RESULT AND DISCUSSION

6.1 Water Quality Parameters

The Ichthyofauna is an important aspect of fishery potential of water body. More work has been, carried out on ichthyofauma in Indian reservoirs the distribution of fish species is variable due to geographical and geological conditions of reservoir.

The diversity of the fishes mainly depends upon the biotic and abiotic factors and type of the ecosystem, age of the water body, mean depth, water level fluctuations, morph-metric features and bottom have great implications. The hydro-biological features of the collection centres also play an effective role in fisheries output to a greater extent.

Ponds are vitally important for freshwater biodiversity and particularly recognised as stepping stone habitats. They also provide a range of ecosystem services and have been used for centuries by local communities.

The present investigation deals with the distribution and association of fish and seasonal variations of certain physico-chemical parameters of pond water in Kanker district, during the year from July 2009 to June 2010. The water quality is declined due to direct discharged of the domestic sewage, municipal wastes and Industrial wastes from various areas of town and villages directly or indirectly affect the biotic community of the water bodies.

Due to discharge of sewage, domestic waste, Industrial effluents, siltation and bathing and washing of clothes by inhabitants in the water body. These cause a change in the physico-chemical characteristics, so it becomes necessary to assess the portability of water due to variation and limnological parameters. Some of the important observations regarding water quality has also been reported by Rai (2003), Singhai (2004), Chandraprakash (2006), and Ravichandran et.al (2008).
For the water convince the discussion in the present investigation has been divided into the following parts.

**Temperature**

All metabolic and physiological activities and life process such as feeding, reproduction, movement and distribution of aquatic organisms are greatly influenced by water temperature. Temperature also affects the speed of chemical changes in soil water contents and pressure of dissolved gases. The oxygen content of water is reduced with rise in temperature. Temperature shows diurnal as well as seasonal variations. Each species has a growth optimum is more or less established throughout the year than the productivity will approach the maximum. The water temperature shows only a little seasonal variations in a year. Winters and summers are severe in intensity; the range of water temperature in plains is 20°C - 24°C which is the tolerance range for the survivability of fishes.

The temperature of a water body is usually lower than the surrounding air. Distinct temperature layers exist in aquatic habitats. There is a gradual decrease in the water temperature with the increase in depth. The temperature of a water body varies with climates season and time of the day. The water temperature can increase due to natural and human factors. Direct sunlight exposure is the major cause for the rise in water temperature.

Dubey and Verma (1966), reported in Budhwari tanks maximum water temperature of 29.4°C in the month of May and maximum water temperature of 14.2°C in December. Verma (1969) noted highest water temperature of 32°C in month of July and lowest water temperature of 19°C in the month of December and January in Tekenpur reservoir. Tondon and Singh (1972) observed in Nagal lake maximum water temperature in September and minimum water temperature in February.

Chandraprakash (1983) reported in Keetham lake higher water temperature in summer and lower water temperature in the rainy season. The present observation is also in agreement with the finding of Chandraprakash in the fact that the highest average water temperature was noted in summer the lowest in the winter and
medium in rainy season. Many researchers like Shrinivasan (1964), Vijayaraghavan (1969), Wetzel (1975), Bohra, et.al. (1975) Kannan (1980), Chourasia (1985), have also reported similar relation between the air and water temperature.

Soni (1980) reported higher water temperature 32°C in summer and lower 15°C in winter season in the Sagar Lake. Thakur and Khan (2006) recorded the highest water temperature in month of May and lowest temperature in the month of September of different lotic and lentic water bodies of Damoh district.

Water temperature exhibited a linear relation with the ambient air temperature and was never found to be higher than air temperature. The lowest water temperature was recorded during winter and the highest during rainy season. The possible reasons could be the same as discussed above. A similar fluctuation pattern of water temperature in Bundelkhand region, water bodies was also recorded by Rao and Govind (1964), Kant and Raina (1989). Sreenivasan (1965) Saxena (1989), Sharma & Thakur (1996), Ramachandra (2001).

Clear thermal stratification was never observed in the water bodies of this region, perhaps due to the fact that water of the water bodies was spread over a wide area and also had a considerable depth. Holomixis of water due to wave action, created by wind velocity as well as bioturbation could be some of the other reasons behind lack of thermal stratification. Sharma (2003) & Kumar (2005) also observed the absence of thermal stratification in some reservoir of Bundelkhand region. The difference of water temperature between different stations of the water bodies was not significant.

Generally, the water temperature of any water body is affected by physical factors, but it governs the other physico-chemical factors of water, as well as sediment, and regulates the productivity and diversity of flora and fauna in an aquatic ecosystem. Hence, temperature is an indispensable factor in limnological and biodiversity study.

During the present investigation the average air temperature ranged from the minimum of 20°C to the maximum of 33.8°C. However the average water
temperature ranged from the minimum 16.40°C in Mahurbandh pond Kanker in the month of January, and maximum 30.31°C in Dandia pond in the month of June. The mean value of the water was minimum during winter season and maximum during summer season.

**Hydrogen Ion Concentration (pH)**

pH is defined as the negative log of the hydrogen ion concentration, (Goldman and Horne, 1983). The pH value is usually influenced by changes in carbon dioxide, carbonates, and bicarbonates. Natural water is mostly alkaline in nature. The value of pH in any water body would be indices of its productivity.

In summer season as a respect of increased algal bloom and decreased stream discharge in the ponds and rivers, which are responsible for changing in morphological, metabolic, behavioural and pathological characters of fish and amphibian. Kahn and Thakur (1984) reported slight variation in pH (6.8-7.5) and attributed it to the migratory and respiratory processes of organism.

Rao and Govind (1964) while studying the fish fauna of Tungabhadra reservoir reported the range of pH variation between 7.61 to 8.36, during 1959.61which minimum values in August-September and maximum in June, and 8.0 to 8.5 during 1963-65, the lowest value of the year were recorded in September-December and highest March-June. The different ranges of pH have been observed by several research in different lentic and lotic water bodies, but it in variably remained towards alkaline side, (Ruttner, 1931; Ganapati 1962; Verma 1964-67; Singh 1965; Vyas 1968; Sreenivasan 1970; Adoni 1975; Awatramani 1980; Singhai 1986;).

Ganapati (1964), Vijayaraghavan (1973), Pant et.al (1980), Soni (1980), also reported the alkaline pH in the natural water bodies of the Sagar division. Kaur and Joshi (2003) studied pH of Ganga river water in Haridwar, pH values fluctuated between 6.6 to 8.6, highest mean value recorded were 8.4 in winter season and lowest pH values 7.0 in July.Kanchan (2004), Kumar (2005), and Belsare (2008), reported in sonar, Ken and Betwa River, values of water quality was monitored in terms of heavy metals and some biological determinants.

pH was alkaline values ranges from 6.43 to 8.92 The maximum pH value (8.92) was recorded in the month of April (summer) and minimum (6.43) in the month of December. Most of bio-chemical and chemical reactions are influenced by the pH.
The reduced rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month (Kamble, S. M. et al.). The factors like temperature bring about changes the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition (Karanth, 1987; Tiwari et al., 2009).

**Electrical conductivity (EC)**

Since the electrical conductivity is a measure to the capacity of water to conduct electrical current, it is directly related to the concentration of salts dissolved in water, and therefore to the Total Dissolved Solids (TDS). Salts dissolve into positively charged ions and negatively charged ions, which conduct electricity.

The electrical conductivity of the water depends on the water temperature the higher the temperature, the higher the electrical conductivity would be. The electrical conductivity of water increases by 2-3% for an increase of 1 degree Celsius of water temperature.

Conductivity is measured by a probe, which applies voltage between two electrode. The drop of voltage is used to measure the resistance and is measured in the amount of conductance over a certain distance. The conductivity unit has been called "mhos" because it is the inverse of "ohm", the resistance unit. Electrical conductivity (EC) of an aqueous solution is a measure of the ability to carry out an electric current (Parashuram and Singh 2007).

The maximum electrical conductivity was observed in January and minimum in May by R. Senthilkumar and K. Sivakumar2007 in Veeranam lake in the Cuddalore district of Tamil Nadu. A sudden rise in conductivity in water during monsoon and post monsoon season indicates addition of some pollutants (Trivedy and Goel, 1984). High value of EC designates pollution status of the lake (Kadam, 1990).

EC ranged between 59 to 71. 60 mhos/cm. recorded by Thirumala. S1, Kiran. B.R2, and Kantaraj.G.S2, 2011, in Bhadra reservoir of Karnataka. High
electrical conductivity was recorded during rainy season. This may be due to greater ionic concentration of the inlet flow (Prithwiraj Jha and Sudip Barat 2003).

The highest EC value (617.2) in summer season while lowest in rainy season (363.2) recorded by Mahima Chaurasia and G.C.Pandey, 2007 in ponds of Ayodhya-Faizabad. The lowest EC value in rainy season was possibly due to rainfall in the catchment area.

In the present study the maximum range of EC (586.2) has been observed in Dandia pond in summer season and the minimum range of EC (315.7) has been observed in Dhanesara pond in rainy season. The present result are in conformity with the earlier works elsewhere (Pandey and Pandey, 2003; Kulshrestha, 1989; Chaurasia and Pandey, (2007).

**Oxidation-Reduction Potential (ORP)**

ORP stands for Oxidation-Reduction Potential. In some parts of the world, it is also known as Redox Potential. ORP measures the presence of oxidizing or [oxidation] reducing agents by their specific electrical charge, thus Oxidation Reduction "Potential"The term redox potential is an expression of oxidising or reducing power of a solution. This power is dependent on the nature of the dissolved substance, as well as on the properties of the oxidised and reduced components in the solution. It is a measurement of oxidize contaminants or a measurement of water’s ability to cleanse itself.

The redox potential of a solution is determined by immersing there by two electrodes, one bright platinum non-reactive and the other, usually a hydrogen electrode. The presence of electrodes sets up an electron flows, the directions of which depends upon the proportion of oxidised to reduced materials .The the intensity of redox msystem is measured by its potential, and the capacity of the system refers to its buffering ability to under go a certain amount of oxidation reduction transformation without an intensity chang. The redox potential system in natural water system is considerably influenced by temperature and PH.

