Chapter – II

REVIEW OF LITERATURE

Water is the soul of nature. It is one of the prime and basic needs of mankind. It is most important environmental factor and is essential for well being of the living world, especially for human population. Due to increasing population, mode of water utilization practices has been changed. It is believed that life was originated in water and sustained by it. Nearly 90% of mass of living population is composed by water. In many parts of Indian subcontinent, groundwater as well as surface water has been used extensively for drinking of agriculture, industries, livestock etc. through the quality criteria of water are different sometimes water is no suitable for drinking and other purposes because of contaminations. Kulkarni, (1990). Wrong agriculture practices also deteriorate the quality water by percolation of contaminantants through sub soil and bedrock and reach the ground water table Phonde, et.al. (1992). The chief source of water includes rainfall, humidity and evaporating power of the air farming Fog mist etc.

Pandey and Sharma (1999) recorded the temperature variations from 13\(^0\)C to 35.4\(^0\)C in Ramganga river at Moradabad and claimed it can be due to direct relationship between bright sunshine, its duration and air temperature. Sharma and Agarwal (1999) recorded the maximum temperature 29.49\(^0\)C in the river Yamuna at Agra. The temperature in the river Pamba varied between 25\(^0\)C and 29\(^0\)C during post monsoon period, 26.8\(^0\)C to 30\(^0\)C during pre monsoon period and 26\(^0\)C to 28.7\(^0\)C during monsoon period. It was found that the fluctuations in the river temperature usually depend on the season, sampling time as well as the temperature of the effluents pouring into the river Koshy and Nayar, (1999) studied the water quality of river Godavari at Nanded and recorded the maximum temperature of 35.7\(^0\)Cin summer.

Sandeep K. Pandeyet. Al., (2007) noted the temperature of treated distillery effluent of Ghazipur city was 28.5\(^0\)C. Fikrat M. Hussainet.al., (2008) recorded the temperature of air and water values ranged between 10.6 to 43\(^0\)C and 10.3 to 32\(^0\)C respectively of river water smples in Shatt- Al Hilla (Iraq). P.N. Kamble et. Al., (2008) noted the temperature of entire Khadakwasala reservoir ranges between 20.08\(^0\)C(winter) to 26.22\(^0\)C (summer). Arunabh Mishra and Vasishta Bhatt (2008) recorded the temperature of ground water in V.V. Nagar and nearby places of Anand district, Gujarat ranging from 28\(^0\)C to 31\(^0\)C. D.K. Sinha and Navneet Kumar (2008) recorded the
temperature of Gagan river water samples in and around Moradabad ranged from 18°C to 20°C. J.C. Akan et al., (2008) the temperature of Jakara waste water of Kano state Nigeria varies from 31.11°C to 36.34°C. The results indicate that some reactions could be speeded up by the discharge of this wastewater into stream and also reduce solubility of oxygen and amplified odour due to anaerobic reaction. These values were higher than WHO standard of 40°C for discharged of wastewater into stream.

Water temperature is of enormous significance as it regulates various abiotic characteristics and biotic activities of an aquatic ecosystem which is recognized by many authors Mc Combie, (1953); Hutchinson, (1957); Jana, (1973); Chari, (1980); Kataria et al., (1995); Iqbal and Katariya, (1995); Sharma and Sarang, (2004); Radhika et al., (2004). It is clear from there were no significant variations in surface-water temperature across stations and over years during the pre-monsoon and the north east monsoon in the Lake, whereas the differences in surface water temperature across the stations and over the years were significant during the southwest monsoon. A comparison of the average of surface-water temperature of the three-year period showed that the variations in temperature across the different stations were insignificant.

An availability of water was considered infinite since ancient ages. However, with many field increase in use of water by human being in all spheres of life combined with explosion in world population, realization has drawn that this national resources is also required to be utilized with due care. Water is required for the most human activity like drinking, bathing, washing, agriculture, industry, recreation, navigation and fisheries. About seventy percent of worlds surface area is covered with water is available for human use as 98 percent of the water is present in seas and 1.998 percent is locked up in the arctic region, glaciers, mountains and clouds Trivedy R. K. (1999). The available water is of two types, marine water with relatively high percentage of dissolved salts such as sea and ocean and fresh water with relatively low percentage of dissolved salts such as ground water, river, lakes, ponds and reservoir water. The main fresh water sources for human use are ground water (contained stored in earth’s crest), surface water flow (various minor and major rivers, and canals) and water bodies from ponds, reservoirs and lakes.

pH is one of the very significant chemical characteristic of all waters, which explains certain significant biotic and abiotic ecological characteristics of aquatic systems in general. pH balance in an ecosystem is maintained when it is within the range
of 5.5 to 8.5 Chandrasekhar et al., (2003). pH of a water body is a diurnally variable property according to temperature variation in the system Ojha and Mandloi, (2004). Kaul and Handoo (1980) found that increased surface pH in water bodies is due to increased metabolic activities of autotrophs, because in general they utilize the CO2 and liberate O2 thus reducing H+ ion concentration. The same authors are also of the opinion that in the bottom of water bodies liberation of acids from decomposing organic matter under low O2 concentration result in low pH.

