Chapter - II

Review of Literature
The fresh water includes underground water and surface water which includes water present in rivers, lakes etc. Water serves as the second natural medium for the growth of micro-organisms and stands next to soil. Algae and other aquatic vegetation are also present in a fresh water. The growth of biotic life in water mainly depends on amount of available mineral, nutrients and the dissolved oxygen present in it. 3/4\textsuperscript{th} surface of earth is covered 95% is ocean, 4% as ice and fresh water is just 1%.

As there is uneven distribution of water resources on this planet, water is stored in dams, lakes, ponds etc. in India, after independence a large number of dam have been constructed on different rivers. Some of these are multipurpose dams. This water is used for irrigation, power generation, industries, domestic purposes, to develop fish and hatcheries etc. Some such important river projects are Bhakra-Nangal, Kosi project, Hirakund dam, Nagarjunsagar project, Chambal project etc. in Maharashtra also several dams viz. Koyana, Jayakwadi, Bhandardara, Nandur Madhameshwar, Bindusara, etc. are constructed in last few decades. (Tambe and Pingle 2010).

Studies on the ecology of various water reservoirs have been carried out in different parts of our country. This includes study of physio-chemical parameters, study of aquatic vegetation, study of birds and animals and their inter-relationships. The main components of such water bodies are algae which are the primary producers in aquatic ecosystem.

One of the striking features of the fresh water algal flora is the comolitanism. Many species are found in all world from tropis to the polar region and in variety of habitats, other species are restricted to particular habitat, but even these may be found at stations, thousands of miles apart (Smith, 1950).
Ecology of planktonic algae from inland Lake of Wisconsin was studied by Smith (1920). In addition, many other workers in first few decades of 20th century performed studies on different rivers. Classen, (1927) studies polluted areas of Genesee river system. Effects of industrial pollution in lower Potapscro river area were observed by Davis (1948) and studied the effect of copper pollution on plankton Palmer (1959, 1969 and 1980) studied algae in water supplies, algae in water pollution and made a composite rating of algae tolerating organic pollution.

A check list of fresh water algae in South Carolina has been published by Jacobs (1968). Many species are found in all parts of world from tropics to te polar region and in variety of habitats, other species are restricted to particular habitat, but even these may be found at stations, thousands of miles apart (Smith, 1950). Planktons of river Illionis and its main basin part have been studied by Kofoi, (1903).


Habib et al. (1997) observed seasonal change in phytoplankton community structure in relatio to physico-chemical factors in Loch Lomond, Scotland. UNEP (1987) also publishes report on environment protection report, about available water.

The toxic algal blooms in the lake Hussain Sagar, Hyderabad has been reported by Kodarkar et al. (1998), Munawar (1974) studied the Limnology of fresh water pond. Munawar and Zafar (1967) studied on a preliminary study of vertical movement of *Eudorina elegans* and *Trinemalineare* eluring a bloom cause by them.

There are comparatively few reports on the study of algae from Assam and Sikkim, studies on limnology and productivity of Dighari Beed, have been carried out by Yadav et al. (1987). A new species of *Oedocladium* i.e. *oominilateralis* has been reported by Das and Nath (1990) from Ranchi. Seasonal variations in limnological properties of wetlands of Santhal paragans of South Bihar were studied by Kumar (1995). He has (1995) also reported periodicity and abundance of plankton in relation to physico-chemical characteristics of the wetlands. Jeeji Bai and Lakshami (1990) studied on the phytoplankton flora of a few temple tanks in Madras and their unique phycobiocoenoses.


Biodiversity of algae from wetlands of North Bihar has been studied by Yadava (2008). They have reported occurance of *Hydrodictyon, Ulothrix, Cladophora, Chaetomorpha, Spirogyra, Rhizoclonium, Chara, Nitrella* and *Batrachospermum*.

The co-relationship of algal blooms at Baroda and certain physico-chemical parameters have been discussed by Nandan (1983). Nandan and Patel (1984) studied ecology of algae of Vishwamitri River. Cladophorales of Gujarat have been reported by Gajaria and Patel (1987). Biswas et al. (1996) studied the river basin potential assessment and management of the river Hoogaly. Ganpathi (1943) studied on ecology of temple tank, containing a permanent Bloom of *Microcystis aeruginosa*. They have also reported
69 taxa of desmids collected from different fresh water bodies in Kerala State, Ramnathan (1964) studied on Ulotrichals.


Gupta (1989) has surveyed different parts of Maharashtra and reported the algal flora of various locations. He has described 402 algal taxa from Kolhapur (1963a), 54 taxa from Mahabaleshwar (1963b), 636 taxa from Vidarbha region of Maharashtra (1973a), desmids from Marathwada (1973b), 151 algae from Marathwada (1974a), Pingle (1981) studied the algae of impoundment and streams in Maharashtra. Oedogonialses of Pashan Lake have been observed by Pingle (2005) and reported 06 species of Oedogonium and 04 species of Bulbochaete for the first time from Maharashtra.

Patil and Nandan (1994) studied on limnological studies of Nakana Lake of Dhule, Tripathi and Pandey (1989) studied on algae of polluted ponds of Kanpur II. Physico-chemical study of Ujani dam back-water has been done by Gore and Pingle (2007), Gore and Pingle (2008) have reported fresh water algae from Ujani dam back-water at Sidhteka of Ahmednagar district, Bapat and Madalpure (1971) studied the observations on the hydrobiology of the river Kham. Bhave and Borse (2001) studied the seasonal variations in temparature, DO., pH and salinity and their influence on planktons in Aner river water, Jalgaon, Balkrishnan and Chaugule (2002) studied the checklist of Algae, Biodiversity of the Western Ghats of Maharashtra. Bodas Kanchan (1991) studied the hydrobiological and taxonomic studies of some lotic and lentic water in the around


Rao (1938) has given a systematic enumeration of species belonging to Myxophyceae of the Orissa Province, Gupta and Sharma (1973) reported seasonal variations in selected limno-chemical parameters of Amarchand reservoirs of Southern Rajasthan. Gupta (1973) studied on statistical methods of water parameters. Misra et al. (2001) have described 17 taxa of Chlorophyceae from Basti District. Fresh water Cyanophycean algae from the same area have also been described by them (2005). Rai (1975) studied on the river Yamuna at Delhi. Rajan (2000) also studied the Chlorophyceae algae. Dwivedi et al. (2005) have described 45 species of blue-green algae from different agro-climatic zones of U.P. and studied their distribution pattern with seasonal variation.


