (Table IV. 13), which is fairly high and thus indicates the eutrophic nature of the lake.

In the present investigation, an inverse correlation was found between the transparencey (Table IV.4) and the organic content (Table IV. 17) of the water. The former is to some extent also dependent upon the temperture of the water.

A direct link was observed between the chloride (Table IV.11) content and the water temperature, since both of them fluctuated identically. Further, with the increase in the chloride content, the nitrate and phosphate contents also increased which is in concurrence with the findings of Sahai and Sinha (1969). The high concentration of chlorides is indicative of richness of organic matter in water or substratum. The latter on account of its rapid decomposition during the summer months brings about an immediate increase in the inorganic nutrients, like nitrates and phosphates in water.

The nitrate and phosphats (Table IV.14), form major raw materials for the protein synthesis. Rawson (1939) nas pointed out that the quantity
of available nitrogen and phosphorus in any water is indicative of its productivity. The amount of nitrate and phosphate in the recent lake was relatively small (Table IV. 12, 14). During summer months when these nutrients were maximum, the venual circulation brought about their uniform distribution in the surface and bottom waters. In monsoon months, the phytoplankton in the upper layer began to consume it, due to which their values started declining considerably. By the death and decay of these micro-organisms in the followings months, large amount of their organic remains get deposited into the bottom of the lake.

The increases in quantity of these nutrients from the onset of summer months in the lake, was mainly due to rise in the water temperture which caused decomposition of the organic remains by saprophytic organisms. The latter were abundantly distributed in the polluted areas of the lake which had the maximum organic waste.

From the lake sediment (Table IV 20 to 29) findings it is evident that there exists an intimate relationship between the total organic matter and the nitrogen content of the bottom deposits of the lakes, since they were maximum during monsoon months and minimum during winter month. It is mainly on account of the fact that with the onset of summer season, the plants inhabiting the lake margin start dying due to high temperature of the season and their organic remains are washed into the lake with the surface runoff from the surroundings areas during the monsoon season. This increases the organic and total nitrogen content in the littoral and polluted
regions of the lake.

The present lake seems to be rich in organic matter. The organic matter and total nitrogen contents are inversely proportional to the nitrate and available phosphorus contents because during summer months the organic matter present in the substrate undergoes a rapid decomposition causing, thereby, an increase in the nitrate and phosphate contents. In the following months, these chemical constituents get dissolved into the water and due to venual circulation, get distributed. The gradual rise in the nitrate and phosphate contents in the lake water with the onset of summer season also substantiates the above contention (Table IV. 24, 26, 28).

The calcium content (Table IV.27) of the mud does not show any distinct relationship with other constituents present there because of its multipurpose functions. It is mostly utilized by the autotrophic and heterotrophic organisms. Its trend of fluctuation shows to some extent a correlation with the rise and fall of the organic matter and total nitrogen.

The calcium is needed in large amounts by the micro- and macro-producers and in lesser amounts by the consumers. The diatoms and molluses accumulate it in their shells and certain macrophytes possess calcium oxalate crystals in their bodies. After the death and decay of these organisms large amount of calcium is released to the substrate again. The high calcium content found in the littoral region is primarily because the free-floating macrophytes are abundant in the shallow regions of the lake as compared to the deeper regions and then the planktonic organisms also
get accumulated along the lake margin due to wind and water currents and after their death and decay, their calcium content is released to the mud of the littoral region (Nishi, 1990).

Sediment is an independent and dynamic body of nature that acquires properties in accordance with the forces which act upon it. Considerable work has been done on morphometries and physico-chemical properties of sediments of different water bodies. But no work on seasonal variation and sediment inter relationship has been worked out. Similar work like in Kondar lake has been done in Ramgarh lake of Gorakhpur (Sahai & Sinha, 1969). The soil is slightly acidic due to presence of humus which posses different amino acids. Break down of humus results in increased concentration of carbon-dioxide. Hydrolysis of acid, salt and production of organic acid which add total acidity of the sediment as reported by Sharma and Sharma (2004). The conductivity of sediment is high as has been observed by Mitsch and Goseline (1986). The conductivity of sediment gradually decreases from winter to monsoon due to rapid decomposition of dead plants and animals (Sharma and Sharma, 2004).