The EC of surface and ground water of Rajangpur was in the range of 179 to 201 µScm\(^{-1}\) Adak and Purohit, (2000). Anand and Sharma (2000) measured the conductance in the lake Surinsar (Jammu) in the range of 0.05 to 0.58 µScm\(^{-1}\). The conductivity was minimum being 119 µScm\(^{-1}\) and maximum 263 µScm\(^{-1}\) in September in Gopalpur tank water at Guna district in Madhya Pradesh. (Sharma and Jain, 2000). The electrical conductivity of water canal at Rajshahi in Bangladesh ranged from 389.642 to 1350.06 µScm\(^{-1}\) and indicates more ionic species in water due to the sugar mill effluents Abdulla et. al., (2000). Koshy and Nayar (2000) measured the electrical conductance in river Pamba at Kozencherry in the range of 50 to 88 µScm\(^{-1}\). It has been suggested that irrigation water having conductivity lower than 250 µScm\(^{-1}\) does not contain enough salts to be safe. The electrical conductivity values of ground water in Ganesh colony, Jalgaon city were in the range of 1138 and 390 µScm\(^{-1}\) for tube well and open well samples and the value of tap water was 358 µScm\(^{-1}\) that is in the prescribed standard limit Patil et. al., (2001). Chawla et. al., (2001) measured the conductance of village pond in Ludhiana district of Punjab from 0.72 to 1.80 µSm\(^{-1}\).

EC is a basic index to select the suitability of water for agricultural purposes Kataria et al., (1995). EC in water is due to ionization of dissolved inorganic solids and is a measure of total dissolved solids (Bhatt et al., 1999) and salinity. Salts that dissolve in water break in to positive charge and negative charge ions. Dissolved solids affect the quality of water used for irrigation or drinking. They also have a critical influence on aquatic biota, and every kind of organism has a typical salinity range that it can tolerate. Moreover, the ionic composition of the water can be critical. Koshy and Nayar (2000) observed that the EC value of 250 µS per centimeter is quite normal for aquatic life of fresh waters. EC of tap water ranges between 50 and 800 µS depending on the source Web Report, (2004). In Periyar Lake, the highest average seasonal EC observed during this study was 80µS at station-5 during the pre-monsoon and lowest EC reported
was just 15.2 µS at station-4B during the northeast monsoon 2004. Therefore, the EC values in Periya lake may be considered quite normal.

Total alkalinity is caused by bicarbonates, carbonates, OH ions, borates, silicates and phosphates Kataria et al., (1995). Alkalinity is a measure of buffering capacity of water and is important for aquatic life in a freshwater system because it equilibrates the pH changes that occur naturally as a result of photosynthetic activity of phytoplankton Kaushik and Saksena, (1989). Alkalinity of water is its capacity to neutralize a strong acid and is characterized by presence of all hydroxyl ions capable of combining with hydrogen ions Koshy and Nayar, (2000). Alkalinity is used as criteria for determining the nutrient status of waters Sorgensen, 1948; and Moyle, (1949).

Although CO2 is a minor component of air it is abundant in water because of its solubility which is 30 times more than that of oxygen, and the amount of CO2 in water usually shows an inverse relationship with oxygen Radhika et al., (2004). Free CO2 is essential for photosynthesis and its concentration affects the phytoplankton, and its productivity. Excess of it gets dissociated into carbonic acid. The limit of free CO2 as per acceptable Standards is 10 mg/L-1 of surface water. Increase in CO2 indicates increase in pollution load Koshy and Nayar, (1999).