The classification of fishes based on economic importance. Lagler (1956) and Mishra *et al.* (2003), Singh and Saha (1981) studied diurnal cycle of above. Parameters in Ramsar well at Bhagalpur (Bihar) and recorded the water temperature fluctuated between 17°C to 26°C. It was highest up to 14 hours and minimum at 5 hours. The water temperature fluctuated between 22°C having diurnal range of 20°C. Similar diurnal range was also observed by Bohra (1977). Dobriyal and Singh (1981) studied on diurnal variation in limnology of the river Mandakim from the Garhwal Himalaya and observed that water temperatuure for 24 hours are in the range of 4.5°C 15.5°C in the Mandakin river water temperature follows a definite pattern of diurnal increase (during day) and decrease (during night), and also reported in the studies of Jakher and Rawat (2003), Verma (1967) and Bohra (1976). There is also a negative relationship diurnal temperature variation and dissolved oxygen as shown by Verma (1967).

Mishra (1991) studied on hydrobiology of Hirakund reservoir and observed the mean water temperature of the reservoir was 29.2°C. The mean temperature dropped slightly to 27.7°C in the bottom waters. There was a slight seasonal temperaturre variation. The reservoir attained highest surface temperature 32°C in October and December at site
while the lowest temperature 27.4°C was recorded in May and August. Sharma (2003), while working on seasonal variations in physico-chemical parameters of the river Munneru at Nandigram town (AP) observed the highest surface water temperature was 37°C in May while it was 19°C in January. According to Fritsch (1975), high water temperature and low dissolved oxygen during summer create favourable conditions for the development of blue-green algae.

Kulkarni and Patil (1995) observed diurnal changes in physico-chemical characteristics of Sadatpur Reservoir of Ahmednagar District (M.S.) and observed that in winter low water temperature, high aeration rate and high photosynthetic activity might have increased amount of dissolved oxygen (DO) 8.60 ppm, than monsoon 7.90 ppm and in summer 5.02 ppm. Increase in the temperature of water in summer might have resulted in decrease of dissolved oxygen (Ellis, 1973) during this period.

Sreenivasan (1974) on Bhavani Sagar reservoir, Bohra (1976) on Padam Sagar and Rani Sagar lake of Jodhpur and Sharma and Michel (1980) also noted the similar relationship between air and water temperature. Joshi (1985) observed that during summer, water temperature was high due to low water level, clear atmosphere and greater isolation from sun, Alien (1920). Prasad and Manjula (2003) stated that temperature is the determining factoring the seasonal distribution of the organisms.

Singh and Saha (1981), observed the temperature in the range of 18.3°C to 35°C which is within the tolerance of most of the cultivable fishes. Singh (2000) recorded physico-chemical parameters in Pherson lake, Allahabad (U.P.) and observed water temperature ranged 16°C to 33.2°C and 15 to 34°C during 1982 and 1983 respect minimum temperature was recorded in January observed maximum in during both the years. Jain and Thakur (1996) studied on seasonal variations in physico-chemical parameters of Amula lake and recorded that water temperature was found to be lower than the air temperature. As such, these two parameters exhibited a good correlation.

Jayabhaye et al. (2008) investigated water temperature ranges from 22.0°C to 31.0°C during 2005-2006 and 22.3°C to 30.8°C during 2006 to 2007 in a minor reservoir
Sawana, Hingoli District. Narayana *et al.* (2008) were recorded water temperature varies from 24.75°C to 30.25°C. highest water temperature was recorded during summer season 30.25°C whereas least was observed in winter season 24.75°C of Anjanpura reservoir near Shikarpur, District Shimoga, Karnataka. Jawale and Patil (2009) were recorded water temparature was maximum 30°C in September and minimum 21°C in December at site I and maximum 29.8°C in September and minimum 21.1°C in February at site II in Mangrul Dam, Dist. Jalgaon, Maharashtra.

Ingole *et al.* (2009) were recorded water temperature fluctuate between 23.1°C (December) to 31.0°C (May) in Majalgaon dam, Dist. Beed, Maharashtra during study period from June 2005 to May 2006. Vasumathi Reddy *et al.* (2009) were recorded the water temparature range between 22.6°C to 32.0°C, being minimum in winter and maximum in summer of Pakhal lake of Warangal District, Andhra Pradesh. Jawale and Patil (2009) were recorded seasonal variation in temparature ranged from 23.0°C to 32.0°C seasonal analysis showed that it was highest 32°C in summer season. Monsoon season in 23°C and winter season is 27°C. The water temparature fluctuated according to atmospheric temparature. Saxena (1982), observed a linear relationship between pH and free carbon dioxide. The steady increase in pH, dissolve oxygen. The higher value of pH can attribute to increased primary production in aquatic ecosystem (Zafar, 1996). High rate of photosynthetic activity will raise the pH (Perkins, 1976).

Karadkhele *et al.* (2008) were investigated the pH value ranges between 7.7 to 8.6 at spot A and 7.6 to 8.4 at spot B from water body in Nana Nani Park, Lahur, Maharashtra. Jaybhaye *et al.* (2008) were recorded the pH values ranged from 7.4 to 8.5 being minimum in summer and maximum in winter of Kayadhu river, Dist. Hingoli, Maharashtra from January 2004 to December 2004, Jawale and Patil (2009) recorded the pH value was highest 8.4 in May and lowest 7.42 in October at site 1 and highest 8.3 in May and lowest 7.6 in December during November 2006 to October 2007.

Ingole *et al.* (2009) were recorded the pH vary from 7.3 (July) to 8.5 (March and February). The alkaline pH levels observed during summer season and could be due to enhanced rate of evaporation in Majalgaon Dam, Beed district of Maharashtra.
Vasumathi Reddy et al. (2009) were observed the pH value of Pakhal lake water ranges from 7.2 to 8.2. The high pH was observed during the summer season (March to May) in Pakhal lake of Warangal District of Andhra Pradesh. Vijayakumar et al. (2009) were recorded the pH ranged between 6.7 to 8.4, lower values were recorded during August to December and higher value in April to June in the Thengaithittu Estuary Pondicherry South India. Tripathi and Pandey (1990), Singh and Rai (1999) also draw similar conclusion. Natural water with pH value between 6-8 can be considered as potable water (Mini et al., 2003).

