CHAPTER- 2

REVIEW OF LITERATURE

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Industrial pollution in water bodies have been dealt by Verma *et al.* (1978) and Curtis *et al.* (1979). A large numbers of workers reported effect of open cast mine on the hydrology, sediments and fauna of the area (Bradshaw and Chadwick, 1986, Mariance *et al.,* 1989). Galpon (1997) reported soil benches in lignite mine in Northwest Spain. Mine water and environment and waste land development were studied by Juwarkar *et al.* (1992). Water, air and soil pollution due to open cast mining was reported by Ghose *et al.* (2001) showed air pollution caused by open cast mining and its abatement measures in India. Parithankar and his co-worker (2001) stated Geo-environmental reclamation in open cast mining area in Vidarbha region in central India. Ramanathan and his co-worker (2002) reported environmental impact assessment in open cast mining region, a case study from the lignite mining area, Neyveli, TamilNadu. Garg *et al.* (2004) reported Methane and Nitrous oxide emission and mitigation on flexibility. Sing and Jha (1992) studied Mining environment and remedies. Panda (2002) reported impacts of Mahanadi coalfields on Darlipali village, Orissa.

Some important works in Assam are: Mine, water and environment in Margherita coalmine was studied by various worker notably Datta *et al.* (2007); Barpujari *et al.* (2006); Khanderwal *et al.* (2005); Hazarika *et al.* (1996) etc. Bhagabati (2002) reported water pollution related to oil fields in and around Sibsagar, Assam. Human induced changes in the Brahmaputra basin due to sediment transport and nutrient flux, Assam was reported by Mahanta and Goswasmi (2002). Dutta and his co-

worker (2004) reported Open cast mining and air quality assessment, Assam. Khanderwal *et al.* (2005) studied prediction of blast induced air overburden in open cast mine, Assam. Impact of coal mining on micro land-forms in Jaintia Hills, Meghalaya was reported by Maiti and her co-worker (2005). Hasin and Islam (2005) compared soil micro-fauna of coalmine and its neighbouring areas of Tikak open cast mine, Margherita, Assam. Barpujari *et al.* (2002) reported growth performance of five dominant plant species in coalmine spoil at Tikak OCM, Margherita, Assam. Mitra (2007) reported that recent survey by PCB, 2001, Assam deceted the presence of heavy metal like Ni, Cr and Pb in Bharalu river, stretching over 10 km from its point of origin near Assam – Meghalaya border.

Some important studies on the relationship of plankton diversity and water quality conducted by various workers are as follows- Toxicity of metals and insecticide are studied by various workers and they found alteration of hydrology and physiological status of the organism (Smith and Heath, 1979; Pascoe *et al.,* 1986; Zitko & Carson, 1976; Devi, 1994). Role of plankton to asses the water quality was analysed by various workers like Butterfield and Purdy (1931) reported some interrelationship of plankton and bacteria in natural purification of polluted water and found that bacterial sp. *B. aerogenes* is found to be a detoxifying bacteria. Polivannya *et al.* (1972) found zoo-plankton as bioindicator in Dnieper River, USSA and crustaceans; polyphagus insect like *Asplanchnidae, Branchioneus calyciflorous, Cyclopodidae etc.* as bioindicator. According to Hada (1974) extensive blooming of flagellates due to pollution in the Inland sea, Hirosima. Metals and several physicochemical parameters, from four sampling sites in a tropical lake receiving

the discharges from a thermal power plant, a coal mine and a chlor-alkali industry, were studied by Rao *et al.* (1982) and reported that use of plant and microbes as organic approach for reducing pollution of soil caused by hydrocarbon and heavy metal (India-Australia Workshop on Biotecnology, 22 Oct, 2008). Water quality of few tropical flood plain lakes of Brahmaputra river basin is reported by Sharma (2001).

Saha (2004) selected five coal field areas of Jharkhand state and determined the effect of coal dust in phytoplankton productivity in different seasons. Diversity indices were calculated by Sharma *et al.*(2005) for the marshy vegetation growing at the bank of three sites along a drain (lotic ecosystem) and three pools (lentic ecosystem), in order to quantify pollution caused by municipal and industrial wastes. Zooplankton density was reported by Zafar and Sultana (2005) in river Ganga and observed that zooplankton density was maximum during summer and minimum during rainy season at all the selected sites.