Pande and Sharma (1998) found low value of DO in the river Ramganga at Moradabad, India. They observed that DO during winter varies from 9.6 to 4.2 mg/L. The values were 3.2 to 8.9 mg/L for summer and 3 to 8 mg/L for rainy season. This shows that DO of river decreases due to effluent wastes from industries apart from the domestic waste water. Shivanikar et.al., (1999) studied the effect of temperature on DO in river Godavari at Nanded. They recorded minimum value of DO i.e. 1.2 mg/L at 36.7°C in summer and maximum value 8mg/L in winter due to low temperature at 26°C, high accretion rate as well as high photosynthetic activity. The low DO in river Godavari might be due to high temperature and discharge of sewage. Dissolved oxygen in winter and summer were found below the prescribed limit and it reaches the lower limit recommended for aquatic life in the monsoon and post monsoon season Archana and Kumar, (1999).

DO is the sole source of oxygen for all the aerobic aquatic life and hence it is considered as an important measure of purity for all waters. Oxygen content is important for direct need of many organisms and affects the solubility and availability of many nutrients and therefore the most significant parameter affecting the productivity of aquatic systems Wetzel, (1983). DO reflect the water quality status and physical
and biological processes in waters and show the metabolic balance of a lake. DO is an important water quality parameter in assessing water pollution Laluraj et al., (2002). The factors affecting oxygen content in natural waters include input due to atmosphere and photosynthesis and output from respiration, decomposition and mineralization of organic matter as well as losses to atmosphere. Hence, the oxygen balances in water bodies become poorer as the input of oxygen at the surface and photosynthetic activity decreases and as the metabolic activities of heterotrophs are enhanced. Fluctuation in DO is also due to fluctuation in water temperature and addition of sewage waste demanding oxygen Koshy and Nayar, (2000).

Chhaya V. Wagh et al., (2009) noted the chloride content of ground water samples of Pravara area ranging from 50 to 250 ppm. Chloride content in fresh water was largely influenced by evaporation and precipitation. D.V. Sonwane et. al., (2009) noted the chloride content of Kurkumbh industrial area varies from 28 to 32 mg/L. The higher value of chloride suggests leaching of effluent from industrial effluent into the ground water. Sanddeep K. Pandey and Shweta Tiwari (2009) noted the chloride content of Ghazipur city ranges from 78 to 106 mg/L. Abida Begum et. al., (2009) recorded chloride content of Cauvery river water ranged from 153.70 to 505.33 kg/day. Sandeep K. Pandey et. al., (2009) recorded the chloride content of treated distillery effluent of Ghazipur city was 875 mg/L.

Tiwari (1999) observed the chloride from 32 to 56 mg/L in the upper lake water of Bhopal, M.P. Jain Kumar, (1999) noted the chloride content in the range of 105 to 120 mg/L in the knhop reservoir in chhatarpur, M.P. The chloride value of upper stretches of Damodar river was reported from 5.0 to 35.3 mg/L singh et. al., (1999). Bhuvaneswaran et. al., (1999) observed the chloride of Adyar river in Chennai city to vary from 171 to 400 mg/L. The higher chloride value indicates saline nature of water. Koshy and Nayar (1999) found the chloride content comparatively with higher values in river Pamba, Kerala from 110 to 176.6 mg/L during pre monsoon period. Pande and Sharma (1999) observed chloride content in the range of 10 to 44 mg/L in river Ramganga at Moradabad (M.P.). Jain (1999) noted chloride concentration in the range of 74.97 to 112.46 mg/L from Hanuman taluka lake a Jabalpur (M.P.). Jacob et. al., (1999) recorded the quantity of chloride from Noyyal river at Tirupur ranged from 375 to 3127 mg/L. Rao et. al., (1999) observed chloride concentration in Kolleru lake fluctuate from 72 to 4788 mg/L.
The chloride content in river of Kumaon, Himalayan ranges from 6.82 to 8.84 mg/L Rawat and Kumar, (1999).

Cl ions in sea-water is around 20,000 mgL-1, in rainwater it is 2 mgL-1 and in unpolluted rivers the amount of Cl ions is usually 2-10 mgL-1; and when the amount is above 200 mgL-1, the water is not used for human consumption (Koshy and Nayar 1999). Maximum permissible limit with regard to Cl content in natural freshwaters according to WHO (1985) is 200 mgL-1 and the same according to ICMR (1975) and ISI(1991) is 250 mgL-1. Halvorsen (2004) reported 0.33 to 0.45 mgL-1 of Cl in a Norwegian mountain lake. In river Mandakini, Chitrakoot, seasonal variation in Cl content (24 to 80mgL-1) was not same at all the stations (Garg, 2002). Jayaraman et al. (2003) observed a variation in Cl content of 1.2 to 15807 mgL-1 in Karamana River which is subjected to sea intrusion in pre-monsoon. They observed that in the river the Cl content increases from southwest monsoon to northeast monsoon to pre-monsoon. Pandey and Sharma(1999) reported a similar trend in Ramaganga River in U.P and Abbasi et al. (1997) in Kuttiaidi River, Kerala