According to Shastri et al. (2004) an increase in TDS increases hardness of water he observe the Visapur dam. Negative correlations of rainfall were observed with chloride and magnesium and dissolved oxygen was pointed by Venna and Mohanty (1995) in fresh water Malayanta Poni in Laxmisagar (Bhubaneshwar). Jain and Thakur (1996) were observed chloride contents in Halali reservoir. Vidisha district (MP) it has high values in summer, minimum in monsoon it varies from 7.9 to 37.0 ppm. Low chlorides (4 to 20 ppm) only indicate the purity of water due to high rainfall and free from pollution Srinivasan and Santhanam (1998). Where as higher values of salts due to less rainfall denote pollution. Singh (1960), Verma and Shukla (1969) have also drawn same conclusions from their own studies. Kheradkhele (2008) recorded the ranges of chloride between 173 to 310 mg/L in Nana Nani Park, Latur. Vasumathi Reddy (2009) recorded the ranges of chloride between 44 to 79 mg/L. Maximum concentration recorded in summer and minimum in winter, in Pakhal Lake, Warangal district (A.P.). Zafar (1966) and Venkateshwarulu (1969) as also make similar observation. High concentration of chlorine may be due to accumulation at excess chlorides in Wilson dam. Excess of chlorine in water can accelerate corrosion, deteriorate, number, may cause tastes in canned foods or frozen products Kaur et al. (1997). According to Trivedy and Goel (1986), the presence of phosphate in water is due to detergents, fertilizers and biolofical processes. Sarvaakumar et al. (2008) the observed high mosonal phosphate value might be due to the regeneration and release of total phosphorous from bottom mud into the water colour hyturbulence and mixing. Basavaraja Simpi et al. (2011) observed the physicochemical parameters of Hosahali water tank in Shimog District, Karnataka.
According to Khaiwal and *et al.* (2011), Phosphate present in natural water ranging from 0.02 to 0.20 mg/L in Delhi upstream. Phosphate value increase during early winter due to the Agricultural runoff containing phosphate fertilizers as well as waste water containing detergent which increases the phosphate value of Delhi downstream water. Shinde and *et al.* (2010) studied the Harsool-Savangi Dam, Aurangabad district in Maharashtra, India. According to the phosphate concentration ranges between 0.14 to 0.92 mg/L and minimum during Summer. Similar results were reported by Lende and Yeragi (2004) from Phirange Kharbav Lake, Maharashtra.

Kamalkhanth and *et al.* (2012) recorded the maximum values of phosphate during the post monsoon season and minimum value was recorded during pre-monsoon season. Kavita Sahani and Sheela Yadav (2012) studied the Bharawas pond Rewari, Haryana. Higher Concentration of Phosphate in dry season may be due to low level of water and pollution. Kamal *et al.* (2007) observed the simiar finding in their studies on Mours river. According to Pandey *et al.*, (1991), Patil (2000) highest nitrate values were found during the monsoon (June to September 2009) at all sites. Chopra and Patrick (2000) observe the minimum nitrate 0.01 mg/L during May 2008 and Novenber 2009 at sampling site S1. according to Khaiwal (2001) the Nitrate value ranges from 0.5 to 2.3 mg/L. Nitrate valus seen to be due to the local run off from adjacent crop field in these areas when the farmers used Nitrogen fertilizers.

According to Kapoor and and Bamniya (2001) Nitrates and Phosphates have been found to be high in the month of September Singh *et al.* (2009) have concluded the Sager lake (India) have attained the highest eutrophic state due to high Nitrogen and Phosphate in the lake water. Shinde *et al.* (2010) reported Nitrate value of Harsool sarangi Dam. The value ranged between 0.51 to 2.1 mg/L Nitrate values were maximum during Monsoon and minimum during winter. Pawar and Mane (2006) reported low nitrate level in Sadatpur lake maharastra, Lendhe and Yeragi (2004) reported high value of nitrates in Phirange Karbav lake Dist Thane Maharashtra.

Ashok prabu and *et al.* (2008) recorded highest values of nitrates in monsoon and could be due to organic materials receive from the catchment area during ebbtide Singh
et al. (2009) studied the sager lake according to him the sulphate value rang between 30.79 to 45.30 higher values recorded in a early in summer. According to Welch (1981) when water is overloaded with organic waste to the point is removed then SO$_2$. as an electron acceptor is often used for the breakdown of organic matter and produces H$_2$S and a rotten egg smell.

Dissolved oxygen (DO) shows diurnal and seasonal variations. It is a well know known fact that oxygen is used by bacteria, Blum (1957), Saxena et al., (1966), Bulusu et al. (1967), Venkateshwarlu (1969) and Tripathi and Pandey (1989) for the decomposition of organic mattet and partly due to its composition in oxidation process, Lalman and Dixith (1989). Do was observed by Kulkarni and Goel (1988) in two small water bodies of situated at Aundh. Karadkhele et al. (2008) were investigated the dissolved oxygen (DO) value ranges between 3.0 to 5.2 mg/L at spot- A and 3.8 to 5.9 mg/L at B indicate the polluted water body in Nana Nani Park, Latur, Maharashtra. Narayana et al. (2008) were recorded dissolved oxygen level in the rang of 4.71 to 8.28 mg/L. DO Masood Ahmed and Krishnamurthy (1990) observe the DO arange of 6.94 to 11.34 ppm during 1976-77 and 7.83 to 11.35 ppm during 1977-78. it was maximum in summers and minimum in monsoon of both the years in Wohar reservoir at Aurangabad (MS). Higher values of DO were recorded during summer months i.e. march to June during both the years was observed by Tripathi and Pandey (1990). Higher values of DO were recorded during summer months i.e. March to June during both the years was observed by Singh (2000) in Pherson lake Allahabad. Pande and Asha Mishra (2000) was studied on fresh water of deharadum, the DO content in Dhara lake Mussoorie is 7.48 mg/1.