Total alkalinity, chloride, organic matter, organic carbon, available phosphorous, nitrate, total calcium and magnesium generally increase from winter to summer. Similar results has been also obtained by Bellamy (1967) in the ephemeral swamp. Chartrath (1992) has reported reduction in total nitrogen, phosphorous and calcium in Dal lake during summer. The
reason for this may be due to the exponential growth of macrophytes (Trihal and Kaul 1983). The increase in these nutrients in the Kondar lake is probably due to the reduction in macrophyte biomass, rapid decomposition of humus. Bhatanagar (1984) have advocated in favour of decomposition of humus during summer. The reduction of water table during summer like in the ours causes setting of water minerals on the sediment bed adding to the nutrient availability of sediments. The increase in water table causes rapid growth of macrophytes which utilize the nutrients from the sediment during monsoon. Therefore in monsoon period, the level of almost all the nutrients of the sediment is decreased. Dixit (1987) have worked out the correlation of different physico-chemical factors of the sediment which shows that conductivity is negatively and significantly correlated with organic carbon at 5% level. Chloride shows negative organic carbon and organic matters show positive significant correlation with available phosphorous at 5% level. Organic carbon was found to be highly significant with organic matter at 1% level.

**Biodiversity of the lake.**

In an aquatic complex, the environmental conditions differ considerably from one type of vegetation to the other. The environment of free-floating aquatics consists of water and air, of submerged aquatics water and soil; of attached emerged aquatics-air, water and soil; and of marshy plants air and soil only. It is, therefore, difficult to establish the role of any one of them in the development and growth of these
macrophytic communities.

Pearsall (1917, 1918, 1920, 1921) from his pioneer researches on the dynamic relationship existing between the hydrophytic communities and their environmental conditions, made observations that in English lakes, the succession of communities is controlled primarily by a allogenic factor.

During the present investigation, although plants like *Hydrilla verticillata* and *Najas graminea* were distributed throughout the lake, yet their growth was luxuriant only in the pelagic waters. On the other hand, the plants like *Potamogeton gramineus*, *Potamogeton pectinatus*, *Chara zeylanica* and *Ceratophyllum demersum* were invariably restricted to the littoral regions of the lake. The chemical composition of the mud where these two different types of communities (*Hydrilla-Najas* community and *Potamogeton-Chara-Ceratophyllum* community) inhabit, showed a significant difference in organic matter, nitrogen and calcium contents.

Soulthorpe (1967) has reported that the principal influence of the substratum upon the distribution of rooted vegetation is primarily due to its physical texture rather than its chemical composition. The important physical properties of the submerged soils are the composition and nature of the basin, deposition of in washed inorganic and organic sediments and the activities of flora and fauna themselves. In the Kondar lake, however, due to low embalance, the substratum forms a smooth, gently slope with slight variation in its physical texture from the margin towards the centre
of the lake which is only up to 3 m deep. Therefore, the chemical composition of the bottom deposits of this lake is more important than its physical texture. A distinct correlation between the mineral composition of the mud and the mineral solutes in water was observed. The latter are frequently utilized by the micro-and macrophytic plants as a nutrient.

In the present lake, it was further observed that with an increase in the free-floating vegetation, the calcium content of the mud decreased. It was probably due to high requirement of calcium during the rapid organic production of these aquatics (Singh, 1981; Sinha, 2007).

It is an established fact that vascular hydrophytes require the same micro- and macro-nutrients that are essential for the healthy growth of terrestrial plants. The ions of major metabolic significance are those of potassium, calcium, magnesium, iron, ammonium, nitrate, phosphate and bicarbonate. Pearsall (1921) observed an abundant growth of macrophytic aquatics where the water was rich in calcium, magnesium and silicate. In the present findings, a direct correlation has been noticed between the free-floating macrophytes and the nitrate and phosphate contents of water.