The chloride of the Hindan river water near East Delhi and Sahibabad varied from 22 to 40 mg/L. The higher values were attributed to industrial effluents and sewage (Masood Alam and Anwar Ahmad, 2003). The chloride concentration of Karamna river in Thiruvananthpuram district, South Kerala ranged from 1.2 to 15.807 mg/L. The higher chloride recorded during pre monsoon may be due to inflow of sewage Jayaraman et. al., (2003). Rajurkar et. al., (2003) noted the chloride content of river Umshyrpi at Shillong, Meghalaya from 10 to 50.1 mg/L during pre monsoon period and12 to 76 mg/L during post monsoon season. The higher value was due to sewage contamination. N. Varadrajan and B.K. Purandara (2003) reported the chloride content of Malprabha river water of Belgaum district Karnataka varies between 7.10 to 758.60 mg/L in pre monsoon and 7.10 to 753.30 mg/L in post monsoon season. M.I. Lone et. al., (2003) recorded the chloride content of sewage water and tube well water from Hassanabdal area district Attock was 1.53 meq/L and 0.21 meq/L respectively.

The fresh water resources are continuously passing through to different problems. Pollution being the main and have reached to the extent that the water contained, it has been rendered unfit for use and toxic for flora and fauna. The water pollution arises from the various activities carried out on land or in the drainage basis of various water bodies. Major activities causing water pollution are sewage and domestic waste disposal,
industry, storm water, from air pollution, agriculture runoff, cultural activities, recreation, cloth washing, vehicle washing, cattle wadding and artificial fertilization for fisheries. However, natural sources of pollution are also important in certain areas. The water flowing through swamps, marshes and forests may carry the nutrients, organic matters and sediments to water resources. The major types of water pollutants can be characterized as oxygen demanding waste, infectious agents, inorganic chemicals and minerals, organic chemicals, plant nutrients, sediments, toxic substances and thermal pollution. The water pollution adversely affects bio-diversity. Environment is the envelope of bio-diversity. If this envelope is distributed, bio-diversity will be adversely affected. It is estimated that there exist about 5.30 million species of living form on the earth, out of which only 1.50 million have been identified and include 3,00,000 species of given plants and fungi, 8,00,000 species of insects, 40,000 species of vertebrates and 3,60,000 species of micro-organisms.

In India about 1,15,000 species of plants and animals have been identified and described. The country can boast of 45,000 species of flora 15,000 flowering plants, 64 gymnosperms, 2843 bryophytes, 1012 pteridophytes, 1940 Lichens and 23,000 fungi, which account for 15 percent of known world plants. Out of the 15,000 species of flowering plants, 35% are endemic and located in 26 endemic centres. Among the monocotyledons, out of 588 genera occurring in the country, 22 are strictly endemic Kotwal and Sujoy; (1998)

The availability of water and its quality in national and international levels to maintain the environmental system, the situation is going from bad to worst and in some continents has reached alarming levels. Nearly three billion populations of the world, live without access. About 30 thousand people, mostly young children and elderly people die every day due to water related diseases. It is also estimated that by year 2025, two third population of the world would be living with water stress condition Shukla et.al.; (2004). Since water as a source and commonly shared resources, has already started becoming causes of conflict,

Indian subcontinent is very rich in fresh water resources. However increasing place of development activities is affecting the quality of fresh water. A survey by NEERI shows that 70 percent of India’s freshwater resources are polluted by conventional standard Agrawal et.al.; (1982).

A large number of hydro-biological studies were carried out on manmade reservoir in Maharashtra. There are many workers associated for such studies Kulkarni et.
al.; (1983), Trivedi et al; (1985), Goel et al; (1986), Anil and Mohamad; (2001), More and Nandan; (2001), Sanjay et al; (2001), Hiware and Ugale; (2002), Barde and Pai; (2004), and Chavan et al; (2004), Hiware et al; (2004), Rajput et al; (2004). However there are no such studies from this region and therefore present working was undertaken.