Karadkhele et al. (2008) were investigated the dissolved oxygen (DO) value of water body in Nana Nani Park, Latur, Maharashtra. Narayana et al. (2008) were recorded dissolved oxygen level of Anjanpura reservoir, Shimoga District of Karnataka State during November 2005 to Octomber. Kumar (1990) estimated that the density of phytoplankton is greater during summer, post monsoon and winter and is lowest in monsoon. Sahu and Choudhary (1985) obtained the maximum density of phytoplankton during July and minimum during January. Verma and Mohanty (1995) recorded the
phytoplankton at Danmundpur pond. Kulkarni et al. (2005) recorded a total 45 phytoplankton species belonging to classes Bacillariophyceae, Pyrrophyceae, Cyanophyceae, Silicoflagellates and also recorded the average contribution of diatoms, dinoflagellates and other algae of phytoplankton of Bhatye estuary, Ratnagiri, Maharashtra. Rajdeep Dutta et al. (2005) also recorded a total number of species of phytoplankton from sewage polluted coastal waters of Thoothudi, Tamil Nadu, Pawar et al. (2006) recorded number of phytoplankton population from pethwadaj dam, Taluka Kandhar, District Nanded, Maharashtra. Narasimha Rao and Raju (2001) observed the Bacillariophyceae from fish culture pond near Gunter, Andhra Pradesh. Nafeesa Begum and Narayana (2006) were observed the phytoplankton population from four lentic water bodies in and around Davagarere city, Karnataka and density of phytoplankton were high during summer season from four lentic water boies and around Davangarere city, Karnataka.

Jayabhaye et al. (2008) were recorded the dissolved oxygen values ranged from 3.9 to 8.5 mg/L. minimum values of DO were recorded during summer season and maximum during winter months. Jawale and Patil (2009) were observed the Mangrul dam Dist. Jalgaon, Maharashtra, Ingole et al. (2009) were observed oxygen concentration of Majalgaon Dam Beed district, Maharashtra. Vasumathi Reddy et al. (2009) were observed dissolve oxygen value of Pakhal lake, Warangal, Andhra Pradesh. Jawale and Patil (2009) were observed the dissolved oxygen during the summer season while high monsoon season and dissolved oxygen were recorded during the winter season in secind Terna Makani reservoir in relation to Pisciculture, Osmanabad distric of Maharashtra during the January 2007 to December 2007. Vijayakumar et al. (2009) were recorded dissolved oxygen (DO) ranged from between 1.3 mg/L to 5.2 mg/L. highest level of dissolved oxygen observed during summer season and low level of oxygen during post monsoon season in the Tengaithittu estuary, Puducherry, South India. Trivedy (1985), More and Nandan (2001) studies the waterbodies of Dhule district.

Chandrasekhar and Kodarkar (1994) studied on Saroor Nagar Lake, Hyderabad (AP) and recorded BOD values of lake water has high nutrient enrichment and resultant Mussorie Lake. Mohmad Musaddiq and Rizwan Khan (2001) studied on Sashastradhara
stream and Mussorie Lake. Mahmad Musaddiq and Rizwan Khan (2001) studied on ecology of Lonar Lake, Buldhana (MS).

Karadkhele et al. (2008) were investigated the BOD value water of Nana Nani Park, Latur (M.S.). Narayana et al. (2008) were recorded water parameters of Anjanpura reservoir near Shikarpura Dist. Shimoga, Karnataka. Jayabhaye et al. (2008) recorded BOD values of Kayadhu river district Hingoli (MS). Ingole et al. (2009) recorded BOD value of Pakhal lake of Warangal district (A.P).

Khapekar and Deshpande (2007) were recorded a total of 20 phytoplankto species during investigation of Naik lake, Nagpur (MS). Jayabhaye et al. (2007) recorded 43 species of phytoplankton belonging to four (4) major groups of algae of Parola dam, Hingoli, Maharashtra. Pinel-Alloul (1995), Gaston (2000) and Wetzel (2001). A large number of studies covering a wide variety of ecosystems and organisms suggest that species richness tends to vary strongly with ecosystem production habitat heterogenicity. This is particularly so with freshwater fauna (Zooplankton), which plays a key role in preservation and maintenance of ecological balance and its basic study is wanting and is absolutely necessary.

Among several factors, temperature seems to exhibit the greatest influence on the periodicity of zooplanktons to Byars (1960), Battish and Kumari (1986), Prasad and Singh (2002) and Kaushik et al. (1992). This is particularly so with fresh water fauna (zooplankton), which plays a key role in preservation and maintenance of ecological balance and its early stages of their external feeding. Seasonal fluctuation in rotifers population are influenced by interrelated climatic and abiotic parameters, which vary from place to place several studies have been made pertaining to ecology of rotifers in different water bodies of Indian subcontinent by Dutta (2005), Jhyoti and Sehgal (1979), Sinha (1986), Dhanapathi (2000) and Pradhan and Chakaborthy (2006). Macrophytes diversity in different freshwater bodies of India and abroad have been done by several workers Billore and Vyas (1981), Dey (1978), Zutshi et al. (1980) Unni (1971) and Kiran et al. (2006) were studied aquatic macrophytes in fish culture ponds at Bhadra fish farm, Karnataka. Sharma et al. (2007) were studied occurrence of macro invertebrates in
relation to water and sediment characteristics in their seasonal ponds of southern Rajasthan.

Aquatic plants can be used as diagnostic tools for surveying water quality in rivers, Holmes, (1987). According to Sugunam (1995), total area under the reservoirs in India is 3.1 million hectares; these include more than 19,000 small reservoirs with a total water surface area of 148,555 hectares and about more than 180 medium and 56 large reservoirs are used for various activities such as drinking, irrigation, fish production, industrial cooling, power generation, and many others, Sathe et al. (2001). Some of the aquatic plants are being cultivated for their astonishing diversity of medical and aesthetic values, Bardach (1968).