It is measured with an ORP meter. These meters display extremely slight, and highly variable differences in the electrical properties of water. ORP readings are expressed in millivolts (1/1000 of a single volt). High pH water has more "reducing" agents (-ORP) and low pH water has more oxidizing agents (+ORP).
A low ORP can indicate low dissolved oxygen, high nitrites, or high DOC (Dissolved Organic Carbon), with the DOC promoting the increase of harmful bacteria. A pond with an ORP value below 200mV will promote growth of slime algae, between 200 and 250 will promote blanket weed or stringy algae, above 250 algae growth will be prevented.

In the present study the highest range of ORP (370mV) has been recorded in Jepra reservoir in rainy season and the lowest range of ORP (235mV) has been recorded in Dandia pond in summer season. There was not much variation in ORP values.

6.2 Fish Fauna Diversity

The fresh water fishes constitute an important part of the ecosystem. Rich diversified fauna is an indication to good environmental conditions of the corresponding areas. Fresh water fishes are common in ponds, lakes, rivers and other water bodies.

The fish fauna of natural water may somewhat differ from the running water due to changes in ecological conditions. Cyprinidae are generally found attached to submerged gestation and middle surface water but Siluridae live partly buried in mud or found creeping in sand or mud at bank of the water bodies in the present investigations.

Swarup (1953) reported the fish fauna of Sagar Lake, reported the twenty one species of fishes and 14 genera and one order. The twenty one species belonging families, 7 to Siluridae, 5 to Cyprinidae, 3 to Ophiocephalidae, 2 to Mastacembelidae, and one to each of the families of Notopteridae, Cobitidae, Belonidae and Nadidae.

The first detailed systematic account of fish fauna of Bastar Region is found in the papers of karmakar A.K. and A.K.Dutta, 1988. They recorded 100 species, 44 genera and 19 families out of which 60 species, from 29 genera and 15 families recorded from the Kanker district, Collected from 24 selected collecting stations on rivers Mahanadi, Saberi and Doodhnadi, village tanks, dams and local fish markets of Bastar region. The study revealed that the various species found in abundance were Chela, Cirrhinus, Rasbora, Anabas, Puntinus, Labeo, Oxygaster, Lepidocephalichthys, Osteobrama, Catla, Wallago, Mystus, Channa, Notopterus, Chanda, Gadusia, Mastacembelus species. These are common species, which
thrive very well in this region. The fish fauna of this region mainly consists of fishes belonging to Cyprinidae and Siluridae. The fishes thrive very well in water bodies because of suitable water conditions. Many authors described the different fish fauna in various regions in India. But in Chhattisgarh not much has been done.

Soni (1959) reported in the short note on the fish fauna of Bhopal lower lake, Madhya Pradesh. He described the number of predaceous fishes belonging to 36 species, compressing 26 genera, and 10 families. Family Cyprinidae of 12 genera, 18 species of Siluridae 5 genera and 5 species, Nandidae 2 genera and 2 species, Clupeidae, Notopteridae, Percidae, Gobiidae, Saccobranchidae one genera and one species belonging to each family and Ophiocephalidae one genus and 4 species and Rhynchobdellidae one genus and two species.

Soni (1975) reported the fish fauna of Sagar-Damoh district (M.P.). He reported the most common and important food fishes such as Catla catla, Labeo rohita, Cirrhinus mrigala. In addition to this these fishes he reported fish like also Channa straitus; C. marulis, C. punctatus, C. gachua, M. seenghala, Wallago attu, Notopterus notopterus, Notopterus chitala, Chela laubuca, C. atpar, G. guiris, N.nandus, C. batrachus, Heteropheustus fossilis, Rasbora daniconius, D.malabaricus, Ambassis ranga, A. nama, P. ticto, Lepidocephalichthys. The important exotic fishes in the Lake, Rivers and pond studied were Cyprinus carpio and Xenentodon cancila. These are the Chinese fishes and which thrive easily in the Sagar-Damoh Rivers and ponds. They are used as food fishes also.

Soni (1980) reported environment studies on the Sagar lake; feeding spectrum of carps. He reported Twenty-two species of fishes, belonging to 16 genera and two families from the Sagar Lake. There were 15 herbivorous, 6 carnivorous and one omnivorous species. Major carps were found mainly in the limnetic zone; whereas the minor carps were present mainly in the littoral zone. Fishes viz. Labeo boggut (Sykes), L. rohita (Ham) Cirrhina mrigala (Cuv. & Val), Cyprinus carpio(Linn.),Catla catla (Ham.), Puntius tor (Blkr), P. ticto (Ham.), P. tetraupagus (Day), P. conchonius (H.&B.), P. sarana (Ham.), p. stigma (Day), P. sophor (ham.), Oxygaster bacaila (Ham.), O.clupeoldes (Ham.), Garra lamta (Ham.), Rasbora daniconius (H.&B.), Nuria danrica (Blkr), Barilus bola (Ham.), Danio malabaricus (Gun.), Rohtee cotio (Ham.), and family Cobitidae Nemacherilus botio (Day.), Lepidocephalichthys guntea (Day).
Arunachalum (1999) reported fishes of Gonda River in Kalakkad Mundanthurai Tiger reservoir. A survey during January (1997-98) revealed 31 species belonging to 5 order, 12 families and 22 genera. Out of these fishes Hypselobarbus dobsoni, Pseudombassis ranga, puntius sarana, or phoides and Glyptothorax modraspatnum were recorded for the first time in this river basin.

Ahirrao and Mane (2000) reported diversity fish fauna taxonomy and fisheries from fresh water of Parbhani district, Maharashtra. The work undertaken for one year (1998-99) by establishing three sampling stations on major rivers, three stations on reservoirs and one at the local fish markets revealed that the Fish fauna consists of 22 species of fishes belonging to 25 genera and 9 families from two orders. The fishes belonged to the categories, carps and trash fishes.

Nanda and Tiwari (2000) reported the fish fauna in Sambalpur- Hirakund-Burla region, Orissa. The survey indicates that 18 species of fishes are commonly found in this region.

Sone and Malu (2001) reported the fish diversity in relation to aquaculture in Ekburgii reservoir, Washimnagar, Maharashtra. Fish diversity revealed three Indian major carps, viz. C. Catla, L. rohita, C. mrigala and three exotic carp viz. Hypothalmichthya molitris (Silver carp) Ctenopharyngodon idealla (Grass carp) and Cypinus carpio (common carp.). Besides these, fishes present in the reservoir were identified.

Prakash et.al (2002) reported the Gooch an important fisheries resources in Sone basin, Bihar. Here fish fauna comprised fishes belonging to 7 orders, 16 families, 13 genera and 41 species during the investigation period.

Yazdani and Singh (2002), Reported the fish fauna of Ujjani wetland contains the most of the fishes occurring in the Krishna river system. He observed of the 54 species belonging to 15 families, 29 genera, 34 species belonging to carps (Cyprinid), 6 species of catfishes (Siluriformes), 3 supp. To loaches (Cobitidae & Balitoridae). The remaining 11 species belong to other groups. Such as perches (Perciformes), murrels (channiformes), Cyprinodonts, gobies (Gobiidae) and mullets (Mugilidae).
Lepez (2002) reported the fish fauna from Colorado river, Argentina. Cyprinus carpio, Oligascarcus jenyasia, Astyanax eigemanniorm, Odontesthes banariensis, Mugil liza, Jeynsia multidentala, Percichthys trucha and Hatcheria macraei were reported.

Thomas et al. (2002) reported Fish fauna of Eravikulam National Park, Kerala. He described only four species viz. Garra hughi, Harola bioba joshu, Nemacheilus keralensis and Salmo gairdnerii belonging to three families from the park.

Venkateshwarlu et al. (2003) reported the Biodiversity of fish fauna of Mudogodu tank, Rangenachalli. About Twenty fish species were identified in this tank which belongs to five order viz. Cypriniformes, Perciformes, Siluriformes, Cyprinodonitiformes and Osteoglassoformes and ten families.

Diversity of fish fauna Tripura State has been described Barman (2004) of sub Himalayan region of north east India shows that this state harbors 129 species of fishes under 78 genera, 33 families and 11 orders. Out of 33 families recorded only 6 families contribute more number of species. The family Cyprinidae represented by 50 species contributes 38.75% of the total species recorded. It is followed by the family Sisoridae represented by 9 species (6.97%), the family Schibeidae and family Bagridae with 7 species each (5.42%), family Cobotidae with 6 species (4.65%), and family represented any 45 species contributing about 34.9% of the total species.

Sharma et al. (2004) reported the fish diversity of Yashwant Sagar reservoir, Indore (M.P.). Sharma has described in Yashwant Sagar reservoir twenty one species of fishes were found, which belong to two orders viz. Cypriniformes dominated with 18 species falling under four families of which Genus Mystus is abundant with four species and genus labeo with 3 species. C. catla, C. mrigala, L. rohita, L. calbasu, L. bata, P. sarana, P. ticto, belonging to family Cyprinidae and O. bimaculatus. W. attu belonging to Siluridae, M. seenghala, M. bleeker, M. tengara, M. cavasius, belonging to Bagridae and H. fossils for Saccobranchidae, N. Notopterus, N. Chitala belonging to family Notopteridae and C. marulis, C. gachua, C. straitiatus, C. punctatus belonging to family chaanidae recorded in the state.

Study of fish fauna diversity and search a new species of the genus Batasio Blyth (siluriformes: Bagridae) from Sharavati river, Uttara Khanda, Karnataka State.

Bhat, (2007) Studied the morphological variation of fish fauna distribution endemism and threat status of fresh water fishes in the Western Ghats of India.

Dr. S.D. Dongre et al. (2012) reported total 68 species from the Tribal District Betul of Madhya Pradesh India were classified in 9 orders and 22 families. The main fishes of the tribal district of Betul are Catla catla, Cirrhinus mrigala, Cirrhinus reba, Labeo calbasu, Labeo fimbriatus, Labeo bata, Labeo gonius, Labeo rohita Cyprinus carpio (Common carp), Hypopthalmichys molitrics (Silver carp), Ctenopharyngodon idella (Grass carp) Tor tor, Mystus seenghala, Mystus cavasius, Mystus aor, Wallago attu, Punctius sarana, Clupisoma gaura Channa species, Mastacembelus armatus, Ompak bimaculatus, Notopterus notopterus.