The density and diversity of zooplankton, fish and birds are depending on water quality of reservoir. The zooplankton is microscopic free-floating organisms, which occupy a central position between the autotrophs and other heterotrophs and form an important link aquatic food webs. They constitute an important component of secondary production in aquatic ecosystem and play a vital role in all location in different tropic levels. The knowledge of their seasonal qualitative and quantitative fluctuation has considered essential for proper manipulation of the factor influencing biological productivity of the reservoir. Considerable work has been done on the zooplankton ecology of different water bodies Ahmed and Singh; (1993), Trivedy; (1993), Pushpendra and Madyastha; (1994), Sinha and Islam; (2003), and Yadav et al.; (2003). Work done so far on the various. Aspects of zooplankton diversity shows that present study area has failed till today to attract the attenuation of ecologist. Hence keeping this in view, the present study has been undertaken to set off a thorough investigation of the zooplankton.

Human life and pattern without the presence of bird is boring. All over the world all freshwater habitats – lakes, ponds, reservoirs, dams etc. provide aquatic creatures, a large number of birds are dependent on aquatic environment for their survival. Though much work has been done on the limnology of various types of freshwater habituates i.e. lakes, ponds, reservoir, dams, swamps etc. in this country Singh; (1986) But practically no information is available on the ecology of birds except the work of Vijayam (1986), who studied some aspects on the conservation of the birds fauna of the Indian freshwater habitats. Mukharjee (1969) studied the food and feeding habitats of the water birds of the Sunderbans. But thanks to the untiring efforts of the world-renowned Indian avian biologist Late Padmashri Dr. Salim Ali For promoting the bird’s protection campaigns. Hence, it is the need of the present day that the people in fauna especially freshwater habitat varieties for protecting and conserving our rich and varied fauna. Considerable work has been done on a survey of birds of water bodies but information on wetland bird’s characteristics is scarce Mandak et. al; (2001). Practically no information is available on the ecology of birds in study area, thus the present investigation was undertaken to carry out the systematic survey of birds.
An overview of the global fisheries trend brings out the growing importance of aquaculture in recent years. The freshwater aquaculture of our country includes 2.25 million hectares of ponds and tanks, 1.30 million hectares water, 2.09 million hectares of lakes and reservoirs, 0.12 million km of canals and 2.30 million hectares of paddy fields (Anita; 2003). Considering the availability of water area exclusively in the form of ponds tanks, it is observed that only 45 percent of the areas have been brought under aquaculture. This shows that potential of horizontal expansion of this sector in the coming years Ayyappan; (2000). Maintenance of healthy aquatic environment and production of sufficient fish food organisms are primary factors for successful pond aquaculture operation. Production and growth of fish food organisms directly depends on the available nutrient element in the water and related physicochemical parameters. Although a number of workers have studied the limnology Unni; (1993), no systematic work has so far been reported on biotechnology of the reservoirs in Pathardi Tahsil regarding the potentialities of aquaculture. Hence, the present investigation was undertaken to study the prospects of aquaculture in reservoirs, located in semi-arid zone of our country in relation to the limnological parameters.

Water is the culture environment for fish and other aquatic organisms. It is the physical support in which they carry out their life functions such as feeding, swimming, breeding, digestion and excretion Bronmark and Hansson, (2005). Based on this, access to adequate, regular and constant supply of good quality water is vital in any aquaculture project. According to Sikoki and Veen (2004), any water body is a potential medium for the production of aquatic organisms. Water quality parameters can be divided into three main categories: physical (density, temperature); chemical (pH, conductivity, nutrients) and biological (bacteria, plankton and parasites) Delince, (1992) and Moody, (2005). All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits has adverse effects on their body functions Davenport, (1993).

Insects represent the most diverse group of organisms, not only in terrestrial but also in aquatic, especially freshwater, habitats. Among the most diverse aquatic insect orders are the Trichoptera, Diptera and Coleoptera; although Ephemeropteracan locally also be very abundant and diverse. In Costa Rica, the taxonomicallybest known orders of aquatic insects are the caddisflies (Trichoptera), dragonflies (Odonata) and stoneflies (Plecoptera) and within the Dipterans, groups of medical importance have received
The interest in aquatic insects has been constantly growing in Costa Rica over the past 10 years, but scientific publications are widely dispersed and often difficult to locate. Due to the importance of aquatic organisms in environmental impact studies and biomonitoring of freshwater habitats, there is an urgent need for comprehensive studies that are locally available. In this sense, the present paper tries to give an overview on the state of knowledge and the literature published. The aquatic insects were collected using pond net (0.5 mm) from 14 study sites during December 2005 and January 2006. Seven orders and 23 families were found, with the highest number of aquatic insects from the family Ephemeroptera. The most abundant family was Baetidae and Caenidae respectively, which were very commonly found in almost all sampling sites. Plecoptera was found in the upper sampling sites, which showed less polluted. The classification method of cluster analysis (UPGMA) and ordination by PCA were used to classify the sampling site. 