Lata and Dubey (2010) recorded 15 species representing 13 families of aquatic macrophytes belonging to 2 free-floating, 6 emergent, and 2 each in respect of submerged and marshy amphibious varieties. They recorded and grouped a total of 17 aquatic macrophytes, of which 5 belonged to dicots, 8 monocots, and 4 were of other groups. Out of 19 species of macrophytes, Chara species is macrophytic algae and Marsilea quadrifolia salvinia malesta and Azolla pinnata were aquatic ferns (Pteridophytes); the rest 13 species were of angiospermic nature. Penfound and Earle (1948), Dymond (1959), Westlake (1963), Jha (1968), and macrophytic diversity in different freshwater bodies of India and abroad. Talnikar (2005) studied and recorded the biomass of Hydrilla verticillata. Kiran et al. (2006) studied and recorded the diversity of aquatic macrophytes in fish culture ponds of Bhadra fish farm, Karnataka. Devi and Sharma (1998) and Gorai et al. (2005) studied and recorded that the solar radiation affects the temperature in the biosphere and controls the seasonal variation, growth, and distribution of living organisms and also recorded the seasonal variation of physico-chemical factors and seasonal occurrence of different zo macro benthos inshore bottom zones of two freshwater ponds, Dhanbad, Jharkhand, India. Boss (1968) found that the temperature and total alkalinity greatly influenced the abundance of benthic organisms. This investigation is also supported accordance with number of research authors.
Kadam and Gaiakwad (2006) were recorded or confirmed the occurrence of 23 fish species from Masooli reservoir district Parbhani, Maharashtra. Jayabhaya et al. (2006) were recorded 11 fish species the Parola dam near Hingoli district, Maharashtra. Pawar et al. (2007) reported 26 fish species belonging to 7 orders, 10 families and 17 genera from Pethwadaj dam, Taluka Kandhar, District Nanded, Maharashtra. Battal et al. (2007) recorded a total 18 fish species from Ekrukh Lake, near Solapur (MS). Sharma et al. (2007) recorded fish diversity is represented by 29 fish species belonging to 6 orders, 11 families and 19 genera from Kishnapura lake, Indore, Madhya Pradesh and also reported that order Cypriniformes was dominant with 15 fish species, Perciformes with 3 species and Mastacembeliformes, Clupeiformes and Beloniformes represented by one species each. Rajaram et al. (2004) have studied ichthyofaunal diversity of great Nicobar Islands. Jayabhaye and Kodarkar (2008) reported a total of 25 fish species belonging to 14 genera from Sawama dam in Hingoli district of Maharashtra.

Okram et al. (1996) and Devi and Sharma (1998) and recorded Ten (10) species occurs throughout the year including Cyperus sp. Cynodon, dactylon, Hydrilla verticillata, Spirodela polyrhiza, Alternthera philixeroids, Jussiaea repens, Vallisnaria sp. Marsilea quadrifolia, Monochoria sp. And Typhy species. Kiran et al. (2006) were recorded altogether 15 macrophytic species belonging to 13 families. This includes 250000 species of flowering plants, 21730 species of fishes, 4522 species of amphibians, 6550 species of reptiles, 9702 species of birds and 4629 species of mammals. Good quality of water described by its physical, chemical and macrobiological characteristics. But some correlation were possible among these parameters and significant one would be useful that indicate quality of water Dhembare et al. (1997). The composition of water are depends on its source such as surface or ground, its geographic origin and seasonal variations. The surface water is constantly exposed to wind and rain which disintegrate its structure and favor, the growth of microorganism’s Gopal et al. (2009).

The huge variety of species and genes represents a living library of options to adapt to change to develops immunity to disease, and to pass improved fitness on to future generations sustaining biodiversity is essential to the health of our environment and to the quantity of human life. Robert et al. (1974). Zooplankton has been a subject of study in
India and several workers worked such as Ganpati (1943), Sharma and Patnaik (1985), (2000), Narsimha Rao and Jaya Raju (2001), studied the dynamics of zooplankton. Patil et al. (2008) and Pawar and Pulle (2005) were studied qualitative and quantitative study on zooplankton in Pethwadaj dam, Nanded. Kamble and Meshram (2005) were study zooplankton diversity of Khatijapur tank, near Achalpur district Amravati. Ugale et al. (2005) was studied zooplankton diversity in Jayatunga Samundra reservoir, Kandhar, Nanded, Maharashrta. Mediha Shafiq et al. (2006) was study the population dynamics of rotifers in Ranjit sagar reservoir. Bharat and Meshram (2007) were studied the zooplankton dynamics of Ambadi dam, near Akot district Akola. Pandit et al. (2007) was studies on zooplankton diversity of Pravara River, near Sangamner city District Ahemdnagar. Krishnamoorthy et al. (2007) was study the diversity of zooplankton in mangrove area of pondicherry, India. India Sree Latha (2007) was study seasonal variation of zooplankton of Goutami-Godavari estuary Yanam Pondicherry (union territory). Charjan et al. (2008) were study on rotifers fauna in Indian waters has been studied by a number of authors, Anderson (1989), Jorge Jimenez et al. (2009), was study seasonal changes in the rotifer (Rotifera) diversity from a tropical high altitude reservoir (Valle de Bravo, Mexico).

Zooplankton in water forms the main taxonomic groups. The members of the zooplankton are important for their role in the tropic dynamics and in Energy transfer in the aquatic ecosystem. Zooplankton diversity refers to verify within their community. They provide food for fishes in the fresh water ponds and reservoir and play a major role in the fish production. Notable contributions on planktonic forms of fresh water ecosystem are available due to Sharma and Michel (1987), Sharma (1996) and Kodarkar (1994).

The knowledge of their abundance, species diversity and special distribution is important in understanding prophodynamics and trophic progression of water bodies Methew (1978). The zooplankton can also play an important role in indicating the presence absence of certain species of fishes. Zutshi et al. (1980), Babu Rao (2001), Dutta (2002), Prasad (2003), Lendhe (2004) and Vaishali Sumani (2004). The zooplanktons in
water belonging to main four Taxonomic groups such as Rotifera, Copepod, Ostracoda and Cladocera.

In general there was fairly good flound in selected study sites of Wilson Dam. The composition and periodicity of Zooplankton varied from station to station as well as month to month. In present investigation it was observed that in winter and summer the Zooplankton population was more. These results correlate with investigation of Raj Narayan et al. (2007) and Singh et al. (2010). They shows higher concentration of dissolved oxygen favored the growth of Rotifers. The same results were obtained during the present investigation.