In addition to the correlations between the aquatic macrophytes on one hand and the chemical conditions of water and mud on the other as shown above, there were certain physical and climatic factors also which influenced the growth and metabolism of these plants to some extent. In the Kondar lake, the marshy vegetation was mainly composed of rainy season plants which showed their first appearance with the commencement of
rains. They produced flowers and fruits during the late monsoon or early winter months and start disappearing with the onset of summer months.

There exists a direct correlation in the densities of the bacillario-phyceae algae and protozoans and an indirect correlation in the densities of rotifers and zooplanktons. The phytoplankton population is always inversely correlated to that of zooplankton population.

The plankton vegetation, on which the entire aquatic animal life depends, directly or indirectly, is largely governed by the interaction of a number of factors (Reid, 1961). The correlation between the physico-chemical factors and the fluctuation in the plankton density is as follows:

From the data in the chapter IV Section-A, it is evident that no single factor, physical or chemical, is responsible for the seasonal growth of the phytoplankton or zooplankton of the lake. Das and Srivastava (1956a) has stressed the need of taking into consideration a number of physical, chemical and biological factors, which act simultaneously, while assessing the seasonal fluctuation of planktonic population in any water.

Amongst the physical factors, water temperature is considered to be mostly responsible for the fluctuation in plankton density. Evans (1962), Boulder (1969) and Prasad (1916) have stated that the temperature is the only determining factor in the seasonal distribution of these organisms whereas, Vashisht (1968) has observed that the plankton density changes inversely with it. The water temperature during study period exhibited a positive correlation with the plankton density.
Further, the diatom population also showed its peak during the summer months when the temperature was maximum. This finding is in concurrence with that of Pahwa and Mehrotra (1966) and Venkateswarlu (1969, 1970).

As observed earlier, the rotifers were maximum during the winter months and thus they showed an inverse correlation with the water temperature—a feature also observed by Slatyer (1977).

Amongst the **Chemical factors** pH, free carbon dioxide, oxygen, alkalinity, nitrate and phosphate seems to affect the seasonal fluctuation in phyto- and zooplankton populations. Stephen *et al.* (1964) has stated that pH value of any water is an important factor is plankton development. Kolff (1967) and Sreenivasan *et al.* (1964) have also shown that water maintains a relatively high pH when the phytoplankton is rich and well developed. In the present investigation, the maximum populations of phytoplankton was recorded when the pH was comparatively low. Similar observation has also been reported by Vyas and Kumar (1968).

Michael (1984) have observed that the zooplankton density was inversalyl correlated with the pH value of the water in a fish pond at Hyderabad. In the present study, however, a direct correlation between the two was observed.

The high oxygen level in the water during post-monsoon months seems to be directly related with the phytoplankton density and thus supports the observations of Arivazhagan and Kamalaveni (1997), Das
and Srivastava (1956 a). The high amount of dissolved oxygen in post-
monsoon months corresponds with the phytoplankton maximum of that
season but in summer months the phytoplankton maximum coincides with
the low value of the dissolved oxygen.

In the Kondar lake, the amount of free carbon dioxide and zooplankton
population show an inverse correlation, which is in concurrence with the
observation of Vyas and Kumar (1968) and contrary to that of Das and
Srivastava (1956 a).

Stephen et al. (1988) has emphasised the importance of alkalinity as
a factor determining the nature and periodicity of plankton population in
fresh waters. He regards the water bodies having alkalinity less than 50
ppm as less productive, 50 to 100 ppm s moderately productive and 100
to 200 ppm or even up to 650 ppm is highly productive. On this basis the
present lake come under the last category. It started increasing with the
rise in the phytoplankton density and the two attained their respective
maxima during August-September.