Thirty two fish species under eleven families were observed by Dubey et al. (2012) from Banisagar Dam at Chhatarpur, Madhya Pradesh, India.

Tamboli et al. (2012) reported 17 species of cat fishes under 12 genera and 6 families from Kelo and Mand river of Raigarh district Chhattisgarh state.

In the present investigation of fish fauna diversity the fishes collected from Dandia pond comprised of 21 genera and 39 species belonging to 11 different families viz. Notopteridae, Cyprinidae, Cobitidae, Bagridae, Saccobranchidae, Ophiocephalid, Centropomidae, Cichidae, Anabantidae, Gobidae and Mastacembelidae.

In the Mahurband pond 42 fishe species has been recorded belonging to 22 genera and 12 families: Notopteridae, Cyprinidae, Cobitidae, Bagridae, Saccobranchidae, Claridae, Ophiocephalidae, Centropomidae, Cichidae, Anabantidae, Gobidae and Mastacembelidae.

22 genera and 38 species belonging to 11 different familie viz. Cyprinidae, Cobitidae, Siluridae, Bagridae, Schilbeidae, Saccobranchidae, Ophiocephalidae, Nandidae, Anabantidae, Gobidae and Mastacembelidae were collected from the Dhanesara pond Narharpur.
From Jepra reservoir Charama, a total of 21 genera and 41 species belonging to 9 families viz. Notopteridae, Cyprinidae, Cobitidae, Siluridae, Bagridae, Ophiocephalidae, Centropomidae, Gobiidae and Mastacembelidae were collected.

21 genera and 34 species belonging to 9 different families viz. Notopteridae, Cyprinidae, Cobitidae, Siluridae, Bagridae, Saccobranchidae, Ophiocephalidae, Cichidae and Gobiidae were collected from the Beech pond Bhanupratappur.

From Devi pond Antagarh a total of 16 genera and 21 species belonging to 9 families viz. Cyprinidae, Cobitidae, Siluridae, Bagridae, Saccobranchidae, Ophiocephalidae, Cichidae, Gobiidae and Mastacembelidae were collected.

26 genera and 40 species belonging to 10 different families viz. Cyprinidae, Cobitidae, Siluridae, Bagridae, Saccobranchidae, Clariidae, Ophiocephalidae, Centropomidae, Nandidae, and Gobiidae, were collected from the Dhanesara pond Narharpur.

Fish assemblages in ponds and reservoir worldwide show longitudinal zonation (Fisher, 1983) and the relationship between assemblage composition and physicochemical variability continue to be actively study (Mefee and Sheldon, 1988). The longitudinal succession was evident in most of the water bodies, with the number of species increasing downstream.

The temperature of standing waters usually varies seasonally and daily, and among location due to climate, elevation, extent of side vegetation and the relative importance of ground water inputs. The temperature of ground water usually is within 1°C of mean annual air temperature. Seasonal changes in water temperature in water bodies show that mean weekly water temperature could be predicted very accurately from air temperature.

The influence of pH on the distribution of fresh water fish species was not significant. The pH of water is dependent on local factors also. The less influence of pH observed during the present study is supportive to the statement of Whitton (1975) as under most natural conditions variation in pH has little effect on fishes, which can tolerate the normal daily pH range as well as the temperature range.
Electrical conductivity (EC) is a measurement of the dissolved material in an aqueous solution, which relates to the ability of the material to conduct electrical current through it. Conductivity measures the capacity of a substance or solution to conduct electrical current.

The electrical conductivity was found to fluctuate between 108.00 ?S/cm (September, 2004) and 246.30 ?S/cm (May, 2004) by R. K. Garg, R. J. Rao, D. Uchchariya, G. Shukla and D. N. Saksena October, 2009 in Ramsagar reservoir, located in Datia district, Madhya Pradesh and that falls within the range observed for Indian waters. Olsen (1950) classified the name for water bodies having conductivity values greater than 500.00?S/cm as eutrophic. According to this criteria, Ramsagar reservoir water falls under the category of mesotrophic water body.

The diversity of the fishes mainly depends upon the biotic and abiotic factors and type of the ecosystem, age of the water body, mean depth, water level fluctuations, morph-metric features and bottom have great implications. The hydro-biological features of the collection centers of water bodies also play an effective role in fishes output to a greater extent.

In this study among 67 species of fishes, the family Cyprinidae was the most dominant in the assemblage composition with 49.25% followed by Bagridae 10.44%, Mastacembelede 5.97 %, Cobitidae, Anabantidae and Ophiocephalidae each with 4.47% Siluridae, Centropomidae, Nandidae each with 2.98%, Notopteridae, Schilbeidae, Saccobranchidae, Clariidae, Mugilidae, Cichidae, Gobiidae each with 1.49%, respectively.

During the period of investigation (July 2008 - 09 to June 2009-10), 67 fish species belonging to 18 families were recorded of which cyprinidae was dominated by 32 species followed by Bagridae with 7 species, Mastacembelede with 4 species, Cobitidae, Anabantidae and Ophiocephalidae each with 3 species, Siluridae, Centropomidae, Nandidae each with 2 species and Notopteridae, Schilbeidae, Saccobranchidae, Clariidae, Mugilidae, Cichidae, Gobiidae each with 1 species Lagler (1956) classified the fish species on the basis of their economic importance.

The concentration of dissolved oxygen is always related to current, temperature or substrate conditions. Oxygen is transported across the gills and other respiratory structures of aquatic organism by diffusion. The current is continually
renewing the water in contact with respiratory structure. The biodata of running waters is in several ways highly dependent upon the ready availability of oxygen (Hynes, 1970) Oxygen is usually not limiting to the biota of running waters. Under certain condition it can be important and depend on interaction involving other physical and biological factor.

In the present study a positive corelation is obtained with flow and dissolved oxygen. The flow indirectly affects the organism of stagnant water(s) also by supplying nutrients and other conditions necessary for survival. According to Angermeir and Karr (1983), fish biomass distributions among habitats within a stream appear to be more closely related dangers of predation by birds and mammals than to the distribution of food resources. However, distributions of small fish are closely correlated with food abundance. Generally small fishes and young ones inhabit close to the substrate with little current. Edds (1993) correlates with one species in first flowing headwaters and 33 species in slow moving low land sites.

Substrate is a complex aspect of physical environment and is determined by the current, together with available parent material. Substrate is relatively uniform in study bottom of low-gradient Rivers or usually very heterogeneous. Slower currents, finer substrate particle size and lower oxygen are correlated (data indicates that the lowland stream sections with sandy or muddy bottom are slow moving with less dissolved oxygen content compared to hill streams). Substrate depends on the parent material available but there is a general tendency for particle size to decrease as one proceeds down streams i.e. larger stones and boulders are noticed in hilly areas and sandy bottom is low land rivers. This is true with the streams in the study area.

Fish habitat assessment generally involves the study of morphology of the rivers (physical features) which depends on river flow duration, substrate distribution or bed features, land use pattern, riparian vegetation, gradient, entrenchment, nature of water, flow rate of water, width and depth of the water bodies, origin and order of the rivers, bank stability and disturbance along the river basin. Winston (1995) studied the co-occurrence of morphologically similar species in red River basin of texas and concluded that the morphologically most similar pairs of rivers-fish species co-occurred significantly less frequently than morphologically less similar pairs. The
identification of limiting factors, or factors correlated with those that are limiting, may improve species management and habitat enhancement on rivers (Layher and Mughan, 1988). The mechanism maintaining community organization in river fishes probably varies along the physical gradient from headwater to downstream or riffle to pool (Schlosser, 1982). According to Rahel (1984) the type of fish assemblage present in small, northern Wisconsin seepage lake was largely determinate by a lakes position along three major environmental gradients - habitat size and heterogeneity. Lake productivity and pH and water oxygen levels.

Woody debris is an important component of forested rivers and its role in physical, chemical and biological process in rivers is complex. It plays a multidimensional role in the structure and functioning of river eco-system. Woody debris not only influenced fish habitat characteristics, but also provided substrate for many aquatic invertebrates, the major food resource of most fish species (Angermeier and Karr, 1984 and Berry 1997).

Out of the 7 water bodies the diversity Tables showed greater values in Dandia pond, Mahurband pond, Jepra resvoir and Pakhanjoor resvoir. These all areas are in low lands. The reason for greater diversity values may be due to the presence of species having adaptations to withstand wide range of temperature and salinity tolerance. An ecotone is a zone of transition between adjacent ecological systems and these low land areas sometimes act as ecotones. The ecotones are generally with high diversity of species. In contrast, the small index values are reported in streams of high altitudes. These fishes have generally narrow range of temperature tolerance.

The fish species recorded from water bodies, the following are considered as economically important and cultivable fishes including *Notopterus notopterus*, *Cyprinus carpio*, *Oreochromis mossambica*, *Labeo rohita*, *Cirrhinus mrigala*, *Catla catla*, *Mystus seenghala*, *Mystus oar*, *Channa striatus* and *Channa punctatus*. The current study has also shown that the reservoir inhabit the ornamental fishes like Puntius sophore, Puntius amphibius and Puntius chola.

The species diversity was at its peak in post monsoon coinciding with the favourable post monsoon conditions such as sufficient water and ample food
resources. The diversity was low in pre monsoon probably due to the shrinkage of water spread of the reservoir. Species richness was at its best in the month of July while species evenness was highest in late monsoon indicating on evenly distributed and rich fauna in the monsoon and postmonsoon, respectively.

Three exotic species viz., Cyprinus carpio, Ctenopharyngodon idella and Oreochromis mossambicus recorded in the present study were not recorded in earlier surveys. This might be due to accidental entry from some fish farms in the basin during rainy season. Moreover, stocking of seed in the near by farm of the reservoir might be a source of the exotic species. However due attention should be paid to the presence of these species, as they may dominate and even eliminate the native fish fauna. An example of such domination has been witnessed in Gobindsagar where exotic carp has established itself as dominant species.