This study was aimed to study the diversity of aquatic insects and physicochemical factors of water in the Mekong River. The aquatic insects were collected using pond net (0.5 mm) from 14 study sites during December 2005 and January 2006. Seven orders and 23 families were found, with the highest number of aquatic insects from the family Ephemeroptera. The most abundant family was Baetidae and Caenidae respectively, which were very commonly found in almost all sampling sites. Plecoptera was found in the upper sampling sites, which showed less polluted. The classification method of cluster analysis (UPGMA) and ordination by PCA were used to classify the sampling site. Physicochemical values, water and air temperature, pH, DO, BOD and nutrient were measured, only BOD value in some study sites was greater than class 4 standard value of the surface water quality standard of Thailand. 

Until now, scientists seldom studied the response of aquatic insect populations to the removal of non-native trout. The research has value because the vast majority of mountain lakes in the western United States have been stocked with trout for several decades. Studies following lake restoration to fishless conditions will help scientists and wildlife managers understand the impact of past actions and future decisions. The researchers used floating nets on each lake’s surface to quantify aquatic insect populations. They also used gill nets to sample trout density at lakes where there was continued stocking or suspension of stocking.
It is needless to emphasise the importance of water in our life. We need water for different purposes; we need water for drinking, for industries, for irrigation, for swimming, for fishing etc. Thus water for different purposes has its own requirements for the composition and purity and each body of water has to be analysed on a regular basis to confirm to suitability. The types of analysis could vary from simple field testing for a single analysed to laboratory based multi component instrumental analysis. The analytical process involves sampling and sample storage since changes in composition of water do not stop once the sampling has been taken. Precaution has to be taken to make sure that the water reaching the laboratory has the same composition as it did when the sampling was done. (Analysis of water)

They are abundant in a great variety of aquatic ecosystems and reach their highest diversity in clean, fast flowing mountain rivers and streams. Among the most diverse orders found in these habitats, are the Trichoptera, Diptera and Coleoptera. Another diverse and locally very abundant group is Ephemeroptera, especially in lotic habitats. In Costa Rica, the taxonomically best known orders of aquatic insects are the caddisflies (Trichoptera), dragonflies (Odonata) and stoneflies (Plecoptera). Several aquatic insect species, from different orders, had been described from Costa Rica by the end of the 19th and the beginning of the 20th century

Among the Odonata, the habit of laying eggs in phytotelmatais, with one exception, limited to tropical or sub-tropical species Corbet Champion (1897) with over half of the 39 species known to develop in these microhabitats occurring in the neotropics. Themoderate temperatures and high rainfall of the tropics make treeholes there a predictable and fairly persistent source of freshwater in moist forests where ponds and lakes are less common than they are in temperate regions, and where streams are often seasonal. On BCI, treeholes regularly hold water for as long as months after the streams on the island have dried. Another important advantage of treeholes as larval habitats is their lack of fish and large invertebrates (e.g. Belostomatid bugs, water scorpions) which are common predators of temperate Odonata larvae. Such advantages are counter-balanced by the obvious constraint of space and low prey availability for a discussion of constraints see Corbet, 1983). Among the types of phytotelmata capable of supporting larval odonates, treeholes provide the largest areas and greatest volume of water Picado (1913), Laessle (1961), Machado (1981) with Fincke (1992) and can thus harbour a more

Water is a vital natural resource and one that is often taken for granted. Today, there is strong evidence of substantial and increasing pressure on the world’s freshwater supply. There is also a growing awareness of the stressness, the relationship between energy, water and food. Over the next 20 years, global demand for each of these is expected to increase by 30-50%, which will result in greater pressure on supply and environment. This makes the management of water resources an issue of concern to the whole of society, including governments and commercial organisations. Most energy cannot be produced without access to reliable supply of water. In addition, oil and gas are becoming more challenging to extract. This involves increasing freshwater use. The industry will have to improve water efficiency across the value chain, from well to refinery and beyond.

Faunal investigation of aquatic insects in the Polar Ural River revealed the presence of 83 species from 4 orders: mayflies (25 species), stoneflies (21 species) and caddisflies (32 species). 21 species are new for the Polar Ural River. Widespread and European species dominated in the fauna; however some Siberian species also occurred. 9 species have northern European populations and widely occur in Siberia. These are Baetis feles, Cinygmalryiformis (Ephemeroptera), Mesocapnia variabilis (Plecoptera), Arctopsyche dogensis, Hydropsyche nevae, stigmatella, Mystrophora altaica (Trichoptera).