The knowledge of their abundance, species diversity and special distribution and literature on zooplankton and biological, indicators of water quality and special prophodynamics and trophic progression of water bodies, Methew (1978), Mahajan (1981), Khan and Seshagiri Rao (1981). The freshwater zooplankton form an important group as most of them feed upon and incorporate the primary producers into their bodies and make them available to higher organisms in food chain, Michael (1973). Michael (1968), Mandal and Moitra (1975) and Sharma et al. (2007) also studied on occurrence of macro-invertebrates in relation to water and sediments characteristics in three seasonal ponds of southern Rajasthan. Adarsh Kumar et al. (2006) studied biodiversity assessment of macroinvertebrates in Ranjit Sagar Reservoir Jammu, J & K, India. Many reports have been published on macrobenthos diversity in and around, Mumbai, Quadros and Athalye (2002), Vankatachalam and Kale (2002), Gorai et al. (2005) studied on the macrobenthos of two freshwater ponds, Dhasnbad, Jharkhand, India. Bhagde and Mane (2005) were studied the biodiversity of edible bivalve shell fishes from the Ratnagiri coast of Maharashtra. Shibu and Rita Kumari (2006) were studied the occurrence and distribution of macrozoobenthos in the riverine and estuarine zones of the Paravur lake, Kerala. Many investigators made the previous studies on macrozoobenthos in India, Krishnamurthy (1966), Bose and Lakra (1994) within the aquatic communities benthic macro-invertebrates represent one of the groups most affected by reservoir construction, Henry (1999). Anitha (2004, 2005) and Rayali Srinivas Rao (2006) were study conducted on lakes in and around Hyderabad, Andhra Pradesh. Sharma et al. (2007) were studied
the biodiversity of benthic macro invertebrates and fish species communities of Kishanpura lake, Indore, Madhya Pradesh.

Pillai (1977) were reported that benthos play a vital role in the marine food chain and in the recycling of essential life sustaining elements. Varsheney et al. (1988) showed that study of macrobenthos can acts as an indicator of demersal fishery potential. Kamble and Kamble (2009) were studied the biodiversity of some aquatic animals (Crustacenas, Molluscans and Fishes) from Ruti reservoir, near Ashti, Distric Beed. Pawar et al. (2007) were studied diversity of macrobenthos in Karanja creek, west coast of India, Raigad, Maharashtra and reported biodiversity of certain crustaceans from class crustacea.

Annadurai (2006) studied Gastropods diversity of the Gulf of Mannar marine biosphere reserve, Tamil Nadu, India. Kulkarni et al. (2006) studied the diversity population density biodiversity and biomass of some molluscan at Haji Ali seashore of Mumbai. Pawar et al. (2007) studied the microbial diversity in water and sediment of Karanja creek, west coast of India, Raigad, Maharashtra. Sharma et al. (2010) were studied distribution of molluscan biodiversity in Narmada River, Madhya Pradesh, India.

Krishnamoorty et al. (2006) were recorded the diversity and richness of Branchyaran crabs of Ariankuppam estuary, Pondicherry, Union Terriory, India, Adarsh Kumar et al. (2006) were studid biodiversity assessment if macro invertebrates in Ranjit Bose and Lakra (1994), Chandrashekhkar and Kodarkar (1966), Bose (1968), Sarkar (1989), Bose and Lakra (1994), Chandrashekhkar and Kodarkar (1994), Anitha et al. (2004) made previous studies on the macro-zoo benthos in India, within aquatic communities benthic macro-invertebrates represent one of the most important groups affected by reservoir washim district, Maharatra.

Macrophic diversity in different freshwater bodies of India and abroad have been done by serveral workers, Unni (1971), Zutshi et al. (1980), Billore and Vyas (1981), Day and Kar (1989) The review on the utiltization and aquatic macrophytes for food, medicine and other miscellaneous uses in peninsular, Malaysia are provided by Nather
Khan (1990) Marginal or partially submerged plants that generally lined the banka of the water bodies are useful in preventing soil erosion some fresh water macrophytes provides a feeding ground for migrating birds and breeding ground for snails. Pillai (1977) reported that benthos play a vital role in the marine food chain and in the recycling of essential life sustaing elements. Varsheney et al. (1988) showed that study of macrobenthos can acts as an indicators of demersal fishery potential Kiran et al. (2006) reported the aquatic macrophyte in fish culture ponds at Bhadra, fish farm, Karnataka Biodiversity is the variability among living organisms from all sources including interalia, terrestrial, marine, freshwatewer and other aquatic ecosystem diversity, which are closely related to each other, Bisby (1995), Maruthanayagam and Sharmila (2004) During present investigation few economically important microphytes including Hydrilla verticillata, valliseneria, Cyprus, Azolla, Eichhorina sp. Chara sp. And Ipomea sp. Marselia sp. etc. are present. According to Hess and Halls (1945) all three types of aquatic plants were seen in Wilson dam.

Tijare and Thosar (2008) recorded 32 species of 25 genera belonging to 13 families under 6 orders from the lakes of Gadchirol district. Ashashree et al. (2008) reported and confirms 18 species of fish which come under 7 orders of 8 families. The order Karnataka. Srikanth et al. (2009) reported 31 species of fishes belonging to 6 orders, 23 genera, 14 families out of which Cypriniformes order with 13 species, Silluriformes 7 species from Rammappa lake, Warangal district, Andhara pradesh. Sugunan and Yadava fishery. Similar type of investigations by central inland capture Fisheries Reserarch institute reported presence of 49 species belonging to 30 genera and 12 families in Bhatghar reservoir. And institute also recorded 44 endemic and 7 introduced fish species in Aliyar reservoir Gopinath and Jayakrishna (1984) mention 17 species of fishes from Idukki reservoir, Kerala. Patole and Patil (2009) reported 25 species comprishing 22 genera, 12 families of 5 orderes. They include most of food fishes and few are game an larviverous fishes. Order Cypriniformes form major bulk (60%) of the local ichthyoafauna followed by Siluriformes and perciformes contribute 16% each and 4% each from Osteoglossiformes, Clupiformes and synbranchiformes from Panzara river (Tahsil-Sakri), Dsitrict Dhule, Maharashtra.
Kamble and Kamble (2009) recorded and confirmed the occurrence of 26 species of fishes belongs to 7 orders, 17 genera and 9 families. The order Cypriniformes was dominant with 12 species followed by order Channiformes with 4 species and Siluriformes with 3 species, order Cjupeiformes, Perciformes and order Mastacembeliformes each with 2 species while order Mugiliformes with one species during the research period from March 2008 to February 2009 from Ruti reservoir, near Ashti, District Beed. Sirsat et al. (2010) reported and confirm the occurrence of 21 fish species belonging to 6 orders, 7 families from Bendsura project, District Beed.