The study findings showed that fish diversity of the study area is reducing with the increase of water quality. The reduced fish diversity eventually decreases the fish production of native species and creates extinction of several species. These consequences eventually create instability in the socio-economic sector of the study area in terms of increased poverty of local fishermen.

Introduction of Tilapia (Oreochromis mossambica) is slowly gaining its phase in these water bodies. As per the local fishermen, the catch of Tilapia is increasing over the years. The catch starts at the post monsoon period and during November, it dominates the entire catch. Due to least demand for this fish in local market, fishermen treat this fish as an unwanted catch. Scientifically, this fish is regarded as a hardy, territorial and a powerful competitor in nature. Ecologically, these fishes have adverse effect on the indigenous fish species.

Hoiwes (1980) separated some of the larger species of Rasbora as genus. They were also doubtful whether the R. daniconius belongs to the genus Ophiocephalus. The Channids represented in the collection are Channa punctatus and C. straitus. Day (1878) considered C. orientalis and C. gachua as two distinct species based on the presence of the ventral fin is attributed to the amphibious mode of life exhibited by them. Shaji (1998) also considered these as the same species based on reports available on the abnormally of the genus, the absence of the ventral fin is considered as an aberration. During the present study period in the
year July 2009 to June 2010 made some remarks on order channiformes and
taxonomic position of *C. panctatus* *C. gachua* and *C. striatus* collected maximum
stations of Kanker district.

Among the total 67 fish species caught over the complete stretch 33 species
fall under carp fish group, 12 species fall under cat fish group and 22 species are
categorized under miscellaneous group. Swarup (1953) classified the fishes of
ponds and rivers into carp, cat and miscellaneous groups and reported their
economic importance in the local market. Soni (1980) has reported 21 species while
Shrivastava (1984) reported 23 species of economic importance. Among the carps
group all species belong to family Cyprinidae. In the cat group of fishes, family
Bagridae gives the maximum contribution of species with 41.67% and members of
other families Schilbidae, Siluridae, Clariidae, Saccobranchidae and Cobitidae
contribute to the rest. The miscellaneous group is composed mainly by family
Ophiocephalidae with a contribution of 23.08%. The other families belonging to this
group are Notopteridae, Ambassidae, Mastacembelidae, Anabantidae, Gobioidae,
Nandidae and Belonidae.

The various fish species observed during investigation have been listed in list-
5.2 (ch.v) the Cypriniformes contributed maximum number (i.e. 47), of fish species in
fish diversity and it counted almost 70.34 percent of the total. Perciformes
contributed by 9 species (13.43 percent), while Mastacembeliformes came third in
contribution and counted 4 species (5.97 percent) and rest species were from
Ophiocephaliformes, Clupeiformes, and Mugiliformes (3,1 and 1 species
respectively). The last four orders contributed 10.44 percent. The detailed monitoring
and through comparison of old collection and observation data with more recent
ones showed that many species of fish are declining and some have been
disappeared.

In present observation 67 species among them 40 species were most popular
as food as well as game fishes and posses' high economical value. Identified fishes
including 3 exotic, 32 species belonging to family Cyprinidae, 7 species belonging to
family Bagridae, 4 species belonging to family Mastacembelede, 3 species belonging
to each family Cobitidae, Anabantidae, Channidae,2 species belonging to each
family Siluridae, Centropomidae, and Nandidae,1 species belonging to each family
Notopteridae, Schilbedae, Claridae, Belonidae, Mugilidae, Amphipnoidae, Cichilidae, and Gobiidae.

Fishes were identified by following Talwar & Jhingran (1991) with modification from Menon. A lot of inconsistency and confusion has been noticed in the classification and nomenclature. This confusion is very clear in adopting the generic names. Puntius Hamilton and Barbus Cuvier. Hamilton-Buchanin placed some species under the division Cyprinus. Day (1878, 1889) used the name Barbus in a wide sense, although in his key he utilized the Bleekerian names without any indication of their status. Hora et al. (1939), Hora & Law (1941), Hora and Nair (1941), Hora (1942) treated Puntius as a subgenus of Barbus. Misra (1962) used for all species described in his work. Yazdani (1992), Menon & Rema Devi (1995) have reviewed the Bleekerian names Barbodes and Hypselobarbus to accommodate some species of Puntius and Gonoprotropterus and Neolissocheilus for representing this genus. Here in this study adopted Puntius has been used for naming three genera, Talwar and Jhingran (1991) included all the species of the subfamily Nemacheilinae in one genus viz. Nemacjeilus while Jayaram (1999) treated it under many genera.

There have been no attempts to compile the information on the fresh water fishes of the Kanker district, since Dutta and Karmakar (Table - 6.2). In this chapter, an attempt is made to review some of the earlier work carried out to the present study. An attempt is also made to compare the present findings with some of earlier records so as to evaluate changes that have occurred in the fish assemblages.

Prior to present studies, about 67 species of freshwater fishes belonging to 18 families and 8 orders had been recorded from Kanker district of which 60 species were reported after the study of Karmakar & Dutta (Table - 6.2) out of these 60 species 24 were newly described.

Fresh water bodies of the Kanker district present the maximum diversification regarding fish fauna. In the present study it is noticed that the protected areas play an important role in conservation of fish species. Rivers sections forest areas and heterogeneity in substrates shows maximum diversity.
The previous 8 years (2000-01 to 2008-09) data of Fish and Amphibian Fauna diversity and their declined population obtained from the department of Central Fisheries and Zoological Survey of India bears the following facts: Maximum population of *Labeo rohita* (Ham.) has been recorded in winter while the maximum population of *Catla catla* (Ham.) was noted in the rainy season. However, the maximum population of *Cirrhinus mrigala* (Ham.) and *Cyprinus Carpio* (L.) has been found during the summer months.

The population study of major carps fishes also revealed that *Labeo rohita* (Ham.) and *Catla catla* (Ham.) were observed higher in limnetic zones than in littoral zones of the water bodies, throughout the period expect in the rainy seasons, while the population of *Cirrhinus mrigala* (Ham.) was higher at limnetic zones except in summer months and the population of *Cyprinus Carpio* (L.) has been observed to be higher only at littoral zones during summer and the rainy season. Analysis of variance of the population of *Cirrhina mrigala* (Ham.), *Cyprinus Carpio* (L.) shows significant F value with zones.

The physico-chemical and biological parameters do not show favorable effect on the production of cultivable fishes but decline of fish population is also marked due to pollution and progressive eutrofication of the water bodies. Thus the water bodies are not suitable for the food good production of cultivable fishes.

Species of Notopteridae overall seems to be doing well *N. notopterus* is common it was found in the four water body sited. It was commonly encountered species and showed high relative abundance near human habitation, while *N. chitala* was not recorded in any of these selected seven fresh water bodies of Kanker district (Table- 6.1).

B. benedelisis and B. barila were less distributed in the study area. Most of these were observed on major ponds with reserve forest, shift cultivation sides and small waterfall and rock crevices. Cyprinidae Fish *C. catla, Cirhinus mrigala, Cyprinus carpio, Esomus danricus, Oxygastur bacalica, Puntius ticto and Rasbora daniconius* showed common distribution and was found in all localities (7 water bodies) in the same area during our study. Another cyprinid species, *Amblypharayngdon mola, Ctenopharyngodon idela, Labeo calbasu, Rasbora elanga*
was found in patchy distribution in different collection sites of water bodies, its occurrence was mostly and occasional (Table - 6.1).

Genus labeo and puntitus contributed 6 and 7 species respectively. Species of puntius were wide spread in the study areas as Puntius amphibious, P. chola, P.conchonius, P.punctatus, P.sarana, p. sophore, P. Ticto. Labeo bata, L. calbasu, L. fimbriatus, L. gonius, L. pangusia, L. rohita, and etc were found during study. L. rohita and P.ticto are very common, while L. calbasu, P.amphibious, P. chola, P.conchonius , P.punctatus, P. sarana, p. sophore, L. gonius and P. sarana are perhaps the next common species. L. bata, L. gonius, L. Fimbariatus, L.pangusia were collected only some localities (Table-6.1). The road side rainwater pool surrounded by secondary forest and sacred groove and small water fall and rock crevices near water bodies. It was a commonly encountered species and showed high relative abundance near human habitation.

Family Cobitidae fish Lepidocephalichthys thermalis was found in all localities (7 water bodies) while L. guntea, Nemacheilus botia showed restricted distribution and was found in max. (2 - 4) localities during the rainy season, in the study area L. thermalis was wide spread in the study areas and collected from all selected water water bodies of Kanker district for study.

Family Bagridae fish M.bleekeri and M. cavasius, M. viittatus, and M. seenghala showed restricted distribution and was found in max. (4 - 5) localities in a temporary water pool and rivers formed during the rainy season, in the study area, the species showed repeated occurrence in the same area for two years during our study. Another M. aor, R.rita, etc. were found in patchy distribution in maximum (1 - 2) localities, and its occurrence was mostly rare and occasional.

In Kanker district, the endemic species, G. gotyla, Oxygaster bacaila, L. guntea, O. bimaculatus, and R. rita etc, were found in different localities of the water bodies, its occurrence was mostly, rare and occasional (Table - 5.11) is facing extinction due to the interlocution of O. moassmbicus, because of similar ecological requirements may challenge their very survival.
The introduction of *Cyprinus Carpio* var specularis was found some localities of water bodies, have been reported to affect the population of indigenous, *L. bata*, *L. rohita*, and *Osteobrama cotio*, respectively. The population of native Catla and Mahseer were depleted considerably in Govind Sagar reservoir after the introduction of silver corps (Mular and Walker, 1988). Introduction of silver corps in Indian reservoirs has in general, a negative impact of fish diversity.

As per the local fishermen, the catch of Tilapia is increasing over the years. The catch starts at the post monsoon period and during November, it dominates the entire catch. Due to least demand for this fish in local market, fishermen treat this fish as an unwanted catch. Scientifically, this fish is regarded as a hardy, territorial and a powerful competitor in nature. Ecologically, these fishes have adverse effect on the indigenous fish species.