Species of Daphnia have been widely used in ecological and evolutionary studies (e.g., on trophic interactions, diel vertical migration, interspecific hybridisation, polyploidy and asexuality, host parasite interactions etc.), and the soon to be available sequence of the whole Daphnia species 1 genome will open further research possibilities in genomics and other fields. Cladocerans have also gained certain economic importance as they are also widely used in aquaculture, and large filter-feeding planktonic species have an indirect economic impact as important fishfood or phytoplankton-controlling group. These animals as intermediate hosts of some parasites may potentially pose a threat to human health. A high diversity of cladocerans can be found in the littoral zone of stagnant waters, as well as in temporary water bodies. These habitats are often negatively influenced by human activities, and especially the loss of temporary waters may lead to a decrease of diversity or even local extinction of some species.
Diels variations of physico-chemical factors and plankton population were investigated in the swamps of Purnia district, Bihar on a seasonal basis. Air and water temperature, pH, DO and bicarbonate alkalinity were found to increase during day time which decreased during night hours. The amount of free CO2 was also observed higher during the night period. Water temperature showed a positive correlation with air temperature, pH, DO₂ bicarbonate alkalinity and a negative one with free CO₂ in most cases. Phytoplankton also showed increased number during day time. Not a very clear-cut pattern of diel variation was observed and this fluctuation was mostly due to photosynthetic activity of producers, respiratory activity of biota and fluctuation in water temperature. A complex interaction of various environmental factors eg. Seasons, climate, nutrients, pollution, light hours etc. also play an important role to decide the fate of diel variation of abiotic factors and biotic population.

The lack of local taxonomic keys makes identification of family and genera difficult for the non-specialist, and next to impossible for species. A first identification guide (in Spanish) to the genera of Costa Rican freshwater macro-invertebrates is going to be published soon by our group with the collaboration of over 40 international specialists. An electronic field-guide with pictures of the most commonly collected Costa Rican stream insect families is available on the Internet (http://bdei.cs.umb.edu/keys/html/index.html), and an illustrated field guide of Costa Rican aquatic insect families is being prepared by Springer and Co-workers. An illustrated field guide to the dragon- and damselflies of Costa Rica was published recently by Esquivel (2006). Also, the Webpage from the National Institute of Biodiversity, in Bio, hosts information on some aquatic insect species, especially mosquitoes (http://darnis.inbio.ac.cr/ubis). Very important for the development of identification keys for a given region is the establishment of reference collections, which also helps to avoid miss identifications.

Many of the scientific collections at the different Costa Rican institutions (especially Universidad de Costa Rica, Museo National, INBio and Universidad National) hold specimens that belong to aquatic insect orders or families. Also, some biological stations (e.g. Maritza, Area de Conservation Guanacaste) and local ONG’s (e.g. ANAI in the Talamanca-Atlantic Area) host collections of aquatic macro-invertebrates from specific areas. The most complete aquatic insect collection, with emphasis on aquatic stages (mainly immature), had been established since 1992 at the Museo de Zoologia, University of Costa Rica Springer 1998). This collection includes at the moment over 300 genera in 95 families and 11 orders; a complete and updated list of the genera deposited
can be accessed through the Internet page of the Museum (http://museo.biologia.ucr.ac.cr), and a connection via this Webpage to the collection’s database with over 12000 registers is planned for the near future. Due to the importance of aquatic organisms in environmental impact studies and bio monitoring of freshwater habitats, there is an urgent need for comprehensive studies and publications that are locally available. The present paper intends to help fill this gap by providing an overview of the literature published to date on the aquatic insects of Costa Rica.

Zooplanktons are often an important link in the transformation of energy from producer stock consumers Shastree and Pathak, (1993), due to their large density, shorter life span, drifting nature, high group or species diversity and different tolerance to the stress, Zooplankton are being used as indicator organisms for the physical, chemical and biological process in the aquatic for the physical, chemical and biological process in the aquatic ecosystem Ganguli (1999). Pawar and Sharma (2001) started that the species richness and evenness were inversely related to the zooplankton biomass. Patil (2003) observed that cladocera and mesoplanktonic larva reached peak abundance in saline water mass. Mishra (2005) noticed that displacement volume were higher at those stations where swarms of hydromedusae and ctenophores occurred.