Pearsall (1932) has associated the diatom periodicity with the amount
of silica, nitrate, and phosphate present in water. In the present study, a
relationship was noticed between the diatom pulse and the chemical
factors of the lake water like chloride, nitrate, phosphate and calcium.
Vyas and Kumar (1968) have also reported that the relatively high amount
of these nutrients in the water of Indrasagar tank promotes the growth of
planktonic algae.
The zooplanktonic population, however, shows an inverse correlation with the rise and fall of these trends in the lake water.

**Interrelationship between abiotic and biotic factors of the lake.**

It is established that metabolic activities of aquatic plants and animals are to a great extent controlled by certain physico-chemical conditions of the water in which they grow. Soulthorpe (1967), while dealing with the biology of aquatic vascular plants has stated, "The intricate pattern of environment-community interaction is difficult to analyse and the various physiographic, climatic, edaphic and biotic factors tend to be somewhat arbitrarily delineated." He has, further, pointed out that the environmental factors interact amongst themselves an none of them is singly responsible for controlling the growth and distribution of aquatic plants. In addition, the biota themselves modify the nature of water to a great extent.

The **aerial environment** has pronounced effect, directly or through its interaction with other physico-chemical conditions of water bodies, on the development, metabolism and production of certain plant communities. Hogweg and Brenkert (1969) have reported that in different geographic regions, their respective climatic conditions may be prohibitive or determinative factors. They have shown that while in Netherlands, the aquatic vegetation was poorly developed or even absent during the cold season it was so during the warm season in many regions of India. They have observed that the atmosphere and/or moisture act(s) as limiting
factor(s).

The climatic condition of the study area differ pronouncedly from one season to the other and have a direct bearing on the ecology of the Kondar lake.

The percentage cover of attached-emerged and marshy plant communities starts decreasing with the onset of summer and reach their respective minimum by the end of the season. They reappear with the onset of monsoon which suggests that they are probably not able to withstand in the low air moisture and hot winds of the summer season.

The phytoplankton productivity shows a positive correlation with the temperature of the lake water as it excess on increasing with the rise in temperature. On the contrary, the zooplankton population shows an inverse correlation with the temperature.

The aerial environment also affects various abiotic components of the lake. The sufficient increase in alkalinity, chloride, nitrate, phosphate, calcium and organic matter content during summer season seems to be directly correlated with the rise in air temperature since the latter causes a rapid decomposition of the organic remains present in the lake. The sharp fall in the quantity of chemical constituents during the following post monsoon season is mostly due to their dilution by rain water.

Further, the high temperature of summer season accompanied by fast blowing winds brings about a fairly uniform distribution of dissolved gases and ions in the lake water. This helps in the rapid increase all types of
planktonic organisms.

The physical and chemical nature of water plays a significant role in the distribution, periodicity and productivity of aquatic plants.

The high turbidity of water in summer and monsoon months, which inhibits the photosynthetic activity of the submerged macrophytes, promotes the growth of the phytoplanktons and attached emerged macrophytes.

The pH value and carbon dioxide of water have some effect on the metabolism of certain aquatic animals, particularly the fishes. The aquatic plants, however, show certain degree of tolerance to these factors. The carbon dioxide available for the photosynthesis of such plants is usually insufficient and to make up this they use the bicarbonate of the lake water as substitute. In the present study the amount of free-carbon dioxide shows a close relationship with the phytoplankton periodicity however, it does not do so with that of the free-floating and submerged macrophytes.

The oxygen concentration is a critical factor in any aquatic environment. The low concentration of oxygen is usually responsible for the mortality of a number of heterotrophic lives. The production of oxygen in photosynthesis by aquatic plant communities is usually many a times more than its consumption in respiration by them. The direct effect of submerged hydrophytes on oxygen balance of the aquatic environment occur from their photosynthesis and respiration reproduction and decay (Sculthorpe, 1967).