Through the introduction of the African Cichlid, Oreochromis mossambicus (Tilapia) in this region has been claimed as a success story by fishery experts, the species seem to have caused unanticipated impact on the fresh water bodies of this region. Though it is a species adapted for reverine life, it was introduced extensively in lentic water bodies in Kanker district. Being a prolific breeder and a hardy fish, Telapia now dominates indigenous ichthyofauna in many water bodies of Kanker district studies on fish diversity of the study area in Kanker district, showed abundant population of Tilapia, replacing native fish fauna in many areas.

Most of the above mentioned endemic species are restricted to these protected areas. This is a convincing indication of the role of the protected areas in the conservation of nature and natural resources. Considering the diversity and endemicity of fish species.

Based on the present observation it is noticed that the following area the species mainly inhabited in water bodies. *Barilus bendelisis*, *B. barila*, *chela laubuca*, *Danio devario*,*Labeo calbasu*, *L.boga*, *Puntius sophore*, *P. filamentosus*, *P. chyyosopterus*,*Ostiobrama cotio*, *Ompok pabda*, *Mystus cavasius*, *M. aor*, *Channa straitus*, *Notopterus notopterus*, *Ambassis nama*, *Mastacembelus pancalus*, *Macrophinathus aculeatus*, *M. armatus*, *M.guntheri*, *Lepidocephalicthys guntea*,*Heteropneustus fossilis*, *Glossogobius guris*, *Chela laubuca*,*Garra gotyla*,
Puntius chonchonius, Nemacheilus botio. Puntius, Ambasssis and Nemacheilus species have ornamental value due to small size and bright colors and can are used as aquarium fishes. Gambusia sp is used as larvivorous fish. However, Labio calbasu found to be rare species in the present study. With the onset of Southwest monsoon, heavy influx of freshwater occurs in the reservoir in early July developing a freshwater isostatic habitat. Consequently, the high floods during monsoon changes the entire system.

The human anthropogenic activities and over exploitation leads to rapid decline in the fish diversity. Though commercially important species are available they are not abundant to make fishery commercial and economical. Conservation measures require aforestation in catchment and awareness on illegal fishing and killing of brood fishes and juveniles.

The fish species recorded from study area, the following are considered as economically important and cultivable fishes including Notopterus notopterus, Cyprinus carpio, Oreochromis mossambica, Labeo rohita, Cirrhinus mrigala, Catla catla, Mystus seenghala, Mystus.oar, Channa striatus and Channa gachua. The current study has also shown that the reservoir inhabit the ornamental fishes like Puntius amphibious, Puntius sophore and Puntius chola.

Garra gotyala is collected from only one water body of Kanker district. According to the original description this species can be readily distinguished from the other species of the genus by its elongated body form, broad head, broadly rounded snout without tubercles, absence of proboscis and lateral lobes, and total absence of scales on ventral surface and mid dorsal streak. The specimens collected in the present study indicate that all the above mentioned characters are present, except one. The specimens collected during the present study had scales on the mid dorsal streak. No such description could be traced in literature. It seems to be new characters confirmed which will be confirmed by further studies.

Approximately half of the species recorded during our surveys were uncommon (found in only 1 or 2 sites). This may be due to the fairly specific habitat requirements of freshwater fish (Gehrke and Harris 2000; Keith 2003), or may be
due to the sampling techniques used during our surveys which relied heavily on observation. As some of the smaller fish, in particular the Sicydiinae gobies, are very cryptic and burrow into the substrate, it is likely we missed them in some sites. Other species that live under riparian plants and/or burrow into the soft mud on river edges may also have been missed in a number of sites. A great deal of uncertainty exists in the taxonomy *D. Aquipinnatus* described from the Pakhanjoor reservoir out of reach of the tides. Day (1878) distinguished the *D. Aquipinnatus* by larger number of lateral line scales and more number of anal fin elements. Hora and Mukerji (1934) separated *D. Aquipinnatus* from other species by the absence of black mark on the upper angle of the gill opening. The specimens of this fish are collected from Pakhanjoor block of Kanker district. The absence of the fish from other sites may be because of unknown physical and biological factors. *Nandus nandus* and *Badis badis* are the only representative of the family Nandidae seems to be biomarker.

The taxonomy of *Anabus testudinus* needs further investigation, but is currently recognised as valid (Eschmeyer and Fricke 2010). There has been a considerable confusion about the taxonomy of the genus Anabas. It is often treated as monotypic, but almost certainly represents a species complex. Rao (1968) stated that there are two distinct species and gave the name oligolepis to the second species. Other authors have called it cobojuis (Talwar and Jhingran 1991).

The present study shows that the number of introduced species is increasing at a rapid speed and the population of local species is showing an alarming in numbers, lack of natural enemies of the introduced species may be the cause for their increased survival, when compared to the native species.

Fish contributes a good share in the diet of human population of Chhattisgarh. However, there is a declining trend in the availability of fishes from the natural sources in the state. This is primarily due to loss of wetlands and over exploitation of the resources. Climate change and increasing pollution add further to the loss of fish fauna in the state. The present manuscript deals with the extant fish species in the state of Chhattisgarh and Kanker district in particular. At present the natural water bodies sustain the populations of *Rohu* and *Catla* as the major food fishes while *Puntius spp.*, *Chela spp.*, *Mystus spp.*, *Mastacembelus armatus*, *Macrognathus aculeatus* and *Channa* spp. as the other commonly available species. The Indian cat fish *Clarias batrachus & Heteropneustes fossilis* are at the verge of extinction in the
State. Similarly *Notopterus notopterus* and *N. Chitala* are becoming very rare species.

Common examples of super-abundant species are amongst *Rasbora, Puntius, Esomus, Amblypharyngodon* and *Lepidocephalus*. These are also the fishes most relished by the rural people that have traditionally adopted indigenous techniques to harvest them in substantial quantities for domestic consumption and the local fish markets. 'Of no interest to fisheries' is a common statement that most of us who have used Talwar and Jhingran's 'Inland Fishes of India' might recognize. These and many other small-sized fish species are also branded as 'miscellaneous' in standard fishery literature. Rural people have however relied on the so-called miscellaneous species for their day-today protein needs and have nurtured Local knowledge on the nutritional and medicinal value of inland fishes in India has not been given adequate importance.

The willingness to pay a higher price for 'safer-to-eat' fish is one of the major factors that play against the popularity of miscellaneous fish. And driven by urban markets inland fishery is increasingly focused on fast-growing large species (including non-native species) that the natural habitats of hundreds of species of small native fish are being transformed and destroyed. Local knowledge on the nutritional and medicinal value of inland fishes in India has not been given adequate importance.

Culture technology for native species is not available. There is a lack of interest among the government and private agencies to promote it, as there is no export demand for these species. Farmers also doubt whether the culture of such species will be profitable.

Small native fish species have not so far been included as part of aquaculture systems. There is a need to promote these species. Small native fish species should be included in aquaculture. A G Ponniah highlighted CIBA's effort to document 80 indigenous traditional knowledge (ITK) systems. For example, there are specially designed 'holding ponds' for rearing brood-stock of Puntius sarana and Clarias batrachus. Seed production of Puntius sarana is undertaken in earthen pots in 24 Parganas (South) District, West Bengal; induced breeding of IMCs is done with
herbal extracts in Manipur. The need for patenting these practices as intellectual property rights (IPR) needs to be explored, he said.

It is noticed that there is a lot of traditional knowledge with respect to small native fish species and it is essential to put in place effective policies and programmes to support such strategies. The knowledge that local communities, particularly the poor, have about the therapeutic value of fish, for example, Puntius sp. with some herbs is used by tribal communities to cure gastric problems. This knowledge is not documented due to limited interaction with local communities. The introduction of exotic species represents a significant threat to indigenous species, he cautioned. Another significant threat is that of habitat loss of these fish species due to factors such as encroachment of wetlands by promoters and developers, and digging works under the NREGS programme.

Monitoring the occurrence of species and their population has been a basis of assessing the effects of environmental impact (Spellen Berg 1996). Fish fauna of an area may change for reasons such as habitat alteration, pollution and overfishing. To have an insight into the warning threats that contribute to the decline of a species or an assemblage of species, there has to be basic data of the distribution and abundance of the species of an area. Such information could be the basis of evaluation of the past, present and future change in the species composition and abundance of the fish fauna.

Fish occupy a significant position in the socio-economic fabric of India by providing nutritious food, income and employment opportunities. Indian subcontinent is the richest zoogeographic region in respect of its inland fish diversity and wildlife. Man-made changes by irrigation, contraction of dams, deforestation and water pollution had devastating effects on the natural fish stocks of the Indian rivers. Dams have become a characteristic component of river basins. These dams radically alter river hydrology both up and downstream creating a new artificial aquatic environment and consequently changing the fish species spectrum.

Introduction of economically desirable species accelerated the decline of native fishes (Talwar and Jhingran, 1991). Besides, overfishing combined with other threats, is responsible for the drastic reduction of entire fish communities, leading fishes to be either in the rare, threatened or endangered category. Human generated pollution and contamination like acid rains, human waste, over use of pesticides can
affect all levels of biodiversity. Various inputs in the form of fertilizers, pesticides and weedicides affect fisheries. Use of excessive fertilizers for enhancing agricultural yield may lead to eutrophication, whereas weedicides may prove toxic and endanger the fishery. Pesticides, like chlorinated hydrocarbons are also toxic to fish and their accumulation in tissues affect the health of fish consumer through food chain.

With the rapid increase in the human population and the increasing dependence on aquatic fishery resources including water and the continuing introduction of exotic species in natural water bodies, the loss of aquatic fish diversity is likely to increase further unless proper conservation measures are implemented. Detailed investigations should be initiated to locate the impact of all the introduced species in the present water body, followed by steps to eradicate the deleterious species (Bijukumar 2000). Any deviation would lead to further erosion of biodiversity that would be detrimental for fisheries and environment as a whole.

Over-exploitation of a species can lead to its disappearance. Many of the world's natural resources are being used by humans faster than they can replace themselves. Over-exploitation has led to dwindling of fish stock which could not come up due to subsequent success including damming. The fishermen reported decline in catch which as attributed to over-fishing. In Kanker district, there was a general assertion that due to over-fishing the catches have dwindled. Sometimes fishermen get injuries due to dynamites in the form of detachment of palms from their hands. These hazardous fishing techniques kill millions of fry and fingerlings of fish, which if, would have survived would enriched the river with tones of adult fish. Unfortunately, these malpractices are being repeated for years causing drastic reduction in biodiversity of fishes of this region. The irreversible reduction of the biological wealth of this planet is the crime for which future generations are likely to blame us. Conservation of biological diversity, therefore, is a crying need of the present time.