Archana Sharma and Devendra Mohan (2010) recorded 14 fish species belonging to 4 orders and 5 families from the Hemawas dam during December 2006 to June 2009. The most dominant order recorded was Cypriniformes which was represented by 10 species followed by order Siluriformes, while Osteoglossiformes and Perciformes were represented by one species each. Ohol and Kamble (2011) reported 59 species of fishes belonging to 10 orders and 13 families in Sangli district water bodies. Jadhav et al. (2011) reported 18 fish species belonging to 6 orders and 10 families from Khandala dam in Naludurg, District Osmanabad of Maharashtra.

Aher and Kamble (2010) recorded 25 fish species belonging to 4 orders and 5 families from the Rameshwar dam, near Deola, Distric Nasik. Dam during February 2008 to January 2010. The most dominant order recorded was Cypriniformes which was represented by 11 species followed by order Chnniformes with 4 species and Siluriformes with 3 species while order Clupeiformes, Perciformes and Mastacembeliformes with only 2 species each and order Mugiliformes with only 1 species during the present investigation.

Tapase and Kamble (2011) recorded 24 fish species belonging to 6 orders, 14 genera and 5 families. The order cypriniforms was dominant with several fish species. The order cypriniforms includes 12 species. This order is found to be dominant as the constitutes highest number of species. The order siluriformes includes four species. The order channiformes includes three species. The order perciformes, mastacembeliformes
and clupeiformes includes two species each of Mula Dam located in Rahuri Taluka of Ahmednagar District, during the February 2007 to January 2009.

The following fishes namely *Notopterus notopterus*, *Notopterus chitala*, *Cirrihina mrigala*, *Cirrihina reba*, *Punctius chola*, *Punctius sophore*, *punctius ticto*, *Labeo rohita Labeo bata*, *Labeo calabasu*, *Catla catla*, *Hypolthicthys miolitriz*, *Cyprinus carpio Mystus cavasio*, *Mystus tengra*, *Rita rita*, *wallago attu*, *Chanda nama*, *Chanda ranga*, *Channa gachua*, *Channa punctatus*, *Channa marulius*, *Mastacembelus aculeatus*, and *Mastacebelus aculeate*.


This investigation is supported by number of research authors by Hora and Misra (1942) reported a complete check list of fishes from Pune, based on the collected by
Fraser was subsequently published which contains 54 species with their local names from Mula Mutha River pune. Sutar (1944) gives their additional survey of this region and reported 17 species of fishes from pune, Mula-Mutha River, Malaviya (1961) reported the fish fauna of Jabalpur. Das (1966) were the first to describe 23 fish species belonging to 7 families and 14 genera in habiting river Tawi and its tributaries. Das and Nath, (1971) were recorded 27 fish species belonging 8 families and 15 genera revised fish fauna if Jammu in river Tawi and its tributaries.

Tilak (1971) surveyed of 35 fish species inhabiting river Tawi and Gadigarh tributary. Malhotra et al. (1975) were recorded and identified a key of 45 fish species including 37 fish species inhabiting river Tawi and tributaries Gadigarh. Dutta (1978) reported 32 fish species inhabiting a spring fed Gadigarh stream and a tributary of river Tawi. Kumar (1990) reported 51 ichthyofaunal species of 9 families in Govindsagar reservoir, Himachal Pradesh, out of which a 12 fish species were commercially important.

Jain (1998) was reported 53 fish species and was grouped into seven categories in Rajasthan state. Ahirrao and Mane (2000) recorded 32 fish species belonging to 25 genera and 8 families belonging to 2 orders from freshwater of parbhani district of Maharashtra. Dutta et al. (2002a) recorded 26 fish species belonging to 6 families and 18 genera collected from the river Chenb. Dutta et al. (2000b and 2001a) worked out the presence of 88 fish species belonging to 7 orders, 20 families and 51 genera inhabiting river Tawi and its tributaries. Sakhre (2001) recorded 23 fish species belonging to 7 orders is Jawalgaon reservoir in Solapur district. Sakhre and Joshi (2002a) observed 28 fish species including 9 species of carps, 5 of cat fishes, 2 of feather bace fishes, 5 of live fish and 7 belonging to miseellunous fishes from Palas-Nilegaon reservoir, Osmanabad.

Kharat et al. (2003) listed 102 fish species from bodies of Mula-Mutha River pune. Paik Tapaskumar et al. (2003) were recorded 75 species of fishes belonging to 50 genera, 23 families and 6 orders in Subarnerekha River in Singbhum district of Jharkhand, India Sakhare and Joshi (2002b) reported the ichthyofauna of Bori reservoir in Maharashtra and a total 20 species of fishes belonging to 14 genera falling under 4
orders (Cypriniformes, perciformes, Siluriformes and Osteoglossiformes). Cypriniformes order dominated with 7 species with genus puntius was abundant. Kamble et al. (2006) recorded 27 fish species from river Manjara, near Kallam district Osmanabad. Chandanshive et al. (2006) recorded from pavana river of Pune, Maharashtra. Muley and Patil (2006) reported a total 32 species of fishes belonging to 24 genera, 12 families and 4 orders from Pavana River. Krishna and Piska (2006) recorded 31 fish species found in the laka of Durgamcheruvu, Ranga Reddy district, Andhra Pradesh, India. Mahapata (2003) recorded abundance of catfishes in Hirakud reservoir and about 43 species were represented in which 18 were economically important. Sakhare and Joshi (2003) reported 34 species of fishes in reservoirs of Parbhani district of Maharashtra. Salaskar and Yeragi (2004) recorded by 10 main fish species from Powai lake, Mumbai in Maharashtra. Meshram and Meshram (2005) were reported the occurrence of 17 species of Teleost fishes belonging to order Cypriniformes and Ophiocephaliformes from some wetlands in and around Amravati, Maharashtra.

According to Santhanam et al. (1987) zooplankton provides the main food for fishes and can be used as indicators of the trophic status of water body, Verma and Munshi (1987). The high zooplankton population density during the summer season could be related to stable hydrological factors, while low density during the monsoon season is attributed to heavy flood and freshwater in flow. The maximum zooplankton population in summer could be related to high productivity of phytoplankton and their wide tolerance to hydrological parameters Rajalakshmi and Krishnamoorthy (2007), Krishnamoorthy et al. (2006), Kamble and Meshram (2005) recorded the zooplankton from different stations of Khatijapur tank. Sankarsan Sahoo and James Deniel Jameson (2006) recorded the total of 33 species of zooplankton in which 25 species of rotifers, 4 species of copepod, 3 species of cladocerans and one (1) species of ostracoda observed and identified from the treatment pond and control pond, pond in cattle waste fed fish pond, Thoothukudi, Tamil Nadu. Kumar (1996) recorded zooplankton at Munger 17 to 137 u/lit in Ganga river in Bihar. Pawar et al. (2002) recorded 28 genera of zooplankton from Sirur dam water near Mukhed in Nanded district. Pandit et al. (2007) were recorded a total 29 species of zooplankton consisting of 11 species of Cladocera, 5 species of
Copepoda, 10 species of Rotifera and 3 species of Ostracoda. The species richness was high in the month of April 2006 (summer) and October 2006 (winter) and it was minimum.