For establishing a correlation between distribution of the aquatic
plants and the amount of oxygen dissolved in the surrounding water is imperative that the oxygen produced by these plants must be liberated to the water and not to the atmosphere. This is not at all possible for all the types of aquatic plant communities because in the free-floating and attached-emerged plants, major amount of oxygen evolved is released to the atmosphere and not to the water. The oxygen concentration in the present lake exhibits two maxima one during winter months and the other during post-monsoon months. Whereas, the former peak coincides with the distribution of submerged plants, the latter with that of the phytoplankton.

In the early part of summer, water hyacinth *Eichhornia crassipes* shows an extensive growth and occupies more than 50% of the total water surface. The oxygen dissolved in the water during this period does not increase in its concentration because much of the oxygen produced in photosynthesis by these plants gets released to the air. Soulthorpe (1967) has rightly said, "Since rate of photosynthesis may well differ between aerial and submerged parts, as a result of different prevailing light intensities and since some oxygen may diffuse from the aerial to the submerged parts, it is impossible to make correlation for assumption based solely on the observed proportion of the crop which is above water. Values of photosynthetic oxygen production calculated from crop data are therefore only very approximate."

This is true that aquatic plants also require the same micro- and macro- nutrients that are essential for the healthy growth of the terrestrial
ones. The ions of major metabolic significance in the fresh waters are those of potassium, calcium, magnesium, iron, ammonium, nitrate, sulphate, phosphate and bicarbonate. Pearsall (1921) has correlated the growth of macrophytic species with the amounts of calcium, magnesium and nitrate present in water. In the Kondar lake, a direct correlation has been observed between the nitrate and phosphate contents of water and distribution of free-floating and attached-emerged macrophytes. Further, the amount of bicarbonate, calcium, nitrate and phosphate contents of the water directly influence the phytoplankton periodicity.

The composition of sediment layer of any water body is important because of the possibilities which it offers for the anchoring of plants to the substratum and the favourable conditions for the survival.

Pearsall (1921) has observed that in English lakes, the distribution of aquatic plants was primarily governed by an allogenic factor: the net accumulation of inorganic silt. Sculthorpe (1967) has reported that the principal influence of a substrate upon the distribution of rooted vegetation was mainly due to its physical texture rather than its chemical composition.

In the present study the lake basin is more or less saucer shaped i.e. has a smooth, gentle slope from its margin towards the centre. There is slight variation in the physical properties of the soil beneath the littoral and the pelagic regions. The density of the rooted vegetation is invariably more in the pelagic region rather than the littoral region. On the other hand, the free floating micro- and macrophytic vegetation is mostly confined to
the littoral region only. The results of chemical estimations of soil from the shallow and deep waters have shown a significant difference in the quantity of major elements like nitrogen, phosphorus and calcium (Table IV.25, 26, 27) which agree with the findings of Pearsall (1921), Rawson (1939) and Reid (1961).

These observations further indicate that both the physical and chemical nature of the substratum are equally important for the growth and distribution of micro- and macrophytes in any water. A distinct relationship exists in the present lake, between the mineral composition of the mud and the mineral solute in water. The distribution of the submerged and attached-emerged macrophytes are markedly affected by certain edaphic conditions.

In addition to the correlations discussed above, the organisms also interact amongst themselves. As the free-floating vegetation is always maximum in the shallow regions of the lake, the submerged aquatics found there, receive comparatively less quanta of light, due to which their growth is considerably retarded. Further certain free-floating macrophytes, like the 'duck-weeds', which form of thin cover over surface of the water, interfere with the gaseous exchange and adversely affect the growth of submerged plants.

The phytoplanktonic organisms were invariably high during summer and monsoon season but in winter season their density declined considerably due to the rapid increase in the population of zooplankton.
This indicates that production of the latter increases at the cost of the former. Other intricate relationships amongst the organisms might also be existing but on the basis of the present findings, no concrete conclusion can be drawn.