The rare and endangered species are mostly concentrated to Mahurband pond, Dhanesara pond and Pakhanjoor resvoir. Habitat quality parameters indicated safer condition in almost all the collection sites. However, some unfavorable features are observed in certain areas. The most important factors found to affect the distribution of species are temperature, flow rate, oxygen and substrate
heterogeneity. The species diversity index is more in lowland and midland areas. At high altitude the species diversity is less.

Due to multiple uses of fisheries resources, fishing has become a major industry and a large number of these aquatic communities are under a big threat of extinction. Habitat loss and environmental degradation has seriously affected the fish fauna. Knowledge of available resources and the biological characters of species serve the base line information for further studies on resource conservation and maintenance. Further, there is a need for survey of diversity of fish fauna in different types of habitat all over the country. Industrial effluents and manmade pollutants also contribute towards the disruption in the balance on aquatic ecosystem. The work will provide future strategies for development and fish conservation. Conservation measures require forestation in catchments on illegal fishing and killing of fishes.

In the context of threatened biota, including Kanker district it is becoming increasingly clear that systematic conservation planning should be implemented without delay. Despite certain problems, it will be fruitful to priorities certain high diversity areas from the Kanker district for conservation. Recent case studies and reports done by others and including this also have discussed elaborately on conservation planning and its implementation. With increasing interest in the biodiversity conservation and setting priority area, a site-wise comparison as well as repeated studies of the same area over a longer time period will help in determining the status of a site in terms of the diversity and prioritizing sites for conservation.

6.3 Association Index

The measured result of interspecific association and association coefficient based on $2 \times 2$ contingency table and Jaccard icdices shows that among 2022 species pairs of 65 fish species, 733 species pairs occurred positively associated. 536 species pairs occurred negatively associated while 753 species pairs occurred with maximum association ($\delta_{AB} = 0$).

13 Dominating species from the fish collection showed the maximum value of association index. All 78 species pairs of 13 fish species found in all sampling units (7 water bodies). These are Catla catla, Cirhinus mrigala, Cyprinus carpio, Esomus danricus,
Oxygastor baccalica, Mystus cavasius, Channa gachua, Channa striatus and Glossogobius giuris. Out of these 3 fish species are carps, 4 fish species are cat fish and 6 fish species are indigenous species.

Among 733 positively associated species pairs, 293 species pair shown distinctly significant positive association their $\delta_{AB}$ value has been found between +.57 to +1.71. Other 440 species pairs shown significant positive association, their $\delta_{AB}$ value has been found between +.42 to +.14.

Out of 536 negatively associated species 202 species pairs shown distinctly significant negative association their $\delta_{AB}$ value is found between -0.57 to -1.71. Other 334 species pairs shown significant negative association their $\delta_{AB}$ value has been found between –0.42 to -0.14.

The maximum value of positive association ($\delta_{AB} +1.71$) has been found in four species pairs they are (1) Chanda ranga – Chanda nama (2) Anabas testudinus – Anabas – cobojius (3) Macrognathus armatus – Macrognathus – guntheri and (4) Ompok pabda – Mystus vittatus.

The positive associan value $\delta_{AB} = 1.42$ found between two species pair they are (1) Ostiobrama cotio - Nemacheilus botia (2) Macrognathus aculeatus – Macrognathus panaculus. 13 and 26 species pairs have been found with $\delta_{AB}$ value of 1.28 and 1.14 respectively.

Species pairs which occurred with maximum association ($\delta_{AB} = 0$), either one or both species has been found in all sample units (7 Water bodies) or $a = 7$ or $a + b = 7$ or $a + c = 7$.

Association index reached its minimum value at $a = 0$ when the two species never found together. The maximum value of association index occurred when both species occurred always together or $a = 7$ and $b = c = 0$. The association index found symmetric that, value of the occurred the same regardless of which species is designated “A” or “B” ($2 \times 2$ contingency table).
The maximum value of negative association (\(\delta_{AB} = -1.71\)) has been found in two species pairs they are (1) *Garra gotyla* – *Macrognathus armatus* (2) *Garra gotyla* – *Macrognathus guntheri*. The negative association value (\(\delta_{AB} = -1.42\)) has been found between two species pairs they are (1) *Aspidoparia morar* – *Mastacembelus panaculus* (2) *Crossocheilus latius* - *Mastacembelus panaculus*. 9 and 10 species pairs have been found with \(\delta_{AB}\) value of -1.28 and -1.14 respectively.

### 6.4 Coefficient of association (C)

Coefficient of association (C) shows what proportion of the association possible with this series of collections was actually found. The number of species pairs which association coefficient occurred +1 is 386 and the number of species pairs which association coefficient have been found below +.5 is 347. 753 species pairs have been found with zero (0) association coefficient. Number of species pairs which association coefficient have been found -1 is 239 and species pair which association coefficient have been found below -.5 was 297.

Present study reveals that species pair with maximum positive association have similar biological characters and similar habitat most of the species pairs were of same family while species pairs with maximum negative association have different biological characters and different habitat. They all were from different families.

Analysis based on 2 \times 2 contingency table reveals that where the value of \(\delta_{AB}\) was 1.71 and 1.41 the value of cell \(a, b\) and \(c\) has been found \(a = 4, b = c = 0\) like wise for \(\delta_{AB} = 1.28\) \(a = 3, b = 1\) or 0 and \(c = 1\) or 0; for \(\delta_{AB} = 1.14\), \(a = 4, b = 0\) or 1 and \(c = 0\) or 1.

In negative association for \(\delta_{AB} = -1.71\) value, \(a = 0, b = 3\) and \(c = 4\); for \(\delta_{AB} = -1.42\) value \(a = 0, b = 2\) and \(c = 5\); for \(\delta_{AB} = -1.28\) value \(a = 0, b = 3\) and \(c = 3\) and for \(\delta_{AB} = -1.14\) value, \(a = 0, b = 2\) or 4 and \(c = 2\) or 4 have been found.

Interspecific association coefficient (C) took the value zero when the joint occurrence is exactly the expected number it took the value +1 when the species
occurred together as many times as they possibly could have and it took the value -1 when the species occurred together the minimum number of time possible.

Causes of interspecific association are usually not discernible without properly designed experiments. We have discussed properties that association index and association coefficient may have in general under statistical independence.

Though I have done hard efforts to collect and identify the fishes of this locality. Still I feel like there is a gap in study of biodiversity of this region. Feeding and reproduction behavioral study of many such animals are still to be done. Many morphological changes occur in males and female which will help other biologist. The depleting population of many species of the groups studied is very alarming and to prevent further loss of species it is the need of the time to awaken the villagers, tribals and citizens.