Shibu and Ritakumari (2006) observed the occurrence and distribution of macrobenthos in riverine and estuarine zones of the Paraver Lake. Sharma et al. (2007) were studied biodiversity of Benthic macro investebrates and fish species communuitites of Kishanpura lake, Indore, Madhya Pradesh. Mandal and Moitra (1975) have reported minimum benthic fauna during winter and maximum in summer. Abundance of benthic macro-invertebrates in summer is also reported by Vasist and Bhandal (1979). Pawar et al. (2007) were studied microbial diversity in water and sediment of Karanja creek west coast of India, Kamble and Kamble (2009) were studied biodiversity of some aquatic animals (Crustaceans, Molluscens and Fishes) from Ruti reservoir, near Ashti, District Beed. Sharma et al. (2010) were recorded a total 16 species of molluscans from Omkareshwar. Michael (1968) recorded the peak population of vivipara in April followed by a sudden decline in a pond in the west Bengal. Chandanshive et al. (2006) studied the fish fauna of Pavana river of Pune, Maharashtra, Pawar et al. (2007) were studied the fish fauna a Pathwadaj dam, Taluka Kandhar, District Nanded (M.S.) Battul et al. (2007) were studied the fish diversity from Ekukh Lake near Solapur, (M.S.) Jayabhaye and Kodarkar (2008) studied fish diversity of Sawana dam in Hingoli district of Maharashtra. Archana Gaur and Devendra Mohan (2008) were studied vertebrate faunual diversity in and around three small wetlands of Jodhpur, Rajasthan, India, Rathod et al. (2008) were studied the diversity of fish fauna of Umra (Shamudin) reservoir, Washim district, Maharashtra.

Kamble et al. (2006) were studied biodiversity of fishes from river Manjara, near Kallam District Osmanabad, and Maharashtra.

Devaraj (1998) recorded 100 species of gastropods and 158 species Bivalves in the Gulf region. Annadurai (2006) were recorded 115 species of gastropods belonging to single subclass, 3 order, 28 families and 44 genera from the Gulf of Mannar, Tamil Nadu, South east Coast of India. Kulkarni et al. (2006) were recorded and identified seven (7) species belonging to seven (7) genera and bivalves are composed of three (3) species and three (3) genera from Haji Ali coastal area of seashore of Mumbai. Bhatt (1959) has reported fifty nine (59) species of gastropods and thirty one (31) species of bivalve recorded from Cuffe parade, Secretariat, Foreshore, Chowpatty sands beach, Chowpatty rocks, Breach Candy, Dadar and Mahim intertidal areas of Mumbai, Hamilton and Buchanan (1822), Day (1878), Jayaram (1981), Beavan (1982), Talwar and Jhingran (1988 and 1991), Khanna (1992), Yazadani (1994), Rao (1999) and recently Sarkar and Banerjee (2000) Yadav (2003, 2005 and 2008), and Mishra et al. (2003), Meshram and Meshram (2005) were studied the ichthyofauna of wetlands in and around Amravati, Maharashtra. Yadav (2004, 2005 and 2006) were reported fish studied from Pench National Park, District Nagpur and Malghat Tiger reservoir, District Amravati and from Tadoba National Park District Chandrapur respectively.

Jayaram (1981 and 1985), Yazdani (1994) reported ichthyofauna from Krishna, Cauveri and Ganga rivers. Yadav (2003) were studied 135 species of fishes from the Western Ghats. Bose and Lakra (1994), Chandrashekhar and Kodarkar (1994), Anitha et al. (2004) made the previous studies on the macrobenthos in India with in aquatic community. Taxonomic investigation on Indian rotifers were initiated by Anderson (1889). Sharma and Michael (1980) reviewed the available information on the Indian rotifer fauna and concluded that these groups were quite rich and varied. They confirmed the presence of 241 species of rotifers from the Indian subcontinent. Subsequently, another nearly 60 species have been added to the list. (Sharma 1987 1990, Sharma and Sharma 1987, Sarma 1988, Patil and Gouder 1989, Segers et al. 1994).
According to a conservative estimate, there are over 500 species of rotifers in Indian waters, although only 330 species belonging to 63 genera and 25 families have so far been authenticated (Sharma 1998). More recently, Segers and Babu (1999) and Sharma and Sharma (2001) have added 5 new taxa to the Indian checklist.

According to Sinha (1992) total absence of rotifers during the monsoon season. Similar observation were also made by them who had reported total absence of rotifers during the monsoon season in the Ganga river. Cladocera prefers to live in deep water and constitute a major item of food for fish. Thus they hold key position in food chain and energy transformation Uttangi (2001). About 600 species of freshwater cladocerans occur through the world Korovchinsky (1996) of which 110 species have been recorded from India Patil and Goudar (1989). Copepods were found to be maximum during winter and minimum during summer. Similar trend was observed by (Chauhan 1993) in Renuka lake, Himachal Pradesh. The factors like water temperature, dissolved oxygen, turbidity and transparency play an important role in controlling the diversity and density of cladocera, Edmondson (1965) Sunkad and Patil (2004). According to Patil and Gouder, (1989) Approximately 110 species are known from the inland waters bodies of the Indian Subcontinent. Maximum ostracods population was recorded in summer months while minimum in rainy season. Similar observations were also made by Sunkad and Patil (2004) in Fort lake of Belgaum (Karnataka).

Patil and Gouder (1989), ostracodes are coloured species were live with algae while gray coloured species live with ooze. Tonapi (1980) has reported higher population of ostracodes during monsoon due to the abundance of fine detritus during this period of the year. Pawar and Pulle (2005) recorded the monthly average and total number of Ostracoda in Pethwadaj dam, Nanded.