Metal toxicity and its impact on various organisms studied by various workers are as follows:-

It is well known that chemical pollutants present in water may induce severe ecological consequences, changing it and consequently affecting aquatic ecosystem's integrity which is also reported by (Heath, 1987; Vosyliene and Jankaite, 2006). Heavy metals are dangerous pollutants for aquatic inhabitants by themselves or by their toxic salts that have a great stability. Metal pollution of the surface waters happens widely by discharge of industrial effluents. Heavy metal

concentration in aquatic ecosystem poses an environmental hazard because of their toxicity and persistence measurements of accumulated metal toxicant concentrations are vital to the interpretation of impact of heavy metals overall aquatic biota (Weiner and Geisy, 1979; Bryan and Langston,1992; Binakumari *et al.,* 2010). The fishery culture is facing a constant decline in fish stocks, both in coastal and Inland water resources on account of constantly increasing water pollution. Among the metal pollutants, the heavy metals cause various abnormalities in fish as well as in humans when they eat. They may some times prove to be carcinogenic or produce teratogenic effects (Cicik and Engin, 2005). The two most important factors that contribute to the deleterious effects of heavy metals are pollutants of indestructible nature unlike organic pollutants and their tendency to accumulate in environment especially in the bottom sediments of aquatic habitats in association with organic and inorganic matter. For healthy fish production, it is very important to evaluate the harmful effects of heavy metals (Cunha *et al.,* 2007). Contamination of freshwater with heavy metal causes devastating effects on ecological balance of all the aquatic environments. The diversity of aquatic organisms becomes limited with the extent of pollution. Cadmium (Cd), Lead (Pb) and Mercury (Hg) are the heavy metals, which are highly toxic and carcinogenic to all animals including many aquatic organisms, because of their high toxicity, non-biodegradability and biomagnification tendencies (Reddy *et al.,* 1998). The heavy metals may accumulate in the body of fish either through "water path" or "food path" (Feldlite *et al.,* 2008). Heavy metals enter in to human

body through various routes including fish, poultry and livestock food products; ultimately disturb the "balance of nature" causing serious health hazards.

Metal pollution due to sewage, industrial effluents, pesticides in water bodies in relation to aquatic diversity was studied by varius wokers like Hada (1974) ; Patterson (1976) ; Angadi *et al.* (2005); Bahadur *et al.* (2005) and reported high Pb, Cu, Ni, Cr, Fe, As in soil and water of affected site.

Field study was carried out by Mahadeb *et al.* in 2004 on the pollution of two water bodies, Karanji lake and Dalvoi lake, Mysore city. The cluster analysis by Mruthunjaya (2004) indicated that the physico-chemical parameters are poorly related to the phytoplankton.

Extensive investigation were carried out by number of workers to study the changes occurred in the liver and other organs of different species of fish after the treatment with variuos insecticides. Olson and Fromm (1973); Dua (1994) ; Acharya *et al.*(2005); Kalele *et al.* (2005), Muthukumaravel *et al.* (2008)already did some works on the micro-anatomical level in different fish species on different target organs and with different chemicals like heavy metals, pesticides and isecticides. Histological changes induced by pesticides in the testes and ovary of fish are reported by Anees (1978); Pandey and Shukla (1985); Arora and Kulshrestha (1984); Singh and Sahai (1984, 85); Sadhu and Mukhopadhayay (1985); Roy Talukdar *et al.* (1985).

From the very beginning of toxicology, liver is one of the most target organ and workers like Woodward and Hagan (1947) and Haag *et al.* (1948). Woodward and

Hagan (1947) reported the effect of insecticide on liver by treating dogs with α-BHC. Moreover, Lang *et al.* (1950), Mathur (1962) observed liver cells with migration, hypertrophy, vacuolation necrosis in fishes exposed to BHC.

Several authors have shown that the histological changes in the gills of fishes exposed to various heavy metals, viz., mercury and copper in *Salmo gairdneri* (Doust *et al.*,1984), cadmimum in *Channa punctatus* (Dubale and Saha,1979) and copper and Zinc in *Puntius conchonius* (Kumar and Pant, 1981). The toxicity of pollutant may be increased or decreased by various water quality factors including pH, temperature, hardness and Dissolved Oxygen content of water (Zitko and Carson, 1976; Pasceo *et al.*, 1986). Smith and Heath (1979) showed that several species of fishes that their Lc50 was decreased with increasing temperature.

Studies of Pugazhendy *et al.* (2008) in industrial pollutants on the gill of Mullet fish, *Mugil cephalus* revealed the histological lesion in the gills. They observed thickening of primary lammellae, hyperplasmia in cartilaginous rod and appearance of vacoules in the gill rays, which might be due to entry of the toxic substances. Samanta (2007) noticed the fusion and atrophy of secondary gill lammellae and dissolution of epithelial cells of renal tubules, hypertrophy of the fish species after the treatment of different pesticide.

Several workers revealed the toxic effects of insecticides and different toxicants on kidney of land and aquatic organisms. Bakthavsthsalan *et al.* (2008) observed alteration in kidney of *Anabus* as a result of sub-lethal furadon tretment. In the fishes acute effects were noticed by the industrial pollution in the form of

degenaration of the tissues, cell walls, nuclei and vacoulations of kidney (Srivastava and Pandey, 1984). Mukherjee and Bhattacharya (1975) recorded lessions of different magnitude in hepato-pancrease of fishes kept in polluted water. Morphological changes in fish red blood cells under xenobiotic poisoining in fishes exposed to chlorine , copper, lead and other pollutants were reported by Buckley *et al.*,1976 ; Singh and Singh, 1982 ; Hardig *et al.*,1998; Sordyl, 1990. Works on different pollutants like pesticides, insecticides and heavy metals are considered as referential work in the study.