This work establishes the data information and idea about the freshwater fishes occurring in the Kanker District, Chhattisgarh, India. More importantly the work gives idea about the association of different species of fishes. Some species found occurring together while some other species never found together moreover association coefficient shows what proportion of the association possible with this series of collection was actually found. The work in general will be helpful in the culture and management of the fishes.
<table>
<thead>
<tr>
<th>Species recorded in previous study</th>
<th>Species recorded in present study</th>
<th>Species not found in previous study</th>
<th>Species recorded in previous study but not found in present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family-Notopterida</td>
<td>Family-Notopterida</td>
<td>Family-Cyniiformes</td>
<td>Family-Cyniiformes</td>
</tr>
<tr>
<td>1. Notopterus notopterus (Pallas)</td>
<td>1. Notopterus notopterus (Pallas)</td>
<td>1. Aspidoporia morar (Ham.)</td>
<td>1. Barilius evezardi (Day)</td>
</tr>
<tr>
<td>Order-2.Cypriniformes</td>
<td>Order-2.Cypriniformes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family - Cyprinida</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Amblyparyngdon mola (Ham.)</td>
<td>3. Amblyparyngdon mola (Ham.)</td>
<td>5. Danio aequipinnatus (McClelland)</td>
<td></td>
</tr>
<tr>
<td>4. Barilius bendelisis (Ham.)</td>
<td>4. Aspidoporia morar (Ham.)</td>
<td>6. Garra gotyla (Gray.)</td>
<td></td>
</tr>
<tr>
<td>5. Barilius barila (Day)</td>
<td>5. Barilius bendelisis (Ham.)</td>
<td>7. Labeo bato (Ham.)</td>
<td></td>
</tr>
<tr>
<td>6. Barilius evezardi (Day)</td>
<td>6. Barilius barila (Day)</td>
<td>8. Labeo boga (Sykes)</td>
<td></td>
</tr>
<tr>
<td>7. Barilius vaga (Ham.)</td>
<td>7. Catia catia (Ham)</td>
<td>9. Labeo angu (Ham.)</td>
<td></td>
</tr>
<tr>
<td>Order-3 Siluridae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Labeo boga (Ham.)</td>
<td>8. Labeo calbasu (Ham.)</td>
<td>10. P. puntatus (Ham.)</td>
<td></td>
</tr>
<tr>
<td>9. Cirhrinis nigra (Ham.)</td>
<td>9. Cirhrinis nigra (Ham.)</td>
<td>10. P. jelius (Ham.)</td>
<td></td>
</tr>
<tr>
<td>10. Cirhrinis reba (Ham.)</td>
<td>10. Cirhrinis reba (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Cirhrinis fulungee (Sykes)</td>
<td>11. Croscoelus latus (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Croscoelus latus (Ham.)</td>
<td>12. Clenoparyngodon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Danio devario (Ham)</td>
<td>13. Cyprinops syrius (Linnaeus)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Rasbora daniconius (Ham.)</td>
<td>15. Esomus danicus (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order-4 Perciformes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Garra mullya (Sykes)</td>
<td>16. Garra gotyla (Gray.)</td>
<td>15. Mystus oar (Ham.)</td>
<td></td>
</tr>
<tr>
<td>17. Labeo angra (Ham.)</td>
<td>17. Labeo bata (Ham.)</td>
<td>16. M. tengara (Ham.)</td>
<td></td>
</tr>
<tr>
<td>18. Labeo boga (Ham.)</td>
<td>18. Labeo calbasu (Ham.)</td>
<td>17. Rila rita (Ham.)</td>
<td></td>
</tr>
<tr>
<td>19. Labeo boga (Sykes)</td>
<td>19. Labeo limbristus (Blok)</td>
<td>18. Riza rita (Ham.)</td>
<td></td>
</tr>
<tr>
<td>20. Labeo calbasu (Ham.)</td>
<td>20. Labeo liquis (Ham.)</td>
<td>Order-2 Beloniformes</td>
<td></td>
</tr>
<tr>
<td>21. Labeo calbasu (Ham.)</td>
<td>21. Labeo panpusia (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Labeo raha (Ham.)</td>
<td>22. Labeo raha (Ham.)</td>
<td>Family Belonidae</td>
<td></td>
</tr>
<tr>
<td>23. Osteobrama coto (Ham.)</td>
<td>23. Osteobrama coto (Ham.)</td>
<td>Order-3 Ophiocheliformes</td>
<td></td>
</tr>
<tr>
<td>24. Qyngaster bacilica (Ham.)</td>
<td>24. Qyngaster bacilica (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Qyngaster clupeides (Blok)</td>
<td>25. Puntius amphiibius (Valenciennes)</td>
<td>Family Chichidae</td>
<td></td>
</tr>
<tr>
<td>26. Puntius amphiibius (Valenciennes)</td>
<td>26. P. chola (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. P. chola (Ham.)</td>
<td>27. P. conchonius (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. P. jelius (Ham.)</td>
<td>29. P. sarana (Ham.)</td>
<td>22. Nandus nandus (Ham.)</td>
<td></td>
</tr>
<tr>
<td>30. P. melanostigma (Day)</td>
<td>30. P. sophar (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. P. sarana (Ham.)</td>
<td>31. P. hicto (Ham.)</td>
<td>18. Kenotodon concia (Ham.)</td>
<td></td>
</tr>
<tr>
<td>32. P. sophar (Ham.)</td>
<td>32. Rasbora daniconius (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. P. ticto (Ham.)</td>
<td>33. Rasbora elonga (Ham.)</td>
<td>Order-5 Mast acmebleformes</td>
<td></td>
</tr>
<tr>
<td>34. Adipsos mordax (Ham.)</td>
<td>34. Adipsos mordax (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. L. thermsalis (Cuvier &amp; Valenciennes)</td>
<td>35. L. thermsalis (Cuvier &amp; Valenciennes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order - Siluridae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Nemacheilus bota (Ham.)</td>
<td>36. Nemacheilus bota (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Wallago attu (Bl &amp; Schn.)</td>
<td>37. Ompok pabda (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Clupisoma garua (Ham.)</td>
<td>38. Wallago atu (Bl &amp; Schn.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Clupisoma montana (Horo)</td>
<td>39. Family Bagridae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. M. bleekeri (Day)</td>
<td>40. M. bleekeri (Day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Mystus cassius (Ham.)</td>
<td>41. M. oar (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. M. montanus (Jorden)</td>
<td>42. M. seenghala (Sykes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. M. seenghala (Sykes)</td>
<td>43. M. tengara (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. M. vittatus (Blok)</td>
<td>44. M. vittatus (Blok)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Rila rita (Ham.)</td>
<td>45. Rila rita (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Pseudopontus atheroides (Blok)</td>
<td>46. Pseudopontus atheroides (Blok)</td>
<td>Family - Schilbeida</td>
<td></td>
</tr>
<tr>
<td>47. Clarias batrachus (Lin.)</td>
<td>47. Clarias batrachus (Lin.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order - 3 Mugiliformes</td>
<td>48. Clarias batrachus (Lin.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Rhinomugil corsula (Ham.)</td>
<td>49. Rhinomugil corsula (Ham.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family - Mugilidae</td>
<td>Order-3 Beloniformes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table – 6.1 Available commercial valued fish species in ponds and reservoir of Kanker district and their comparison from previous study**
<table>
<thead>
<tr>
<th>Family: Mugilidae</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50. Rhinomugil corsula(Ham.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Ophiocephaliformes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Ophiocephalidae</td>
<td></td>
</tr>
<tr>
<td>51. Channa gachua(Ham.)</td>
<td></td>
</tr>
<tr>
<td>52. Channa punctatus(Ham.)</td>
<td></td>
</tr>
<tr>
<td>53. Channa striatus(Bl.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Cymbranchiformes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Amphipnoidae</td>
<td></td>
</tr>
<tr>
<td>54. Amphipnous cuchia(Ham.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Perciformes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Centropomidae</td>
<td></td>
</tr>
<tr>
<td>55. Chanda ranga(Ham.)</td>
<td></td>
</tr>
<tr>
<td>56. Chanda nama(Ham.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Perciformes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Cichidae</td>
<td></td>
</tr>
<tr>
<td>57. Telapia mossambica(Peters)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Nandidae</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Nandidae</td>
<td></td>
</tr>
<tr>
<td>58. Badis badis(Ham.)</td>
<td></td>
</tr>
<tr>
<td>59. Nandus nandus(Ham.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Amenantidae</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Anabantidae</td>
<td></td>
</tr>
<tr>
<td>60. Anabas testudinus(Bloch.)</td>
<td></td>
</tr>
<tr>
<td>61. Anabas coboju(Ham.)</td>
<td></td>
</tr>
<tr>
<td>62. Colisa fasciato(Bl.&amp;Schn.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Gobidae</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Gobididae</td>
<td></td>
</tr>
<tr>
<td>63. Glossogobius giuris(Ham.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order: Mastacembelede</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Family: Mastacembelede</td>
<td></td>
</tr>
<tr>
<td>64. Macrignathus aculeatus(Bloch)</td>
<td></td>
</tr>
<tr>
<td>65. M.armatus (Lacepede)</td>
<td></td>
</tr>
<tr>
<td>66. M.guntheri(Day.)</td>
<td></td>
</tr>
<tr>
<td>67. Mastacembeleus panaculus(Ham.)</td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>Dandia pond</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>1. Notopterus notopterus (Pallas)</td>
<td>O</td>
</tr>
<tr>
<td>2. Amblypharyngodon microlepis (Bleeker)</td>
<td>O</td>
</tr>
<tr>
<td>3. Amblypharyngodon mola (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>4. Aspidorhynchus moror (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>5. Barilius bendelisis (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>6. Barilius barila (Day)</td>
<td>N</td>
</tr>
<tr>
<td>7. Catla catla (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>8. Chela catla (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>9. Cirrhinus miragla (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>10. Cirrhinus reba (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>11. Crossochelus latius (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>12. Ctenopharyngodon idelio (Valenciennes)</td>
<td>C</td>
</tr>
<tr>
<td>13. Cyprinus capio (Linnaeus)</td>
<td>C</td>
</tr>
<tr>
<td>14. Danio aequipinnatus (McClelland)</td>
<td>Vc</td>
</tr>
<tr>
<td>15. Esox lucius (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>16. Gaira gaster (Gray.)</td>
<td>N</td>
</tr>
<tr>
<td>17. Labeo bata (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>18. Labeo callasi (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>19. Labeo fimbriatus (Bloch)</td>
<td>N</td>
</tr>
<tr>
<td>20. Labeo gonius (Ham.)</td>
<td>R</td>
</tr>
<tr>
<td>21. Labeo pandusia (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>22. Labeo rohitu (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>23. Osteobrama cota (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>24. Oxygen stegos (Ham.)</td>
<td>Vc</td>
</tr>
<tr>
<td>25. Puntius insula (Valenciennes)</td>
<td>C</td>
</tr>
<tr>
<td>26. P. chola (Ham.)</td>
<td>Vc</td>
</tr>
<tr>
<td>27. P. conchonius (Ham.)</td>
<td>Vc</td>
</tr>
<tr>
<td>28. P. punctatus (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>29. P. solomon (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>30. P. sphen (Ham.)</td>
<td>Vc</td>
</tr>
<tr>
<td>31. P. ticto (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>32. Rasbora daniconius (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>33. Rasbora elag (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>34. Lepidocheilichthys guntea (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>35. L. thermalis (Chever &amp; Valenciennes)</td>
<td>C</td>
</tr>
<tr>
<td>36. Nemacheilus bota (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>37. Ompok pabda (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>38. Wallago attu (Bloch &amp; Schn.)</td>
<td>N</td>
</tr>
<tr>
<td>39. M. bleekeri (Day)</td>
<td>Vc</td>
</tr>
<tr>
<td>40. Mystus cavatus (Ham.)</td>
<td>C</td>
</tr>
<tr>
<td>41. M. oar (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>42. M. koyala (Sykes)</td>
<td>N</td>
</tr>
<tr>
<td>43. M. tengara (Ham.)</td>
<td>Vc</td>
</tr>
<tr>
<td>44. M. vittatus (Bloch)</td>
<td>N</td>
</tr>
<tr>
<td>45. Rita rita (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>46. Pseudobrycon atherinoides (Bloch)</td>
<td>N</td>
</tr>
<tr>
<td>47. Heteropneustes fossilis (Bloch)</td>
<td>O</td>
</tr>
<tr>
<td>48. Chela catla (Ham.)</td>
<td>N</td>
</tr>
<tr>
<td>Order 3 Beloniformes</td>
<td>N</td>
</tr>
<tr>
<td>Order 4 Mugiliformes</td>
<td>N</td>
</tr>
</tbody>
</table>