**Fauna of the lake**

Kondar, wetland is of prime importance as it attracts thousands of migratory avifauna every year in winters. The prevailing suitable climatic conditions, presence of plenty of food materials and nesting and breeding sites are the reasons for their immense immigration into this wetland area. Besides the migratory avifauna, resident birds, fishes, molluscs and fresh water turtles are also frequent in this wetland. Zooplankton which feed on the phytoplanktonic organisms play an important role in forming the food web. These microplanktonic organisms also indicate the water quality in which they found, therefore, serve as "Bio indicator".

In a wetland *faunistic* features and their interrelationship with vegetational features and physico-chemical characteristics of water and sediment is of extreme importance to understand the interaction amongst all the components of the ecosystem. Hence *faunistic* parameters have also been carried out and envisaged in the work. These include census on population of aquatic birds and habitat preference of common fishes.

**Nature tourism of the Kondar lake.**

The ecotourism or nature tourism is of immensene importance and multiferious interests involving a number of social, national and international
areas. In the recent trends, the tourism has been declared an industrial field of commerce i.e. business. This field has been recognized with great potential in developing a healthy economy of the country, state and region concerned. But due to lack of a coherent policy of an agency the tourism industry is not making much headway. The ecotourism, nature tourism and beach tourism along the sea beaches are the very new additions towards the type of the tourism. Although these are attracting the interests of the tourists towards their natural lust but there is great scope in popularising this aspects of the tourism among the people of this country and foreign also. In the form of the new destinations of the tourism going out for recreation and entertainment. The ecotourism has to be promoted because it involves a minimum monetary and human resources for the maintenance and upgradation of the lake, hills, garden, parks and sea beaches etc. as lure for the incoming tourists. The lake can be considered as endowments on parks with any other tourist destination only because of its scenic beauty attractions. Ecotourism industry at present need a serious boosting in this area. It is a non-investment area of the tourism industry based on the natural resources, scenic beauty and other ecological attractions with great scope. It is further facilitated by local participation due to local employment generating potential plus environmental conservation. This Kondar lake can attract national as well as international tourists because it is associated with the other tourists places of this area. Hence, there is strong scope for the development of the ecotourism in this area.
A number of studies have been done on the social and cultural impact of tourism development because it is a positive relationship in between "hosts and guests". This all leads towards a development while travelling. The social impact of tourism will vary according to the difference between the visitors and the visited, whether in term number, race, culture or social outlook. The relationship between hosts and tourists establishes a transitory relationship often coupled with language barriers but allow a limited relationship between two. Some time this relationship is restrained because as tourist are on holiday but the hosts are at works usually. The impact to tourism on traditional life style is especially important where as that tradition forms the basis for the development of the tourism. There are certain other related aspects such as economic, environmental besides social and cultural values. Attitudinal impact of tourists and host are also other very important points to be considered but there is an important role for ecotourism in nation and community, increasing a greater social contact with tourists. These observation are in close agreement with our observation in the present work. Positive cooperation between tourism and environmental authorities is very crucial for future development of ecotourism. There is urgent need to create awareness among the people about the in tourism sector which creating job as well as earning of national and foreign exchange.

There may be debate upon the importance of tourism. Boom or Ban, some people think that glorious contribution of ecotourism upon income
and employment while other feel that it has deleterious effects ranging from introduction of drugs, gambling, prostitution, deforestation, psychological, colonialism and so on. Therefore, the ecotourism benefits are at the costs of social values. Ecotourism is a part of the tourism and is a multifaced activity in the area ranging from snow-clad mountains, silky beaches, and forests, it is of two-way exchange between economical value and cultural resources. Just like the example of bird's watching at Bharatpur, Rajasthan while others prefer to watch bird's suicide at the site of Jattingha, Assam. Some way or the other it is detrimental to the environmental concern. Although the ecotourism is smokeless and less exposed to pollution because its development is not like to that of petrochemicals or steel plant which bring about a number of environmental hazards.