Limnological studies in India have a brief history starting from 1920’s. Joseph, (1994). Sugunan (1997) found out that among the fresh water bodies, reservoirs are the prime resource regarding the fisheries and extensive aquaculture in India. He emphasized that the reservoirs and natural water bodies in the country are threatened by increasing environmental degradation and need conservation efforts. A large number of fresh water studies in the country were found in the literature since 1950. Ganapatiet al. (1953) investigated the hydro-biological conditions of Gangadhareswar temple tank in Madras. Ganapati (1956) investigated the hydrobiology of the Hope reservoir and of the Thamparaparani River at Papanasanam, TN. Zafar (1956) investigated the Limnology of Hussainsagar Lake, Hyderabad. Sreenivasan (1964) analyzed the hydrobiology of Bhavanisagar reservoir, Madras. Sreenivasan (1966) studied the Limnology of Stanely reservoir and Metturdam. Unni (1967) examined the vegetation of ponds, swamps, and river banks in Raipur, M.P. Ganapati and Sreenivasan (1968) investigated different aspects of Limnology, primary production and fisheries in the Stanely reservoir, Madras. Sreenivasan (1968) studied the Limnology and fish production in two ponds of Chungalepet, Madras. Sreenivasan (1970) compared the Limnology of two major reservoirs in Madras. Varkey (1971) studied the fresh water conservatories in Kerala with
special reference to physiology of specific grounds. Nair (1971) investigated the water wealth of Kerala. Kaliyamoorthy (1973) studied the transparency of waters of the Pulicat Lake with reference to plankton productivity.


Fish is worldwide distributed food commodity. It is regarded as a potentially a cheap source of protein especially greater significance to developing countries like India where, problem of nutritional deficiencies persist. As a rich source of nutriment, fish provide a good balance of protein, vitamin and mineral and relatively low caloric content. Fish especially liver oil is rich in vitamin A and D. Fishes also contain vitamin B6 and B12 which help in producing RBCs, antibodies and maintain central
nervous system. Beside vitamin fishes also contain mineral like iodine and calcium that are vital to our health. Fishes are good sources of potassium, magnesium, which help in normalize blood pressure. Fishes are good source of copper which help to manufacture red blood cell and collagen. Omega-3, fatty acid in fish helps to lower the level of triglycerides and increase HDL which is good cholesterol, thus reducing the cardiovascular diseases and certain types of cancers. Fishes are known to provide several nutritional and therapeutic benefits for health problem like coronary heart disease, hypertension, obesity and osteoporosis and iron deficiency. Economic importance and scope of fish and fisheries especially in Maharashtra it is essential to study the distribution and availability of fish from fresh water reservoirs. Shinde et al., (2009)

Freshwater fishes are not only the most diverse group of vertebrates but also the one that features the greatest proportion of threatened species Bruton, (1995); Leidy and Moyle, (1998); Duncan and Lockwood, (2001). The relatively limited space occupied by freshwater fishes (i.e. river or lake basins) with very reduced ability for inter-basin movement Hocutt and Wiley, 1986; Unmack, (2001), in contrast with the relatively free-moving marine fishes, lays in the base of the conservation problems of the former Richter et al., (1997). The decline of freshwater fishes is a generalised phenomenon noticeable on global Duncan and Lockwood, 2001; Cowx and Collares-Pereira, ( 2002), regional and scales. The principal threats to freshwater fishes are the deterioration or destruction of habitats, both by pollution and intense modifications (i.e. damming, channelizations) and the introduction of exotic species Moyle,( 1986); Allan and Flecker, (1993).

Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the earth Ehrlich, P.R. and E.O. Wilson, (1991). Fish biodiversity of river essentially represents the fish faunal diversity and their abundance. River conserves a rich variety of fish species which support to the commercial fisheries. In India potential of fish culture is yet to be fully exploited. Fishes being rich source of proteins and have high nutritive value. Extensive development of aquaculture needs to be given priority after green revolution to feed ever growing population. Success of fish culture depends apart from other factors, on selection of suitable species. Secondly the country is rich in diversity of such important group of animals. Further, there is a need of a survey of diversity of fishes in different types of habitats of Rivers all over the country.( S.E. Shinde, T.S. Pathan, K.S. Raut, R.Y. Bhandare and D.l. Sonawane( 2009)
The present study on the four man made water bodies in the same climate region from southern part of Tahsil Pathardi (19°9’N, 75°10’E) of Ahmednagar District, Maharashtra State, India was carried out to find out their pollution status with physiochemical and hydrobiological characteristics. The region is falling in semi-arid zone, have undergone drastic development at agriculture front with simultaneous rise in population. It is important to understand the water quality, flora, fauna, their dynamics and functioning of these ecosystems as well as the impact of increasing human activities on them for management of freshwaters and keep them in healthy state to sustain the future progress of the region.