**TABLE – 6.2 FISH SPECIES AND RELATIVE ABUNDANCE IN DIFFERENT WATER BODIES OF KANKER DISTT. DURING THE YEAR FROM JULY 2008-09 TO JUNE 2009-10**
<table>
<thead>
<tr>
<th></th>
<th>C = Common, Vc = Very common, O = Occasionally, R = Rare, N = Not recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.</td>
<td>Rhinomugil corsula(Ham.)</td>
</tr>
<tr>
<td></td>
<td>Family- Ophiocephaliformes</td>
</tr>
<tr>
<td>51.</td>
<td>Channa gachua(Ham.)</td>
</tr>
<tr>
<td>52.</td>
<td>Channa punctatus(Ham.)</td>
</tr>
<tr>
<td>53.</td>
<td>Channa striatus(Bl.)</td>
</tr>
<tr>
<td></td>
<td>Order 6. Cymbranchiformes</td>
</tr>
<tr>
<td></td>
<td>Family- Amphipnoidae</td>
</tr>
<tr>
<td>54.</td>
<td>Amphipnous cuchia(Ham.)</td>
</tr>
<tr>
<td></td>
<td>Order 7. Perciformes</td>
</tr>
<tr>
<td></td>
<td>Family- Centromochlididae</td>
</tr>
<tr>
<td>55.</td>
<td>Chanda nama(Ham.)</td>
</tr>
<tr>
<td>56.</td>
<td>Chanda rango(Ham.)</td>
</tr>
<tr>
<td></td>
<td>Order 8. Mastacembeliformes</td>
</tr>
<tr>
<td></td>
<td>Family- Mastacembelida</td>
</tr>
<tr>
<td>57.</td>
<td>Telapio mossambica(Peters)</td>
</tr>
<tr>
<td></td>
<td>Family- Nandidae</td>
</tr>
<tr>
<td>58.</td>
<td>Badis badis(Ham.)</td>
</tr>
<tr>
<td>59.</td>
<td>Nandus nandus(Ham.)</td>
</tr>
<tr>
<td></td>
<td>Order 9. Mastacembeliformes</td>
</tr>
<tr>
<td></td>
<td>Family- Mastacembelida</td>
</tr>
<tr>
<td>60.</td>
<td>Anabas testudinus(Bloch.)</td>
</tr>
<tr>
<td>61.</td>
<td>Anabas cobojius(Ham.)</td>
</tr>
<tr>
<td>62.</td>
<td>Colisa fasciata(Bl.&amp;Schn.)</td>
</tr>
<tr>
<td></td>
<td>Order 10. Mastacembeliformes</td>
</tr>
<tr>
<td></td>
<td>Family- Mastacembelida</td>
</tr>
<tr>
<td>63.</td>
<td>Glossogobius giuris(Ham.)</td>
</tr>
<tr>
<td>64.</td>
<td>Macrognathus aculeatus(Bloch)</td>
</tr>
<tr>
<td>65.</td>
<td>M.armatus (Lacepede)</td>
</tr>
<tr>
<td>66.</td>
<td>M.guntheri(Day.)</td>
</tr>
<tr>
<td>67.</td>
<td>Mastacembelus panaculus(Ham.)</td>
</tr>
</tbody>
</table>
**General Remark**

Since fishes have good nutritive, economic, medical and taxonomic value and solved the food and health problem up to certain extent, it is very essential to manage the water resources related with fish culture and their Biodiversity study. Though several limnological and biodiversitical studies have been conducted in rivers. Ponds, lakes and reservoirs but limnologists and taxonomists have not yet paid much attention towards the study of physic-chemical and biological factors with a view to enhance the fish fauna production and their biodiversity. Ponds, reservoir and rivers cover a major portion of fresh water of our country and are utilized for fish production and their biodiversitical study. However their Biodiversitical study is frustrating low. Hence the aim of current investigation was to conduct a fish fauna biodiversity and association index along with limnological study. The following facts could be ascertained after a through fish fauna Biodiversitical and limnological study of fresh water bodies.

1. Water bodies were opened and not protected from the sides, the fishing as well as netting is carried out by people before the fish grow their maximum size. During the period of investigation (July 2008 - 09 to June 2009-10) 67 fish species belonging to 18 families were recorded. Cyprinidae was dominated by 32 species followed by Bagridae with 7 species, Mastacembelede with 4 species, Cobitidae The physico-chemical factors vary with the seasons and the localities of water bodies.

2. Thermal and chemical stratification were not clear.

3. The water of the water bodies remained turbid throughout the study.

4. The Anabantidae and Ophiocephalidae each with 3 species, Siluridae, Centropomidae, Nandidae each with 2 species and Notopteridae, Schilbeidae, Saccobranchidae, Clariidae, Mugilidae, Cichidae, Gobiidae each with 1 species.

5. Cultivation of exotic species viz. Telapia affects the indigenous fish

6. Population. The population of fish varies with season and also with localities of water bodies. Decline of fish population is also marked due to pollution,
7. Small indigenous freshwater fish species form a major component of food consumed by families, especially those living closer to freshwater resources.

8. Among traditional communities indigenous knowledge about the health benefits of such species exists, for example, Amblypharyngodon mola commonly found, is often included in the diet of pregnant and lactating mothers.

9. Decline of fish population is also marked, due to pollution, urbanization, scarcity of food, shelter and habitat destruction and progressive eutrophication of water bodies.

10. Thirteen Dominating species from the fish collection shown the maximum value of association index these are *Catla catla*, *Cirhinus mrigala*, *Cyprinus carpio*, *Esomus danricus*, *Oxygastor baccalica*, *Mystus cavasius*, *Channa gachua*, *Channa striatus* and *Glossogobius giuris*.

11. The maximum value of positive association (AB +1.71) has been found in four species pairs they are (1) *Chanda ranga* - *Chanda nama* (2) *Anabas testudinus* - *Anabas coboijus* (3) *Macrognathus armatus* - *Macrognathus guntheri* and (4) *Ompok pabda* - *Mystus vittatus*.

12. The maximum value of negative association has been found in species pairs of *Garra gotyla* - *Macrognathus armatus*, *Garra gotyla* - *Macrognathus guntheri*, *Aspidoparia morar* - *Mastacembelus panaculus*, and *Crossocheilus latius* - *Mastacembelus panaculus*. 
Bibliography


Aziz, A. (1989); Ecological Study of Fish in relation with the Aquatic habitats in kerala Aquaculture, 50(1); pp. 210-215.


Boyle, T. P. 1980 Effects of the aquatic herbicide 2,4-D DMA on the ecology of experimental ponds. Environmental Poll. 21(Series A): 35-49


Braaten, W. And Berry. R. (1997); Studies of fish Biodiversity relation to their habitat conditions, Aquaculture, Sci. 75(2); pp. 226-230.


Caswell,H.H.,Jr.1956.the application ofmeasurs of association to analysis of ecological relationship among birds.Theresis Cornell University Library.


Cuplin, W. (1986); Methods for the assessment of fish habitat in various inland water bodies reference to stream, Trans.Am.Fish.Soc. 94(3); pp. 214-218.


Daniels, R.J.R. Endemic fishes of the Western Ghats and the Satpura hypothesis. Current Science; 81 (3): 240-244.


Greller, S. Et.al. (1997); Ecology study of Fish in relation with the Aquatic habitats in Kerala, Aquaculture, 41; pp. 229-234.


Hora, S. L. and D. D. Mukerji. 1935. Fish of the Naga Hills, Assam. Records of Indian Museum 37: 381-


Kottelat, M. 1990. Indochinese Nemacheilines, a revision of Nemacheiline loaches (Pisces: Cypriniformes) of Thailand, Burma, Laos, Cambodia and southern Viet Nam. Verlag Dr Friedrich Pfeil, Munchen, Germany.


Kumar, P. and Chattopadhyay, S. (1995); Ecology Study of Fish in relation with the Aquatic habitats in Kerala, Aquaculture, 52; pp. 631-635.


Muikerjee, D. D. (1931 River, NJ: Prentice-Hall.) On a small collection of 
fish from the Bhavani River (South India). Journal Of Bombay Natural 
History Society.35,162-171.

0858.

Warangal.


Nath, P. and S. C. Dey. 2000. Fish and fisheries of North Eastern India (Arunachal 

Nebeshwar, K., K. Bagra and D. N. Das. 2007. A new species of the Cyprinoid 
genus Psilorhynchoides Yazdani et al. from Arunachal Pradesh, 

601 pp.

Ng, H.H. 2004. Batasio elongatus, a new species of bagrid catfish from southwest 
Myanmar (Siluriformes: Bagridae). Ichthyological Exploration of 

Ng, H.H. and Kottelat, M. 2008. The identity of Clarias batrachus (Linnaeus, 1758), 
with the designation of a neotype (Teleostei: Clariidae). Zoological Journal 
of the Linnean Society 153: 725-732.

Ng, H.H. and Kottelat, M. 2007. A review of the catfish genus Hara, with the 
description of four new species (Siluriformes: Erethistidae). Revue Suisse 
de Zoologie. 114 (3): 471-505.

Biodoversity. 36-41 pp. In: Gupta, M.V., Bartley, D.M. and Acosta, B.O. 
(eds.). Use of genetically improved and alien species for aquaculture and


Perthiyagoda, R. & Kottelat, M. (1994) New species of fishes of the genera Osteochilichthys (Cyprinidae), Travancoria (Balitoridae) and Horabagrus (Bagridae) from the Chalakudy River, Kerala, India. Journal of South Asian Natural History. 1, 97-116.

Peter Artedi, J. (1705-1734); The problem of conserving fishes in the western Ghats India, Curr. Sci. 73(2), 169-170.


Exploitation Conservation and Management, 21-22 March, 206, Madurai kamaraj University, Madurai 625021.


Ray & Wellughby (1635-72) : Diversity, Diversity indices and Tropical Cockroaches, Oecologica 58 : pp. 290-298.

Ray, J. and Wellughby, N. (1935-72) Taxonomic uncertainties and conservation assessment of the Western Ghats, Curr. Sci. 60(11); pp. 530-532


Suraj. K. Et.al. (1979); Ecological Study of Fish in relation with the Aquatic habitats in Kerala, Aquaculture, 31 pp. 119-126.


Tamang, L., S. Chaudhry, and D. Choudhury. 2007. Ichthyofaunal Contribution to the state and comparison of habitat contiguity on taxonomic diversity in senkhi


Valenciennes's (1822-1850) Natural History of Fishes and systematic of freshwater fishes of India, Narendra Publication House, New Delhi, pp. 530-535.


Winston, R. (1945); Studies of fish Biodiversity relation to their habitat conditions, Aquaculture, Sci. 78; pp. 303-319.


